juwi Renewable Energies (Pty) Ltd

Castle Wind Energy Facility

Transportation Route Assessment

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1. Introduction

juwi Renewable Energies (Pty) Ltd proposes developing a Wind Energy Facility and associated infrastructure, which shall be called Castle Wind Energy Facility.

The proposed Wind Energy Facility shall consist of no more than 31 wind turbines, each having a generating capacity of between 3,5 and 2,4 MW and is to be located approximately 28 km northeast of De Aar and 24 km southwest of Philipstown, on Portions 12 and 13 of Vendussie Kuil (Farm 165) within the Emthanjeni Local Municipality and Portion 1 of Knapdaar (Farm 8) within the Renosterberg Local Municipality, both of which are part of the Pixley ka Seme District Municipality of the Northern Cape Province of South Africa.

Hatch Goba (Pty) Ltd has been appointed to carry out a transportation route assessment for the large components of the wind turbines from various ports to the site.

2. Scope

The scope of this transportation route assessment for the large components (abnormal loads) of the wind turbines from the Port of Ngqura to the proposed Wind Energy Facility.

The scope of this report excludes all normal transportation required to the proposed Wind Energy Facility.

3. Purpose

The purpose of this transportation route assessment for the large components of the wind turbines from the Port of Ngqura to the proposed Wind Energy Facility is to identify any issues of potential significance to be investigated and assessed during the EIA phase.

4. Methodology

The identify and evaluate of the transportation routes from the Port of Ngqura to the proposed Wind Energy Facility, is limited to a ‘desk top study’.

Google Earth and various GPS software were used to identify the various transportation routes from the Port of Ngqura to the proposed Wind Energy Facility. Google Earth (street view) was used to identify the physical constraints and limitations along the paved routes within South Africa. Although every effort has been taken to identify the various physical constraints and limitations along the routes, this is only as accurate as the reference material used and the consultant cannot be held liable for the accuracy of the reference material.

As requested by the client, the limitations and constraints of the routes identified were not physically validated. The logistics company will have to validate the preferred route once appointed.

5. Exclusions

This transportation routes assessment does not address the access routes onto the proposed Wind Energy Facility nor the transportation routes to and from the proposed Wind Energy Facility by non abnormal vehicles.

6. Transportation Requirements

6.1 Legislative Framework

The National Road Traffic Act (Act 93 of 1996) and the National Road Traffic Regulations (2000), prescribe certain limitations on vehicle dimensions and axle and vehicle masses that a vehicle using a public road must comply with. However, certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass, as prescribed. Where such a vehicle or load cannot be dismantled, without disproportionate effort, expense or risk of damage into units that can travel or be transported legally, it is classified as an abnormal load and is allowed to travel on public roads under an exemption permit issued in terms of Section 81 of the National Road Traffic Act.

These Permits are normally issued by the Provincial Road Authorities and, if necessary, input is obtained from local and metropolitan authorities. Should such a permit be required, the client would need to obtain the necessary road permits from the relevant Road Authorities as it is outside of the scope of the EIA process.

6.2 Guideline Documentation

The Technical Recommendations for Highways (TRH 11 – Aug 2009) entitled “Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles” is the main guideline document.

In this document, various types of abnormalities and abnormal load and vehicle configurations are described. Abnormal load classification in terms of dimensions and mass is presented and routes are categorised in terms of paved width and posted speed limit. Dimensional and mass limitations for abnormal vehicles allowable under an exemption permit are defined. Marking and escorting requirements and speed restrictions applicable to abnormal vehicles are described. An overview of methods to estimate road pavement damage by abnormal vehicles is given.

A vehicle or a vehicle with its load that is considered to be indivisible, can be abnormal either in terms of dimension or mass or both.

6.2.1 Dimensional Limitations

The dimensions of an abnormal load may cause an obstruction and danger to other road users. For this reason, all loads must, as far as possible, conform to the dimensions requirements.

A vehicle / combination is dimensionally abnormal when any of the following dimensions exceeds the legal limitations:

- Length
- Width
- Height
- Overhangs

- Load projections
- Wheelbase

6.2.2 Load Limitations

The maximum load that an abnormal vehicle will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicle, as rated by the manufacturer;
- the load which may be carried by the tyres;
- the damaging effect on pavements;
- the structural capacity on bridges and culverts;
- the power of the prime mover(s);
- the load imposed by the driving axles and
- the load imposed by the steering axles.

7. Wind Turbine Components

There are a number of wind turbine manufacturers worldwide. Each manufacturer has a variety of turbine models available on the market. Since the final selection of the turbine manufacturer and model will only be finalised later, the requirements and limitations on the transport routes, in terms of specific load weight and load height clearances, are based on Vestas V90 – 3.0 MW wind turbine (105 m high).

The dimensions and weights of the wind turbine components vary depending of the capacity and height of the wind turbine. As a worst case scenario, in terms of the size and number of turbine components that have to be transported to site, the information provided below is based on the Vestas V90, although this is not necessarily the wind turbine that is to be used on this project.

7.1 Foundation Insert

The foundation insert (varies depending on suppliers) is a steel element that is cast into the concrete foundation onto which the base section of the tower is fixed. The foundation insert has a diameter of 4,7 m and a length of 2,4 m. The weight of the foundation insert is in the order of 27,5 tons.

7.2 Tower sections

A 105 m tall tower normally consists of five sections. The lengths of these sections vary between 10 m (base) to 29,1 m (top). The base section has a maximum diameter in excess of 4 m and has a weight of 48 ton, while the top section has a minimum diameter of 2,3 m and has a weight of 33,5 ton. Each of these sections are transported separately on a suitable trailer.

7.3 Nacelle

The nacelle is fixed on top of the tower and houses the drive train. The weight of the nacelle, excluding the drive train, is in the order of 40 tons.

7.4 Drive Train

The drive train consists of the main shaft, the bearings, the gearbox and the generator. The components of the drive train weigh approximately 30 tons and are housed in the nacelle. To reduce the transportation weight, the drive train is installed in the nacelle on site.

7.5 Hub and Nose Cone

The hub is fixed to the drive train and the blades are fixed to the hub. Depending on the manufacturer, the hub and nose cone are either transported as a combined unit, or separately. The combined weight of the hub and nose cone is in the order of 25 tons.

7.6 Blades

These are the longest component and need to be transported on a specially transport trailer. The transport vehicle exceeds the dimensional limitations (length) of 22 m and will require a transportation permit.

7.7 Conclusion

Based on the information provided above, to deliver the components for a single wind turbine, from the Port of Ngqura to the proposed Wind Energy Facility, will require twelve individual trips.

Thus based on the assumption that 31 wind turbines are to be erected, a total of three hundred and seventy-two trips will be required. Not all of these trips will be classified as abnormal loads. However, this document does not address the transportation of any cranage that might be required for the off-loading or erection these components.

8. Castle Wind Energy Facility

The proposed Wind Energy Facility is to be located approximately 28 km northeast of De Aar and 24 km southwest of Philipstown, as shown on the Google image below. The only access to the national road network is via gravel roads onto the R389.

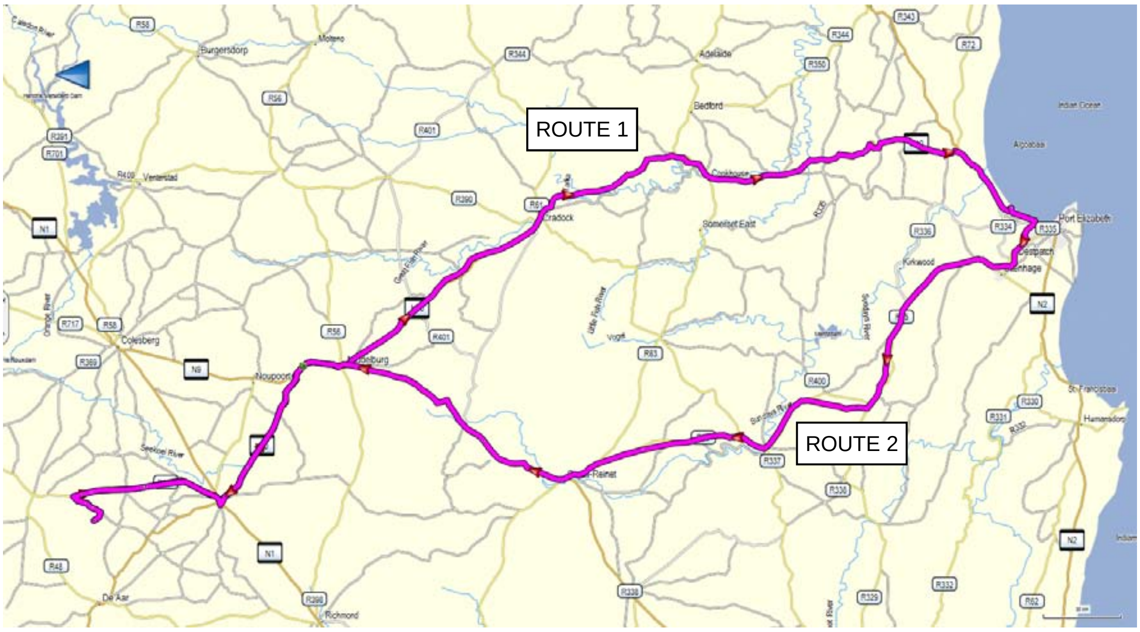
9. TRANSPORT ROUTE

9.1 Preamble

South Africa has an extensive road network, most of which is unpaved.

The closest port to the proposed Wind Energy Facility is the Port of Ngqura. Thus the wind turbine components are to be imported into South Africa via the Port of Ngqura and transported to the proposed Wind Energy Facility via road.

There are two routes from the Port of Ngqura to the proposed Wind Energy Facility, that are to be evaluated in this report. These two routes are shown in the image below:



The routes are as follows

- Route 1 – From the Port of Ngqura to the proposed Wind Energy Facility via the N10. The total distance is 491 km.
- Route 2 – From the Port of Ngqura to the proposed Wind Energy Facility via the R75. The total distance is 537 km.

The same route is followed from Middelburg to the proposed Wind Energy Facility.

These routes are subject to the limitations of the transportation permits and the transportation vehicles to be used by the logistics company appointed to transport the wind turbine components from the Port of Ngqura to the proposed Wind Energy Facility.

9.2 Route 1 - Port of Ngqura to Wind Energy Facility

Over the past number of months, the Port of Ngqura has seen an increase in activities due to the construction of the wind farms in the Eastern Cape.

The image below represents the route from the Port of Ngqura to the proposed Wind Energy Facility via the N10, and is described as follows;

- Exit Port of Ngqura, follow Neptune Road
- Turn Right onto N2 to Grahamstown, for long loads the south bound off-ramp is to be used (this implies that traffic travel against the normal flow of traffic until the vehicles can cross the median to get back onto the east bound carriageway), for other loads the normal on-ramp is to be used.
- At the N2 / N10 interchange continue on the N10 to Cradock
- Proceed on the N10 trough Cookhouse and Cradock
- R75 becomes R63

- Turn Right onto the N9 to Graaff-Reinet
- Proceed through Graaff-Reinet and Middelburg
- Turn Left onto N10 to Hanover
- Turn Right onto N1 to Colesberg
- Turn Left onto R389 to Philistowm
- Turn Left onto a gravel road to Burgerville
- Turn Right onto a gravel road and proceed to the site access

The total distance of this route is in the order of 491 km, of which 18 km is on gravel road.

A number of anomalies along this route were identified during the desk-top study, these anomalies would have to be further investigation by the relevant logistics company once appointed. The anomalies identified during the desk-top study, include inter alia;

- Under-passes (height and width constraints),
- Overhead cables (power, communication, etc)
- Intersections
- Bridges / culverts (load constraints)
- Passes
- Access through towns

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9.3 Route 2 - Port of Ngqura to Wind Energy Facility

Over the past number of months, the Port of Ngqura has seen an increase in activities due to the construction of the wind farms in the Eastern Cape.

The image below represents the route from the Port of Ngqura to the proposed Wind Energy Facility via the R75, and is described as follows;

- Exit Port of Ngqura, follow Neptune Road
- Turn Left onto N2 to Port Elizabeth
- Turn Right onto the R75 at the N2 / R75 interchange to Uitenhage
- Proceed on the R75 through Jansenville,
- R75 becomes R63
- Turn Right onto the N9 to Graaff-Reinet
- Proceed through Graaff-Reinet and Middelburg
- Turn Left onto N10 to Hanover
- Turn Right onto N1 to Colesberg
- Turn Left onto R389 to Philistowm
- Turn Left onto a gravel road to Burgerville
- Turn Right onto a gravel road and proceed to the site access

The total distance of this route is in the order of 541 km, of which 18 km is on gravel road.

A number of anomalies along this route were identified during the desk-top study, these anomalies would have to be further investigation by the relevant logistics company once appointed. The anomalies identified during the desk-top study, include inter alia;

- Under-passes (height and width constraints),
- Overhead cables (power, communication, etc)
- Intersections
- Bridges / culverts (load constraints)
- Passes
- Access through towns

10. Route Evaluation

There are very little differences between the two routes up to Middelburg, there after the same route is followed to the proposed Wind Energy Facility. The selection of the final route is to be determined by the logistics company at the time of transportation.

11. Conclusion

Based on the information provided above, both routes are very much the same, there is no one route that is more advantages than the other, from the Port of Ngqura to the proposed Wind Energy Facility.

The final route selection will be subject to the limitations of the transportation permits and the transportation vehicles to be used by the logistics company appointed to transport the wind turbine components from the Port of Ngqura to the proposed Wind Energy Facility.