# Hands-on Session Outline – EMTP for 9/14/2023

- Extract *SystemLevel.zip* to *c:\temp\i2x\emt2*

- Show the IEEE 39-bus diagram and hosting capacity analysis results to support choice of bus 14

- Modify WindSystem.ecf with breakers, rms meters (scope), and fault near bus 14

- Check the load flow with machines, then run a fault with machines

- Add a 300-MW wind plant at bus 14. Set 345-kV voltage on the general and park transformer tabs, 180 turbines, voltage control mode, Vref=1, Pref=0.8, init. Q from load flow, scope P, Q, PLL, and FRT outputs.

- Run load flow again, the slack bus should generate 240 MW less

- Run the fault again and notice the FRT flag picks up. Change park transformer tap ratio to 1.15 and run again.

- As time permits, try other fault scenarios, lines out, control modes, dispatch, audience suggestions, etc.

- ====================== 15-minute break ===========================

- Examine *Wind2.*ecf for choices of DM (10μs), AVM (20μs), REGC_A (100μs), odd time step (7μs)

- Show DM vs. AVM harmonics in *cplot3.ipynb*

- Examine and run *FaultScript.dwj* on *Wind4.ecf* as an automation example

- Show fault responses in *cplot4.ipynb*

- As time permits, show *Wind5.ecf*, *Wind6.ecf*, and *PlantScript.dwj* to automate P2800.2 test suites (results are not finalized yet).

IEEE 39-Bus Model has 10 generators and 30 candidate buses
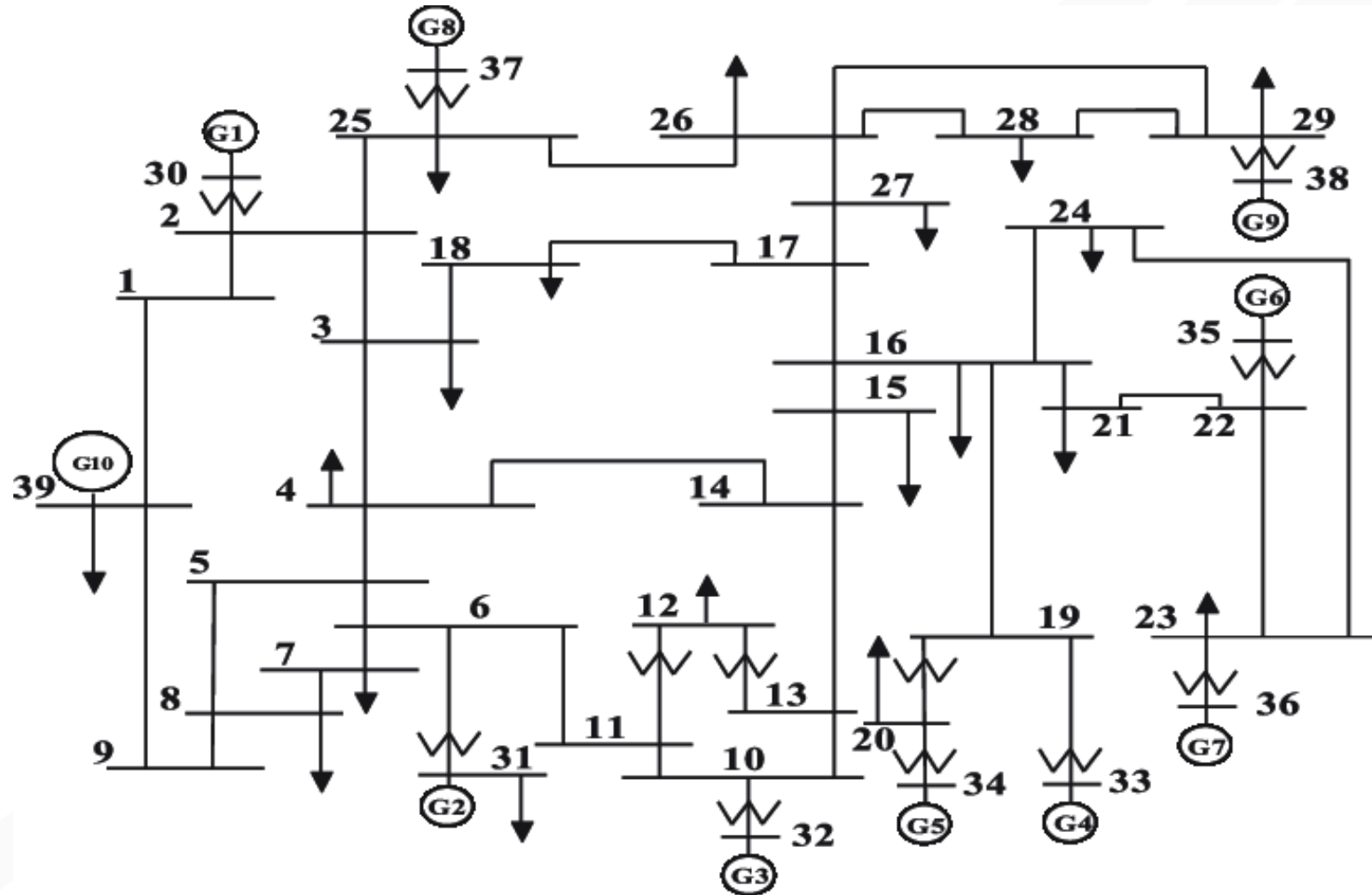
Modifications around bus 14 to begin IBR simulations
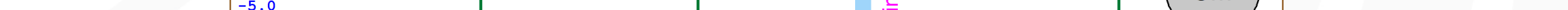
"WECC Wind Park" Model Feature Summary

Tab	Options
General	# turbines, ratings, grounding, collector circuit, Q/V/pf control
Park Transformer	Windings, impedances, saturation, tap ratio for inverter voltage
Inverter Transformer	Per-turbine transformer parameters
Mechanical	WTGQ_A, WTGP_B, WTGT_B and/or WTGT_A, Inertia, choose Speed/Power control
Converter Control	DM+generic, AVM+generic, REGC_A, REGC_C, REEC_D
Protections	Sag, overcurrent, ac under/overvoltage, inst. OV, chopper
Park Controller	REPC_A, Q/V and P/frequency
Harmonics	Inject harmonics for steady-state, time-domain, frequency scan
Scopes	Control signals (w/ PLL frequency), protection flags
Help	Link to PDF