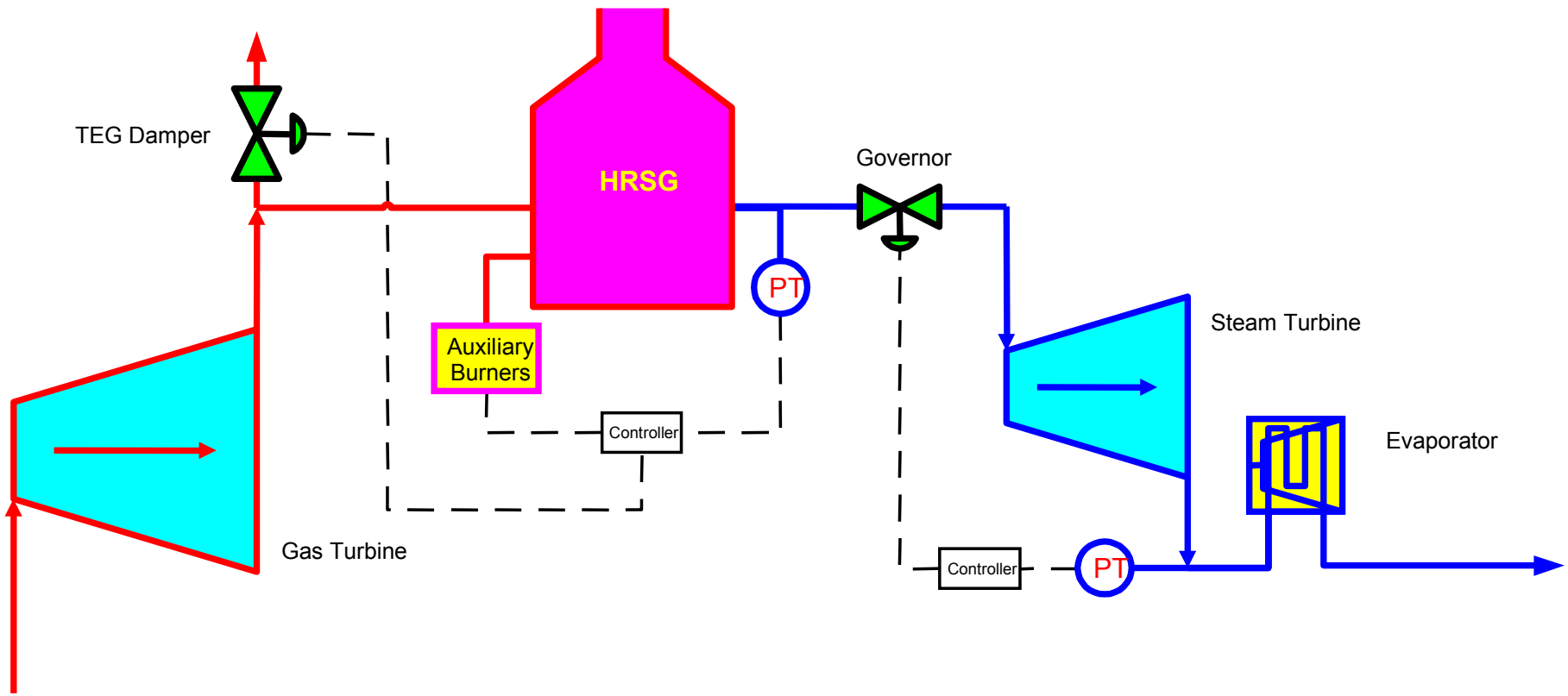
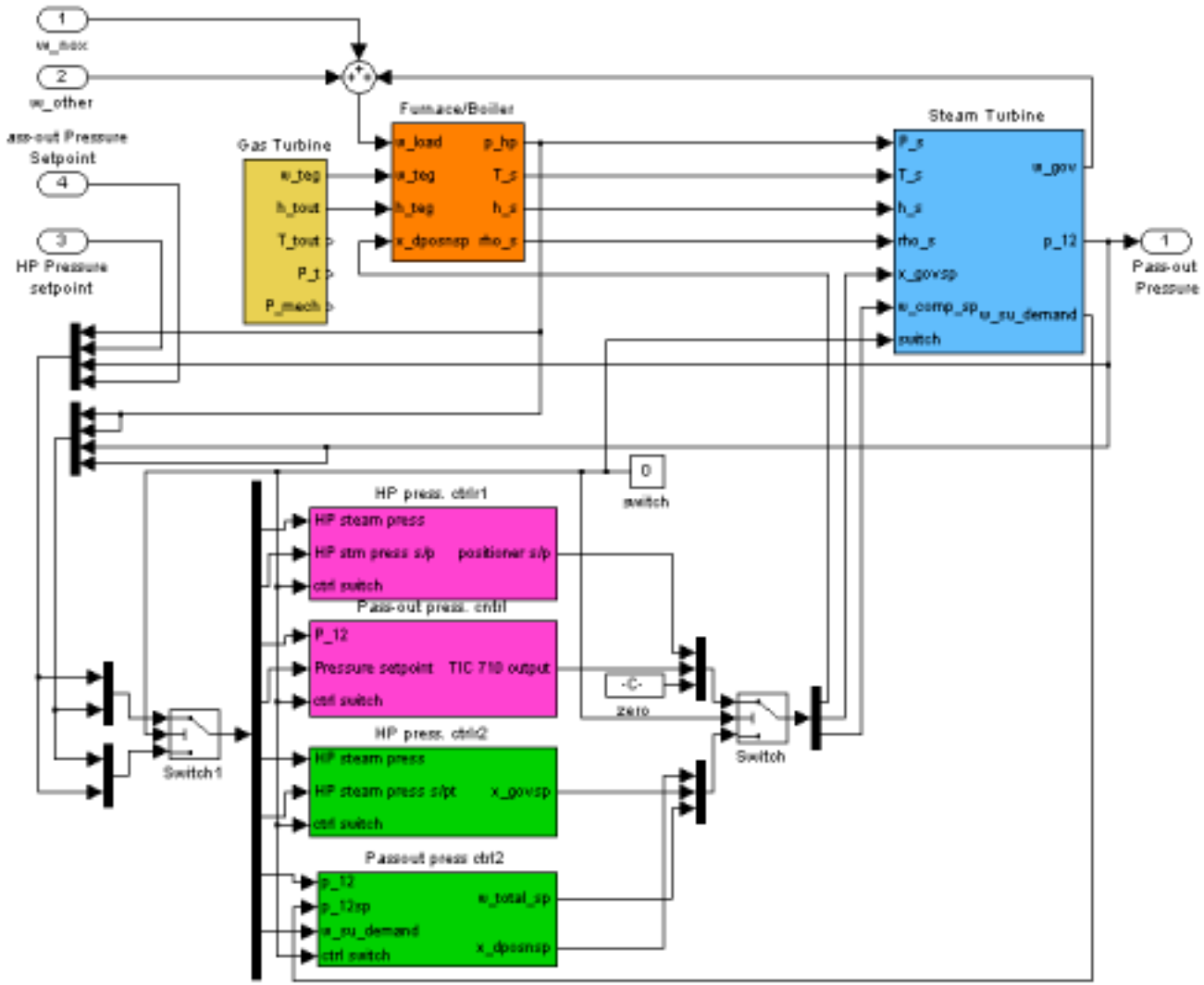
Contract example – Power Industry

Improving 40 bar Steam Pressure Stability

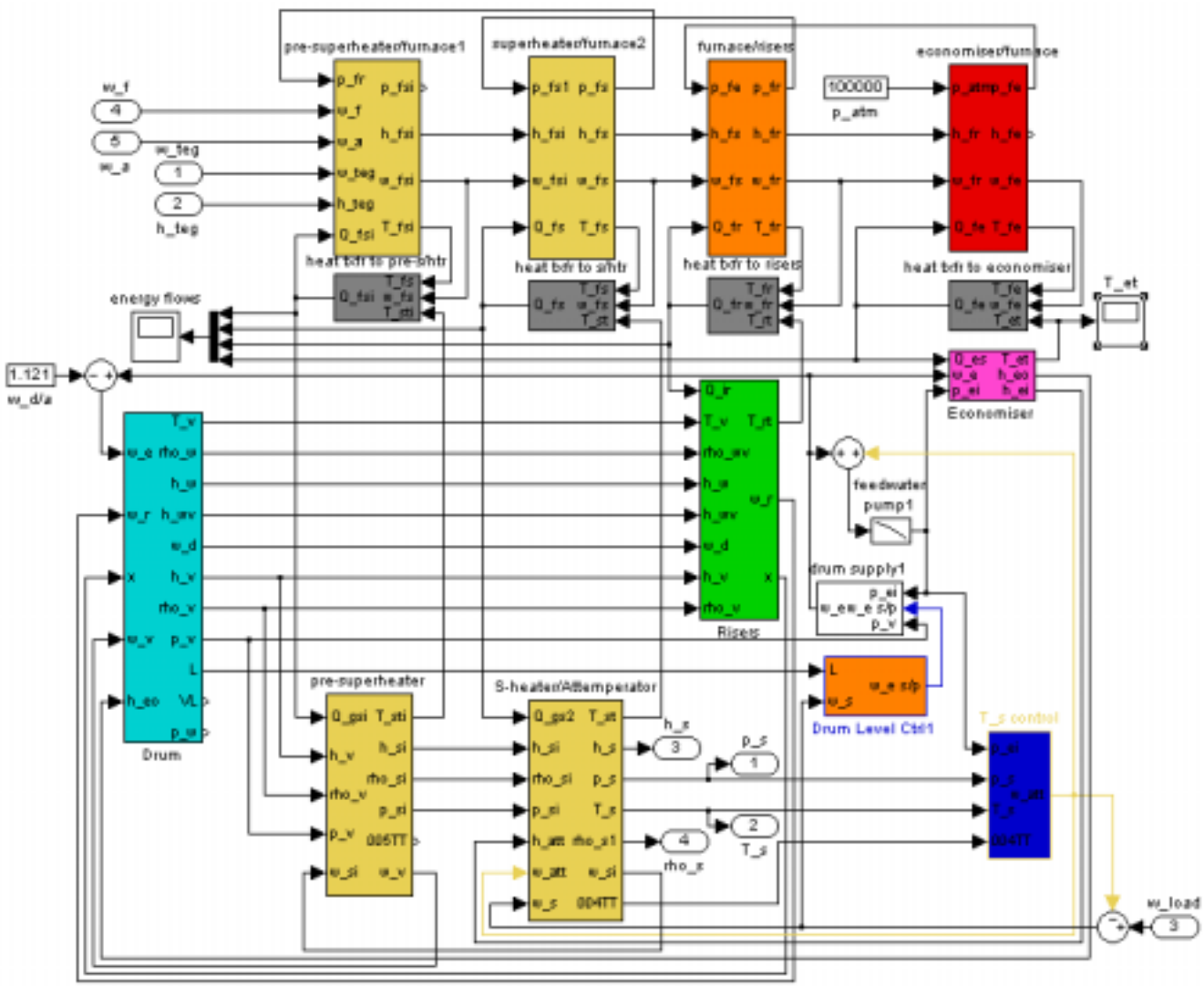
‘XYZ’ CHP Control – Current Strategy



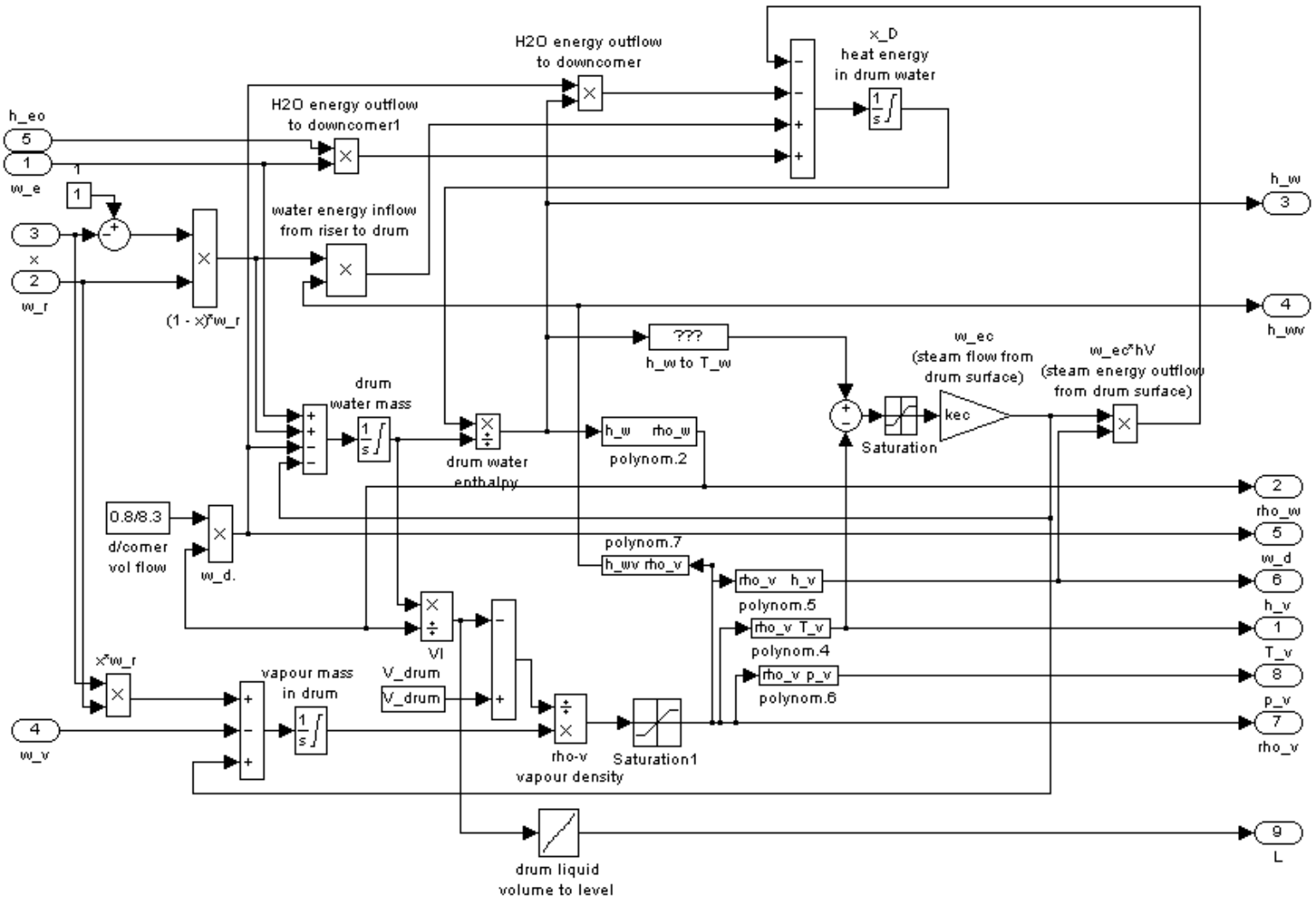
‘XYZ’ CHP Plant - Model



‘XYZ’ CHP Plant – HRSG model



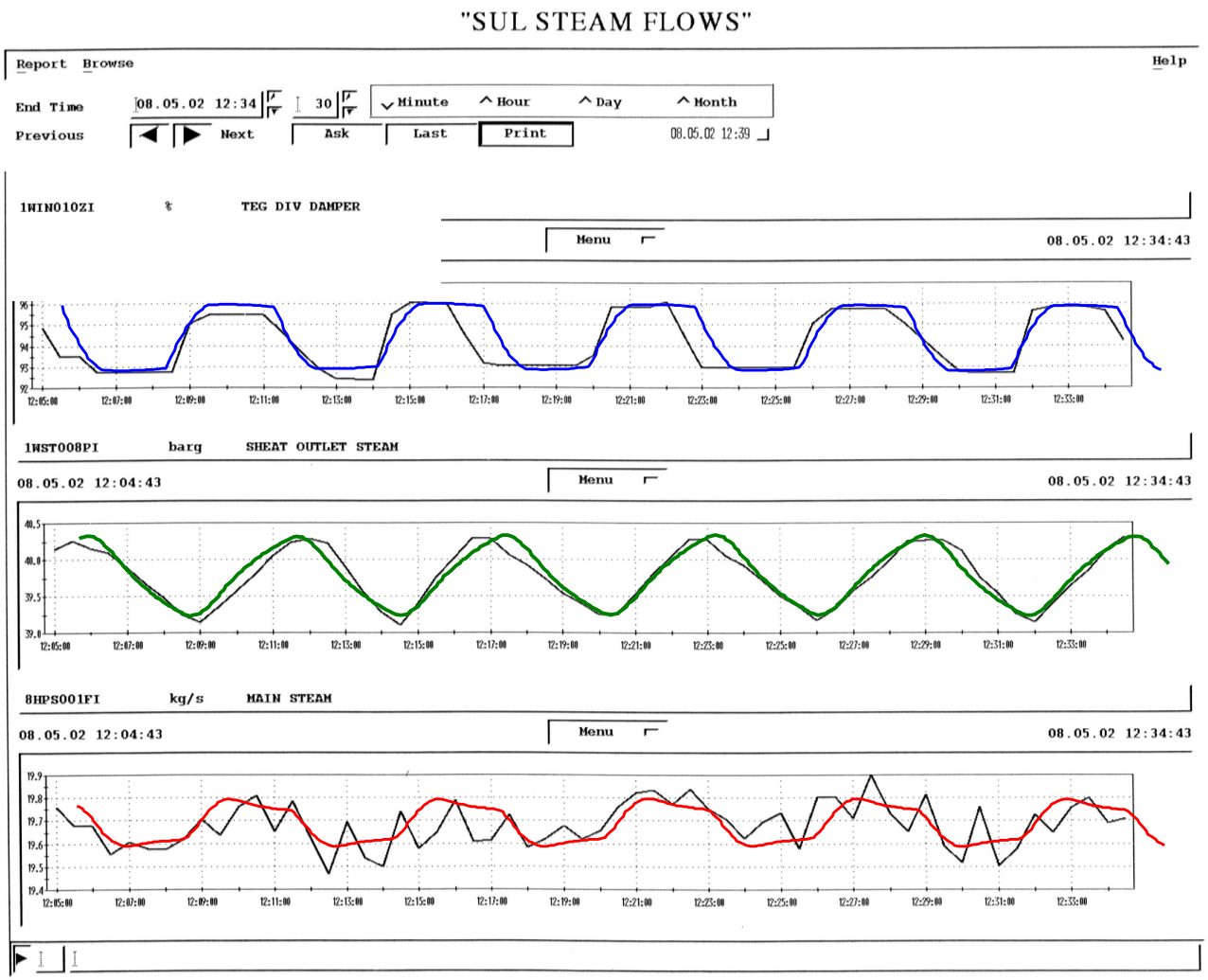
‘XYZ’ CHP Plant – Drum model



‘XYZ’ CHP Plant Model Controls

- Controls included in the model:
  - Drum Level (three element control)
  - Superheated Steam Temperature (cascade)
  - 40 barg Pressure
  - Steam Turbine Pass-out Pressure

Validation – 40 bar Pressure Control



Damper Position

- Plant data – black
- Model data – blue

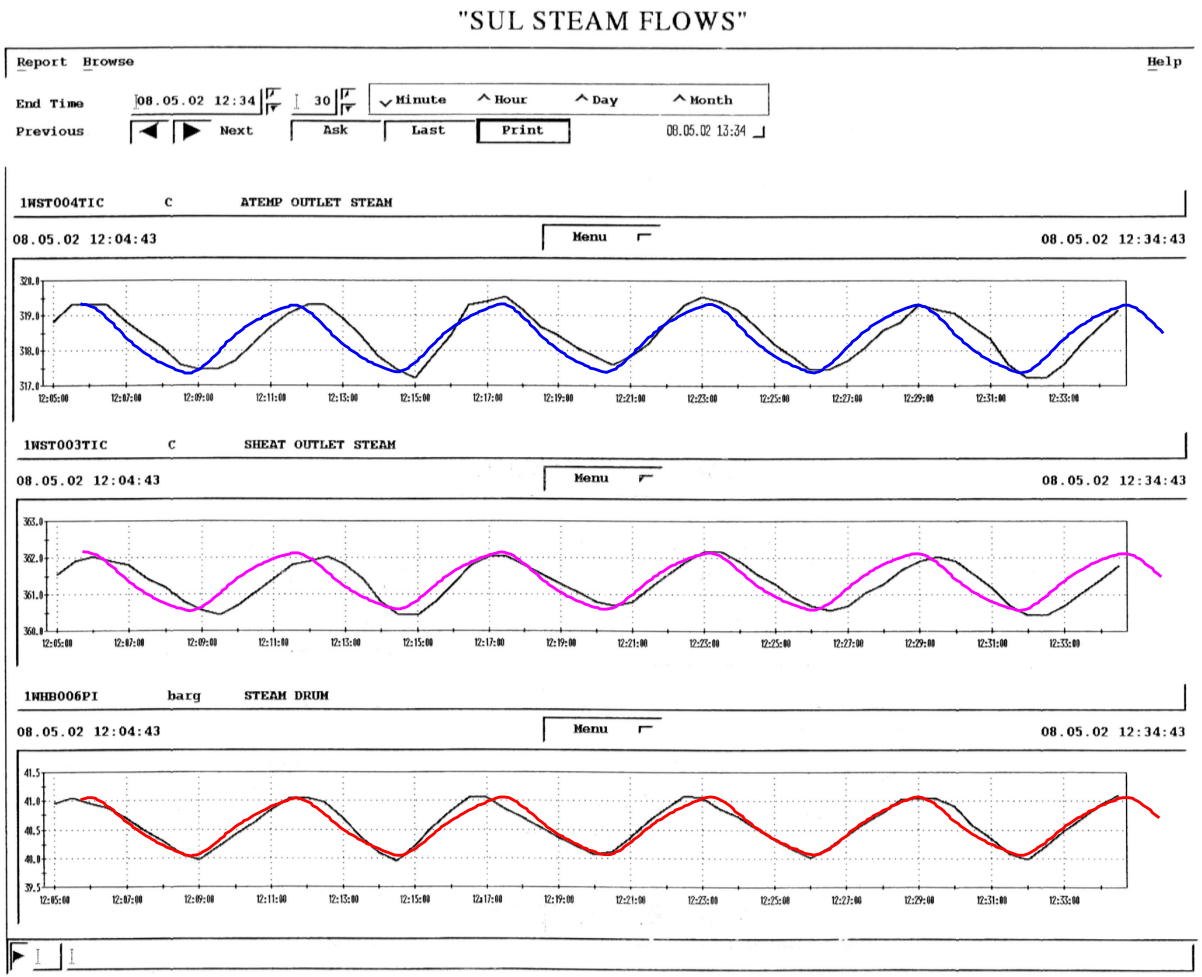
40 bar HP Steam Pressure

- Plant data – black
- Model data – green

Main Steam Flow

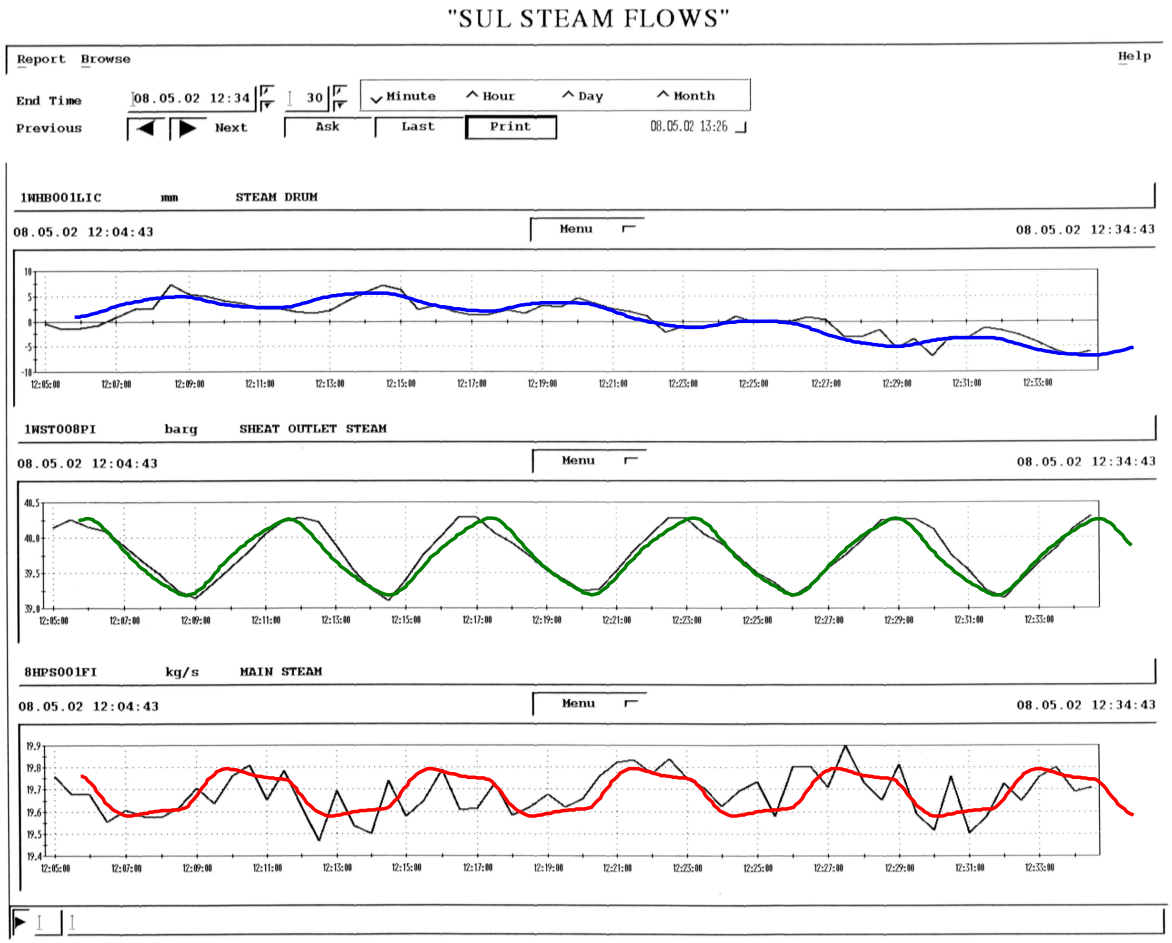
- Plant data – black
- Model data – red

Validation – Superheater Temperatures



- Attemperator Exit Temperature
  - Plant data – black
  - Model data – blue
- S/heater Outlet Temperature
  - Plant data – black
  - Model data – magenta
- Steam Pressure in Drum
  - Plant data – black
  - Model data – red

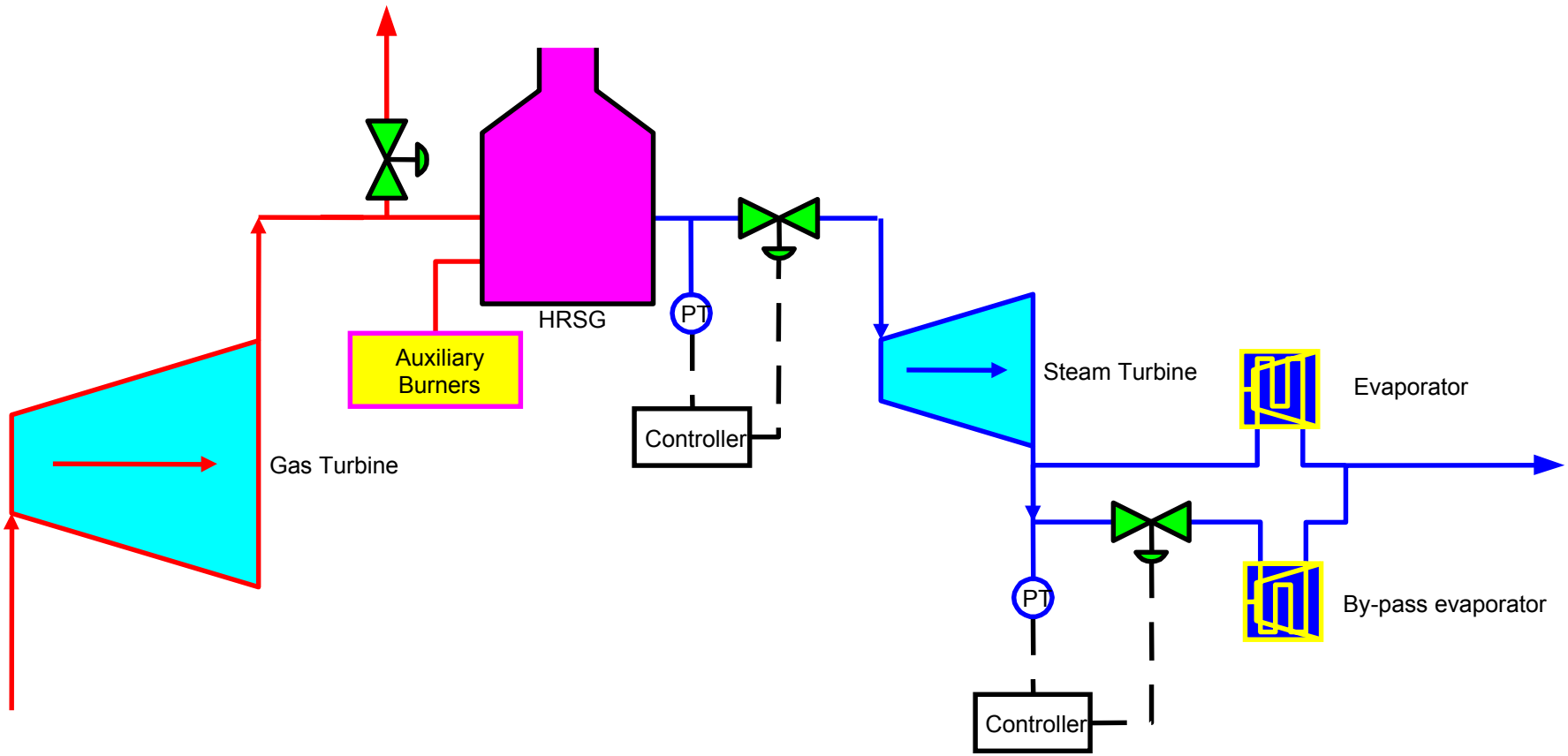
Validation – Drum Level/Steam Flow



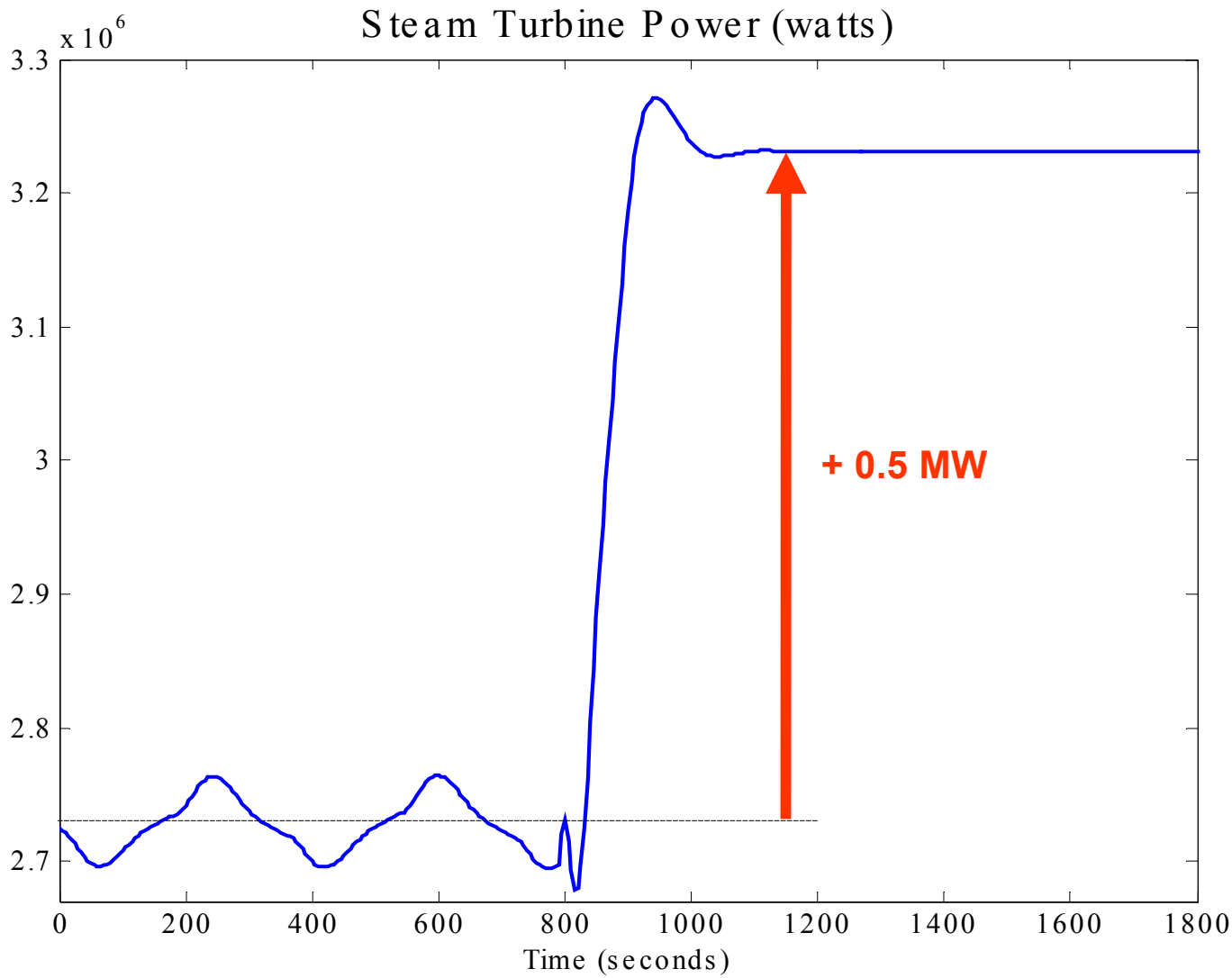
- Drum Level
  - Plant data – black
  - Model data – blue
- S/heater Outlet Pressure
  - Plant data – black
  - Model data – green
- Steam Mass Flow
  - Plant data – black
  - Model data – red

‘XYZ’ CHP Control Alternative - 1

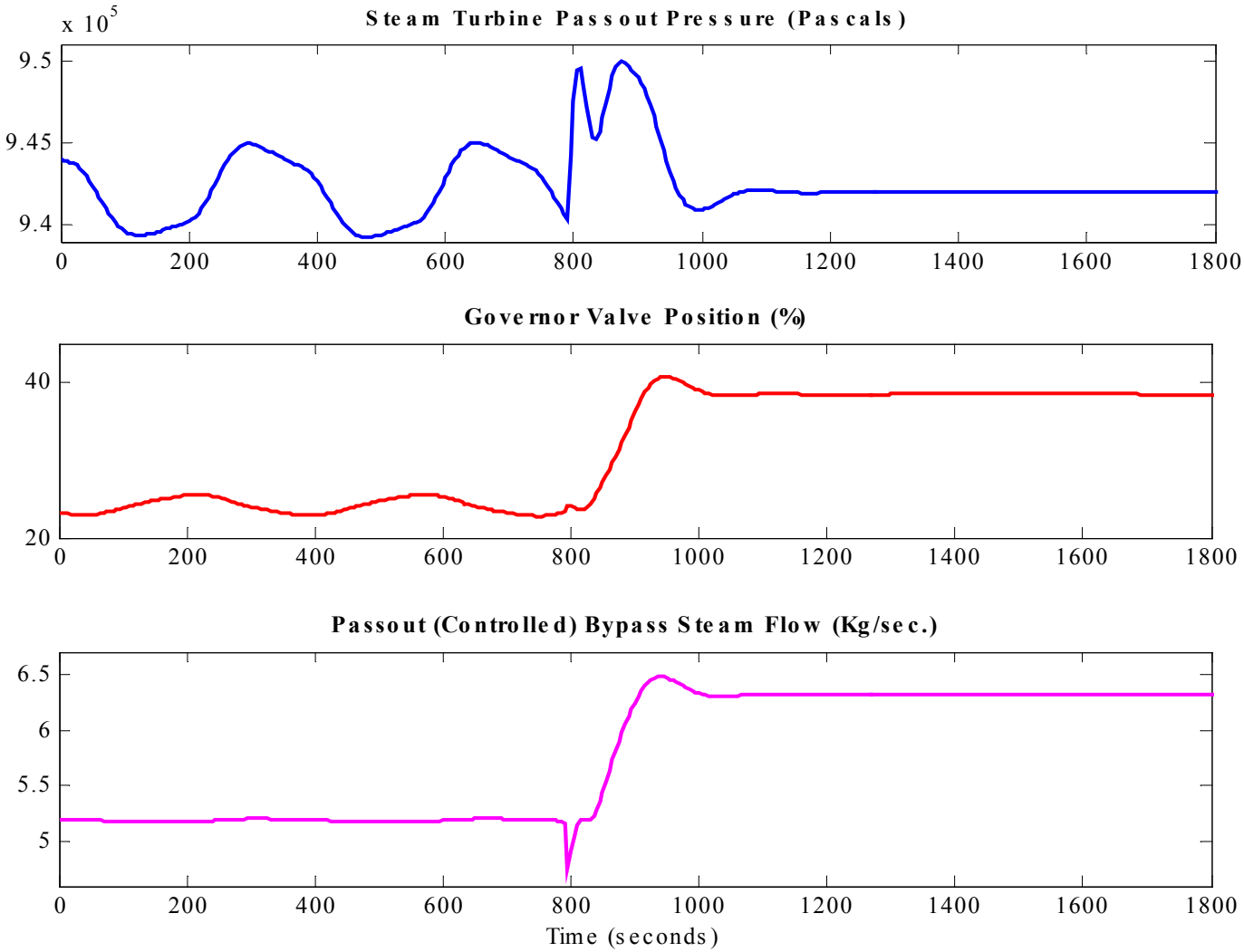
- *ST pass out pressure – controlled via load by-pass flow*
- *HP steam pressure – controlled via governor valve*



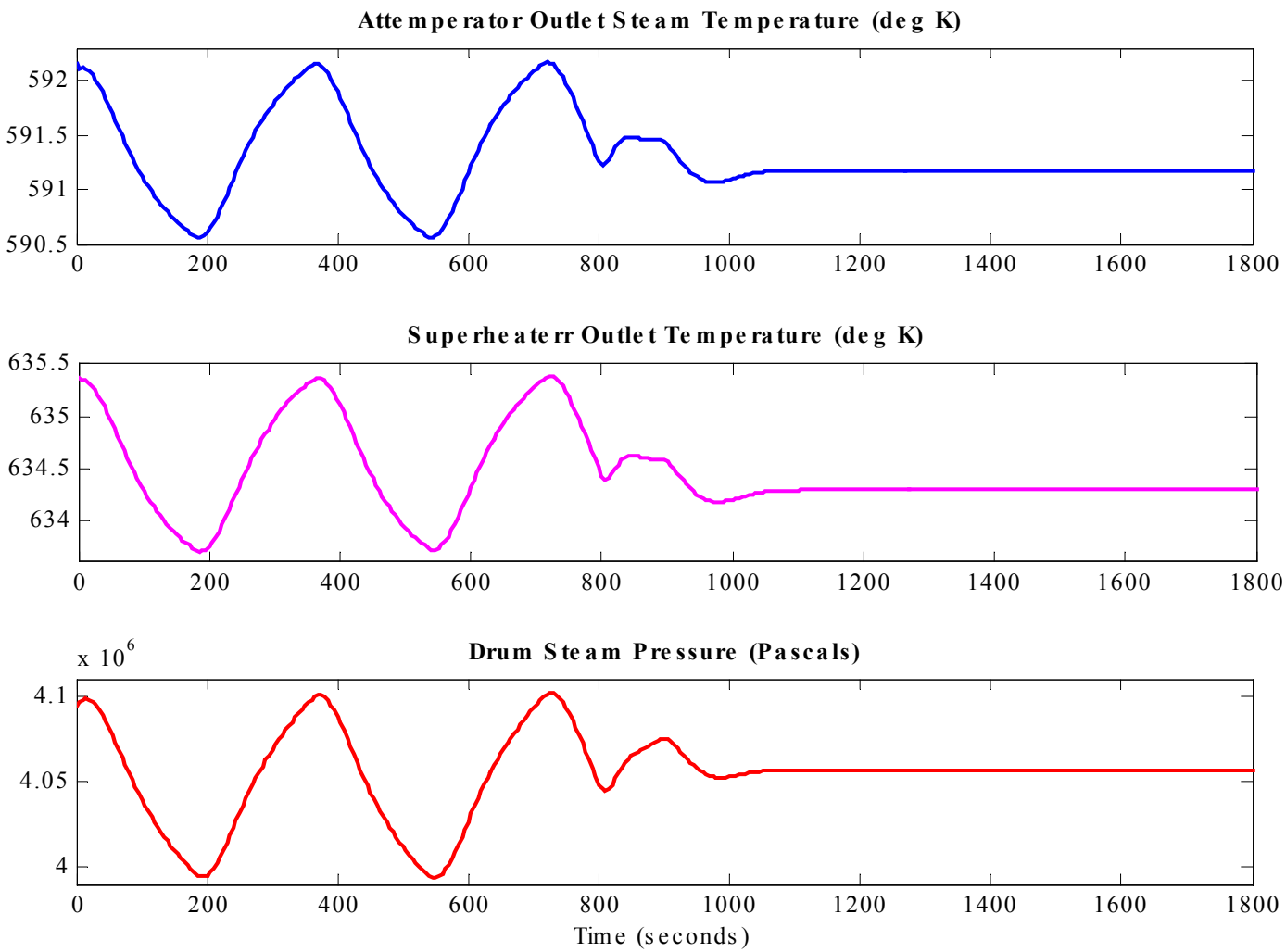
Steam Turbine Power
(Comparing Current & Alternate Strategy)



Steam Turbine Pass-out Pressure
(Comparing Current & Alternate Strategy)



Steam Turbine 40 barg Pressure
(Comparing Current & Alternate Strategy)



40 barg Steam Pressure & Mass Flow
(Comparing Current & Alternate Strategy)