Sustainable Energy Briefing 27: Eye on Eskom's commitment to air quality at Medupi

The South African minimum emission standards (MES) were published in terms of the National Environmental Management: Air Quality Act (AQA) 39 of 2004 and come into effect in April 2015. Even stricter MES will come into effect from April 2020. MES apply to activities which result in atmospheric emissions that have a significant detrimental effect on the environment and also human health. But, a provision of the minimum emissions standards allows for applications to be made for polluting companies to postpone compliance with the 2015 and 2020 deadline. The deadline has prompted several of South Africa's largest polluters to approach the Department of Environmental Affairs (DEA) to request postponement or even exemption from MES.

In late October 2013, Eskom submitted its draft application for public comment. The draft application is for exemption from MES until the end of 2026 for Medupi, its coal-fired power station still under construction. The application included requests for exemption from both the 2015 and 2020 limits for sulphur dioxide ($S0_2$). Eskom argues that the installation of the technology that will reduce harmful $S0_2$ emissions at Medupi is impractical and too expensive. Eskom's refusal to abide by South African environmental legislation is becoming more obvious as Medupi reaches its final stages of construction. Eskom is thereby committing the population of South Africa to a future of health and environmental problems.

This Sustainable Energy Briefing outlines the history of the World Bank loan to Eskom and the required flue gas desulphurisation (FGD). The briefing further outlines the MES requirements for combustion installations published in terms of the AQA, and describes the reasons behind Eskom seeking exemption from the MES, arguing that Eskom's application for exemption or postponement on the grounds of water unavailability is unreasonable because the technology for dry FGD is available. Lastly, the briefing describes the negative impacts of an oversupply of sulphur dioxide in the atmosphere and the possible consequences for South African citizens should Eskom not comply with MES.

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I. Introduction

On the 27th of November 2013 Eskom was nominated in the international Public Eye Awards by three South African NGOs (Earthlife Africa, Groundwork and Greenpeace) as the worst company in the world in terms of environmental degradation and human rights abuse[1]. The nomination placed Eskom right up there with international polluters the likes of Gazprom. The reason behind this nomination is that while Eskom continues to generate electricity from the extremely health-hazardous method of burning coal, it refuses to take any action in minimising the emissions which endanger the health of communities and contribute greatly towards global climate change.

Eskom, South Africa's state-owned electricity company, powers the country by 18 coal-fired power stations producing more than 90% of the country's electricity. The majority of these coal-fired power stations do not comply with the Minimum Emissions Standards (MES) and operate in areas which have been declared "Priority Areas" in terms of the AQA. These are areas in which ambient air quality standards are being, or may be, exceeded; and the area requires specific air quality management action to rectify the situation (s18 AQA). Eskom claims that it does not have the funds nor is there a sufficient water reserve to enable it to comply with the MES.

Despite the obvious human health and environmental risks associated with coal-fired power stations, Eskom applied for a loan from the World Bank in 2008 for the construction of the 4th largest coal-fired power station in the world – Medupi. The World Bank loan was approved on the condition that Eskom would install FGD in the new coal-fired power station in order to minimise the harmful impact of SO_2 emissions on the health of South African citizens.

It is now four years later and the Medupi project is running almost two years behind schedule[2].

1 Public Eye Awards. (2013). Available online at: http://publiceye.ch/en/

2 Hlongwane. (2013). "Power play: Medupi disaster drags on as winter approaches" Available online at: http://www.dailymaverick.co.za/article/2013-02-25-power-play-medupi-disaster-drags-on-as-winter-approaches/#.UpeX49JDs8E

Medupi is Sepedi for “rain that soaks parched lands”; the name therefore insinuates that the project is meant to provide economic relief. But in South Africa, the name ‘Medupi’ has become synonymous with delay, high level corruption, worker mismanagement and public frustration. Furthermore, Eskom has applied for an exemption from the 2015 and 2020 $S0_2$ MES in terms of AQA, and is also currently arguing why it cannot install FGD at Medupi – at least until 2027. It is becoming increasingly apparent that Eskom does not intend on meeting the SO_2 reduction requirement set by the MES at present nor in the future. Eskom argues that FGD is too expensive, too water-intensive and that its coal-fired power stations are not the source of poor air quality in South Africa. In its Background Information Document, Eskom also alleges that power station emissions do not harm human health[3]. By its arguments Eskom is effectively displaying a continued disregard and disrespect for the citizens of the democratic Republic of South Africa to whom Eskom should be accountable.

II. History of the World Bank in South Africa

The negative impact of World Bank development financing on the poorest of the poor in developing countries has been well documented. Writers and development thinkers argue that the World Bank’s poverty reduction strategies act as barriers to growth at the grassroots level through increasing inequality, especially amongst women and children. One World writes that: “When the International Monetary Fund (IMF) and World Bank arrive in southern countries, corporate profits go up, but so do poverty and suffering. Decades of promises that just a little more "short-term" pain will bring long-term gain have exposed the IMF and World Bank as false prophets whose mission is to protect those who already control too much wealth and power”[4]. The World Bank’s decision to finance the power utility monopoly of South Africa, Eskom, is testament to this statement.

It has largely been a policy of South Africa to avoid World Bank financing in order to remain free from crippling debt and structural adjustment. Prior to democracy, the World Bank made a total of 11 loans to South Africa between 1951 and 1966 to the amount of US $242 million. These loans were largely directed at developing the rail and harbour systems of the country, and for the generation and transmission of electricity. Lending to South Africa was sanctioned in 1966 due to apartheid opposition but all earlier loans were repaid by South Africa by 1985. The bank resumed its activities in South Africa only after 1991 when it began to advise the new government on policies and also started to approve limited grants to the government[5].

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3 Eskom. (2013). “Applications for postponement of, and exemption from, the minimum emissions standards for Eskom’s coal and liquid fired power stations”. Available online at http://iliso.com/index.php?option=com_content&view=article&id=5&Itemid=5 under the heading “Eskom’s Minimum Emission Standards Exemption/Postponement Application’

4 One World. (2013). “50 years is enough”. Available online at: http://www.oneworld.net/campaigns/imf&wb/index.html under "50 years is enough"

5 The World Bank. (2008.). “Country Partnership Strategy. Available online at: http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/02/12/000020439_20080212144515/Rendered/PDF/38156.pdf

Based on the reasoning of accelerating economic growth, poverty reduction, encouraging rapid labour absorption and effective service delivery, the Country Partnership Strategy (CPS) was developed between the World Bank and the South African government. This CPS is supposedly framed by urban and rural development, and regional integration. The first CPS was presented to the Board in May 1999, nearly five years after the end of apartheid rule in South Africa, but was deemed vague and was criticised for failing to develop effective tools towards poverty alleviation. The CPS was subsequently redrafted in 2008 with a clearer vision towards integrating the World Bank Group's programme with the then contemporary South African development agenda. The revised CPS was jointly developed with the Bank and with the National Treasury (NT) and incorporated a "rapid response" to the changing need and demands of the country.

The World Bank Loan for the Medupi Power Station is argued in terms of pillar one- urban and rural development- and more specifically in terms of the infrastructural development goal of the CPS. The construction of the Medupi coal-fired power station raised a considerable amount of public concern in South Africa. At the outset critics argued that the deal with the World Bank was pushed through because the African National Congress (ANC) profited indirectly from procurement procedures. Further, environmental groups criticised the World Bank for supporting the continued use of coal instead of a cleaner and more sustainable development path. More recently, the Medupi project has been criticised for its continued delays, and for applying for exemption from the MES published in terms of AQA.

III. The World Bank Medupi Loan

On the 8th of April 2010, the World Bank approved a loan of US $ 3.75 billion to South Africa for building Medupi. According to the Project Appraisal Document (PAD), the proposed Project Development Objective was "to enable Eskom South Africa to enhance its power supply and energy security in an efficient and sustainable manner so as to support both economic growth objectives and South Africa's long term carbon mitigation strategy"[6]. The World Bank Panel did, however, find that: "the Medupi Power Plant represents four major challenges with respect to potential project-induced harm: significant water consumption raising issues of both scarcity and pollution in the local area; emission of gases and particulates causing increased health problems in the local area; added burden on the limited institutional and financial capacity of local authorities that have to cope with rapid industrialization of the area, especially as related to public and social infrastructure and environmental management; and emissions of greenhouse gases by the Medupi Power Plant"[7]. The loan far exceeds the amount of any loan previously granted to South Africa from the World Bank and is the first loan granted to the country by the World Bank after the fall of the Apartheid regime in the

[6] The World Inspection Panel. (2010). "Eskom Investment Support Project. Available online at: http://web.worldbank.org/WBSITE/EXTERNAL/EXTINSPECTIONPANEL/0,,contentMDK:22533082~pagePK:64129751~piPK:64128378~theSitePK:380794,00.html

[7] The World Bank. (2011). Investigation Report. Available online at http://siteresources.worldbank.org/EXTINSPECTIONPANEL/Resources/Eskom_IPN_Investigation_Report_11.21.11.pdf

mid 1990's.

Medupi is a dry-cooled coal-fired power station situated in the water-scarce Lephalale region of Limpopo province. Coal-fired power stations burn coal to heat water and create the steam necessary to turn the turbines which create electricity. Once the steam has been used to generate electricity it must be cooled so that it can return to water and be used again in the electricity generation process. The most cost- efficient way to cool the steam is with cold water but dry-cooling systems use air instead of water. Although dry cooling systems can reduce the water consumption of a power plant by up to 90%, one of the disadvantages for dry-cooling is that more fuel is required to produce each unit of electricity. Therefore the power plant operates at a much higher cost[8].

When Medupi is complete it will "boast" six boilers that will each power an 800 Mega Watt (MW) turbine providing a total capacity of 4800 MW, rendering it the fourth largest coal-fired power station in the world. Medupi will operate for a life span of 50 years and it has been documented that it will boost the South African Gross Domestic Product (GDP) by 0, 35% per year. But this calculated economic boost has not considered the external costs of the combustion of coal for electricity generation, such as the hidden costs of air and water pollution. The Exxaro Grootgeluk coal mine will provide the Medupi coal-fired power station with the necessary coal for electricity generation for a period of 40 years[9].

IV. The Air Quality Act

The DEA promulgated the AQA in order to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development. Moreover AQA was promulgated in order to give effect to section 24 (b) of the Constitution of the Republic of South Africa which mandates the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people (s2 AQA)[10].

AQA provides the list of activities which result in atmospheric emissions that have or may have a significant detrimental effect on the environment, health, society, the economy, the ecology or cultural heritage. Such listed activities require an atmospheric emission licence (AEL) and must comply with the MES prescribed in the list. The list of activities came into effect on the 1st of April 2010, but made a five year provision for industry and other emitters to comply with the 2015 MES. A ten year provision was created for industry to comply with the stricter 2020 MES. Combustion

8 The Union of Concerned Scientists. (2013). "How it works". http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html

9 http://www.eskom.co.za/Whatweredoing/NewBuild/MedupiPowerStation/Pages/Medupi_Power_Station_Project.aspx

10 http://www.info.gov.za/view/DownloadFileAction?id=67978

installations, such as Eskom's coal-fired power stations including Medupi, fall within its ambit.

The list of activities stipulates that MES will apply to normal operating conditions of both permanent and experimental plants with a design capacity equivalent to the one of the listed activities ((1)-(2)). The list of activities further stipulates that MES are to be expressed in terms of average daily recordings under normal conditions of 273 K, 101.3 kPa, specific to oxygen percentage and dry gas ((4)). Measurements of MES will be carried out by a standardised method of sampling and analysis which is set out in Annexure A to the list. If a different method of measurement is used, written consent must be granted by the National Air Quality Officer (NAQO) ((5)-(7)).

Existing plants must comply with the 2015 MES by the 1st of April 2015, and with the 2020 MES by the 1st April 2020. New plants are required to comply with the new plant MES immediately ((8)-(10)). The Framework provides that industries may apply for postponements if ambient air quality standards in the area are in compliance. Applications must, however, include: an air pollution impact assessment, a detailed justification for the application and a concluded public participation process. The air pollution impact assessment must be submitted to DEA at least 1 year before the compliance date and the applicant must demonstrate that its "air emissions are not causing any adverse impacts on the surrounding environment". According to the Framework, "this provision would ensure that any requirement to upgrade is informed by an understanding of any environmental impact of the affected plant". The framework also indicates that, "at the end of the extension period granted, a further extension could be made possible subject to a repeat of the impact assessment process." The ambient air quality standards in the areas where Eskom's power stations are located are not in compliance with the law because all of these areas have been declared as Priority Areas (s5.4.3.5).

According to the list of activities, the NAQO, with the concurrence of the Licensing Authority, may grant a postponement of the compliance time frames for a period not exceeding 5 years per postponement. The NAQO, with the concurrence of the Licensing Authority, may - (a) from time to time review any postponement granted should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards; and (b) on good grounds, withdraw any postponement following – representations from the affected plant; and representations from the affected communities ((13)-(14)).

MES for coal-fired power stations are applicable in Category 1 of the list (combustion installations). Solid fuel combustion installations are addressed in subcategory 1.1 and are defined as installations for the combustion of solid fuels used primarily for steam raising or electricity generation. This subcategory applies to coal-fired power stations. For this category, the list of activities stipulates that continuous monitoring of Particulate Matter (PM), SO_2 and Mono Nitrogen Oxides (NO_x) is required.

Table 1: Minimum emissions standards for new and existing combustion installations

Description:	Solid fuels combustion installations used primarily for steam raising or electricity generation.		
Application:	All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used.		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under normal conditions of 10% O_2, 273 Kelvin and 101.3 kPa.**
Common name	**Chemical symbol**		
Particulate matter	N/A	New	50
		Existing	100
Sulphur dioxide	SO_2	New	500
		Existing	3500
Oxides of nitrogen	NO_X expressed as NO_2	New	750
		Existing	1100

On the 28th of October 2013, Eskom made its draft application for exemption from MES for Medupi available for public comment. At the same time, it applied for postponements and/or exemptions from MES for all but one of its other coal-fired power stations. Eskom argued that it would be unable to meet the MES for either existing or new plants because it would be unable to install FGD technology in all of the units at Medupi. Eskom argued that it was constrained by insufficient water in the Lephalale region, and because of a lack of finances. Eskom further argued that the five year exemption period was insufficient and that it would only be able to install FGD by April 2027 when the second phase of the Mokolo Dam Crocodile River Water Augmentation Project (MCWAP) was complete. MCWAP is scheduled for 2019.

On 2 December 2013, Eskom's consultants advised all stakeholders that they were no longer applying for any exemptions, but instead, would apply for "'rolling' postponements, viz. reapplying for postponement every 5 years, rather than applying for exemption." The updated applications and supporting documents will be available for comment on 6 January 2014.

V. Flue Gas Desulphurization at Medupi

The main selling-point of the World Bank loan for the construction of Medupi coal-fired power plant was that Eskom would be required to install super-critical technology such as flue-gas desulfurization (FGD). FGD can be understood as a set of technologies that reduce sulphur dioxide (SO_2) from the emissions of coal-fired power stations and other industrial processes. In a typical coal-fired power station, FGD can remove up to 95 % of the SO_2 in the flue gases. Flue gas is the collective term for all the gases that exit the coal-fired power station, or the combustion exhaust gas. The exact composition of the flue gas depends on what is being burned. The flue gases of a typical coal-fired power station usually comprise the following quantities and types of gases: 61% Carbon, 4.3 % Hydrogen, 7.4 % Oxygen, 3.9% Sulphur, 1.2% Nitrogen, 12% ash and 10% moisture.

FGD is rapidly being implemented in countries world-wide as the harmful effects of SO2 on human health are becoming more widely understood. FGD may be implemented in any of the following forms: wet scrubbing making use of an alkaline sorbent; spray-dry scrubbing using similar sorbent slurries; a wet sulphuric acid process that recovers sulphur in the form of commercial quality sulphuric acid; SNOX FGD that removes SO_2, nitrogen and other particles from flue gases or dry sorbent injection systems. These methods have been studied since 1850 as a result of public concern that arose in England after the construction of large-scale power plants to support early industrialisation. 150 years later, Eskom argues that the technology remains unsuitable.

The dry FGD process would be most suited to the Medupi Power Plant because Medupi is located in such a dry region of South Africa where all water is already allocated between the different users. The dry process involves the injection of calcium hydroxide $Ca(OH)_2$ into the flue gas before a filtering unit which consists of a bag filter or electrostatic precipitator. In the reactor, the acid gas, SO_2, already begins to react with the calcium hydroxide to neutralise it, and this process continues into the filter. There are several types of dry FGD technologies available. Medupi is in the fortunate position that since it is still under construction it can be designed to accommodate this technology, whereas retrofitting older coal-fired power stations with the most effective technology is more difficult.

In World Bank Management's Report and Recommendations dated 7 March 2012 (Recommendations)[11], the Bank confirms that it "*insisted on, and obtained a legal commitment by Eskom to install FGD at Medup*i" (p19)[12]. The Recommendations also note that the ambient air quality standards require the installation of FGD (p19). The Bank further noted in its Recommendations (p25), as well as in its Note (p1) that air quality and water supply are central concerns, and that it would monitor, *inter alia: "progress with MCWAP as it pertains to water supply*

[11] World Bank Inspection Panel Reports. Available online at: http://web.worldbank.org/WBSITE/EXTERNAL/EXTINSPECTIONPANEL/0,,menuPK:64132057~pagePK:64130364~piPK:64132056~theSitePK:380794,00.html

[12] World Bank. Document archive. Available online at: http://search.worldbank.org/all?qterm=medupi&_Top/country=South+Africa

for FGD, and, as relevant, to the adequacy of water supply to Lephalale; and installation of FGD and the corresponding air quality results". In its Note (p1), the World Bank indicates that Management "*is committed to monitor on an exceptional basis air quality aspects until 2022, twelve months after commissioning of the flue gas desulphurisation (FGD) for the sixth unit, which is expected to be installed at the end of 2021. This monitoring will enable the Bank to follow up with the appropriate authorities as needed*". This is also addressed in the Recommendations (p25).

In its latest and 4th environmental supervision mission report, the World Bank indicated that the Eskom team were preparing to employ a team of consultants for an Environmental Impact Assessment (EIA) for FGD for the six units of the Medupi Power Plant. Another team of consultants are developing the specifications for the supply of the FGD and bidding is expected to open in 2014. Eskom estimates that the water required to operate FGD at Medupi will be 10Mm3/annum and that the installation of FGD will reduce the electricity output of the Medupi Power Station by 3-5% because of the pumping requirements for limestone and other infrastructural needs (p3).

On the 5th of June 2013, Eskom publicly disclosed in a Background Information Document (BID) that it will need to request a postponement or exemption from compliance with the MES for some of its power stations, including the Medupi Power Plant. It then invited public participation in the regulatory process. Eskom went on to explain – in its exemption application - that the Medupi Power Plant will not be able to comply with SO_2 emissions standards in April 2015, and that it is further likely that Medupi will not be able to comply even by April 2020. The primary reason that Eskom stated behind its application for exemption or postponement is that FGD installation would not begin until 2018 and will not be completed before 2022. The reason behind the delay in the installation of FGD is because of water shortages in the Lephalale region. Eskom estimates that the water required to operate FGD at Medupi will be 10Mm3/annum and further that the installation of FGD will reduce the electricity output of the Medupi Power Station by 3-5% because of the pumping requirements for limestone and other infrastructural needs (p3).

VI. Medupi, water allocation and FGD

The production of electricity from coal requires a large amount of water but the Medupi Power Plant is being constructed in the water-scarce region of Lephalale in Limpopo Province. Lephalale falls in the Limpopo River catchment area. The Mokolo and Lephalale Rivers run through the north of the municipal area, Matlabas River runs through the south east of the municipal area and the Mogalakwena River creates the Eastern boundary. All four of these rivers feed into the Limpopo River which creates the border between Botswana and South Africa. These rivers do not yield a constant supply of water. The Mokolo Dam was completed in 1980 in order to supply the Matimba Power Station, the Grootgeluk Mine, the Lephalale Municipality and agriculture in the area[13]. The water supply from the Mokolo Dam is therefore already allocated and new water supplies were

[13] Department of Water Affairs. (2013). "Project Overview". Available online at: http://www.dwaf.gov.za/Projects/MCWAP/overview.aspx

required to meet the demands of the Medupi Power Station. Further, FGD is considered a water-intensive technology and therefore it is expected that installing FGD would increase the water use of Medupi substantially.

In order to meet the water demands of the Medupi power station and supposedly for the installation of FGD, the Department of Water Affairs (DWA) is developing the Mokolo Dam Crocodile River (West) Water Augmentation Project (MCWAP) in a phased process. The first phase of the MCWAP entails the construction of a 43 km pipeline from the Mokolo Dam to the Medupi Power Station with the capacity of 30 billion litres per annum. Water delivery will commence in June 2014 and will supply Medupi with 10, 9 billion litres of water per year to support general electricity generation and partial FGD. Phase 1 of MCWAP will also supply water to Exxaro.

The Water Resources Assessment, which is an annexure to Eskom's exemption application, indicates that: "*Phase 1 of MCWAP will be capable of supplying Medupi with 10 Mm3/annum to support Medupi's six unit operations and three units with FGD. In the interim, water is being supplied through the existing pipeline from Mokolo Dam and is sufficient for Medupi's commissioning requirements and six unit operation without FGD*".

Therefore a second phase of the MCWAP to draw more water towards Lephalale was deemed necessary. Phase 2 of the MCWAP has been significantly delayed, which is also a delay to the installation of FGD at Medupi. Planning for the second phase of the MCWAP is underway and is expected to be able to supply water to Medupi by 2019. The second phase of the MCWAP will entail the capture of large volumes of artificially augmented water from the Crocodile River (West) which will supply continued migration towards and industrialisation of the Lephalale region. The artificial flows in the Crocodile River (West) will occur because of waste water treatment from the North of Johannesburg and the upper Crocodile basin[14]. Eskom also notes, however, that this discharge water from Johannesburg is not yet currently available but that its volume will increase over time.

The Water Resources Assessment further indicates that: "*DWA's latest reconciliation strategy shows that there is sufficient water in the Crocodile River basin to be transferred through the MCWAP Phase 2, once implemented to meet the projected water demands including Medupi's full water requirements including FGD and the energy related developments in the Lephalale area. Is it expected that the MCWAP-2's water supply will be commissioned in 2019 and will achieve an ultimate required net transfer capacity of 110 Mm3/annum*". It is therefore not clear why Eskom seeks an exemption from/postponement of compliance until 2027.

[14] Department of Water Affairs. (2010). "Mokolo Dam Crocodile River Water Augmentation Project-Feasibility Study". Available online at: http://www.dwaf.gov.za/Projects/MCWAP/Documents/Technical%20Module/Supporting%20Report%202.pdf

VII. Impacts of SO2 on human health

The objectives of the AQA have been set out above. To meet these objectives, it is essential to reduce pollution levels from coal-fired power stations and other industries, thereby reducing the harmful impact of emission pollution on human health and other sectors. Coal-fired power stations are in particular major sources of pollution because the waste that they produce includes nitrogen oxide (NOx), mercury (Hg) and SO2. Because this Sustainable Energy Briefing has focused on South African MES and FGD in relation to SO_2, only the negative impacts of SO_2 on human health are considered here, although coal-fired power station produce a range of other pollutants which negatively affect human health in other ways.

When SO_2 is released into the atmosphere it reacts with water to form various acidic compounds, fine particles and also ozone. These compounds and particles can remain in the air for very long periods which may even last years. Likewise, winds can transport these pollutants to distant areas, and even across borders. The compounds and particles can even fall to earth in either wet or dry forms. Overall, these compounds and particles lead to impaired visibility; acidification of water resources such as rivers and lakes; acidic rain; impaired air quality; degraded ecosystems; an accelerated decay of assets and cultural artefacts; and of course a negative impact on human health.

According to the United States Environmental Protection Agency[15], scientific evidence links short-term exposure to SO_2 to respiratory illness such as bronchoconstriction and increased incidence of asthma. Short-terms exposure to SO_2 is particularly dangerous for asthmatics. The EPA also writes that collected data shows a direct correlation between times of SO_2 exposure and hospital visits for respiratory-related illnesses. The EPA further writes that increased amounts of SO_2 in the environment leads to premature mortality; increased incidence of heart and lung disease particularly in the young and in the elderly; decreased lung function and new cases of chronic bronchitis; increased absenteeism from work leading to economic losses; mucous secretion; vasodilatation; cough; apnea followed by rapid shallow breathing; and hypertension. The reason behind the wide range of diseases stemming from exposure to SO_2 is that SO_2 is almost completely absorbed in the nasal passages of humans and is soluble in drinking water.

[15] United States Environmental Protection Agency. (2013). "Health". Available online at: http://www.epa.gov/air/sulfurdioxide/health.html

VIII. Concluding remarks

It remains unclear at the time of writing this Sustainable Energy Briefing (late 2013) as to whether Eskom is requesting a postponement or a complete exemption from compliance with MES although it has indicated that it will apply for "rolling postponements". What is clear, however, is that Eskom has no intention of complying with the MES for its new Medupi Power Plant by either 2015 or even 2020. Instead, Eskom plans on complying with MES by 2027. The postponement that Eskom is seeking is a direct result of Eskom's refusal to install FGD technology which helps to reduce SO_2 emissions from coal-fired power stations. Eskom claims that the operation of the final 3 FGD units is dependent on the completion of the second phase of the MCWAP project, which is to be commissioned in 2019. The 2027 compliance date proposed by Eskom is therefore unsuited to the planned water delivery of the MCWAP for FGD and is negligent of dry FGD technology. The delay in the installation of FGD will have a significant impact on efforts to protect the health of people in South Africa, particularly of the growing community near to Medupi.

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