

IEEE 9-BUS MODIFIED TEST SYSTEM DATA

Nomenclature

Rated MVA	Machine-rated MVA; base MVA for impedances
Rated kV	Machine-rated terminal voltage in kV; base kV for impedances
H	Inertia constant in s
D	Machine load damping coefficient
r_a	Armature resistance in p.u.
x_d	Unsaturated d axis synchronous reactance in p.u.
x_q	Unsaturated q axis synchronous reactance in p.u.
x'_d	Unsaturated d axis transient reactance in p.u.
x'_q	Unsaturated q axis transient reactance in p.u.
x''_d	Unsaturated d axis subtransient reactance in p.u.
x''_q	Unsaturated q axis subtransient reactance in p.u.
x_l or x_p	Leakage or Potier reactance in p.u.
T'_{do}	d axis transient open circuit time constant in s
T'_{q0}	q axis transient open circuit time constant in s
T''_{do}	d axis subtransient open circuit time constant in s
T''_{q0}	q axis subtransient open circuit time constant in s
$S(1.0)$	Machine saturation at 1.0 p.u. voltage in p.u.
$S(1.2)$	Machine saturation at 1.2 p.u. voltage in p.u.
T_r	Regulator input filter time constant in s
K_a	Regulator gain (continuous acting regulator) in p.u.
T_a	Regulator time constant in s
V_{Rmax}	Maximum regulator output, starting at full load field voltage in p.u.
V_{Rmin}	Minimum regulator output, starting at full load field voltage in p.u.
K_e	Exciter self-excitation at full load field voltage in p.u.
T_e	Exciter time constant in s
K_f	Regulator stabilizing circuit gain in p.u.
T_f	Regulator stabilizing circuit time constant in s
E_1	Field voltage value,1 in p.u.
$SE(E_1)$	Saturation factor at E_1
E_2	Field voltage value,2 in p.u.
$SE(E_2)$	Saturation factor at E_2
P_{max}	Maximum turbine output in p.u.
R	Turbine steady-state regulation setting or droop in p.u.
T_1	Control time constant (governor delay) in s
T_2	Hydro reset time constant in s
T_3	Servo time constant in s
T_4	Steam valve bowl time constant in s
T_5	Steam reheat time constant in s
F	Shaft output ahead of reheater in p.u.

TABLE I
IEEE 9-BUS MODIFIED TEST SYSTEM MACHINE DATA

Type	GENROU	GENROU	GENROU
Operation	Sync. Gen.	Sync. Gen.	Sync. Gen.
Default Unit no. (New Unit no.)	1(12)	2(10)	3(11)
Rated power (MVA)	512	270	125
Rated voltage (kV)	24	18	15.5
Rated pf	0.9	0.85	0.85
H (s)	2.6312	4.1296	4.768
D	2.000	2.000	2
r_a (p.u)	0.004	0.0016	0.004
x_d (p.u)	1.700	1.700	1.220
x_q (p.u)	1.650	1.620	1.160
x'_d (p.u)	0.270	0.256	0.174
x'_q (p.u)	0.470	0.245	0.250
x''_d (p.u)	0.200	0.185	0.134
x''_q (p.u)	0.200	0.185	0.134
x_l or x_p (p.u)	0.160	0.155	0.0078
T'_{d0} (s)	3.800	4.800	8.970
T'_{q0} (s)	0.480	0.500	0.500
T''_{d0} (s)	0.010	0.010	0.033
T''_{q0} (s)	0.0007	0.0007	0.070
$S(1.0)$	0.090	0.125	0.1026
$S(1.2)$	0.400	0.450	0.432

TABLE II
IEEE 9-BUS MODIFIED TEST SYSTEM EXCITER DATA

Type	IEEET1	IEEET1	IEEET1
Default Unit no. (New Unit no.)	1(12)	2(10)	3(11)
Rated power (MVA)	512	270	125
Rated voltage (kV)	24	18	15.5
T_r (s)	0.000	0.000	0.060
K_a (p.u)	200	30	25
T_a (s)	0.395	0.400	0.200
V_{Rmax} (p.u)	3.840	4.590	1.000
V_{Rmin} (p.u)	-3.840	-4.590	-1.000
K_e (p.u)	1.000	-0.020	-0.0601
T_e (s)	0.000	0.560	0.6758
K_f (p.u)	0.0635	0.050	0.108
T_f (s)	1.000	1.300	0.350
E_1 (p.u)	2.880	2.5875	2.4975
$SE(E_1)$	0.000	0.7298	0.0949
E_2 (p.u)	3.840	3.450	3.330
$SE(E_2)$	0.000	1.3496	0.37026

TABLE III
IEEE 9-BUS MODIFIED TEST SYSTEM GOVERNOR DATA

Type	BPA_GG	BPA_GG	BPA_GG
Default Unit no. (New Unit no.)	1(12)	2(10)	3(11)
Rated power (MVA)	512	270	125
Rated voltage (kV)	24	18	15.5
P_{max} (p.u)	0.8984	0.8518	1.056
R (p.u)	0.00976	0.01852	0.040
T_1 (s)	0.150	0.100	0.083
T_2 (s)	0.050	0.000	0.000
T_3 (s)	0.300	0.259	0.200
T_4 (s)	0.260	0.100	0.050
T_5 (s)	8.000	10.000	5.000
F	0.270	0.272	0.280