NON-TECHNICAL SUMMARY

INTRODUCTION

This study is an update of the social and environmental impact study conducted by SOCREGE in June 2011. The update resulted in clarifications and amendments pertaining to a number of significant items in the study that have evolved in the meantime. The update also incorporates additional information that appeared necessary to ensure certain international requirements are met.

The site of the solar power station being studied is located on land belonging to the Village of Zina, 1 km from the homes of said village (whence the name Zina solar power station). The Village of Zina is located approximately three (3) kilometres from the main municipality of the Commune (Town of Kona). The Village of Zina is located approximately 60 km from Boromo (capital of the province of Balés) and 180 km from Ouagadougou, the capital of Burkina Faso. The power station covers a surface area of 74 hectares of which 37 hectares will be used for the solar power station implementation.

In accordance with current legislation, this study is intended to provide an inventory and assessment of the positive and negative, direct and indirect, immediate or long-term impacts of the solar power station construction and operation project. It addresses the various alternatives and proposed variations whose impacts could be less significant. The study also proposes mitigation measures for those impacts, as well as a project implementation and environmental and social monitoring plan.

OVERVIEW

The power station project was initiated in 2009 as part of a public/private partnership between the Government of Burkina Faso and SEMAFO Énergie Burkina, which became Windiga Énergie Burkina in 2013, an independent entity from SEMAFO. The project is being developed by Windiga Énergie in the form of a private investment based on the BOOT (build, own, operate and transfer) concept with a view to filling the energy shortfall in Burkina Faso. Following an international request for proposals, the solar power station will be built and operated by Bouygues Energies & Services in connection with an EPC-OM (engineering, procurement and construction—operation and maintenance) contract.

The concept of the project consists in connecting the solar power station to the SONABEL grid which will use SONABEL's new 90 kV Pa – Mana transmission line to distribute power to all the customers of SONABEL who can be connected by this line, including the Mana mine of SEMAFO BF SA.

The line, a long time in the planning under the Government's policy of connecting all of the mines to the SONABEL power grid, will run relatively nearby the power station. Given its route and because of the mine, the line will potentially facilitate power supply by SONABEL to a dozen villages in the area under its rural electrification plan. SONABEL will then build the necessary substations for connections to its power grid.

PROJECT DESCRIPTION

The project consists in building a solar power station with photovoltaic technology and a capacity of 26.6 MW_P (22.4 MVA for inverters) and operate said station over a 25-year period, which is the life of the project. Power station construction is slated to begin 2016. The energy from the station will then be injected into the power grid comprising a mix of thermal, imported, hydroelectric and solar energy.

The technical specifications are as follows:

- Panels: Polycrystalline silicon, slope toward the south with gaps of approximately 6 metres between rows;
- Foundations: Screw or driven piles, able to withstand the stresses from all combined loads, such as the weight of the structure and panels and the wind;

- Electrical links between panels, inverters and the point of delivery: underground wiring, protected from mechanical stresses and rodents;
- Surge arrester: grounds and lightening protection;
- 7.8 km 33 kV transmission line between the power station and SONABEL's transformer substation in Wona which will provide the connection with SONABEL's 90 kV transmission line between Pâ and Mana. The 7.8 km line has been included in project costs but will belong to SONABEL.

Based on the types of projects submitted for environmental and social assessment in Burkina Faso, photovoltaic solar power station projects can fall under an impact statement in light of relatively limited impacts of solar power given that it is a renewable energy. However, given the scope of the project in terms of surface area and that the Windiga project is a new project for Burkina Faso, the sponsor considered it preferable to conduct an environmental and social impact study to ensure all impacts of the solar energy project are identified.

The solar power station will be built over a relatively short period, ranging from 12 to 14 months. It will be operated over a 25-year term. It is anticipated that the power station will be sold to SONABEL at the end of that period.

Construction involves levelling, equipment delivery, pile installation for the frames, frame and panel installation and inverter and cable installation. Operation of the power station consists in maintaining the equipment and periodically washing the panels, which requires little staff.

POLITICAL, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

The legislative and institutional framework of the environmental study is assessed in an integrated manner through national legislation and major policies governing undertakings in Burkina Faso. The main pieces of legislation assessed are the Environmental Code of Burkina Faso, the *Agrarian and Land Reform Act*, the Forest Code, the *Water Management Policy Act* and their implementing provisions.

The various international statutes and policies, particularly those of the Wold Bank Group (more specifically, International Finance Corporation or SFI) are also reviewed to identify the requirements applicable to the project contemplated by this study.

Furthermore, with a view to an effective segregation of duties in the Environmental and Social Management Plan (ESMP), the institutional framework is disclosed detailing the main Burkinabe ministerial departments involved in areas of the environment and energy.

DESCRIPTION OF THE AS-IS STATE OF THE ENVIRONMENT

In light of the size of the project, the study and description of the as-is state were prepared to include the entire commune, which has a surface area of 60,517 hectares.

Biophysical environment

The Boucle du Mouhoun region is located in the Sudano-Sahelian climate zone. Analysis of monthly rainfall data show that nearly 90% of annual rainfall occurs from May to September, with the remaining 10% occurring from October to April. Annual rainfall highs of 1,200 mm are met and exceeded.

Average annual pan evaporation ranges from 2,800 mm to 3,500 mm. Average temperatures range from 21.9°C to 34.6°C, with extreme lows of 15.1°C and extreme highs of 40°C some years. The area is influenced by Harmattan trade winds, and monsoons as of the Bobo-Dioulasso compass rose. It has been determined that the area receives less dry wind (33%) than humid wind (56%). Calm winds are on the order of 11%. Excluding disturbances, wind speeds average approximately 1–4 m/s.

With regard to surface water, the area under study is located entirely in the upper Mouhoun watershed. Creeks are temporary and only flow after strong rain. During the rainy season, the plains are often flooded with numerous pools forming in the depressions.

Hydrogeological conditions comprise a set of rocks consisting of granitoid, greenstone and volcano-sedimentary shales, and a set consisting of sedimentary rocks. In fractured aquifers, the resource is located and flows within the rock fractures. These aquifers are tapped by boreholes. In the semi-fractured and altered media aquifers, the resource is located within porous media and flows within the fractures. These aquifers are tapped by modern wells and certain traditional wells. In alterite aquifers, water is located within porous media associated with the alteration. This is the favourite area for tapping traditional wells. Drilling speeds are relatively high and in some areas exceed 20 m³/h. The site contains several water catchments that are readily sufficient to meet water needs which will remain very low, as they consist solely of the water needed to wash the solar panels.

Following a soil survey conducted at the project site, three soil subgroups were mapped:

- Lithosols on a layer of hardpan and lithosols on clay that are irremediably inhospitable for all possible crops;
- Largely non-eroded regosols and shallow indurated leached ferruginous tropical soils marginally hospitable for all crops;
- Shallow indurated leached tropical ferruginous soils moderately hospitable for all crops.

The power station site features lands and agricultural fields with rain-fed crops. In 2002, the agricultural fields covered 62 of 74 hectares, or 88% of the project's total surface area. However, on-site investigations conducted in January 2011 revealed that the surface area of agricultural fields had fallen, then representing only 19% of the 74 hectares. This percentage will probably be even lower on the 37 hectares occupied by the power station once the definitive configuration is completed.

The site is currently occupied by fields cultivated by some twenty farmers (owners and/or non-owners) all have of whom have customary rights over substantially all of the 74 ha comprising the project). The crops grown in those fields consist of millet and sorghum, sesame, cotton and cowpea. The farmers comprise households that derive most of their livelihood from the harvests from their fields.

The project site's small footprint (74 ha) and the fact that it is relatively covered by seasonal agricultural fields explain the scant wildlife presence within perimeter of the solar power station. However, the literature and meetings with residents indicate that the region is home to terrestrial wildlife consisting of large and small mammals and reptiles, as well as an abundant bird population.

Human environment

The power station site is in an uninhabited area with no buildings. Its eastern border is in proximity to the road. The site is located over 1 km from the Village of Zina, which has around 400 inhabitants.

Based on the results of the 1996 General Population and Housing Census (RGPH), the Town of Kona was home to 14,696 inhabitants, consisting of 49.8% women and 50.2% men.

In its 2006 edition, the census returned a total population of 19,606 inhabitants, of which 48.28% were women and 51.72% were men. In its 2014 projections, the National Institute of Statistics and Demography (INSD) forecasted 24,548 inhabitants, of which 11,852 were women (48.3%) and 12,696 were men (51.7%).

The PAPs identified in the wayleave come from 4 villages: Yona (3 PAPs), Kona (12 PAPs), Zina (4 PAPs) and Blé (1 PAP). A total of 20 PAPs has been identified in the wayleave of the solar power station.

Kona is a rural commune with 34 town counsellors at the last combined elections (legislative and municipal) held in 2012. However, in November 2014, all town counsels were dissolved following the sociopolitical crisis that hit the country. Nevertheless, the traditional social and political organization persists and is characterized as follows. Each village is led by a chief who is typically the eldest member from the area's most longstanding lineage. The village chief is also the land chief.

The commune's ethnic makeup consists primarily of four groups, which in order of importance are: the Marka, the Bwabas, the Mossis and the Peulhs. Islam is the dominant religion, followed by Christianity. The traditional religion, ancestor worship, is officially the least widespread religion, but in reality, the inhabitants practice religious syncretism, as nearly all Aboriginal peoples take part in rites rooted in ancestral religions.

The Commune of Kona has four local health care centres, known as Health and Social Promotion Centres (CSPSs): the Kina, Kouana, Dangouna and Lah CSPSs. In 2013, epidemic-prone diseases across the health district consisted of meningitis, measles, cholera, febrile jaundice, acute flaccid paralysis, bloody diarrhea and respiratory infections.

At the beginning of the 2014-2015 school year, the Kona Basic Education District (CEB) had 24 schools, consisting of 22 public and 2 private schools (French-Arabic). This year, 87 classrooms are open. Note that the schools are relatively well distributed across the commune, as each village has its own school.

The commune has a general education college (CEG) which opened its doors in Kona in 2010 with five classrooms. It became the Departmental Lycée of Kona in 2014.

With regard to literacy, the commune's 2007-2008 campaign was built around 30 centres. Five years later, there were 52 centres with 1,791 female and male learners.

In 2008, the Commune of Kona had 71 water points distributed across 43 boreholes (including 8 non-functional) and 28 large-diameter wells (including 5 non-permanent), for a ratio of 276 inhabitants/modern water point. In 2013, the Commune of Kona had 95 water points across 58 boreholes (including 8 non-functional) and 28 large-diameter wells and 5 temporary wells.

Agriculture is the principal economic activity of the population in the Commune of Kona. It accounts for 90% of assets. Generally, cereals and cotton constitute the most widespread enterprises. Surpluses reported in the 2012, 2013 and 2014 cereal balance sheets amounted to 10,697 tonnes, 10,859 tonnes and 11,837 tonnes, respectively. Overall, the cereal balance sheet was positive for the past three-year period. Inhabitants derive most of their cash income from cotton.

Animal husbandry is the second-largest economic activity after agriculture. Animal husbandry includes cattle, sheep, goats, pigs and poultry. Donkeys are also bred, but to a lesser extent. Inhabitants practice extensive traditional and sedentary animal husbandry with livestock grazing over large areas. The commune's total livestock count in 2003 was approximately 83,700. Since 2003, that count has grown unabated across all categories of livestock.

IMPACT IDENTIFICATION AND ASSESSMENT AND IDENTIFICATION OF MITIGATION AND ENHANCEMENT MEASURES

The method chosen to assess the probable significance of impacts is based on identifying impact sources and the main assessment criteria, which are impact duration, scope and intensity.

Potential project impacts are generated by the activities carried out during the construction and dismantling phases, as well as during the facility's operation and maintenance phase. With regard to project scope, its remote location relative to inhabited areas and the technology used, the main adverse impacts on the biophysical and human environments occur during the site preparation and construction phase. For most activities, such impacts have little significance. The most significant impacts are related to the acquisition of land and vegetation cutting on-site which will affect certain ecosystems related to agricultural production and animal husbandry. A total of six (6) PAPs will be economically impacted by the construction of the solar plant. However, applying appropriate mitigation and enhancement measures will reduce residual impacts to medium significance. In the operation phase, the project has few adverse impacts. In contrast, there are numerous positive impacts on the biophysical and human environments during that phase. Lastly, in the dismantling phase, the main adverse impacts are neutralized by the site renaturization following the end of operations.

In any event, the study proposes mitigation measures for the power station's preparation, construction, operation and closure phases which will have to be planned to prevent, eliminate, mitigate or offset the adverse impacts. It also proposes enhancement measures, which would afford the community greater economic benefits from the project.

For the biophysical environment, the anticipated measures include:

- The use of equipment and trucks in good running condition;
- The inclusion of a used-oil management clause in the specifications provided for contractors;
- Regular inspections of maintenance areas and used oil and waste collection means;
- Restoration of borrow and work camp areas after work is completed;
- Measures to combat water and wind erosion;
- Selective felling of trees and management of collected wood in agreement with the commune;
- Prohibition of hunting and illegal wood cutting;
- Planting of trees around the site to screen out visual nuisances caused by the PV equipment and breezes;
- Creation of an Emergency Measures Plan to address all potential outcomes.

For the human environment, the anticipated measures include:

- The adoption, before any work begins, of an Occupational Health and Safety Plan (OHSP);
- Medical visits for workers;
- Regular staff instruction on the use of personal protective gear;
- Road safety awareness;
- Installation of no trespassing signs and the implementation of security guards to prevent any public access to the site;
- Education of residents regarding the presence of solar panels and their effects;
- Creation of an Emergency Measures Plan to address all potential outcomes;
- Priority hiring of local workers and priority given to local businesses for the completion of related work.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) AND MONITORING PLAN

The plans will be implemented in conjunction with the other stakeholders and aim to ensure the execution of all mitigation and/or enhancement measures that are applicable and identified in this report and that such measures form part of (a) the specifications provided to the suppliers charged with site preparation, construction, operation and closure, (b) the roles and responsibilities assigned to Windiga Energy, or (c) the institution players responsible for certain measures.

In addition to oversight of the implementation of the mitigation and optimization measures and the supporting initiatives aimed at protecting the biophysical and human environments (monitoring), the ESMP also provides for a capacity-building plan. Such a plan is necessary to ensure stakeholders are well equipped to implement the ESMP and will be implemented as early as possible in the project cycle.

The ESMP's Monitoring Program will serve to ensure that mitigation and enhancement measures implemented, that such measures produce the anticipated results and that they are amended, discontinued or replaced when found inadequate. Furthermore, environmental monitoring will assess compliance with Burkinabe environmental and social policies and standards, as well as those of financial backers.

The ESMP contains several measures that the primary contractor or other services providers of Windiga Energy will be required to implement. The implementation costs for such measures will be negotiated at a later date. Regarding the measures that Windiga Energy will be in charge of for the duration of the project, the related costs are deemed to form part of the project's operating budget. In connection with this study, the specific environmental and social measures (which are independently budgeted in the specifications and operating budget of Windiga Energy) and ESMP implementation, monitoring and tracking costs amount to CFAF **301,685,000** and CFAF **11,500,000**, respectively.