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WECC Guideline:

Typical Machine Data for Power System Simulation Modeling

Date: 06/18/2014

Approved By:

Approving Committee, Entity or Person	Date
WECC Modeling and Validation Work Group	June 18, 2014

Typical Machine Data for Power System Simulation Modeling

The following typical machine data for thermal, hydro, wind, and solar generating units can be used for planning studies if data is not available for the machine, either because the machine is not yet built or is owned by another entity. **This data is not to be used for generator interconnection studies or for base case data submittals of existing units.** For existing generating units, follow the Generating Unit Model Validation Policy.

Typical Power System Simulation Modeling Parameters for Thermal Generating Units

Below are typical parameters for thermal generating units: gas turbines (GT), single shaft combined cycle turbines (SS-CC), and steam turbines (ST).

Gentpj

Parameter	Value
T'do	7
T"do	0.03
T'qo	0.75
T"qo	0.05
H	**
D	0
Ld	2.1
Lq	2.0
L'd	0.2
L'q	0.5
L"d	0.18
L"q	0.18
Ll	0.15
S(1.0)	0.05
S(1.2)	0.30
Ra	0
Rcomp	0
Xcomp	0
Accel	0.5
Kis	0

** Steam	4.5
** HD GT	6.5
** Aeroderiv	1.5

Esst4b

Parameter	Value
Tr	0.0
Kpr	3
Kir	3
Ta	0.02
Vrmax	1
Vrmin	-0.87
Kpm	1
Kim	0
Vmmax	1
Vmmin	-0.87
Kg	0
Kp	6.5
Angp	0
Ki	0
Kc	0.08
Xl	0
Vbmax	8
Vgmax	99

Esac8b

Parameter	Value
Tr	0
Kpr	40
Kir	40
Kdr	0
Tdr	0.1
Vrmax	15
Vrmin	-12
Ka	1
Ta	0
Te	0.5
Vfemax	99
Vemin	0
Ke	1
Kc	0.05
Kd	2
e1	3
Se1	0.0001
e2	4
Se2	0.001
Vtmult	0
Spdmult	1

Pss2a

Parameter	Value
j1	1
k1	*
j2	3
k2	*
Tw1	2
Tw2	2
Tw3	2
Tw4	0
T6	0
T7	2
Ks2	**
Ks3	1
Ks4	1
T8	0.5
T9	0.1
n	1
m	5
T1	0.25
T2	0.04
T3	0.2
T4	0.03
Ks1	***
Vstmax	0.1
Vstmin	-0.1
a	1
Ta	0
Tb	0

*	Bus No

**	Tw2/(2H)

***	5 for exst4b
***	15 for esac8b
Field adjustable	

Ggov1

Parameter	GT	SS-CC	ST
R	0.04	0.04	0
Rselect	1	1	1
Tpelec	1	1	1
Maxerr	0.05	0.05	0.05
Minerr	-0.05	-0.05	-0.05
Kpgov	10	10	25
Kigov	2	2	0
Kdgov	0	0	0
Tdgov	1	1	1
Vmax	1	1	1
Vmin	0.1	0.1	0.01
Tact	0.2	0.2	0.2
Kturb	1.5	1.5	1
Wfnl	0.15	0.15	0.01
Tb	0.5	300	10
Tc	0	195	3
Flag	0	0	0
Teng	0	0	0
Tfload	3	3	99
Kpload	1	1	1
Kiload	0.2	0.2	0.2
Ldref	1	1	1
Dm	-2	-2	0
Ropen	0.1	0.1	0.1
Rclose	-0.1	-0.1	-0.1
Kimw	##	##	##
Pmwset	###	###	###
Aset	0.1	0.1	0.1
Ka	5	5	5
Ta	0.02	0.02	0.02
db	0	0	0
Tsa	4	4	4
Tsb	5	5	5
Rup	99	99	99
Rdown	-99	-99	-99

##	Zero when load controller is inactive
##	0.002 when load controller is active
###	Set to initial generator output

Typical Power System Simulation Modeling Parameters for Hydro Generating Units

Below are typical modeling parameters for hydro generating units.

Gentpj	
T'do	7
T''do	0.035
T'qo	0
T''qo	0.035
H	3
D	0
Ld	1
Lq	0.75
L'd	0.32
L'q	0.75
L''d	0.23
L''q	0.23
Ll	0.15
S(1.0)	0.15
S(1.2)	0.45
Ra	0.003
Rcomp	0
Xcomp	-0.05
Accel	0.5
Kis	0.07

Esst4b	
Tr	0.0167
Kpr	35
Kir	10
Ta	0
Vrmax	1
Vrmin	-0.87
Kpm	1
Kim	0
Vmmax	99
Vmmin	-99
Kg	0
Kp	2
Angp	0
Ki	0
Kc	0.08
Xl	0
Vbmax	6
Vgmax	999

Pss2a	
j1	1
k1	0
j2	3
k2	0
Tw1	7.5
Tw2	7.5
Tw3	7.5
Tw4	0
T6	0
T7	7.5
Ks2	*
Ks3	1
Ks4	1
T8	1
T9	0.2
n	1
m	5
Ks1	7
T1	0.1
T2	0.0167
T3	0.1
T4	0.0167
Vstmax	0.1
Vstmin	-0.1
a	1
Ta	0.1
Tb	0.0167

*	Tw2/(2H)

hyg3	
Pmax	1
Pmin	0
Cflag	1
Rgate	0
Relec	0.05
Td	0.02
Tf	0.02
Tp	0.1
Velop	0.1
Velc1	-0.1
K1	0.01
K2	1.5
Ki	0.75
Kg	2
Tt	0.2
db1	0
eps	0
db2	0
Tw	1
At	1
Dturb	0.5
qnl	0
H0	1
Gv1	0.07
Pgv1	0
Gv2	0.23
Pgv2	0.2
Gv3	0.57
Pgv3	0.8
Gv4	0.66
Pgv4	0.9
Gv5	0.8
Pgv5	0.98
Gv6	1
Pgv6	1

oel1	
Ifdset	2.5
Ifdmax	3.3
Tpickup	20
Runback	0
Tmax	999
Tset	999
Ifcont	2.5
Vfdflag	0

Typical Power System Simulation Modeling Parameters for Wind Generating Units

The WECC Approved Dynamic Model Database contains generic models for four types of wind turbine generators (WTG). Different manufacturers use different control approaches, and it is understood that different control approaches have different parameters. It is recommended that users fully review the model documentation and consult with WTG manufacturers before applying the model.

The second generation generic wind plant models include:

Software Platform	Type 1			Type 2		
	PSLF™	PSS®E	PowerWorld	PSLF™	PSS®E	PowerWorld
Generator	wt1g	WT1G1	wt1g, WT1G1	wt2g	WT2G1	wt2g, WT2G1
Excitation				wt2e	WT2E1	wt2e, WT2E1
Turbine	wt1t	WT12T1	wt1t, WT12T1	wt2t	WT12T1	wt2t, WT12T1
Pitch Controller	wt1p_b	WT12A1	wt1p_b, WT12A1	wt1p_b	WT12A1	wt1p_b, WT12A1

Software Platform	Type 3			Type 4		
	PSLF™	PSS®E	PowerWorld	PSLF™	PSS®E	PowerWorld
Plant Controller	repc_a	REPCAU1	repc_a	repc_a	REPCAU1	repc_a
Generator/Converter	regc_a	REGCAU1	regc_a	regc_a	REGCAU1	regc_a
Electrical Control	reec_a	REECAU1	reec_a	reec_a	REECAU1	reec_a
Turbine	wtgt_a	WTDTAU1	wtgt_a	wtgt_a	WTDTAU1	wtgt_a
Aerodynamics	wtga_a	WTARAU1	wtgar_a			
Pitch Controller	wtgp_a	WTPTAU1	wtgpt_a			
Torque Controller	wtgq_a	WTTQAU1	wtgtrq_a			

	PSLF™	PSS®E	PowerWorld
Voltage / Frequency Protection (optional)	lhvrt / lhfrt	VTGTPAT / FRQTPA	lhvrt / lhfrt

The wind plant powerflow and dynamic modeling guidelines are available on the MVWG website in the MVWG Approved Documents folder. The dynamic guideline includes the model parameters and default settings that could be used to represent a generic plant.

Typical Power System Simulation Modeling Parameters for Solar Generating Units

The WECC Approved Dynamic Model Database contains generic models for PV generators. It is recommended that users fully review the model documentation and consult with PV manufacturers before applying the model.

The generic large scale PV plant models include:

Module	PSLF™	PSS®E	PowerWorld
Grid interface	regc_a	REGCAU1	regc_a
Electrical controls	reec_b	REECBU1	reec_b
Plant controller (optional)	repc_a	REPCAU1	repc_a
Voltage/frequency protection (optional)	lhvrt / lhfrt	VTGTPAT / FRQTPA	lhvrt / lhfrt

For distributed and small PV plants, the PVD1 model is available.

The PV plant powerflow and dynamic modeling guidelines are available on the MVWG website in the MVWG Approved Documents folder. The dynamic guideline includes the model parameters and default settings that could be used to represent a generic plant.