windlab

Site Selection Motivation

Project: **West Coast One, Rheboksfontein and Suurplaat**

Location: **Western Cape and Northern Cape, South Africa**

Report Prepared For: **Moyeng Energy**

Commercial in confidence

Boeing Centre
55 Blackall St
Barton, ACT, 2600,
AUSTRALIA

3913 Jackson Rd
Ann Arbor
Michigan 48103
USA

Suite 300, 5 Richard Way S.W.,Calgary,
Alberta, T3E 7M8
CANADA

Green Building,
9b Bell Crescent Close, Westlake,
7945
SOUTH AFRICA

www.windlab.com

Document Approval

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Author	Francis Jackson / Richard Mackie	2010/7/20
Checked by	Nathan Steggel	2010/7/21
Approved by	Richard Mackie	2010/7/27

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Important Notices

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1 Background

The Environmental Impact Assessment process requires motivation with regard to the selection of the West Coast One, Rheboksfontein and Suurplaat wind farm sites. Assessment of site alternatives is required and this has been addressed at several levels, from the macrolevel to the level of micro-siting of turbines. The text below is provided to describe the motivation for selecting the wind energy facility locations.

2 Site selection process

The sites proposed for the West Coast One, Rheboksfontein and Suurplaat wind energy facilities have been selected at hand of a detailed process of identification and elimination of sites based on a combination of attributes that are required for a suitable wind farm. This is performed by analysing wind farm attributes and constraints using computerised Graphical Information System (GIS) overlays including appropriate wind energy, environmental, topographical, infrastructure and residential information in combination with a hand-picking process where the wind engineer applies detailed attention to areas of concern or potential, drawing on their experience of wind turbine siting issues that cannot be purely algorithmically defined.

Site selection draws on macro-level assessment of broad constraints, but also requires that micro-siting issues are considered in order to determine whether the project forms a cohesive unit that as a whole can constitute a potentially viable site. For example, a spread of spots where turbines might be situated which are too far apart may not render a wind energy facility possible.

The site selection process that resulted in choosing these locations involved a narrowing focus from regional through local as follows, beginning in 2007:

1. Western Cape Province in particular was targeted at the time of site selection given the existence of a policy that encourages the uptake of renewable energy.
2. Northern Cape's wind energy potential was explored with the optimism that policy would be introduced to encourage the uptake of renewable energy in line with national policy under development.
3. The wind resource was mapped using Windlab's proprietary *Windscape™* wind mapping technology.
4. Regional areas of suitable wind resource potential were identified after applying constraints at a macro level such as: topographical, grid infrastructure, land tenure, flora and fauna and housing.
5. Local constraints within each region were identified and mapped
6. Individual wind farm locations were provisionally identified which resulted in approximately 40-50 provisional wind farm locations.
7. These were ranked according to ability to connect to the electricity network with the help of a specialist network consultant and the short-list passed to the next phase.
8. The provisional energy generation potential was determined using Windlab's proprietary wind analysis techniques, micrositing constraints and key risks for the project concept identified. This information was then summarised in a "virtual wind farm" report for each shortlisted site. 14 such sites were identified at this stage.
9. Landowners at each shortlisted site were then contacted and site visits conducted.

10. After site visits, some sites were excluded due to lack of interest from landowners or unsuitability of terrain for constructing a wind farm.
11. The results of this process was the selection of five sites and three, West Coast One, Rheboksfontein and Suurplaat were chosen as having the most favourable wind, engineering and environmental characteristics.

Constraints considered in the site selection process included, but were not limited to the following, listed under the two distinct categories of:

- Engineering and Economic Constraints
    - These constraints are driven by the wind developer's understanding of the factors that make a wind farm feasible from an engineering perspective as well as the impact of variables on the financial model.
- Social and Environmental Constraints
    - Preliminary assessment of constraints is conducted using the project sponsor's experience and understanding of interaction of wind energy facilities with the social and ecological setting. Key experts and stakeholders may be consulted at an early stage to inform this process. At a more detailed level, this is the domain where the relevant government departments, social organisations and consultants are best equipped to evaluate concerns during the consultative phases of the project.

2.1 ENGINEERING AND ECONOMIC CONSTRAINTS

2.1.1 WIND RESOURCE

Without the wind resource there is no wind energy facility. Hence this is selection gate number one. Other constraints need not be considered if the region does not have the appropriate resource. Windlab was launched out of the CSIRO in Australia in 2003 on the basis of the development of a high-resolution wind mapping software, *WindScape™*. This in-house capability enables Windlab to identify regions with promising wind resource at a very early stage of the project with significantly higher certainty than would be possible otherwise, thereby improving the ability to identify economically viable sites.

On-site measurement to provide bankable data to verify the resource is still required, however with this upfront increased confidence in the first site selection gate, wastage of time and resource into assessment of other concerns at poor wind resource sites can be minimised.

The wind resource is defined in terms beyond average wind speed and includes Weibull distribution, turbulence and wind rose (pattern of wind direction) – key items that determine whether micro-siting constraints will render the project suitable as a whole.

Windlab's preliminary assessment of the wind resource from measurement at the West Coast One, Rheboksfontein and Suurplaat sites indicate that the proposed projects would generate sufficient energy to support an economically viable wind energy facility within bounds of uncertainty considered acceptable at this stage of development.

2.1.2 TERRAIN AND ACCESS

Complex terrain introduces wind flow effects such as turbulence that may not be acceptable for turbine siting. Terrain alignment with respect to the wind rose also needs to be assessed

in order to ensure that workable turbine spacing can be effected. Access roads to the region must be assessed and complex terrain may typically bring with it access constraints due to limited road infrastructure and constricted turning circles.

The terrain at West Coast One, Rheboksfontein and Suurplaat is considered to be suitable for a wind farm installation with a low to moderate terrain complexity and good access infrastructure into the area.

2.1.3 EXISTING GRID INFRASTRUCTURE

The electricity grid infrastructure in the region needs to be of sufficient strength and configured in such a way as to be able to accept the incoming power. Upgrades and the length of additional lines required to reach the infrastructure will add to the cost of the project. The exact length and extent of these requirements differs from project to project.

With the presence of suitable electricity grid infrastructure nearby, Windlab consider the West Coast One, Rheboksfontein and Suurplaat sites to have an appropriate means of distributing the electrical output from each wind farm.

2.1.4 LAND TENURE

A wind energy facility will form a complementary use of the involved land, where it will need to exist alongside other land uses such as agriculture. It is hence essential that the land involved is available in terms of the land use being compatible and the land owners being amenable to the development of the potential facility.

Agreements have been reached with the owners of the land involved to enable the development of the project and the current land uses, which are predominantly cropping and grazing, are very compatible with wind farming.

2.2 SOCIAL AND ENVIRONMENTAL CONSTRAINTS

The detailed establishment of socio-environmental constraints is performed in the Scoping and EIA phase of development, however preliminary assessments of these are conducted on a macro scale during the process of site selection.

Key concerns are primarily proximity-based and include taking cognisance of warning signs from the following:

- Nature reserves
- Avian breeding grounds
- Residential areas
    - Proximity to clustered residential areas will raise the setbacks required for background noise concerns and increases the risk of visual impact.
    - Scattered residences, including those of land owners involved in the project are addressed as a micro-siting constraint
- Scenic landmarks
- Aviation zones – airports and immediate flight paths

Where proximity-based constraints can be applied, a GIS layer has been applied to the prospecting process. Other concerns need to be addressed on an individual basis by consultation with stakeholders.

Windlab's preliminary assessment in this regard has rendered the view that the social and environmental issues investigated to date are compatible with the installation of a wind farm project at the West Coast One, Rheboksfontein and Suurplaat sites and that the EIA Scoping study should be undertaken to determine if key concerns are raised by a more in-depth assessment.