

Contribution of computation techniques on cost reduction of wind energy plants

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As modern machinery industry seeks greater challenges while keeping costs low and weight light, complex simulations are more often included in their design methods. Wind turbines are an example of that due to their big, slender structures and complex topologies that require remarkable engineering efforts including accurate loads' computation multibody tools coupled with specific loads' models and controllers.

However, recent reviews show that capital costs of such devices are dominated by manufacturing and installation costs, whereas engineering and development take just around 2% of the capital cost. Some bibliography exist that also reports the high operation costs due to frequent and expensive failures with long down times.

The latter turns into a limited use of computation methods and technology by development departments of wind turbine manufacturers. Although during the last decade some important contributions have been incorporated from other disciplines and industries, the state of the art of computation techniques in wind energy still lags behind other more mature industries like helicopters, railway or oil and gas. For instance, loads computation models are far more simple than those used in aerospace industry, optimisation is almost absent from development departments and key code development is often seen as outsourceable matter.

Science, on the other side, keeps making up new computation technologies and, nowadays, advanced technologies are available to the industry which can push innovation forward. That is the case of, new computation optimisation and statistical techniques and other artificial intelligence methods; all that added to the amount of computation power accumulated in companies and in the cloud that may be used in parallel computation schemes.

Taking a look to evolution of the cost of energy of wind energy plants it is easy to identify the innovation impact of breakthroughs such as pitch control, individual pitch, increase of rotor size, etc. Increasing the development budget with an aim to reduce overall cost of energy seems after all a reasonable objective for the following decade and may have a leading role in the future breakthroughs in this industry.