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# Certification strategies for modular wind turbine designs

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## Introduction and background

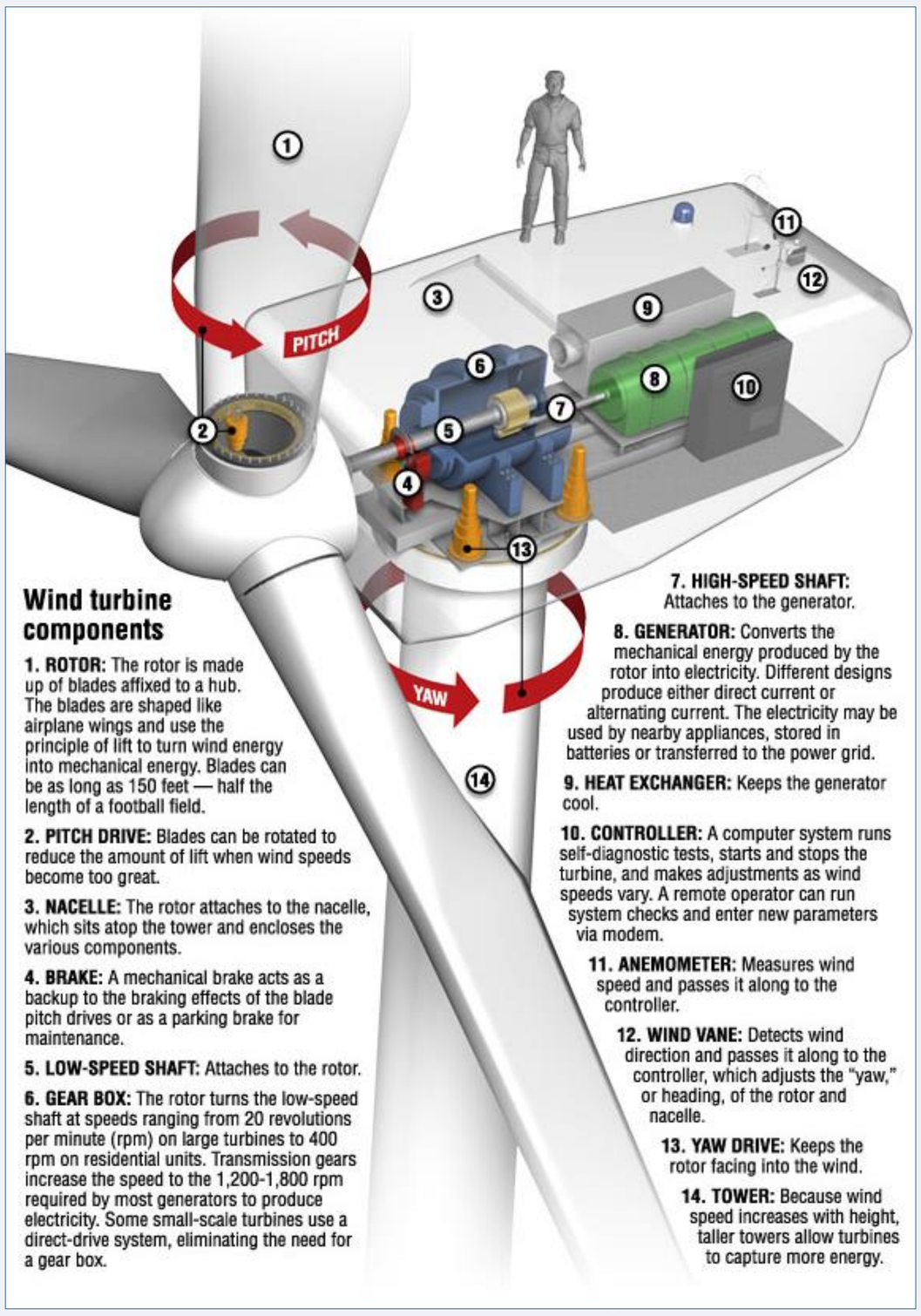
Development of new offshore wind turbines is a process lasting on average three to five years. In contrast, Type Certification of the new turbine model occupies normally the last two to three years of the wind turbine development, in parallel with the deployment of the first turbine prototypes.

The long time span between the conceptual design phase and the conclusion of the design validation phase constitutes a large risk for all the industry's actors, among other reasons also for the complexity of managing the design of all turbine components at the same time, along with the necessary prototype manufacturing and testing campaign. A delay in any of these phases might cause a delay in the introduction to market of the turbine and possibly also in the financing and execution of the offshore wind park projects.

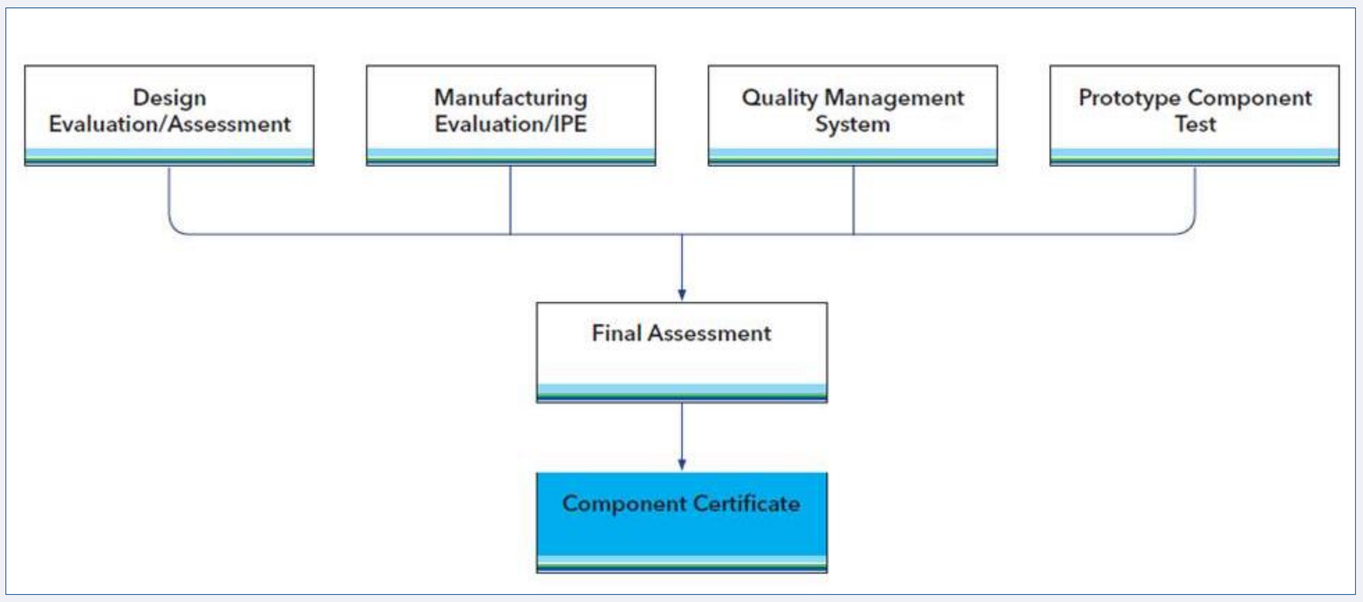
An effective mitigation measure would decouple design, validation and certification of the main wind turbine components from the design, validation and certification of the wind turbine and the specific offshore wind park project.

The wind turbine may be considered a combination of modules which are designed and certified separately and at an earlier stage of the turbine development process. The risk is now shared among several stakeholders and can be managed more easily.

On top of that, the same certified component can be easily incorporated in several wind turbine models. This allows turbine manufacturers, or even wind park developers, to use already developed and certified components with different wind turbine models, thereby promoting truly modular wind turbine designs.




Wind turbine parts which typically undergo component certification – www.awewa.org




Typical phases of a Component Certification project – www.dnvgl.com

## Interfaces to the wind turbine

To consider when integrating a certified components:

- Geometrical dimensions, specification of connection, tolerances
- Mass, inertia and dynamic properties
- Design loads, actuator capacity
- Control system interface, I & O communication protocol
- Electrical interfaces, name plate
- Transportation, installation, operation and maintenance provisions

## Tests and assessments upon integration in a wind turbine

Integrating certified components in a wind turbine might require:

- New load calculations
- New analysis of the drivetrain dynamics
- New load validation campaign
- New safety and function tests
- New gearbox field tests

## Conclusions

Wind park developers and owner may take advantage of Component Certification to assemble a turbine from components designed, tested and certified individually. The turbine configuration may be tailored to the specific project requirements.

This strategy might still require some assessments and tests to be executed during the commissioning phase on the turbines selected for the specific wind park.

The advantage is that the design of the offshore wind turbine is validated for the specific offshore project, reducing the technical and commercial risks considerably.