One size no longer fits all

It is to be expected that not every turbine will be required to work under the same conditions, and in the past, developers have gone with the accepted wisdom that each turbine should be the same across a site, which means an inevitable compromise on the efficiency of energy production – until now. PES speaks to Laurent Carme (Alstom’s Onshore Wind Product Platform Director) about their unique approach that means one size no longer fits all...

“We are able to offer all the benefits of using a single product e.g. standardized maintenance programs, parts and support from a single supplier, but with far greater flexibility.”
The nature of wind farm sites means that installed turbines face distinct variations in the conditions under which they operate: different landforms, the presence of vegetation, buildings, etc., bring about a variety of wind conditions (average wind speed, Weibull parameters, turbulence levels, etc.) within the same project. Traditionally, the approach to wind farm development considers the site as a whole, which has meant specifying the best single wind turbine model which fits all positions. Given the variations between turbines, this “one size fits all” approach is not able to make optimal use of the wind resource available across the whole site, and given the uncertain future of subsidies for wind power, the need for developers to do more for less, and cut down waste has never been greater.

Of course, it would be possible for a developer, having carried out a feasibility study on the site, to specify individual turbines, each with their own rotor diameter, power output and hub height to optimize the capacity factor of each turbine its own position – this would clearly result in greater efficiency and a reduction of the overall cost of energy is achieved.

However, this solution faces a major disadvantage: the use of different wind turbines within the same site might require that the operation and maintenance of the wind farm has to be individualized for each turbine model. Clearly, the need to tailor maintenance procedures, procure different, possibly non-standardized spare parts or distinct training manuals, etc., will result in higher operational costs of the wind farm which might unbalance or even nullify the benefits gained by the optimization of the site’s capacity.

Now, this disadvantage can be overcome by applying a product platform approach, which allows the sharing of superior core designs, proven sub-systems, optimized production processes, common logistics and supply chains within a range of products, to efficiently expand the product offering and serve broader market needs.

The platform approach

Alstom is effectively applying the platform strategy to its ECO 100 platform, which allows project developers to select the best wind turbine rotor for the specific wind conditions found in the different positions of the wind farm, and ultimately optimize the factor of the project by up to 10 per cent. The Alstom ECO 100 platform works by utilizing three different models in the 3 MW range together: the ECO 100 3MW for class I conditions, ECO 110 3MW for class II conditions and ECO 122 2.7MW for class III conditions. The combination of two or even three of these wind turbine models within the same wind site has been named by Alstom as the “POWEROF3™” concept.

Three rotors, one product

The developer who has opted for the POWEROF3™ approach will be able to use a mix of different rotor diameters integrated on the same platform. Following this concept, it is possible to select 3 MW IEC class I wind turbines with a 100-meter-rotor to be installed in those positions with the highest wind speeds, whereas for positions with lower wind speeds the installation of 3MW class II (110-meter-rotor) or even 2.7 MW class III wind turbines (122-meter-rotor) is feasible. This approach allows the developer to make a more effective use of the wind resource over the entire site, increasing the capacity factor at each wind turbine position. In fact, when comparing the capacity factor achieved by POWEROF3™ with using a single, large turbine in each position, there is an increase of approximately 10 per cent.

It is not only the optimized power capacity that makes the POWEROF3™ concept such an attractive one; with fewer turbines required, the infrastructure necessary to support such developments is significantly reduced.

Reducing the Balance of Plant costs

Potential reductions in both the size and number of turbines – depending on the

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**Interview: Laurent Carme, Onshore Wind Platform Director, Alstom**

**How did the POWEROF3™ concept come about?**

“The objective of any new development is twofold: to maximize the annual energy production, and minimize the infrastructure, or Balance of Plant (BOP) costs. The achievement of these two objectives will ultimately bring about a significant reduction in the overall cost of energy – this was the motivation for this new product platform approach.”

**How did the idea develop?**

“Well, once a feasibility study has been conducted on the site, a turbine is selected but it tends to be the case that developers choose a single type to fit each position. Given that the conditions for each turbine are different, in order to optimize the site, the developer might find that they have many turbines densely packed into the highest wind speed areas, whereas some turbines will be installed in areas of lower than optimal resource for the technology – clearly this is not an ideal situation.”

**What are the benefits beyond power optimization?**

“Beyond optimizing capacity and reducing Balance of Plant costs, the ECO 100 Platform is the most proven 3MW-class platform today, and with this new approach, we are able to offer all the benefits of using a single product i.e. standardized maintenance programs, parts and support from a single supplier, but with far greater flexibility in having three different rotor sizes to maximize the return on resources.”

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TALKING POINT
specifics of the site – means that savings are made across the project at an infrastructure level. Cabling, foundations and roads are all highly significant costs in the development of a wind farm – with the POWEROF3™ development approach, combining three different rotor diameters in the 3 MW range, will increase the capacity factor of the project and reduce investment cost, ultimately reducing the overall cost of energy.

Up with returns, down with costs

So, by effectively applying core technology and processes with customized rotor designs, the ECO 100 Platform, utilized within the POWEROF3™ concept allows the developer to increase the annual energy production of the wind farm and at the same time reduce the investment cost when compared with traditional development approaches. Besides, the product platform approach results in common spare parts for the whole site and standardized operation and maintenance procedures, given that all components come from the same product ‘family’. The ability to select the best product for a specific site from within a common product platform translates into lower cost of energy in a wide range of wind projects.

About the ECO 100 Platform

These large wind turbines – the ECO 100 has a swept area larger than an Airbus A380 – are the answer for projects that require both high energy yield and high reliability from the wind turbines.

Three turbines make up the ECO 100 platform:

- The high wind (IEC Class IA) ECO 100 turbine has one of the leading capacity factors for turbines in this wind class.
- The medium wind (IEC Class II-A) ECO 110 turbine has one of the largest rotors available for class II sites to maximize the energy yield of the turbine.
- The low wind 2.7MW onshore ECO 122 wind turbine combines high power and high capacity factor to boost energy yield in low wind regions worldwide. At a wind speed of 7.5 m/s the turbine delivers a net wind farm capacity factor of up to 42%, equivalent to 3,600 full-load hours each year. Its 122-metre rotor diameter and swept area of 11,700 m² – the largest in the 2 MW to 3 MW turbine segment – maximise the harvest of energy and the return on investment to create new business opportunities for customers from low wind sites.

The ECO 100 platform is among the most proven multi-megawatt platforms in the marketplace with (at mid-2012) more than 500,000 cumulative operating hours, and 500MW installed or under construction worldwide.
FORCE Technology is a leading supplier of automated inspection systems:

- Reliable turbine performance without disassembly
- Blade assessment under harsh weather conditions
- Prediction of residual blade life-time
- Smart blade guided working platform
- Structural non-destructive inspection
- Offshore and onshore multi-MW turbines.