MATLAB Power Grid Simulation — Report

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1) System Overview

• Buses: 132 kV, 11 kV, 400 V (3ϕ, 50 Hz). • Generation: G1 1 MW @ 11 kV (Swing), G2 2 MW @ 12 kV (PV), G3 4 MW @ 10 kV (PV). • Transformers: GSUs Yg–Δ; GSS Δ–Yg; Dist Δ–Yg. • Load: 2 MW at 400 V (Y or Δ). • Powergui: Discrete Ts=5e-5 s; Initialize from Load Flow.

2) Component Parameters

2.1 Generators

Generator	Voltage (kV L-L)	Hz	Config	Type	P set (MW)	Q limits
G1 Gas Turbine	11	50	Yg	Swing (1.0∠0°)	–	–
G2 Hydro	12	50	Yg	PV	2	±0.5 pu
G3 Diesel	10	50	Yg	PV	4	±0.5 pu

2.2 GSU Transformers (to 132 kV)

Path	Vector	Pn (MVA)	V1 (kV L-L)	V2 (kV L-L)	R/X (pu)	Magnetization (pu)
G1→132 kV	Yg–Δ	1.5	11	132	0.01 / 0.08	Rm=500, Lm=30
G2→132 kV	Yg–Δ	2.5	12	132	0.01 / 0.08	Rm=500, Lm=30
G3→132 kV	Yg–Δ	5.0	10	132	0.01 / 0.08	Rm=500, Lm=30

2.3 GSS & Distribution

Transformer	Vector	Pn (MVA)	V1 (kV L-L)	V2 (kV L-L)	R/X (pu)	Magnetization (pu)
GSS 132→11	Δ–Yg	10	132	11	0.01 / 0.08	Rm=500, Lm=30
Dist 11→0.4	Δ–Yg	6	11	0.4	0.01 / 0.05	Rm=1000, Lm=40

3) Baseline Measurements (from your model)

• 132 kV Bus (L-L RMS): **127,987 V** (~0.97 pu).

• Generator LV (Phase RMS): G1 11 kV = **6290.5 V**; G2 12 kV = **6861.8 V**; G3 10 kV = **5663.2 V**.

• Example HV current: **25.76 A** @ **132 kV** → approx **5.89 MW** total.

4) Expected Currents (pf≈1) — sanity guide

Case	I (A)
1 MW @ 132 kV	4.37
2 MW @ 132 kV	8.75
4 MW @ 132 kV	17.5
7 MW @ 132 kV (full)	30.62
12 MW @ 132 kV	52.49

Generator @ kV	I_line (A)
G1 1 MW @ 11 kV	52.5
G2 2 MW @ 12 kV	96.2
G3 4 MW @ 10 kV	230.9

5) Scenarios & Results

5.1 Load = 2 MW (paste load waveforms and fill values)

Gen	V_L-L (kV)	I_line (A)	P (MW)

G1 (Swing)			
G2 (PV 2 MW)			
G3 (PV 4 MW*)			
Total			2.00

*(You may set G3 PV P=0 for this scenario, or export surplus over the line.)

5.2 Load = 5 MW

Gen	V_L-L (kV)	I_line (A)	P (MW)
G1 (Swing)			
G2 (PV 2 MW)			
G3 (PV 4 MW)			
Total			5.00

5.3 Full Load (7 MW)

Gen	V_L-L (kV)	I_line (A)	P (MW)
G1 (Swing)			
G2 (PV 2 MW)			
G3 (PV 4 MW)			
Total			7.00

5.4 12 MW Case — Discussion (paste 400 V waveforms, bus voltages, notes on Q-limits/hits)

6) Loss Calculation (2 MW case)

Method A — System balance: Losses = (Σ P_gen) − P_load

Method B — Line-only: Losses = P_in (sending end) − P_out (receiving end)

Your values (fill from measurement): Σ P_gen = ____ MW; P_load = 2.00 MW → Losses = ____ MW.

7) Best Practices & Safety

Keep one Swing source; PV others with finite Q-limits. Maintain ±5% bus voltages. Ground Yg neutrals on LV; use Δ on HV to block zero-sequence and contain triplen harmonics. Place breakers for isolation; start from Load Flow steady-state.