Google Reactor Calibration Model

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This note is to describe the parameters and formula Google IPB Reactor Calibration Model.

Energy COP defined as

$$COP_{energy}(t) = \frac{\int_0^t [P_{out}(t) + P_{stored}(t)]dt}{\int_0^t P_{in}(t)dt} \tag{1}$$

$$P_{out}(t) = k_{as}[T_a(t) - T_s(t)] + k_{bs}[T_b(t) - T_s(t)] \tag{2}$$

$$P_{stored}(t) = c_a \frac{dT_a(t)}{dt} + c_b \frac{dT_b(t)}{dt} \tag{3}$$

$$\frac{dT_a(t)}{dt} = \frac{P_{in} - k_{as}(T_a - T_s) - k_{ab}(Ta - T_b)}{c_a} \tag{4}$$

$$\frac{dT_b(t)}{dt} = \frac{P_{in} - k_{ab}(T_a - T_s) - k_{bs}(Tb - T_s)}{c_b} \tag{5}$$

$$P_{in}(t) = (a_{10} + a_{11}T_a + a_{12}T_a^2)P_{heater} + (a_{20} + a_{21}T_a + a_{22}T_a^2)P_{core-Q} \tag{6}$$

$$k_{as} = (k_{as0} + k_{as1}T_a + k_{as2}T_a^2) \tag{7}$$

$$k_{ab} = (k_{ab0} + k_{ab1}T_a + k_{ab2}T_a^2) \tag{8}$$

$$k_{bs} = (k_{bs0} + k_{bs1}T_b + k_{bs2}T_b^2) \tag{9}$$

$$c_a = (c_{a0} + c_{a1}T_a + c_{a2}T_a^2) \tag{10}$$

$$c_b = (c_{b0} + c_{b1}T_b + c_{b2}T_b^2) \tag{11}$$

Power COP defined as

$$COP_{power}(t) = \frac{P_{out}(t) + P_{stored}(t)}{P_{in}(t)} \tag{12}$$