

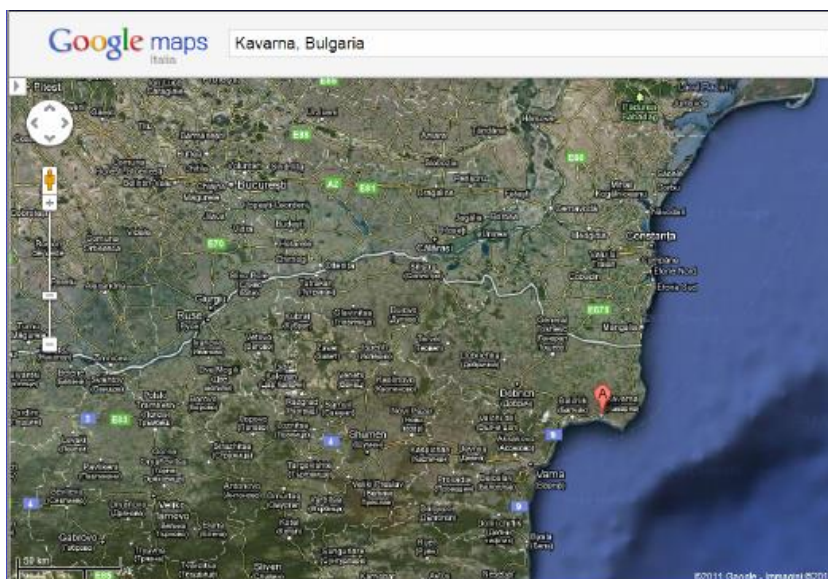
GL Garrad Hassan



LUKERG (Lukoil – Erg JV), (ERG Group), Genova, Italy

LONGMAN Wind Farm, Bulgaria

Technical Due Diligence – High-Level Review
Turbine Foundation Design



REPORT

Authors:

Dott. Ing. Luigi Cesare Speranza (email: l.c.speranza@scangea.eu)

Dott. Ing. Marco Franceschini (email: m.franceschini@scangea.eu)

Prof. Ing. Claudio Scarponi (email: claudio.scarponi@uniroma1.it)

Document: **scangea_GH8_BULGARIA_LONGMAN_draft-1**

Date: **2011-09-30**

Issue: 01

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Executive Summary

This is a high-level review, aimed at broadly assessing the ‘life expectancy’ (and capability to generate income) of a three-year-old wind park in Bulgaria (Longman) being sold by the current owners to a perspective buyer (Lukerg JV), which has appointed GL-Garrad Hassan as their consultants.

Critical factors for the durability of the civil works component are as follows:

1. Adequacy of geotechnical model adopted for foundation design;
2. Adequacy of foundation design (static scheme, geometry);
3. Adequacy of soil chemistry analysis (concrete chemical aggression);
4. Adequacy of design of surface water drainage system;
5. Adequacy of design of connection between tower shaft and plinth;
6. Quality of materials used during construction (concrete and re-bars);
7. Quality of construction process;
8. Quality and effective implementation of maintenance plan.

This review has been conducted on the basis of the documentation available in an on-line data base (iRoom Tchergea - please refer to attached list of reviewed documentation) and the findings of a site inspection.

Findings are given in evaluation tables followed by paragraphs of comments and independent calculations, when they have been carried out. Indeed, independent calculations were not in the initial scope of works. We have nevertheless performed quick manual checks so as to verify the fundamentals of the foundation design.

Conclusions

We have found the LONGMAN foundation design basically viable (though overturning stability is acceptable only with ground water level below foundation bottom). However, available design documentation conveys the impression of a product obtained more through copying and collating of general technical material issued by Vestas rather than the result of a thorough site-specific design process. In particular, geotechnical modelling appears rather poor and obscure. We could not find information about the maintenance plan.