Scope for Subgroup 5: Post Commissioning IBR Plant Level Verification

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A clause in P2800.2 will be dedicated to Post-commissioning testing. The Subgroup will use Table 20 of IEEE P2800 as a reference and write a procedure for each post-commissioning testing process with regard to each relevant P2800 requirement that has R (required) or D (depends) entry in the respective cells of the table. Where it's stated "depends" this clause should specify on what does it "depend", this may or may not need defined testing procedures.

The sub-group will focus on the following testing processes:

- **Post-commissioning model validation**
- **Post-commissioning monitoring** (especially following TS events where the POM voltage and/or frequency deviate from the normal operating region).
- **Periodic tests**
- **Periodic verification** (including after any substantial changes[1] to the IBR plant)

For each of the above processes the group will define:

- a trigger for the test/validation (e.g. period of time after commissioning or triggering event) and periodicity of tests/verification (for periodic ones)
- is the test to be conducted on one or more IBR units, supplemental IBR devices and/or an IBR plant?
- measurements/data needed to conduct testing/validation/verification for each specific requirement. Is data outlined in Table 19 of P2800 covers all that needed or are there any gaps? Consider suggesting guidance for data recording, acquisition and post-processing, such as:
    - data sampling rate
    - data signals/channels (e.g. 3ph voltage & current, control signals, etc.)
    - account for measurement filtering & scaling
    - data storage capability and retention
    - data format and sharing
    - data time-stamping and coordination across equipment, devices and protection oscillography
    - Event triggering coordination

[1] These may include, but not limited to:

- Functional software or firmware changes have been made on the IBR plant.
- Any hardware component of the IBR plant has been modified in the field or has been replaced or repaired with parts that are not substitutive components compliant with this standard.
- Protection settings have been changed after factory testing.
- Protection functions have been adjusted after the initial commissioning process

Additionally, for non-recording assessment, consider suggesting guidance for proof of compliance through control parameter assessments, design records, design study results, attestations, etc.

- specification or recording of grid and plant operational conditions for each test
    - Recommendations for plant and IBR automatic monitoring and fault recording capability (e.g. SCADA acquisition, data historian and logging, digital fault recording)
- testing/validation/verification procedure. It is possible that some of the procedures will be the same or similar as during interconnection process. (Coordination with other subgroups needed)
  Account for testing modalities, such as:
    - staged tests (e.g. external device switching)
    - control stimulus/step/injection tests within IBR, plant controls or protective relays
    - recording/monitoring during ongoing operation and grid events
- criteria for conformity of the test/verification/validation results with each specific requirement. It's possible that in most cases same criteria as in As-designed evaluation and/or in Commissioning tests will be used
- steps to be undertaken in case of non-conformity (is this within scope?):
    - equipment upgrades,
    - change of control settings,
    - model updates (pos. sequence fundamental frequency and EMT models)
    - validation of updated models
    - re-tests and re-verification

  Any changes need to be included in the models.

  Consider providing guidance what changes are sufficiently substantial (in periodic verification or upgrades/updates in case of non-conformity) to trigger a re-study?

Where testing/validation/verification procedures will differ by generation type the sub-group will define procedures for each relevant type.

The sub-group will coordinate with other relevant standards and resources, including but not limited to:

- IEC 61400-27.2 Wind energy generation systems - Part 27-2: Electrical simulation models - Model validation
- IEC TS 63102 Grid code compliance assessment methods for grid connection of wind and PV power plants
- IEC-61400-21: Measurement and Assessment Of Power Quality Characteristics Of Grid Connected Wind Turbines
- IEEE 1547.1 Conformance Test Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces
- NERC MOD, PRC and FAC standards
- IRPWG Interconnection Studies work
- Others?

Clause 12.2.3 Design Evaluation says “This evaluation may also determine other verification steps that may be required such as commissioning test or post-commissioning monitoring.” Will Design Evaluation sub-group define those cases for commissioning and post commissioning sub-groups?

Excerpt of Table 20 of IEEEP2800 related to post-commissioning part (only including Clause 4 so far)

Requirement	RPS at which the requirement applies	IBR plant-level verifications (at the RPA)			
		Post-commissioning model validation	Post-commissioning monitoring	Periodic tests	Periodic verification
		Responsible Entity			
		Developer / IBR Operator /TS owner/TS operator	IBR Operator /TS owner/TS operator	IBR Operator /TS owner/TS operator	IBR Operator /TS owner/TS operator
Clause 4 General interconnection technical specifications and performance requirements					
4.4 Measurement performance and accuracy	POC & POM	NR	R	D	D
4.5 Operational measurement and communication capability	POM	NR	R	D	D
4.6 Control capability requirements	POM	NR	R	D	D
4.6.1 Execution of mode or parameter changes	POM	NR	R	D	NR
4.6.2 Ramping for control parameter change	POM	NR	R	D	NR
4.7 Prioritization of IBR Responses	POM	NR	R	D	NR
4.8 Isolation device	POM	NR	NR	R	NR

4.9 Inadvertent energization of the TS	POC & POM	NR	R	D	NR
4.10 Enter service	POM	R	R	D	NR
4.11 Interconnection integrity	POM	NR	NR	NR	NR
4.12 Integration with TS grounding	POM	NR	NR	D	NR

Etc….