

Reference System & Cost Competiveness

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Content

- Introduction to B7
- Reference System
- economical sensitivity analysis
- ...

Introduction B7

- Base for technical and economic assessment
 - Excel Tool for calculation / system representation
 - T48 Standard & specific values
- Main Target: system assessment & evaluation
- Comparison of SHC & Reference Systems
- Overall system & subsystem

Reference System - VCC

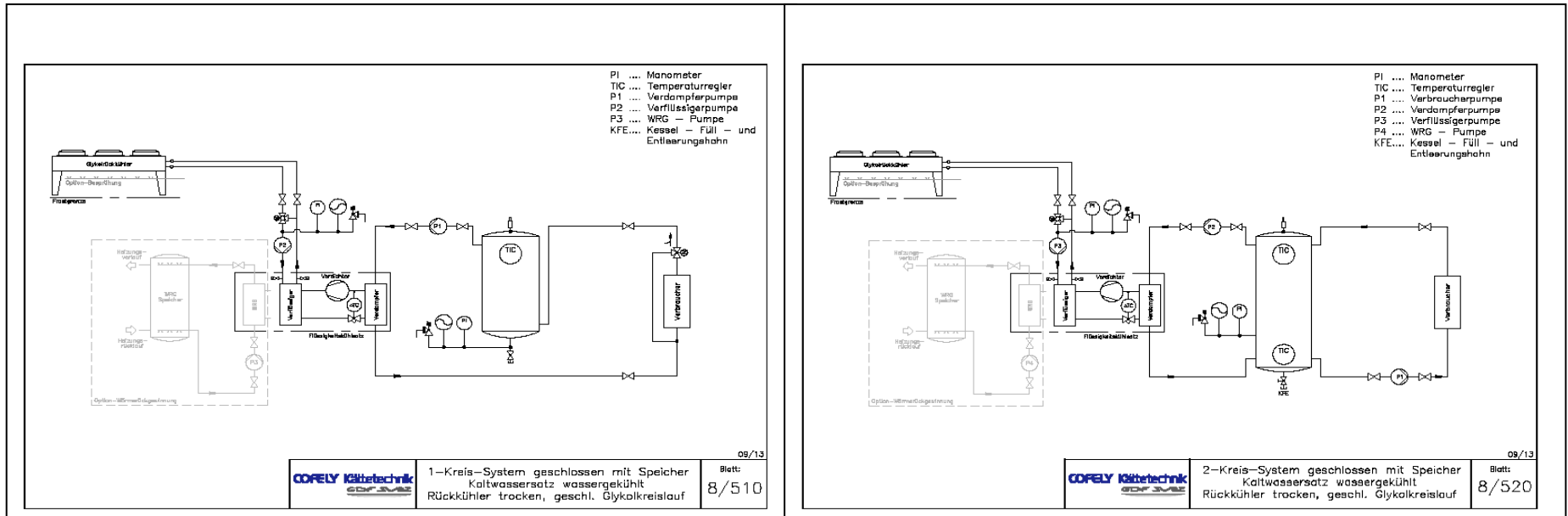
- Water cooled VCC
- Air cooled VCC
- Depending on different capacities
 - configuration (1/2 circuits)
 - Technologies (comp.: scroll, screw, turbo; heat exchanger;...)

COFELY Kältetechnik
GDF SVEZ

Capacity [kW]	Circuit	Water cooled	Air cooled
5	1	-	Scroll
10	1	-	Scroll
20	1	Scroll	Scroll
50	1	Scroll	Scroll
100	1	Scroll	Scroll
250	2	Scroll/Turbo	Scroll / Turbo
500	2	Turbo	Screw / Turbo
1000	2	Turbo	Screw / Turbo

Reference System - VCC

Water cooled VCC

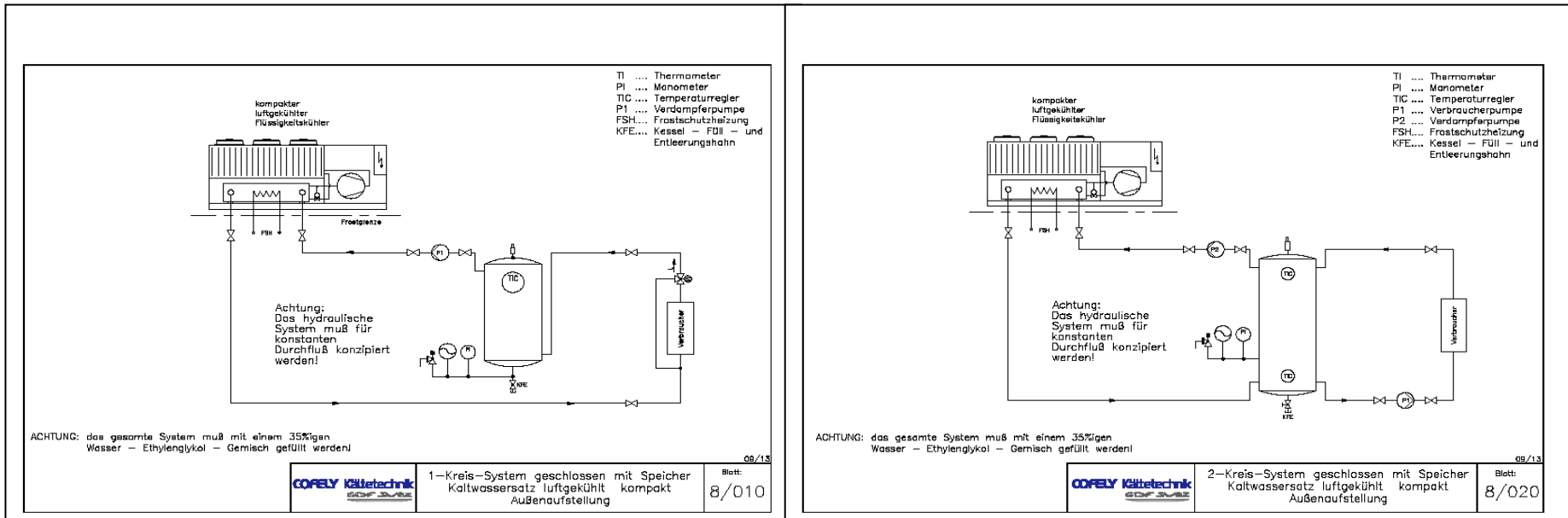


< 100kW

>100kW

Reference System - VCC

■ Air cooled VCC



< 100kW

>100kW

Reference System - VCC

- EER / ESEER according to EUROVENT

	Temp. inlet condenser [°C]		Load [%]	weight
	AIR	WATER		
EER_A	35	30	100	0,03
EER_B	30	26	75	0,33
EER_C	25	22	50	0,41
EER_D	20	18	25	0,23

air conditioning
@ 7/12°C

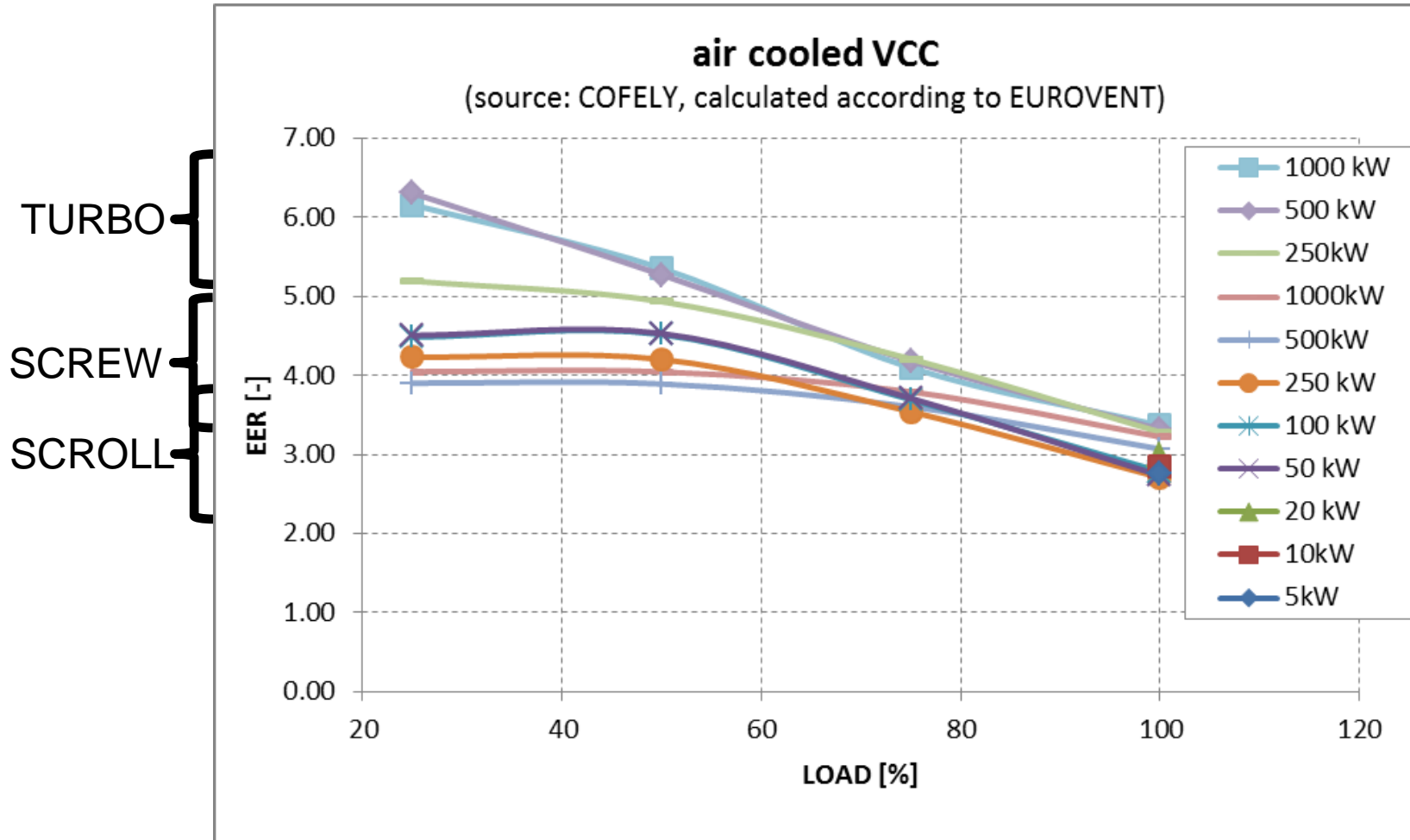


$$ESEER = A * EER_A + B * EER_B + C * EER_C + D * EER_D$$



» www.eurovent-certification.com

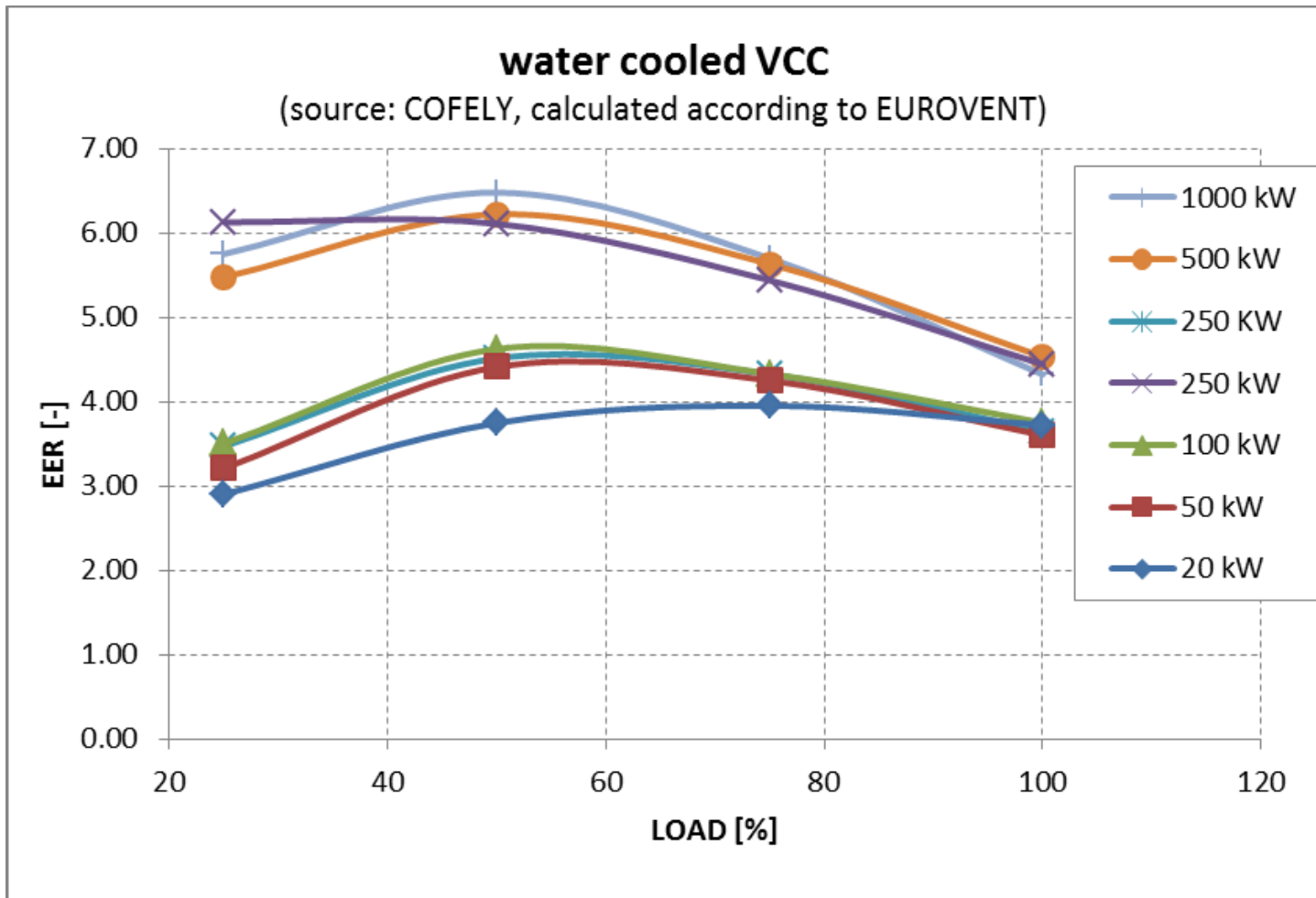
Reference System - VCC



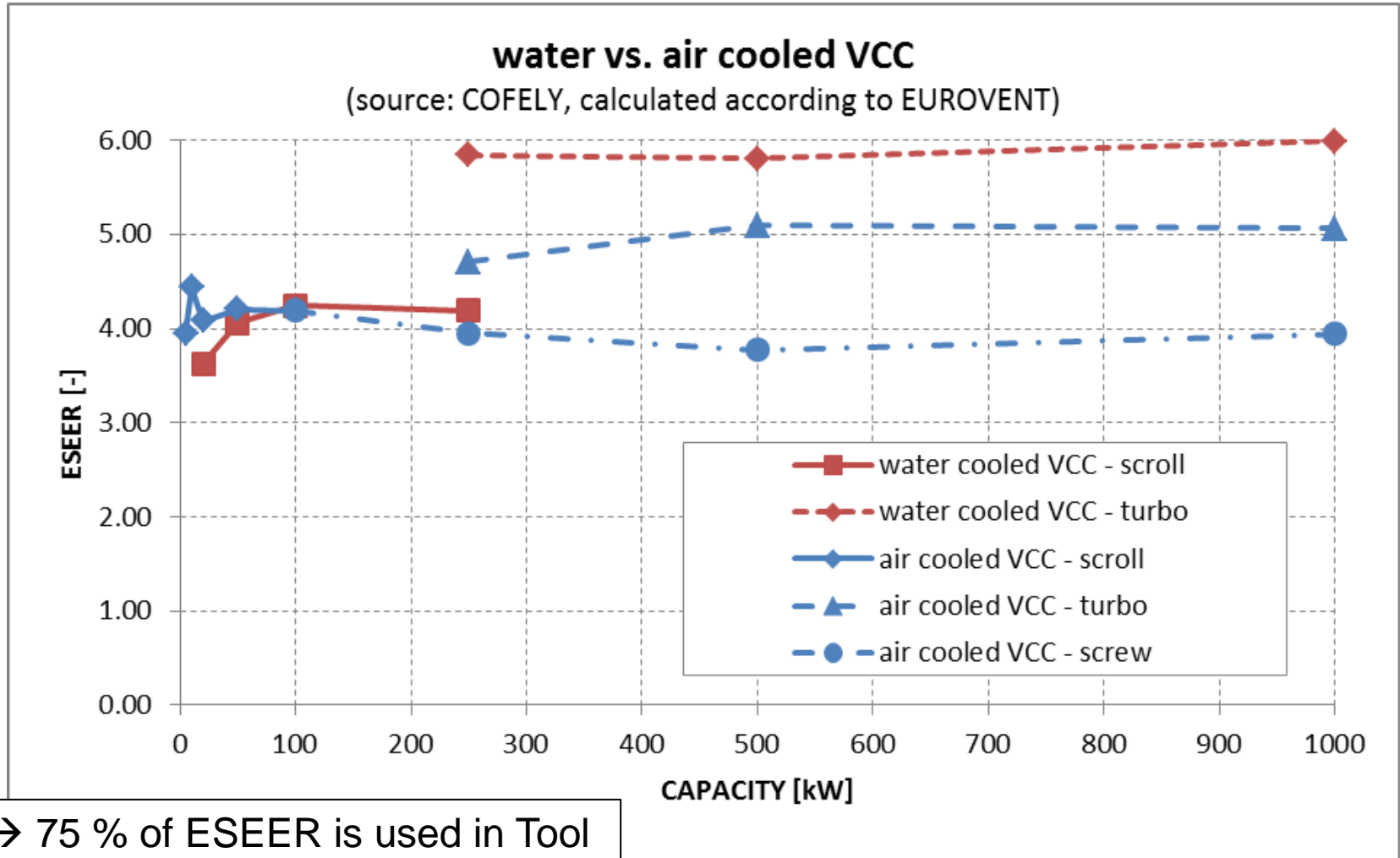
Reference System - VCC

TURBO {

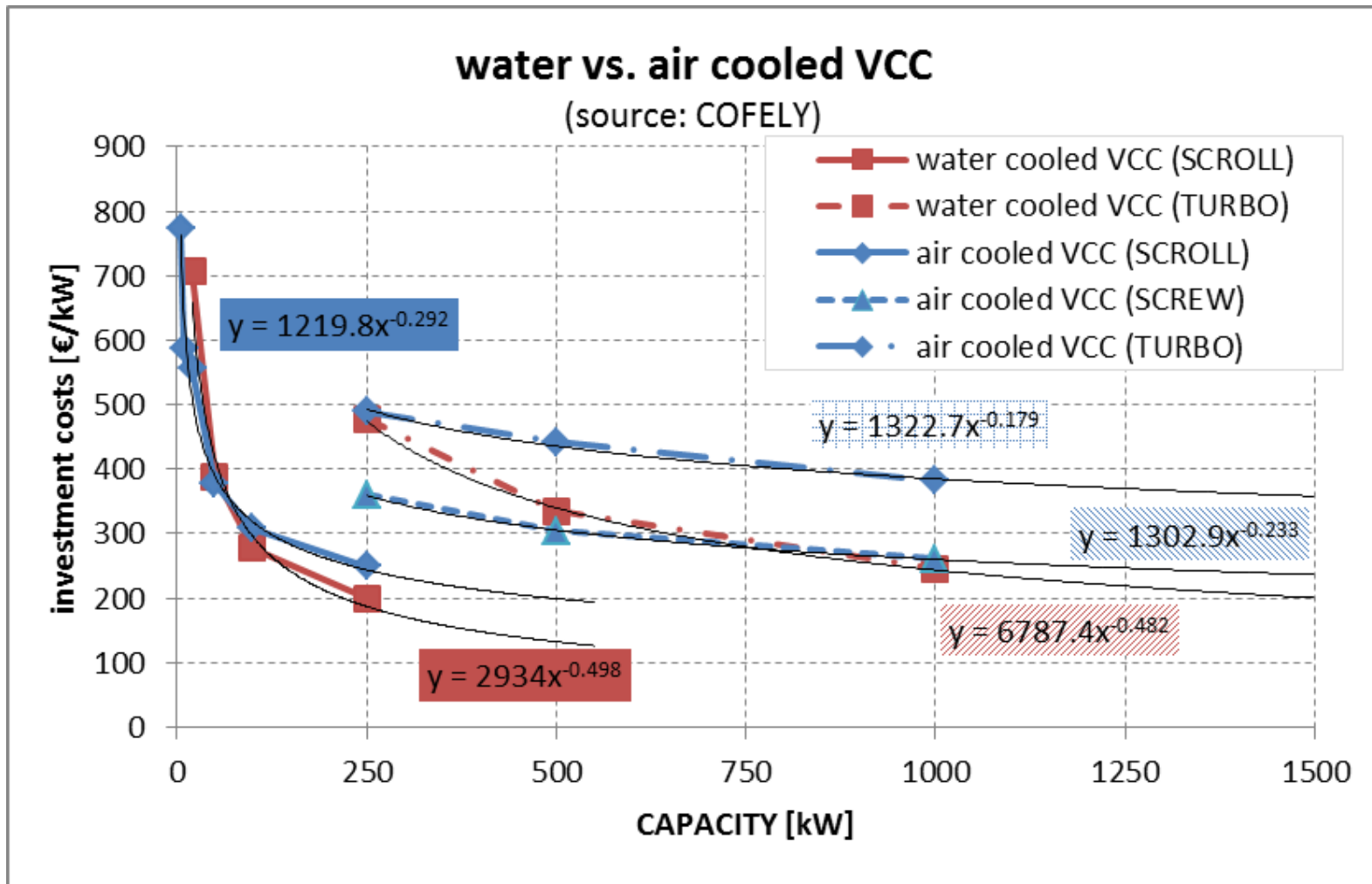
SCROLL {



Reference System - VCC



Reference System - VCC



Cost calculation

- Inputs - economics

period under consideration	a	N	25
credit period	a	NL	10
inflation rate	%	i	3.0%
market discount rate	%	d	3.0%
credit interest rate	%	m	3.0%
inflation rate for energy prices electricity	%	iee	3.0%
inflation rate for energy prices gas	%	ieg	3.0%
equity ratio	%	fL	0.0%
public fundings rate	%	p	0.0%

Cost calculation

- Inputs - consumption based costs

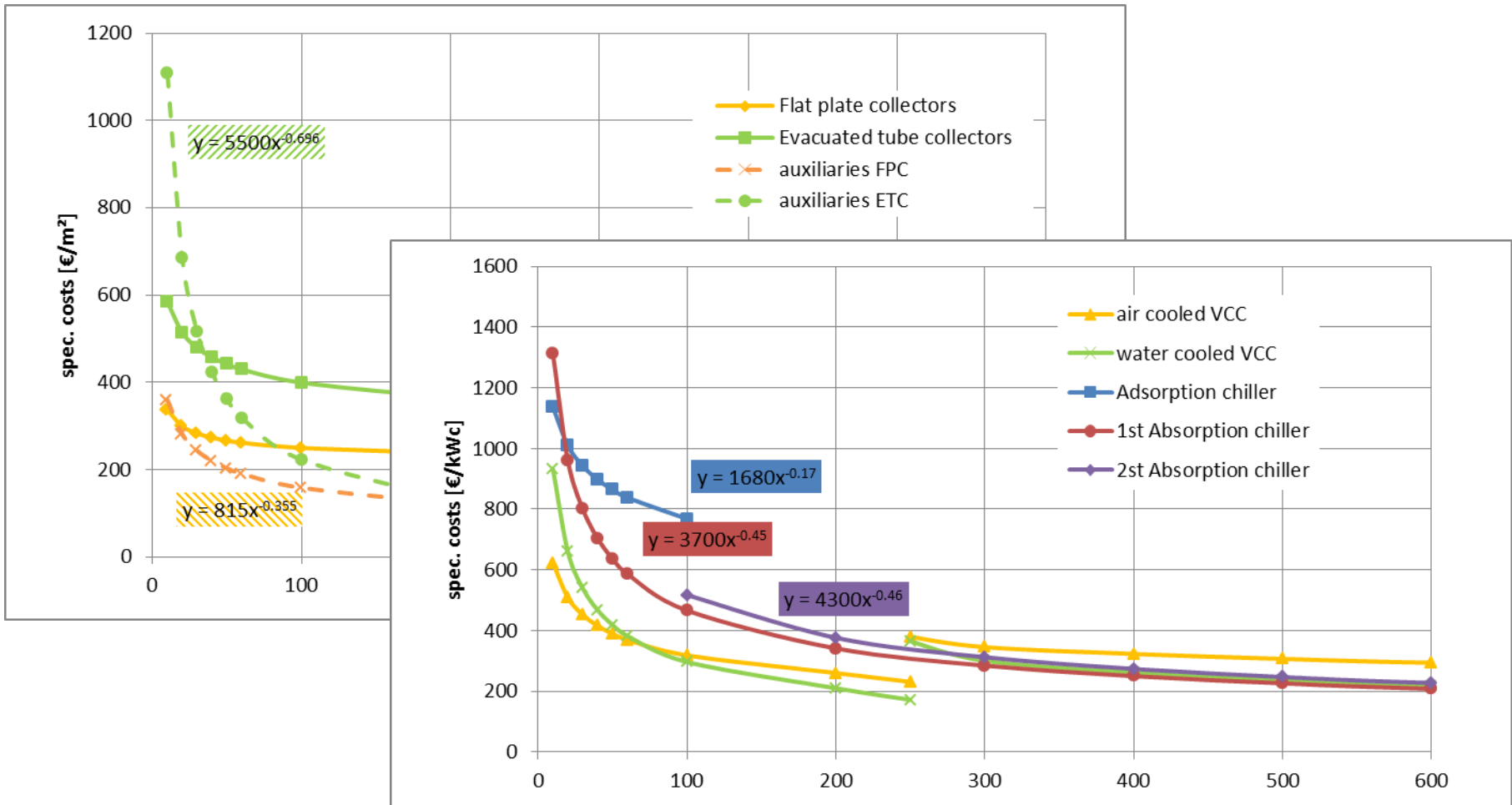
Electricity				
electricity consumption	€/kWh			0.1
electricity peak power	€/kW/year			80
Energy Carrier				
gas consumption	€/kWh	natural gas consumption		0.05
gas annual fix	€/year	natural gas annual		70
pellets consumption	€/kWh	pellets consumption		0.05
pellets annual	€/year	pellets annual		40
specific HB consumption	€/kWh	specific HB consumption		0.05
specific HB annual		specific HB annual		50
Water consumption				
water consumption	€/m ³			2.5

Cost calculation

- Inputs investment / replacement / maintenance

Solar collectors		T48 Standard		specific	T48 S
		cost per unit € decreasing coefficient	economy of scale €/unit	user defined costs/unit	ac to V
Flat plate collectors	€/m ²	757	368	360	
	-	-0.173			
Evacuated tube collectors	€/m ²	800	487	500	
	-	-0.119			
specific1	€/m ²			250	
Solar collectors auxiliaries					
FPC	€/m ²	815	185	180	
		-0.3553			
ETC	€/m ²	5500	301	300	

Cost calculation



Cost calculation

- Other investment costs (as % of invest)
 - Control, electricity and monitoring
 - Design, planning and commissioning
 - General costs associated to works
 - Indirect cost and industrial benefits

- Detailed calculation of
 - Investment costs
 - Replacement + residual value
 - Maintenance
 - Consumption based costs

Cost calculation

Summary

- A lot of parameters and assumptions
- detailed inputs necessary
- „T48 Standard“ typical average values!?
- Use specific inputs for your detailed calculation

→ sensitivity of parameters for small capacity system (SH+C)

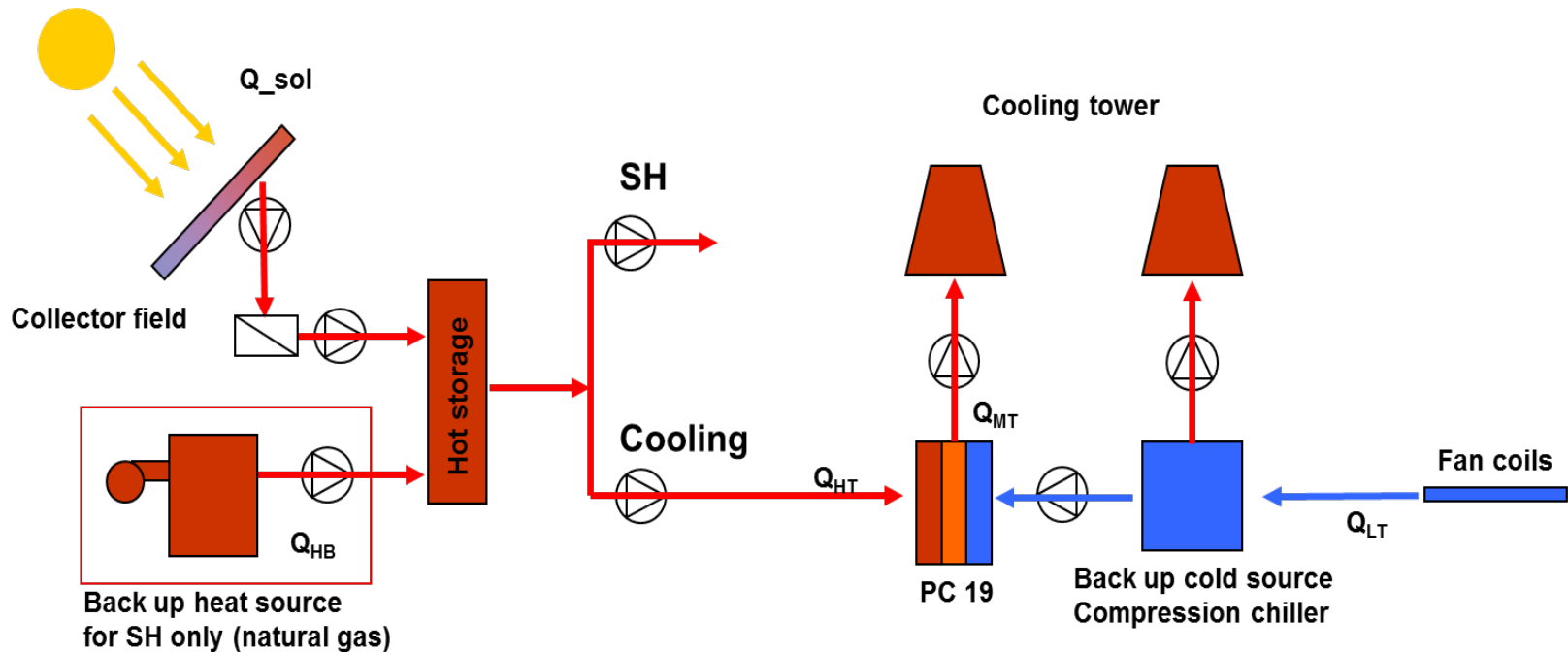
Cost calculation - Sensitivity

QCD.system

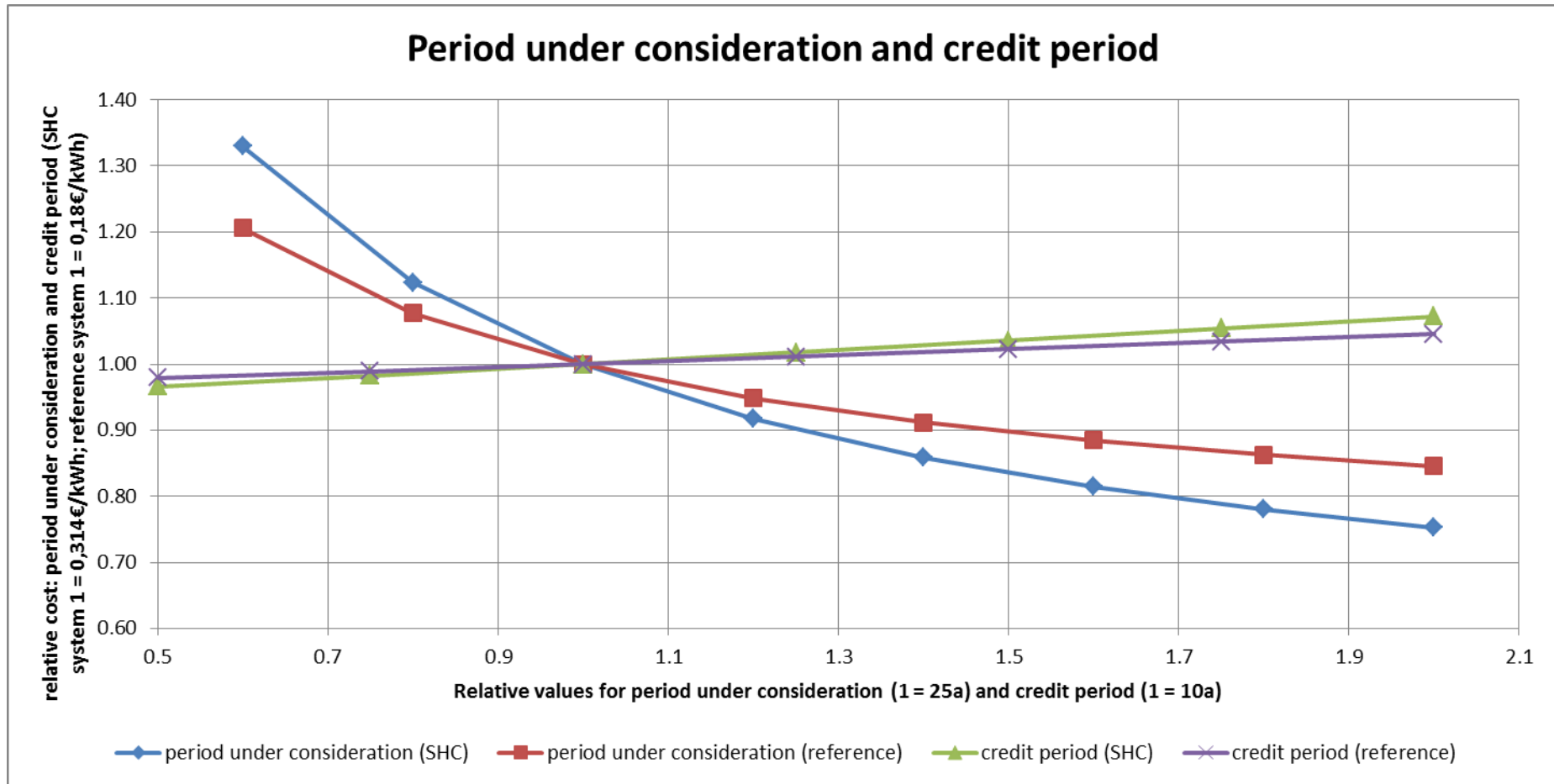
7'500 kWh/a

QSH.system

30'000 kWh/a

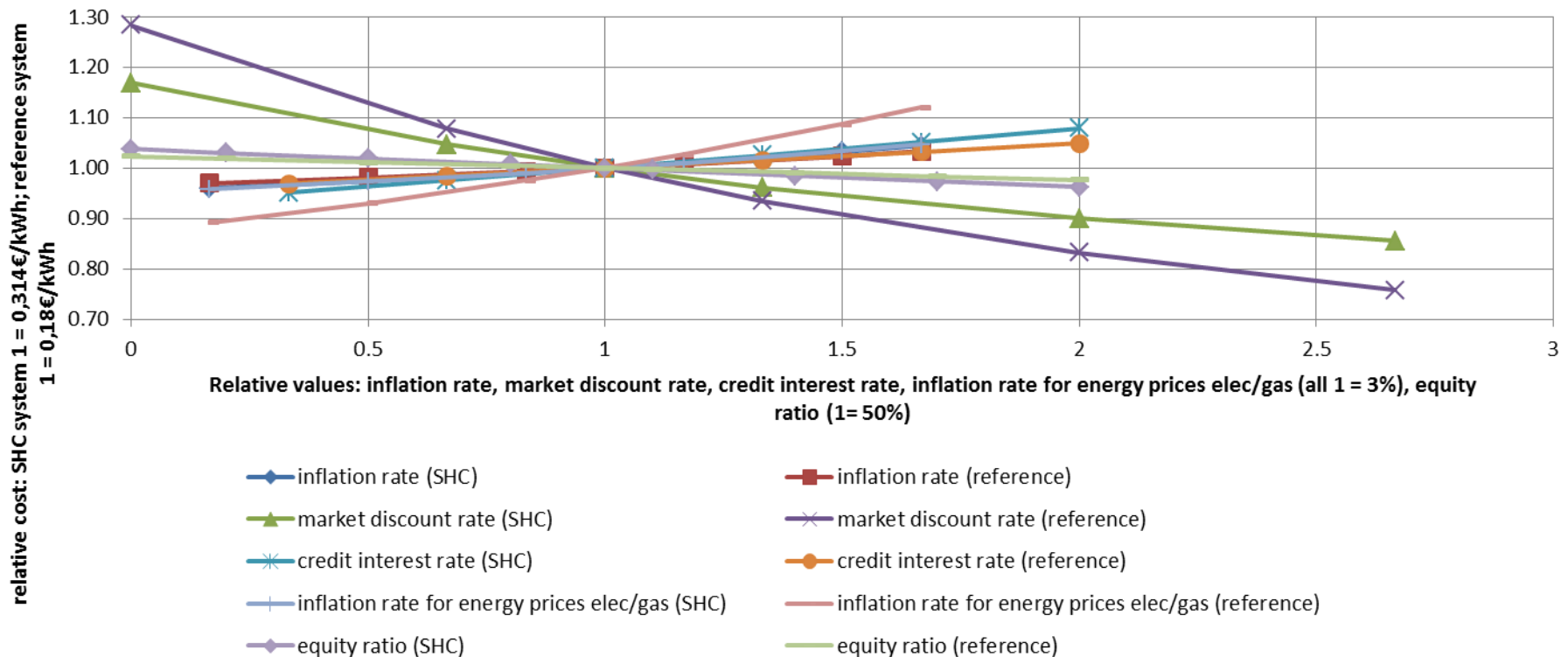


Cost calculation - Sensitivity



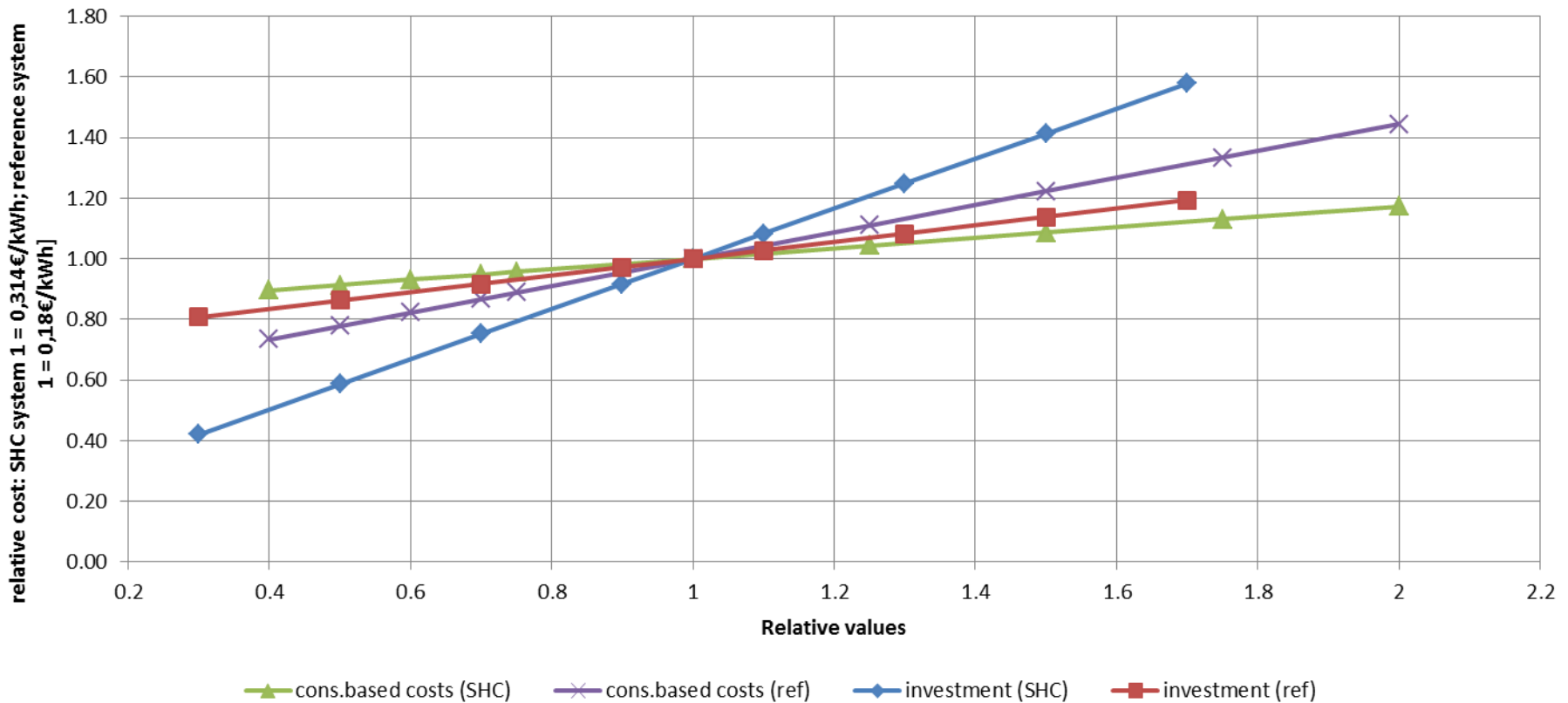
Cost calculation - Sensitivity

inflation rate, market discount rate, credit interest rate, inflation rate for energy prices elec/gas, equity ratio



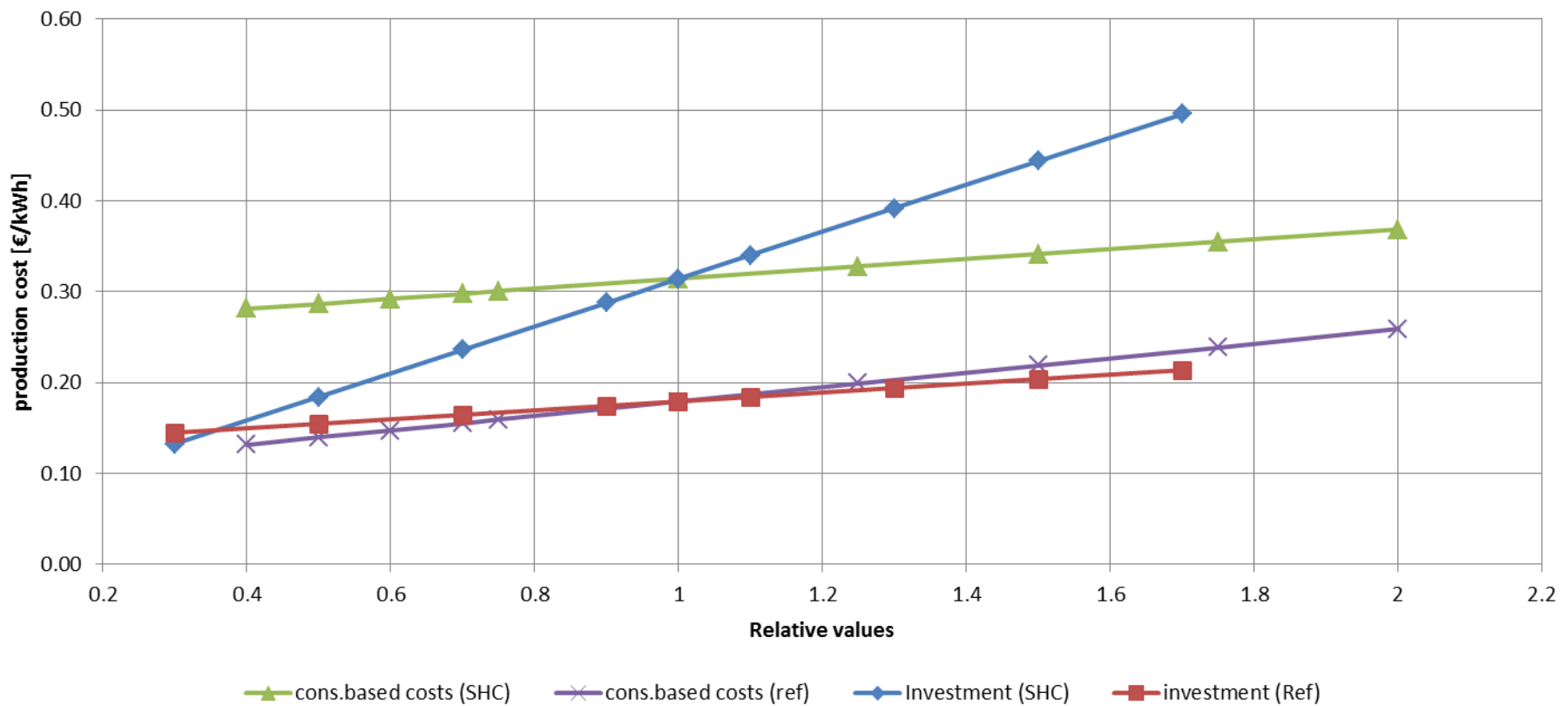
Cost calculation - Sensitivity

investment & consumption based costs



Cost calculation - Sensitivity

investment & consumption based costs



Summary

- Examples with best practice highly welcome
- More Details in the B7/C2 discussion

Thank you for your attention!

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