Supplementary Information for:

Towards sustainable heat supply with decentralized multi-energy systems by integration of subsurface seasonal heat storage

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Schemes for a 65 ˚C heat pump condenser temperature are given in Figure S1-S3 for the modes with a different temperature scheme than at 50 ˚C condenser temperature as explained in section 2.3.3 of the paper.

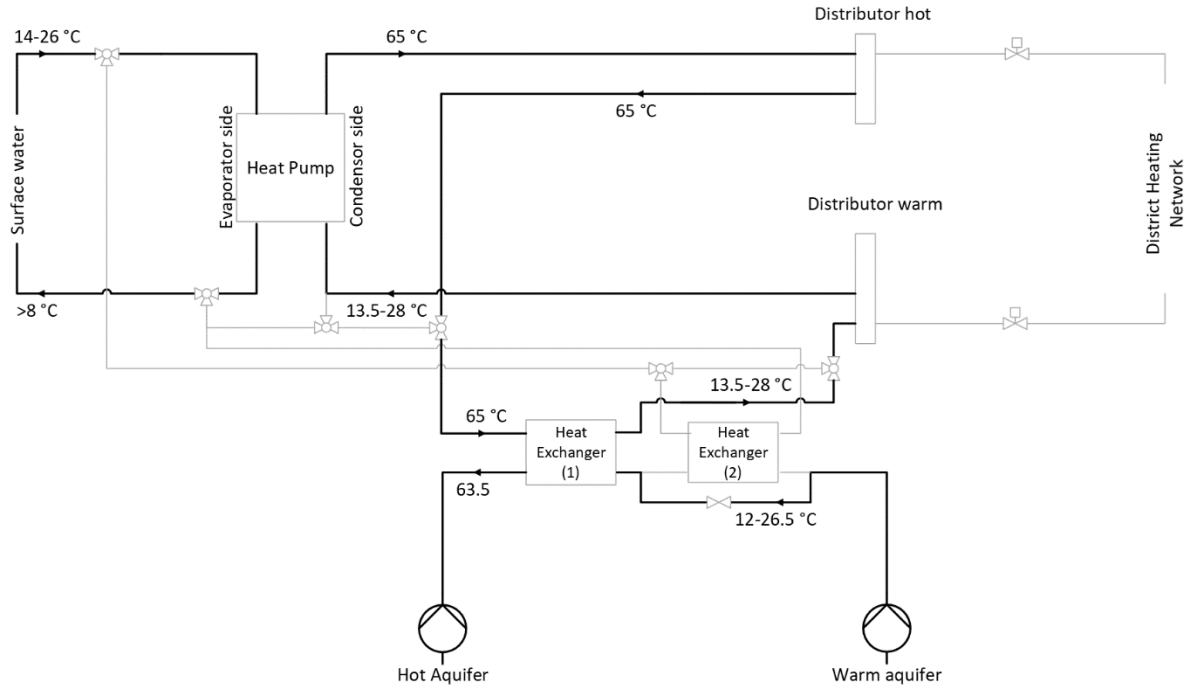

Figure S1. *Mode of operation 1: Heat production and storage in the HT-ATES. - Overview of the hydraulic scheme for charging the HT-ATES with a heat pump condenser temperature of 65˚C. The shaded lines are inactive hydraulic connections, needed for other modes of operation. An indication of the temperature (range) of the different flows is given.*

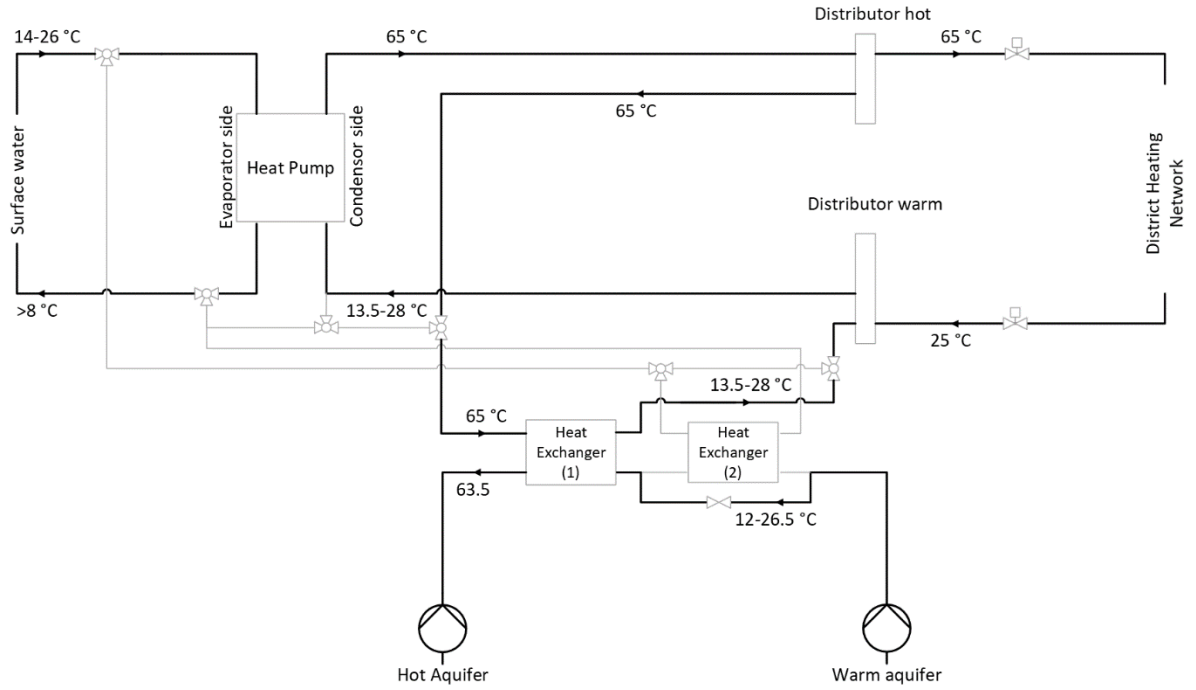

Figure S2. *Mode of operation 2: Simultaneous heat production and delivery. - Overview of the hydraulic scheme for loading and simultaneously delivering (part of) the heat with a heat pump condenser temperature of 65˚C. The shaded lines are inactive hydraulic connections, needed for other modes of operation. An indication of the temperature (range) of the different flows is given.*

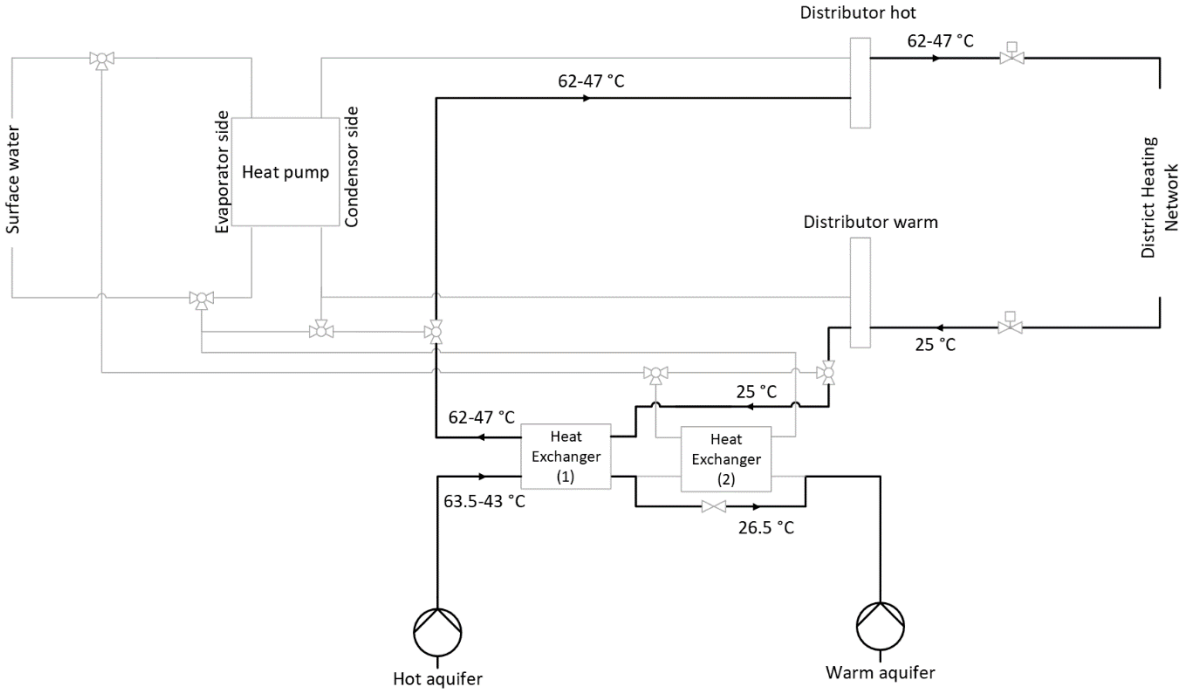

Figure S3. *Mode of operation 3: Heat delivery from the HT-ATES above the inlet temperature of the DHN. - Overview of the hydraulic scheme for heat delivery above the threshold value of 43˚C to ensure heat delivery of at least 40˚C. The shaded lines are inactive hydraulic connections, needed for other modes of operation. An indication of the temperature (range) of the different flows is given.*