Software
TRL 2

SINTEF

STAS – A unified state-space model of a wind power plant

Innovation description

STAS is a unified state-space model of a wind power plant. The entire wind power plant – wind and waves, aerodynamics, structures, electrical systems, and various levels of control – is incorporated into a model of the standard form

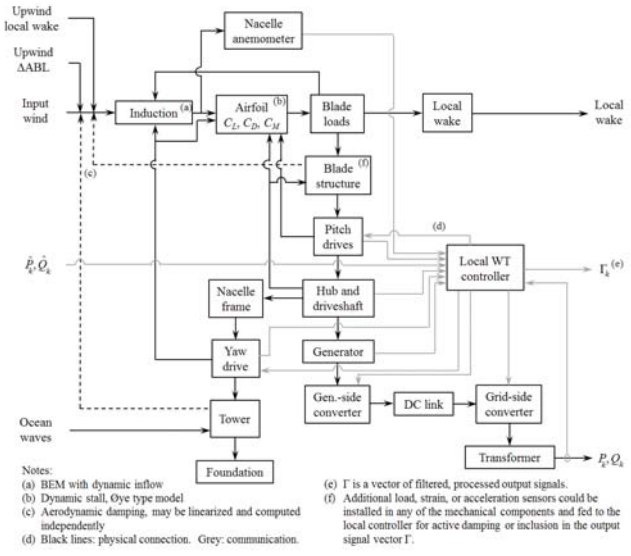
dx/dt = Ax + Bu, y = Cx + Du.

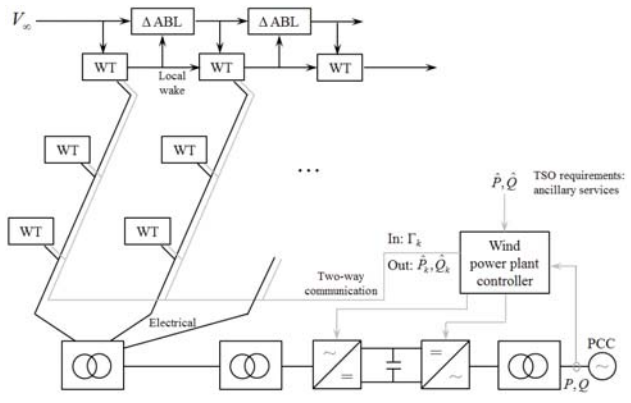
This allows the powerful theorems of stability and control of linear systems to be applied to the wind power plant.

What distinguishes STAS from previous attempts at wind power plant modelling is that high-quality physical models are employed for the relevant components and phenomena, both mechanical and electrical.

Impact

STAS makes an important contribution to optimizing and de-risking large wind power plants. Linear control theory can be used to design optimal multi-variable control algorithms at the plant level.





Accurate prediction of electrical/mechanical/control interactions (subsynchronous resonance) requires a complete model of the plant, with good models of both the mechanical and electrical systems.

Further development

The present effort is focused towards an initial study of the control of multiple wind turbines connected via the atmosphere and electrical system. A time-domain module is being developed, in order to study turbine- and plant-level control mode transitions. Simplified models of turbulent atmospheric flow, appropriate for such a state-space framework, are to be developed in collaboration with atmospheric scientists. Commercial release is a long-term goal.

References

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