Validation of thermal– hydraulic loss calculation in CEA network model

Method:

* Compare the simulated results from the CEA network model against the identical thermal network model using Simulink Thermal Liquid Library.
* The networks in CEA and Simulink have identical layout, pipe properties and plant supply temperatures, and the thermal and hydraulic losses are simulated in both models.
* Three test cases are developed in both cea and simulink:

|  |  |  |
| --- | --- | --- |
| Network 1 | Network 2 | Network 3 |
| C:\reference-case-open-network\baseline\inputs\network\network catalog\network1\network1.png | C:\reference-case-open-network\baseline\inputs\network\network catalog\network2\network2.png | C:\reference-case-open-network\baseline\inputs\network\network catalog\network3\network3.png |
| Parameters (input to simulink) | | |
| Pipe Insulation thermal conductivity | 0.023 [W/mK] |  |
| Soil thermal conductivity | 1.6 [W/mK] |  |
| Pipe roughness | 2e-5 | Steel pipe |
| Pipe length | 125 [m] |  |
| Pipe diameter | m | From cea network |
| Pipe insulation thickness |  | From cea network |
| Plant supply temperatures | C | Hourly data from cea |
| Substation flow rate | kg/s | Hourly data from cea demand |
|  |  |  |
| Outputs |  |  |
| Flow rate in each pipe | kg/s | on the supply side |
| Total pressure loss | Pa | on the supply side |
| Total heat loss | kW | on the supply side |

Results:

* Network3
  + Thermal losses
  + The simulated results between CEA and Simulink are within the range of 10% difference in most of the hours. Except at the instance when