

ENVIRONMENTAL BASIC ASSESSMENT PROCESS
DRAFT BASIC ASSESSMENT REPORT

PROPOSED BIOMASS CO-FIRING DEMONSTRATION
FACILITY AT ARNOT POWER STATION,
MPUMALANGA PROVINCE

DEA Ref No: 12/12/20/2380

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environmental affairs

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REPUBLIC OF SOUTH AFRICA

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Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2010, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

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PROJECT DETAILS

DEA Reference No.	:	12/12/20/2380
Title	:	Environmental Basic Assessment process: Draft Basic Assessment Report: Proposed Biomass Co-firing Demonstration Facility at Arnot Power Station, Mpumalanga Province
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When used as a reference this report should be cited as: Savannah Environmental (2011) Draft Basic Assessment Report: Proposed establishment of the Eskom Biomass Co-Firing Demonstration Plant at Arnot Power Station, Mpumalanga Province.

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OVERVIEW OF THE PROPOSED PROJECT

CHAPTER 1

Eskom Holdings SOC Limited (Eskom) is proposing the establishment of biomass co-firing facility for demonstration purposes at the existing coal-fired Arnot Power Station located approximately 50 km east of Middleburg in the Mpumalanga Province (refer to Figure 1.1). This station has a nominal base load generation capacity of 2 400 MW, generated from six units, each with a nominal capacity of approximately 400 MW. Eskom is proposing the substitution of a limited amount of coal with biomass (white wood pellets) as a co-firing fuel source. These wood pellets are proposed to be sourced from a suitable source, as determined through a competitive bidding process. Potential sources have been identified in Mpumalanga, KwaZulu-Natal and the Eastern Cape. The wood pellets will be transported to the power station by road or rail, depending on the source selected. This project is considered a pilot exercise which will form part of Eskom's initiatives towards the reduction of their non-renewable carbon footprint.

The proposed project will be developed and implemented within the existing footprint of Arnot Power Station (i.e. it is a brownfields project). Two milling process options are to be considered within the Basic Assessment process, i.e.:

1. **Co-milling** of biomass and coal within the existing coal mills which will be fed into three of the units. This process will result in replacement of 5% of coal with biomass at three (3) units; and
2. **Separate milling** of coal and biomass which will be fed into only one of the units. This process will result in replacement of 10% of coal with biomass at one (1) unit.

Eskom propose that both of these methods be implemented to facilitate the phasing in of the biomass substitution within the power station. Due to time and infrastructure constraints, co-milling will initially be implemented, and will eventually be replaced by separate milling. Should the biomass not be available for any reason, the power station would continue being operated on 100% coal.

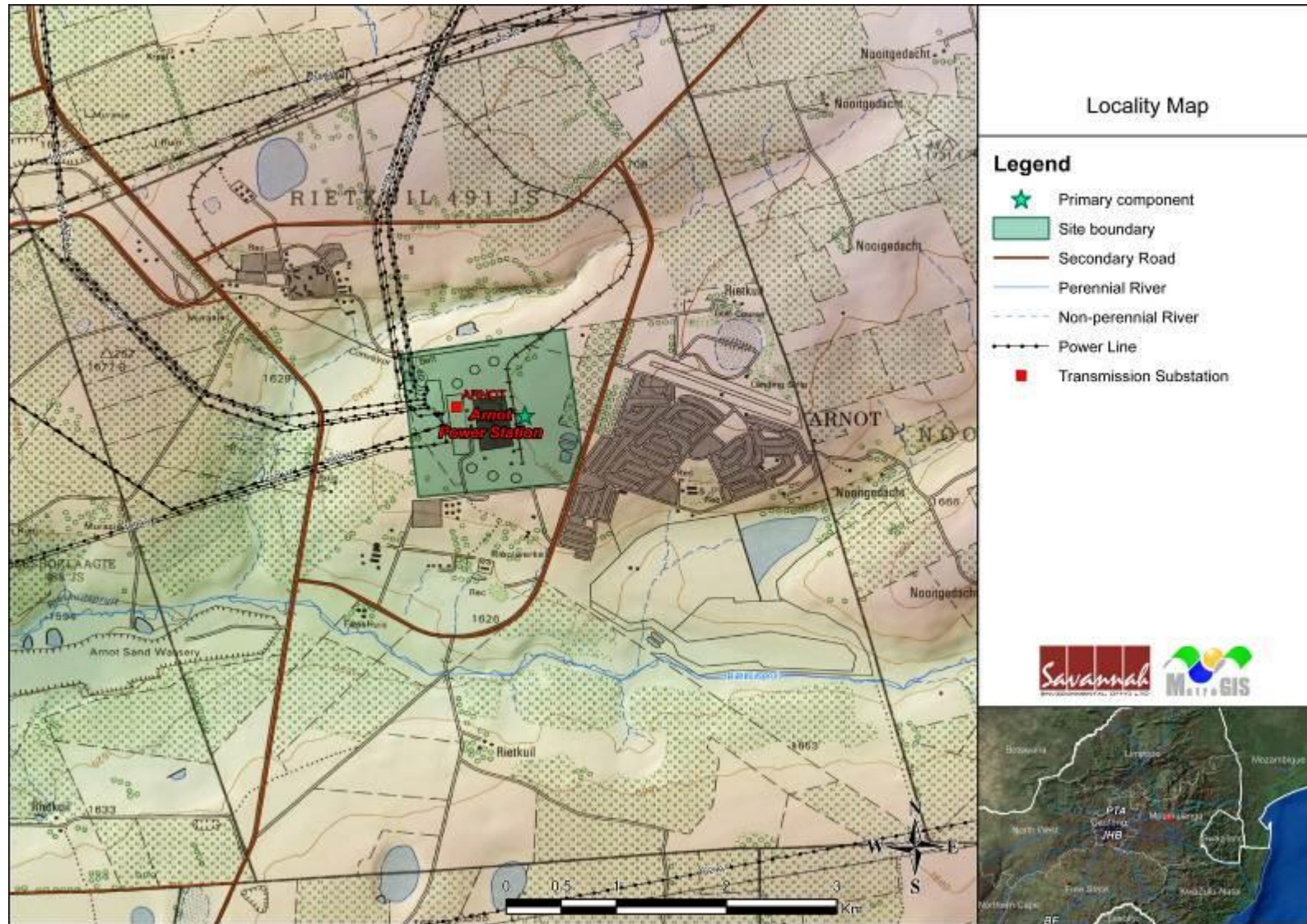


Figure 1.1: Locality map showing the location of the project development site within the footprint of the Arnot Power Station

The flow of biomass at the power station from the point of delivery to the point of entering the boiler is proposed as follows:

1. Access the plant via the coal delivery gate
2. Traverse across coal weighbridge
3. Off loading building
4. Convey to screening plant
5. Convey to Storage Silo

From this point, the following is applicable for the two milling options:

Co-milling:

- a) From storage silo to existing mill coal conveyor.
- b) From conveyor to coal bunker to existing coal milling plant
- c) From milling plant pneumatic transport to the boiler

Separate milling:

- a) Convey to Day Bin
- b) From Day bin to milling plant
- c) From milling plant pneumatic transport to the boiler

The associated infrastructure required as part of the demonstration facility will include:

- » *Roads* - existing roads and infrastructure will be used as far as possible. However, upgrading of internal existing roads and an additional new road portion will be constructed to enable the delivery of the biomass fuel. It is proposed that the existing gravel road, within the station boundaries, be extended for a distance of approximately 300 m (surface area of 8 m wide road - max 2400 m²) leading up to the off-load facility. The road is also extended into a loop system around the off loading facility. The loop road will be 4m wide and an estimate length of 500m (surface area of 4 m wide road - max 2000 m²). The proposed new portions of road will be tarred.
- » *Other infrastructure* - The construction of new buildings, conveyors and other infrastructure within the power station footprint will also be required in order to accommodate the biomass transportation, milling and temporary storage for separate milling.
- » *Storage* - Two metal storage silos are currently proposed. The first silo is the storage silo and the second is the day bin. Both are similar capacity of between 8 - 12 hours, but would have different discharge equipment. The storage silo is proposed to be located close to the current coal stockpile area,

and the day bin is proposed to be located adjacent to the boiler house above the milling plant. The two are linked by a conveyor of 200-300 m.

- » *Electricity supply* - power would be required for the delivery system, storage facility and screening plant required for the biomass transportation, milling and temporary storage. New transformers are likely to be required (i.e. bigger than 33 kVA), the existing switchgear rooms within the power station will need to be expanded, and a new switchgear room will be required at the offloading plant.
- » *Water* - supply for all activities will be sourced from the existing water allocation to Arnot Power Station (i.e. the station will share its water allocation among all operations).
- » *Waste disposal* - the biomass ash will be mixed with coal ash and disposed by means of the existing Arnot ash disposal system. Other waste associated with the proposed development (such as construction waste) will be disposed of in compliance with the power station's existing waste management procedures and processes.

1.1. Rationale for the Development of the Proposed Facility

1.1.1 National and International Climate Change Policy Context

Climate change-related activities are the subject of both national and international discussions; and domestic policy is being developed in tandem with international agreements. The Department of Environmental Affairs has produced a National Climate Change Response Green Paper which has gone through a public commenting period and is in the process of being turned into a white paper. The objectives of the national Government, which are contained in the draft Green Paper, are "to make a fair contribution to the global effort to achieve stabilization of greenhouse gas (GHG) concentrations..." and to "effectively adapt to and manage unavoidable and potential damaging climate change impacts..." and the White Paper is intended to outline Government's vision for an effective response in this regard. Given the wide-ranging consequences of both the projected climate change impacts and international responses to climate change issues, of necessity an effective domestic response should address all sectors of South Africa. On the international front, there is pressure for an inclusive and legally-binding agreement to be in place by the time the Kyoto Protocol expires in 2012. There was disappointment that such an agreement was not reached at the 15th meeting of the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) that was held in Copenhagen, Denmark, in December 2009. In the interim, the 16th meeting of the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) was held in Cancun, Mexico, in December 2010 and the next COP will

be hosted by South Africa in Durban from 28 November to 9 December 2011 where there is tremendous pressure on South Africa to host a successful COP 17 that will result in a global agreement and for South Africa itself to show leadership on the African Continent.

1.1.2 Taking opportunities of the carbon market including the CDM

The Clean Development Mechanism (CDM) is a market based mechanism that allows developed countries to purchase emissions reductions (as a result of developing clean projects e.g. renewable energy; energy efficiency; clean coal technologies; etc.) from developing countries in order to meet their own Kyoto Protocol emissions' targets. The Kyoto Protocol is the implementation vehicle that sets individual legally binding targets for industrialized (i.e. developed) countries prepared to take positive steps to reduce emissions of carbon dioxide (CO₂) and other greenhouse gases (GHGs) from sources within their boundaries (UNFCCC, 2006). In the Protocol the developed countries are known as Annex 1 parties while developing nations are referred to as non-Annex 1 parties. Emissions reductions (also known as carbon credits) generated from CDM projects are termed certified emissions reduction (CER), expressed in tonnes of CO₂ equivalent (tCO₂ eq.). The revenue accrued from these clean technology projects assists the developing countries towards promoting sustainable development. CDM is a compliance market regulated by the UNFCCC. The UNFCCC provides the basis for concerted international action to mitigate (reducing emissions) and to adapt to its impacts (UNFCCC, 2006).

This section seeks to support the Business Case for the construction of the Biomass Co-firing at Arnot Power Station by investigating an international commercial opportunity provided by the CDM for this project. The objective is to investigate the potential to generate tradable emissions reductions (carbon credits) from plant with partial fuel switch and possibly increase the capital revenue for the project by selling these carbon credits in the international carbon markets. The revenue from carbon credit sales will help offset the project's initial capital costs, and ongoing incremental biomass fuel costs. The intent to consider the project for CDM registration will be communicated to the public in parallel with the Basic Assessment (BA) process.

1.2. Requirement for an Environmental Impact Assessment Process

In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), authorisation is required from the National Department of Environmental Affairs (DEA) as the competent authority, in consultation with the Mpumalanga Department of Economic Development, Environment, and Tourism (MDEDET), for

the establishment of the proposed demonstration facility. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GN R543 – R546, a Basic Assessment process is required to be undertaken for the proposed project. The project has been registered with the National Department of Environmental Affairs as the **competent authority** under application reference number 12/12/20/2380.

Relevant Notice	Activity Number	Description of the Listed Activity	Applicability to Project
544, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where: (i) The electricity output is more than 10 MW but less than 20 MW; or (ii) The output is 10 MW or less but the total extent of the facility covers an area in excess of 1 ha.	Arnot Power Station is an existing coal-fired power station located approximately 50 km east of Middleburg in the Mpumalanga Province. Eskom is proposing the displacement of a limited amount (5% in each of 3 units with co-milling and 10% in one unit with separate milling) of coal with biomass (wood pellets) as a co-firing fuel source.
544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV; or (ii) Inside urban areas or industrial complexes with a capacity of 275 kV or more.	Electricity will be required at the project development site. An overhead power line has not been proposed for the supply of electricity from the power station. An additional transformer and switchgear would be needed.
544, 18 June 2010	22 (ii)	The construction of a road, outside urban areas where no reserve exists where the road is wider than 8 metres.	It is proposed that the existing gravel road, within the station boundaries, be extended for a distance of approximately 300m (surface area of 8 m wide road - max 2400 m ²) leading up to the off-load facility.
544, 18 June 2010	28	The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a permit	The proposed project would not affect the total generating capacity of the power station, but would require an amendment of the air

Relevant Notice	Activity Number	Description of the Listed Activity	Applicability to Project
		or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	emissions license which Eskom holds for the Arnot Power Station.
544, 18 June 2010	29	The expansion of facilities for the generation of electricity where: <ul style="list-style-type: none"> (i) The electricity output will be increased by 10 MW or more, excluding where such expansion takes place on the original development footprint; or (ii) Regardless the increased output of the facility, the development footprint will be expanded by 1 ha or more. 	The infrastructure required for the milling process (i.e. of the wood pellets) will be developed over an area of bigger than 1 ha on land within the broader footprint of the power station property.

1.3. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by Eskom to undertake the Basic Assessment process for the proposed demonstration facility. Neither Savannah Environmental, nor any of its specialist sub-consultants on this project are subsidiaries of, or are affiliated to Eskom. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of

projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The proposed project team members from Savannah Environmental include:

- » *Jo-Anne Thomas* is the project manager responsible for planning, programming, and overseeing of the Basic Assessment process. Jo-Anne has considerable experience (i.e. > 10 years) in conducting EIAs and in EIA project management.
- » *Tammy Kruger* is the Environmental Assessment Practitioner (EAP) responsible for preparation of the Basic Assessment report and assessment of environmental aspects. Tammy has more than 4 years' experience in the environmental field.
- » *Alicia Govender* is responsible for the public participation process. Alicia has 3.5 years' experience in the environmental field.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?

YES ✓

If YES, please complete the form entitled "Details of specialist and declaration of interest for appointment of a specialist for each specialist thus appointed.

Any specialist reports must be contained in Appendix D.

1. ACTIVITY DESCRIPTION

Describe the activity, which is being applied for, in detail¹:

Eskom Holdings SOC Limited (Eskom) is proposing the establishment of biomass co-firing facility for demonstration purposes at the existing coal-fired Arnot Power Station located approximately 50 km east of Middleburg in the Mpumalanga Province (refer to Figure 1.1). This station has a nominal base load generation capacity of 2 400 MW, generated from six units, each with a nominal capacity of approximately 400 MW. Eskom is proposing the two scenarios, phased as discussed.

- » Co-milling: A maximum of 5% coal by biomass displacement at 3 units;
- » Separate milling: A maximum of 10% displacement of coal by biomass at one unit.

This project is considered a pilot exercise which forms part of Eskom's initiatives towards the reduction of their non-renewable carbon footprint².

The proposed project will be developed and implemented within the existing footprint of the Arnot Power Station (i.e. it is a brownfields project). Should the biomass not be available for any reason, the power station would continue being operated on 100% coal.

Potential sources have been identified in Howick (KZN), at Coega (EC), in Sabie (Mpumalanga) and KwaMbonambi (KZN). The wood pellets will be transported to the power station by road or rail, depending on the source selected.

The flow of biomass at the power station from the point of delivery to the point of entering the boiler is proposed as follows:

6. Access the plant via the coal delivery gate
7. Traverse across coal weighbridge
8. Off loading building
9. Convey to screening plant

¹ Please note that this description should not be a verbatim repetition of the listed activity as contained in the relevant Government Notice, but should be a brief description of activities to be undertaken as per the project description.

² Biomass cofiring also releases carbon, but those emissions are considered "carbon neutral" as long as the fuel is sourced using sustainable practices

10. Convey to Storage Silo

From this point, the following is applicable for the two milling options:

Co-milling:

- d) From storage silo to existing mill coal conveyor.
- e) From conveyor to coal bunker to existing coal milling plant
- f) From milling plant pneumatic transport to the boiler

Separate milling:

- d) Convey to Day Bin
- e) From Day bin to milling plant
- f) From milling plant pneumatic transport to the boiler

Associated infrastructure required as part of the demonstration facility will include:

- » *Roads* - existing roads and infrastructure will be used as far as possible. However, upgrading of internal existing roads and an additional new road portion will be constructed to enable the delivery of the biomass fuel. It is proposed that the existing gravel road, within the station boundaries, be extended for a distance of approximately 300 m (surface area of 8 m wide road - max 2400 m²) leading up to the off-load facility. The road is also extended into a loop system around the off loading facility. The loop road will be 4m wide and an estimate length of 500m (surface area of 4 m wide road - max 2000 m²). The proposed new portions of road will be tarred.
- » *Other infrastructure* - The construction of new buildings, conveyors and other infrastructure within the power station footprint will also be required in order to accommodate the biomass transportation, milling and temporary storage for separate milling.
- » *Storage* - Two metal storage silos are currently proposed. The first silo is the storage silo and the second is the day bin. Both are similar capacity of between 8 - 12 hours, but would have different discharge equipment. The storage silo is proposed to be located close to the current coal stockpile area, and the day bin is proposed to be located adjacent to the boiler house above the milling plant. The two are linked by a conveyor of 200-300 m.
- » *Electricity supply* - power would be required for the delivery system, storage facility and screening plant required for the biomass transportation, milling and temporary storage. New transformers are likely to be required (i.e. bigger than 33 kVA), the existing switchgear rooms within the power station will need to be expanded, and a new switchgear room will be required at the offloading plant.
- » *Water* - supply for all activities will be sourced from the existing water allocation to Arnot Power Station (i.e. the station will share its water allocation among all operations).
- » *Waste disposal* - the biomass ash will be mixed with coal ash and disposed by means of the existing Arnot ash disposal system. Other waste associated with the proposed development (such as construction waste) will be disposed of in compliance with the power station's existing waste management procedures and processes.

What is Biomass

Biomass, a renewable energy source, is biological material from living or dead organisms. Biomass is commonly plant matter grown to generate electricity or produce heat, usually by direct incineration. By-products and waste from livestock farming, food processing, agriculture and preparation and domestic organic waste, can all form sources of biomass. Although fossil fuels have their origin in ancient biomass, they are not considered biomass by the generally accepted definition because they contain carbon that has been "out" of the carbon cycle for a very long time.

The biomass composition depends on the type of biomass, plant species, and part of the plant used, and a host of associated characteristics related to where and how the plant is grown. For the proposed project, it is intended to use wood pellets, made from sawdust residue and tree off-cuts or bark.

What is Co-Firing

Co-firing refers to the combustion of more than one different type of materials simultaneously, i.e. the burning of a biofuel (in this case wood pellets³) along with a more traditional fuel (i.e. coal). Two milling processes options are to be considered for the proposed co-firing. Eskom is considering a phased approach with co-milling as the first phase and separate milling as the second phase.

- » **Co-milling** of biomass and coal within the existing coal mills (a maximum of 5% coal by biomass displacement at 3 units) - where coal and biomass are pre-mixed and milled in the existing mills. The trucks loaded with biomass fuel will use the same access as being used currently by the coal trucks (i.e. the trucks will cross over the existing coal weighbridge). The existing gravel road will be used to access the new offloading area. The existing road, within the station boundaries, will be upgraded for a distance of approximately 300 m (surface area of 8 m wide road - maximum 2400 m²) leading up to the off-load facility to a tarred road and then extended into a loop system around the off-loading facility. The loop road will be 4 m wide and an estimated length of 500 m (surface area of 4 m wide road - max 2000 m²). The total new road will therefore be approximately 800m. The proposed new portions of road will be tarred.

The location of the new proposed off-loading facility is also within the station boundaries. The offloading building will be a covered shed with a concrete slab at the bottom. A front end loader will be used to load the biomass onto a loading hopper which will be equipped with a variable screw discharge feeder. Biomass will be blended onto the existing coal understaith reclaim conveyor. The existing coal infrastructure will be used to move the blend of biomass and coal to the coal bunkers and feed the existing coal mills. This system feeds three units; hence control of biomass pellet supply to only one unit is not possible. The biomass and coal will be milled and fired in the boiler via the existing systems at the plant.

³ The choice of biomass fuel is pelletized wood due to its similarities to a European benchmark (Amer Centrale Power Station).

» **Separate milling** of coal and biomass (a maximum of 10% displacement at one unit) - where biomass and coal are milled separately, milled biomass can then be injected into the existing pulverised coal lines or via separate burners. Road trucks will enter the power station property via the existing coal truck entrance and will cross over the existing coal weighbridge. As with co-milling, the existing gravel road will be used to access the new offloading area. A road truck offloading area is proposed at the open area at the northern side of the existing coal stockyard and the western side of coal staith 4. This new offloading area will incorporate the following:

- * A roofed area where the tarpaulin covers can be removed from the trucks.
- * Biomass sampling equipment.
- * A fully enclosed shed with a concrete floor and an elevated offloading ramp for side tipper trucks with dust extraction / dust suppression systems. A micro water spray system (mixture of water and air) may also be included to assist with dust control. The water usage will be minimal and will be obtained from Arnot Power Station water supply. Fire/explosion control systems will be included.
- * Biomass will be transported from the off-loading facility on a conveyor (estimated length of 34 m) to the screening plant. The conveyor will be enclosed to protect the biomass against the elements (i.e. wind and water).
- * The screening building will contain the vibrating screens provided for the separation of oversize and foreign materials as well as a metal separation system and may include an automated sampling facility. The metal separation system will comprise a mechanical magnet separation mechanism, and no chemical treatment will be involved. The waste metal will not be treated by Eskom but will most probably be returned to the fuel supplier. The expected footprint of the screening building will be 100 m² and comprise of mainly steel structures.
- * The discharge from the screening plant will feed onto an enclosed conveyor system (i.e. 100 m long) which will feed a coated metal transfer bin (144 m² – planned footprint) with an approximate capacity of 12 hours.
- * The discharge from the transfer bin will be conveyed to a day bin (i.e. 12 hours capacity) located above a new milling plant (144 m²) by means of inclined aero-conveyors (i.e. 315 m long). It is proposed that the day bin will be located near the unit 4 fabric filter plant or adjacent to the boiler house.
- * The day bin's outlet will be linked to hammer mills (milling plant). The feed into each mill will be by means of a variable speed screw feeder linked to the mill. Discharge from the mills will be by means of variable speed screw feeders into a pneumatic conveying pipeline arrangement. This pneumatic piping network will transport the milled feed stock to the pulverized fuel pipes or secondary air ports.

Baseline Conditions

- » **Climatic conditions** - The power station lies on the eastern edge of the Mpumalanga Highveld at approximately 1 680 m above sea level. This area subsequently experiences a temperate climate with summer rainfall and dry winters. Winters are mild and dry with average maximum temperatures dropping below 25 °C in May, June, July, and August but cold at night in June

and July when temperatures drop below 7 °C. Average summer maximums exceed 27 °C from September to March, with extremes reaching more than 30 °C particularly from December to January. In 2011, the area experienced an annual average rainfall of 643 mm with rain occurring almost exclusively in the summer months from October to March, with more than 60% of the rain occurring from November to February. Rainfall seldom occurs in winter between April and September. Generally the winds are light and seldom exceed 5.4 m/s.

- » Ambient air quality - the Arnot Power Station is located in the Steve Tshwete air quality hot spot⁴ identified in the Air Quality Management Plan for the Highveld Priority Area (HPA) (Republic of South Africa, 2011a). Exceedances do not occur throughout the hotspot, but in three nodes. Exceedances of the SO₂ standard occur in the Arnot node. The Arnot Power Station itself is an industrial source of air pollutants which is surrounded by agricultural land with a number of mining activities and heavy industry some distance away. In the Steve Tshwete air quality hotspot, modelling shows that the areas of non-compliance with ambient air quality standards include the Middelburg and Arnot nodes. This suggests that ambient air quality near the Arnot Power Station is relatively poor. In terms of existing sensitive receptors⁵ most of the area around the site is used for mining and agricultural activities with small holdings. The closest and most sensitive residential area near the Arnot Power Station is the residential township of Rietkuil, which is located immediately adjacent to the power station property. The western side of the Rietkuil boundary is located approximately 400 m away from the boiler stack on the southern end of the power station and 600 m away from the coal stockpiles on the northern end. The other sensitive receptors include the residential townships of Hendrina (~24 km, south-southwest), Pullens Hope (~20 km, west-southwest) and Kwazamokuhle (~22 km, south-southwest). Areas of ecological importance include the Middelburgdam (~27 km, northwest) and the Nooitgedacht Dam Nature Reserve (~24 km east-southeast).

2. FEASIBLE AND REASONABLE ALTERNATIVES

"Alternatives," in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to –

- (a) The property on which or location where it is proposed to undertake the activity;
- (b) The type of activity to be undertaken;
- (c) The design or layout of the activity;
- (d) The technology to be used in the activity;
- (e) The operational aspects of the activity; and
- (f) The option of not implementing the activity.

⁴ This in an area where measured or modelled ambient air quality standards are exceeded.

⁵ Sensitive receptors are defined as residential areas where individuals may be exposed to air pollutants when going about their daily activities i.e. commercial and residential.

Describe alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes etc.) or both are appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Paragraphs 3 – 13 below should be completed for each alternative.

No **site alternatives** have been proposed for the establishment of the proposed demonstration facility. Eskom identified Arnot Power Station as the most appropriate power station for the demonstration facility. The Arnot Power Station site is the closest site to the most probable biomass fuel source in the Mpumalanga province. In addition, the engineering design of the proposed biomass co-firing facility at Arnot Power Station closely matches similar European power stations that also co-fire biomass fuel. The site within the power station for the location of the biomass infrastructure was identified in order to ensure minimal disruption to the operation of the existing power station. As such, no feasible alternative sites were identified for investigation.

No **activity/technology alternatives** have been proposed for the establishment of the proposed demonstration facility. Due to time and infrastructure constraints, it is proposed that both of these methods be implemented to facilitate the phasing in of the biomass substitution within the power station. Co-milling will initially be implemented (as this method does not require additional infrastructure), and will eventually be replaced by separate milling. Therefore, the two methods are not alternatives to one another, but will both be implemented as part of the project phasing. Co-milling is less capital intensive and could be implemented in a shorter timeframe (as it would make use of existing infrastructure) whereas separate milling would require more investment in addition to expanding the footprint area of infrastructure within the existing power station. The separate milling approach is viewed as the worst case related to the impact it would have on the environment due to the additional footprint required for development.

No **design/layout alternatives** have been proposed for the establishment of the proposed demonstration facility. No alternatives of the layout were considered since the proposed new project is required to fit into the functioning of an existing system. The layout has therefore been drafted such that it does not interfere with the current operation of the power station and the existing infrastructure as-built. As such the design is based on a number of assumptions, i.e.:

- » The preferred power station for the implementation of the demonstration biomass co-firing facility is the Arnot Power Station. Within this power station footprint, a preferred site was identified on the basis of the area where the proposed infrastructure would have the least impact on the current operations of the power

station.
 » The design is to cater for road delivery of wood pellets.

No feasible **operating alternatives** can be implemented for a facility of this nature since it is to be implemented within an existing power station, which provides base load power to South Africa.

3. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

List alternative sites, if applicable.

Alternative:

Alternative S1⁶ (point at the centre of the proposed development area)
 Alternative S2 (if any)
 Alternative S3 (if any)

Latitude (S):		Longitude (E):	
25°	56.604'	29°	47.740'

In the case of linear activities:

Alternative:

Alternative S1 (preferred or only route alternative)

- Starting point of the activity
- Middle/Additional point of the activity
- End point of the activity

Latitude (S):		Longitude (E):	

Alternative S2 (if any)

- Starting point of the activity
- Middle/Additional point of the activity
- End point of the activity

Alternative S3 (if any)

- Starting point of the activity
- Middle/Additional point of the activity
- End point of the activity

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250m along the route for each alternative alignment.

⁶ "Alternative S." refers to site alternatives

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:

Size of the activity:

Alternative A1 ⁷	8 838 m ²
Alternative A2 (if any)	m ²
Alternative A3 (if any)	m ²

Or, for linear activities:

Alternative:

Alternative A1	m
Alternative A2 (if any)	m
Alternative A3 (if any)	m

Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:

Size of the site/servitude:

Alternative A1	m ²
Alternative A2 (if any)	m ²
Alternative A3 (if any)	m ²

5. SITE ACCESS

Does ready access to the site exist?

YES ✓	
	m

If NO, what is the distance over which a new access road will be built

Describe the type of access road planned:

The existing access road and entrance to the Arnot Power Station will be used. Existing roads and infrastructure will be used as far as possible. However, upgrading of internal existing roads and an additional new road portion will be constructed to enable the delivery of the biomass fuel. It is proposed that the existing gravel road, within the station boundaries, be extended for a distance of approximately 300 m (surface area of 8 m wide road - max 2400 m²) leading up to the off-load facility. The road is also extended into a loop system around the off loading facility. The loop road will be 4m wide and an estimate length of 500m (surface area of 4 m wide road – max 2000 m²). The proposed new portions of road will be tarred. The position of the entrance to the site and the internal access roads are indicated on the site plan contained in **Appendix A**.

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

⁷ "Alternative A." refers to activity, process, technology or other alternatives.

6. SITE OR ROUTE PLAN

A detailed site or route plan has been included as **Appendix A** to this document. The site or route plans indicates the following:

- 6.1 The scale of the plan which must be at least a scale of 1:500;
- 6.2 The property boundaries and numbers of all the properties within 50 metres of the site;
- 6.3 The current land use as well as the land use zoning of each of the properties adjoining the site or sites;
- 6.4 The exact position of each element of the application as well as any other structures on the site;
- 6.5 The position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, street lights, sewage pipelines, storm water infrastructure and telecommunication infrastructure;
- 6.6 All trees and shrubs taller than 1.8 metres;
- 6.7 Walls and fencing including details of the height and construction material;
- 6.8 Servitudes indicating the purpose of the servitude;
- 6.9 Sensitive environmental elements within 100 metres of the site or sites including (but not limited thereto):
 - Rivers;
 - The 1:100 year flood line (where available or where it is required by DWA);
 - Ridges;
 - Cultural and historical features;
 - Areas with indigenous vegetation (even if it is degraded or invested with alien species);
- 6.10 For gentle slopes the 1 metre contour intervals must be indicated on the plan and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the plan; and
- 6.11 The positions from where photographs of the site were taken.

7. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this form. It must be supplemented with additional photographs of relevant features on the site, if applicable.

Colour photographs have been taken from the centre of the proposed site in the eight major compass directions; refer to **Appendix B**.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

Facility illustrations which represent the proposed infrastructure are attached within **Appendix C**.

9. ACTIVITY MOTIVATION

9(a) Socio-economic value of the activity

The details provided below are estimations at this stage in the project planning process. These details will only be confirmed following the final design of the demonstration facility and determination of the source of biomass.

What is the expected capital value of the activity on completion?	R1.15 billion
What is the expected yearly income that will be generated by or as a result of the activity?	Nil
Will the activity contribute to service infrastructure?	YES✓
Is the activity a public amenity?	YES✓
How many new employment opportunities will be created in the development phase of the activity?	Nil
What is the expected value of the employment opportunities during the development phase?	Nil
What percentage of this will accrue to previously disadvantaged individuals?	Nil
How many permanent new employment opportunities will be created during the operational phase of the activity?	Nil - Eskom will resource this project from existing resources and do not at this point foresee that employment will be created during the co-firing proof of concept.
What is the expected current value of the employment opportunities during the first 10 years?	Nil
What percentage of this will accrue to previously disadvantaged individuals?	Nil

9(b) Need and desirability of the activity

Motivate and explain the need and desirability of the activity (including demand for the activity):

NEED:		
1.	Was the relevant provincial planning department involved in the application?	YES✓
2.	Does the proposed land use fall within the relevant provincial planning framework?	YES✓
3.	If the answer to questions 1 and / or 2 was NO, please provide further motivation / explanation:	

DESIRABILITY:			
1.	Does the proposed land use / development fit the surrounding area?	YES✓	
2.	Does the proposed land use / development conform to the relevant structure plans, SDF, and planning visions for the area?	YES✓	
3.	Will the benefits of the proposed land use / development outweigh the negative impacts of it?	YES✓	
4.	If the answer to any of the questions 1 - 3 was NO, please provide further motivation / explanation:		
5.	Will the proposed land use / development impact on the sense of place?		NO✓
6.	Will the proposed land use / development set a precedent?		NO✓
7.	Will any person's rights be affected by the proposed land use / development?		NO✓
8.	Will the proposed land use / development compromise the "urban edge"?		NO✓
9.	If the answer to any of the question 5 - 8 was YES, please provide further motivation / explanation.		

BENEFITS:			
1.	Will the land use / development have any benefits for society in general?	YES✓	
2.	Explain: The displacement of coal with wood pellets for the firing of the power station will positively affect society in general through the reduction of the power station's non-renewable carbon footprint.		
3.	Will the land use / development have any benefits for the local communities where it will be located?		NO✓
4.	Explain: The proposed project is located within the footprint of the existing Arnot Power Station. Eskom will resource this project from existing resources and do not at this point foresee that additional job opportunities will be created during the co-firing proof of concept. This will however only be confirmed during the final design phase of the demonstration facility.		

10. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline: **Administering authority:** **Date:**

Title of legislation, policy or guideline:	Administering authority:	Date:
National Environmental Management Act (Act No. 107 of 1998)	» National and Provincial Department of Environmental Affairs	1998
National Environmental Management: Waste Act (Act No. 59 of 2008)	» National and Provincial Department of Environmental Affairs	2008
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	» National and Provincial Department of Environmental Affairs	2004
National Water Act (Act No. 36 of 1998)	» National Department of Water Affairs » Mpumalanga Department of Water Affairs	1998
Environment Conservation Act (Act No. 73 of 1989)	» National and Provincial Department of Environmental Affairs	1989
National Heritage Resources Act (Act No. 25 of 1999)	» South African Heritage Resources Agency	1999
Hazardous Substances Act (Act No. 15 of 1973)	» Department of Health	1973
National Road Traffic Act (Act No. 93 of 1996)	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	1996
Promotion of Access to Information Act (Act No. 2 of 2000)	» National Department of Environmental Affairs	2000
Promotion of Administrative Justice Act (Act No. 3 of 2000)	» National Department of Environmental Affairs	2000
Policies and White Papers		
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» N/A	1998
The White Paper on Renewable Energy (November 2003)	» N/A	2003
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» N/A	N/A

11. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

11(a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase

YES ✓

If yes, what estimated quantity will be produced per month?

To be determined through the final design of the facility

How will the construction solid waste be disposed of (describe)?

This will be disposed of at an approved waste disposal facility. This disposal will be in compliance to the power station's existing waste disposal procedures and processes.

Where will the construction solid waste be disposed of (describe)?

This will be disposed of at an approved waste disposal facility. This disposal will be in compliance to the power station's existing waste disposal procedures and processes.

Will the activity produce solid waste during its operational phase?

If yes, what estimated quantity will be produced per month?

YES✓
To be determined through the final design of the facility

How will the solid waste be disposed of (describe)?

The ash produced from the burning of the biomass within the power generation process for both the separate and co-milling operation will be disposed by means of the existing Arnot ash disposal system.

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

The ash produced from the burning of the biomass within the power generation process for both the separate and co-milling operation will be disposed by means of the existing Arnot ash disposal system.

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?

NO✓

If yes, inform the competent authority and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility?

NO✓

If yes, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

11(b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?

	NO ✓
--	-------------

If yes, what estimated quantity will be produced per month?

	m ³
--	----------------

Will the activity produce any effluent that will be treated and/or disposed of on site?

	NO ✓
--	-------------

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?

	NO ✓
--	-------------

If yes, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

Not applicable.

11(c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere?

YES ✓	
National Environmental Management: Air Quality Act (39 of 2004)	

If yes, is it controlled by any legislation of any sphere of government?

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Eskom already holds an air quality permit for the existing power station activities. Therefore, the relevant listed activity (i.e. Activity 28 of GN 544) requires that a Basic Assessment process be undertaken as the air emissions license will be amended. This is the purpose of this report.

If no, describe the emissions in terms of type and concentration:

N/A

11(d) Generation of noise

Will the activity generate noise?

NO ✓

If yes, is it controlled by any legislation of any sphere of government?

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the noise in terms of type and level:

Noise associated with the biomass operations will not add to the existing noise generated by the power station. However, in light of the baseline noise conditions, the potential for significant noise generation is not considered significant.

12. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(s)

Municipal	Water board	Groundwater	River, stream, dam or lake	Other⁸ ✓	The activity will not use water
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If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:

--

Does the activity require a water use permit from the Department of Water Affairs?⁹

NO ✓

If yes, please submit the necessary application to the Department of Water Affairs and attach proof thereof to this application if it has been submitted.

13. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Additional power will be required at the delivery point for the delivery system, storage facility and screening plant. Additional power will also be required at the day storage facility for the new mills and additional switchgear may be required for equipment hook-ups. Power needs are not known at present; however it is expected to be additional power boards on existing circuits. Additional transformer(s) will be required to be installed bigger than 33 kVA and the existing switchgear rooms within the power station are to be extended with a new switchgear room at the offloading plant.

It is not possible to reduce the energy requirements of the proposed facility.

⁸ Water will be used from the existing allocation to the power station from the Komati Water Scheme.

⁹ Water will be sourced from Arnot Power Station's existing Water Use License which has spare capacity of 10 000 ML per annum to accommodate requirements of the co-firing pilot project.

However, it must be noted that energy efficiency of the power generation system at Arnot Power Station has been one of the main design optimisation criteria that was employed during the design of the additional plant and the selection of the relevant plant equipment.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

The intention of the new plant infrastructure is to prove the concept of biomass co-firing at an operational station. The optimisation of the design that would include energy efficiency evaluations are not part of the current scope of the project. Optimisation efforts could be done once the concept of co-firing has been proven.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

For linear activities (pipelines, etc.) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section C and indicate the area, which is covered by each copy No. on the Site Plan.

Section C Copy No. (e.g. A):

1. Paragraphs 1 - 6 below must be completed for each alternative.

2. Has a specialist been consulted to assist with the completion of this section? **NO** ✓

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed.

All specialist reports must be contained in **Appendix D**.

Property description/physical address:

(Farm name, portion etc.) Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application.

In instances where there is more than one town or district involved, please attach a list of towns or districts to this application.

Current land-use zoning:

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to , to this application.

Is a change of land-use or a consent use application required? **NO** ✓
Must a building plan be submitted to the local authority? **NO** ✓

Locality map: An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.) The map must indicate the following:

- An indication of the project site position as well as the positions of the alternative sites, if any;
- Road access from all major roads in the area;
- Road names or numbers of all major roads as well as the roads that provide access to the site(s);
- All roads within a 1km radius of the site or alternative sites; and
- A north arrow;
- A legend; and
- Locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection).

The locality map has been included and attached as **Appendix A**:

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

Flat✓	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5
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Alternative S2 (if y):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5
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Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5
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2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

Alternative S1:

- 2.1 Ridgeline
- 2.2 Plateau
- 2.3 Side slope of hill/mountain
- 2.4 Closed valley
- 2.5 Open valley

2.6 Plain ✓

- 2.7 Undulating plain / low hills
- 2.8 Dune
- 2.9 Seafront

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following (tick the appropriate boxes)?

	Alternative S1:	Alternative S2 (if any):		Alternative S3 (if any):	
Shallow water table (less than 1.5m deep).	NO ✓	YES	NO	YES	NO
Dolomite, sinkhole, or doline areas.	NO ✓	YES	NO	YES	NO
Seasonally wet soils (often close to water bodies).	NO ✓	YES	NO	YES	NO
Unstable rocky slopes or steep slopes with loose soil.	NO ✓	YES	NO	YES	NO
Dispersive soils (soils that dissolve in water).	NO ✓	YES	NO	YES	NO
Soils with high clay content (clay fraction more than 40%).	NO ✓	YES	NO	YES	NO
Any other unstable soil or geological feature.	NO ✓	YES	NO	YES	NO
An area sensitive to erosion.	NO ✓	YES	NO	YES	NO

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. (Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted).

4. GROUNDCOVER

Indicate the types of groundcover present on the site:

The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Alternative S1:

Natural veld - good condition ^E	Natural veld with scattered aliens ^E	Natural veld with heavy alien infestation ^E	Veld dominated by alien species ^E	Gardens✓
Sport field	Cultivated land	Paved surface	Building or other structure✓	Bare soil✓

If any of the boxes marked with an "E" is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that does currently occur within a 500 m radius of the site and give description of how this influences the application or may be impacted upon by the application:

- 5.1 Natural area
- 5.2 Low density residential
- 5.3 Medium density residential
- 5.4 High density residential
- 5.5 Informal residential^A
- 5.6 Retail commercial and warehousing
- 5.7 Light industrial
- 5.8 Medium industrial^{AN}
- 5.9 Heavy industrial^{AN}
- 5.10 Power station**
- 5.11 Office/consulting room
- 5.12 Military or police base/station/compound
- 5.13 Spoil heap or slimes dam^A
- 5.14 Quarry, sand, or borrow pit
- 5.15 Dam or reservoir**
- 5.16 Hospital/medical centre
- 5.17 School
- 5.18 Tertiary education facility
- 5.19 Church
- 5.20 Old age home
- 5.21 Sewage treatment plant^A

- 5.22 Train station or shunting yard ^N
- 5.23 Railway line ^N
- 5.24 Major road (4 lanes or more) ^N
- 5.25 Airport ^N
- 5.26 Harbour
- 5.27 Sport facilities
- 5.28 Golf course
- 5.29 Polo fields
- 5.30 Filling station ^H
- 5.31 Landfill or waste treatment site
- 5.32 Plantation
- 5.33 Agriculture
- 5.34 River, stream or wetland
- 5.35 Nature conservation area
- 5.36 Mountain, koppie or ridge
- 5.37 Museum
- 5.38 Historical building
- 5.39 Protected Area
- 5.40 Graveyard
- 5.41 Archaeological site
- 5.42 Other land uses (describe)

If any of the boxes marked with an "N" are ticked, how will this impact / be impacted upon by the proposed activity?

--

If any of the boxes marked with an "AN" are ticked, how will this impact / be impacted upon by the proposed activity?

If YES, specify and explain:

If YES, specify:

If any of the boxes marked with an "H" are ticked, how will this impact / be impacted upon by the proposed activity.

If YES, specify and explain:

If YES, specify:

6. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including

	NO✓
	NO✓

Archaeological or palaeontological sites, on or close (within 20m) to the site?

If YES, explain:

--

If uncertain, conduct a specialist investigation by a recognised specialist in the field to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist:

--

Will any building or structure older than 60 years be affected in any way?

	NO✓
	NO✓

Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?

If yes, please submit or, make sure that the applicant or a specialist submits the necessary application to SAHRA or the relevant provincial heritage agency and attach proof thereof to this application if such application has been made.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENTS AND NOTICES

- » A2 site notices, in both English and Afrikaans, were placed on the entrance fence at the Arnot Power Station.
- » A stakeholder letter was distributed to the database of registered parties. This included relevant officials from the Mpumalanga Department of Economic Development, Environment, and Tourism, the Provincial Roads Department, the Department of Energy, the Department of Water Affairs, the Department of Agriculture, Forestry, and Fisheries, key stakeholders, and organs of state relevant to the proposed project. The stakeholder letters served to announce the proposed project and invite comment on the Draft Basic Assessment Report.
- » A notice was placed in The Middleburg Observer to advertise the Basic Assessment process and the availability of the Draft Basic Assessment Report.

Refer to Appendix E for proof of placement of the advertisements, site notice, and letters to stakeholders.

2. CONTENT OF ADVERTISEMENTS AND NOTICES

The contents of the notices and adverts were in accordance with the following requirements:

- (a) Indicate the details of the application which is subjected to public participation; and
- (b) State –
 - (i) That the application has been submitted to the competent authority in terms of these Regulations, as the case may be;
 - (ii) Whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental Authorisation;
 - (iii) The nature and location of the activity to which the application relates;
 - (iv) Where further information on the application or activity can be obtained; and
 - (iv) The manner in which and the person to whom representations in respect of the application may be made.

3. PLACEMENT OF ADVERTISEMENTS AND NOTICES

Where the proposed activity may have impacts that extend beyond the municipal area where it is located, a notice must be placed in at least one provincial newspaper or national newspaper, indicating that an application will be submitted to the competent authority in terms of these regulations, the nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations in respect of the application can be made, unless a notice has been placed in any Gazette that is published specifically for the purpose of providing notice to the public of applications made in terms of the EIA regulations.

Advertisements and notices must make provision for all alternatives.

The proposed installation is unlikely to result in any impacts that extend beyond the municipal area where it is located. However, the transportation of biomass will be over a distance of 200km or more, the sources of which are located within another municipal area and/or province. Therefore, it was deemed necessary to advertise in local, regional and national newspapers.

The advertisement placed detailed the Basic Assessment process, the nature, and location of the proposed project, where further information on the proposed activity could be obtained and the manner in which representations on the application could be made. The advertisement also indicated the availability of the draft Basic Assessment Report for public review. At submission of Final Basic Assessment Report (FBAR), registered Interested and Affected Parties (I&APs) will be notified.

Copies of the advertisement and proof of placement are included within Appendix E.

4. DETERMINATION OF APPROPRIATE MEASURES

The practitioner must ensure that the public participation is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees, ratepayers associations and traditional authorities where appropriate. Please note that public concerns that emerge at a later stage that should have been addressed may cause the competent authority to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was inadequate.

Due to the small footprint and the localised nature of the proposed project within a power station (i.e. brownfields site) a public meeting was not deemed necessary. The use of a stakeholder database and letters, an advertisement, and site notices was deemed adequate for the involvement of the public in the process.

5. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments and respond to each comment of the public before the application is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to this application. The comments and response report must be attached under Appendix E.

All issues, comments, and/or concerns raised thus far have been attached as Appendix E6. All comments received, as well as responses provided will be captured and recorded within the Comments and Response Report attached with the Final Basic Assessment Report.

6. AUTHORITY PARTICIPATION

Please note that a complete list of all organs of state and or any other applicable authority with their contact details must be appended to the basic assessment report or scoping report, whichever is applicable.

Authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input.

Authorities were informed of the Basic Assessment process through the submission of stakeholder letters:

- » National Department of Environmental Affairs
- » Mpumalanga Department of Economic Development, Environment and Tourism
- » Mangaung Municipality
- » Steve Tshwete Local Municipality
- » Nkangala District Municipality
- » Thaba Chewu Municipality
- » Department of Water Affairs
- » Provincial Roads Department
- » Department of Energy

List of authorities from whom comments have been received:

To date comment has been received from the Department of Agriculture who requested a site visit. The EAP has subsequently explained that the project is within the footprint of the power station. The Department of Agriculture has therefore indicated that they do not need to visit the site.

All issues, comments, and/or concerns raised thus far have been attached as Appendix E6. All comments received, as well as responses provided will be captured and recorded within the Comments and Response Report attached with the Final Basic Assessment Report.

7. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for linear activities, or where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub regulation to the extent and in the manner as may be agreed to by the competent authority. Proof of any such agreement must be provided, where applicable.

A stakeholder database of is attached in Appendix E.

Has any comment been received from stakeholders?

YES ✓

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

To date comment has only been received from Department of Agriculture.

All issues, comments, and/or concerns raised thus far have been attached as Appendix E6. All comments received, as well as responses provided will be captured and recorded within the Comments and Response Report attached with the Final Basic Assessment Report.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2010, and should consider applicable official guidelines. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

List the main issues raised by interested and affected parties.

No issues have been raised to date.

Response from the practitioner to the issues raised by the interested and affected parties (A full response must be given in the Comments and Response Report that must be attached to this report as Annexure E):

The Comments and Response Report includes comments received on the proposed project as well as responses from members of the project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA Process, clear reasoning for this view is provided.

2. IMPACTS THAT MAY RESULT FROM THE PLANNING, DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING, AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

List the potential direct, indirect and cumulative property/activity/design/technology/operational alternative related impacts (as appropriate) that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

2.1. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN PHASE

Alternative (preferred alternative)

No impacts are anticipated that may result from the planning and design phase of the proposed development. The identified site has already been transformed for industrial purposes (i.e. power generation) and therefore no excavation/exploratory work which may affect the environment is anticipated to be required.

2.2. IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION PHASE

Potential impacts associated with the construction of the proposed project are

discussed below. The following methodology was used in assessing impacts related to the proposed development. All impacts are assessed according to the following criteria:

- » The **nature**, a description of what causes the effect, what will be affected, and how it will be affected.
- » The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).
- » The **duration**, wherein it is indicated whether:
 - * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - * The lifetime of the impact will be of a short duration (2–5 years) - assigned a score of 2;
 - * Medium-term (5–15 years) – assigned a score of 3;
 - * Long term (> 15 years) - assigned a score of 4; or;
 - * Permanent - assigned a score of 5.
- » The **magnitude**, quantified on a scale from 0–10, where a score is assigned:
 - * 0 is small and will have no effect on the environment;
 - * 2 is minor and will not result in an impact on processes;
 - * 4 is low and will cause a slight impact on processes;
 - * 6 is moderate and will result in processes continuing but in a modified way;
 - * 8 is high (processes are altered to the extent that they temporarily cease); and
 - * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- » The **probability** of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
 - * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
 - * Assigned a score of 2 is improbable (some possibility, but low likelihood);
 - * Assigned a score of 3 is probable (distinct possibility);
 - * Assigned a score of 4 is highly probable (most likely); and
 - * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- » The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- » The **status**, which is described as either positive, negative or neutral.
- » The degree to which the impact can be reversed.
- » The degree to which the impact may cause irreplaceable loss of resources.
- » The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$S=(E+D+M)P$; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance** weightings for each potential impact are as follows:

- » **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- » **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- » **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

Nature of impact: Dust creation and air quality impacts		
<p>During the construction phase impacts related to dust creation and noise are expected which may affect surrounding landowners. Dust emissions during construction result mainly from earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. All aspects of the construction inherently generate dust, but the movement of construction vehicles on paved and unpaved surfaces at the construction site are generally the largest source of dust. Dust is also easily entrained from exposed areas by the wind.</p> <p>Construction activities will result in the emission of low quantities of terrestrial and construction dust, the impact of which is more of a nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100 m to 1 km of the Arnot Power Station. A temporary nuisance impact may be experienced in parts of Rietkuil, only 500 m away.</p>		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Immediate (1)	Immediate (1)
Magnitude	Moderate (6)	Low (4)
Probability	High (3)	Low (2)
Significance	Low (24)	Low (12)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
<p>Mitigation measures:</p> <ul style="list-style-type: none"> » Implementation of a dust management plan. » Construction activities should be confined to a clearly demarcated area. » The vehicles transporting the components required for the facility and the associated construction materials may only use the existing access roads/tracks. 		

- » Any waste/spoil material should be removed and taken off-site to a licensed waste disposal facility.
- » The appropriate measures must be taken to limit the creation of additional dust and noise which will exacerbate existing conditions at the power station.
- » The relevant personal protective equipment should be used at all times.

Cumulative impact:

- » With respect to cumulative impacts, mining and agricultural activities, tailings dams, and domestic fuel burning in the area are identified as existing sources of dust. There will thus be a cumulative impact with dust generated during construction.

Residual impact:

- » No residual impact that last beyond the construction phase is expected.

Nature of impact: Job creation

From a social perspective, there are unlikely to be any positive impacts resulting from job opportunities during the construction phase, as Eskom has indicated that no new employment opportunities will be created. As such the potential significance rating is not assessed further.

2.3. IMPACTS THAT MAY RESULT FROM THE OPERATIONAL PHASE

Nature of impact: Waste creation

The burning of biomass both as part of the co-milling and/or separate milling operations will not create additional waste. Rather it will replace a certain percentage of the waste generated by the burning of coal. The waste generated by the proposed facility will be disposed of in the same manner as is already used by the power station. As such no additional impacts are expected and therefore the potential significance rating is not assessed further.

Nature of impact: Impacts on air quality

Direct impacts will result from the continued inhalation of NO₂, SO₂ and particulates (PM₁₀) emitted during the operational phase (i.e. as part of the combustion process).

Particulate emissions from the Arnot Power Station contribute to the current ambient PM₁₀ concentrations of the eastern Highveld. However the modelled cumulative concentrations comply with the national ambient standards. The impacts associated with PM₁₀ have a low significance. Since the predicted concentrations of PM₁₀ for the biomass co-firing scenario are lower than for the baseline scenario (coal only), the proposed project biomass co-firing is expected to have a positive impact on air quality in terms of PM₁₀.

For SO₂ the predicted annual average concentration complies with the national ambient standard for coal, as well as for the coal and the wood biomass mix. The cumulative concentrations also comply with the annual standard. The introduction of wood biomass results in a marginal reduction in predicted ambient SO₂ concentrations, but it is unlikely that the reduction can be measured. Since the predicted concentrations of

SO₂ for the biomass co-firing scenario are lower than for the baseline scenario (coal only), the proposed project is expected to have a positive impact on air quality in terms of SO₂.

For NO_x the predicted annual average concentration complies with the national ambient standard for NO₂ for coal, as well as for the coal and the wood biomass mix. The cumulative concentrations also comply with the annual standard. NO₂ emissions from Arnot Power Station contribute to current ambient concentrations. However the modelled cumulative concentrations comply with the national ambient standards. Since the predicted concentrations of NO_x for the biomass co-firing scenario are lower than for the baseline scenario (coal only), the proposed project is expected to have a positive impact on air quality in terms of NO_x.

Indirect impacts associated with the SO₂ and NO_x emissions relate to acidification, and those associated with CO and CO₂ relate to global warming. The magnitude of indirect impacts associated with the two operational scenarios (i.e. the baseline scenario and the scenario with biomass added as a fuel source) relates to the relative contribution to acidification and global warming. While quantification of the relative contribution of CO and CO₂ from Arnot Power Station is difficult, the contribution is considered to be relatively small in the national and global context, and the non-renewable source of CO and CO₂ would be somewhat less for the co-fired option. The significance of the indirect impacts is therefore anticipated to be low for both operational scenarios. The carbon content of wood is less than that of coal. Despite this, the CO₂ emission is expected to increase by 0.08% and 0.12% for 10% and 5% wood biomass substitution on one and three units, respectively. This is an equivalent increase of 31 ton/day of CO₂ for a 10% substitution in one unit and 48 ton/day for a 5% substitution in each of three units. The increase is counter intuitive and results as more wood is required than coal to generate an equivalent amount of heat due to its lower calorific value. The biomass co-firing option will however reduce Arnot Power Station's reliance on fossil fuel (coal) by up to 10% as biomass is a renewable source of energy. Therefore, on a holistic basis, there will be a reduction (albeit marginal) in the non-renewable carbon footprint associated with power generation at the Arnot Power Station.

In terms of emissions, the increased number of trucks (i.e. 35 per day) has been taken into consideration. The activity rate was taken as the total distance travelled by the trucks per day on the gravel road¹⁰. The emissions for PM₁₀ were estimated to be 5.64 ton/year and for total suspended particulate matter 22 ton/year. The activity rate was taken as the total distance travelled by the trucks per day on the gravel road. The emissions for PM₁₀ were estimated to be 0.95 ton/year and 22 ton/ year for NO_x.

	Coal only	10% biomass substitution
Extent	Local/municipal extending only as far	Local/municipal extending only as

¹⁰ The length of the gravel road was estimated to be about 800 m. The total distance travelled by the 35 trucks on the gravel road was calculated to be 28 km/day.

	as the local community or urban area (5)	far as the local community or urban area (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (4)
Probability	High (4)	High (4)
Significance	Medium (60)	Medium (52)
Status (positive or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation measures:		
» Plant engineers and operators are to continue ensure that the abatement technology that is currently installed is always in working order and maintained on a regular basis as per standard operating procedures.		
Cumulative impact:		
» The Arnot Power Station is surrounded by agricultural land with a number of mining activities; and heavy industry some distance away. This will lead to some cumulative impacts on sensitive receptors in the immediate vicinity of the power station.		
Residual impact:		
» Not expected.		

Nature of impact: Job creation

From a social perspective, there are unlikely to be any positive impacts resulting from job opportunities during the operational phase as Eskom has indicated that no new employment opportunities will be created in the operational phase of the activity. As such the potential significance rating is not assessed further.

No Go Alternative

The impact that will result from the no-go alternative will mean that the possibility to offset some carbon emissions would not be realised. In addition, the no go option would result in Eskom not having an opportunity to test the technology.

2.4. IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING PHASE

It is the intention of Eskom is to run this operation until end of life of the power station. At which time it would be decommissioned with the plant.

Nature of impact: Dust creation

Dust emissions during decommissioning result from the demolition of structures, earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. During the decommissioning phase impacts related to dust creation and noise are expected which may affect surrounding land owners. The movement of vehicles on paved and unpaved surfaces are generally the largest source of dust. Dust is also easily entrained from exposed areas by the

wind.		
Decommissioning activities will result in the emission of low quantities of terrestrial and construction dust, the impact of which is more of a nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100 m to 1 km of the Arnot Power Station. A temporary nuisance impact may be experienced in parts of Rietkuil, only 500 m away.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Immediate (1)	Immediate (1)
Magnitude	Moderate (6)	Low (4)
Probability	High (3)	Low (2)
Significance	Low (24)	Low (12)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation measures:		
<ul style="list-style-type: none"> » Implementation of a dust management plan. » Activities should be confined to a clearly demarcated area. » Vehicles may only use the existing access roads/tracks. » Any waste/spoil material should be removed and taken off-site to a licensed waste disposal facility. » The appropriate measures must be taken to limit the creation of additional dust and noise which will exacerbate existing conditions at the power station. » The relevant personal protective equipment should be used at all times. 		
Cumulative impact:		
<ul style="list-style-type: none"> » With respect to cumulative impacts, mining and agricultural activities, tailings dams, and domestic fuel burning in the area are identified as existing sources of dust. There will thus be a cumulative impact with dust generated during decommissioning. 		
Residual impact:		
<ul style="list-style-type: none"> » No residual impact that last beyond the decommissioning phase is expected. 		

No-go alternative (compulsory)

The impact that will result from the no-go alternative will mean that Eskom will not decommission the demonstration facility at Arnot Power Station.

3. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Eskom is proposing the establishment of biomass co-firing facility for demonstration purposes at the existing coal-fired Arnot Power Station located approximately 50 km east of Middleburg in the Mpumalanga Province (refer to Figure 1.1).

- » Co-milling: A maximum of 5% coal by mass (per unit) displacement at three (3) units;
- » Separate milling: A maximum of 10% displacement at one (1) unit.

The biomass is proposed to be sourced from a suitable identified source and transported to the power station by road or rail. This project is considered a pilot exercise which will form part of Eskom's initiatives towards the reduction of their carbon footprint.

The following impacts have been considered in the Basic Assessment Process:

- » Impacts on air quality (i.e. emissions and dust) during the construction, operation, and decommissioning phases.
- » Job creation during the construction, operation, and decommissioning phases. This impact is not expected to have a significant positive impact during either the construction or operational phases.
- » Waste creation during the construction, operation, and decommissioning phases. This impact is not expected to have a significant positive impact during either the construction or operational phases as low volumes of construction waste are expected and the waste created during the operational phase will be discarded with the coal ash.

Air Quality

The Arnot Power Station, which is located in the Steve Tshwete air quality hot spot¹¹, is an industrial source of air pollutants which is surrounded by agricultural and industrial activities. Modelling shows that the baseline ambient air quality near the Arnot Power Station is relatively poor. As such the closest and most sensitive residential area near the Arnot Power Station (i.e. the residential township of Rietkuil, which is located immediately adjacent to the power station property) are already affected in terms of air quality.

For construction and decommissioning of the infrastructure for the biomass receipt,

¹¹ This in an area where measured or modelled ambient air quality standards are exceeded.

storage, milling and mixing, the impacts on ambient air quality concern particulate matter only. The impacts are expected to be of a nuisance nature only, and will be limited to less than 1 km from the source and may impact on Rietkuil. The impacts have a low significance.

Particulate emissions from the Arnot Power Station are well controlled using bag filters, and some control measures are in place to control diffuse sources at the power station. With the imminent publication of the AQMP for the HPA, despite the fuel mix, Arnot Power Station will need to evaluate all aspects of its operation in order to comply with Goal 2 of the AQMP which reads '*By 2020, industrial emissions are equitably reduced to achieve compliance with air quality standards and dust fallout limit values*'. Objectives of this goal include, amongst others:

- 1) Quantification of emissions from all sources
- 2) Reduction of gaseous and particulate emissions
- 3) Minimisation of fugitive emissions
- 4) Reduction in emissions from dust-generating activities
- 5) Reduction on Greenhouse gas emissions
- 6) Reduction in the incidences of spontaneous combustion in coal storage piles and discard dumps
- 7) Optimum operation of appropriate abatement technology, and
- 8) Exceedances of ambient air quality standards and dust fallout limit values because of plant emissions are assessed.

The introduction of wood biomass at Arnot Power Station reduces ambient concentrations of PM₁₀, SO₂, and NO_x marginally. It is however unlikely that this small difference is measurable. Predicted ambient concentrations of these pollutants comply with all ambient air quality standards when coal and when coal and wood biomass mix are used. Since the predicted concentrations of PM₁₀, SO₂, and NO_x for the biomass co-firing scenario are lower than for the baseline scenario (coal only), the proposed project biomass co-firing is expected to have a positive impact on air quality.

As part of the Environmental Management Programme (EMP), mitigation measures are proposed to manage /and or mitigate these potential impacts.

No-go alternative (compulsory)

The impact that will result from the no-go alternative will mean that Eskom will not be in a position to create a demonstration platform for the reduction of their non-renewable carbon footprint.

SECTION E. RECOMMENDATION OF THE PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?

YES ✓

If "NO," indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment):

If "YES," please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application:

The installation of the biomass co-firing plant is considered environmentally acceptable from a site perspective.

The mitigation measures as recommended in the air quality specialist report should be implemented, most importantly the implementation of a dust management plan.

Is an EMPR attached?

YES

The EMPR must be attached as **Appendix F**.