



10.9.2026

Grid Models

Hybrid power plant simulation model testing

FINGRID

- This document describes tests and operating modes that shall be carried out when testing hybrid plant models.
- A hybrid plant may consist separate power plants that are required to comply with different grid codes. This document does not specify which grid code shall be applied, but it describes how the models shall be tested in accordance with the applicable requirements.
- This document considers controller hierarchies that are known to be used. Other control architectures may be acceptable, but these instructions may not be sufficient for all implementations.

Example 1

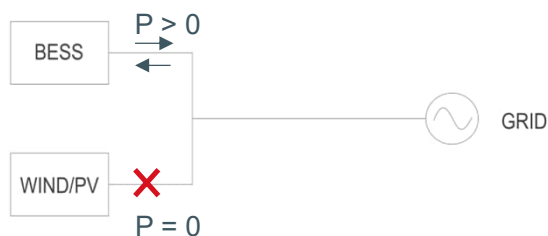


Operating modes

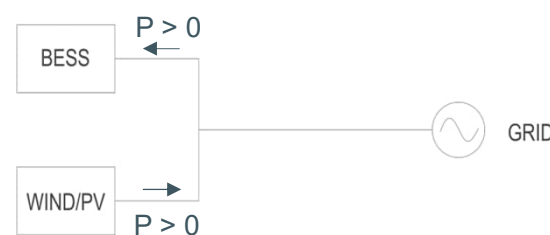
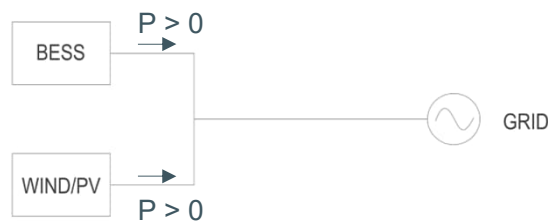
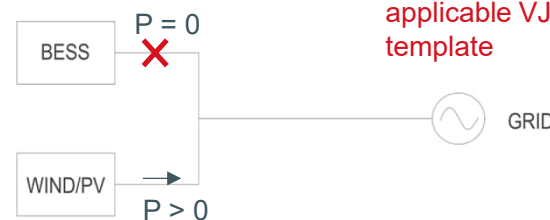
- Each hybrid plant section capable of operating independently shall be tested according to the applicable VJV or SJV test list for that specific plant section. During these tests, only the plant section under evaluation shall respond to control signals and system disturbances. All other plant sections shall remain offline.
- The plant operating in hybrid mode (i.e. more than one section operating) shall be tested according to the hybrid plant test list. The test list is not exhaustive and additional tests may be required in specific cases. The test list is not limiting the tests conducted by Fingrid.
- For hybrid plants including a BESS system, the hybrid plant tests shall be conducted with both operating modes of the BESS i.e. charge and discharge.
- All controllers required for plant operation shall be active during the simulation tests and configured as they would be in the actual plant installation.

Hybrid plant operating modes and test requirements, example

Testing according to applicable SJV test template



Testing according to applicable VJV test template



Testing according to hybrid plant test template

FINGRID

Test list for hybrid plant

- The test cases can be found from separate test template documentation

Test #	Test	Active power/ Operating point	Description	Background network	Acceptance criteria	Model complies (Yes/No)	Comments
G1.3	Setpoint change - pf-control	P ramp for BESS, other 1.0 pu	Setpoint change 1.0 -> 0.98. After setpoint change P change 1.0 pu -> -1.0 pu -> 1.0 pu	SCR Normal	Reactive power to PCC is expected according to setpoint change		Only applicable for hybrids with BESS
G2.1	Frequency sensitive mode	BESS ± 0.1 pu, other 0.5 pu	Frequency 50 Hz -> 49.5 Hz -> 50 Hz -> 50.5 Hz -> 50 Hz	SCR Normal	Active power follows frequency setpoints. Droop 2-12 %		
G2.2	Limited frequency sensitive mode	BESS ± 0.1 pu, other 0.5 pu	Frequency 50 Hz -> 49 Hz -> 50 Hz -> 51 Hz -> 50 Hz	SCR Normal	Active power regulates as expected. Droop 4 %		
G3.1	Operating limits - Voltage - Full power	1.0 pu	PCC voltage 1.0 pu -> 0.9 pu -> 1.0 pu -> 1.1 pu -> 1.0 pu	Infinite bus - Forced voltage to PCC	Stable operation		
G3.2	Operating limits - Voltage - Partial power	0.5 pu	PCC voltage 1.0 pu -> 0.9 pu -> 1.0 pu -> 1.1 pu -> 1.0 pu	Infinite bus - Forced voltage to PCC	Stable operation		
G3.3	Operating limits - Frequency - Full power	1.0 pu	Frequency 50 Hz -> 47.5 Hz -> 50 Hz -> 51.5 Hz -> 50 Hz	SCR Normal	Stable operation. Active power reduction is not more than 10 % per 1 Hz when frequency is below 49.0 Hz		
G3.4	Operating limits - Frequency - Partial power	0.5 pu	Frequency 50 Hz -> 47.5 Hz -> 50 Hz -> 51.5 Hz -> 50 Hz	SCR Normal	Stable operation. Active power reduction is not more than 10 % per 1 Hz when frequency is below 49.0 Hz		
G5.1	Step response test	1.0 pu	According to SJV2024 chapter 14.1.2	VSCSR	Performance criteria from SJV2024 13.2.2. Reactive power to PCC matches droop setting.		
G6.1.1	Fault ride through – Disturbance 1	1.0 pu	VJV table 10.3 or 10.4, 3-ph SC	SCR normal after fault SCR minimum	No tripping, expected recovery according to VJV2024		
G6.1.2	Fault ride through – Disturbance 2	1.0 pu	VJV table 10.3 or 10.4, 3-ph SC	SCR Normal	No tripping, expected recovery according to VJV2024		
G6.1.1	Fault ride through – Disturbance 3	1.0 pu	SJV table 14.2, 3-ph SC	SCR normal after fault SCR minimum	No tripping, expected recovery according to SJV2024		
G6.3	Multiple FRT	1.0 pu	Fault and reconnection cycle. 3-ph SC. 100ms fault time @ T+0s, T+0.5s, T+1.0s, T+30.0s, T+35.0s	SCR Normal	Expected performance		
G6.5	Netw ork vector shift	0 and 1.0 pu	Vector shift +30° and -30° without fault and with SCR change, operation points A2, A4 and A5	SCR normal after fault SCR = max(ESCR HV, 2)	No tripping, stable response, active power resists the vector shift		
G6.8	Impedance scan	-	Dynamic impedance scan from frequency range 1-300 Hz	Infinite bus	Performance criteria from SJV2024 10.4.3 and 10.4.4		

FINGRID