ZUMA COAL-FIRED POWER PLANT:
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
EXECUTIVE SUMMARY (REVISED APRIL 2015)

Project Name: Zuma Coal-Fired Power Plant: Zuma Energy Nigeria Ltd.
Country: Nigeria
Project Number: P-NG-FB0-001
Division: ONEC 1

1. INTRODUCTION

This report is a non-technical summary of the Environmental and Social Impact Assessment (ESIA) for the Zuma Coal-Fired Power Plant (ZCFPP) in Nigeria. It describes the Project design and the potential impacts they may have on the physical and biological environments and on people. It also addresses the measures that the Project will implement to reduce adverse impacts and to enhance potential social benefits, and how environmental and social issues will be managed during construction and operations, taking into account the imperative for compliance with applicable safeguard policies of the Bank. The contents of the ESIA includes: (i) Policy Legal and Administrative framework, (ii) Project justification, (iii) Project description, (iv) Description of the Project Environment, (v) Associated and Potential Impacts, (vi) Mitigation Measures, (vii) Public Consultations and Disclosure, (viii) Environmental & Social Management and Monitoring plans, and (ix) 16 Appendices.

2. PROJECT DESCRIPTION AND JUSTIFICATION

Project Area: The project covers an area of 491 hectares at Itobe town in Kogi State, north-central Nigeria (7° 14’ 09”N & 7° 23’ 58”N and longitudes 6° 55’ 32”E & 6° 92’ 57”E), with the plant to be located at about 2km to River Niger, which will be the main source of water supply for the project (Figure 1). It is about 125 km by road from the coal mine site (lat/long). The power that is generated will be evacuated through a 25km-330KV Transmission line for tie-in into Ajaokuta-Lokoja-Gwagwalada 330KV double circuit line. The ESIA for the coal mine and the Transmission line have been completed in separate ESIA processes¹.

¹ The ESIA for the Transmission lines (not part of the project) is a separate process and has been completed and received the approval of the Federal Ministry of Environment. It is attached as an Appendix 14.
Project Purpose: The purpose of the ZCFPP is to generate 1,200 MW, using coal, to increase the electricity generating capacity of Nigeria, and support the country’s efforts to enhance people’s access to affordable and reliable electricity supply.

Project justification: Nigeria faces serious power crisis. For it to improve upon its performance in many sectors of its economy, Nigeria needs to significantly increase electricity availability to its increasing population and industrial requirements. ZUMA’s intention to install a Coal-fired Power Plant at Itobe is based on the need for an efficient power generation and management system for the growing business as well as other industries in the country. This is in concert with the Federal Government’s resolve to increase the nation’s power generation through public and private participation. This facility, when in full operation, shall effectively supply electricity to the national grid which has a present supply that varies between 3,500 MW and 4,000 MW. The project will also result in the improvement of infrastructure as well as the enhancement of the social-economic structure in the surrounding communities, as it will provide temporary employment for about 400 people per day during the construction phase of about 3 years and sustainable employment for about 250 persons during its operational phase of about 40 years.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The ESIA process for the proposed coal-fired power station and ancillary infrastructure has been undertaken in accordance with the requirements of all relevant Nigerian legislation including inter alia, those of:

i. Environmental Impact Assessment (EIA) Act No 86 of 1992, which restricts public or private development projects without prior consideration of the environmental impact.

ii. National Environmental Standards and Regulations Enforcement Agency (NESREA) Act (2007), which empowers the Agency to enforce all national environmental laws and
regulations (except those related to the oil and gas sector) and international treaties or conventions to which Nigeria is signatory. The Agency has issued 24 environmental regulations, which prescribe pollution abatement measures, limits and other safeguards for various industries and for noise, surface and ground water discharges among others.

iii. **National Electrical Power Reform Electric Power Sector Reform Act (2005),** which established the National Electricity Regulation Commission (NERC) and requires all entities intending to generate, transmit and or distribute power to include an EIA Approval Certificate, or Proof of submission and acceptance for processing of the Report on EIA to the Ministry of Environment in their applications;

iv. **National Policy on the Environment,** with the goal of achieving sustainable development for the country and emphasis on (a) securing for all Nigerians a quality environment adequate for their health and well-being; (b) conserving and using the environment and natural resources for the benefit of present and future generations; and (c) restoring, maintaining and enhancing ecosystems and ecological processes essential for the functioning of the biosphere and for the preservation of biological diversity and to adopt the principle of optimum sustainable yield in the use of living natural resources and ecosystems.

v. **Land Use Act (1978),** which recognizes the rights of all Nigerians to use and enjoy land and the natural fruits thereof in sufficient quality to enable them to provide for the sustenance of themselves and their families.

vi. **Kogi State Environmental Protection Board Law No.3 of 1995,** which states, among others, that no person shall cause any waste generated in the process of manufacturing or business operation to be discharged without treating or purifying it in accordance with the standards approved by the Board.

vii. **In addition to the ESIA requirements of Nigeria, the ESIA preparation for the ZCFPP also conforms with the Environmental and Social Assessment Procedures (ESAP, 2001) of the African Development Bank** and identified applicable Bank’s operational safeguards and policies including Involuntary Resettlement, Consultations with CSOs/NGOs, Gender, Poverty Alleviation, and Information Disclosure that must be complied with in project implementation.

At the state level, the Kogi Environmental Protection Board Law No.3 of 1995 states, among others, that no person shall cause any waste generated in the process of manufacturing or business operation to be discharged without treating or purifying it in accordance with the standards approved by the Board.

Some of the relevant global laws and conventions which were taken into consideration in the conduct of the ESIA for the ZCFPP include: (i) **UN Convention on Biological Diversity** with the goals of conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from genetic resources; (ii) **UN Framework Convention on Climate Change,** with focus on the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system; (iv) **Vienna Convention for the Protection of the Ozone Layer** and (v) **Ramsar Conventions** that are to stem un-progressive encroachment on and loss of wetlands and encourage the conservation and sustainable utilization of wetlands.

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2 According to AfDB environmental and social assessment procedures, this project is assigned Category 1.
There is also Zuma HSE policies provide the administrative framework for conducting and implementing this ESIA.

4. DESCRIPTION OF THE PROJECT ENVIRONMENT

The following is a summary of the biophysical and socio-economic conditions prevailing in the project area.

4.1 Bio-physical Environment

**Climate:** The study area has a tropical climate, which is essentially characterized by two main seasons: the rainy (March to October) and dry (November to February) seasons. Temperatures are generally high throughout the year with a small monthly range. Based on the analysis of the 11-year (2000 – 2010) data available, air temperature values are generally slightly higher for the dry season months (33.3–36.6°C) than the wet season months (30.0–33.1°C). The annual rainfall ranges between 1,100mm and 1,300mm for the period of analysis. Mean monthly relative humidity is generally low to moderate with no month experiencing mean values up to 80%. During the dry season, the wind direction is predominantly northeast, while the southwest winds are dominant during the wet season. Mean wind speed during the field study varied from 0.8 to 1.8m/s during the wet season and 0.6 – 3.1 m/s during the dry season.

**Geology:** The geology of the area reveals that the rocks are of Pre-cambium crystalline basement complex and the cretaceous sedimentary of the mid-Niger Basin. The northern segment of the area falls within the southern middle Niger Embayment (Bida Basin). The zone comprises of the Agbaja Ironstone Formation, Lokoja Formation and Patti Formation, which are essentially made up of conglomerates, coarse to fine grained feldsparhic, sandstones, siltstones (Gegubeki) clay and oolitic, pisolitic and concretionary ironstone. In general, the area is covered by young sedimentary rocks and alluvium along the riverbeds.

**Geomorphology and Drainage:** The geomorphology of the study area is undulating with elevation ranging from 37m – 73m to hill-tops. The main water bodies in the study area and its environs are the River Niger, Idebu stream in Ite community and other seasonal streams that cut across the project area and used mostly for irrigation. The Niger River is subject to two annual flood regimes: (i) the white flood (occurs between July and October) and (ii) the black flood which begins in December with the arrival of floodwaters from upstream.

**Soils:** The major soil types occurring in the study area are: (i) Juvenile/lacustrine alluvium or hydromorphic soils (soils of the flood plains, which are permanently or seasonally water logged located mainly on lower slopes and alluvial areas referred to as “fadama”); (ii) Ferrisols/ferruginous (soils that frequently had a leached A horizon and a textural or structural B-horizon) and (iii) Lithosols (weakly developed genetic horizons containing coarse elements and having solid rock within 30-60cm of the surface). The soil types observed ranged from sand to loam with the sand fraction varying from 68.3-95.3%. The percentage silt content varied from 2.3 – 20.7% while the clay content varied from 2.3 – 20.0%. The soils are acidic to slightly alkaline (pH 3.8 – 7.6), with no distinct trend in pH values for the wet and dry seasons. The electrical conductivity values were low (15.3 –270μs/cm) indicating that the study area is within the fresh water zone. The carbon concentration of 0.42 – 4.19% indicates high organic carbon due mainly to the dense vegetation.
**Flora and Fauna:** The typical vegetation of the project area is savannah woodland, made up of mixtures of trees, shrubs, herbs and grasses. A total of 62 plant species belonging to 27 families/sub-families and comprising trees/shrubs, herbs and grasses were recorded within the savannah woodland vegetation where the study area is a part. The families/sub-families that had the highest frequency of occurrence of plant species include Caesalpinioideae, Ochnaceae, Cochlospermaceae, Mimosaceae, Annonaceae, Verbaceae, Ulmaceae, Cleomaceae, Lamiaceae, Loganiaceae, Euphorbiaceae, Araceae and Poaceae. Plant species with frequencies of occurrence of 50% and above within this vegetational zone: Trees of the family Caesalpiniaceae (eg Daniellia oliveri, Piliostigma thonningii) are particularly common in the study area. Due to anthropogenic pressure, there is very little wildlife occurring in the project area. However, the wetland habitat in the study area hosts a variety of wildlife including those vertebrate animals living, breeding and feeding in water, and those closely associated with water bodies due to their feeding, roosting behaviour and other activities associated with the aquatic environment. The common bird species found in the wetland are herons, water fowl, fish eagle and darter. The common species of mammals are mongoose, civets and genets, as well as the large cloven footed African giant Hippopotamus amphibius (rarely seen). The common species of reptiles are the crocodiles (e.g. Crocodylus niloticus and C.cataphractus) and monitor lizards (e.g Nile monitor - Varanus niloticus). There are also tortoises, terrapins and snakes associated with aquatic habitats in the study area though they are more widespread during the rainy seasons. The large cloven footed African giant Hippopotamus amphibius was reportedly seen by community members last in 2010. The wetland in the proposed project location is not part of the Ramsar wetlands in Nigeria. Overall, the floral and faunal status of the project area indicates that there is no presence of endangered species that could be affected or subjected to extinction as a result of the project activities. In this regard, the project activities will not contradict the UN CBD convention on biodiversity.

4.2 Socio-Economic Environment

**Land Use:** The project area is predominantly rural, but has recently witnessed tremendous transformations in the various land uses, with the built-up area expanding to 49.84%, vacant land 18%, cultivated land 19.46%, and vegetation 22.7%. This spatial and temporal change in the unplanned growth of the built-up area is exacerbating and impacting negatively on the environment. Environmental phenomena, such as erosion, indiscriminate waste disposal, siltation, and contamination, of River Ofu are on the increase.

**Population:** The total population of Itobe is 2,500 (NPC, 2006), with an anticipated growth rate of 3% yearly from 2006 to 2014 the population of Itobe is expected to rise to about 3,168. With the installation of the Zuma Coal-fired power plant project there will be influx of people both staff and others who will come and go, an anticipated staff of about 1000 will accompany the project.

**Ethnic Composition:** The Igala ethnic group makes up about 85% of the population in the study area, other tribes (Ebira and Okun) who came in as civil servants, and traders etc makes up the remaining 15% of the population.

**Religion/Cultural Heritage:** The inhabitants of the study area are mostly moslems (about 85%), with 10% as christians and the rest worshippers of traditional religion. Both adherent of Islam and Christianity
believe in the existence of one Supreme Being, the traditional worshippers believe in Agbaji Itobe, which lives beside people of Itobe. The Amana Itobe is the Chief priest of Agbaji; any other person can make sacrifice to Agbaji with the express permission of the Amana of Itobe who appoints a representative. Some of the cultural heritage of the people of Itoe community includes shrines, cemetery/graves, festivals etc. The shrine and cemetery/graves have been captured in details in the RAP. The most prominent festival in Itobe land is the Ane festival; it is celebrated in March/April of every year.

**Political Administration/Social Organization:** There are two levels of political governance in the study area: the formal government, and the local/traditional administration. At the formal Government level, the study area is under Ofu Local Government Area (LGA) of Kogi State, with the executive, legislature and judiciary functions of the modern government well integrated. The traditional administration is headed by the Onu of Itobe and functions to ensure peace and justice in the area. He is assisted by the district heads and family heads. Community social organizations that exist in the project area include Itoe Community Development Association, Itoe Pioneer Association, Ite Youth Movement and Itoe Youth Development Association.

**Agriculture and Fisheries:** Itoe community is largely rural, and by virtue of its location along the bank of River Niger, fishing constitutes a main means of livelihood. Fishing activities are carried out mostly in the nights, early mornings and evenings, and generally done from dugout canoes operating from the camps along the river. Twenty-nine fish species distributed in 17 families were identified during the field work. *Gymnarchus niloticus* (Mormyrid), *Channa obscura* (Snake head fish), *Heterotis niloticus* (African bony tongue fish), and *Chrysichthys auratus* (Silver cat fish) were the most palatable among the fish species. All the fishes examined did not show any physical evidence of parasitic infestation. Farming is subsistence with principal crops being cassava, maize, and rice.

**Education:** The level of education is generally low among the populace in the project area. About 15% of the youth in the study area have acquired National Certificate of Education (NCE) and above while only 10% of the middle-aged adults have acquired a tertiary level of education. There are only three (3) secondary schools and seven primary schools. These schools are characterized by poor infrastructure, inadequate qualified work force, absence of modern teaching aid and congestion.

**Health:** The most frequent illness in the study area; Cholera, Typhoid, Malaria etc. There are four (4) private clinics and one local government health clinic with no qualified nurses and doctors. The majority of the people resort to traditional herbal treatment or self medication/spiritual healing when sick.

**Quality of Life:** There is a high level of poverty in the study area. About 75% of the sample people regard themselves as poor in terms of inability to take care of their personal or immediate family needs. More than 75% of the dwelling houses do not possess modern housing and social conveniences. Unemployment and underemployment is a common trend especially among the youth. Reasons for poverty in the community are attributed to high unemployment level, absence of credit facility from the government and environmental problem. Human diet in the community is predominantly carbohydrate based on cassava, yam, garri and fufu pastes combined with variety of vegetable soup admixture. Fish, bush meat and beef are the main animal protein sources. Kerosene and fuel wood are the main cooking fuels, while commonest asserts include motorcycle and radio set. Telephone handset is becoming common possession within households, while refrigerators are not generally available.

**Infrastructure:** Infrastructure and social services in the study area are generally deplorable and grossly inadequate. There is no access road to link the study area to nearby villages as such; the major means of
transportation is motorcycle. In educational facilities, Itobe community has only three secondary schools and seven primary schools. These schools are characterized by poor infrastructure, inadequate qualified workforce, absence of modern teaching aid and congestion. Although the community is linked to the national grid of the Power Holding Company of Nigeria (PHCN), power supply remains epileptic. For potable water system, dug well water account for up to 95% of community water supply. Two available boreholes in the study area are not functioning. About 5% of the populace obtain their drinking water from River Niger. About four (4) health care facilities are located in the study area and centre for primary and secondary Medicare activities. There is one local Government health clinic. The Itobe market, which is the only market in the project area, lacks modern facilities.

5. PROJECT ALTERNATIVES

Based on the Health, Safety and Environment Impacts, best available technology and socio-economic considerations, three options were considered. These are (i) nothing, (ii) upgrading of existing facilities and (iii) installation of a 1200MW Power Plant. The nothing option was rejected because of the dire need of Nigeria to generate and distribute additional energy for its development. The option to upgrade the existing gas plant at Ajaokuta was rejected because of inadequate supply of gas in the country which has encumbered the start-up of some IPP projects in the country and the high volume of gaseous emissions usually associated with the process. The third option of installing a 1200 MW plant was preferred because it provides a system whereby the best available technology (clean coal technology) is employed in power generation in an environmental-friendly manner.

With respect to the project’s site, a number of location factors were considered. They include: (i) proximity to water source; (ii) proximity to the fuel (coal) source; (iii) accessibility by road and rail; (iv) proximity to a tie-in point to the national grid; (v) coal transportation logistics including use of barge; (vi) availability of land space for the power plant, auxiliaries and residential colony for workers; (vi) positive preliminary environmental feasibility including rehabilitation and resettlement requirements.; and (vii) compliance with IFC Performance Standard 4. On the basis of these criteria, Itobe was preferred for the proposed project because of its proximity to River Niger for water supply and the proximity to the national grid for power evacuation. Moreover, the site is not close to a wildlife sanctuary or forest reserve, neither does it have any archaeological monument/heritage site. The Itobe location is not a part of the Ramsar wetlands in Nigeria and is not habitat to any endangered species and also not a breeding ground for any identified plant and or animal species. In addition, Itobe community offered a warm and enthusiastic reception of the proposed project.

For the technology alternatives, the primary consideration was based on continuous availability of raw material, closeness to raw materials and cost (especially, maintenance cost). The feasibilities for solar, wind, gas-base and coal-base electricity production were considered. While the use of solar systems has many advantages in terms of availability, the use of the solar technology was rejected because Nigeria is in need of a large amount of power output and the solar power stations cannot match the output of other conventional power stations such as coal and hydro due to the low efficiency rate of solar panels which is less than 30%. Wind power project won’t be feasible for this project because of marked variation in the strength of the wind from zero to storm force on a regular basis. This means that wind turbines will not produce the same amount of electricity all the time and there would be times when the turbines will not produce any electricity at all, in a country that is in dire need. The use of gas for electricity generation in the project area was not accepted feasible because the existing and planned facilities in the area which include Geregu 1 & 2 (414MWand 434MW), Ceramic Plant and the proposed Supertek (500MW) Plant makes use/will make use of the gas supply to the project area. There is a lot of
doubt about the sustainability and/or continuous supply over a long period, in addition to the persistent problem of vandalism. The coal-base power was preferred because of: (i) availability of abundant coal reserves; (ii) coal-based power plant will meet the fast growing power demand of Nigeria in comparison of solar and wind energy (as these have long gestation period); (iii) the proposed power plant is near to the coal field and water is available; and (iv) pollution control technologies like lime injection and ESP.

The Fluidized bed boiler technology chosen is a proven technology that has been in operation since 1930’s and 1940’s with multiple applications. The technology has successfully been deployed worldwide. Fluidized bed is divided into three major categories: bubbling bed, turbulent fluidized bed and circulating fluidized bed (CFB).

6. POTENTIAL IMPACTS AND MITIGATION/ENHANCEMENT MEASURES

6.1 Potential and Associated Impacts

The ZCFPP project is expected to have both positive and negative impacts on the physical and socio-economic environment of the project area. The anticipated positive impacts include:

- **Creation of jobs**: During mobilization, movement of goods, personnel and equipment will create unskilled job opportunities (offloading, storing, security-related, etc.). This will be enhanced to skilled employment during the site preparation, construction, operation and maintenance of the Zuma Energy Coal-fired Power Plant project.

- **Improved Business Opportunities/Economic Enhancement**: The local economy will enjoy a “boom” that is expected to last throughout the construction phase and even slightly beyond. Employment opportunities will increase with the establishment of project-related processing plants and industries.

- **Improvement of Infrastructure**: The presence and the operation of the project will potentially bring about the improvement of existing infrastructure and introduction of new infrastructure. For example, the provision of health facility and good access roads for the project’s use will benefit the immediate and the surrounding communities.

- **Enhanced Skills Acquisition**: The construction, operation, and management of this power plant project have the potential for employment opportunities for qualified community indigenes (who may be employed in the project), new skills in building, construction and overall project development and management will be provided.

- **Increased Potential for Sustainable Rural-to-Urban Community Transformation**: The project has the potential to increase the amenities in the area. Some workers attracted during the construction phase will not all depart even after demobilisation of workers at the end of the construction phase. Through the process of natural increase (and further influx of people over time), the population of the community will be on the increase. Other types of need would evolve providing business economic opportunities, and this occurrence will increase demand and supply for essential infrastructure and services, features of urban communities.

- **Increased Potential for Corporate and Community Understanding**: By encouraging the fostering of local institutional responsibilities, adopting a participatory approach and sustained dialogue, this project offers an opportunity for improved relations between project construction workers and the host communities.

Significant negative impacts at various stages of project implementation may include:
- **Community displacement due to land acquisition**: When the ownership of Ite land changes, the members of the community will be displaced and restricted from the use of their land for agricultural purposes and other uses. This may lead to community unrest. A resettlement action plan has been prepared to minimize impact. It is submitted as a separate document.
- **Loss of medicinal shrubs and other biodiversity resources due to land acquisition**: The acquired portion of the community played host to some medicinal shrubs and thus will be lost during the construction of the proposed CFPP. A biodiversity offset programme will be developed to minimize impact.
- **Impacts of Jetty construction on fishing activities**: The dredging period is short lived but will adversely affect the breeding ground of the fishes. The construction will also affect the Catch Per Unit Effort CPUE of the fishes as the fishes will drift away into the deep.
- **Closure of Ite road**: The 2km road off Itobe-Ajaokuta road is the only access road to Ite community. Its closure of Ite road will not have any adverse effect on the community since the community members will be relocated.
- **Increased potential for road traffic volume and risk of accidents/injuries**: It is anticipated that road traffic will increase during mobilization of personnel and equipment to site throughout the construction and operations phase, traffic is also expected to increase because more people and vehicles will be expected at the project area. More so as coal will be hauled from Ankpa to the power plant site over a distance of about 135km by road. An average of 10 trucks per hour is expected for this exercise, i.e., 240 trucks per 24-hour-day. Increases in the volume of traffic have the potential to increase the risk of accidents and noise levels along the route.
- **Pipelines damage**: During the Operational phase of the project, there will be likely accidental damages to pipelines buried below especially during excavation for other services. These accidental damages may lead to leakages from the pipelines thereby obstructing normal operations. Some leakages may also be caused from deterioration as a result of corrosion.
- **Unauthorized access to and leakage from storage and loading facility**: The storage and loading facility will be located on the Zuma Energy site. It comprises of a Tank Farm consisting of a storage tank for the storage of liquid propane and butane (collectively known as LPG or coking gas) with dedicated pipelines that will be constructed with a storage capacity of 5000 tons, corresponding with an annual throughput of some 50,000 tons per annum and a fire fighting system composed of a fire Truck, water storage tank, Fire hydrant, electrical pumps connecting hoses and standby generator, distribution pipeline, fire monitors, extinguishers and hoses, and sprinkler systems. Without adequate security measures being put in place, unauthorized persons will have access into Facility. Improper storage and loading Facility could lead to leakage on the facility that could result in a fire and possible explosion.
- **Influx-related impacts**: The influx of workers during the project implementation will not only lead to significant population increase in the project area, but also have many impacts, including but not limited to (i) alteration of the age-sex distribution in favour of the 20 – 44 age groups and males; (ii) increased pressure on existing deficient physical, social and economic institutional infrastructure; (iii) increase in communicable diseases (including STIs) due to the influx of a largely youthful, sexually active people, many of who are likely to be single and without their families; (iv) increase in cost of living/Inflation; (v) increase in social vices such as crime rate, fraud, prostitution, drug and alcohol abuse, etc.; (vi) stress on existing security structures; (vii) shift from the traditional primary activities of farming and fishing to other

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3 ESIA already prepared and approved for the coal mine.
economic activities; and (viii) increase in community unrest, particularly if the local citizens perceive that the immigrants would deprive them of job and/or business opportunities

- **Potential for erosion on and off the site:** Activities associated with construction (including land clearance, excavation and grading) in the proposed area would increase the potential for erosion as a result of increase in the amount of impervious surfaces around the construction site, which will aid run-off.

- **Soil degradation and soil/groundwater contamination:** Construction equipment generates some volumes of waste oil. If fuelling, maintenance and servicing protocols for construction machinery at the worksite are not controlled, there is potential for impact due to leakage and/or spill. Its proper handling is critical because improper discharge and/or storage, and leakage can result in the contamination of soils, surface water and groundwater. Collection, treatment and environmentally safe disposal of wastewater are important. Depending on the topography of the area, there is a potential for faecal coliform impact on the water from the shallow well located in the vicinity of the pit toilet. Possible contamination of ground water due to project activities if not properly managed.

- **Reduction in air quality:** Project activities like vegetation clearing, excavation etc. will impact on the air quality due to generation of dust and gaseous emissions from movement of heavy machineries. The particulate matter that would be released into the air could reduce visibility. The particles may settle on leaf surfaces thereby blocking stomata pores through which gaseous exchange occur during respiratory/photosynthetic activities. These impacts are, however, reversible and of short duration. Exhaust fumes during power generation from heavy machinery will contain gaseous hydrocarbons and noxious oxides like CO2, NO2 and SO2. Gaseous discharges and dust particles from vegetation clearing, excavation and heavy machinery and vehicles during construction could affect lung functions and may lead to aggravate respiratory disorders such as bronchitis and asthma. These impacts are direct and long-term. Flue gas/ fly ash from the power plant could reduce air quality and predispose to acid rain. Airshed and emission analysis have already been undertaken (Appendix 6).

- **Pollution from increase in the type and amount of waste generated:** Significant amount of wastes from (a) dredge spoil from jetty construction and land clearing spoil during construction, (b) run-off water during construction and from coal stock pile, (c) flue gas and fly ash during operation, (d) bed ash during operation, (e) heat during operation and (f) domestic solid waste and effluent may lead to land and water pollution.

- **Loss of employment and community unrest after decommissioning:** At the decommissioning phase of the facility, it is likely that workers will lose their jobs. This event could result in considerable hardship for the affected families, and may lead to community unrest.

### 6.2 Mitigation Measures

In addition to enhancing the positive impacts, Zuma Energy Company has designed mitigation measures and options for all the potential and associated negative impacts identified with the project implementation to either completely eliminate or minimize their effects. The design basis for the ZCFPP Project will ensure project risks and impacts are reduced to as low as reasonably practicable, with emphasis on improving the environmental sustainability of the project. Mitigation measures that will be implemented to eliminate or minimize negative project impacts in various areas and sectors include the following:
- **Community displacement due to land acquisition:** Resettlement of Ite community will be guided by a Resettlement Action Plan (RAP) which has been developed in concert with the people of the community (Appendix 10). Dialogue with community using appointed community CLO, community leaders. To forestall community unrest, the project shall develop and maintain established channels of communication with communities, and the Power plant Management shall listen sympathetically to the needs of the host communities with a view to assisting for impact. In addition, a Community Relations Officer to liaise with the host communities on issues of concern.

- **Loss of medicinal shrubs and other biodiversity resources due to land acquisition:** The power plant Management shall ensure that natural resources around the project site are not used up but conserved for further purposes. Rare and endangered species will be removed and replanted in designated places, and Cultural Heritage Sites (Shrine) shall be properly relocated. A green belt shall be established, with the implementation of the Green Belt Development Plan that has been developed (Appendix 9).

- **Impacts of jetty construction on fishing activities:** Management shall ensure proper scheduling of barge/boat movement so as not to interfere so much with local fishing activities. It will sensitize local boat drivers on company’s safety plan. Swamplike areas of the proposed power plant site will be properly filled and reclaimed. To curtail possible deterioration of the water of River Niger due to the jetty construction, controlled dredging and shortening of dredging time for water to recover will be undertaken.

- **Closure of Ite road:** Resettlement of Ite Community will be properly undertaken in accordance with the developed RAP.

- **Increased potential for road traffic volume and risk of accidents/injuries:** The Power plant Management shall ensure effective journey management plan and pre-mobilization inspection of all vehicles before deployments. Visible warning signs shall be placed on roads and vehicles, while speed breakers shall be installed at sections of the road traversing communities. Large and slow moving vehicles shall be scheduled during off-peak periods. Compulsory defensive driving training all drivers shall be conducted, while common sense speed limits entrenched in the Zuma Energy road journey management plan shall be enforced. To reduce possible noise nuisance to the barest minimum, no night-driving policy and compliance with the World Bank noise limit shall be enforced for all the contractors. In addition, engineering controls, prevention through design by the installation of exhaust mufflers and silencers coupled with regular servicing/maintenance of equipment to keep noise level within set limits. With respect to minimizing injuries at work, there shall be the enforcement of Zuma Energy’s HSE policies on accident management and Zuma Energy safety rules and regulations. The use of personnel protection equipments (PPEs) shall be enforced, while clinic/health centres for handling emergencies will be set up. Health care providers for handling serious medical treatment cases (MTC) will be employed on retainership basis and there will be the employment of workmen compensation and other insurance instruments. Safety awareness training for workforce and representatives of host communities, as well as accident prevention initiatives campaign shall be embarked upon.

- **Pipelines damage:** The Power Plant Management shall ensure that pipelines will be buried up to 10 feet below where required and make access and tampering difficult wherever they pass through public thoroughfare. It shall also ensure that a dyed concrete cover will be cast over the top of the back-filled trench in which the pipe is buried so as to clearly identify the location of the said pipeline and alert maintenance crews of the hazard. Other activities that will be undertaken include (a) putting in place written operating procedures governing the operating and maintenance of the pipelines; (b) using special coat to resist corrosion and further protected
with cathodic protection; (c) regular inspection of the cathodic protection system, and (d) carrying out tests like ultrasound, liquid penetrant method and magnetic particle detection to guarantee pipe integrity

- **Unauthorized access to and leakage from storage and loading facility:** To forestall unauthorized access to storage and loading facility, the site will be enclosed by chain-link fencing, at least 2m high with barbed wire on top, with a gate to limit access. Security personnel will man the gate 24 hours per day and only legitimate persons will be allowed to enter. To prevent leakage from the storage facilities, the tanks be mounded, i.e. installed above ground in a solid concrete enclosure and the enclosure filled with suitable material to cover the tanks, leaving only the connections exposed. The tanks will be given corrosion protection, and an elaborate fire-fighting system will be put in place.

- **Mitigation for Influx-related Impacts:** These will include ZCFPP Management, among others (i) encourage contractors to employ qualified females of working age; (ii) support expanding physical, social and economic institutional infrastructure; (iii) support immunization in collaboration with State Ministry of Health, and shall organise training with health practitioners and community health workers to strengthen primary health care in the project area; (iv) enforce expatriate malaria policy and immunization and provide mosquito repellent cream on regular basis; (v) support activities of the State Action Committee on Aids (SACA) to reduce the incidence of HIV/AIDS; (vi) support skill development and enhancement programmes in the communities; (vii) support intensive enlightenment campaign and health education for the abatement of abuse of drugs and alcohol; (viii) ensure that both contractor and other Staff develop a high level of security consciousness both within and outside the work area; (ix) establish special security force and foster partnership with the community so as to guarantee security; (x) maintain established channels of communication with host communities throughout the duration of the project, and require contractors to hire local labour where feasible, as required by law to reduce community unrest; and (xi) support local capacity building programmes and undertake and agree on an MOU on peaceful co-existence with the local communities.

- **Potential for erosion on and off the site:** Monitor potential areas for erosion and implement appropriate remedial measures.

- **Soil degradation and soil/groundwater contamination:** The power plant Management shall ensure Contractor provides containment for any chemicals and liquid discharges. Its waste management policy shall be enforced in cases of domestic waste, scrap metals, non-plastic combustible packaging materials, plastic packing materials, drums and containers as well as medical wastes. The Management shall ensure that a controlled fuelling, maintenance and servicing protocol for construction machinery at worksite is established and followed, while all equipment shall be pre-mobbed on site before deployment. In addition, it shall ensure that wastewater is processed in accordance to the nature of chemicals present in each type of wastewater. Domestic wastewater, special chemical spillage and associated wash-down water generated in these industries would be collected, treated and safely disposed. Management shall provide containment, proper treatment and disposal of chemicals and liquid discharges.

- **Reduction in air quality:** To reduce the negative impacts of project generated emission into the air, contractors shall be made to ensure that exhausts of heavy engines, vehicles and trucks are properly maintained. Water sprinkling and other dust suppressant will be employed to reduce dust and particulate matter that will impair air quality. Finely ground limestone or other Calcium Carbonate rich material shall be injected into the circulating bed to form Calcium sulphate \((\text{CaSO}_4)\) compound and carbon dioxide. CFBC boiler shall be designed to limit NOx emissions within the value of 400mg/Nm3 (v) dry at 6% \(\text{O}_2\) basis. Fly and bottom ash, generated from the
combustion process, will be used as mine fill, construction of roads, manufacturing of ash bricks and substitute for cost intensive sand in the project area. Generated CaSO$_4$ shall be properly stored and sent to be used by cement factories.

- **Loss of employment and community unrest after decommissioning**: The Power plant Management shall provide counselling services to staff before disengagements, and shall provide retirement training to staff before disengagements. The Power plant Management and Contractors shall honour all MOU obligations and encourage staff to buy into contributory pension of the Federal government through PENCOM early at commencement of employment of the employee.

- **Pollution from increase in type and amount of waste generated**: The Power plant Management shall ensure all waste generated be inventoried and segregated at source to enable effective handling treatment and disposal. All the waste generated from the power plant project will be handled in accordance with the power industry best practices and standard waste management procedures.

Table ES1 shows the financial commitment of the ZCFPP for various mitigation measures to ensure environmentally friendly operations.

**Table ES1: Environmental and Social Mitigation Plan Estimated Costs**

<table>
<thead>
<tr>
<th>S/No</th>
<th>Description</th>
<th>Allocation</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sensitization campaigns and trainings (for the community health and safety)</td>
<td>Plant Management</td>
<td>74,640.00</td>
</tr>
<tr>
<td>2</td>
<td>Resettlement of Ite Community</td>
<td>Plant Management</td>
<td>6,195,428.53</td>
</tr>
<tr>
<td>3</td>
<td>Relocation of Cultural Heritage Site (Shrine)</td>
<td>Plant Management</td>
<td>15,571.47</td>
</tr>
<tr>
<td>4</td>
<td>Skill Acquisition and Human Development for Land take</td>
<td>Plant Management</td>
<td>933,000.00</td>
</tr>
<tr>
<td>5</td>
<td>Corporate Social Responsibility</td>
<td>Plant Management</td>
<td>1,244,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Greenbelt Establishment</td>
<td>Plant Management</td>
<td>47,964.58</td>
</tr>
<tr>
<td>7</td>
<td>Establishment of an Elaborate Fire Fighting Unit and Personnel Training</td>
<td>Plant Management</td>
<td>933,000.00</td>
</tr>
<tr>
<td>8</td>
<td>Effluent Treatment Plant</td>
<td>Contractor’s Contract</td>
<td>1,368,400.00</td>
</tr>
<tr>
<td>9</td>
<td>Sewage Treatment Plant</td>
<td>Contractor’s Contract</td>
<td>1,057,400.00</td>
</tr>
<tr>
<td>10</td>
<td>Construction of Lined Bunded Walls to Prevent the seepage and run-off of any spilled hazardous substance</td>
<td>Contractor’s Contract</td>
<td>373,200.00</td>
</tr>
<tr>
<td>11</td>
<td>Construction of Solid Waste Disposal Facility</td>
<td>Contractor’s Contract</td>
<td>2,488,000.00</td>
</tr>
<tr>
<td>12</td>
<td>Mercury Trapping Device</td>
<td>Contractor’s Contract</td>
<td>497,600.00</td>
</tr>
<tr>
<td>13</td>
<td>Construction and Maintenance of Access Roads with necessary infrastructure</td>
<td>Contractor’s Contract</td>
<td>2,985,600.00</td>
</tr>
<tr>
<td>14</td>
<td>Special Security Unit, Equipment and Training</td>
<td>Plant Management</td>
<td>248,800.00</td>
</tr>
<tr>
<td>15</td>
<td>Provision of Clinic, Ambulance and Personnel</td>
<td>Plant Management</td>
<td>435,400.00</td>
</tr>
<tr>
<td>16</td>
<td>Building of the capacity of ESMP Implementation</td>
<td>Plant Management</td>
<td>217,700.00</td>
</tr>
<tr>
<td>17</td>
<td>ESMP Monitoring and Supervision</td>
<td>Plant Management</td>
<td>311,000.00</td>
</tr>
<tr>
<td>18</td>
<td>Contingency</td>
<td>Plant Management</td>
<td>1,126,175.35</td>
</tr>
<tr>
<td>19</td>
<td>Grand Total</td>
<td></td>
<td><strong>20,552,879.93</strong></td>
</tr>
</tbody>
</table>

7. **ENVIRONMENTAL HAZARD MANAGEMENT**

ZCFPP Management has a Disaster Management Plan in place with the objective of making use of the combined resources of the plant and the outside services to achieve the following: (a) Rapid control and containment of hazardous situation; (b) Effective rescue and medical treatment of casualties; (c) Safeguarding other people, (d) Minimizing damage to property and the environment; (e) Initially
containing and ultimately bringing the incident under control; (f) Identifying any dead; (g) Providing for the needs of relatives; (h) Providing authoritative information to the news media; (i) Securing the safe rehabilitation of affected area; and (j) Preserving relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency. The plan is designed to address levels 1 - 3 of emergencies. In addition, the prevention of workplace accidents and incidents during the construction and operation of the proposed project shall be achieved using a good hazard analysis procedure. As a minimum, the contingency plans that shall apply to both Zuma Energy Coal-fired Power Plant Management and contractors, and shall address emergency situations, including, but not limited to serious injury or illness; weather related disasters; and land vehicle and boat/barge mishaps.

8. MONITORING PROGRAM

Effective implementation of the recommendations of the ESIA and its management plan: The Zuma Energy Coal-fired Power Plant Management shall appoint an Environmental Monitoring Team (EMT) to ensure effective implementation of the recommendations of the ESIA and its management plan. This team shall be made up of representatives of the project team and Security Departments. The project team and Security Team Leader shall additionally provide leadership to the EMT. However, final environmental responsibility lies with the Zuma Energy Coal-fired Power Plant Project Manager. The EMT shall liaise at a predetermined interval with contractors, engineers, quality assurance officers, supervisors and relevant Zuma Energy Coal-fired Power Plant departments on all environmental matters. The Zuma Energy Coal-fired Power Plant Project Manager and Security Team Leader assisted by the EMT shall be the focal point for all environmental matters relating to detailed design and monitoring of construction, operation and maintenance of the Zuma Energy Coal-fired Power Plant Project. The EMT shall verify the effectiveness of the ESMP implementation in liaison with regulators and other stakeholders as appropriate. Notwithstanding, all action parties within the project team shall demonstrate compliance directly from their line through to the Zuma Energy Coal-fired Power Plant Project Manager. In this way, Zuma Energy Coal-fired Power Plant Management shall take responsibility for all environmental matters and ensure that all contractors involved in this project comply with all applicable environmental laws, regulations and policies. The contractors shall in principle be responsible for implementing those aspects of the ESIA recommendations that pertain to the various phases of this Zuma Energy Coal-fired Power Plant Project.

Scope of Monitoring: Regular environmental monitoring shall be undertaken to: (i) obtain baseline data so as to identify project impacts on environmental components and impacts of the environment on the project; (ii) develop future predictive models from the baseline data obtained; and (c) develop integrated pest management and erosion control programmes, using trained personnel.

Environmental Audit: Environmental audit will be conducted on regular basis for all operations throughout the lifespan of the project. The audit scope would include periodic compliance monitoring plan. This audit process shall be used to monitor prediction in the ESIA process as well as assess the

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4 Level-1 Emergency is a local accident with impact of not more than 250m from the site of primary accident and may require evacuation of the building where accident occurred and utmost the adjacent buildings. Level-2 Emergency is a plant level accident with impact distance up to 1000m for potential threats to life and property requiring the evacuation of all plant personnel except the emergency response personnel. Level-3 Emergency is an accident involving a very serious hazardous situation and with likely impact area extends well beyond the plant boundary limit, such as, major fire, very large release of hazardous or inflammable material and explosion of large quantity of explosive materials which may require evacuation of surrounding population around the plant periphery up to a distance of 1000 m.
environmental performance during the operation phase of the project development. This process will demonstrate that environmental protection and management procedures as specified in the ESIA are implemented.

9. PUBLIC CONSULTATIONS AND PUBLIC DISCLOSURE

9.1 Public Consultations

Effective consultation with and disclosure to the public on information about the project was undertaken during the ESIA process for the project. The consultation meeting took place on June 23, 2010 with various stakeholders in attendance. They included representatives of the Host community (Ite in Itobe), Ofu Local Government Council, Kogi State Government (represented by the State Ministry of Environment), Federal Government (represented by Federal Ministry of Environment) and social organizations like; Itobe Development Association, tobe Pioneer Association (IPA), Itobe Youth Movement (IYM), Itobe Youth Development Association and Itobe Cooperatives.

The key objective of the consultation was to notify the stakeholders of the nature, scale and timing of the propose Power Plant in Itobe, thereby eliminating any fears or apprehension. The process was also used to facilitate information gathering between the state government and the other stakeholders.

In preparing this ESIA report the consultation process is implanted at three (3) levels: The first level of consultation identifies the social and economic issues in the project area and ensures visible management commitment to addressing them. This level starts with the project conception. The second level streamlines the issues and makes plans for specific actions. This level recognizes various phases of engagements among project proponent, host community, village council, women/men’s groups, and youth organization. The third level ensures regular communication with stakeholders throughout the project’s life; the second and third levels of consultation commence at project inception and continue through the life span of the project. In all the public consultation and disclosure activities for the project were made to conform to (i) Nigerian Regulations; (ii) Requirements from the World Bank and IFC Performance Standards; and (iii) Zuma Energy Policies.

Zuma Energy intends to continue to consult with the regulatory agencies, the host community, all stakeholders and other relevant parties concerned with or are likely to be affected by the project at all stages of project development. At the approval of the ESIA for the ZCFPP, Zuma Energy will sign a detailed Memorandum of Understanding (MoU) with Ite community before the commencement of project construction.

9.2 Summary of Disclosure

The ESIA report for the 1200MW Coal-fired Power Plant (CFPP) project in Itobe, Ofu LGA, Kogi State, Nigeria was publicly disclosed and subjected to public discuss. Radio announcements at the national and state levels were made for the locations of copies of the report and the public display of the document at the Federal Ministry of Environment, Abuja, Kogi State Ministry of Environment, Lokoja and Local Government Area Office, Lokoja took place between 20th June and 18th July 2011. A Technical Panel reviewed the contents of the ESIA report from 11th to 13th September 2011 in Nostalgia Hotel, Lokoja, Kogi State, and provided comments and inputs. Comments that were raised at the meeting and inputs from the general public were used to finalise the report. The revised ESIA report was approved by the
Federal Ministry of Environment on 16th July 2012. The ESIA summary shall be disclosed on the AfDB’s website for 60 days.

9.3 Summary of Concerns

The concerned community agreed that the proposed power plant project will be of immense benefit to them, once a number of concerns are properly addressed. They include: (i) absence of necessary social infrastructure/amenities like pipe borne water, access road etc; (ii) availability of employment opportunities for the indigenes in the proposed project area; (iii) women access to soft loans and grants to improve their economic empowerment; (iv) development of a modern market; (v) establishment of a modern hospital and other medical facilities; (vi) provision of standard and well equipped secondary school; (vii) development of a standardized scientific based sewage disposal plan that will contain the expected mega waste from the envisaged gargantuan project; and (viii) rehabilitation and provision of more classrooms, teaching aids, library and technical infrastructure (laboratory, introductory technology workshop etc) at the only primary school in the project area.

10. COMPLEMENTARY INITIATIVES

Coal mining at Ankpa – 125 km from project site. and Ajaokuta 330KV DC Power Transmission Line Project. ESIA for the Coal Mine and the Power Transmission Line Project have already been prepared and approved by the Federal Ministry of Environment, Nigeria. They have also been submitted to the Bank.

11. CONCLUSION

If the proffered mitigation and monitoring measures are followed, the ZCFPP Management is of the view that the proposed power project can be implemented and operated without significant adverse impact to the environment.

12. REFERENCES

The main documents consulted to prepare the Summary are:

2. AfDB (2001): Environmental and Social Assessment Procedures
3. AfDB (undated): Environmental and Social Assessment Procedures Basics
4. World Bank (2005), Environmental Impact Assessment (EIA) and Safeguard Policies.