

# Report from the Expert Group 'Requirements for Pump-Storage Hydro modules' (EG PSH) – **phase 2**

Ralph Pfeiffer, Chair of EG PSH

16<sup>th</sup> Grid Connection European Stakeholder  
Committee Meeting

12 December 2019, Brussels

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# EG PSH structure



Expert group: Requirements for pump-storage hydro power generation modules (EG PSH)

Approved by the GC ESC on September 14, 2018  
Subject to possible updates on the list of members

Revised version including phase 2 work was approved by GC ESC on December 12, 2019

Chair: ENTSO-E, Ralph Pfeiffer  
Vice-Chair: VGB, Klaus Oberhauser

## Problem Statement

On 11 June 2018, the Grid Connection European Stakeholder Committee (GC ESC) has decided to establish an expert group on requirements for pump-storage hydro modules (PSH). The creation of this EG was proposed by ENTSO-E to elaborate on connection network code (CNC) issues, which had been raised by stakeholders during the CNC implementation. The ENTSO-E proposal was based on a stakeholder survey to identify priority topics.

## Target (objectives)

The objective of the EG PSH is to identify specific characteristics / constraints for this kind of Power Generating Module (PGM) for each operation mode (generation, pumping, synchronous compensation), which may have impact on the connection requirements as defined by Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RfG). The EG PSH will proceed to targeted recommendations on how the NC RfG can be further improved to incorporate the results of this analysis with respect to the scope of NC RfG and any implications to other NCs/GLs, if any.

## Legislative background

NC RfG, Article 6(2) foresees that: "Pump-storage power-generating modules shall fulfil all the relevant requirements in both generating and pumping operation mode. Synchronous compensation operation of pump-storage power-generating modules shall not be limited in time by the technical design of power-generating modules. Pump-storage variable speed power-generating modules shall fulfil the requirements applicable to synchronous power-generating modules as well as those set out in point (b) of Article 20(2), if they qualify as type B, C or D."

## Task description

### Phase 1 – October 2018 to June 2019

- Discussions with stakeholders / responses received during consultations / stakeholder interventions at the GC ESC / in workshops have revealed that this provision is probably too generic and in its generality lead to requests for derogations or compliance issues. In particular, a better distinction of the applicability of the RfG requirements in the different operation modes (generating, pumping, synchronous compensation) and different types of pump storage facilities needs to be investigated;

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## Public space

EG PSH

Requirements for pump-storage hydro power generation modules.

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Annex

- EG PSH Reporting 14th GC ESC
- EG PSH Reporting 13th GC ESC
- EG PSH Reporting 12th GC ESC

## Internal EG space

### EG PSH

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All Documents

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✓	📁	Name	Modified
	📁	archive (non-exhaustive)	... 26 September, 2018
	📁	Kick-off meeting_181015	... 4 October, 2018
	📁	meeting_190319_Brussels	... 10 March
	📁	Report	... 28 February
	📁	RfG amendment	... 18 November
	📁	ToR and Annex	... 29 November, 2018
	📁	webinar_181113	... 8 November, 2018
	📁	webinar_181210	... 29 November, 2018
	📁	webinar_190118	... 15 January
	📁	webinar_190207	... 7 February
	📁	webinar_190315	... 10 March
	📁	webinar_191107	... 18 November
	📁	webinar_191119	... 18 November
	📄	180914_GC ESC EG PSH_notes from preparatory call	... 26 September, 2018

The ToR/Annex has been updated to include Phase 2 activities

# EG PSH meetings



- 07 November 2019 kick off webinar
- 19 November 2019, webinar
- 11 December 2019, webinar



- 18 listed members
- 7 different representative organizations + 1 invited expert
- ~50% participation of members in the web/meetings
- >80% participation of organizations in the web/meetings



- Continued good collaboration among the members, with useful discussions and presentations
- Good input in accordance with agreed actions
- Common space (SharePoint) and emails are used to provide inputs – recommendation to use SharePoint as much as possible
- Workplan continues as agreed to meet timeline

# EG PSH – from phase 1 to phase 2

- **In phase one**, EG PSH has assessed the applicability and technical feasibility of the RfG requirement for PSH power generating modules.
- As a result, EG PSH concludes, that the RfG requirements cannot be applied in their generality, but a distinction needs to be made between typical PSH technologies and operation modes.
- EG PSH shares a common view on the possibilities and limitations of PSH power generating modules, which is described in the report on phase one.
- **In phase two**, EG PSH is tasked to draft precise text proposal for amending the RfG requirements to adequately take into consideration the PSH specificities together with underlying technical justifications as per the phase one report.
- The outcomes of phase two will be documented in a report.
- This phase two work shall be based on the assumptions, that requirements for PSH power generating modules shall be covered by RfG for all three operation modes (turbine, pumping, synchronous compensation)

# EG PSH – Work progress 1/2

- The final report of phase 1 has still been subject to further improvements and clarifications – recently approved by the EG members
- The work is now focused on a draft list of relevant amendment proposals which aims at reflecting all the exclusions (technology limitations) of each PSH technology and for each operating mode.
  - *Pump-storage power-generating modules with fixed speed pumps and single shaft ternary machines shall be considered as synchronous power generating modules*
  - *Pump-storage power-generating modules with variable speed pumps shall be considered as power park modules, except for doubly-fed induction machines, to which the parameters of Table 3.1 or Table 7.1 shall apply to define the voltage-against-time profile with regard to fault-ride-through capability*
  - *The requirements of this regulation, that apply to pump-storage power-generating modules in pumping mode and concern active power, apply to the same extent to active power generation as to active power consumption*
  - *To pump-storage power-generating modules with fixed speed pumps in pumping operation mode and synchronous compensation operation mode, Articles 13(2), 13(3), 13(4), 13(5), 13(7)(b), 14(2), 15(2), 15(5)(a), 15(5)(b), 15(5)(c) and 15(6)(e) shall not apply.*
  - *To pump-storage power-generating modules with single shaft ternary machines in pumping operation mode, Articles 13(4), 13(5), 15(5)(a), 15(5)(b) and 15(5)(c) shall not apply. In addition, Articles 13(2), 13(3), 13(7)(b), 14(2), 15(2), and 15(6)(e) shall not apply, if only pumps are operated.*

# EG PSH – Work progress 2/2

- *To pump-storage power-generating modules with single shaft ternary machines in synchronous compensation operation mode, Articles 13(2), 13(3), 13(4), 13(5), 13(7)(b), 14(2), 15(2), 15(5)(a), 15(5)(b), 15(5)(c) and 15(6)(e) shall not apply.*
- *To pump-storage power-generating modules with variable speed pumps in pumping operation mode, Articles 13(4), 13(5), 15(5)(a), 15(5)(b) and 15(5)(c) shall not apply.*
- *To pump-storage power-generating modules with variable speed pumps in synchronous compensation operation mode, Articles 13(2), 13(3), 13(4), 13(5), 13(7)(b), 14(2), 15(2), 15(5)(a), 15(5)(b), 15(5)(c) and 15(6)(e) shall not apply.*