

ABSTRACT

The proliferation of generation systems, especially those from renewable sources, brings new requirements regarding grid integration. Fault Ride Through (FRT) tolerance capabilities are one of the essential characteristics that any power generation system connected to the grid need to hold in order not to compromise grid stability: in the event of a temporary under-voltage on the grid, the generating unit must be able to withstand this and stabilize the voltage with reactive power.

The requirement of performing Low Voltage Ride Through (LVRT) tests is since some years an usual demand to be able to obtain main grid code certifications. Nevertheless, overvoltages are also relevant events on the grid and until 2016 High Voltage Ride Through (HVRT / OVRT) capabilities have not been required by any grid code, when FGW (German grid code) included it. Most likely HVRT capabilities will be gradually included at other grid codes during the next years, starting in IEC and India during 2017 or 2018.

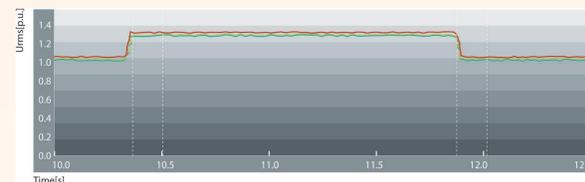
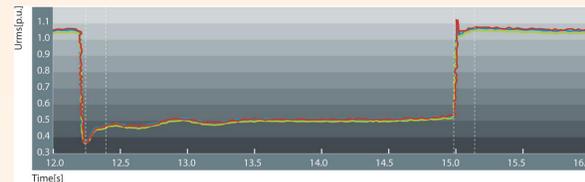
Currently, with regard to undervoltage and overvoltage issues, most grid codes cover this kind of network events but only under fundamental levels. For instance, some relevant grid codes may require overvoltage capabilities until 140% in the near future, even any grid code is susceptible to experience practical overvoltages until 170%, especially those grids less robust. The same happens with the 0% voltage level: most relevant grid codes require between 0 - 200 ms, while a short-circuit length can be in practice much longer.

How power generation systems like wind turbines react when this severe event affects to them? Is it interesting to evaluate the behavior of the generator under these particular conditions?

CAPABILITIES

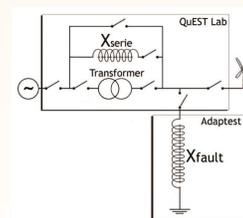
Being conscience of the importance of overvoltages, the Spanish company **4fores is for long time performing this kind of test, since at 2010 was pioneer by designing the first mobile laboratory to perform both LVRT and HVRT tests***.

4fores mobile testing Laboratories evaluate the suitability of generation systems according to any grid code, covering voltage dips, swells and phase shifts.



4fores is able to provide testing services including certified report as 17025 Laboratory accredited by 61400-21.

* technology designed by 4fores protected with patent ES 2395364 A1 and PCT/ES2012/070092



CASE STUDIES

During more than 7 years 4fores has been carrying out testing including HVRT for the most demanding customers. As specialists in FRT, main corporations trust on us, like:

- ✓ Various major wind turbine manufacturers globally
- ✓ First European genset manufacturer
- ✓ Relevant inverter manufacturers
- ✓ Renewable energy plants property developers

CONCLUSIONS

The need for protection from overvoltages and undervoltages is now much greater, since technology has evolved by making electronic components smaller and more sensitive to electromagnetic disturbances.

After 4fores' experiences at this matter, it seems that longer testing time/level should be interesting to test in order to improve quality and robustness of wind power generation systems, and consequently to accomplish an optimal operation of wind turbines and wind farms under any grid event.

To sum up, it is advisable to understand power generator systems behavior at any condition in a detailed way, not only in terms of security but in damage reduction costs. In addition, this adds value regarding robustness, and allows power generator manufacturers to accredit that its equipment is able to withstand the whole range of network events under safe operation. Wind turbine manufacturers may make one step further on this line in the near future in order to know the limits of their equipment and specially to improve quality and security.

AUTHORS

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About 4fores

4fores is a technological company dedicated to the optimization of electric power generation systems and specialized in grid integration of renewable energies.

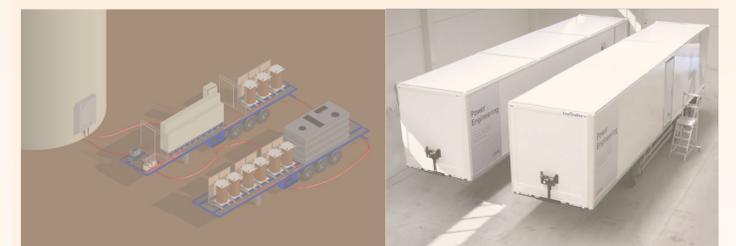
The company has extensive experience in the field evaluation and testing of power systems and power generation sources, specially those from renewable origin.

4fores is specialist in electrical testing and electric-power generation system certification. Its services include Fault Ride Through (FRT) tests including LVRT, HVRT, Design of FRT test Laboratory, Grid quality assessment or Consulting services.

Fault Ride Through testing



LVRT & HVRT Laboratory Design & Manufacturing



Other activities



Control Cabinets

Cable & SET testing

R & D

Talk to us!

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