Existing Building and Systems

Description
The selected building is the dwelling Johan his parents live in. It is a semi-detached dwelling with a floor surface of 135 m² from the year 1973. The dwelling has a high efficiency boiler (Remeha Avanta - CW4) for heating purposes. The generated heat by the boiler is supplied in the rooms by radiators. Figure 1 shows a picture of the building and a pipes and instruments (PI-)diagram of the current system.

Simulated current energy usage and comparison with measured data
The dwelling uses gas to heat the rooms. The measured gas consumption is given in m³/week. The simulation in Matlab is rescaled to this unit. Figure 2 gives a comparison of the measured and simulated values.

As shown in figure 2, there are differences between the simulated and measured gas consumption. The differences can be clarified by:
• Using an other reference year;
• Influences of the woodstove in the boiler;
• Heating of the domestic water is not taken into account. From figure 2 it is possible to conclude that the trend of the simulated values nearly match the measured data.

New Sustainable Measure

Description of the new models
The new sustainable measure is the application of a solar collector. Figure 3 shows a PI-diagram of the new model, where the solar collector is integrated in the current installation. The solar collector provides also heating, to get a lower gas consumption.

The integrated model in SimuLink
Figure 4 shows the model with the application of the solar collector in Simulink. In the model a selection can be made of three solar collectors, namely a flat plate, vacuum and a plastic collector.

Simulated improved energy usage
Of the investigated solar collectors, the vacuum collector combined with low temperature heating is the most energy efficient. Figure 5 shows the results of the vacuum collector over the year 1984. The gas consumption is lowered with 178 m³ a year.

Figure 1. The dwelling with the PI-diagram of the current system
Figure 2. Overview of the results of the simulated energy usage
Figure 3. PI-diagram of the new system
Figure 4. An overview of the integrated model in SimuLink
Figure 5. Overview of the results