Transformers for a sustainable energy transition: data-driven, smart design choices in a carbon-constrained world

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Introduction

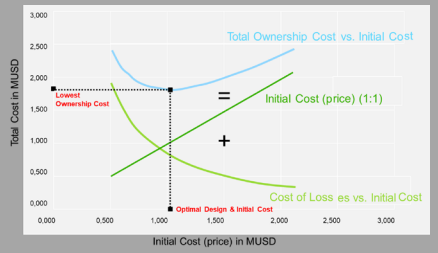
Transformers are key electrical components to collect wind power, connect to the grid and transmit it through the electricity network.

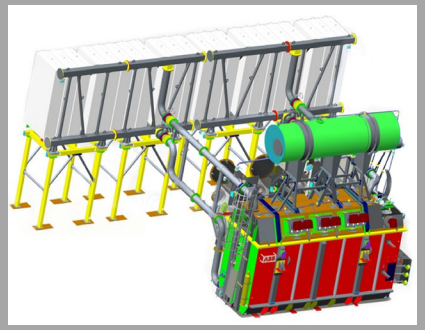
What are the challenges today in deploying the optimal transformer solutions to ensure the highest quality and stability of electricity supply and at the same time to support the initiatives to reduce the levelized cost of offshore wind energy ?

Methods

There are various possible solutions to reduce the levelized cost of energy (LCOE) through using the most appropriate transformer technologies combined with using advanced transformer design and optimization tools

The weight & size of offshore platform transformer may be optimized to reduce the weight/size/costs of the platform





There are very many drivers influencing size, weight and cost of the transformer:

- basic electric system requirements,
- environmental conditions,
- loading cycle and overloading,
- cooling mode,
- general arrangement / space & weight limitation,
- transport limitation,
- energy efficiency,
- environmental requirements,
- fire hazardous,
- new high-temperature insulation materials,
- purchasing cost vs costs of losses and TCO.

Results

- Active part design optimized to the electric system requirements and to minimize TOC considering the loss $/kW evaluation criteria.
- Total weight and size optimized considering the $/kg evaluation criteria and/or $/m2 evaluation criteria.
- General arrangement compacted to reduce the footprint (compact tank design, size and location of the cooling bank, location of cable connections, location of the conservator)
- General arrangement to simplify assembly and installation works and make easy the maintenance works

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