```
model G3P3_System
  extends Icons.Simulation;
  Types.Fraction DNI;
  Types.Fraction HX_op;
  Types.Fraction HX_m_dot;
  Types.Fraction Heater_m_dot;
  Types.Heat Q_loss_total;
  Types.Heat Q_loss_components;
  Types.Heat Q_loss_ducts;
  Types.Heat E_loss(start = 0.0);

FallingParticleReceiverSystem.Components.FallingParticleReceiver
Receiver(A_ap = 1.2 * 1.2, T_s_out(fixed = true), V_rec = 0.01)
annotation(
    Placement(visible = true, transformation(origin = {10, 190},
extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.HeliostatField Field
annotation(
    Placement(visible = true, transformation(origin = {-50,
170}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.WeatherData Weather
annotation(
    Placement(visible = true, transformation(origin = {-42,
228}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
ReceiverDownComer(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {10, 164},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.LumpedStorageBin
HotBin(A_bin = 3.1415 * 2.5 * 2.5, T_s_0 = 1048.15,
T_s_out(fixed = true), V_bin = 60, h_loss = 0.25, m_s(fixed =
true), m_s_0 = 1000) annotation(
    Placement(visible = true, transformation(origin = {10, 48},
extent = {{-30, -30}, {30, 30}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.WedgeMassFlowHopper
ReceiverInventoryHopper(n = 10) annotation(
    Placement(visible = true, transformation(origin = {10, 220},
extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.LumpedStorageBin
ColdBin(A_bin = 3.1415 * 2.5 * 2.5, T_s_0 = 888.15,
T_s_out(fixed = true), V_bin = 60, h_loss = 0.25, m_s(fixed =
true), m_s_0 = 119000) annotation(
    Placement(visible = true, transformation(origin = {10, -
130}, extent = {{-30, -30}, {30, 30}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.ParticleHeatExchanger
ParticleHeatExchanger(H = 1.5, N_plate = 33, T_CO2(each fixed =
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false), T_m(each fixed = false), T_s(each fixed = false), W =
0.6, h_conv_CO2 = 3000, h_conv_sw = 450, hc_s = 0.003, n = 20)
annotation(
    Placement(visible = true, transformation(origin = {-80, -
30}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.BucketElevator
Elevator(n = 10) annotation(
    Placement(visible = true, transformation(origin = {130,
123}, extent = {{-18, -23}, {18, 23}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.ElectricalHeater
ParticleHeater annotation(
    Placement(visible = true, transformation(origin = {-80, 92},
extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.LumpedStorageBin
IntermediateStorage(A_bin = 1 * 1, T_s_0 = 888.15, T_s_out(fixed
= true), V_bin = 6, h_loss = 0.1, m_s(fixed = true), m_s_0 = 1)
annotation(
    Placement(visible = true, transformation(origin = {60, 10},
extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.SolidSplitter
HotBinDiverter annotation(
    Placement(visible = true, transformation(origin = {10, 130},
extent = {{-10, 10}, {10, -10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.SolidJunction
HeatExchangerJunction annotation(
    Placement(visible = true, transformation(origin = {-80, 10},
extent = {{-10, 10}, {10, -10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
HotBinBypass(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {60, 90},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.SolidSplitter
ReceiverDiverter annotation(
    Placement(visible = true, transformation(origin = {10, 250},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
ReceiverBypass(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {-80,
130}, extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
HeaterDischarge(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {-80, 50},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
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  FallingParticleReceiverSystem.Components.WedgeMassFlowHopper
HeatExchangerHopper(n = 10) annotation(
    Placement(visible = true, transformation(origin = {-80, -
58}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
HeatExchangerDownComer(T_m(fixed = true), h_loss = 0.6, length =
10, perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {-40, -
80}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.SolidJunction
ColdBinJunction annotation(
    Placement(visible = true, transformation(origin = {10, -80},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.SolidSplitter
IntermediateStorageDiverter annotation(
    Placement(visible = true, transformation(origin = {60, -60},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.SolidJunction
BucketElevatorJunction annotation(
    Placement(visible = true, transformation(origin = {60, -
180}, extent = {{-10, 10}, {10, -10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
ColdBinBypass(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {60, -
130}, extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
ColdBinDischarge(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {30, -
180}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
HotBinInlet(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {10, 100},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
BucketElevatorDownComer(T_m(fixed = true), h_loss = 0.6, length
= 10, perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {50, 280},
extent = {{10, -10}, {-10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.SourceSink.CO2Source CO2Inlet
annotation(
    Placement(visible = true, transformation(origin = {-130, -
30}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.SourceSink.CO2Sink CO2Outlet
annotation(
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    Placement(visible = true, transformation(origin = {-30, -
30}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.DecomposeTime
DecompTime annotation(
    Placement(visible = true, transformation(origin = {-144,
274}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
HotBinDischarge(T_m(fixed = true), h_loss = 0.6, length = 10,
perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {-30, 10},
extent = {{10, -10}, {-10, 10}}, rotation = 0)));
  FallingParticleReceiverSystem.Components.FreeFallDuct
IntermediateStorageDownComer(T_m(fixed = true), h_loss = 0.6,
length = 10, perimeter = 0.785, thickness = 0.003) annotation(
    Placement(visible = true, transformation(origin = {60, -30},
extent = {{-10, -10}, {10, 10}}, rotation = -90)));
  Modelica.Blocks.Sources.Constant Zero(k = 0) annotation(
    Placement(visible = true, transformation(origin = {-170,
210}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  Modelica.Blocks.Continuous.LimPID ReceiverPID(Ti = 600,
controllerType = Modelica.Blocks.Types.SimpleController.PI,
initType = Modelica.Blocks.Types.Init.NoInit, k = 2, yMax = 12,
yMin = 0.00001, y_start = 10) annotation(
    Placement(visible = true, transformation(origin = {-128,
212}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  Modelica.Blocks.Sources.Constant ReceiverSetPoint(k = 775 +
273.15) annotation(
    Placement(visible = true, transformation(origin = {-170,
170}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
  Modelica.Blocks.Math.Add add1(k2 = -1) annotation(
    Placement(visible = true, transformation(origin = {-122,
164}, extent = {{-10, -10}, {10, 10}}, rotation = 0)));
equation
  connect(Weather.Insolation, Field.Insolation) annotation(
    Line(points = {{-47, 218}, {-50, 218}, {-50, 180}}));
  connect(add1.y, ReceiverPID.u_m) annotation(
    Line(points = {{-110, 164}, {-128, 164}, {-128, 200}}, color
= {0, 0, 127}));
  connect(Receiver.OutletTemperature, add1.u2) annotation(
    Line(points = {{2, 184}, {-98, 184}, {-98, 144}, {-148,
144}, {-148, 158}, {-134, 158}}, color = {0, 0, 127}));
  connect(ReceiverInventoryHopper.ParticleOutlet,
Receiver.ParticleInlet) annotation(
    Line(points = {{10, 210}, {10, 198}}));
  connect(Receiver.ParticleOutlet,
ReceiverDownComer.ParticleInlet) annotation(
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    Line(points = {{10, 182}, {10, 182}, {10, 174}, {10,
174}}));
  connect(ReceiverPID.y, Receiver.MassFlow) annotation(
    Line(points = {{-116, 212}, {2, 212}, {2, 196}, {2, 196}},
color = {0, 0, 127}));
  connect(Zero.y, ReceiverPID.u_s) annotation(
    Line(points = {{-158, 210}, {-142, 210}, {-142, 212}, {-140,
212}}, color = {0, 0, 127}));
  connect(ReceiverSetPoint.y, add1.u1) annotation(
    Line(points = {{-158, 170}, {-134, 170}, {-134, 170}, {-134,
170}}, color = {0, 0, 127}));
  connect(HotBinInlet.ParticleOutlet, HotBin.ParticleInlet)
annotation(
    Line(points = {{10, 90}, {10, 78}}));
  connect(HotBin.ParticleOutlet, HotBinDischarge.ParticleInlet)
annotation(
    Line(points = {{10, 18}, {10, 10}, {-20, 10}}));
  connect(CO2Inlet.CO2Outlet, ParticleHeatExchanger.CO2Inlet)
annotation(
    Line(points = {{-120, -30}, {-90, -30}}));
  connect(ParticleHeatExchanger.CO2Outlet, CO2Outlet.CO2Inlet)
annotation(
    Line(points = {{-70, -30}, {-40, -30}, {-40, -30}, {-40, -
30}}));
  connect(ParticleHeatExchanger.ParticleOutlet,
HeatExchangerHopper.ParticleInlet) annotation(
    Line(points = {{-80, -40}, {-80, -48}}));
  connect(HeatExchangerJunction.ParticleOutlet,
ParticleHeatExchanger.ParticleInlet) annotation(
    Line(points = {{-80, -1.49012e-07}, {-80, -20}}));
  connect(IntermediateStorageDownComer.ParticleOutlet,
IntermediateStorageDiverter.ParticleInlet) annotation(
    Line(points = {{60, -40}, {60, -40}, {60, -50}, {60, -
50}}));
  connect(IntermediateStorage.ParticleOutlet,
IntermediateStorageDownComer.ParticleInlet) annotation(
    Line(points = {{60, 0}, {60, 0}, {60, -20}, {60, -20}}));
  connect(HotBinDischarge.ParticleOutlet,
HeatExchangerJunction.ParticleInlet2) annotation(
    Line(points = {{-40, 10}, {-70, 10}, {-70, 10}, {-70,
10}}));
  connect(BucketElevatorDownComer.ParticleInlet,
Elevator.ParticleOutlet) annotation(
    Line(points = {{60, 280}, {100, 280}, {100, 136}, {120,
136}, {120, 136}}));
  connect(BucketElevatorDownComer.ParticleOutlet,
ReceiverDiverter.ParticleInlet) annotation(
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    Line(points = {{40, 280}, {10, 280}, {10, 260}, {10,
260}}));
  connect(HotBinDiverter.ParticleOutlet1,
HotBinInlet.ParticleInlet) annotation(
    Line(points = {{10, 120}, {10, 120}, {10, 110}, {10,
110}}));
  connect(ColdBin.ParticleOutlet,
ColdBinDischarge.ParticleInlet) annotation(
    Line(points = {{10, -160}, {10, -160}, {10, -180}, {20, -
180}, {20, -180}}));
  connect(ColdBinDischarge.ParticleOutlet,
BucketElevatorJunction.ParticleInlet1) annotation(
    Line(points = {{40, -180}, {50, -180}, {50, -180}, {50, -
180}}));
  connect(ColdBinBypass.ParticleOutlet,
BucketElevatorJunction.ParticleInlet2) annotation(
    Line(points = {{60, -140}, {60, -140}, {60, -170}, {60, -
170}}));
  connect(IntermediateStorageDiverter.ParticleOutlet1,
ColdBinBypass.ParticleInlet) annotation(
    Line(points = {{60, -70}, {60, -70}, {60, -120}, {60, -
120}}));
  connect(Elevator.ParticleInlet,
BucketElevatorJunction.ParticleOutlet) annotation(
    Line(points = {{119.2, 109.66}, {99.2, 109.66}, {99.2, -
180.34}, {69.2, -180.34}, {69.2, -180.34}}));
  connect(IntermediateStorageDiverter.ParticleOutlet2,
ColdBinJunction.ParticleInlet1) annotation(
    Line(points = {{50, -60}, {10, -60}, {10, -70}, {10, -
70}}));
  connect(ColdBinJunction.ParticleOutlet, ColdBin.ParticleInlet)
annotation(
    Line(points = {{10, -90}, {10, -90}, {10, -100}, {10, -
100}}));
  connect(HeatExchangerDownComer.ParticleOutlet,
ColdBinJunction.ParticleInlet2) annotation(
    Line(points = {{-30, -80}, {0, -80}, {0, -80}, {0, -80}}));
  connect(HeatExchangerHopper.ParticleOutlet,
HeatExchangerDownComer.ParticleInlet) annotation(
    Line(points = {{-80, -68}, {-80, -80}, {-50, -80}}));
  connect(HeaterDischarge.ParticleOutlet,
HeatExchangerJunction.ParticleInlet1) annotation(
    Line(points = {{-80, 40}, {-80, 20}}));
  connect(ParticleHeater.ParticleOutlet,
HeaterDischarge.ParticleInlet) annotation(
    Line(points = {{-80, 82}, {-80, 82}, {-80, 60}, {-80,
60}}));
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  connect(ReceiverBypass.ParticleOutlet,
ParticleHeater.ParticleInlet) annotation(
    Line(points = {{-80, 120}, {-80, 120}, {-80, 102}, {-80,
102}}));
  connect(ReceiverDiverter.ParticleOutlet2,
ReceiverBypass.ParticleInlet) annotation(
    Line(points = {{-1.49012e-07, 250}, {-80, 250}, {-80, 140},
{-80, 140}}));
  connect(ReceiverDiverter.ParticleOutlet1,
ReceiverInventoryHopper.ParticleInlet) annotation(
    Line(points = {{10, 240}, {10, 240}, {10, 230}, {10,
230}}));
  connect(HotBinBypass.ParticleOutlet,
IntermediateStorage.ParticleInlet) annotation(
    Line(points = {{60, 80}, {60, 20}}));
  connect(HotBinDiverter.ParticleOutlet2,
HotBinBypass.ParticleInlet) annotation(
    Line(points = {{20, 130}, {60, 130}, {60, 100}}));
  connect(ReceiverDownComer.ParticleOutlet,
HotBinDiverter.ParticleInlet) annotation(
    Line(points = {{10, 154}, {10, 154}, {10, 140}, {10,
140}}));
equation
  DNI = Weather.DNI;
// Heat Exchanger Flow Rate
  CO2Inlet.T = 565 + 273.15;
  CO2Inlet.m_dot = 5;
// Receiver Flow Rate
  if ColdBin.m_s > 1000 then
    Receiver.Q_solar = Field.Q_rec;
  else
    Receiver.Q_solar = 0.0001 * Field.Q_rec;
  end if;
// Receiver Diverter Valve Control
  if HotBinDiverter.T_s_in > 765 + 273.15 and
HotBinDiverter.T_s_in < 800 + 273.15 then
    HotBinDiverter.m_dot_s_out_1 = HotBinDiverter.m_dot_s_in;
  else
    HotBinDiverter.m_dot_s_out_2 = HotBinDiverter.m_dot_s_in;
  end if;
// Intermediate Storage Diverter Valve Control
  IntermediateStorageDiverter.m_dot_s_out_2 = 0;
// Heat Exchanger Flow Rate
  HotBin.m_dot_s_out = HX_op * HX_m_dot;
  if DecompTime.hour_day > 2.0 and DecompTime.hour_day < 10.0
then
    HX_op = 1.0;
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  else
    HX_op = 1E-10;
  end if;
// Electrical Heater Flow Rate
  if HotBin.m_dot_s_out < 0.01 then
    ParticleHeater.m_dot_s_out = Heater_m_dot;
  else
    ParticleHeater.m_dot_s_out = 0.0;
  end if;
  ParticleHeater.T_s_out = 615 + 273.15;
// Total Heat Loss
  Q_loss_components = ColdBin.Q_loss + HotBin.Q_loss +
IntermediateStorage.Q_loss + Elevator.Q_loss;
  Q_loss_ducts = BucketElevatorDownComer.Q_loss +
ReceiverBypass.Q_loss + ReceiverDownComer.Q_loss +
HotBinBypass.Q_loss + HotBinDischarge.Q_loss +
HeaterDischarge.Q_loss + HeatExchangerDownComer.Q_loss +
IntermediateStorageDownComer.Q_loss + ColdBinDischarge.Q_loss;
  Q_loss_total = Q_loss_components + Q_loss_ducts;
  der(E_loss * 3600) = Q_loss_total / 1E6;
// Control Algorithm
algorithm
// Heat Exchanger Operation
  when initial() then
    HX_m_dot := 1E-10;
    Heater_m_dot := 0.1;
  elsewhen HotBin.m_s > 10000 then
    HX_m_dot := 5.0;
  elsewhen HotBin.m_s < 1000 then
    HX_m_dot := 1E-10;
  end when;
// Receiver Operation
  when initial() then
    DNI := 1E-10;
  elsewhen DecompTime.hour_day > 10.0 then
    if DecompTime.day_number == 5.0 then
      DNI := 1E-10;
    elseif DecompTime.day_number == 3.0 then
      DNI := 900;
    elseif DecompTime.day_number == 7.0 then
      DNI := 850;
    else
      DNI := 1000;
    end if;
  elsewhen DecompTime.hour_day > 16.0 then
    DNI := 1E-10;
  end when;
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// Intermediate Storage Bin Discharge Control
  when initial() then
    IntermediateStorage.m_dot_s_out := 0.0;
  elsewhen IntermediateStorage.m_s > 10 then
    IntermediateStorage.m_dot_s_out := 1.0;
  elsewhen IntermediateStorage.m_s < 1.0 then
    IntermediateStorage.m_dot_s_out := 0.0;
  end when;
// Energy Loss Reset
//  when DecompTime.hour_day > 23.999 then
//    reinit(E_loss, 0.0);
//  end when;
  annotation(
    Diagram(coordinateSystem(extent = {{-200, -300}, {200,
300}})),
    Icon,
    __OpenModelica_commandLineOptions = "");
end G3P3_System;
```