

Development of a 1 MW Wind Turbine

Bennett Associates has been involved in Wind Power since the company started in the early 1980s. The first projects undertaken tended to be component based, checking individual systems within the turbine. The company has recently completed its most ambitious project within the industry in the design and analysis of a complete 1MW turbine.

The wind energy market is intensely competitive, so the product, as shown in the photographs on this page, had to enter the market at the top, a challenge for any newcomer to an industry. This was clear from the outset to the project team which comprised Renewable Energy Systems (client) and Peter Brotherhood (manufacturer) in addition to Bennett Associates. With this in mind, novel analysis techniques were implemented (and in some cases developed) for the application.

The design drivers for these turbines is fatigue, due to the constant rotation of the mechanism, coupled with the turbulence of the wind driving the system. Unlike other systems such as a crane, however, the direction of loading is completely unpredictable. Where with a standard fatigue analysis only one loading channel has to be considered, with the hub of the turbine, eighteen simultaneous channels were incorporated. Bennett Associates took this on board and developed bespoke software, running alongside the finite element analysis, to validate the design against a twenty year simulated load time history. This approach led to weight savings of up to forty percent in some components against standard method, greatly reducing the weight and cost of the unit. Further advanced analysis was used in other areas of the design, including composites for the Nacelle cover.

The turbine has since been sold by RES to Eastern Electricity. It operates from a site in Northern Ireland, meeting the electricity requirements for 625 homes in the local area. Work is now under way to extend the capabilities of the unit even further, to produce more power with minimal increase in unit cost.

Bennett Associates (originally founded in 1984) was acquired in 2008 by Atkins; bringing their proven technical expertise to the UK's leading engineering consultancy.

