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Innovative Protection Unit - Protect WTGs, Control your ROI

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Abstract

The stable and consistent performance of each **Wind Turbine Generator (WTG)** is the most critical factor to wind energy developers for recovering their **Return on Investment (ROI)** in a short period of time.

This demands wind farms in new requirements for both MV switchgear and associated protection functions. New protection & control relays are **designed to respond to the constantly changing needs in the protection and automation of wind turbine generators.**

Objectives

Main objective

To continuously optimise the performance and energy production of on and offshore WTGs, improve **turbine reliability** and **grid service capacity**, while keeping them protected against electrical faults.

Key features

Compact devices	Avoid extra space needs on WTGs
Self-powered protection	For safety during energizing and power supply failures
Bidirectional overcurrent protection	For tripping acceleration on internal faults
Increase of the nominal power of WTGs	**Avoid inrush tripping** on transformer energizing
Grid code compliance	**Sequential reconnection** for energizing the WTG transformers after a voltage absence
Measure generation in each turbine (V, I, P, Q)	From the MV interconnection and remote access
Remote control and operation	Fault and event records / MV switchgear monitoring / Alarms / Remote operation on motorised switchgear
Harsh climatic performance	▪ Severe environmental conditions ▪ Extreme wind automation
Integration with other devices and **information exchange**	By standard **communications protocols**
Monitoring the health of the insulation	Through **partial discharges**

Methods

Compact & robust relay for integration on circuit breaker cubicle

- Avoid extra space requirements
- Factory-installed, set and tested equipment resulting on minimization of wiring errors and in field commissioning time
- Same relays to be used in all earthing methods
- Functional at harsh climatic conditions
- MTBF optimization (increase of working hours)

Enhanced Protection & Control features

- Self-powered protection: Energy from current transformers
- Scalable models with different protection functions and automations
- Dedicated powerful protections CPU to cope with measurements and protection functions (V, I, P, Q, E, harmonics, bidirectional protection)
- Automatic settings change due to climatic effects
- Dedicated CPU for automation (sequential reconnection, low temperature disconnection/reconnection, etc.)
- Remote control & operation through communications with SCADA on standard protocol (IEC-61850, IEC-60870-5-104, DNP3-TCP, Modbus-TCP, etc.)
- Remote access for maintenance purpose through webserver for retrieving information (alarms, events, faults, measurements, etc.)

Reliability

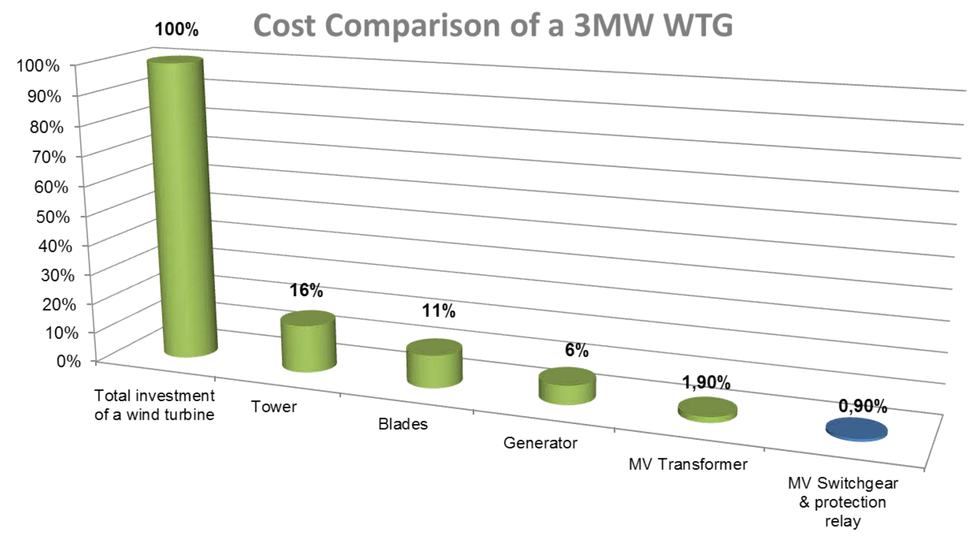
- Programmable automation vs wired
- Standardized solutions: Faster and safer production and commissioning
  - Complete testing in factory
  - Same elements and information on every installation
  - Communications database standardization
- Compatible with partial discharges measurement for commissioning and maintenance services.

Conclusions

The constant evolution of the technologies in wind generation imply new features in protection & control devices as one of the main factors in the connection of the generator to the electrical network.

Some of the new features are improvements to enhance the functionality of the WTG, but some others are grid code or safety requirements that must be fulfilled.

The relative cost of protection & control relays compared to the complete WTG is presented in the following chart, which shows the comparatively low investment (0,9% of total investment of a WTG) required on a device that provides higher safety for personnel and equipment, as well as longer working hours for the whole WTG.



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