



solarcombi+

Identification of most promising markets
and promotion of standardised system
configurations for the market entry of
small scale combined solar heating &
cooling applications

SolarCombi+: Hydraulic Kit for the Spanish market based on a Rotartica

The DERBI Conference

Perpignan 12th of June of009

INTRODUCTION



Within the European project **solarcombi+** several partners started working on

- the definition of standardised schemes and
- the design of pre-engineered kits

that are specially adjusted to the best performance of the different thermally driven chillers.

This presentations aims to show the work realised for the case of the Rotartica chiller, specifically targeting a Spanish market.

RESTRICTIONS OF THE SPANISH LAW

According to the Spanish regulations(CTE- Basic document HE Energy Saving, chapter 3.3.3.2 Joints location, point 4):

THE CONNECTION OF AN AUXILIARY HEATER SYSTEM DIRECTLY ON THE SOLAR STORAGE TANK IS NOT ALLOWED.

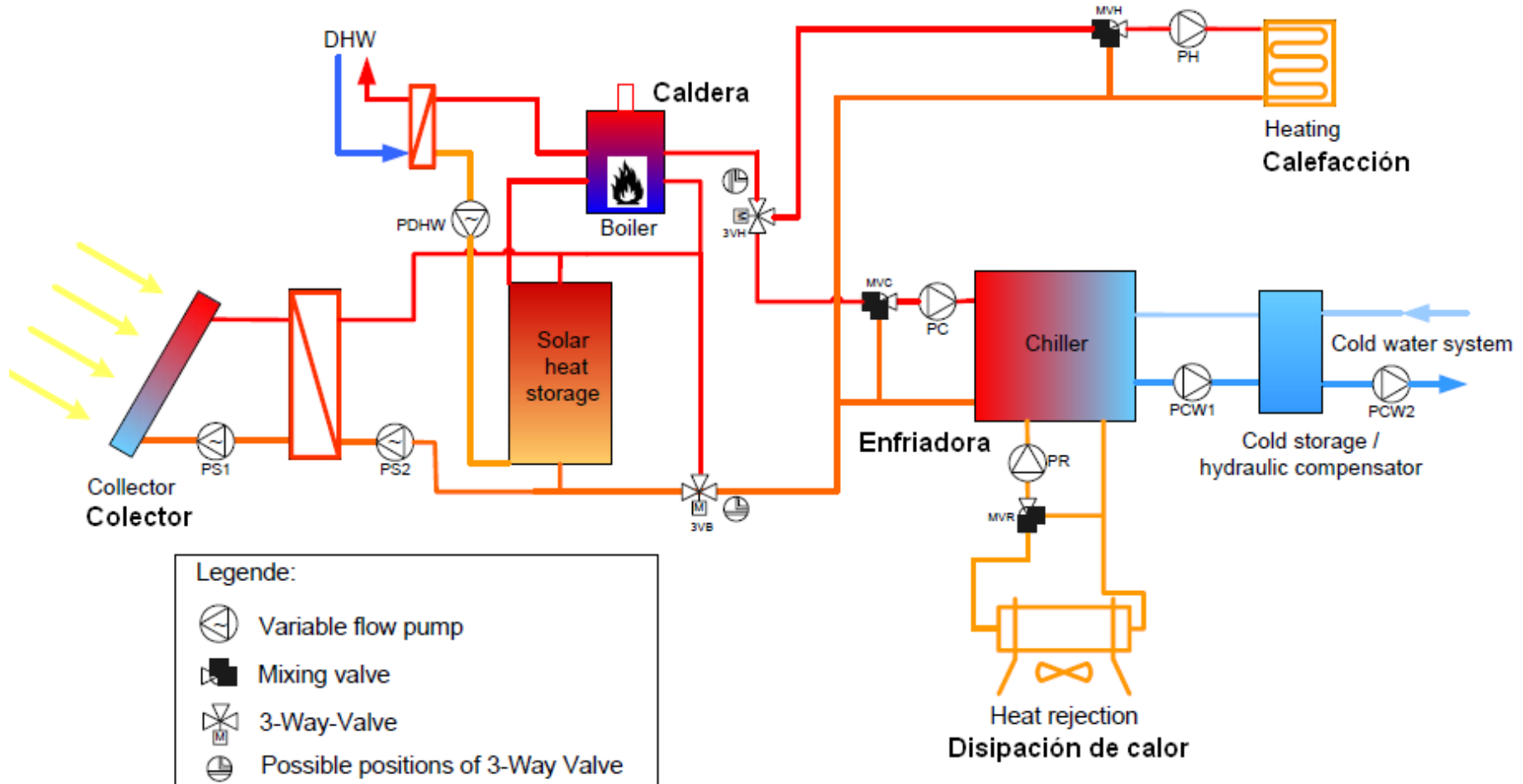
This legislation makes compulsory the installation of solar systems in buildings, but just mentions solar domestic hot water applications.

The law does not mention any exceptions for solar systems providing heating or cooling additionally to DHW, so, initially Combi+ systems would theoretically also comply with it...

This is the reason why the boiler is set in series with the storage tank.

PROPOSED HYDRAULIC SCHEME

ESQUEMA C1 Modificado



System C1_modified

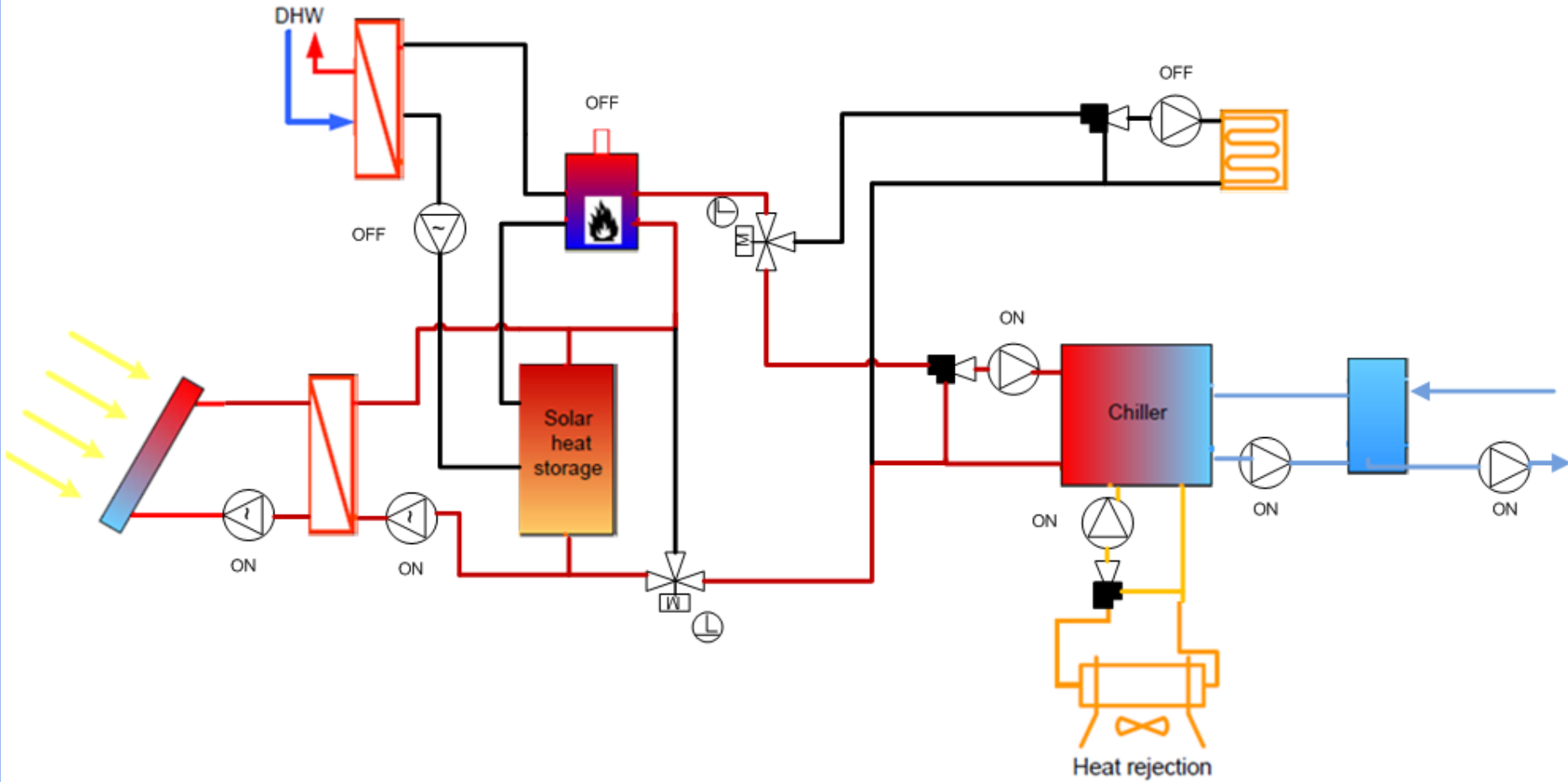
Control: BASIC OPERATION MODES

The hydraulic scheme is linked to a integrated plant control system.

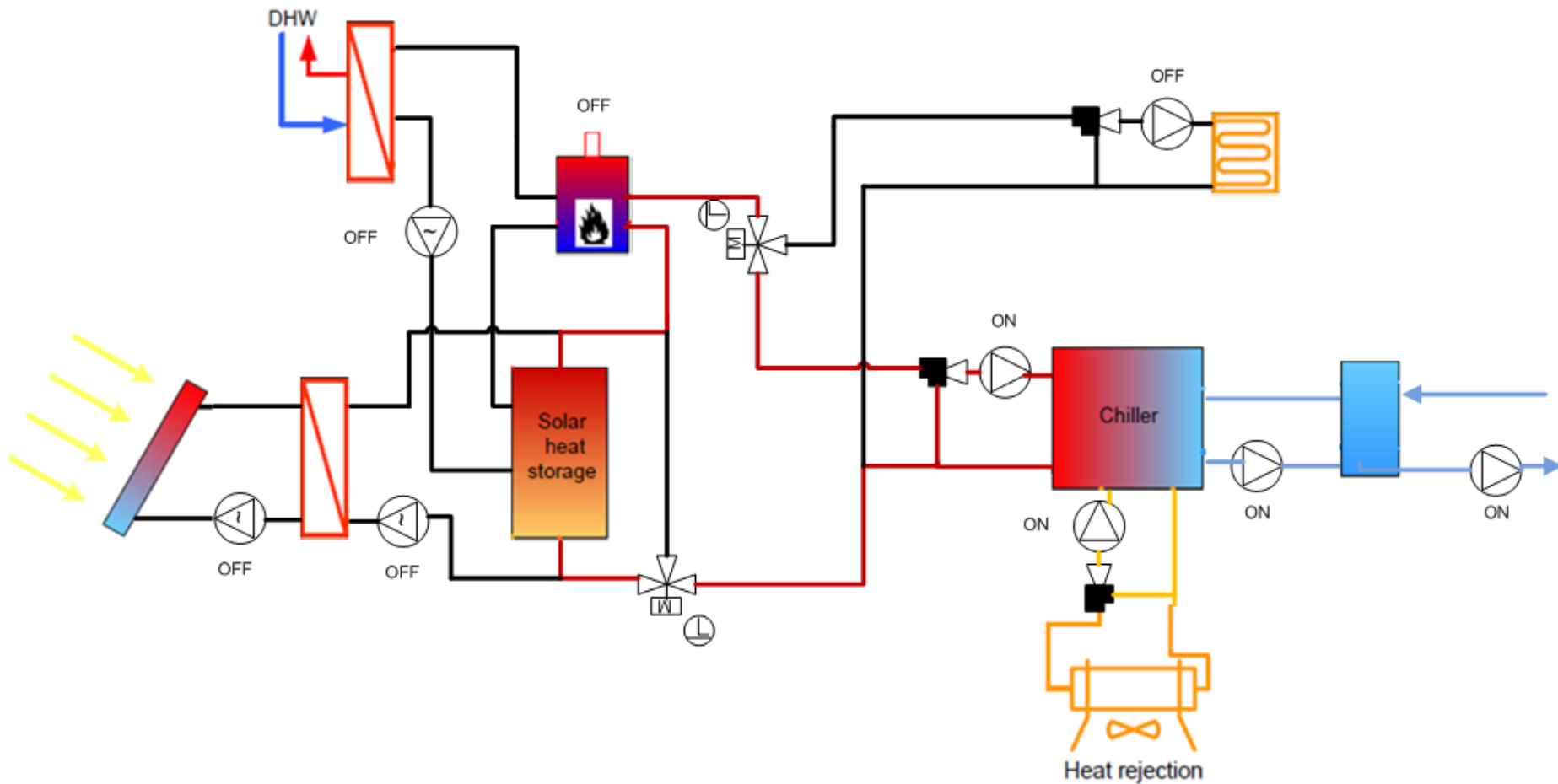
7 basic operation modes are possible:

- **Mode 1, Summer, Direct Solar Air-conditioning**
- **Mode 2, Summer, Solar Air-conditioning through solar storage tank**
- **Mode 3, Summer, Air conditioning using auxiliary boiler (not recommended)**
- **Mode 4, Winter, Direct solar heating**
- **Mode 5, Winter, Solar heating through solar storage tank**
- **Mode 6, Winter, Heating using auxiliary boiler / or other heat supplies**
- **Mode 7, winter and summer, Domestic hot water service (in parallel, heating or cooling service could be also provided)**

Mode 1: Solar Air Conditioning

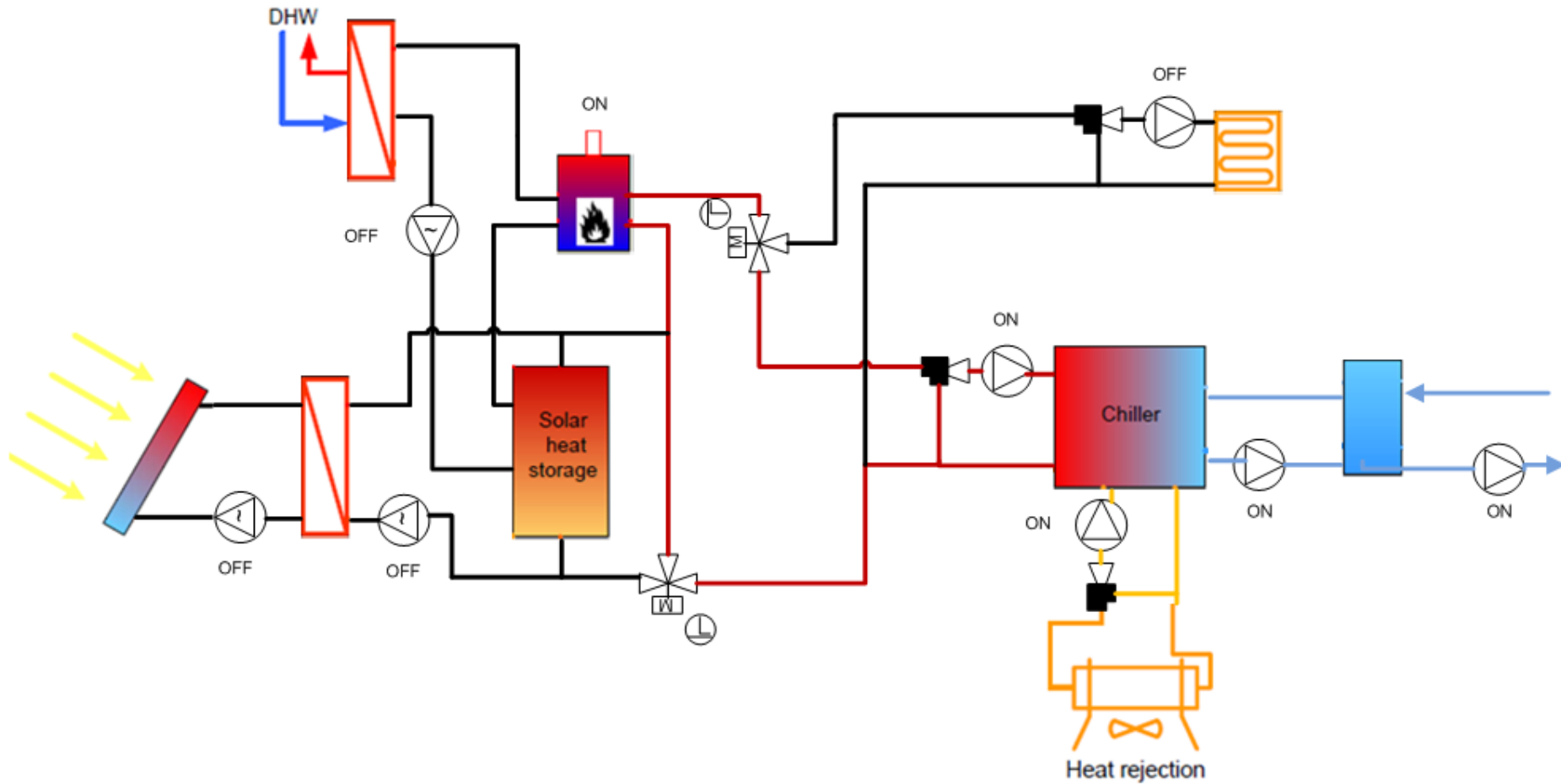


Mode 2: Solar Air Conditioning from tank

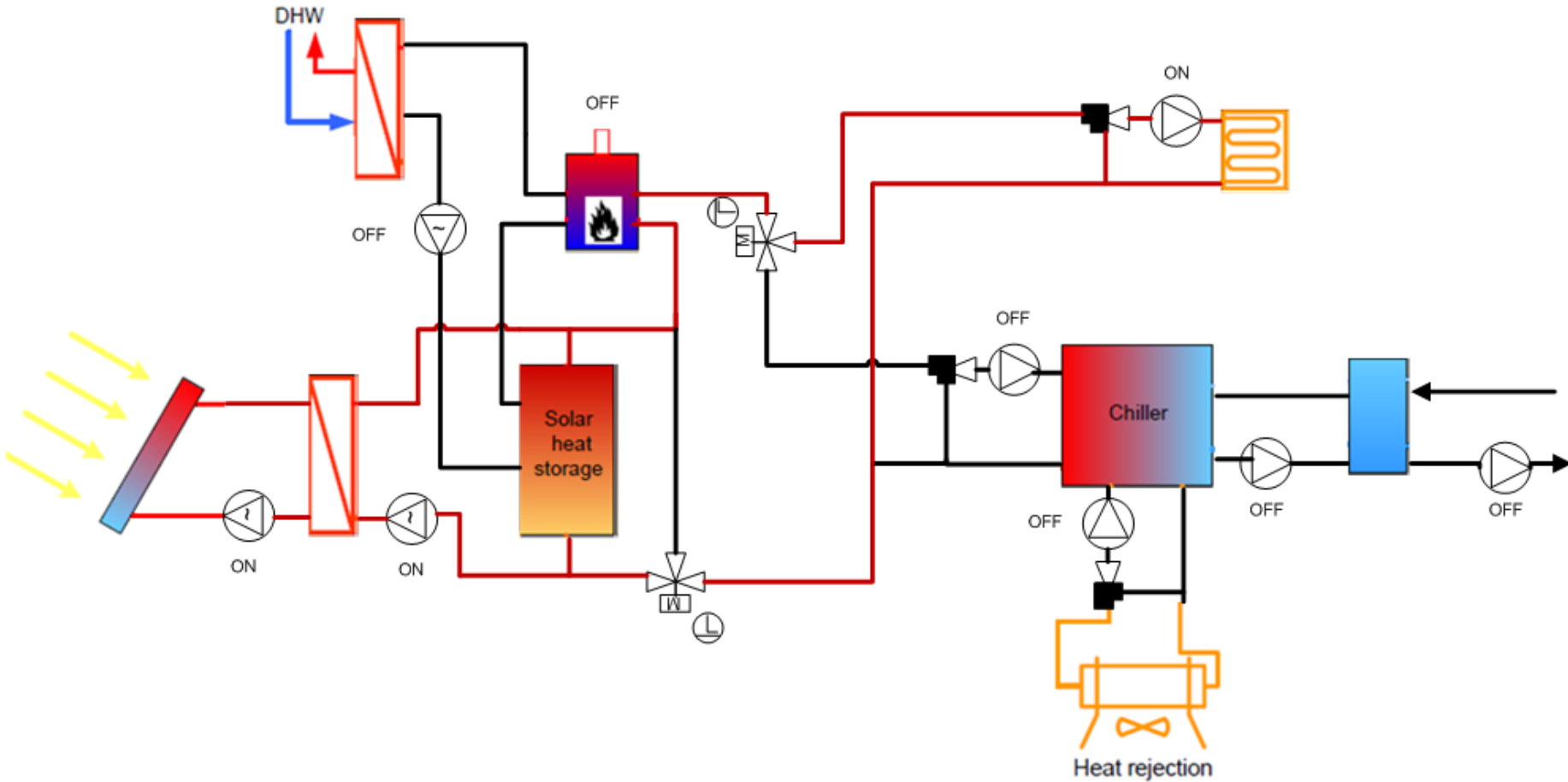


Mode 3: Solar Air Conditioning using auxiliary boiler →

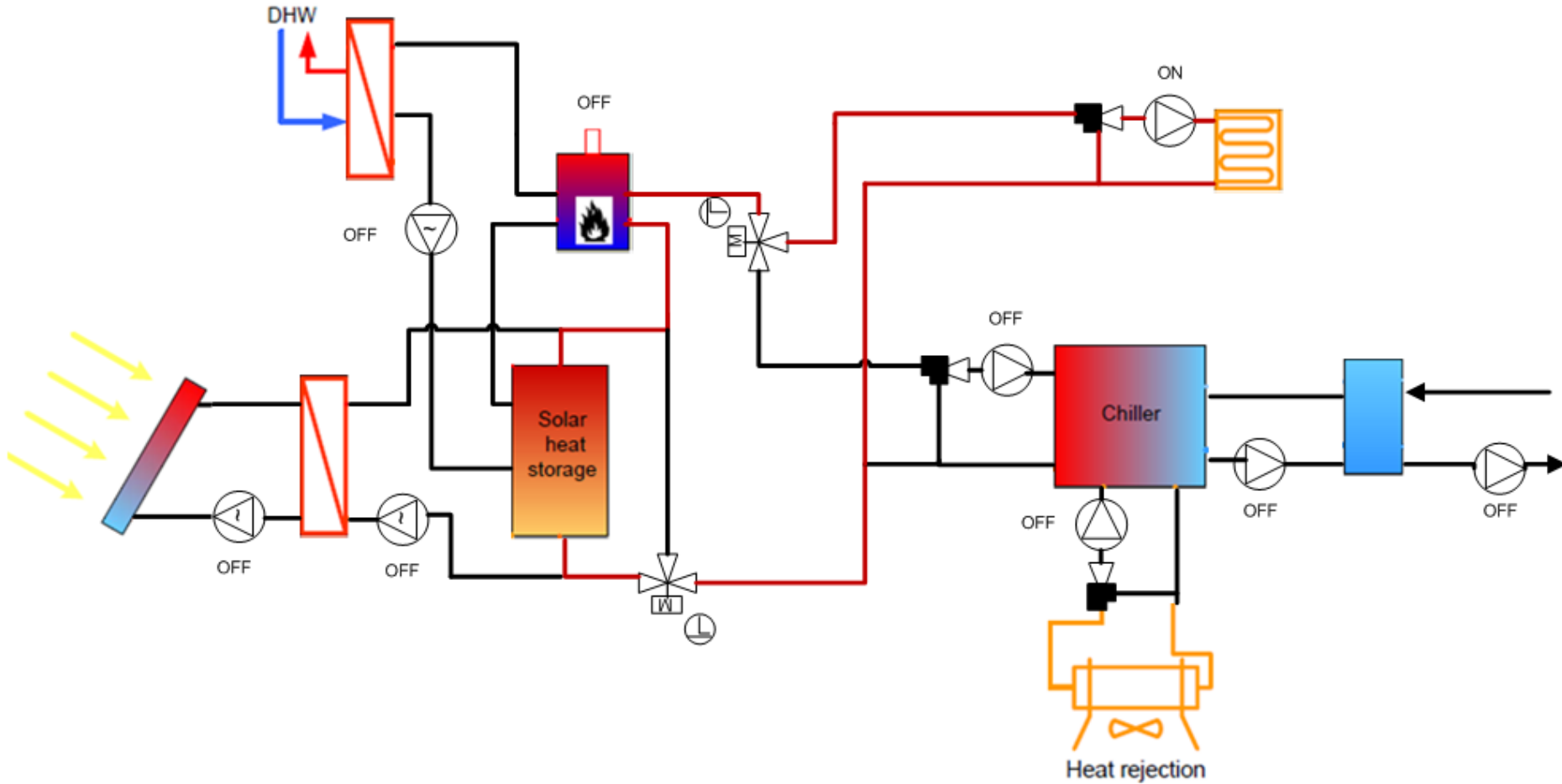
Check negative impact in the primary energy savings!



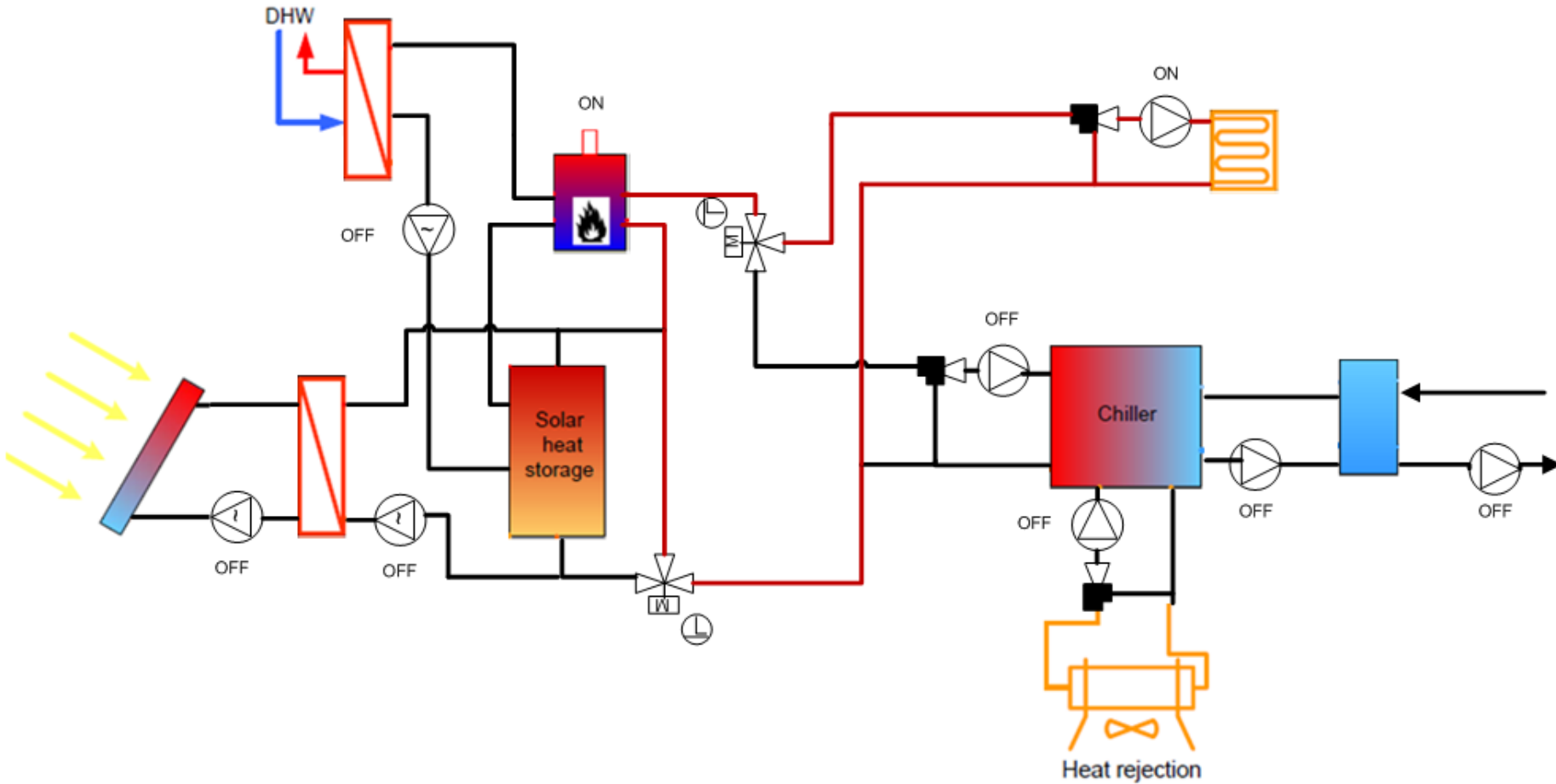
Mode 4: Winter, direct solar heating



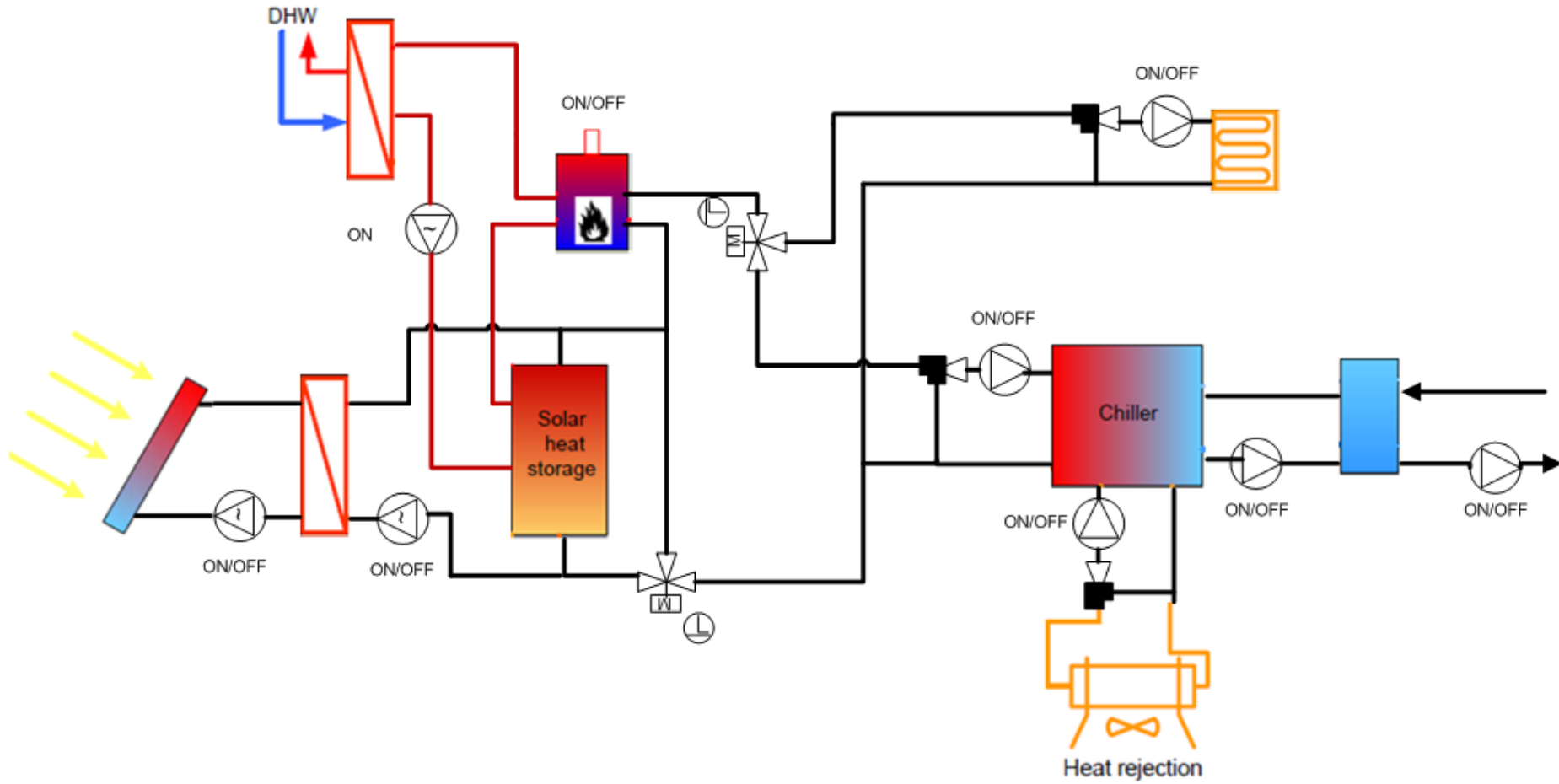
Mode 5: Winter, heating from tank



Mode 6: Winter, heating using auxiliary boiler



Mode 7: Winter/Sumer, DHW Service



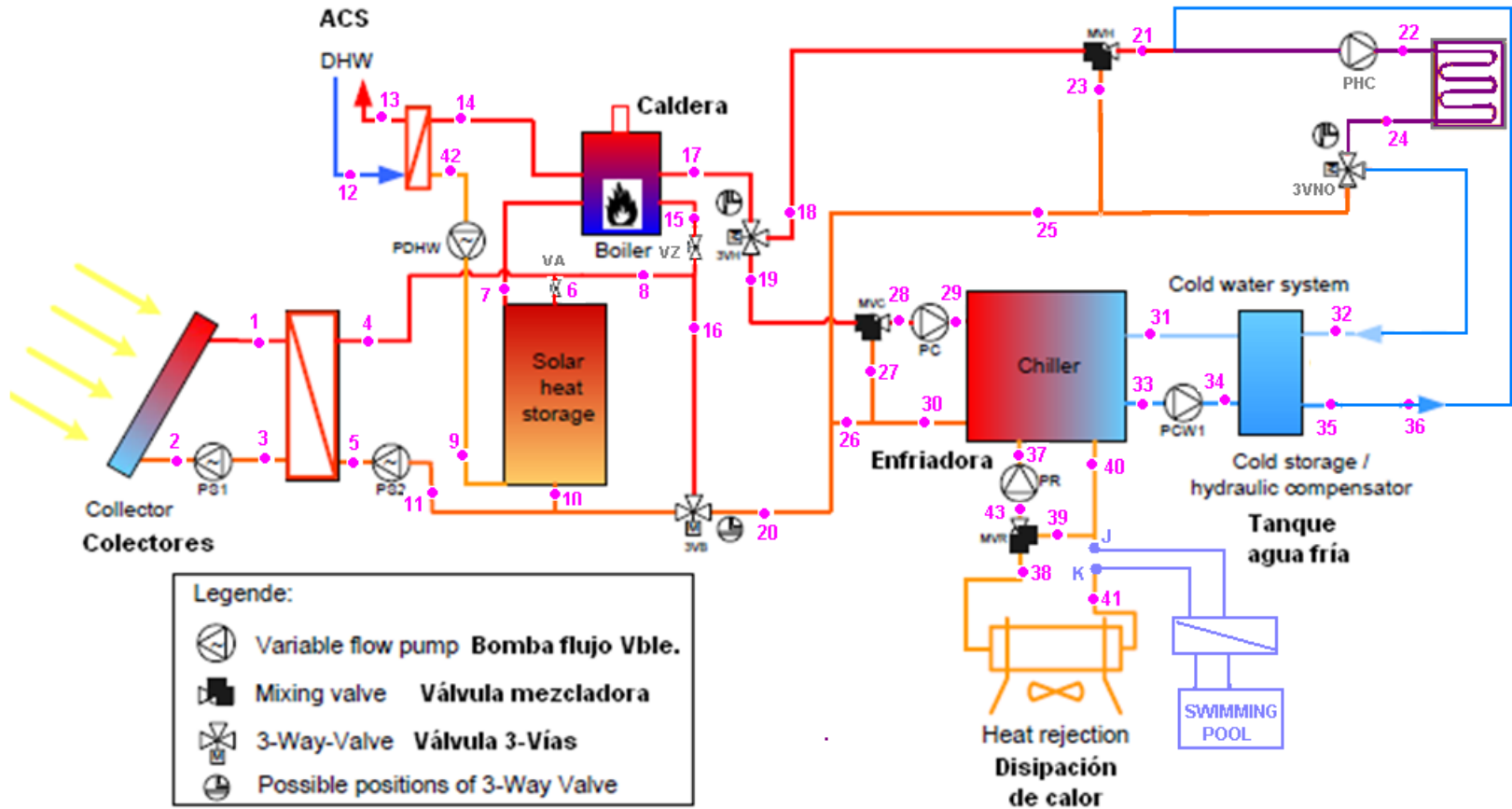
Why a kit is needed ?

- **ENSUREs QUALITY and REDUCEs COSTS by easing:**
 - the plant conception and engineering
 - the plant assembly
 - the plant commissioning
 - the maintenance of the whole plant
- **Supports different plant versions based on a unique plant concept (different HR concepts including a pool, etc)**

Option 1

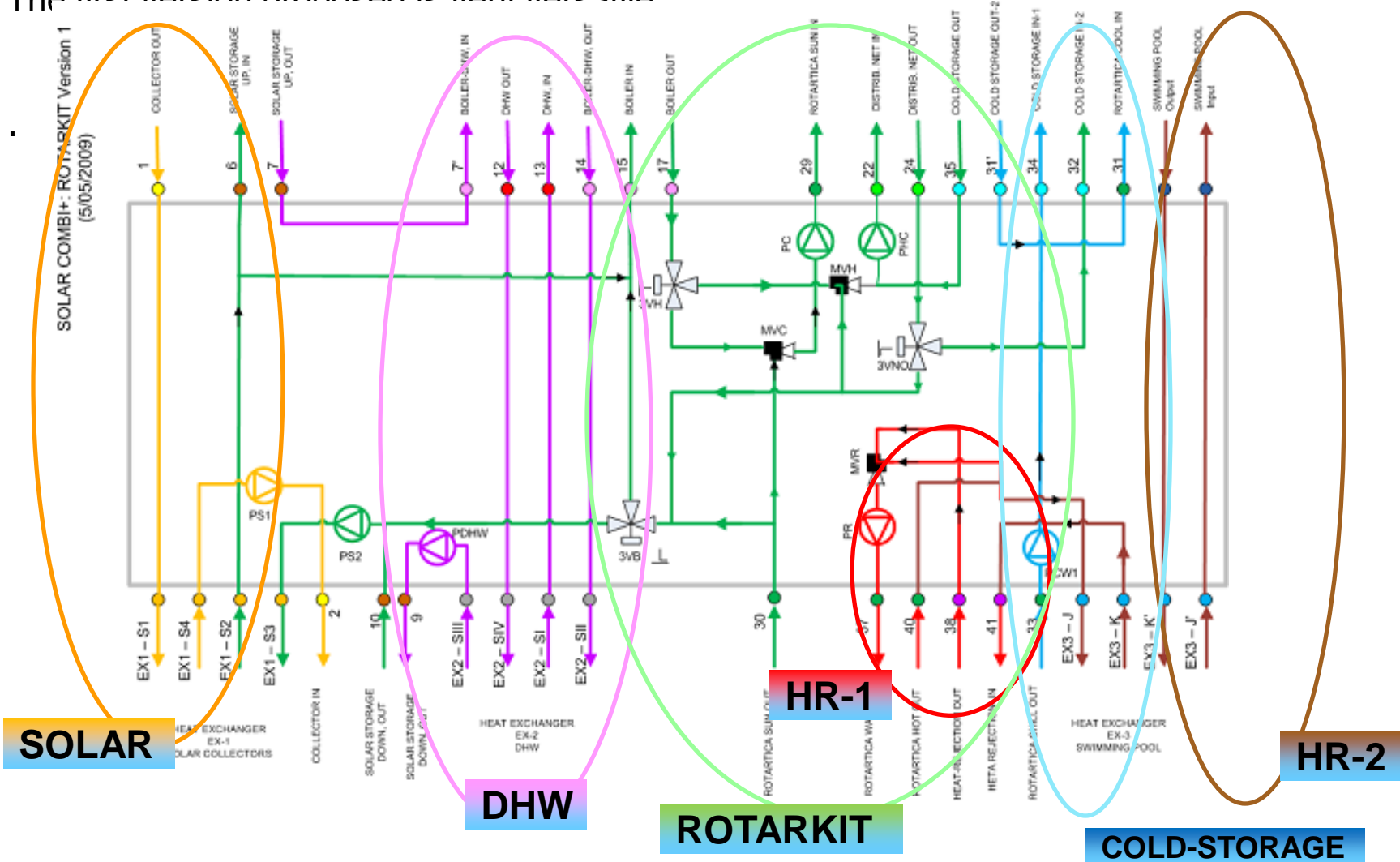
The first version proposed is based on Solar Combi+ C1 configuration.

SCHEME C1- ESQUEMA C1



First version. Basic connections, pumps, valves and lines

The first version proposed is very versatile



First version. Advantages and disadvantages

ADVANTAGES

As a kit , it is **very versatile**, so it has been study the possibility that some of the blocks are not used or are not connected to the kit, such as:

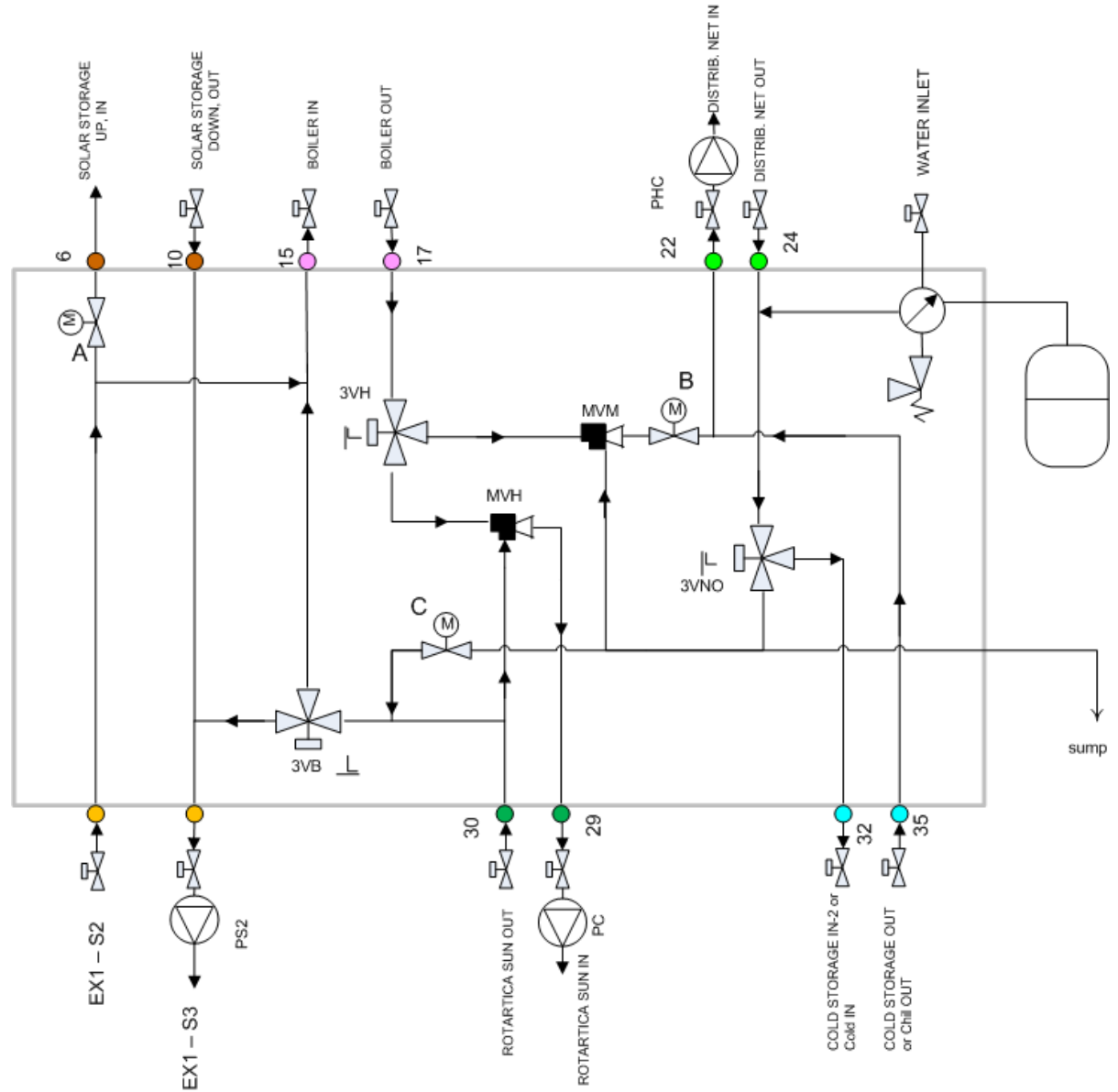
- There is not Rotartica chiller: Keep without being connected 29, 30, 31, 33, 37 and 40; 38 and 41; 31', 32, 34 and 35 connections. And PR, PC and PCW1 pumps are no needed.
- There is not cold storage tank: Connect 34 and 35 connections, and 31' and 32 connections between them.
- There is not swimming pool to be heated: Connect J and K connections.
- There is not auxiliary boiler: Connect 7 and 14 connections, and 15 and 17 connections between them.
- There is not DHW/ACS: Keep without being connected F, G, H, I and 9; 7, 14, 12 and 13 connections. And PDHW pump is no needed.

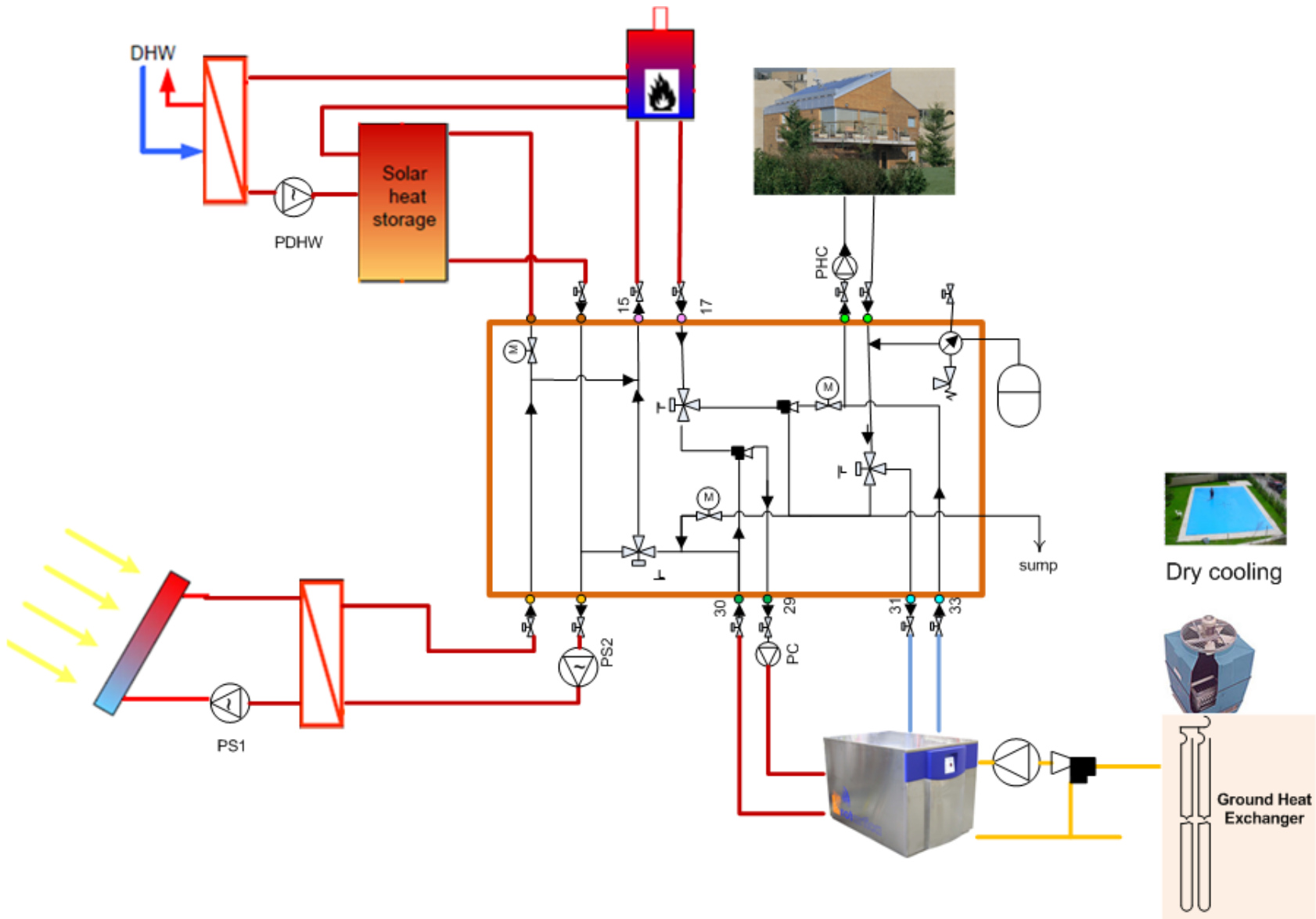
DISADVANTAGES

There is **too complex**, due to the quantity of connections (40 in total) and tubes that are optionally going to be used or not. The dimension of the kit could be **oversized** innecessarily.

So, it was considered necessary to simplify somehow the kit although some services will be loss.

Proposed simplified kit:





ADVANTAGES

- **Fast, easy and mistake-avoiding assembly, commissioning and maintenance**
- **Balance between standardization & Flexibility:**

Standardised	Flexible
One basic plant concept	Different HR, heat sources, etc. options
Common control system, with integrated common sensors	Several control versions
Same hydraulic kit	Easy pump exchange (pumps out of kit)

Thank you for your attention!