



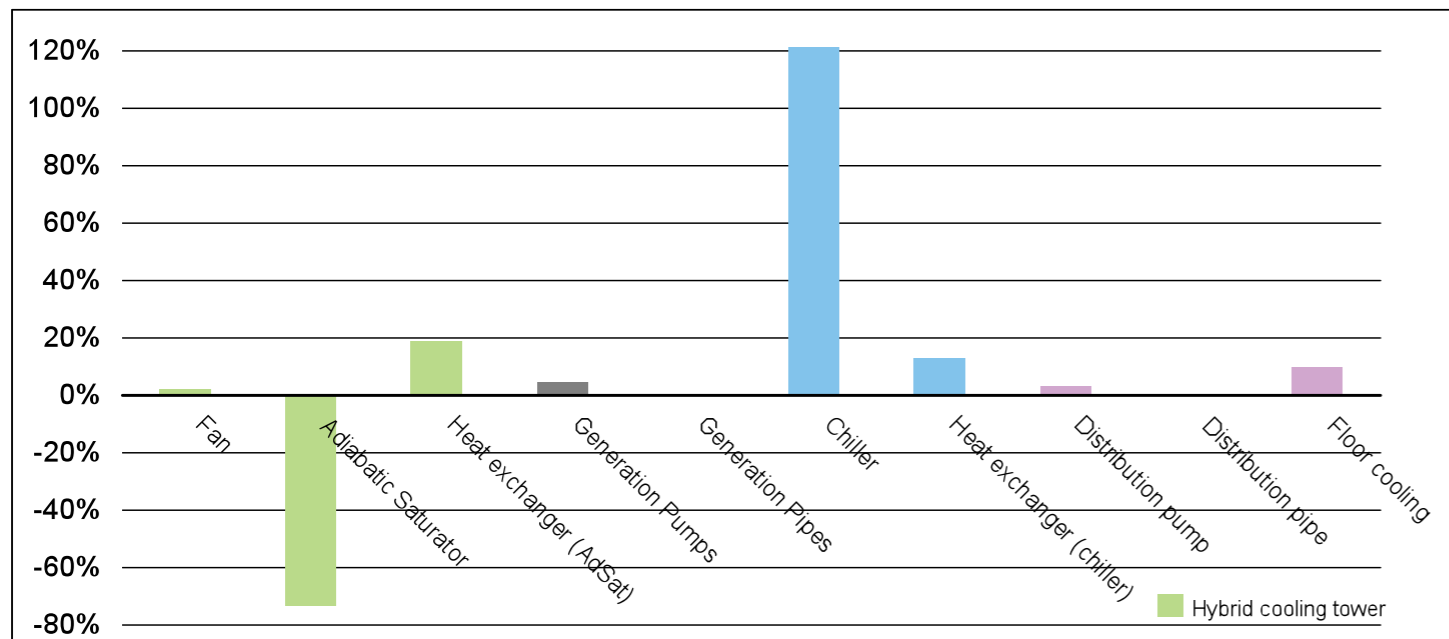
SEPE Tool

Software for Exergy Performance Assessment - Annex 49 deliverable

Forrest Meggers

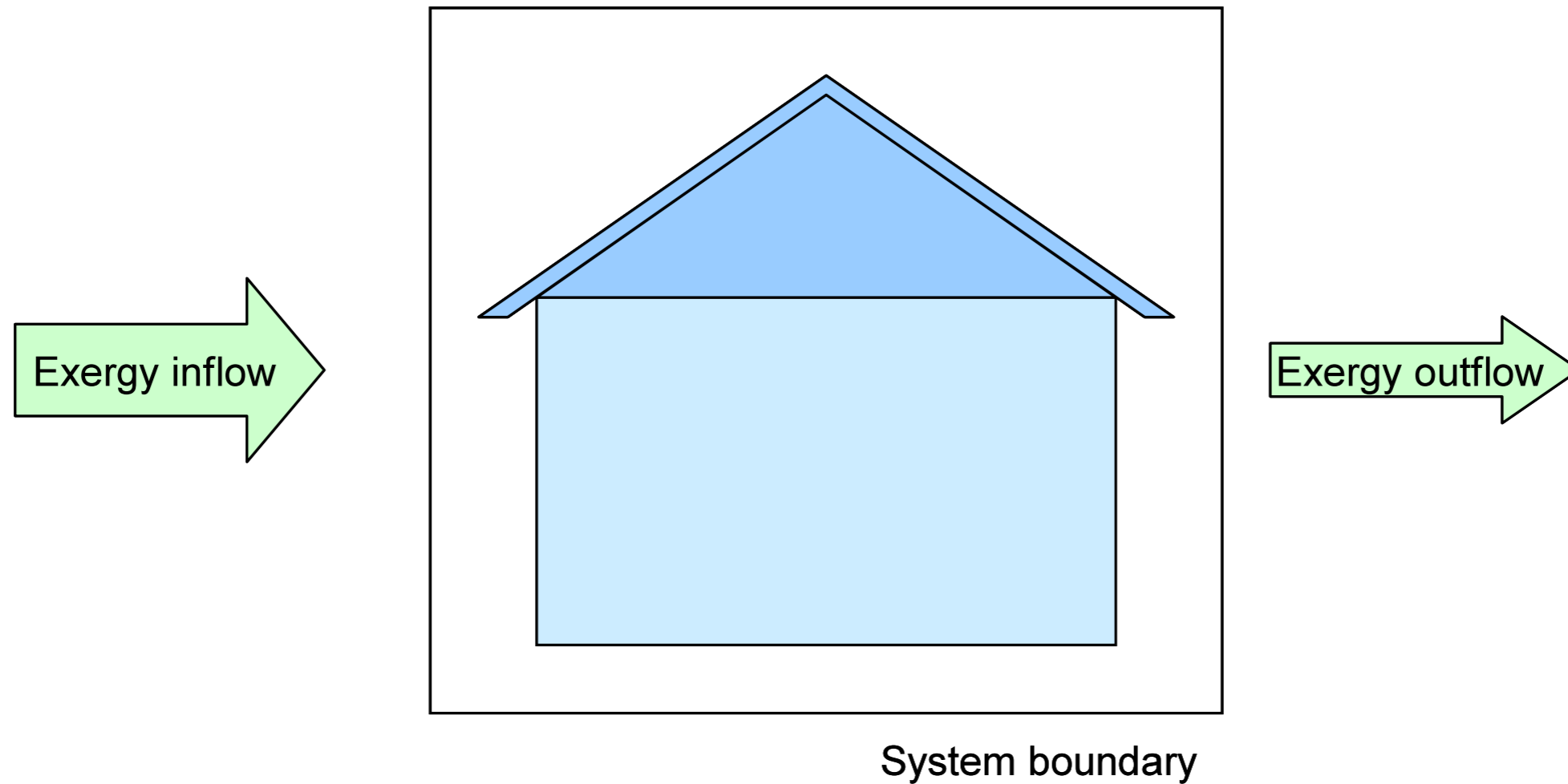
Professur für Gebäudetechnik (GT) - Building Systems Group

26.Nov 2010



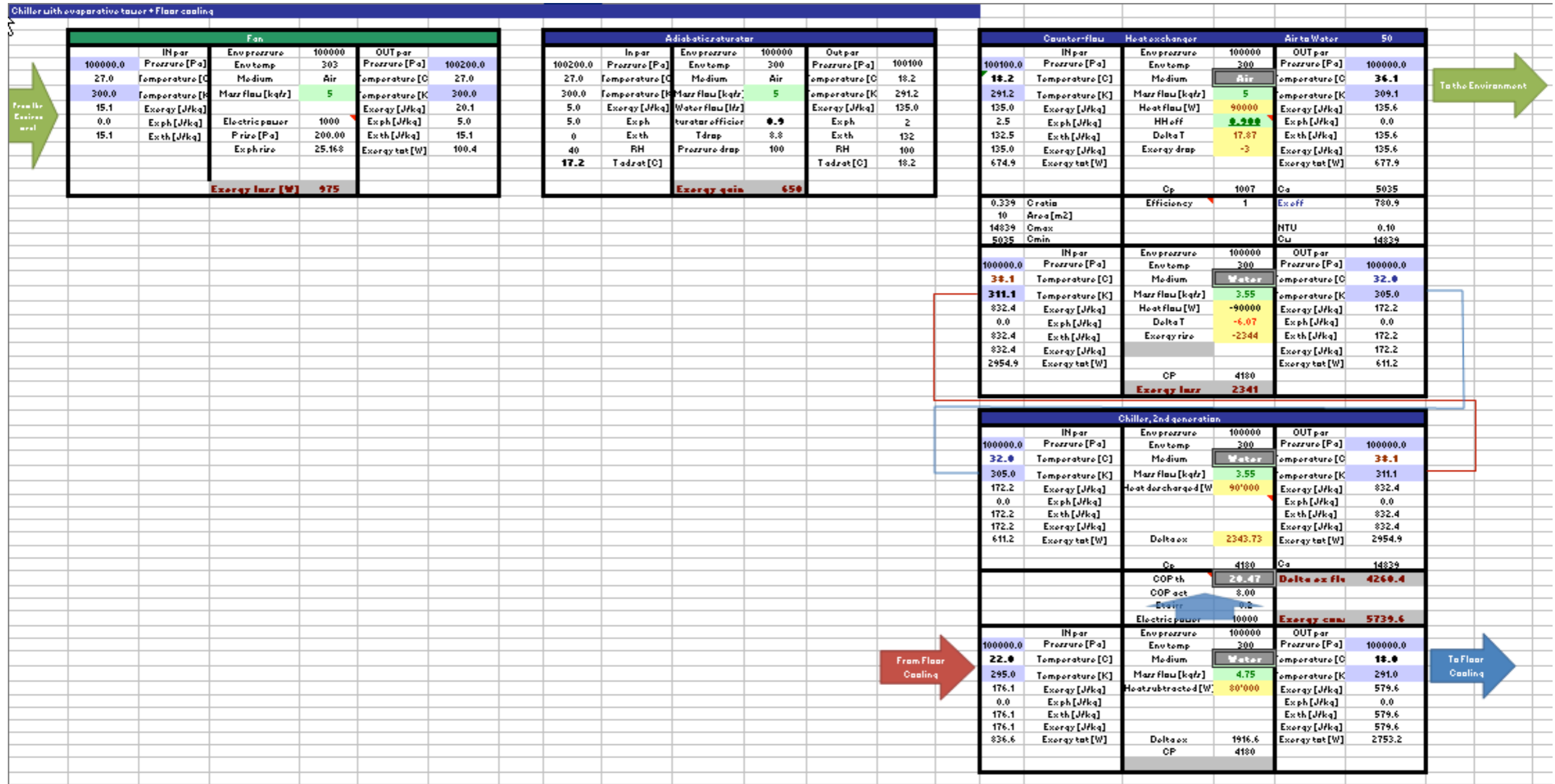
Exergy Calculation with SEPE

Developed at the KTH in Sweden - Marco Molinari, Gudni Johannesson, Petra Benz-Karlström



Exergy Calculation with SEPE

Simple cut and paste input system in Excel



Each Component has three parts

input values, characteristic equations, output values

Fan					
input values	IN par	Env pressure [Pa]	characteristic equations	OUT par	output values
	Pressure [Pa]	Env temp [K]		Pressure [Pa]	
	Temperature [C]	Medium		Temperature [C]	
	Temperature [K]	Mass flow [kg/s]		Temperature [K]	
	Ex ch,s [J/kg]	Power input [W]		Ex ch,s [J/kg]	
	Ex ph,s [J/kg]	Pressure rise [Pa]		Ex ph,s [J/kg]	
	Ex th,s [J/kg]	Exergy ph rise [W]		Ex th,s [J/kg]	
	Ex total,s [J/kg]			Ex total,s [J/kg]	
	RH [%]			RH [%]	
	x [kgw/kga]	Exergy efficiency [%]		x [kgw/kga]	
Exergy total [W]	Exergy loss [W]	Exergy total [W]			

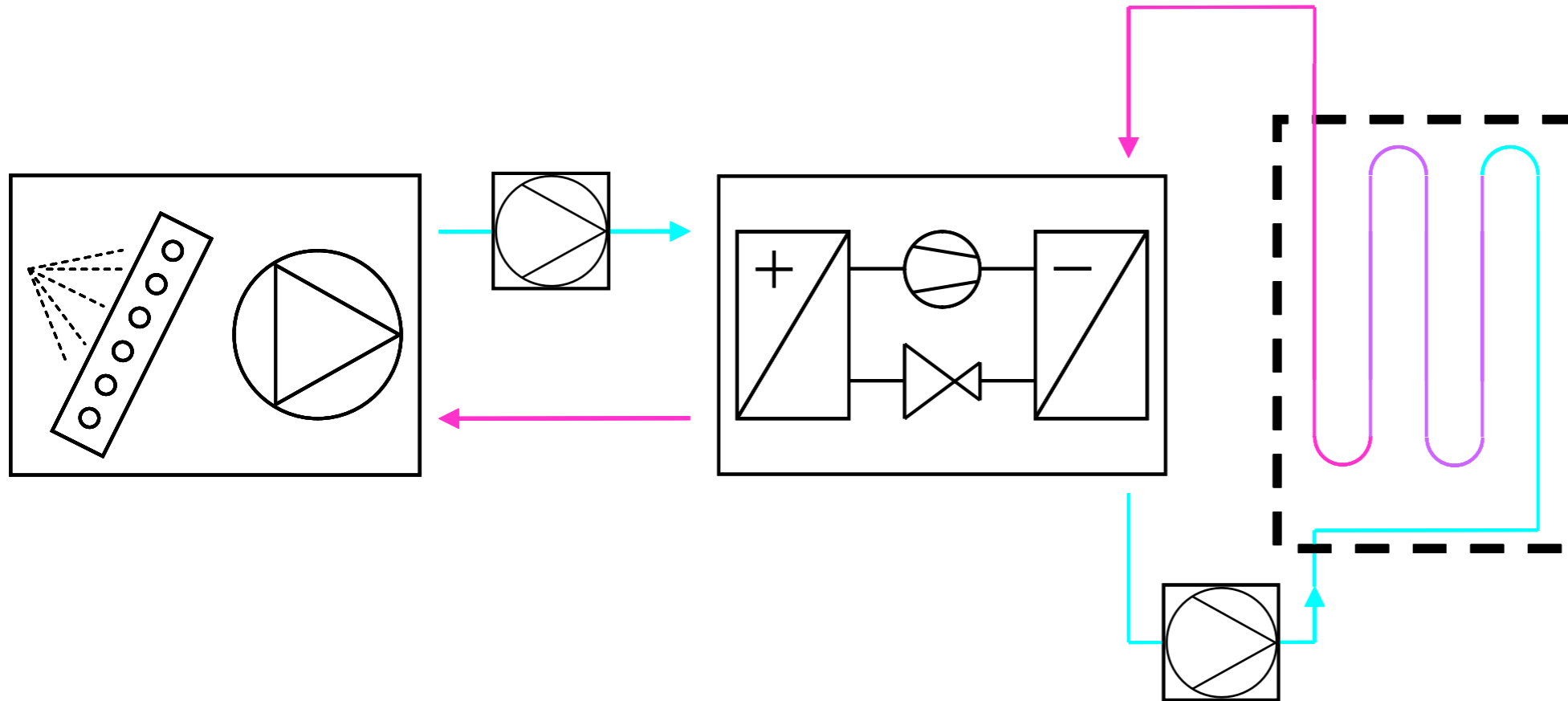
Components with multiple flows (HX)

more extensive setup

		Parallel-flow Heat exchanger		Water to Water 1000		
primary side	input values	IN par Pressure [Pa] Temperature [C] Temperature [K] Ex ch,s [J/kg] Ex ph,s [J/kg] Ex th,s [J/kg] Ex total,s [J/kg] RH [%] x [kgw/kga] Exergy total [W]	Env pressure [Pa] Env temp [K] Medium Mass flow [kg/s] Pressure loss [Pa] Heat flow [W] Effectiveness Delta T [K] Exergy drop [W] Cp [J/kgK]	characteristic equations	OUT par Pressure [Pa] Temperature [C] Temperature [K] Ex ch,s [J/kg] Ex ph,s [J/kg] Ex th,s [J/kg] Ex total,s [J/kg] RH [%] x [kgw/kga] Exergy total [W]	output values
		C ratio [-] Area [m ²] Cmax [J/K] Cmin [J/K]	Thermal efficiency Exergy loss [W]		Thermal exergy efficiency NTU C1 [J/K] C2 [J/K]	
secondary side	input values	IN par Pressure [Pa] Temperature [C] Temperature [K] Ex ch,s [J/kg] Ex ph,s [J/kg] Ex th,s [J/kg] Ex total,s [J/kg] RH [%] x [kgw/kga] Exergy total [W]	Env pressure [Pa] Env temp [K] Medium Mass flow [kg/s] Pressure loss [Pa] Heat flow [W] Delta T [K] Exergy rise [W] Cp [J/kgK]	characteristic equations	OUT par Pressure [Pa] Temperature [C] Temperature [K] Ex ch,s [J/kg] Ex ph,s [J/kg] Ex th,s [J/kg] Ex total,s [J/kg] RH [%] x [kgw/kga] Exergy total [W]	output values

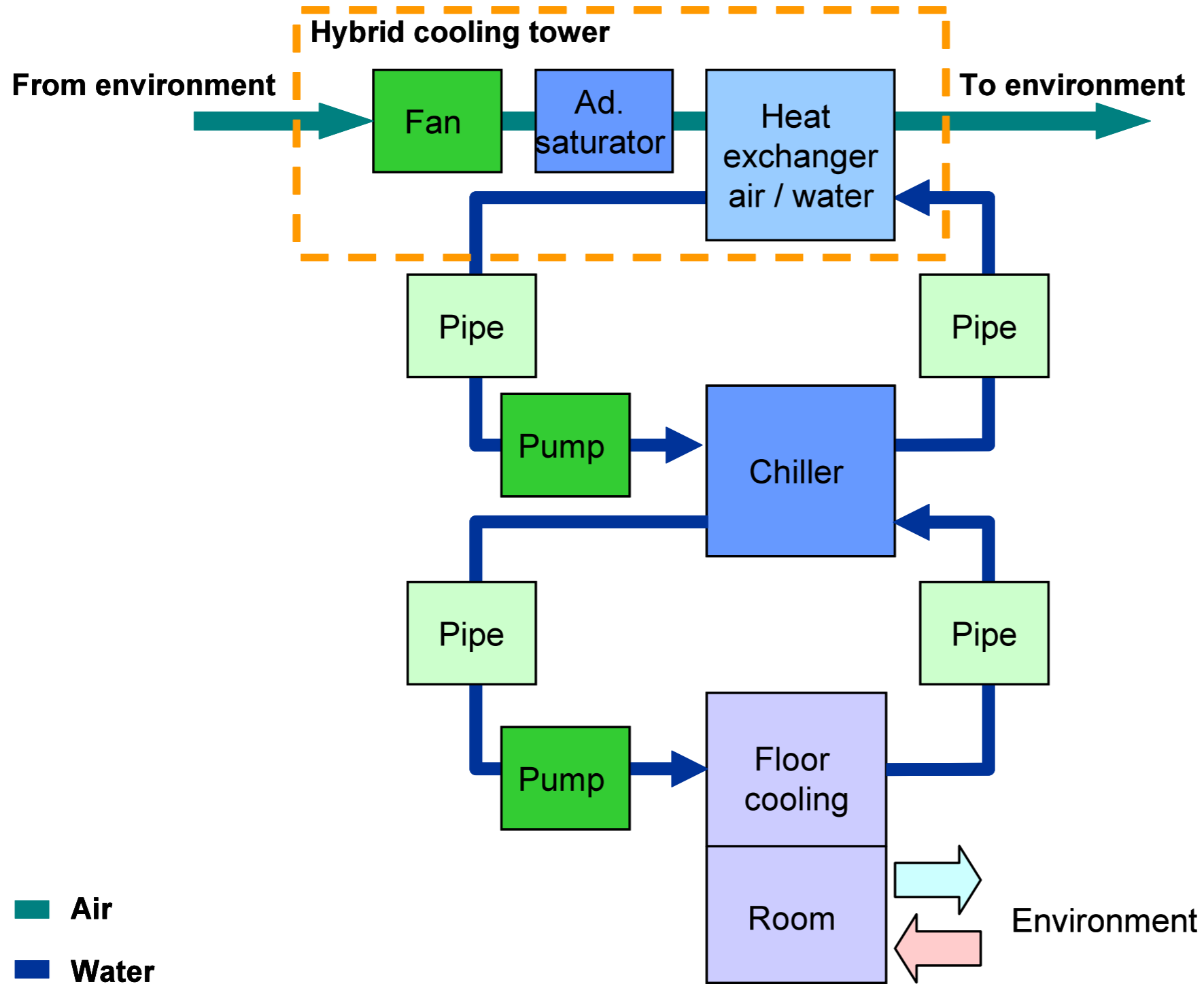
Example: Configuration

Chiller with low temperature lift, hybrid cooling tower and floor cooling



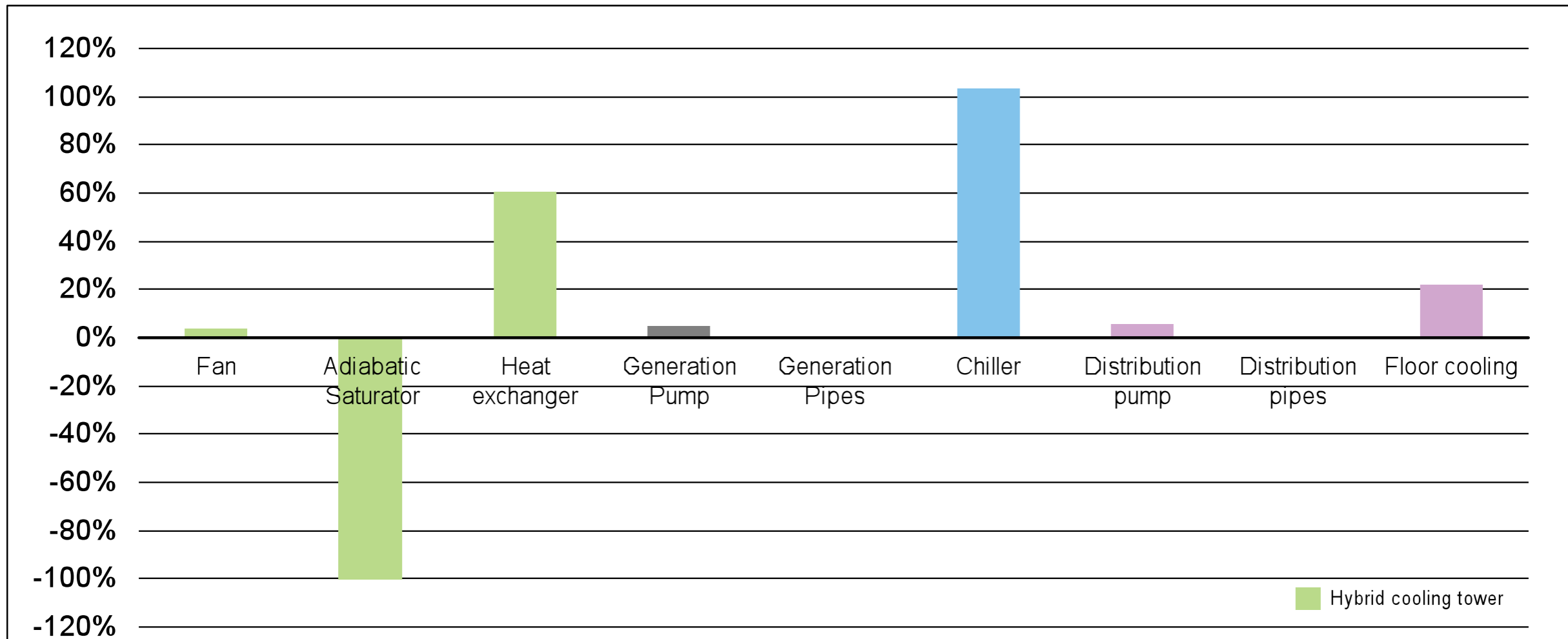
Example: SEPE representation

Chiller with low temperature lift, hybrid cooling tower and floor cooling



Example: Results exergy losses

Chiller with low temperature lift, hybrid cooling tower and floor cooling



Exergy losses	Fan	Adiabatic Saturator	Heat exchanger	Generation Pump	Generation Pipes	Chiller	Distribution pump	Distribution pipes	Floor cooling	Total
[W]	100	-2800	1690	130	10	2880	150	4	610	2770
	4%	-101%	61%	5%	0%	104%	5%	0%	22%	

Conclusions

- **More Info in Schlussbericht von BfE**
- **Also see www.annex49.com**
- **Thanks to the BfE for the support**