

HPS2 High Performance Solar @ EMSP

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eltherm



steinmüller
engineering

RWE

RIOGVASS



Knowledge for Tomorrow



Why Molten Salt?

Comparison to state of the art: synthetic oil

- CSP Solar Power Plants have the purpose to produce CO₂-free, renewable and **dispatchable** (in comparison to PV and wind plants) electricity
- Dispatchability is achieved using a thermal energy storage
- Comparison of state-of-the-art-technology with molten-salt-technology:
 - Life steam parameters and power block efficiency:
 - State-of-the-art: 386 °C / 100 bar: **39,2%**
 - Molten salt: 550 °C / 150 bar: **45,5 %**
 - HTF-pump auxiliary load:
 - State-of-the-art: **6-7 %**
 - Molten salt: **1-2 %**
 - Volume of thermal energy storage at same capacity:
 - State-of-the-art: **100 %**
 - Molten salt @550 °C: **36 %**
 - Direct storage of HTF opens fully independent operateability of solar field and power block



Project Objectives

- HPS2 strives to demonstrate the feasibility of operation of a solar thermal power plant in a safe and reliable manner by:
 - Engineering the process of molten salt based solar thermal power plant ✓
 - Procurement of all relevant equipment, materials machines and services to erect the plant ✓
 - Perform Quality Control and Quality Assurance during construction phase ✓
 - Pre-Commissioning of all sub-systems ✓
 - Cold Commissioning (“Water-Run”) of the overall plant process using Water ✓
 - Salt Melting of nearly 100 tons of nitrate salts ▶
 - Hot Commissioning of the overall plant process using molten salt ▶
 - Proof of operatability of the HPS2 plant

Legend:



accomplished



ongoing



Who is HPS2?

Industry Partners



Solar Field EPC and
Collector Structure



Ca-based Nitrate Salts



Impedance Heating/EHT



Steam Generating
System and W/S cycle



Molten Salt HCE and
Mirrors

O&M / Technology Partners



O&M Team



O&M Team



O&M Team



O&M Team



Project Coordinator / EPC /
Process Design / Scientific
Program / Electrical + I&C system

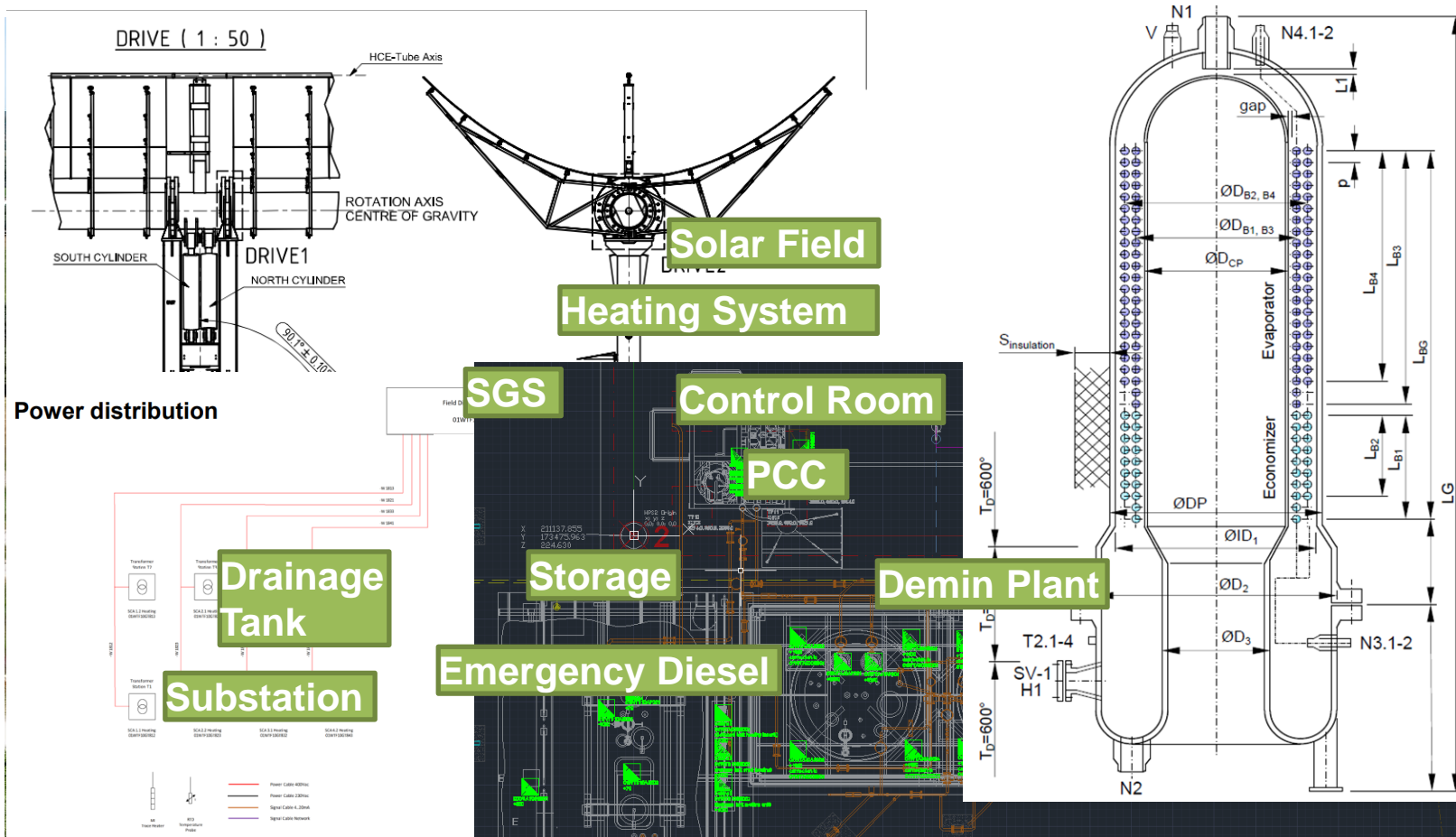


Site Owner and Scientific
Program, Molten Salt Piping

Research Institutes (Partner) and Infrastructure



Actual situation of HPS2 @ EMSP



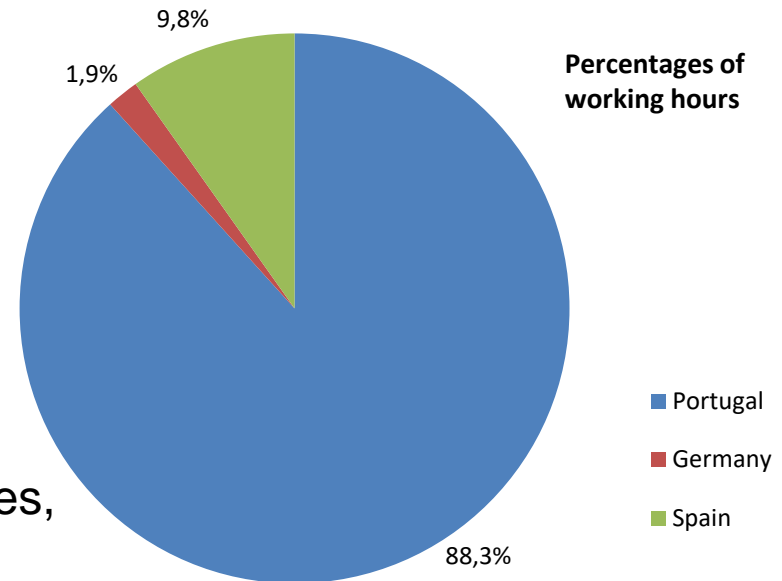
Breaking News: Solar Field filled with molten salt on 19.10.2021 11h00



Workers on Site and Sub-Contractors

- More than **30** different companies from Portugal, Spain and Germany contracted by HPS2 that worked on-site

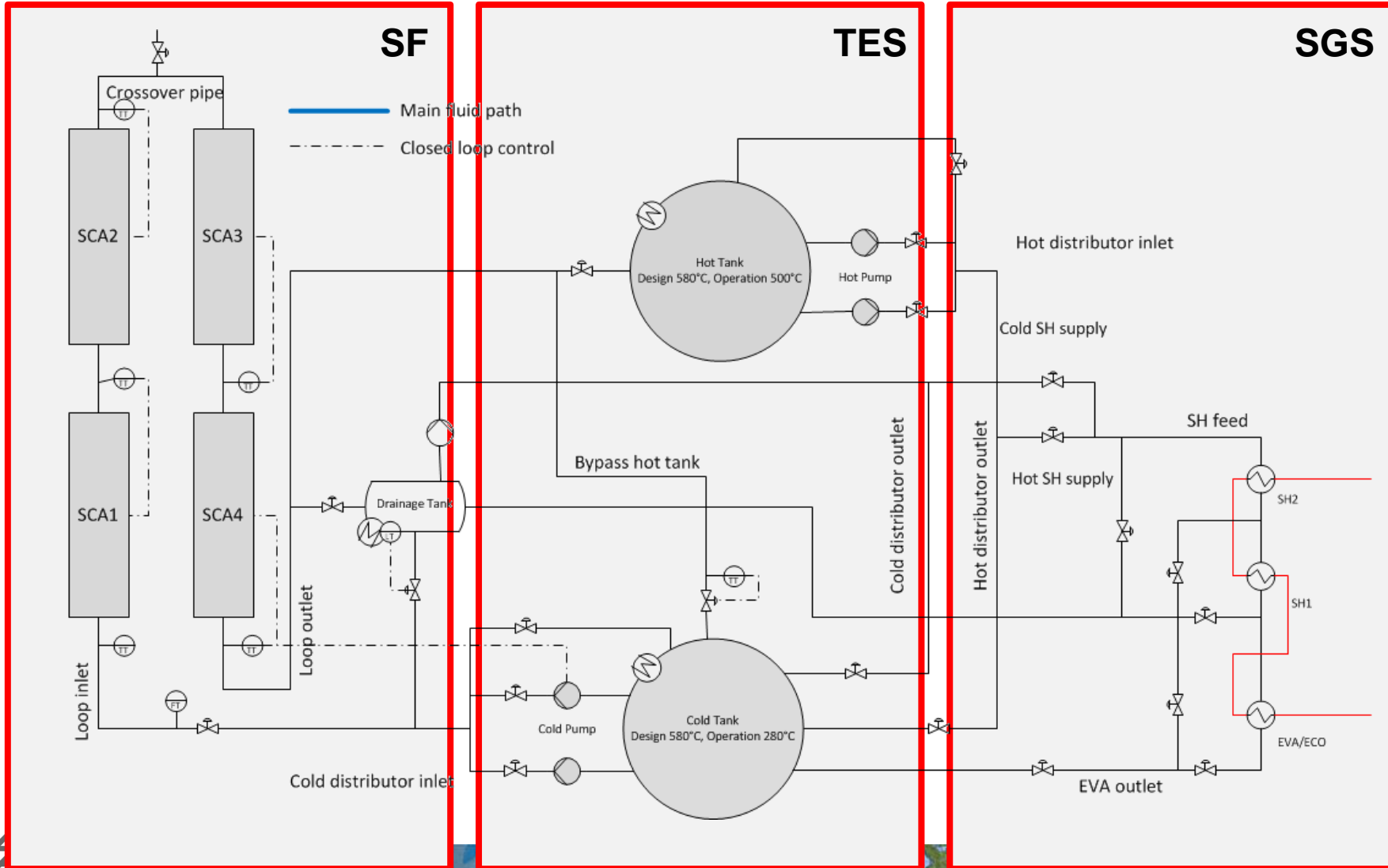
e.g. Notified Bodies, Mechanical, Civil companies, Security, Industrial Cleaning Companies, Welding Companies, Fitters, Iron Workers, Gardeners, etc.



- Ranging from international enterprises to medium/small enterprises
- In more than 40.000 working hours there is **ZERO** injuries with loss time of any worker!

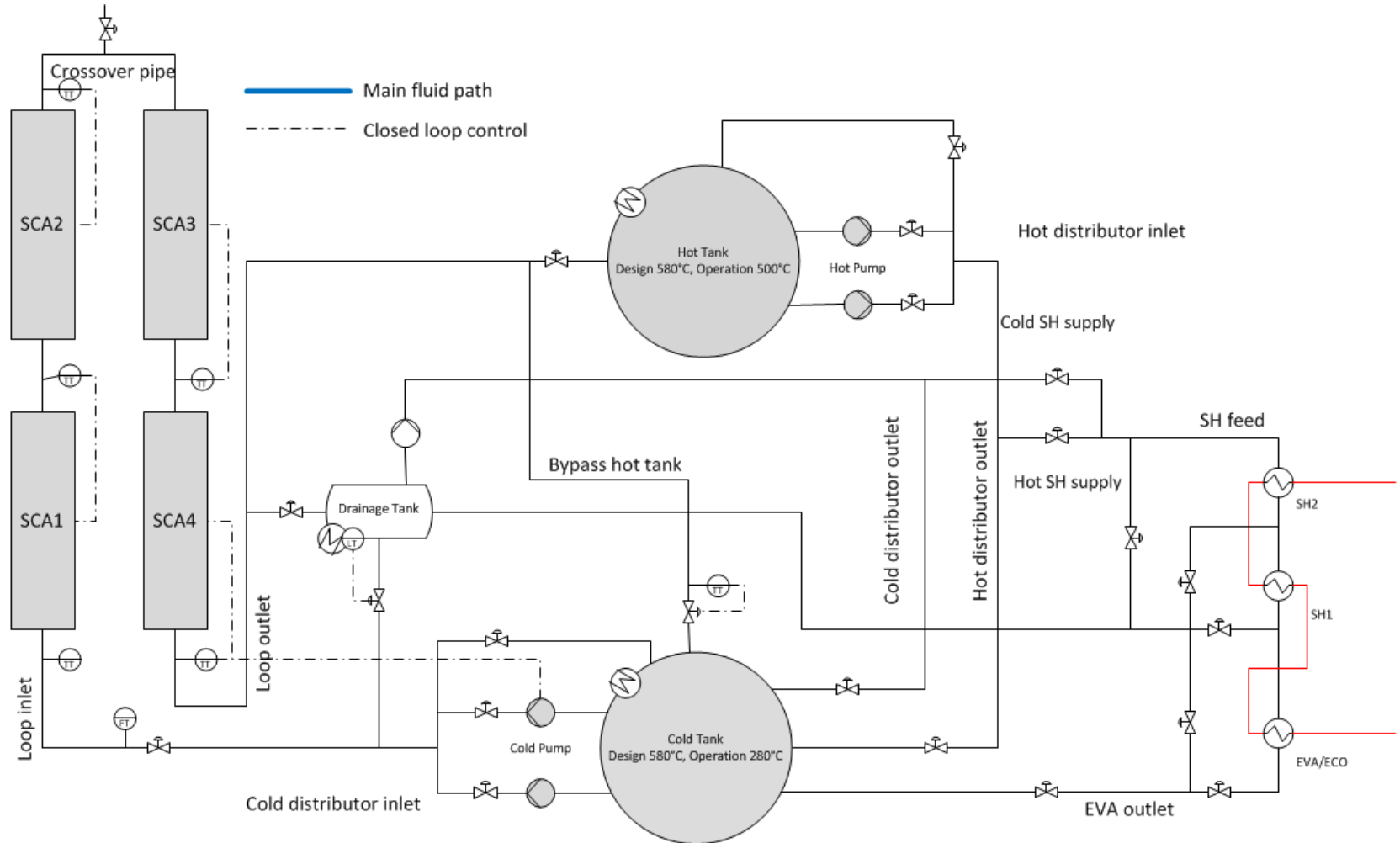


The HPS² process



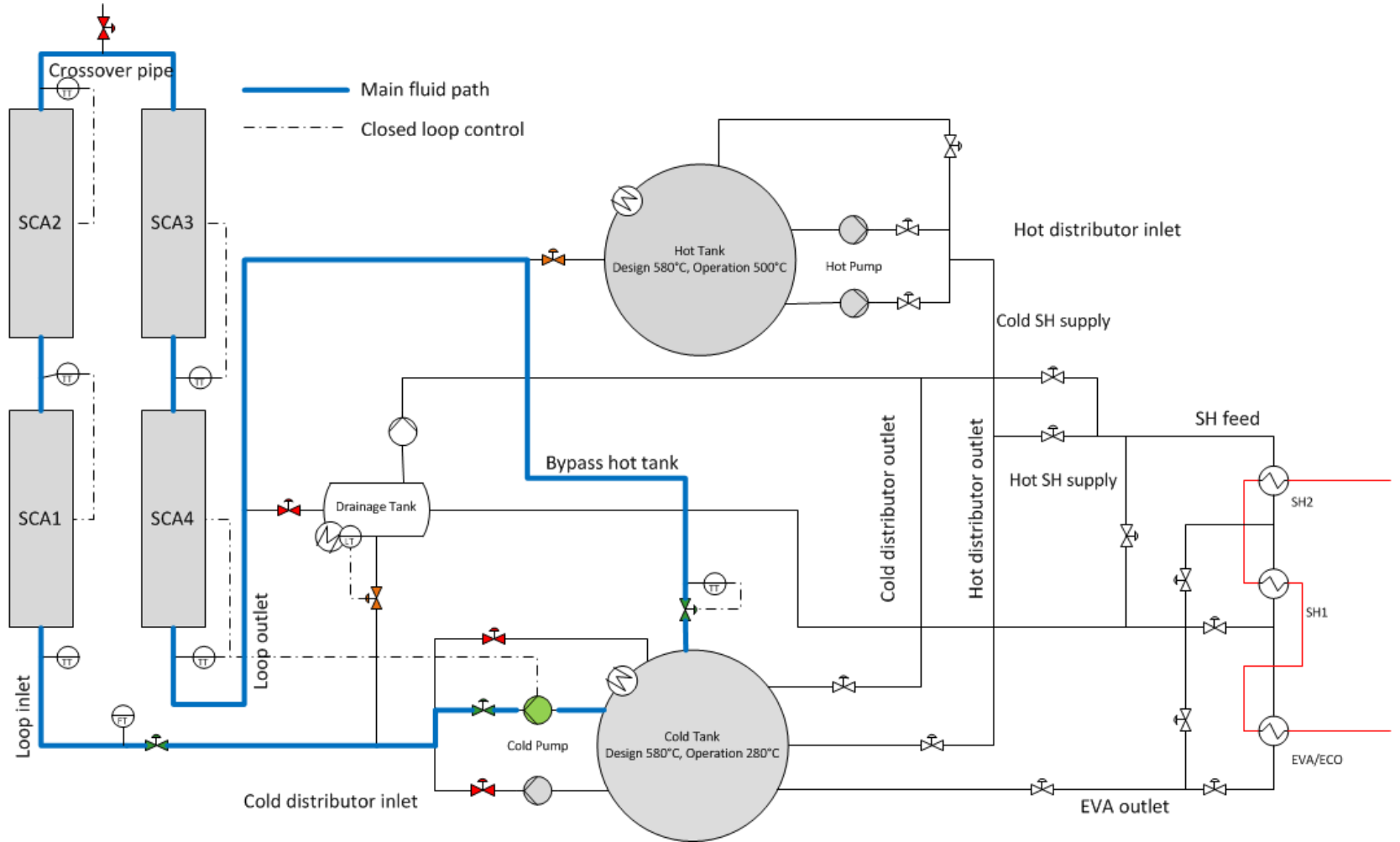
The HPS² process

Overview



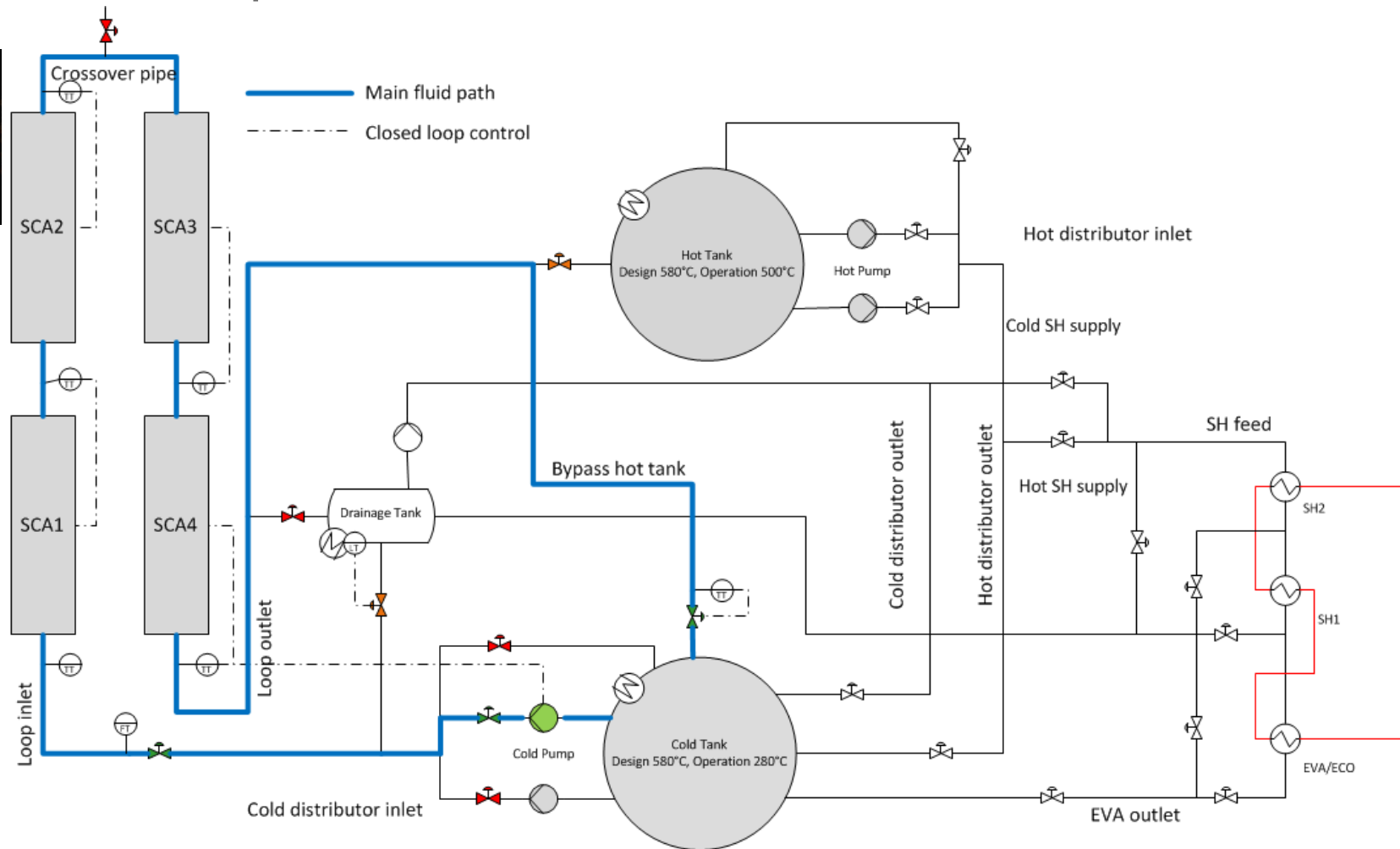
The HPS² process

Op: SF antifreeze



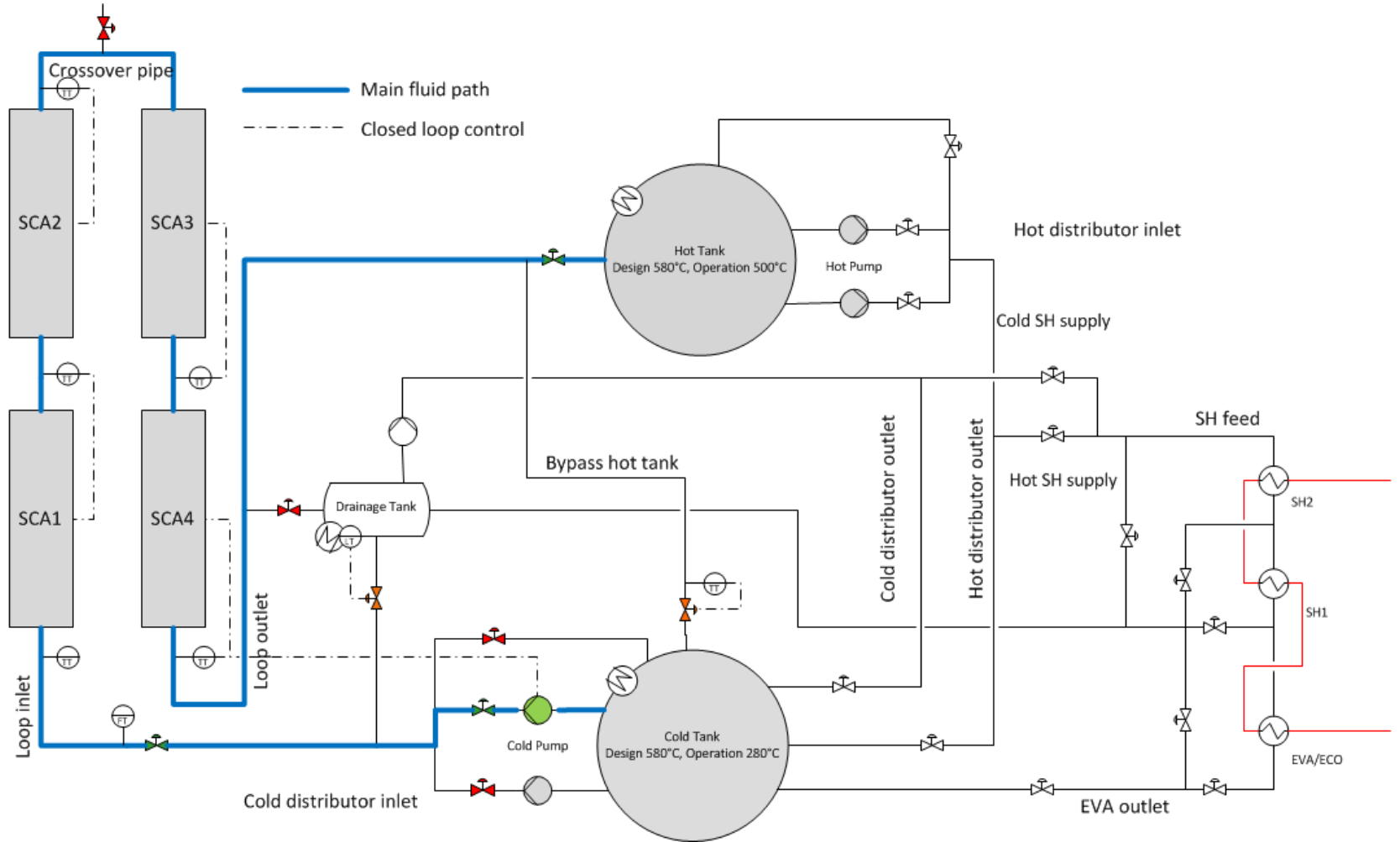
The HPS² process

Op: SF start-up



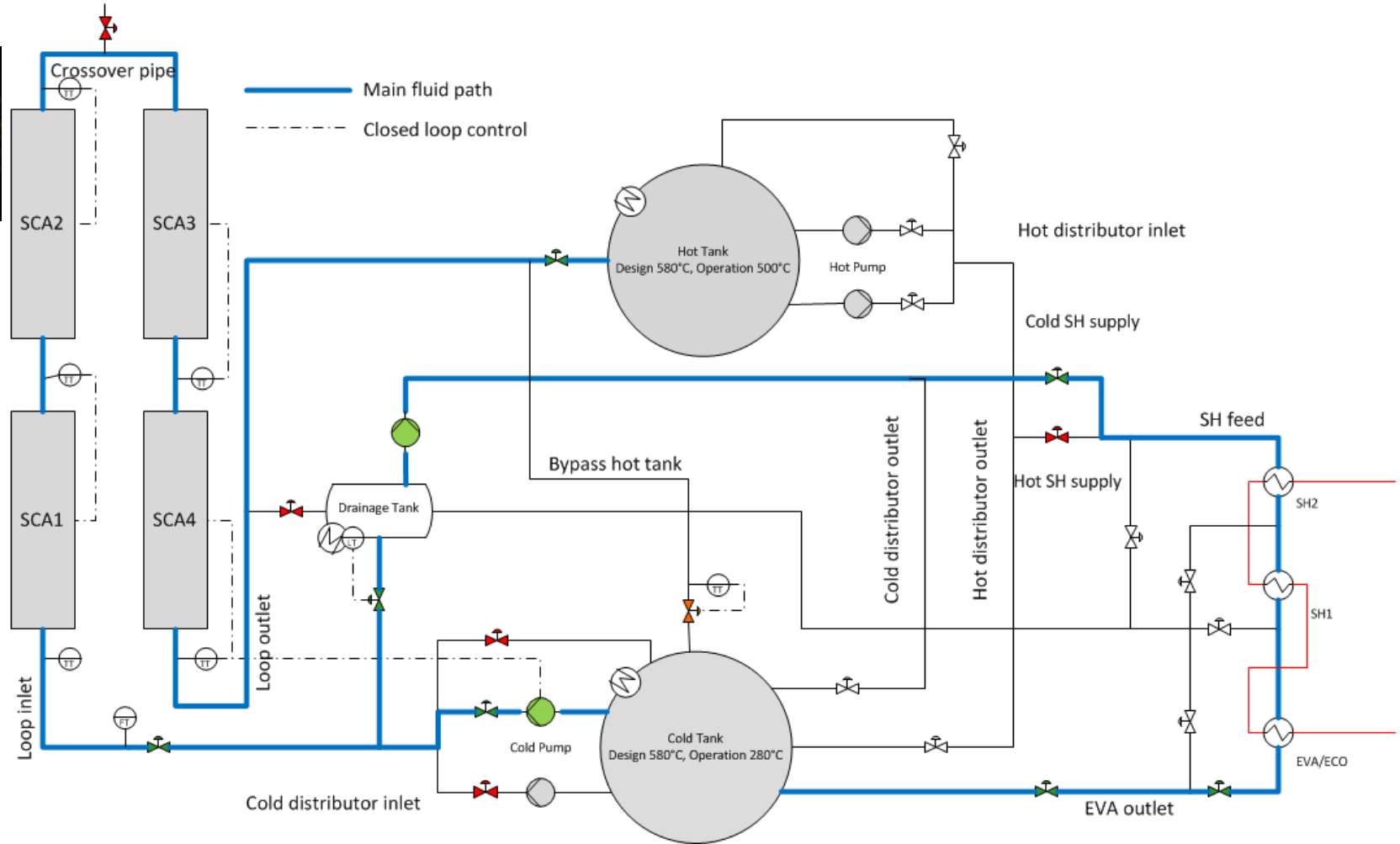
The HPS² process

Op: SF normal



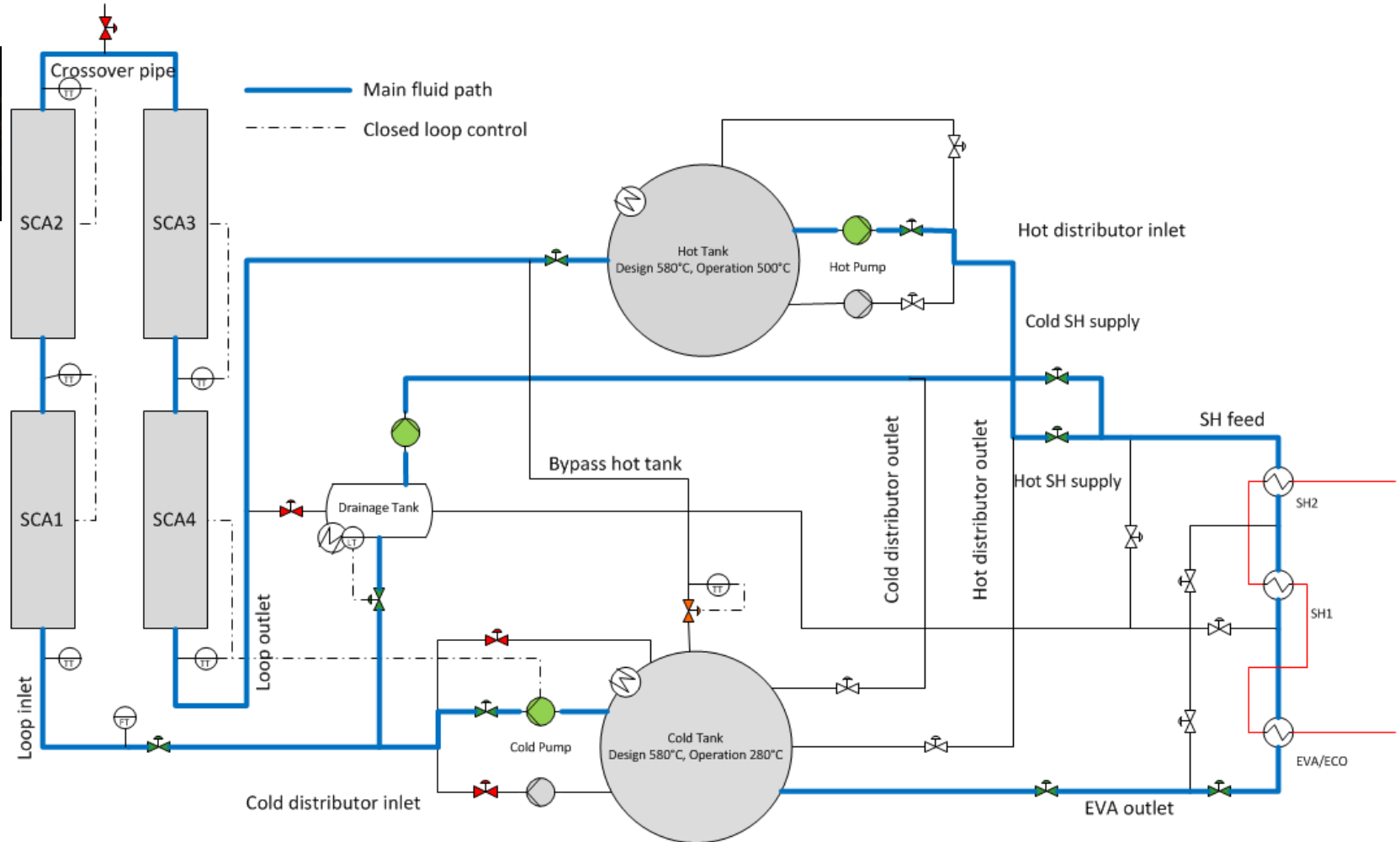
The HPS² process

Combined: SF normal, SGS antifreeze



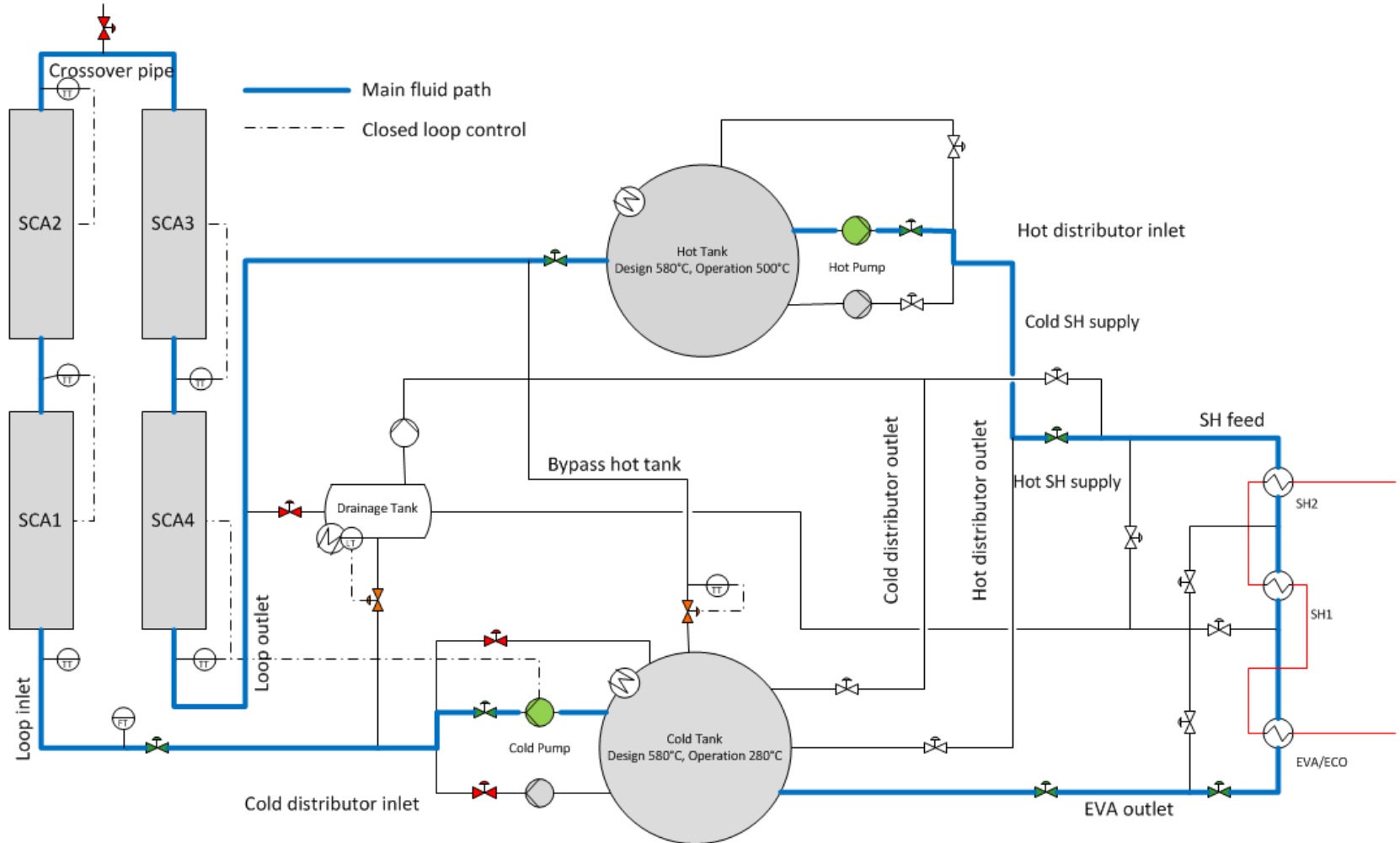
The HPS² process

Combined: SF normal, SGS startup/shutdown



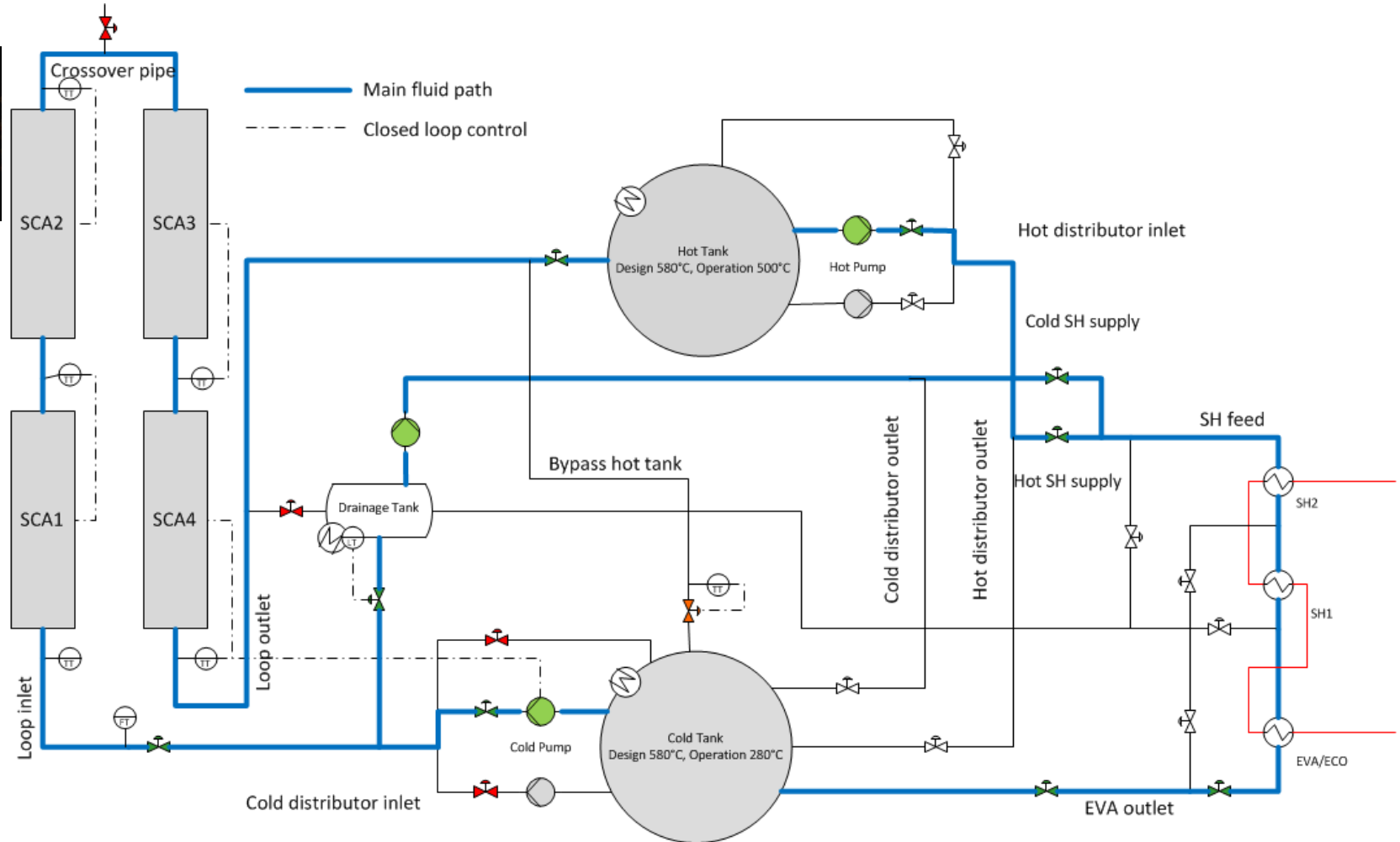
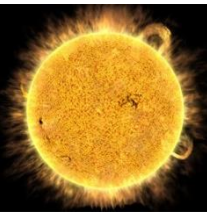
The HPS² process

Combined: SF normal, SGS normal



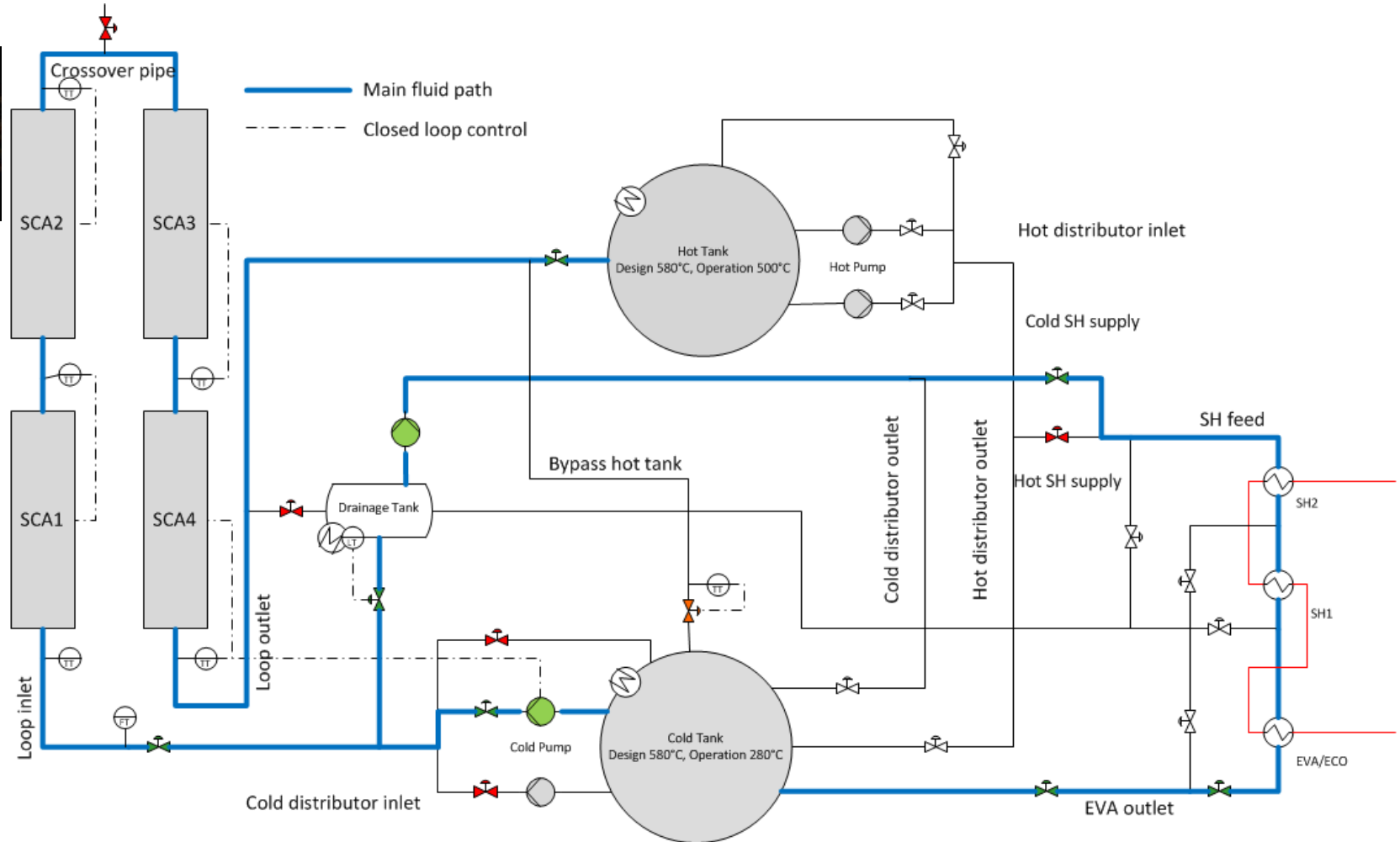
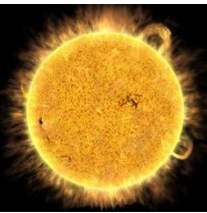
The HPS² process

Combined: SF normal, SGS startup/shutdown



The HPS2 process

Combined: SF normal, SGS antifreeze



Thank you for your attention!

HPS2 strives to demonstrate the feasibility of operation of a solar thermal power plant in a safe and reliable manner.

Acknowledgements:

- University of Évora – Team of Catedra ER, Team of Administration
- HPS2 partners, staff and colleagues
- Commissioning/O&M team
- German Ministry of Economical Affairs and Energy
- Projektträger Jülich
- Workers on Site

Supported by:



on the basis of a decision
by the German Bundestag

