

Governor UCCPSS

Governor UCCPSS Cigre 238 Combined Cycle Gas and Steam Turbine Model

Model originated CIGRE 238 Technical Brochure
"Modeling of Gas Turbines and Steam Turbines in
Combined-Cycle Power Plants" from Task Force 25 of
Advisory Group 02 of Study Committee 38 in April 2004

Pmech MW is then calculated as the summation

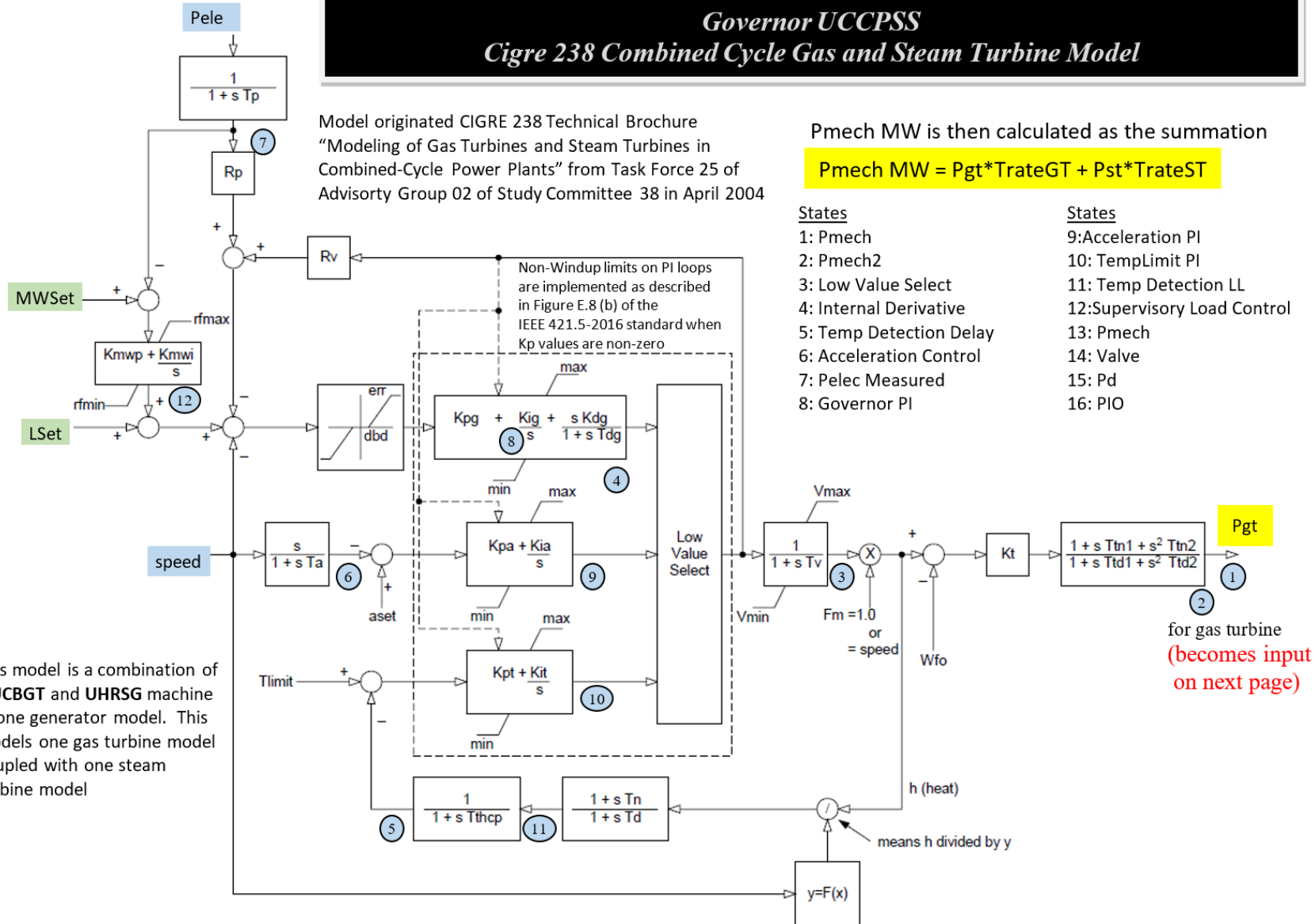
$$P_{mech} \text{ MW} = P_{gt} * Trate_{GT} + P_{st} * Trate_{ST}$$

States

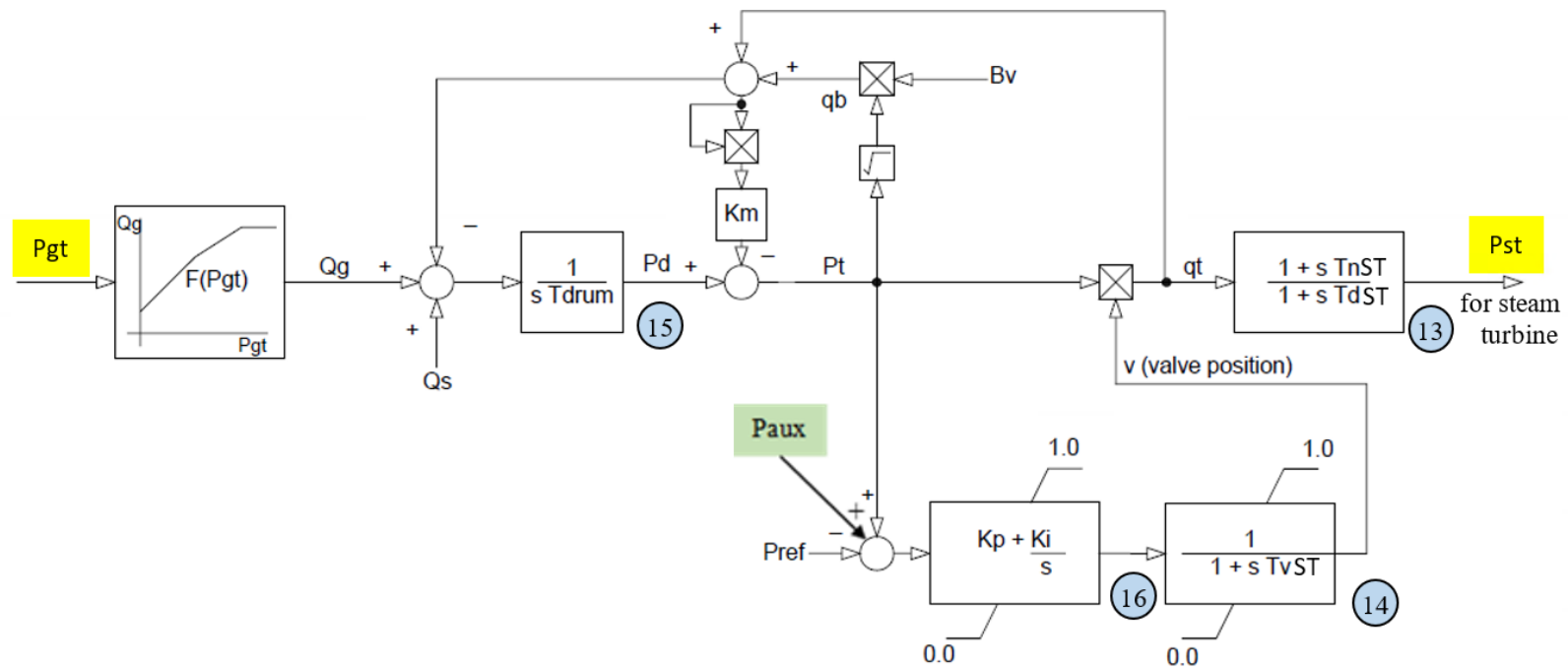
- 1: Pmech
- 2: Pmech2
- 3: Low Value Select
- 4: Internal Derivative
- 5: Temp Detection Delay
- 6: Acceleration Control
- 7: Pelec Measured
- 8: Governor PI

States

- 9: Acceleration PI
- 10: TempLimit PI
- 11: Temp Detection LL
- 12: Supervisory Load Control
- 13: Pmech
- 14: Valve
- 15: Pd
- 16: PIO



This model is a combination of a UCBGT and UHRSG machine in one generator model. This models one gas turbine model coupled with one steam turbine model



Parameters:

Rp	Electrical power feedback droop
Tp	Electrical power feedback time constant
Rv	Governor feedback droop
Kmwp	Proportional gain for outer loop MW control
Kmwi	Integral gain for outer loop MW control
rfmax	Maximum limit on outer loop MW control loop
rfmin	Minimum limit on outer loop MW control loop
Dbd	Intentional deadband
Err	Intentional error limit
Ta	Acceleration control differentiator time constant
aset	Acceleration limit set-point
Kpg	Speed governor proportional gain
Kig	Speed governor integral gain
Kdg	Speed governor derivative gain
Tdg	Speed governor derivative time constant
Kpa	Acceleration control proportional gain
Kia	Acceleration control integral gain
Kpt	Temperature control proportional gain
Kit	Temperature control integral gain
Fmax	Maximum fuel flow command
FMin	Minimum fuel flow command
Tlimit	Temperature limit (in pu corresponds to fuel flow required for 1 pu turbine power i.e. = $1/K_t + W_{fo}$) (4)
Tthcp	Thermocouple time constant
TnGT	Heat transfer lead time constant
TdGT	Heat transfer lag time constant
TvGT	Fuel system time constant
Vmax	Maximum valve opening
Vmin	Minimum valve opening
Fm	Fuel flow multiplier; typically set to 1.0. In some cases this is equal to speed (e.g. liquid fuel system with shaft driven fuel pump)
Wfo	Full-speed no-load fuel flow
Kt	Turbine gain
Ttn1	Turbine transfer function numerator time constant 1
Ttn2	Turbine transfer function numerator time constant 2
Ttd1	Turbine transfer function denominator time constant 1
Ttd2	Turbine transfer function denominator time constant 2
x1	Turbine characteristic curve speed 1
Fx1	Turbine characteristic curve output for speed 1
x2	Turbine characteristic curve speed 2
Fx2	Turbine characteristic curve output for speed 2
x3	Turbine characteristic curve speed 3

Fx3	Turbine characteristic curve output for speed 3
TrateGT	Gas Turbine rating in MW
Pgt1	Power Point #1 for Heat versus gas turbine power function
Qgt1	Heat at Power Point #1 for Heat versus gas turbine power function
Pgt2	Power Point #2 for Heat versus gas turbine power function
Qgt2	Heat at Power Point #2 for Heat versus gas turbine power function
Pgt3	Power Point #3 for Heat versus gas turbine power function
Qgt3	Heat at Power Point #3 for Heat versus gas turbine power function
Pgt4	Power Point #4 for Heat versus gas turbine power function
Qgt4	Heat at Power Point #4 for Heat versus gas turbine power function
Pgt5	Power Point #5 for Heat versus gas turbine power function
Qgt5	Heat at Power Point #5 for Heat versus gas turbine power function
Pgt6	Power Point #6 for Heat versus gas turbine power function
Qgt6	Heat at Power Point #6 for Heat versus gas turbine power function
Pgt7	Power Point #7 for Heat versus gas turbine power function
Qgt7	Heat at Power Point #7 for Heat versus gas turbine power function
Tdrum	Drum time constant
Km	Pressure loss due to flow friction in the boiler tubes
TvST	Actuator time constant for main steam
Kp	Governor proportional gain
Ki	Governor integral gain
TnST	Turbine lead time constant
TdST	Turbine lag time constant
Qs	Amount of supplemental firing, in per unit, applied to the boiler; it is to be defined by the user or by the program upon initialization of the model.
Bv	Fixed position of the bypass valve defined by the user to simulate a fixed amount of steam extraction.
Pref	Minimum steam pressure reference
TrateST	Steam Turbine rating in MW