RESCUE

RENEWABLE SMART COOLING FOR URBAN EUROPE

RESCUE Impact Calculator

Stratego Workshop Edinburgh, 2014-11-17

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Rationales for the tool

- provide rough estimations based on few input numbers, so that it can be used with small previous knowledge
- Compare District Cooling to a distributed solution in terms of
  - Costs
  - Environmental measures

Basics were developed in the project and are documented in the reports on the website

The Development Process for District Cooling

Potential

- Market potential
- Sources
- Environmental savings

How to get access:

Pre-final version available

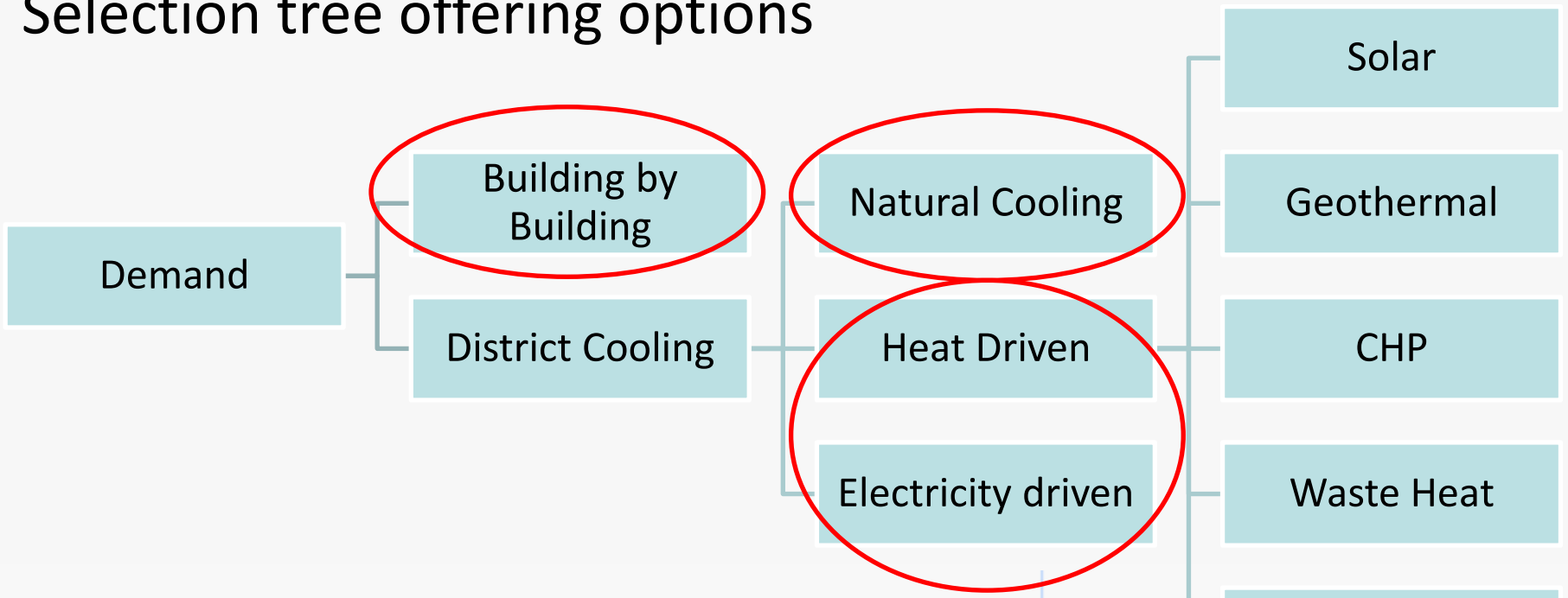
http://www.rescue-project.eu/fileadmin/user_files/WP4_Reports/RESCUE_Calculator.xlsx

→ Quick Start Guide and manual

→ Feedback appreciated

Providing basic Information

Selection tree offering options



Example - Dundee

INPUT

1. Framework for energy factors and prices		
Country	United Kingdom	
price level in country	high	

2. Demand			
Demand known?	No		
City	not in list		
ECI known?	Yes		
ECI given	30		
Area	350000	m2	coloured buildings
number of ETS	15		
pipe length	1100	m	

3. What type of demands has the area? In case there is more than one please provide de percentage of area			
Residential	0	%	
Service Sector	39	%	
Industrial Sector	1	%	
uncooled	60	%	100%
specific cooling dmd. industrial areas	78	kWh/m2/a	

4. Base Case: What type of cooling system are install? In case there is more than one please provide de			
Room Air Conditioner & Central Air Conditioner	0	%	
Air-Cooled Chiller	0	%	
Water-Cooled Chiller	100	%	
Absorption Chiller	0	%	100%

5.Is cold water (4...16°C) available?	
River, Sea, Aquifer	Yes

6. Which heat sources should be considered?		7. Give the share of heat sources in the mixed source heating network
fossil fired boilers	Yes	10%
Solar Thermal	No	0%
Geothermal	No	5%
CHP	No	80%
Heat Waste	No	5%
DH mixed sources	Yes	100%

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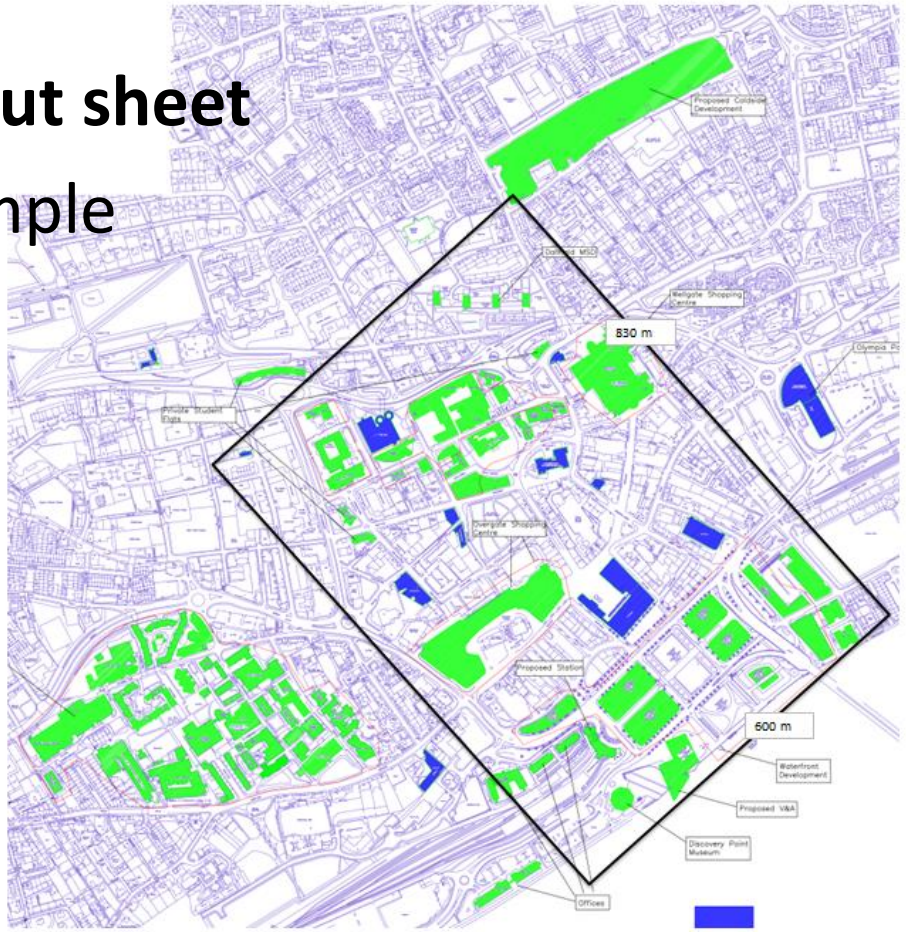
MAP



The input sheet

kept simple

Providing basic Information

1. Framework for energy factors and prices	
Country	United Kingdom
price level in country	high

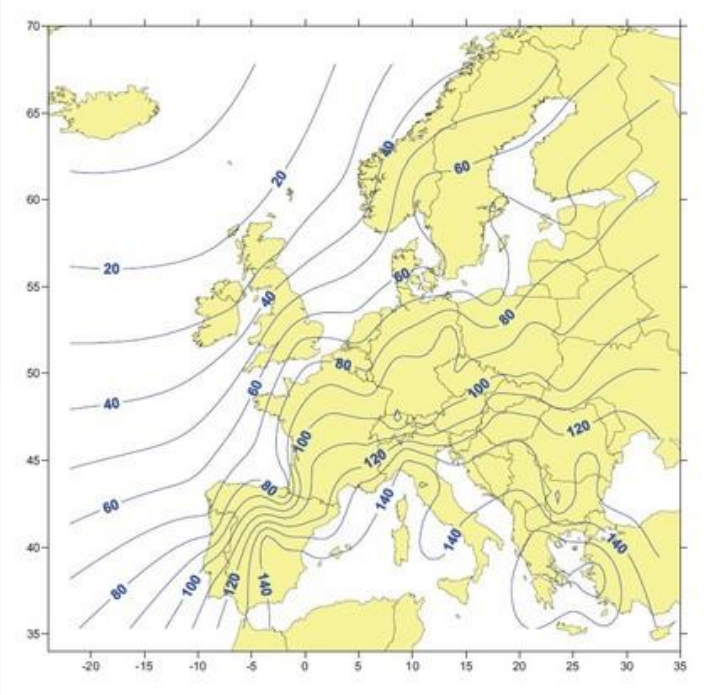
Price level of the country

Energy factors: e.g. how many emissions are connected to 1 kWh of electricity

Cooling demand calculation

3 options:

1. Demand is known
2. demand is calculated with the ECI of this city
3. annual average temperature should be given



1

2. Demand		
Demand known?	Yes	
demand given	0	kWh/a

2

2. Demand		
Demand known?	No	
City	not in list	
ECI known?	Yes	
ECI given	30	

3

2. Demand		
Demand known?	No	
City	not in list	
ECI known?	No	
Temperature	10	°C

Example – Dundee – Demand calculation II

- Area

Area	350000	m2

- Type of area (Comfort cooling, process cooling)

3. What type of demands has the area? In case there is more than one please provide de percentage of area		
Residential	0	%
Service Sector	40	%
Industrial Sector	0	%
uncooled	60	%

Example – Dundee – Costs Calculation

- Important for investment costs and pumping energy

number of ETS	15	
pipe length	1100	m

Cooling demand calculation

Definition of a base case:

- Usually this will be a room Air Conditioner with Central Air supply, which has a EER of 1.5…3
- other devices are bit more efficient, exact values can be found in the manual
- Values of EER can also be adopted if you as an expert are aware of these numbers

4. Base Case: What type of cooling system are install? In case there is more than one please provide de		
Room Air Conditioner & Central Air Conditioner	0	%
Air-Cooled Chiller	0	%
Water-Cooled Chiller	100	%
Absorption Chiller	0	%

Cooling demand calculation

Definition of sources /heat sinks:

- cold water, that is suitable for natural cooling (approx 4…16°C)
- heat sources (fossil fired boilers and electricity are postulated to be always available)
- District Heating Network incl. share of the heat sources

5.Is cold water (4…16°C) available?	
River, Sea, Aquifer	Yes

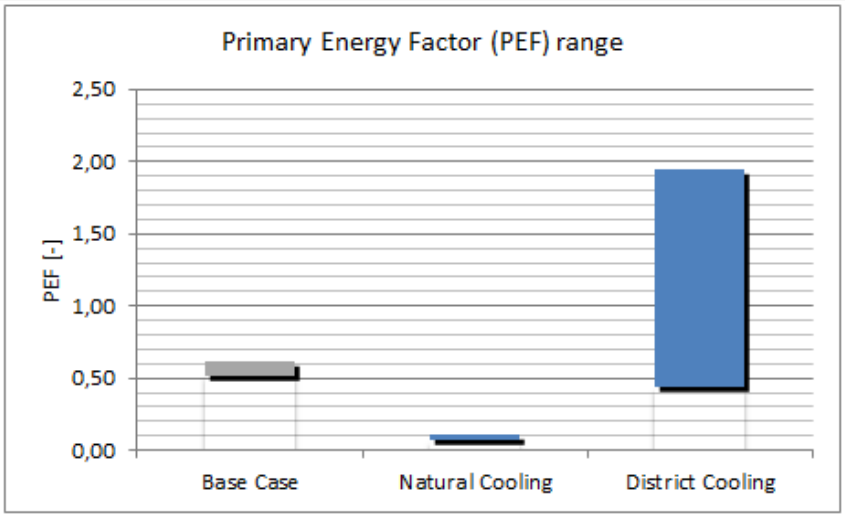
6. Which heat sources should be considered?	
fossil fired boilers	Yes
Solar Thermal	No
Geothermal	No
CHP	No
Heat Waste	No
DH mixed sources	No

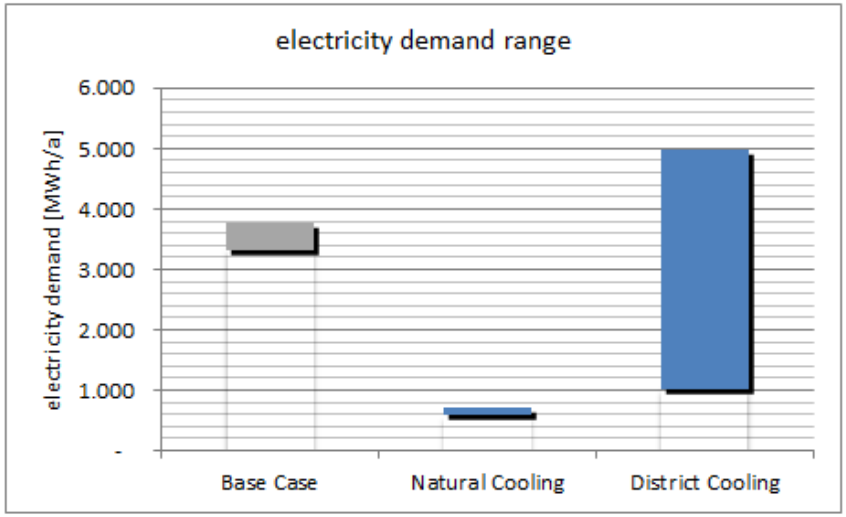
Cost calculation

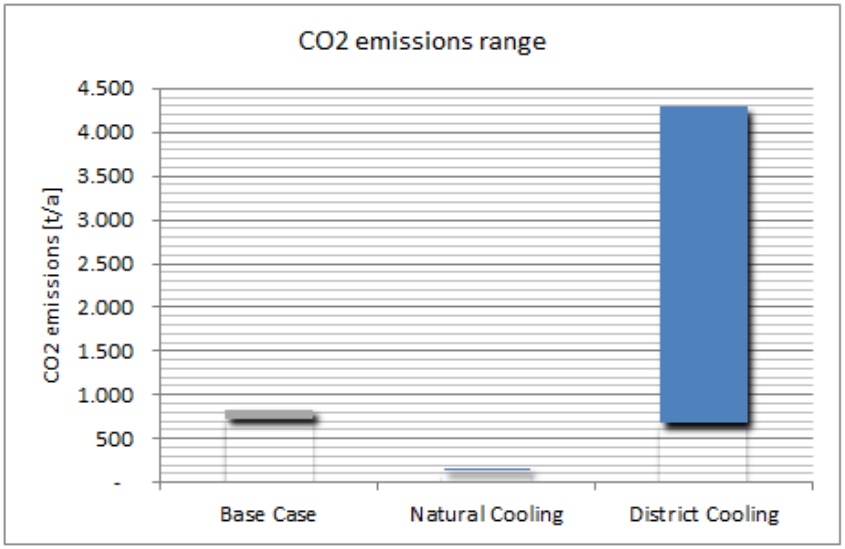
The tool cannot provide you with the dimensioning of the system, so you have to do it (roughly)

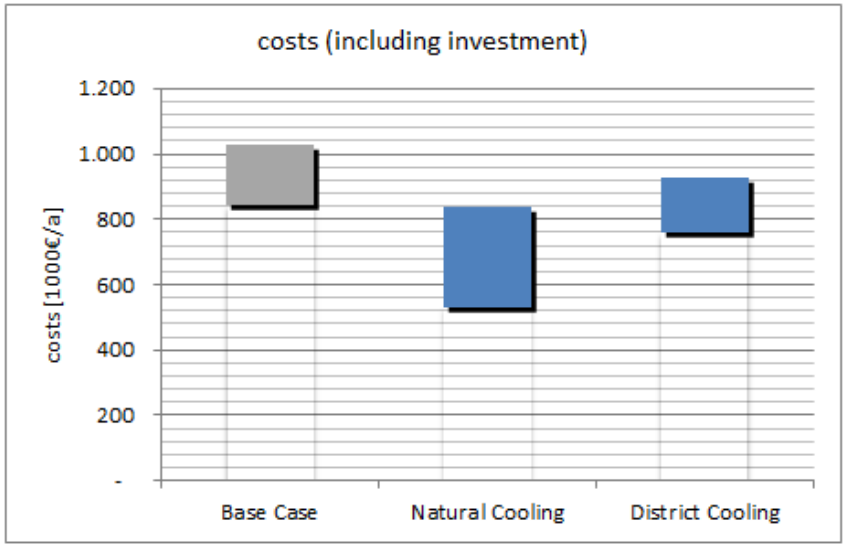
		Base Case - distributed production					District Cooling		
capacity	kW	9.000					10.000		demand calculated
cooling production	MWh	10.800				production differes a lot - values hardly compareable!	12.000		10.938
price level in country									
Alternative production costs									
production costs mean	€/MWh	86					77		
machine type		I (Residential)	II (Service)	III (Industrial)			DC		
number	1	0	15	0					
capacity	kW (100...3000)	100	600	1000	installed capacity altogether	9	MW 10	<-- for cell J5 choose the value which is closest to L5 --> (if in doubt choose the bigger value)	9
investment	-	Re-investment	Re-investment	Re-investment					
recooling	-	air	air	air					
full load hours	h	400	1200	8760	average full load hours	1200	1200	price level	
production costs	€/MWh	249	86	60	average production costs	86	61		
					piping specific costs		1000	€/m	
					pipe lengths		1100	m	
					piping investment costs		1100000	€	
					life time network		25	a	
					piping annual costs		44000	€/a	
					number of transfer station		15		
					avg capacity transfer station		667	kW	
					costs of ETS (Energy Transfer Stations)		1308200	€	
					life time ETS		25	a	
					ETS annual cost		52328	€/a	

Example – Dundee - Output









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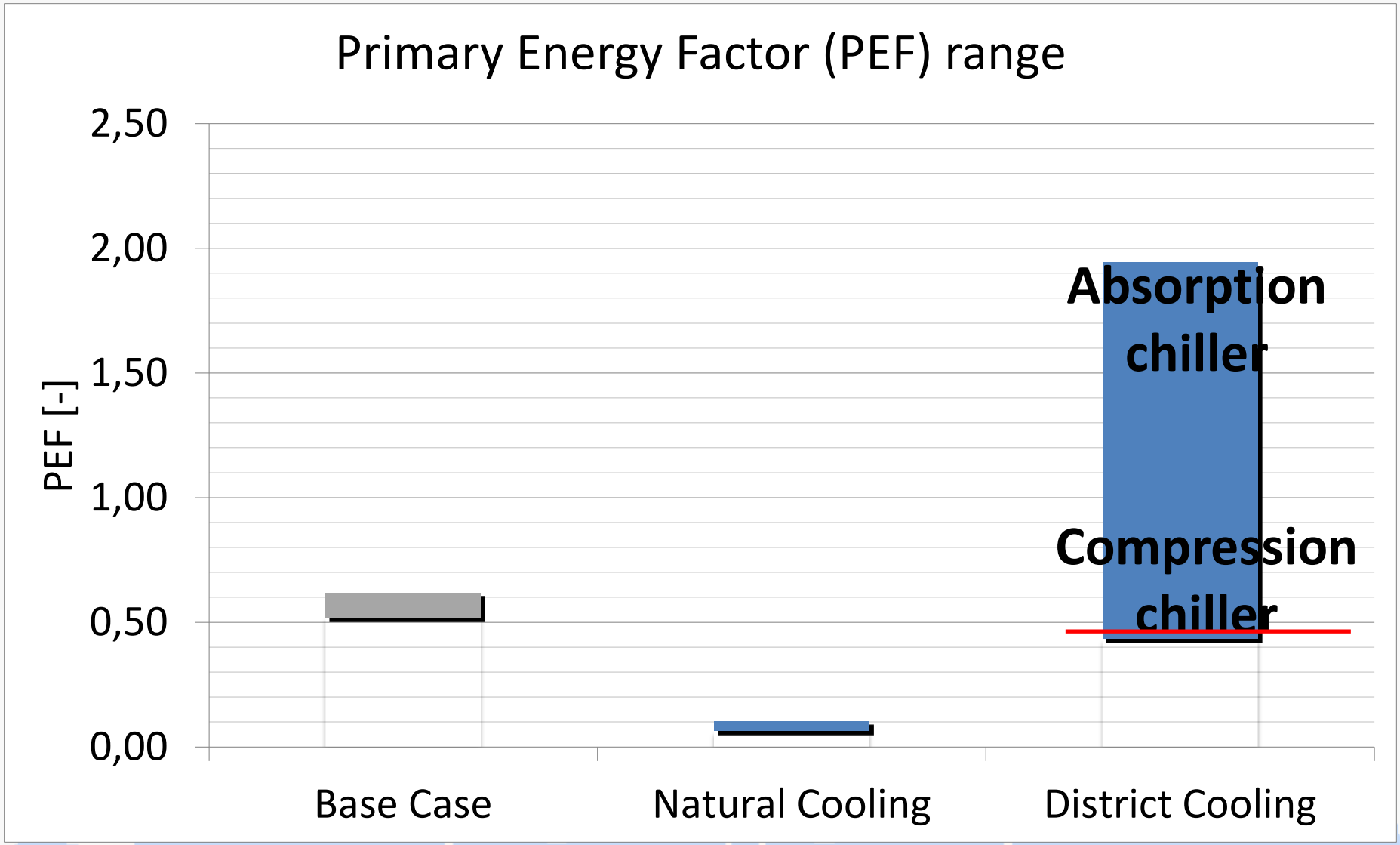

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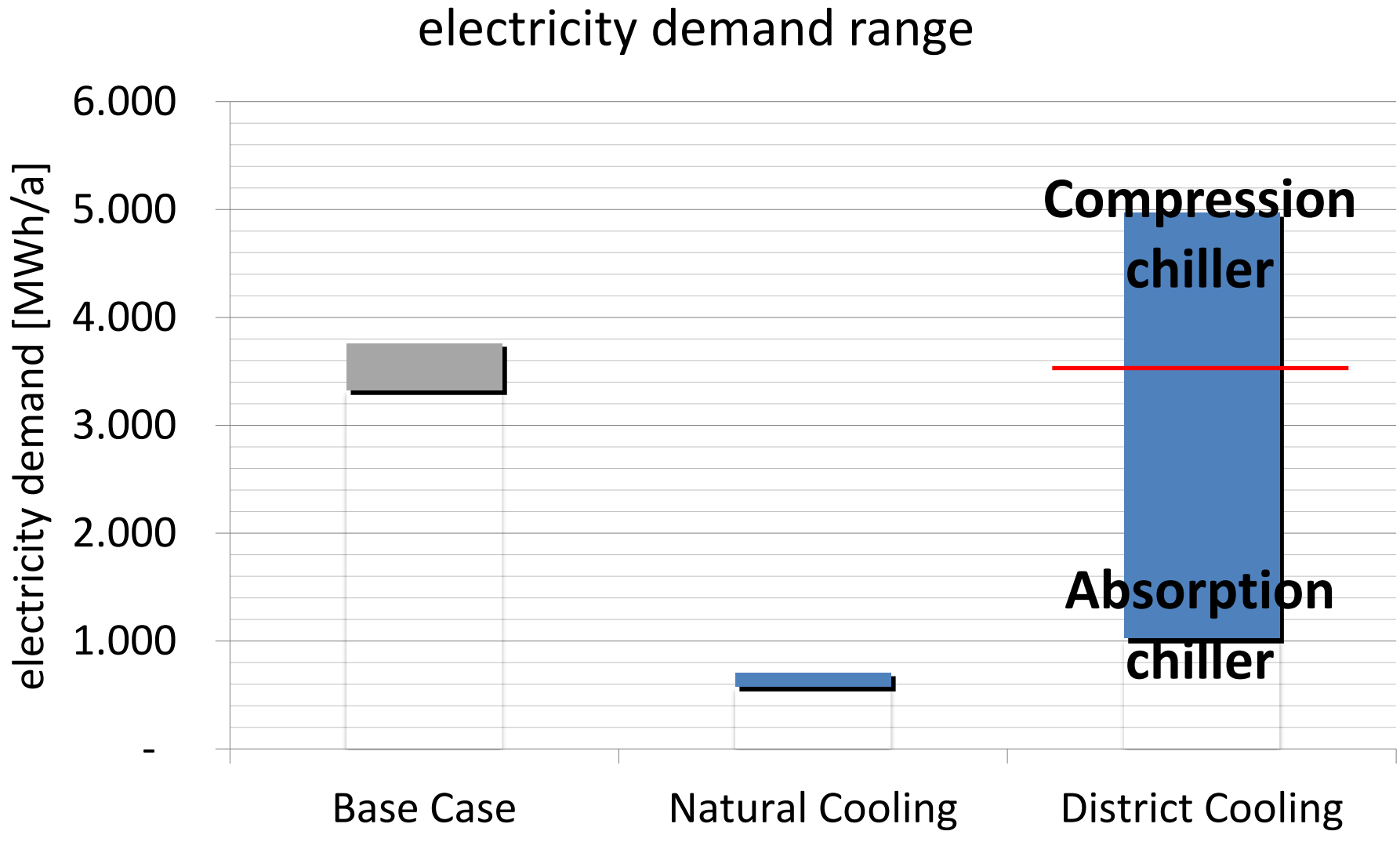

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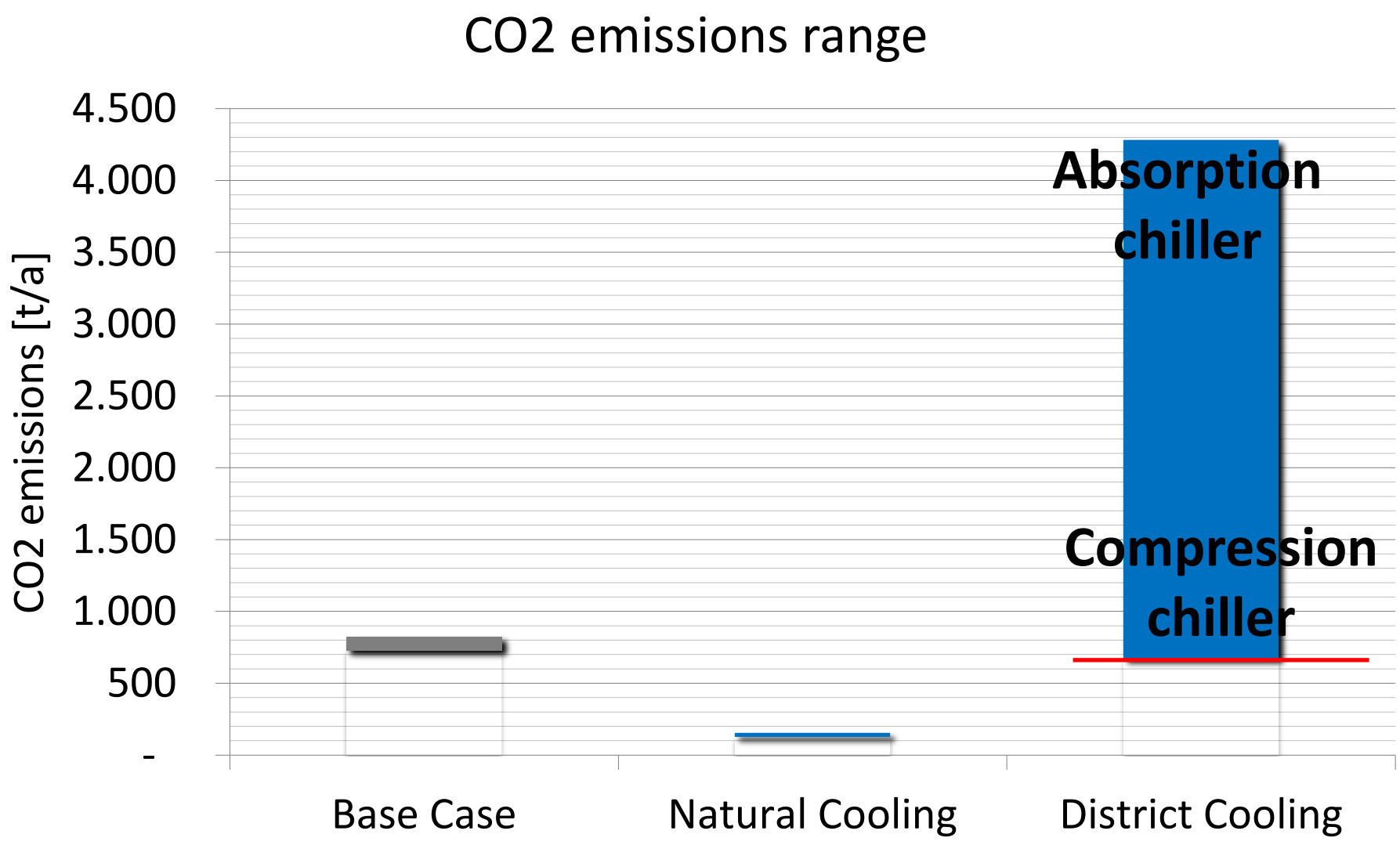

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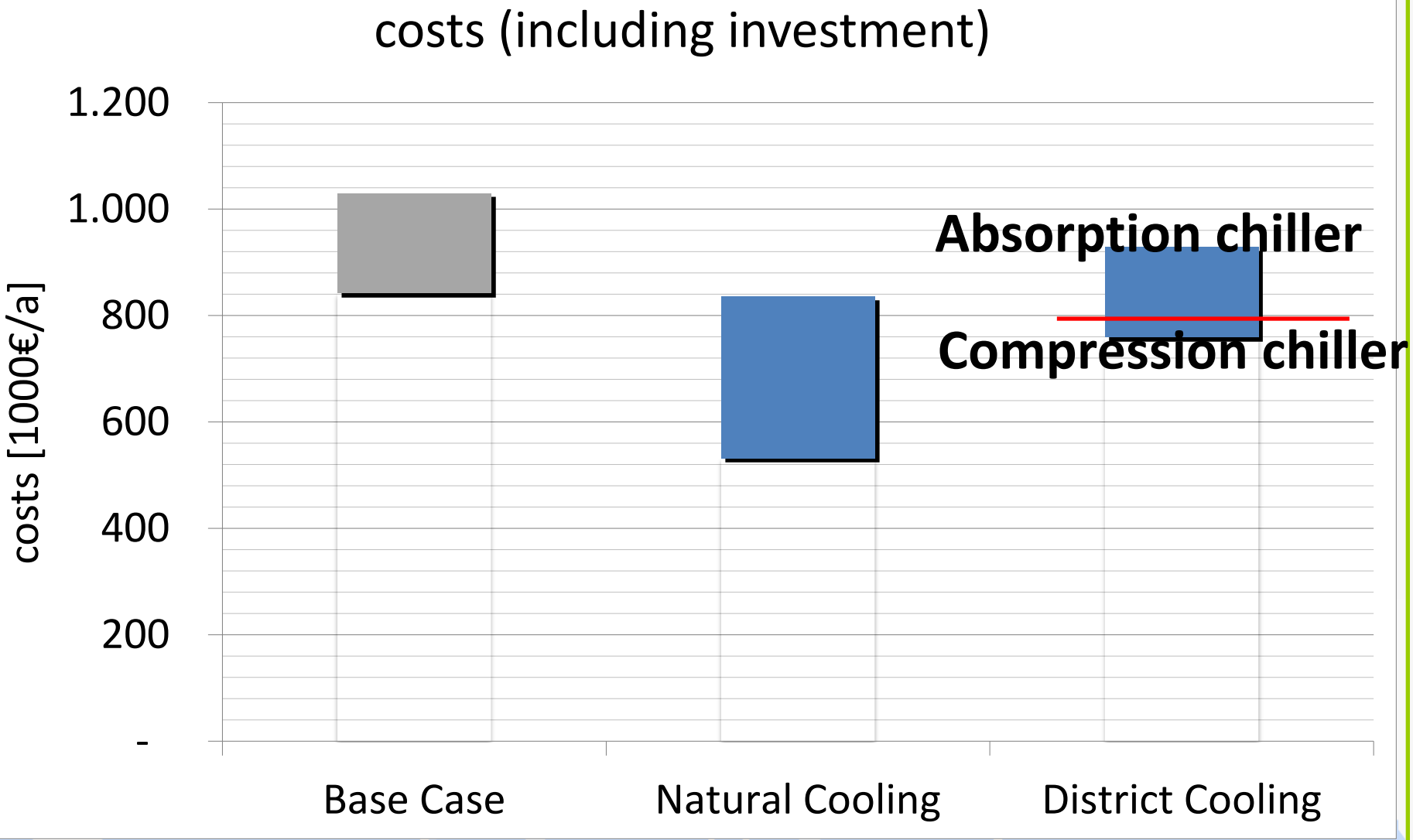

Thank you for your attention

Check your options:

http://www.rescue-project.eu/fileadmin/user_files/WP4_Reports/RESCUE_Calculator.xlsx

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