

## Study Committee C5

Electricity markets and regulation

Paper 11040

# Spanish Technical Standard (NTS) for grid connection of generation

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## Motivation

- Requirements for Generators (RfG) requires new Power generating modules (PGM) to be compliant with the RfG technical requirements since its commissioning and throughout its lifetime.
- RfG allows TSO/DSO to totally or partially delegate the PGM compliance process to third parties.
- Lots of renewable plants should be connected in a short period and its commissioning processes should ensure compliance with the RfG requirements.

## Method/Approach

- In Spain, both the TSO and the DSOs agreed on delegating to authorized certifiers most of the PGM compliance process.
- The Spanish Technical Standard (NTS) is a guideline for submitting the PGM conformity certificates to the TSO/DSO by third parties.

## Objects of Investigation

- The compliance process of a new Power generating modules (PGM) to ensure the fulfilment of its technical requirements.
- Very few countries, e.g., Germany and Spain, have implemented similar compliance schemes (delegating on third parties) and have developed ad-hoc technical standards for the compliance monitoring process.
- The different compliance schemes might be explained by the pre-existing compliance schemes, the volume of generation to be integrated in the system that does not allow the TSO/DSO to tackle the compliance testing and simulation activity, and the availability of laboratories and certification bodies that have been traditionally performing these tasks.

## Experimental setup & test results

- A Power Generating Module (PGM) is made of: “Power Generating Units” + “Components”
- In RfG, the compliance of Power Generating Units and Components can be made by: (i) manufacturer certificates, (ii) tests, or (iii) simulations.
- In Spanish Technical Standard (NTS), some additional simulations are introduced to ease the compliance process, while quality and reliability are assured.

## Discussion

- The TSO and the main DSOs led a working group with the stakeholders to draft the Spanish Technical Standard (NTS).
- The active role of stakeholders in the whole process has improved the quality of NTS.
- NTS fosters the mutual accreditation of Power Generating Units and Components certificates across countries to better exploit the economies of scale by manufacturers.

## Conclusion

- The achievement of ambitious decarbonization targets in a short period requires rethinking the existing Power generating module (PGM) commissioning and compliance processes.
- Any improvement in the compliance processes must always ensure that all the new PGM are reliable and fulfil all the technical requirements.
- After an exhaustive analysis and discussion, TSO/DSO decided that most of the PGM compliance monitoring in Spain is delegated to third parties.
- NTS fosters a mutual accreditation of Power Generating Unit (PGU) and Component certificates across countries to better exploit economies of scale by manufacturers.
- Lower costs for manufacturers might induce lower costs for all the end-customers through their lower levelized cost of energy (LCOE).
- This compliance process requires a continuous assessment by TSO/DSO to identify future improvement points.

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#### PGM classification in RfG:

- Power generating modules (PGM) technologies:
  - Power Park Modules.
  - Synchronous Power Generating Modules.
- Significance level in Spain:
  - Type A:  $V < 110 \text{ kV}$  and  $0,8 \text{ kW} \leq P \leq 100 \text{ kW}$ .
  - Type B:  $V < 110 \text{ kV}$  and  $100 \text{ kW} < P \leq 5 \text{ MW}$ .
  - Type C:  $V < 110 \text{ kV}$  and  $5 \text{ MW} < P \leq 50 \text{ MW}$ .
  - Type D:  $V \geq 110 \text{ kV}$  or  $P > 50 \text{ MW}$ .

#### PGM compliance framework in RfG

- Power generating modules (PGM) owners shall ensure that the PGM complies with the requirements applicable since its commissioning and throughout its lifetime.
- TSO/DSO shall assess the PGM compliance and make publicly available: (i) a list of documents to be provided by the PGM owner; (ii) the requirements to be fulfilled in the compliance process.
- In RfG, the “PGM Statement of Compliance” is the document stating the compliance with the PGM requirements, and its part of its commissioning process.

#### Spanish compliance process (NTS)

- TSO/DSOs agreed on delegating to authorized certifiers most of the Power generating modules (PGM) compliance process, which is not the most common approach across Europe.
- TSO/DSOs led a working group with the stakeholders to draft the Spanish technical standard (NTS) published in November 2020.
- NTS defines the process for authorized certifiers to issue the “PGM Statement of Compliance” depending on the PGM technology and significance level.

#### Pros from delegating on third parties

- Power generating module (PGM) owners can choose its authorized certified in a free-market framework, which enables an efficient and reliable integration of renewables, also in short-time.
- PGM owner might face lower costs.
- This choice promotes a high added-value activity.

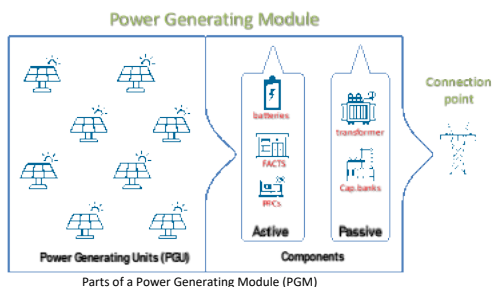


Revisión	Motivo	fecha	Comentarios
1.0	Publicación	18/07/2019	
2.0	Publicación versión 2	3/11/2020	Aprobación de la Orden TED/748/2020 y del Real Decreto 647/2020
2.1	Publicación versión 2.1	9/7/2021	Incorporación de las conexiones de la versión 2.0 y otras modificaciones

Norma Técnica de Supervisión de la Conformidad

#### Power Generating Module parts

- In the Spanish Technical Standard (NTS), each part of a Power Generating Module (PGM) is divided between:
  - Power Generating Units (PGU): main generation plant.
  - Components: Any additional device that might affect the fulfilment of any technical requirement.



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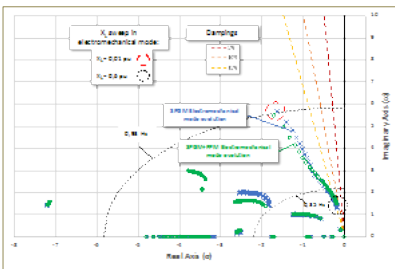
Technical requirements to assess in NTS

Technical requirement	Assessment methodology	Complementary simulation
LFSM-O, LFSM-U and FSM	Testing and Simulation	Yes if a Component might affect the PGU response
FRT, post fault P recovery, fast fault current injection	Testing	No
Reactive capability and control (P=Pmax; P<Pmax)	Testing	Yes
System restoration	Blackstart (Testing) Island op.(Simulation) Rapid resynchr.(Testing)	No
Synthetic inertia*	Simulation	No
P controllability	Testing	No
P-f control*	Testing	No
Oscillations*	Simulation	No

Note \*: Evaluated by TSO at request of PGU manufacturer

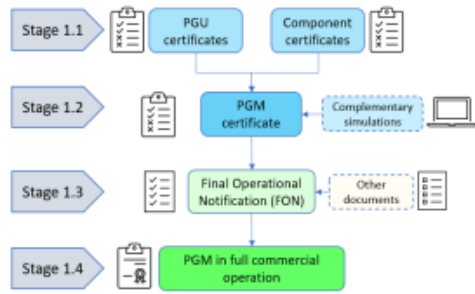
Oscillations technical requirement

- Installing a power oscillation damping module for the Power Park Modules (PPM) is not mandatory.
- The PPM owner (or the manufacturer of the Power Generating Units and Components) should provide to the TSO technical studies, based on simulations, to show how the voltage and reactive power control characteristics of PPMs do not adversely affect the damping of power oscillations.



Eigenvalue analysis for assessing power oscillations in a PPM

PGM Conformity assessment process



- Stage 1.1: Individual certificates of Power Generating Units (PGU) + Components for each requirement
- Stage 1.2: Specific complementary simulations for some requirements, i.e. voltage requirements
- Stage 1.3: Power Generating Module (PGM) owner sends the “PGM Statement of Compliance” to the TSO/DSO to receive a Final Operational Notification (FON).
- Stage 1.4: The PGM is in full commercial operation.

Conclusion

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