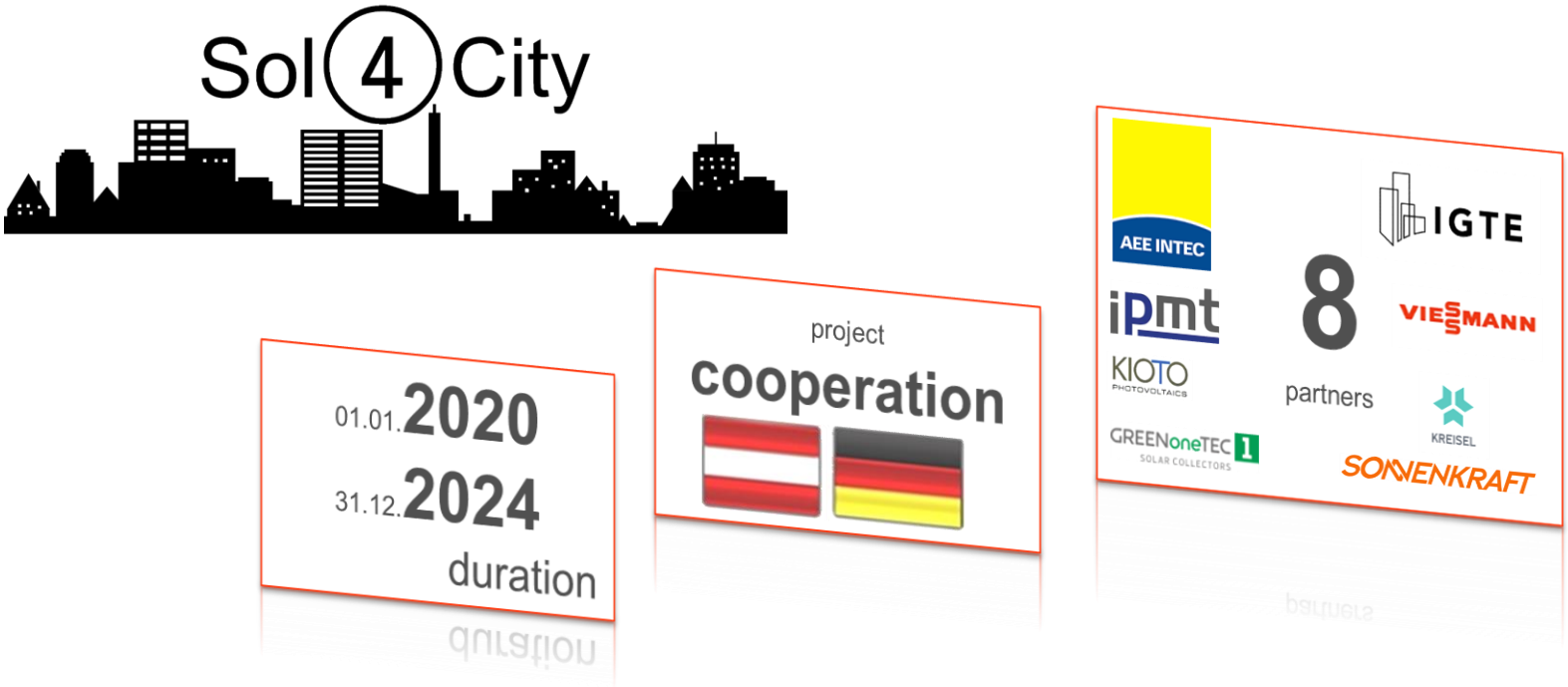
Solar heat and ice storages in cold district heat networks for heating and cooling

operation and control aspects

IEA SHC Task 66 Industry Workshop | Oktober 2023 | Graz | Ralf Dott

research project „Sol4City“

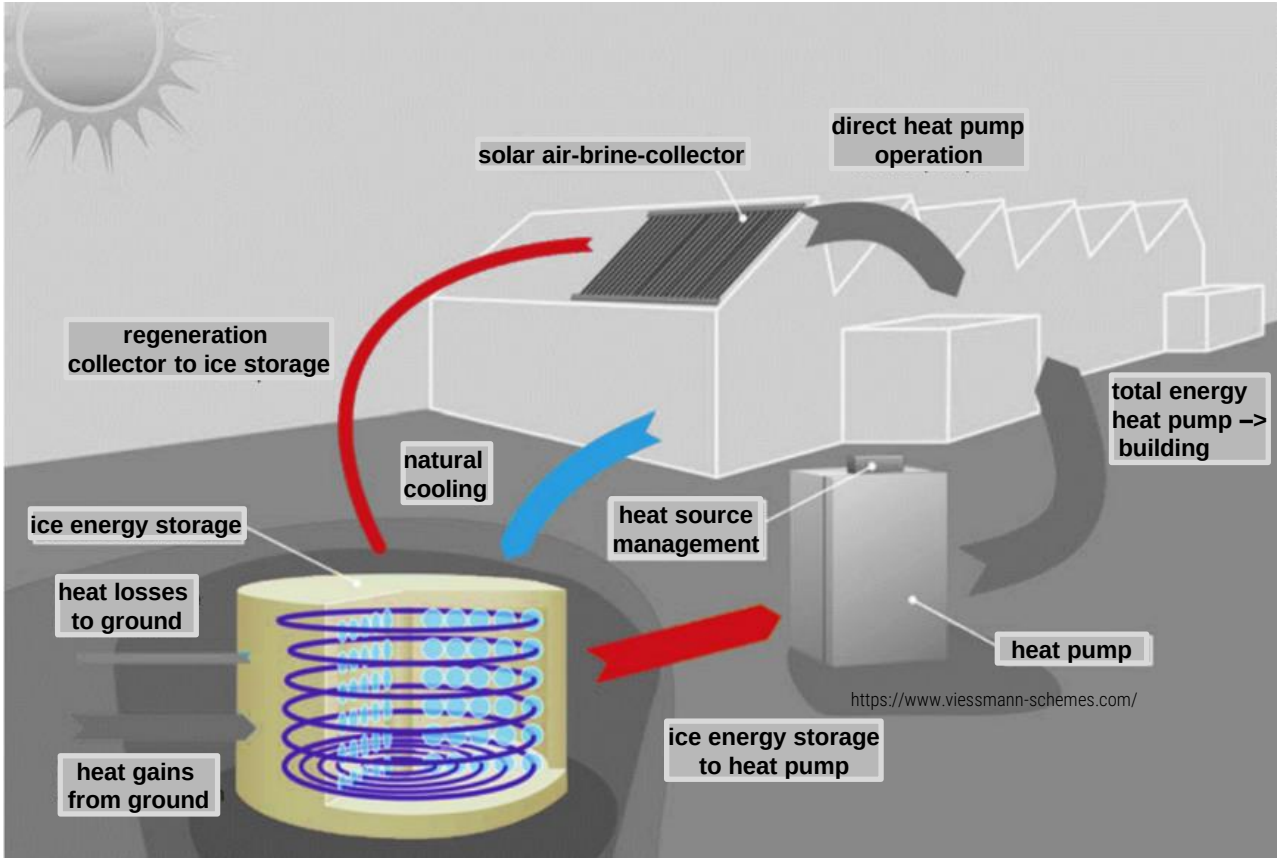


research project „Sol4City“

focus

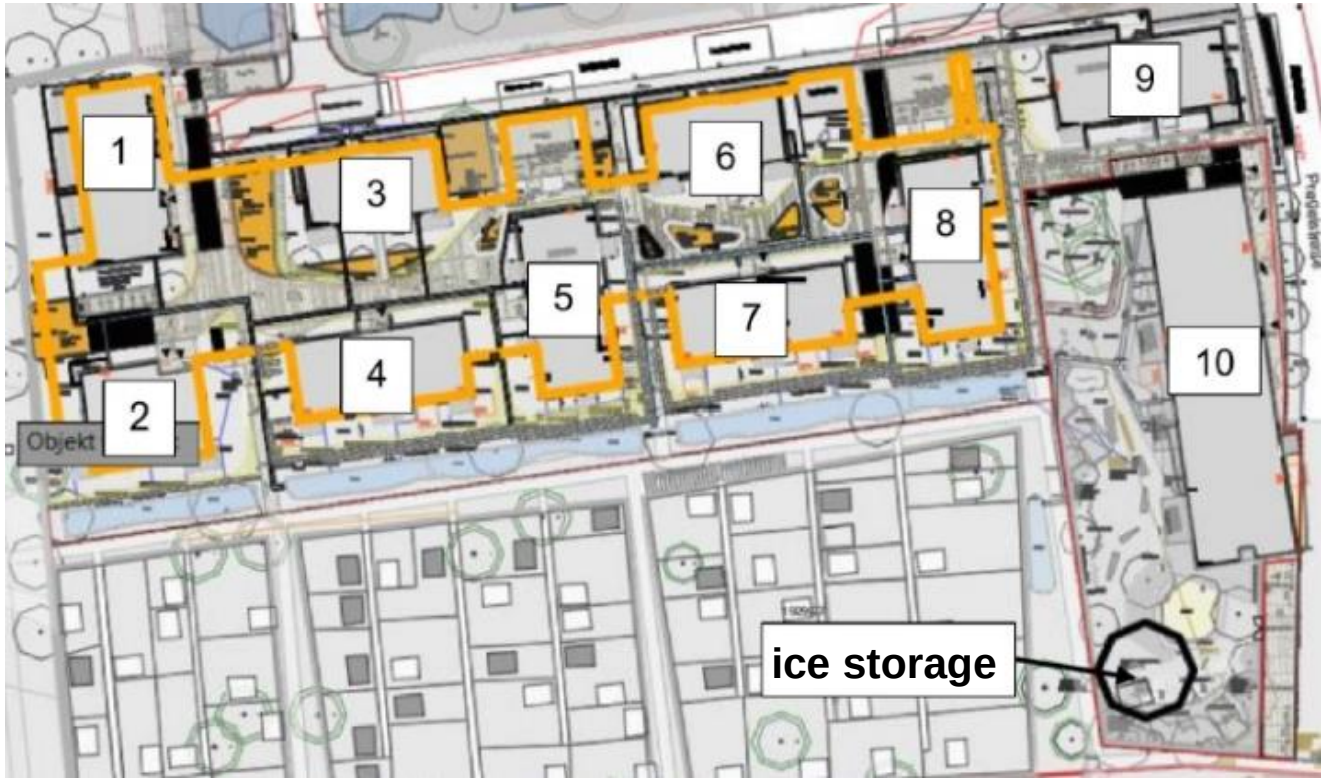
- Using renewable energies
  (100 % cooling, 85 % heating, 60 % electricity)
- Choose best heat source: solar heat, PV, outside air
- PCM storage zur Lastentkopplung (“Eisspeicher”)
- Low temperature heat networks (“cold district heat”)
- Decentral heat pumps
- Decentral heat storage with reduced heat losses

Ice storage system with solarthermal air-brine-collectors



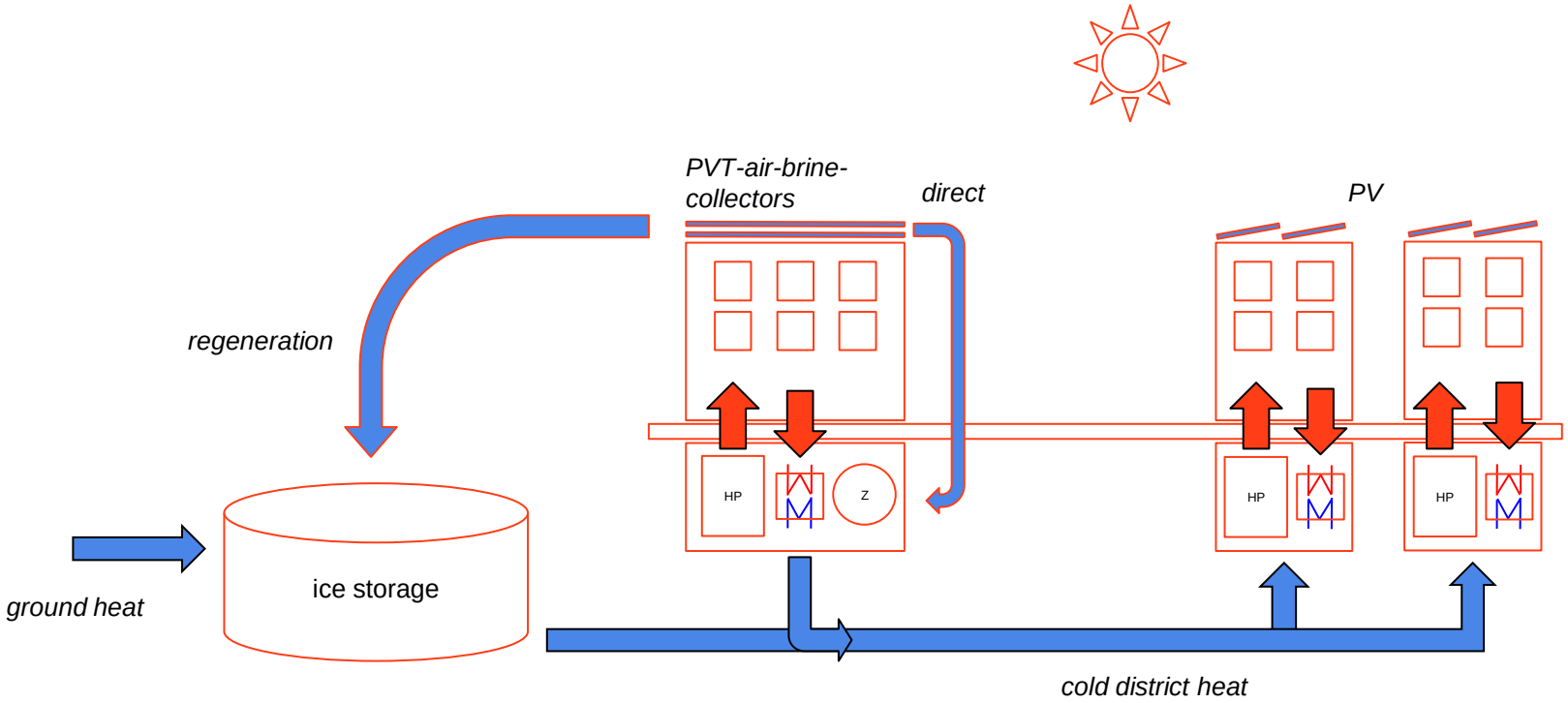
Cold District Heat

Field plant 2 with accessability of heat sources

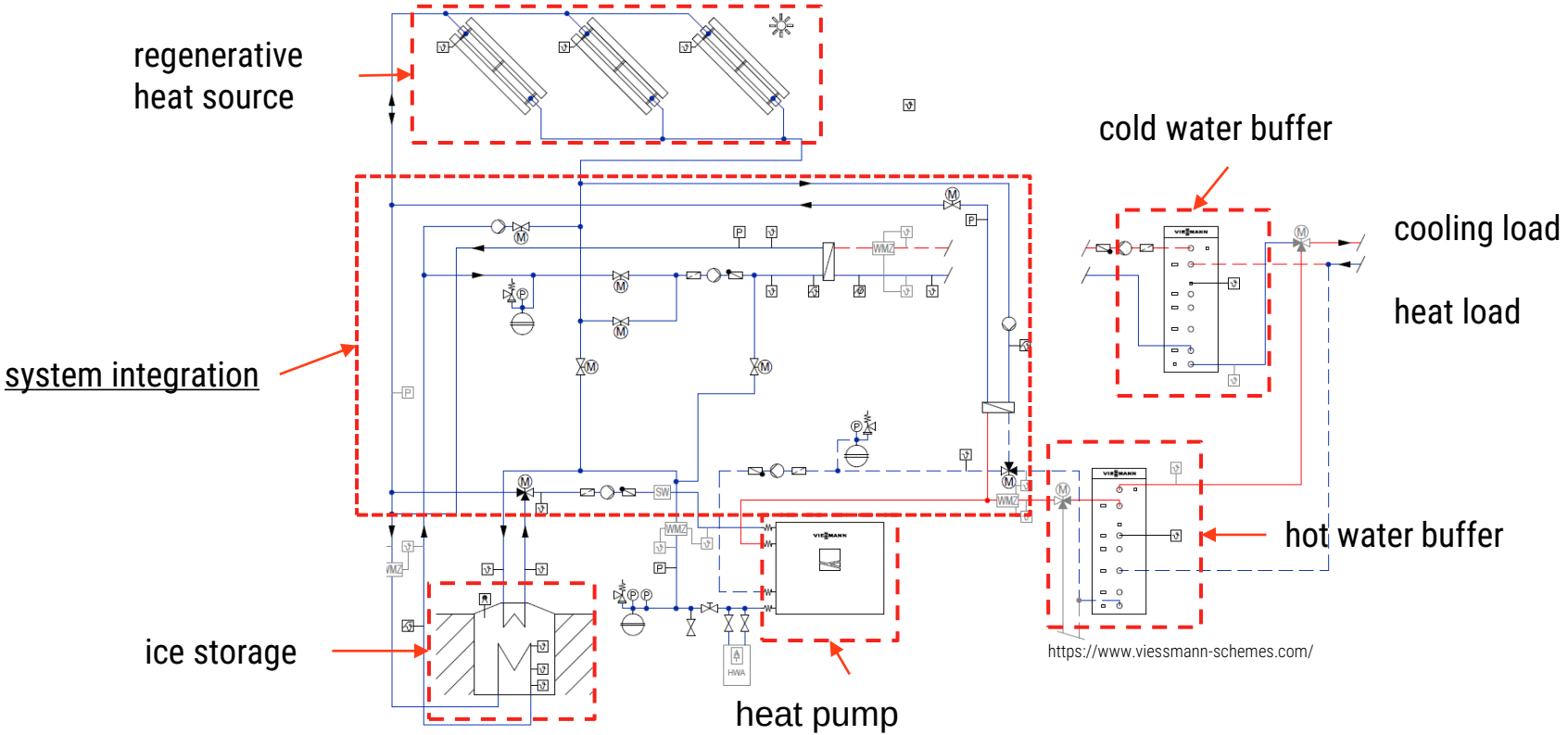


Cold district heat

Field plant 2

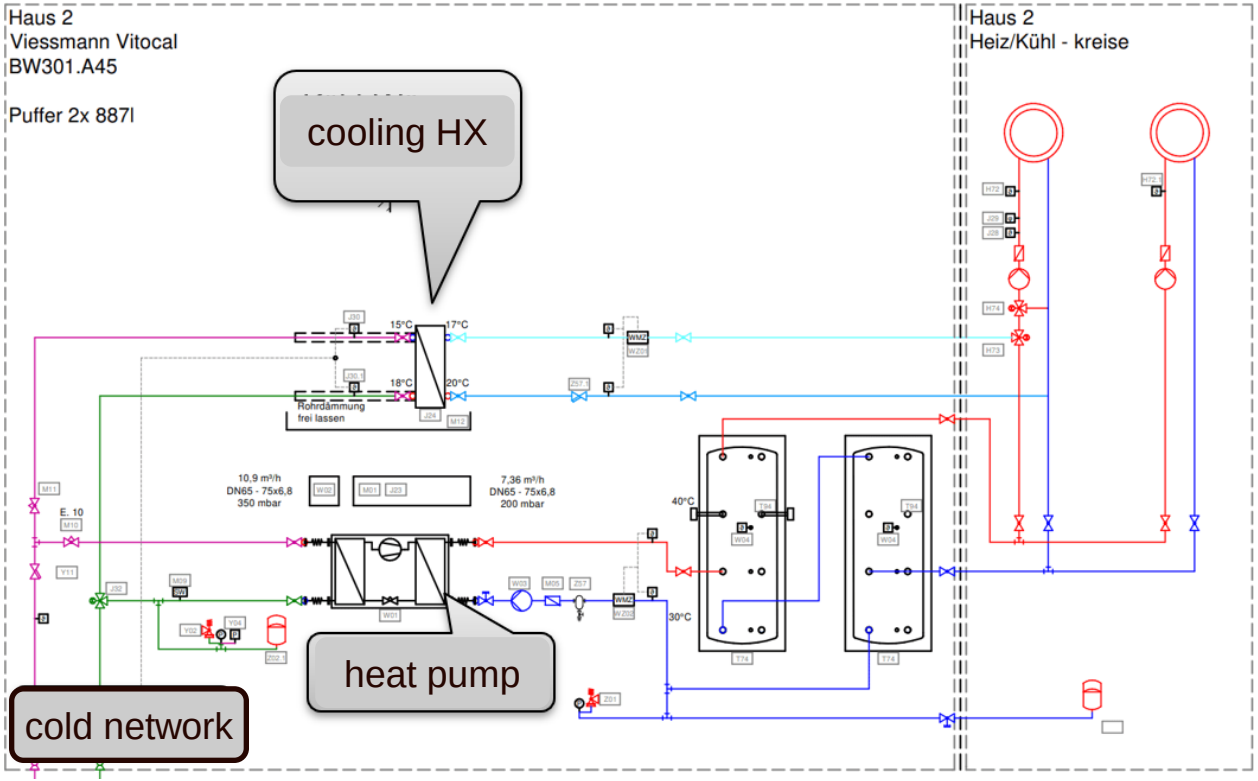


Hydraulic scheme & scope of control



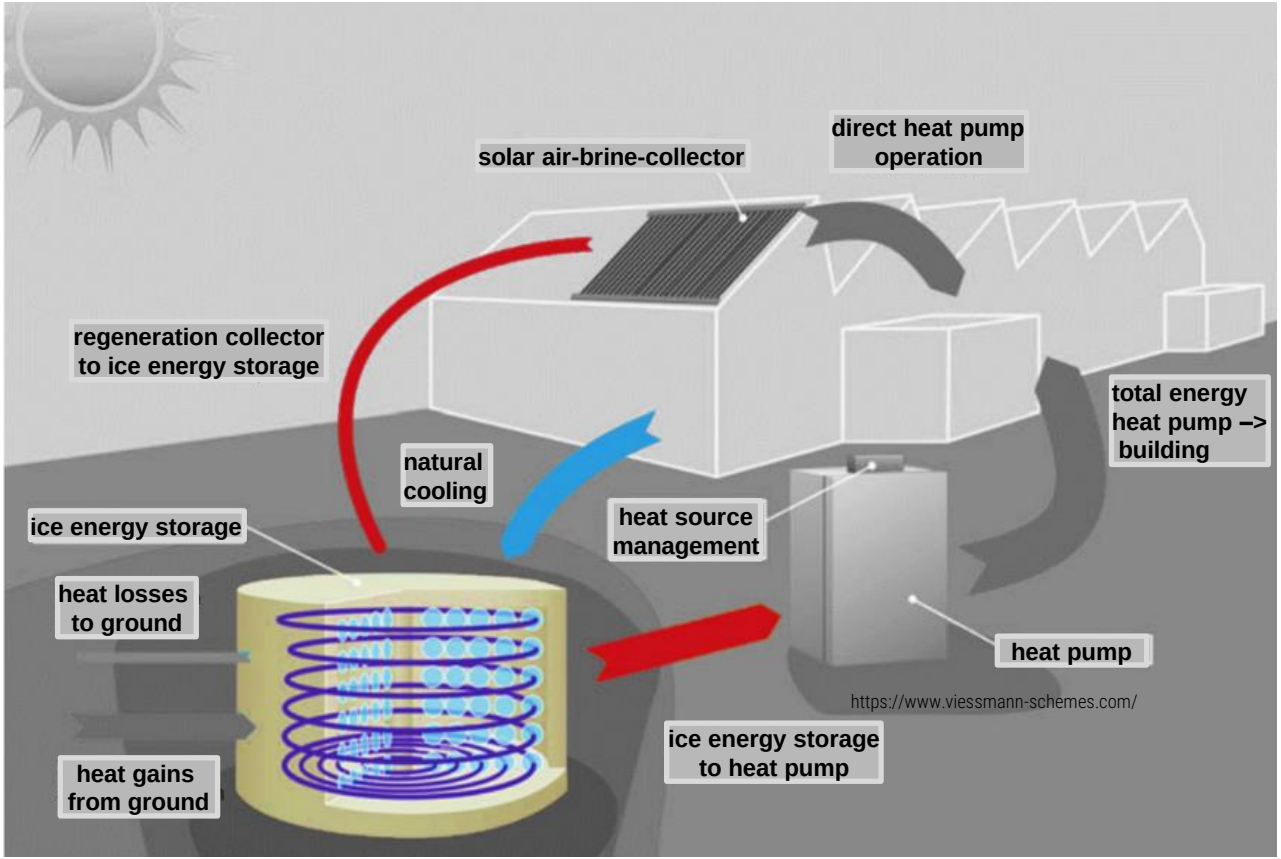
Cold district heat

Field plant 2

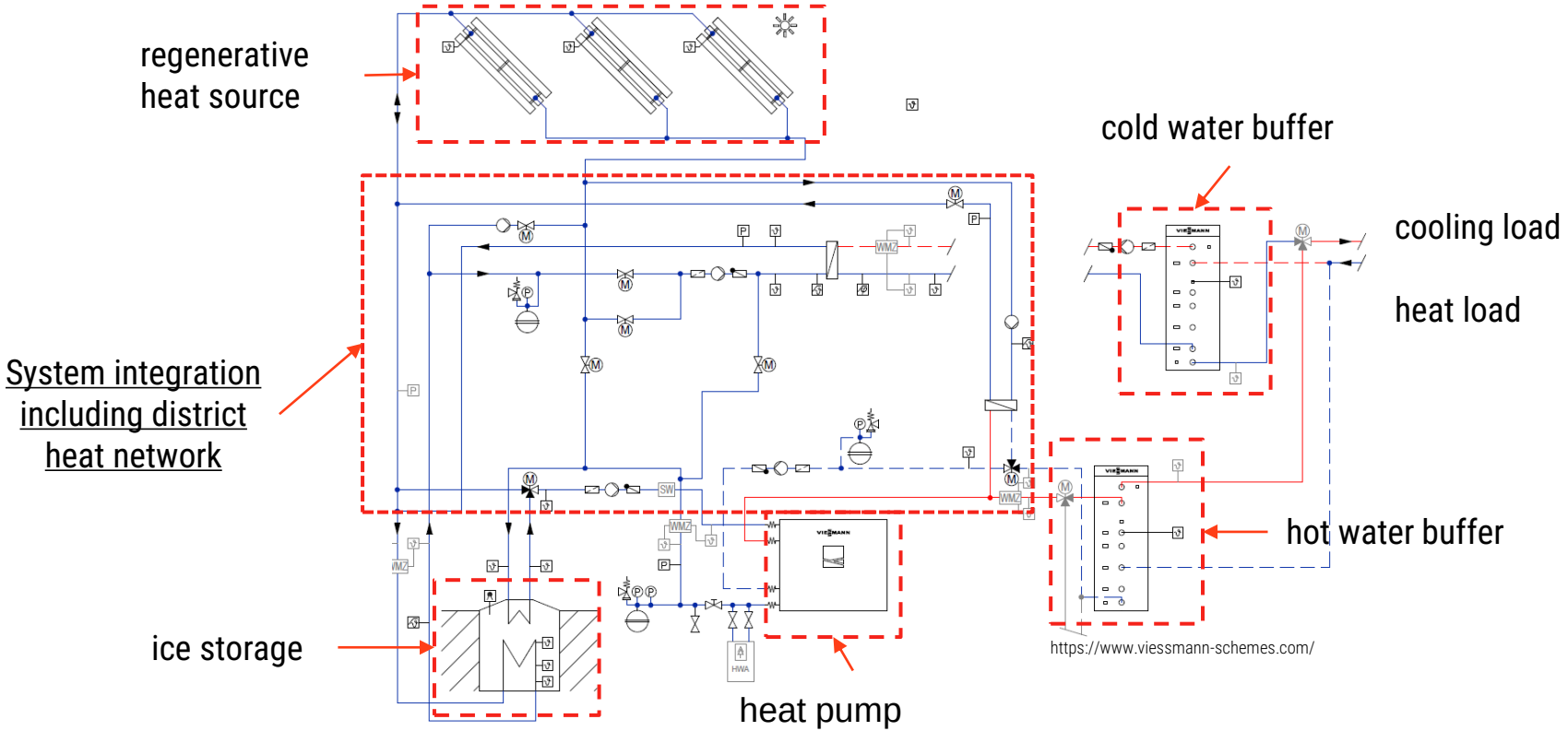


- buildings operate independently
- switching heating <XOR> cooling central per building (seasonal load)
- most simple concept in the building
- central heat network supplies heat source/sink
- minimum temperature control centrally in the district network

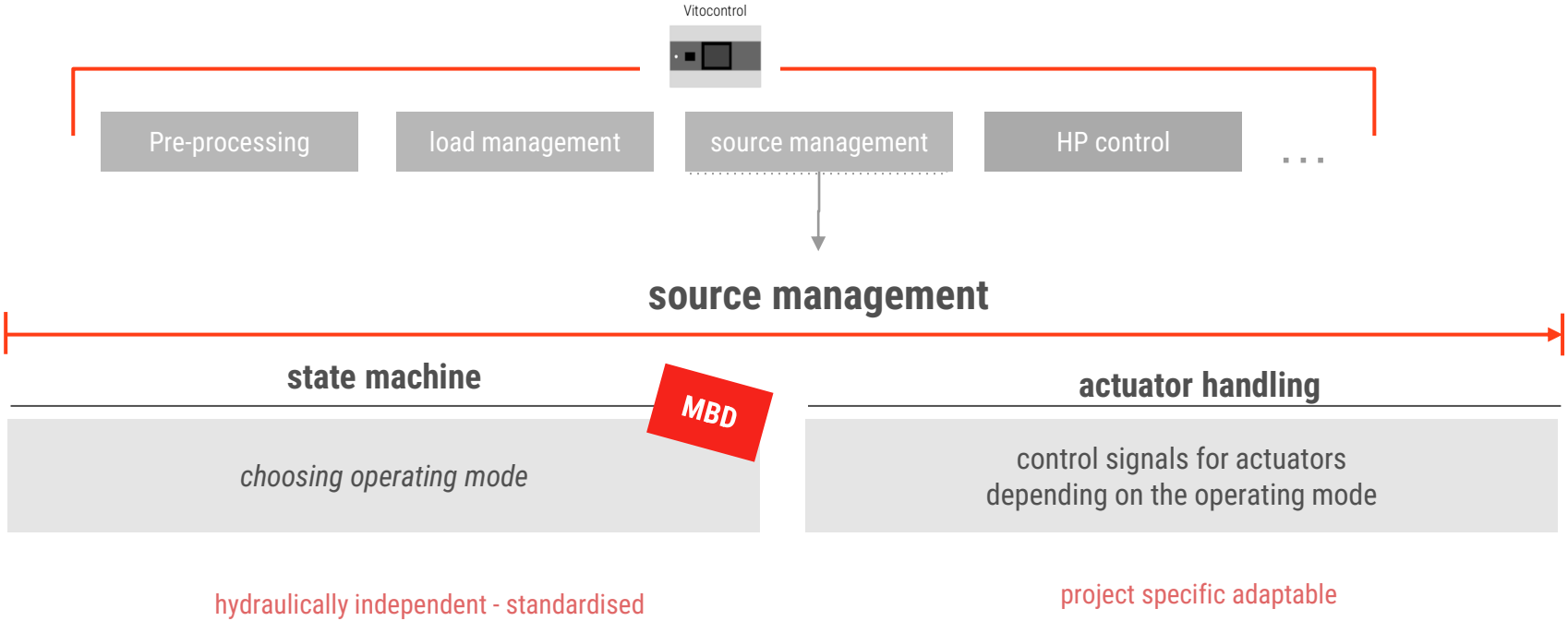
Control methods + controller development



hydraulic scheme & scope of control

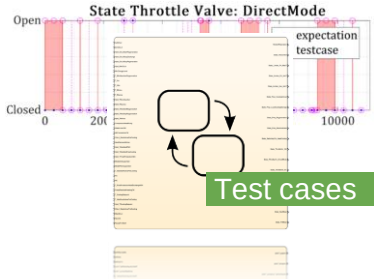


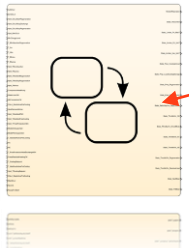
Development of a system controller architecture

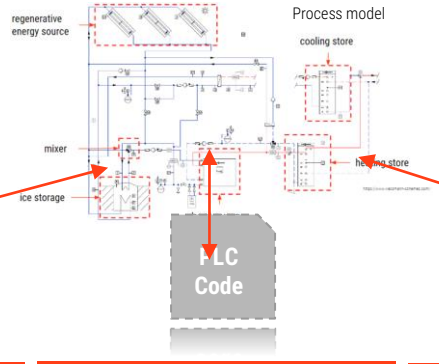


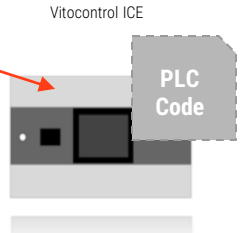
Testing of the system controller

Simulink & PLC









Unit test	MiL test	SiL test	HiL test	Field test
Generation of test cases per function & operation mode with predefined exceptions Development of an automated testbench	Testing the controller logic with a replication of the energy system in Simulink	Testing the PLC Code integrated in the PLC PowerShell	Testing the PLC Code integrated in the final hardware	**Currently monitoring the behavior of the control strategy under real conditions**

Thank you for your attention!

Project Partners

IGTE

Universität Stuttgart, Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)

VIESSMANN

Viessmann Climate Solutions SE

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