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Wind Power Development in Kagbeni Area, Mustang from view point of Geological and Meteorological Concerns

Ranjan Kumar Dahal[1], Kalyan Dev Bhattarai[2], Ghanashyam Neupane[3], and Kumud Raj Kafle[4]

[1] *Department of Geology, Tri-Cahndra Campus, Ghantaghar, Kathmandu, Nepal*

[2] *Swet Bhairab Power Supply Pvt. Ltd., Baluwatar, Kathmandu, Nepal*

[3] *Department of Mines and Geology, Lainchaur, Kathmandu, Nepal*

[4] *HEET Consult Pvt. Ltd., Putalisadak, Kathmandu, Nepal*

(Corresponding author email: ranjan@ngs.org.np)

ABSTRACT

The wind power is being used to generate electricity since 100 years. Today, only in USA, over three billion kilowatt-hours of electricity annually produce which is enough to meet the needs of over one million people of USA (NREL, 1999 and AWEA, 1999). India produces around 200 MW of electricity (VestasRRB, 1999) by the help of Wind Electric Generators (WEGs). The wind energy is becoming most popular in the world due to its environmental benefits, improved technology and dramatic reduction on equipment cost with reduced construction cost. In California, probably from the charismatic fact and very favourable policy for investor from the State, wind industries grew from no installed capacity in 1979 to about 500 MW at the beginning of 1985, to a high of 1,679 MW at the end of 1991 (NREL, 2002 and DWIA, 2002). Unquestionably, every country will inspire from this amazing fact of wind electricity.

The wind energy potential in Nepal is also high. There have been previous attempts towards the development and utilization of wind as a source of mechanical and electrical power generation. NEA established a pilot project of 20 kW in Kagbeni, Mustang as a rural electrification project (MWR, 1995). However the project failed due to collapse of the tower. Considering the fast development of wind energy in other part of the world and its potentiality in Nepal, it is very necessary to develop wind energy as a supplement to the hydropower to fulfill the requirement of power needs of country and remote area like Mustang.

Kaligandaki valley of Mustang is one of the famous river valley for the katabatic wind which generally flows toward upstream (south to north). The available wind data (WECS, 2002) was used to prepare windrose diagram and which shows 90% of the wind direction is limited to 0^o to 30^o directional range. Similarly, in winter season, some days are also noticed in which wind flows upstream (N) to downstream (S). The wind data also revels that the variation of wind speed is generally ranges from 0 m/s to 22.96 m/s. Calm wind flow generally experienced in early morning and evening.

During study, to identify the suitable sites for wind mills, available wind data, topographical maps, geological and geomorphological maps with reports of previous wind mills of 20 kW were critically examined. During field visit, topographical survey as well as geotechnical survey was carried out. The available wind data is also verified in field. After proper site identification, detail soil investigation was carried out by the help of rotary drilling up to the depth of 10 m at two locations of WEG towers.

Laboratory analysis of soil samples was also performed. From laboratory test as well as the drilling data, bearing capacity of the subsurface strata was determined as 128 kN/m^2 at borehole 1 and 132 kN/m^2 at borehole 2. Similarly, the geophysical study reveals that the surface resistivity ranges between 1500 to 1600 ohm m. An engineering geological map was also prepared during field study.

As a pilot study, the site is evaluated for less than 1 MW wind power. But it is also felt that, only in the Kagbeni area, there is feasibility of more than 25 MW of wind power.