

Environmental Impact Assessment Study for Wind Turbines in the Desert of Kuwait

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Abstract— As part of Kuwait's Renewable Energy Program, 10 MW Wind Plant will be implemented at designated site of Shagaya area, in the western area of the State of Kuwait, for a lifetime of 25 years. The wind power project includes the engineering, construction and installation of 5 wind turbines of 2 MW each and connection to a substation of 132 kilovolt (kV). Each turbine will have a tubular tower of up to 78m height, and three rotor blades with a maximum rotor diameter of 97m. This study aims to fulfill the environmental requirements of Shagaya Wind Plant thru evaluating the expected potential impacts and investigating the proper mitigation measures and ensuring that the provisions of the latest legal acts currently enforced by Kuwait Environment Protection Authority (K-EPA) are also complied.

As per the requirement of Environmental Protection Law No. 42 of 2014 and EPA Executive By-Law of Law 21/1995 comprehensive descriptions of the project environment and the surrounding areas which may be affected by the project have been taken into account. Thus, the Environmental Baseline Study (EBS) for site assessment was conducted in general accordance with these guidelines. The results showed that the allocated site is an open desert area, devoid of any perennial vegetation and has no inland surface water bodies or coastal wetlands. The nearest land use, to the project area, is the new scrap located at about 20km. The topographic elevation of the site rises gradually from east to the western side (240-250 meter). Geomorphologically, the area is situated at the flank of a paleo plain, with sedimentary sequence of the Arabian monocline. Surface drainage network, in the project area, is not very well developed. The project area is dominated by the upper and lower members of Dibdibba Formation. At the time of investigation, ground water table was not encountered from natural ground level (NGL) to the depth of 30m in any of the boreholes conducted by Geotechnical Inspection Company. Seismically the area seems to be quiet with no earthquake observation record. The soil of the study area is mainly Typic Petrogypsid which is permanently unsuitable and moderately saline. No metal contamination was found in the soil samples analyzed by Kuwait University Labs. Recent studies show that the study area is classified among the high wind energy deserts. High class of sand encroachment susceptibility is constituted to the study area.

Metrological measurement data features a very strong NNW prevailing wind direction and around 7m/s monthly mean average at 80 m above ground. The wind conditions are also

characterized with a summer peak in wind speed and higher wind speeds during night time. Based on Air quality monitoring results (11 July 2015 to 21 July 2015) show that all measured pollutants are below stipulated Kuwait EPA Air quality standards and none of the measured gases exceeded the allowable limits. The area is mostly characterized by natural environmental noise with no exceedence of Kuwait EPA noise standards.

An assessment of environmental effects was completed for all the phases of the proposed wind farm project. There are a variety of environmental impacts associated with the project. The notable negative impacts of wind turbines are on wildlife (mostly avifauna) and public health and safety (sound and visual impact). During the construction phase, the negative impacts on soil and topography, air quality, land water will be short term and do not present significant effects due to their temporary natures. Negative environmental impacts can be mitigated by implementing measures during the construction, operating, maintenance and decommissioning phases to eliminate or significantly reduce them.

The project may generate some employment opportunities and commercial activities in nearby areas which is beneficial. Long-term benefits will also include reduction in greenhouse gases emission, reduction in fuel consumption and costs, reduction in electricity costs to consumers, promotion of alternative sources of energy and tourist attraction. The notable positive impact during the operational phase may also include biodiversity enhancement in the site as a result of turning the site into protected/conservative area. Such kind of protection helps maintain ecological processes that cannot survive in most intensely managed landscapes (e.g. desert).

Based on the project's inputs, K-EPA guidelines and detailed analysis carried out in this study, it can be concluded that the Project is not likely to cause significant adverse impacts (both biophysical and socio-economic) on the existing environment, but it provides substantial benefits for local climate, health, and economy.

Keywords— EIA; Renewable Energy; Wind; Impacts

