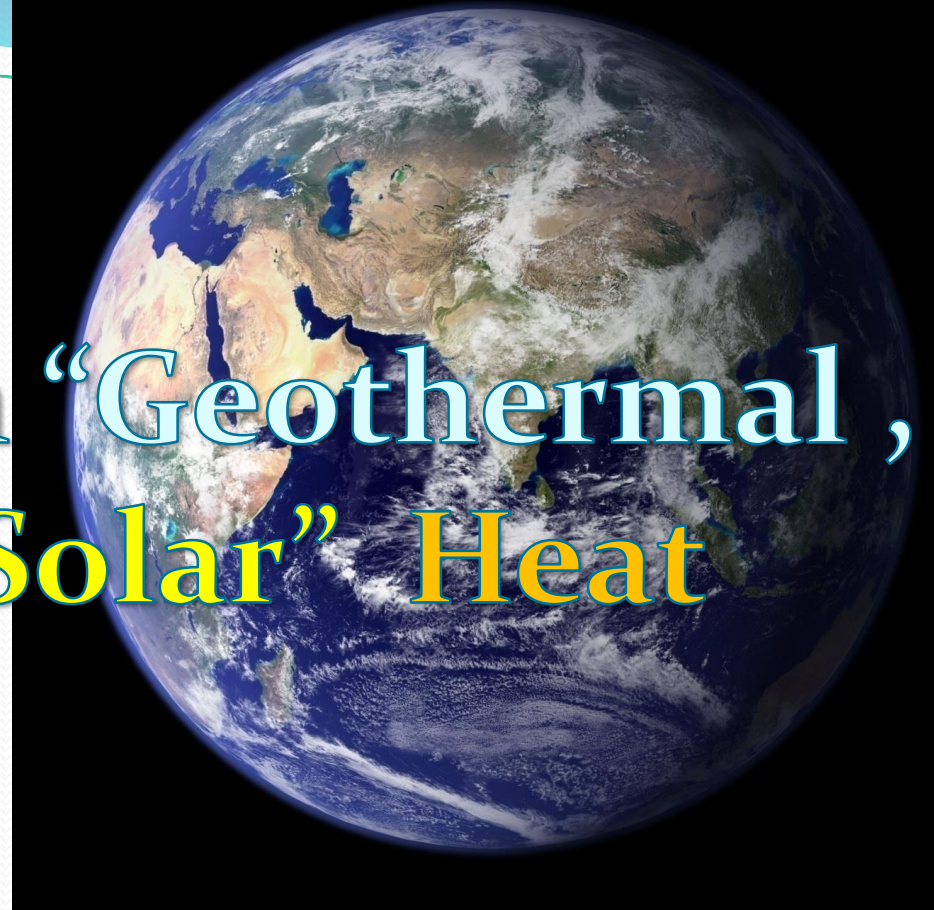


De Beijer RTB B.V



# Cooling with “Geothermal, waste or Solar” Heat



OTTI/ IEA-Task 53  
Rome 23 September 2015

# Introduction De Beijer RTB:

## Profile:

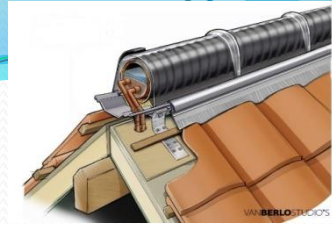
- Engineering company with 30 years of experience in renewable energy solutions and products.
- Many international cooperation's with institutes and universities.
- Various renewable energy products successfully launched to the market in the past.

## Main activity:

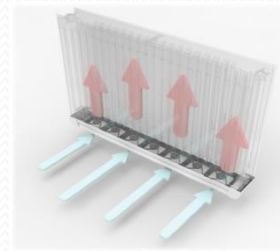
De Beijer RTB is mainly active in the field of Solar, thermo-chemical-energy storage and thermo-chemical conversion technology.

## Main projects:

Development, cost-effective pre-production method for SolabCool and ClimateBooster. Market introduction. Development and the pre-production SunRidge and thermo-chemical energy storage



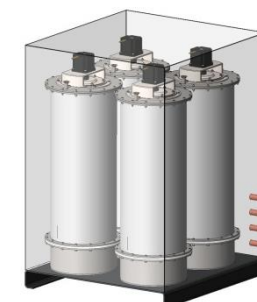
SunRidge



ClimateBooster

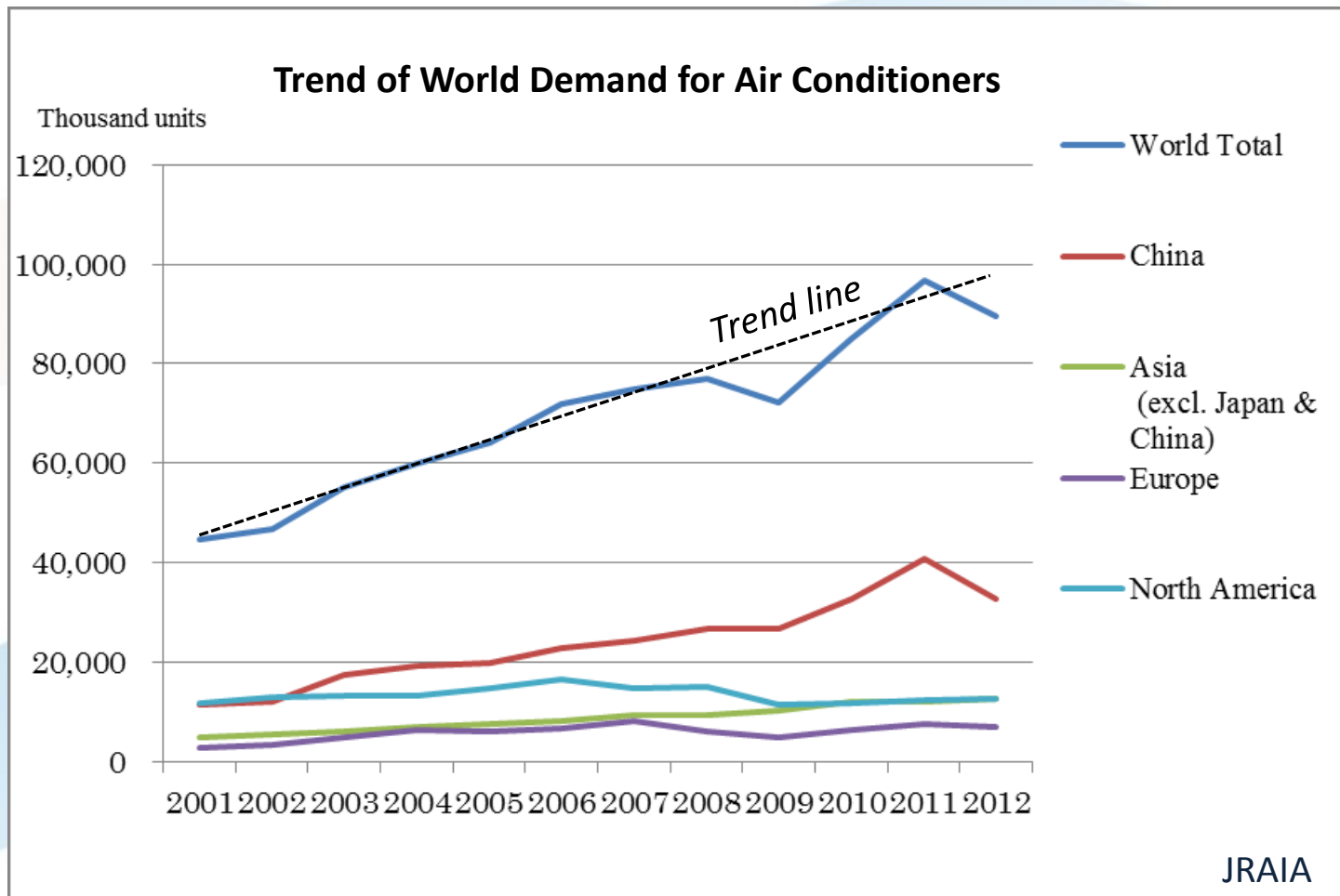


SolabCool



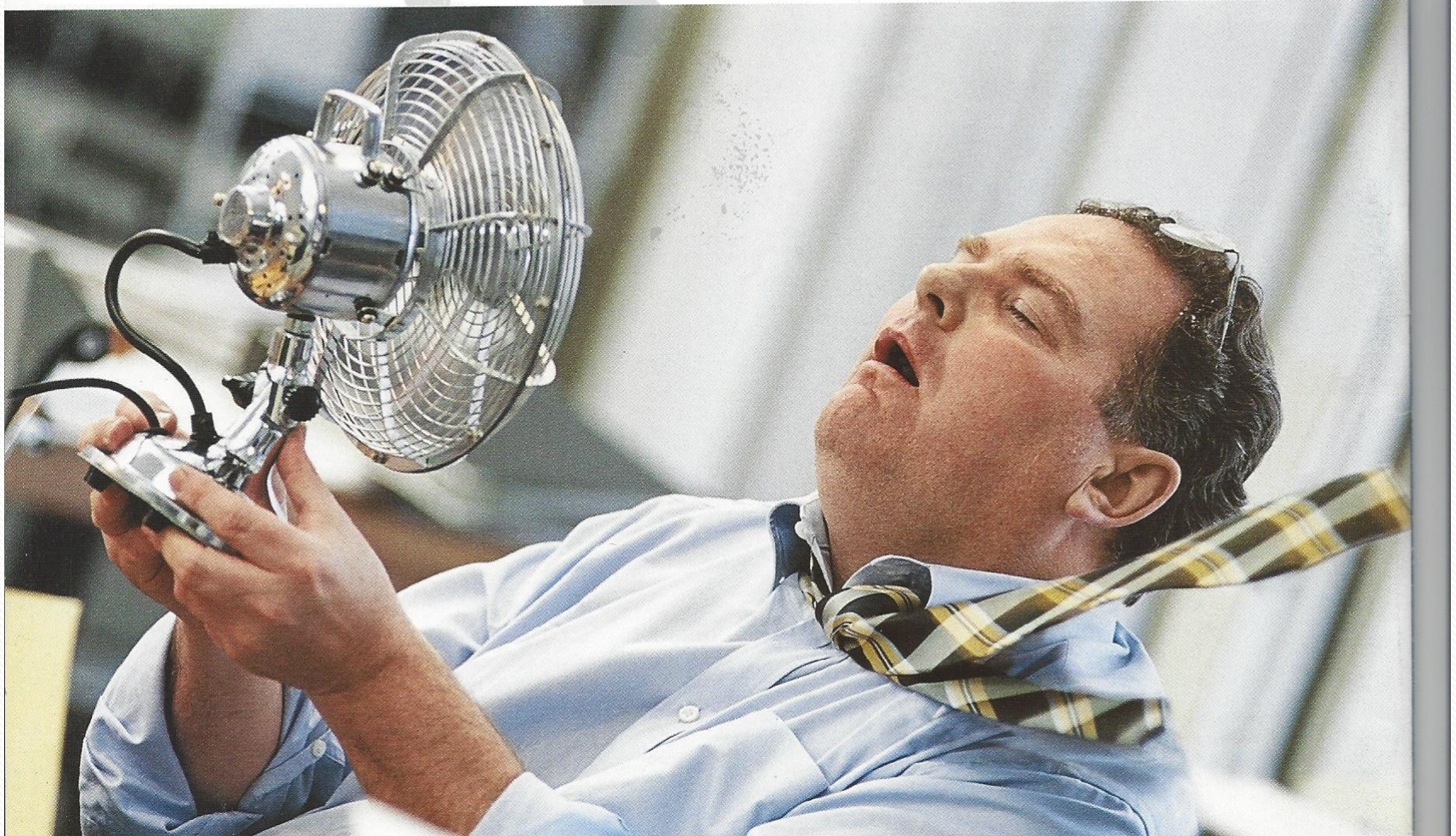
Thermo –chemical energy storage

# Growing Demand for air conditioning





# Problems with building cooling?



# Willes Carrier







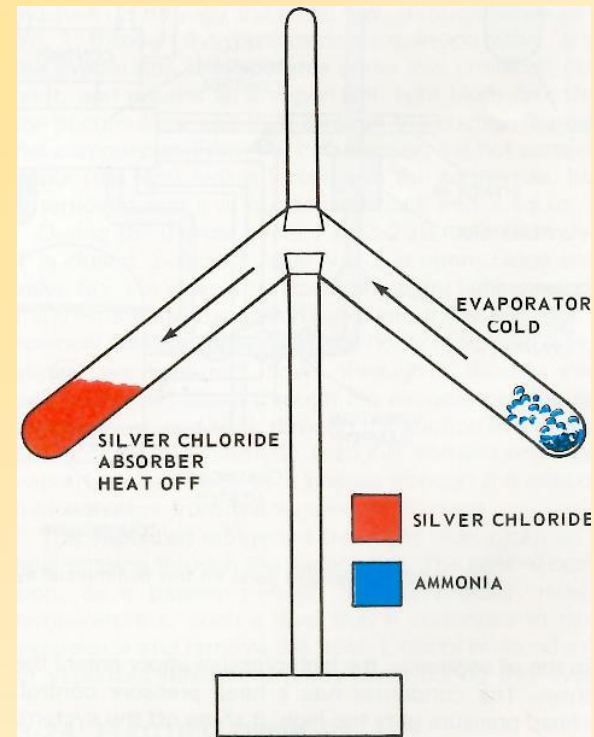
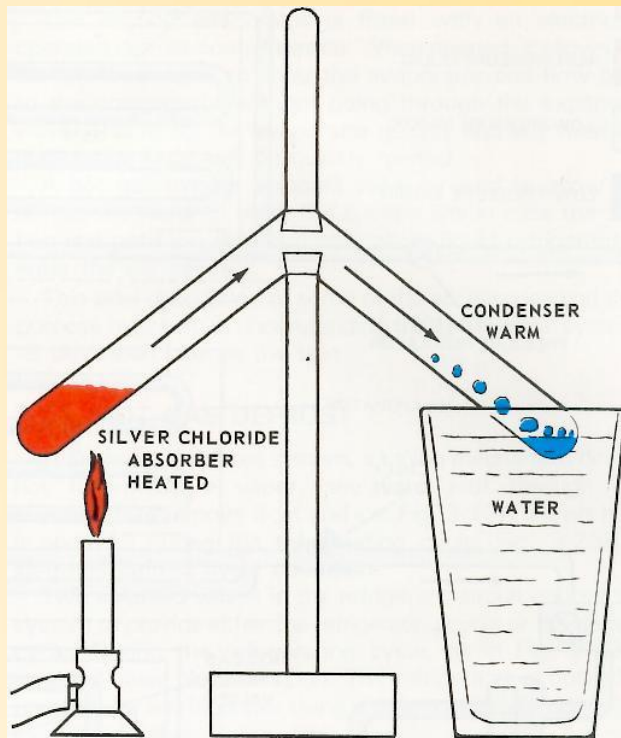
# Adsorption

It all started with Faraday in 1821


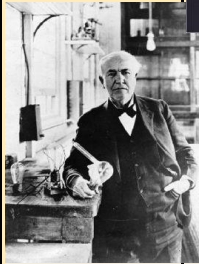




These machines adsorb the refrigerant into a solid  
It is a discontinuous (batch) process



**Michael Faraday** scientist and inventor (1791-1867)



# Development of refrigeration

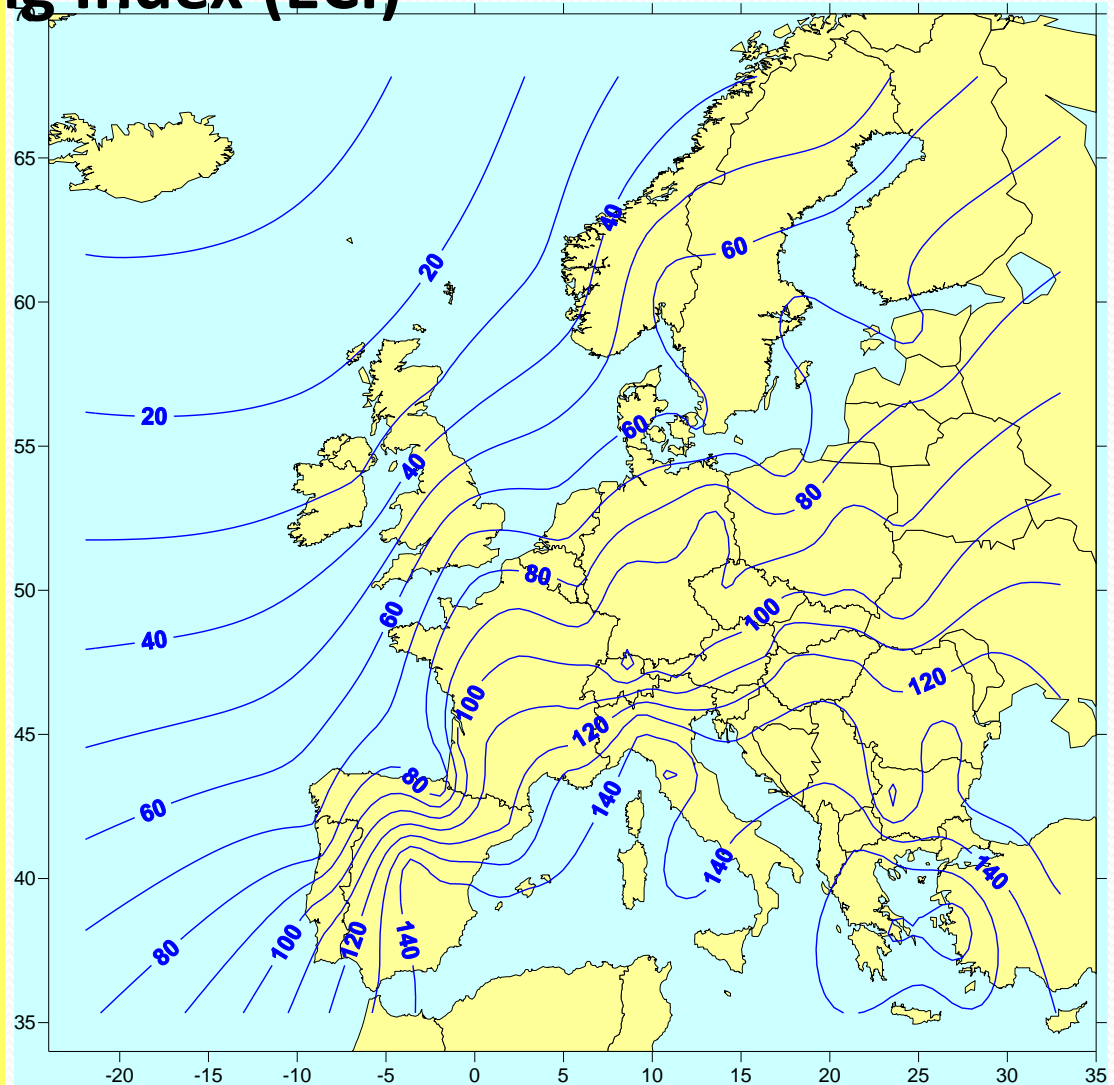
<b>Adsorptietechniek Michael Farrady</b>		<b>General Electric</b>	<b>Westinghouse</b>	<b>UTC/Carrier</b>	<b>Electrolux</b>	<b>ontwikkeling van Energie opslagsystemen</b> De Beijer RTB  KIC innoEnergy TKI-energiebesparing KP7/ Merits									
				<b>Compressie koelmachine Willes Carrier</b>	<b>Adsorptie techniek Baltzar von Platen en Carl Munters</b>	<b>Start ontwikkeling SolabCool</b>	<b>Oprichting SolabCool</b>	<b>Productie start SolabCool</b>							
<b>1800</b>	<b>1821 1823</b>	<b>1882</b>	<b>1893</b>	<b>1902</b>	<b>1922</b>		<b>1970</b>	<b>1973</b>	<b>1987</b>	<b>1999</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
	<b>Ontwikkeling van de electromotor Michael Farrady</b>	<b>Ontwikkeling electriciteit net Thomas Edison</b>	<b>Ontwikkeling van het wisselspanningsnet George Westinghouse en Nikola Tesla</b>				<b>Rival van adsorptie tgv wereldwde energie crisis</b>	<b>Tepidussysteem door E-A-Brunberg</b>	<b>Overname van Tepidus door De Beijer RTB</b>	<b>Oprichting van SWEAT</b>					



## The European Cooling Index (ECI)

European cooling index (ECI) in a contour map computed from information from 80 urban locations in Europe.

The average space cooling demand should be proportional to this index.



# *Waste heat potential*

- The waste heat potential in the Netherlands is around 100 PJ per year (CE Delft).
- This equals one third of the heat consumption of Dutch households.

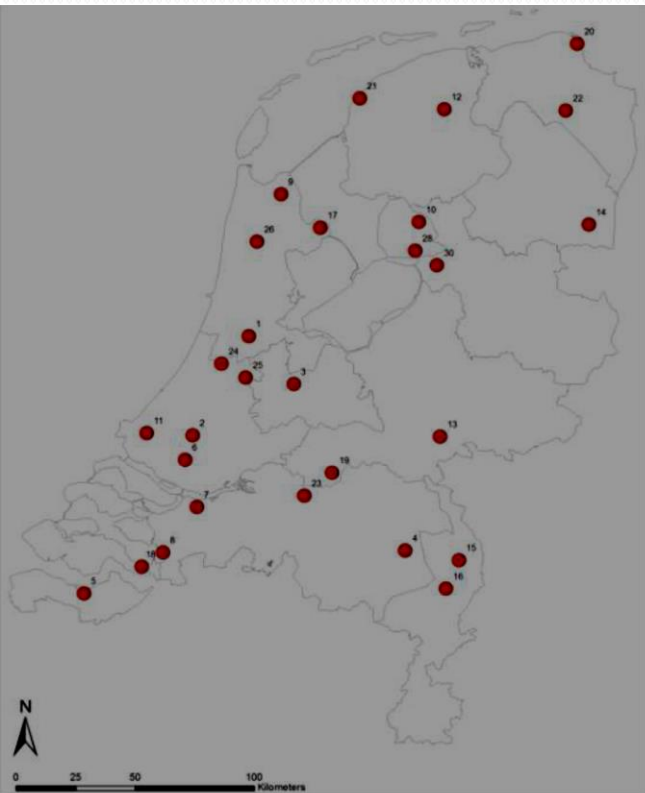
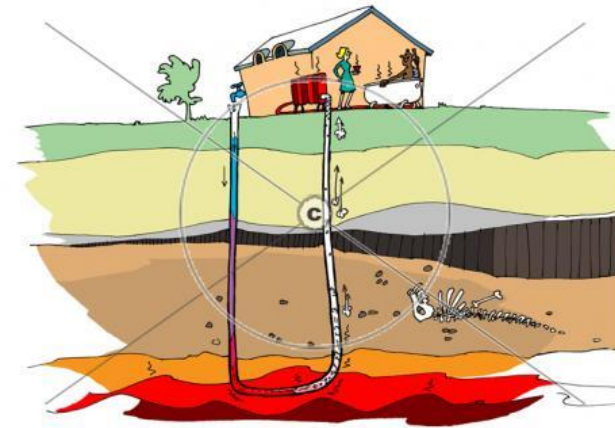


# Geothermal in Nevis – Options in Saba, Dominica, Guadeloupe etc.





# 11000 houses in groningen(NL)



Nr	Locatie	Toevoeging
1	Aalsmeer e.o.	
2	Bleiswijk e.o.	"B-driehoek", Zuidplaspolder
3	Vleuten, Harmelen	
4	Deurne	
5	Terneuzen	
6	Zuidhollandse eilanden	Hoeksche Waard/Voorne Putten
7	Moerdijk	
7a	Dinteloord	nieuw te ontwikkelen
7b	Made	nabij Amer centrale
8	Bergen op Zoom	
9	Wieringermeer	"Agriport A7"
10	Lutteleest	
11	Westland	
12	Berlikum	
13	Huissen/Bemmel	"Bergerden"
14	Klazienaveen	+ Erica
15	Horst a/d Maas	"Californie"
16	Maasbree	"Siberie"
17	Omgeving Enhuizen/Andijk	't Grootslag
18	Omgeving Rilland	
19	Zaltbommel e.o.	Bommelerwaard
20	Omgeving Eemshaven	
21	Sexbierum	
22	Hoogezand-Sappemeer	
23	Elshout	
24	Roelofarendsveen	
25	Nieuwkoop	
26	Heerhugowaard	
28	Ens	
30	Koekoekspolder	

## Glastuinbouwgebieden

Onderwerp: Locatie  
 Referentie: 61335/WN  
 Auteur: MB  
 Datum: 26-9-2011  
 Status: definitief



# IEA Task 28 groep energy storage and geothermal





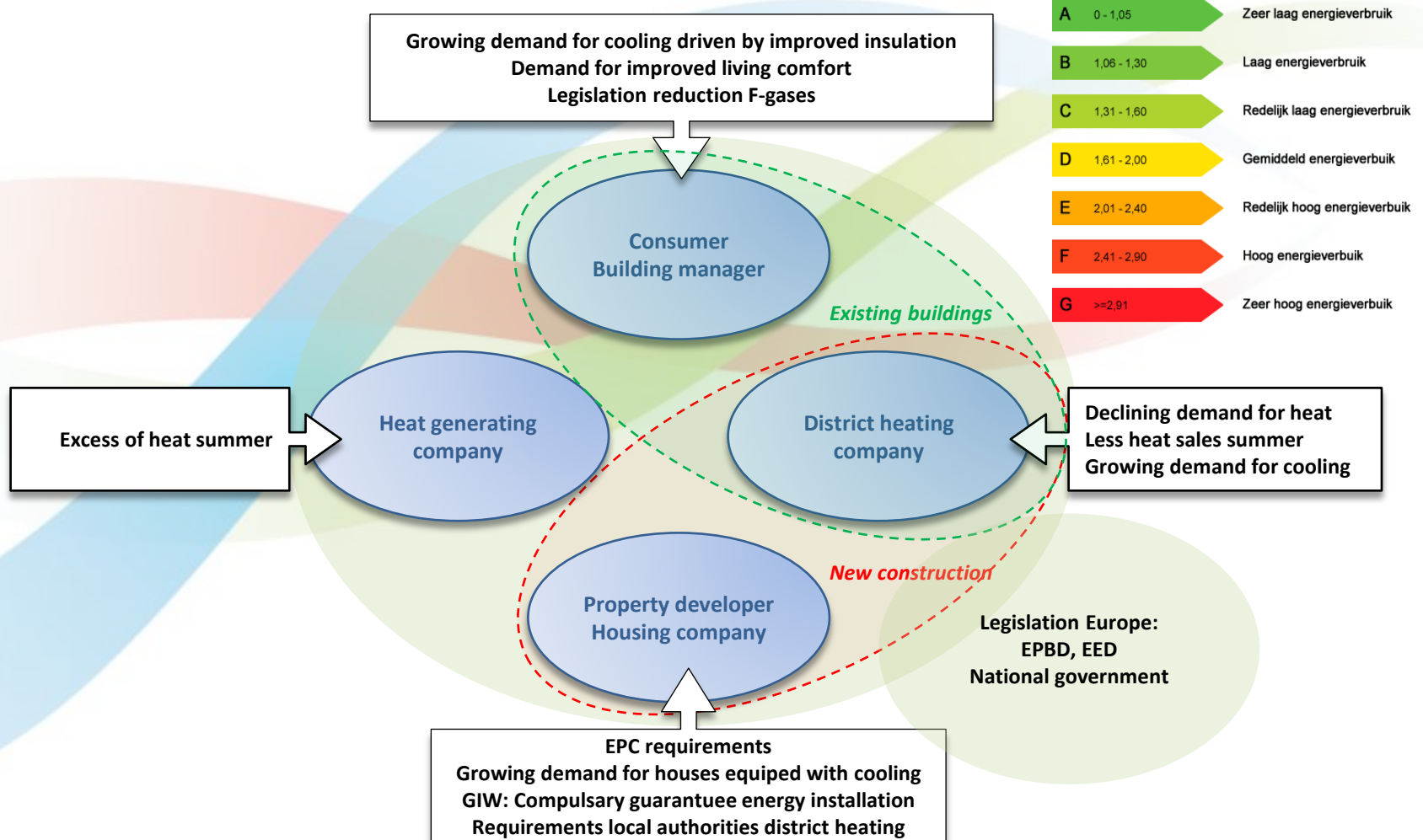
# *Solar island District heating 'Almere'*



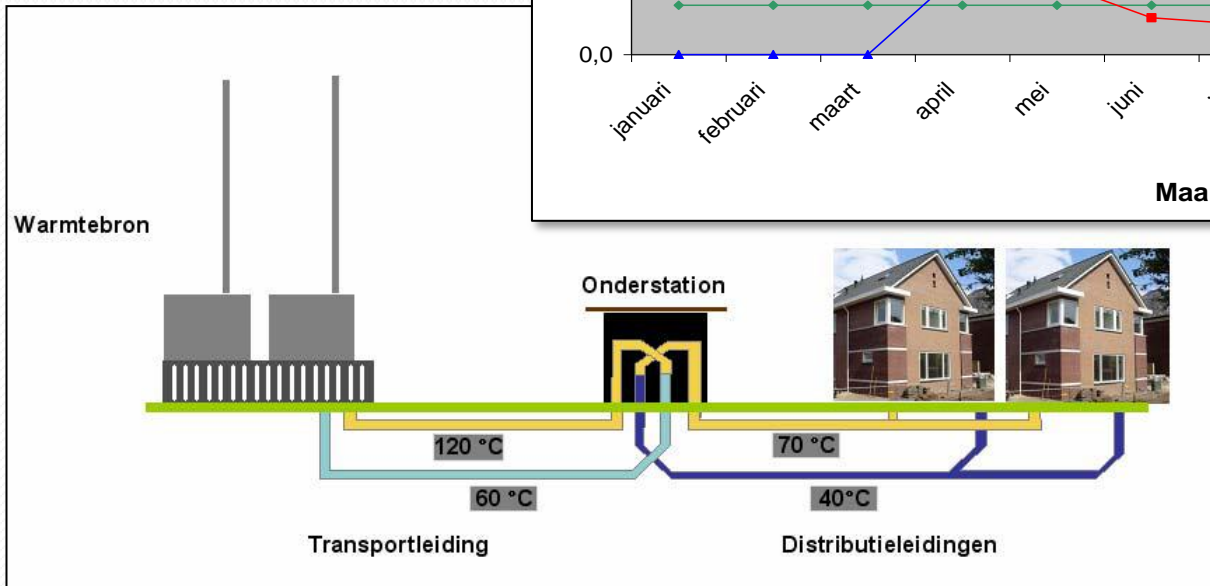
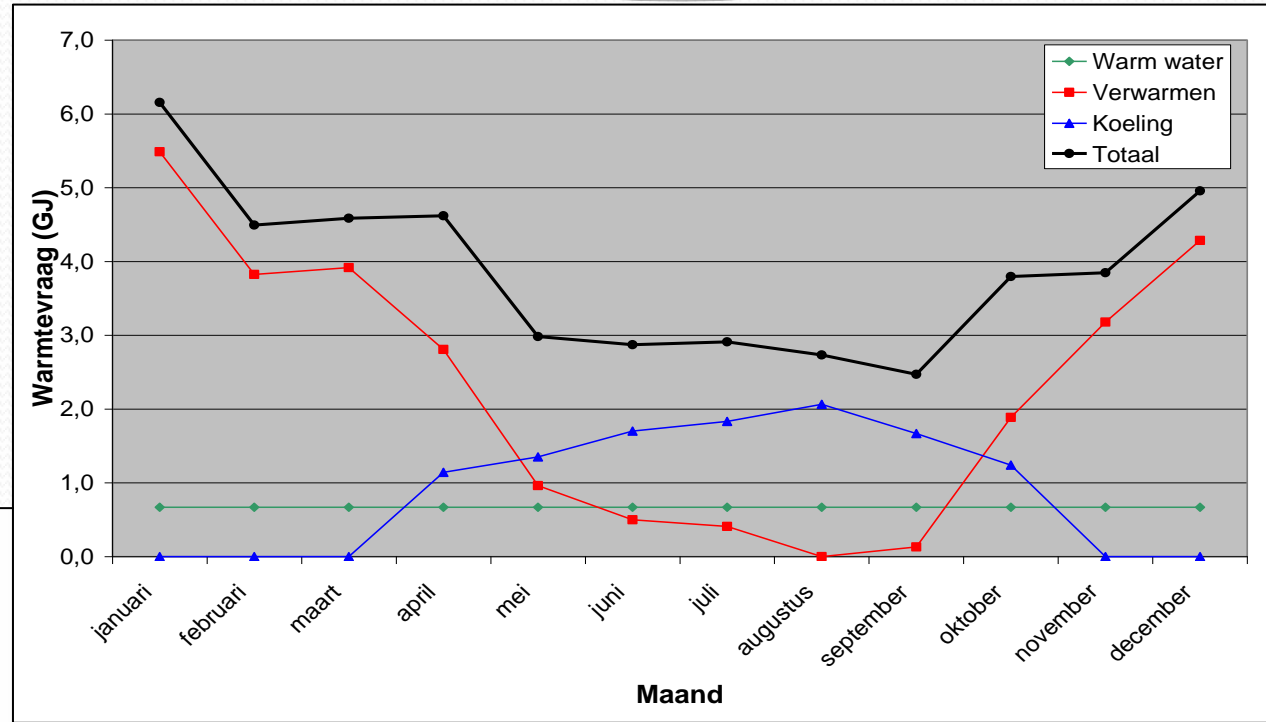
**Flat Plate Collectors 7000 m<sup>2</sup> Production 10,000 GJ/y at 75 C**



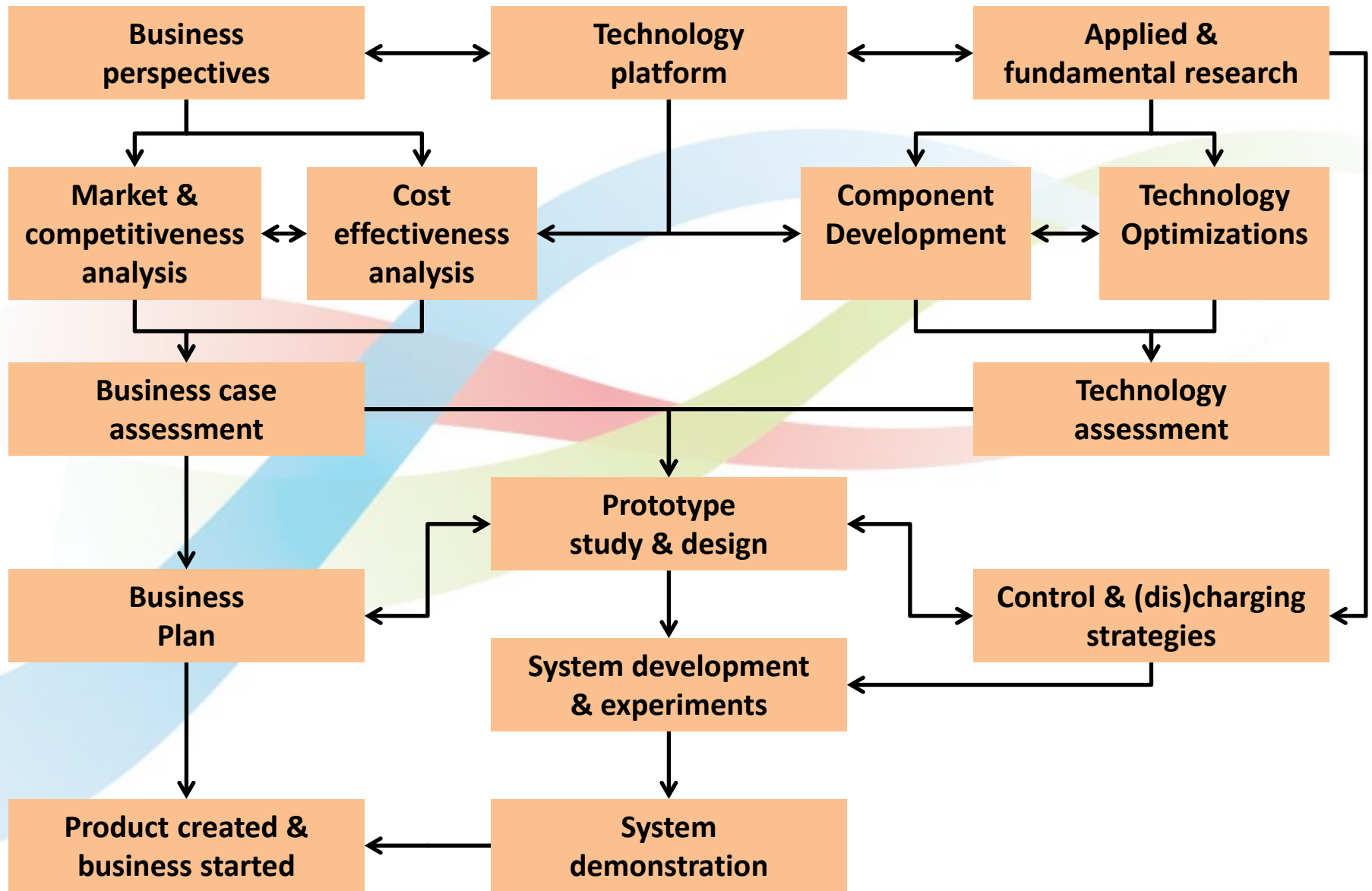
# Key players and marketdrivers



# District heating: excess heat in summer

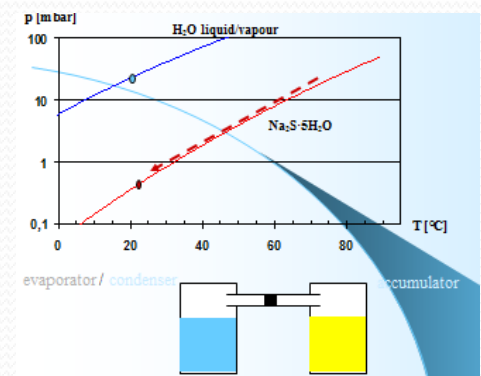
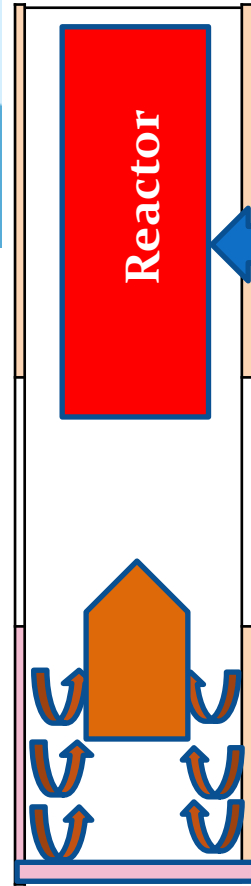
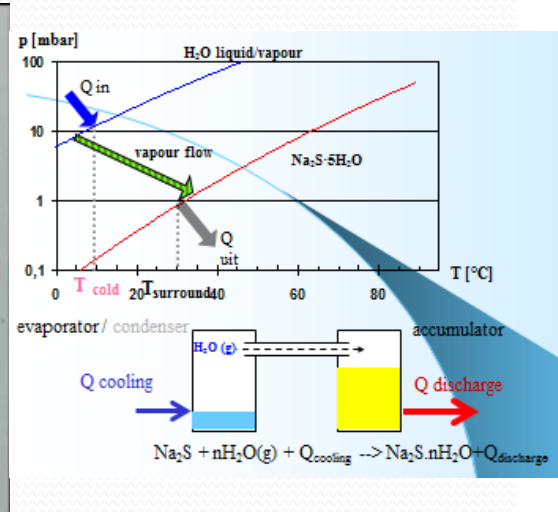
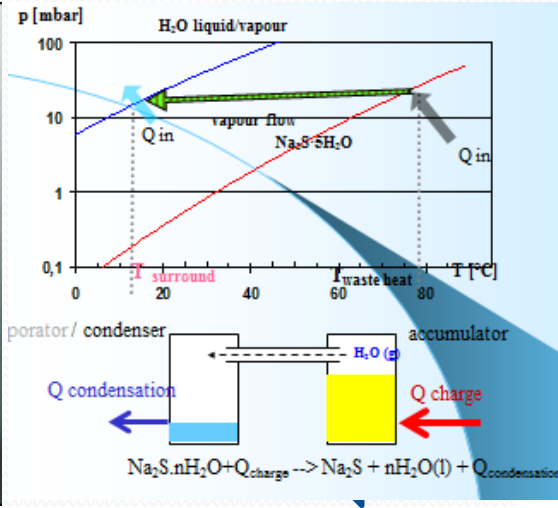


# Process flow

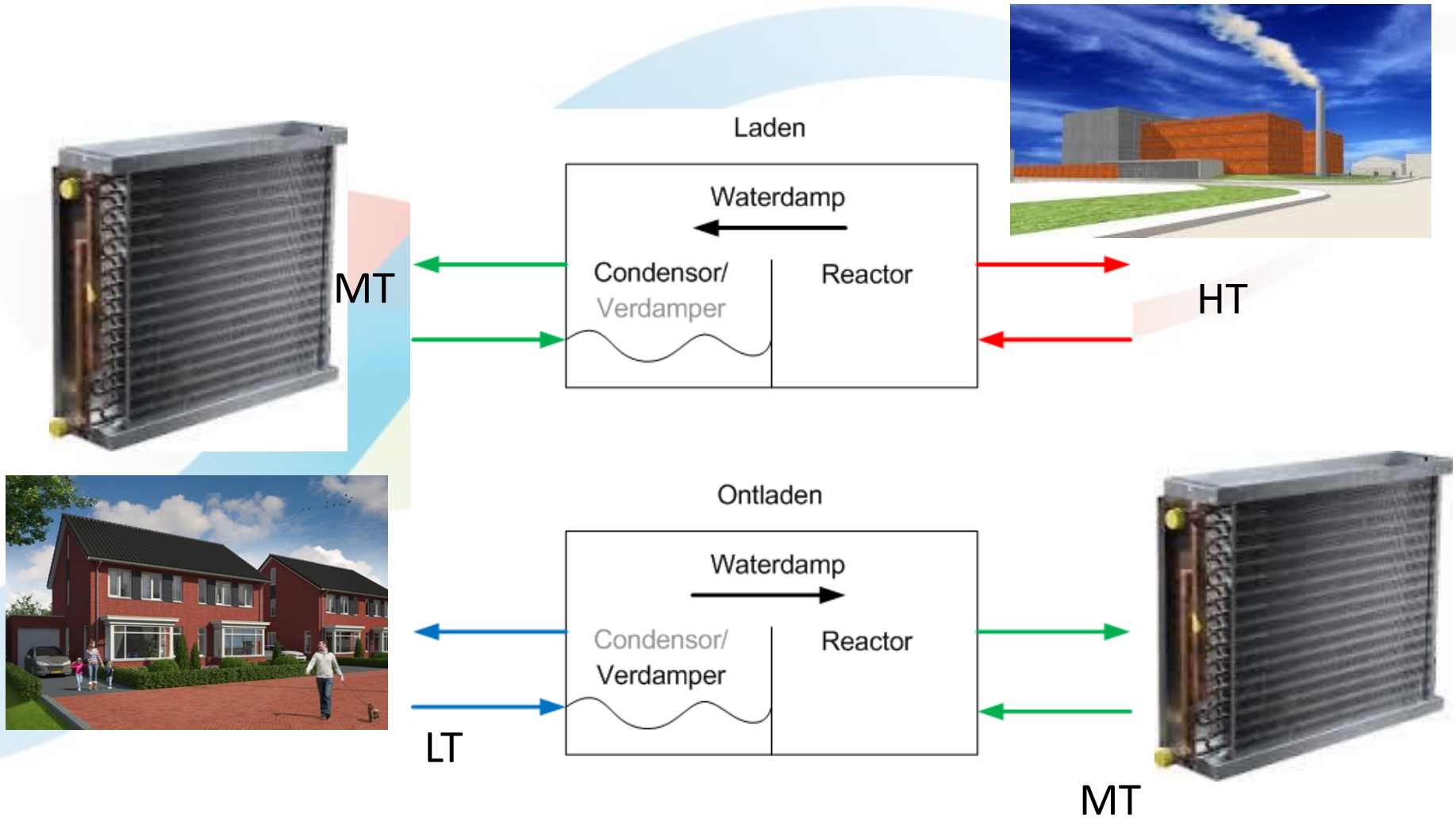




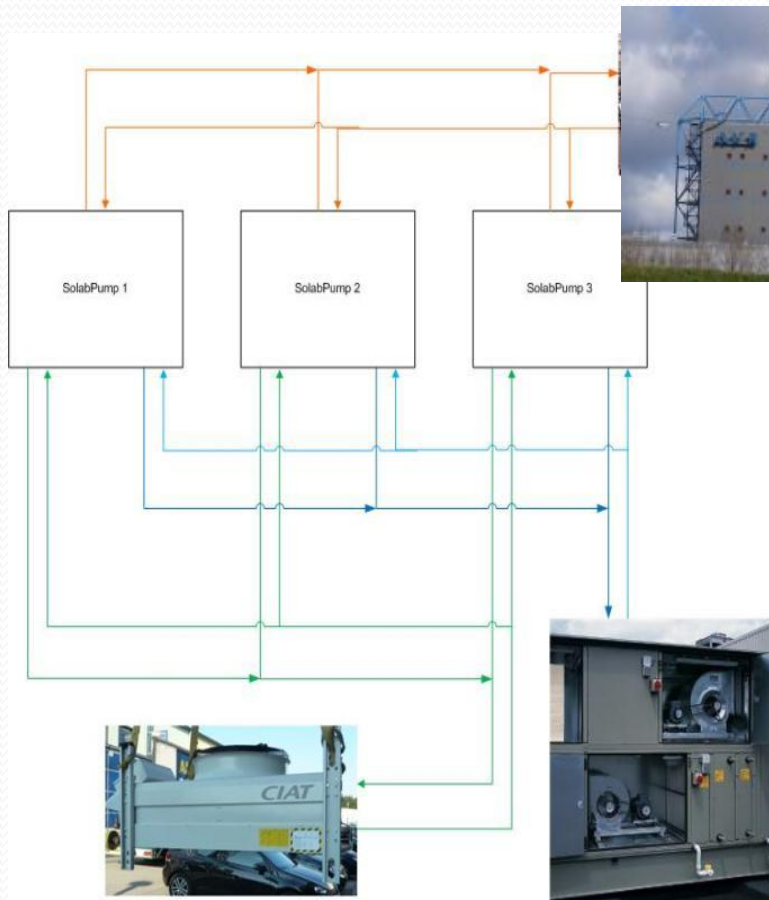
# Energy storage and conversion



# Discontinious adsorption process

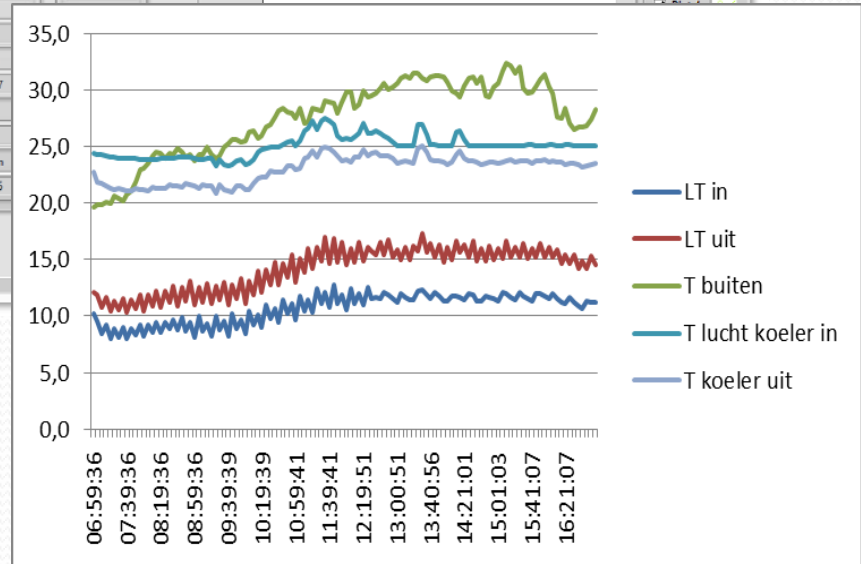
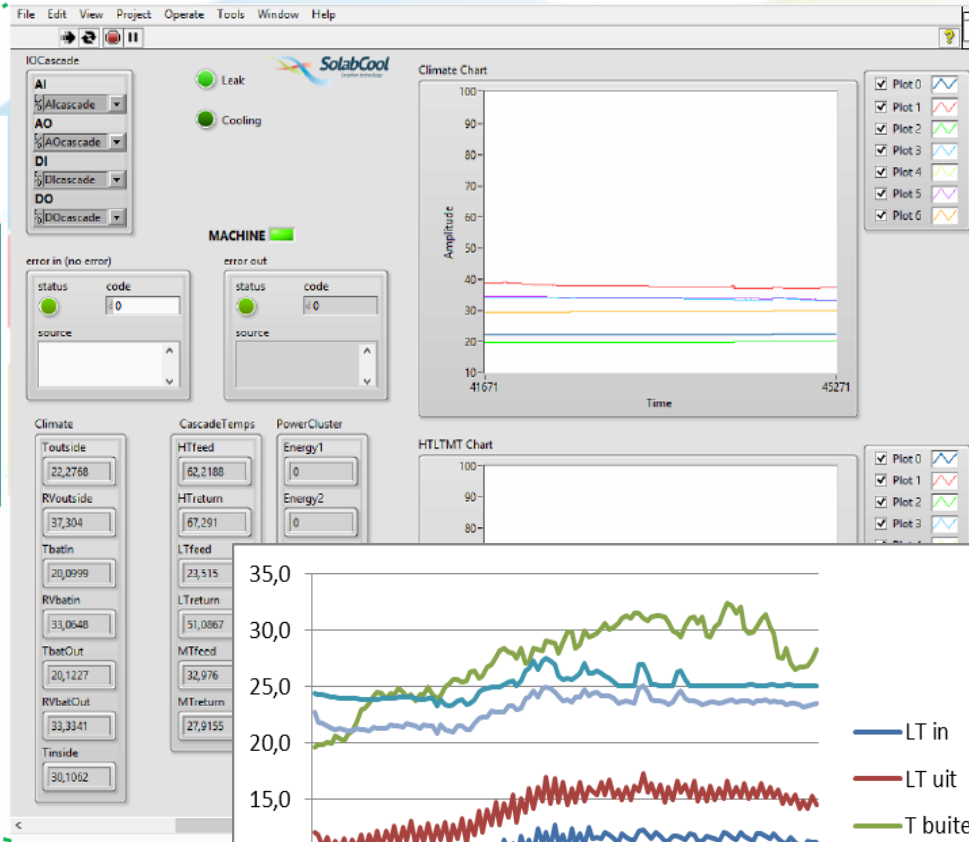
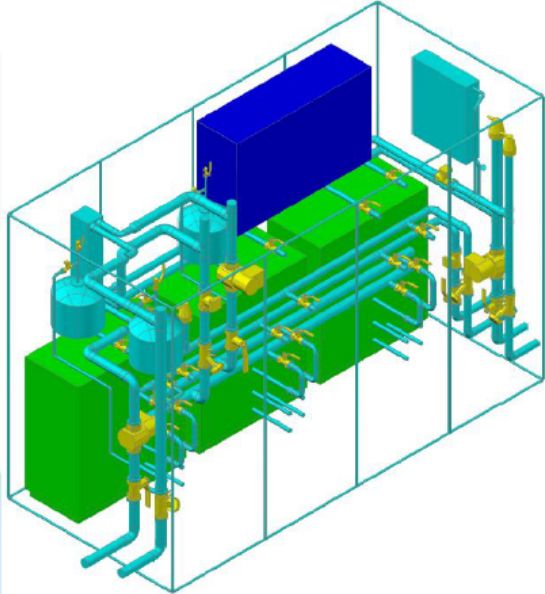


# Cooling office building incineration plant

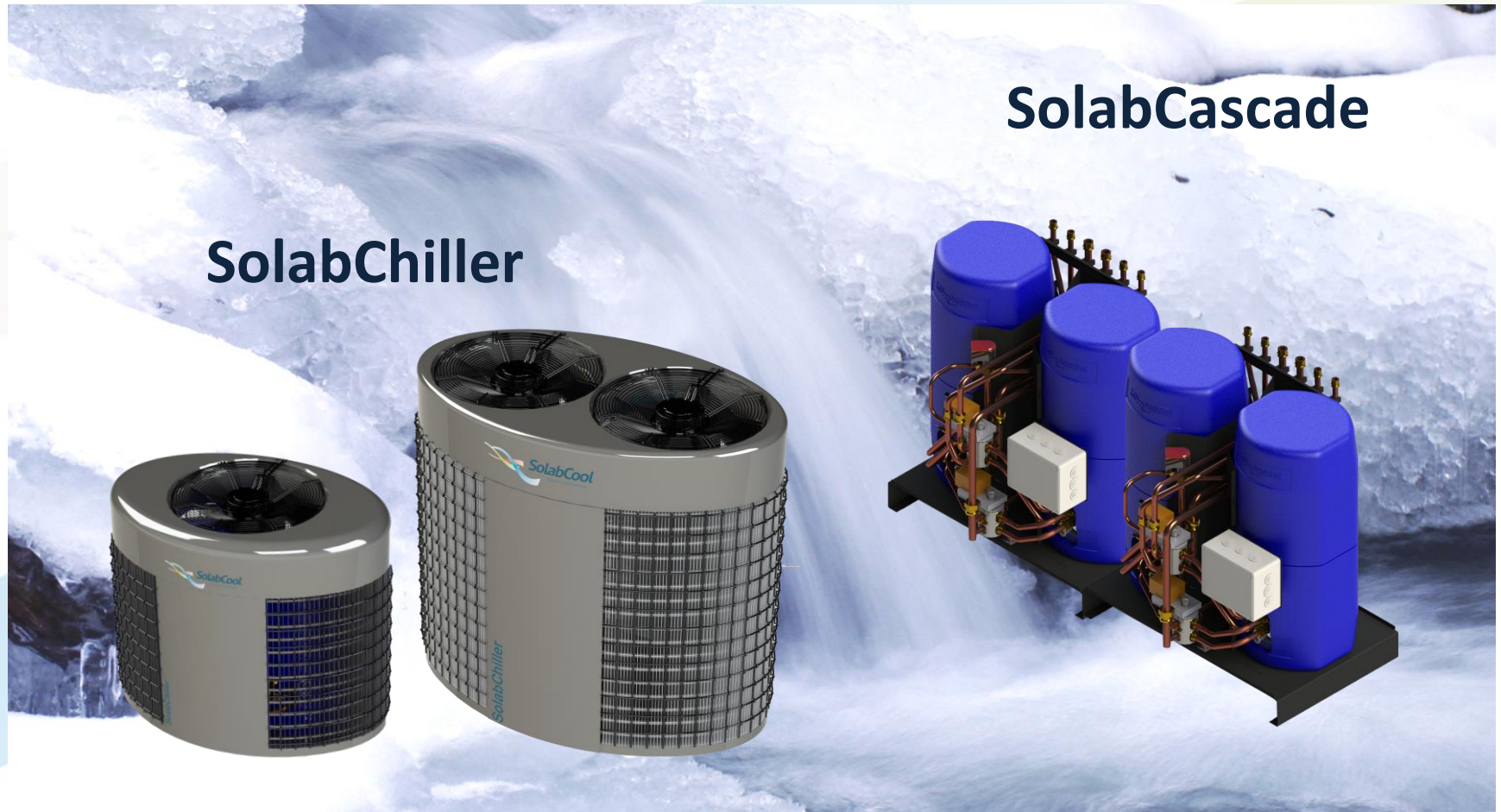




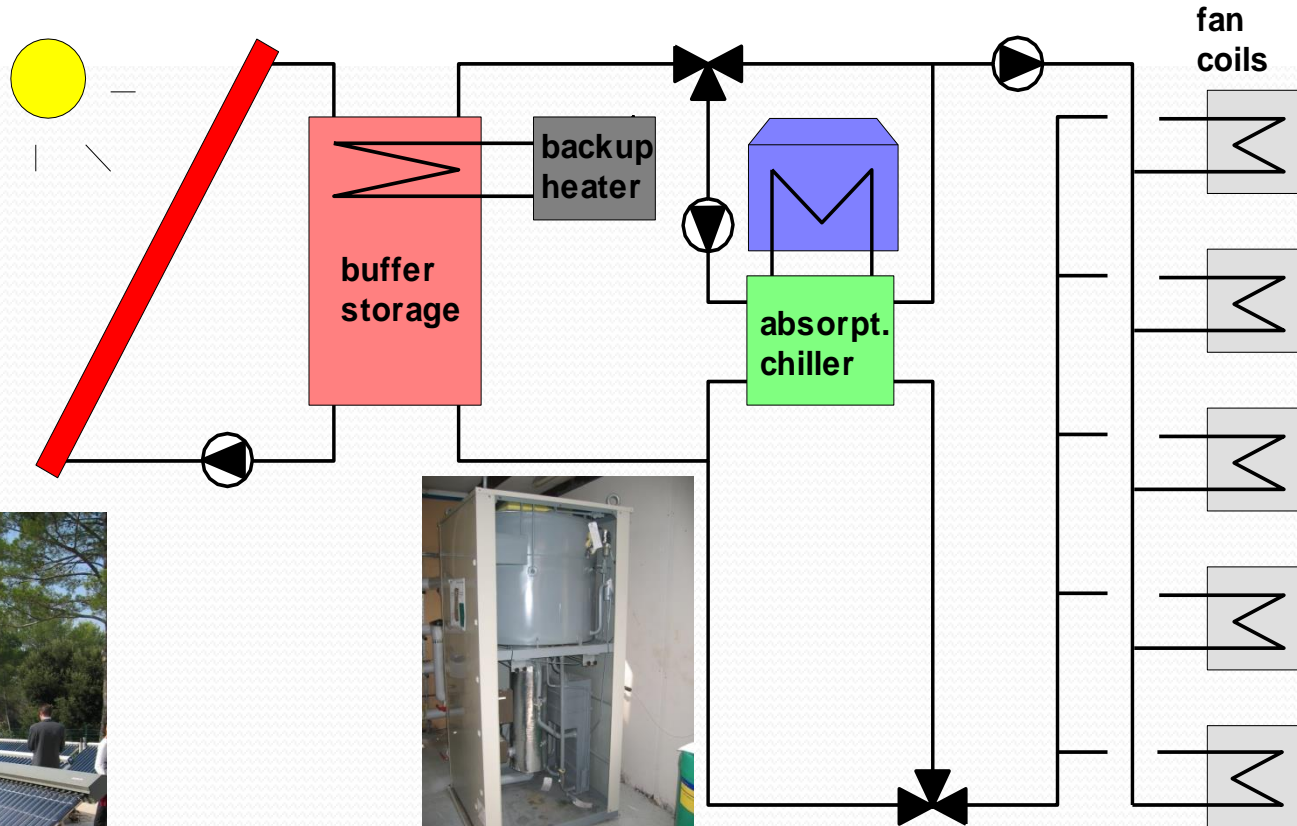
# Solabcascade Monitoring



# *SolabCool product range*



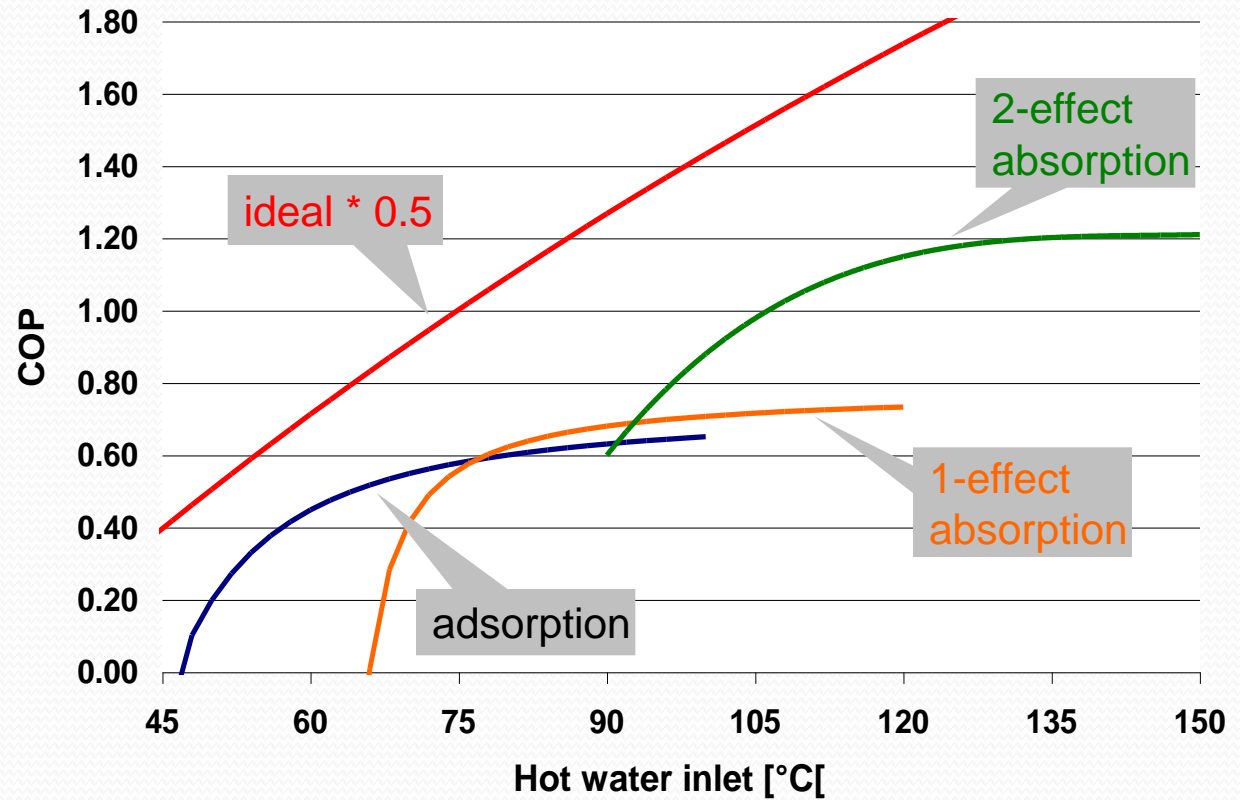
# Fan-coil system – single-effect absorption chiller





# COP of heat driven water chillers

temperature of chilled water: 8°C  
temperature of cooling water: 28°C



# Heat-driven cooling

Zonne-energie



Warmtenet



Warmtekracht-koppeling



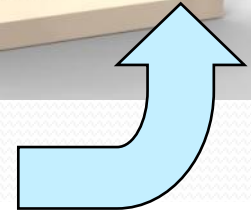
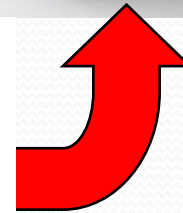
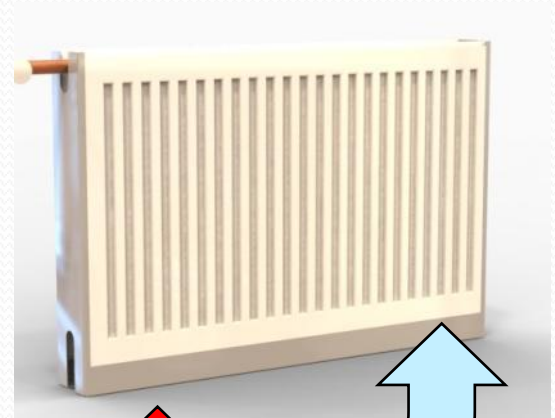
**SolabCool**  
The best comfort with pure energy

# Energy density of the materials

	<i>Storage options</i>				
	Hot water	Phase change materials	Thermochemical	Electical Batteries	Chemical Looping
Storage density ( dT= 50°C)	< 0.2 GJ/m <sup>3</sup>	< 0.3 GJ/m <sup>3</sup>	~ 1 GJ/m <sup>3</sup>	~ 1 GJ/m <sup>3</sup>	~ 3 GJ/m <sup>3</sup>
Storage duration	Day	day-year	day-year	minites-months	day-year
Storage	Thermal	Thermal	Thermal	Electrical	Electrical > thermal
Cycling efficiency	~ 70%	~ 90%	~ 90%	75%	70%



# Solar/Heat /Cold storage distribution system



## *Benefits for you*

- Optimal use of excess ,solar or geothermal heat
- Up to 90% reduction of electricity use compared to conventional air conditioning
- Improved return heat grids due to heat sales summer
- Up to 90% CO<sub>2</sub> reduction depending on heat source
- Dutch manufacturer with extensive know-how
- Cooling without fluorinated gases
- Easy integration existing system heat/cold distribution
- Limited maintenance and long lifetime

- De Beijer RTB

[www.ares-rtb.nl](http://www.ares-rtb.nl)

- SolabCool

[www.SolabCool.com](http://www.SolabCool.com)

- SWEAT

[www.Sweatbv.nl](http://www.Sweatbv.nl)

- Tel

+31 26 3120289



**Cool Energy with SolabCool Technology**  
Consortium:  
Provincie Gelderland | Gemeente Duiven  
AVR | SolabCool | E.nu Veluwe | Hollander techniek



# Company 'Principles'

- ***Spirit***
- ***Reliability***
- ***Flexibility***
- ***Innovation***
- ***Fun***



*It's our Competence that makes the difference*