IEA SHC Task 48 6th expert meeting

Quality assurance and support measures for Solar Cooling

DHW/Cooling hybrid strategy for solar cooling :

One full year monitoring results in South of France

Daniel MUGNIER – Kingston, 12/05/2014

Targeted building description

Montpellier Heating and System net utilities
=> System owner

TECSOL : engineering company

AXIMA GDF SUEZ : Company in charge of the works

Building A view

Existing Building block in ZAC Jacques Coeur in Port Marianne area (Montpellier, France, built in 2010)

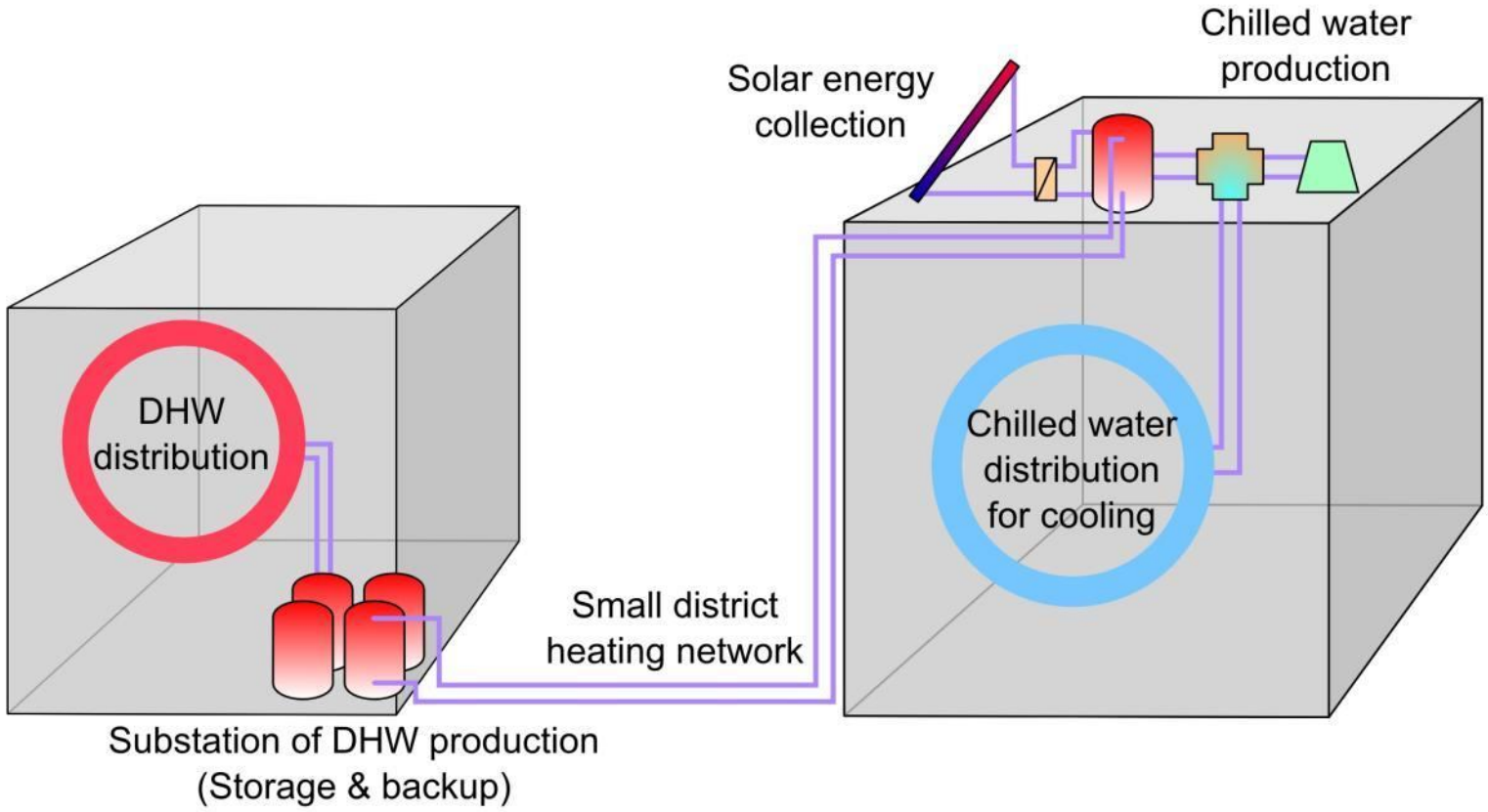
2 parts : building A & B (mini district)

Building A : 11 000 m² for offices and shops

Building B : 10 600 m² with 167 dwellings

Buildings situation

Hydraulic principle



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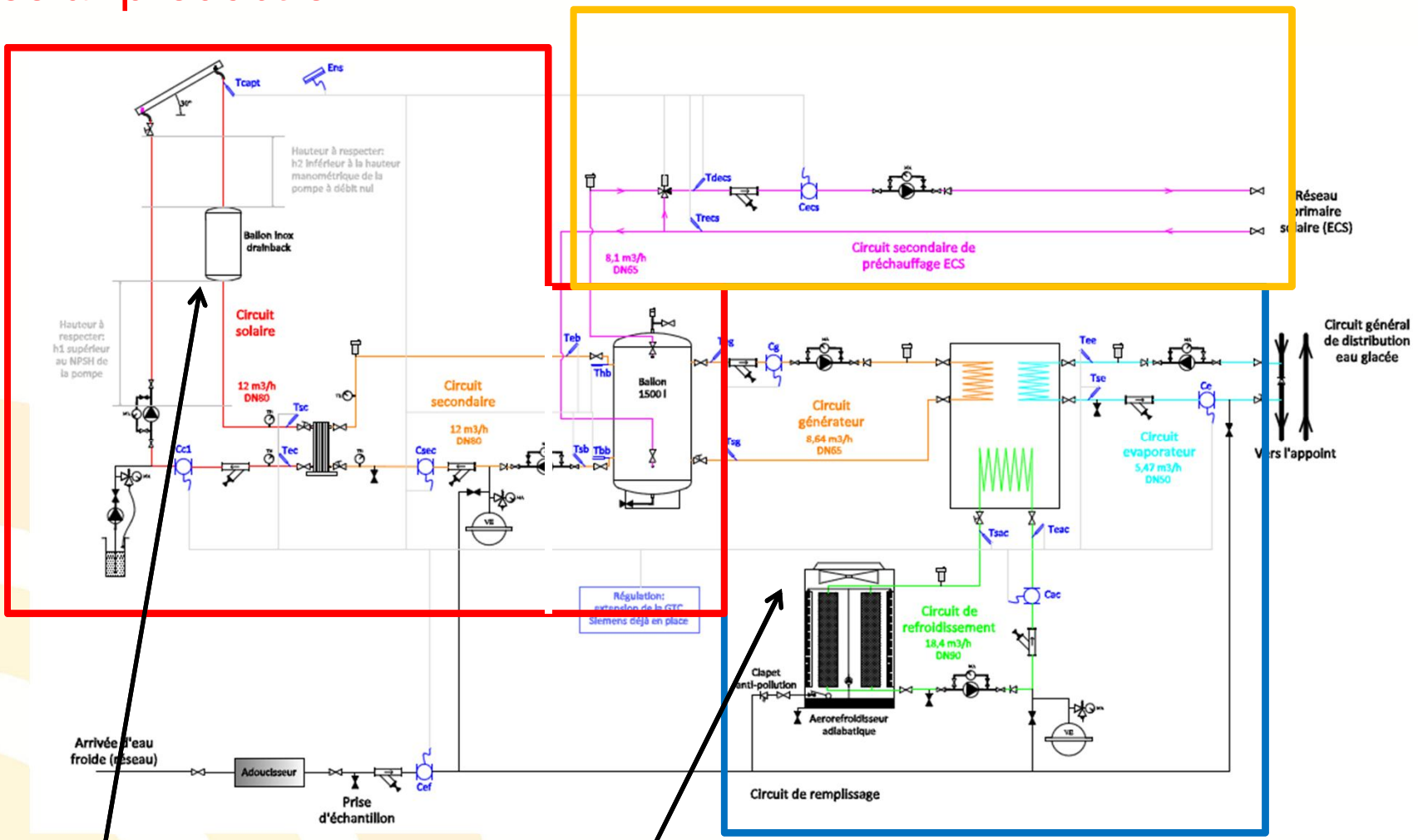
Hydraulic scheme

Solar production

DHW distribution



Drainback system

Cold production

Anti legionnella adiabatique cooling tower

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Monitoring results in DHW mode

DHW monitoring results for a Winter day

Date	18 march 2013	
Energies		
Available solar energy	1491,28	kWh
Collected solar energy (secondary circuit)	563,48	kWh
Solar DHW distributed (after the buffer tank)	494,17	kWh
Electrical energy consumed	12,29	kWh
Ratios et calculations		
Collector & Heat exchanger yield	37,78	%
Buffer tank yield	87,70	%
Installation yield (from solar to DHW)	33,14	%
Electrical COP	40,22	-

Energies and energies ratio for March 18th 2013

The installation performances on a sunny day in March are quite good with **an electrical COP reaching 40**

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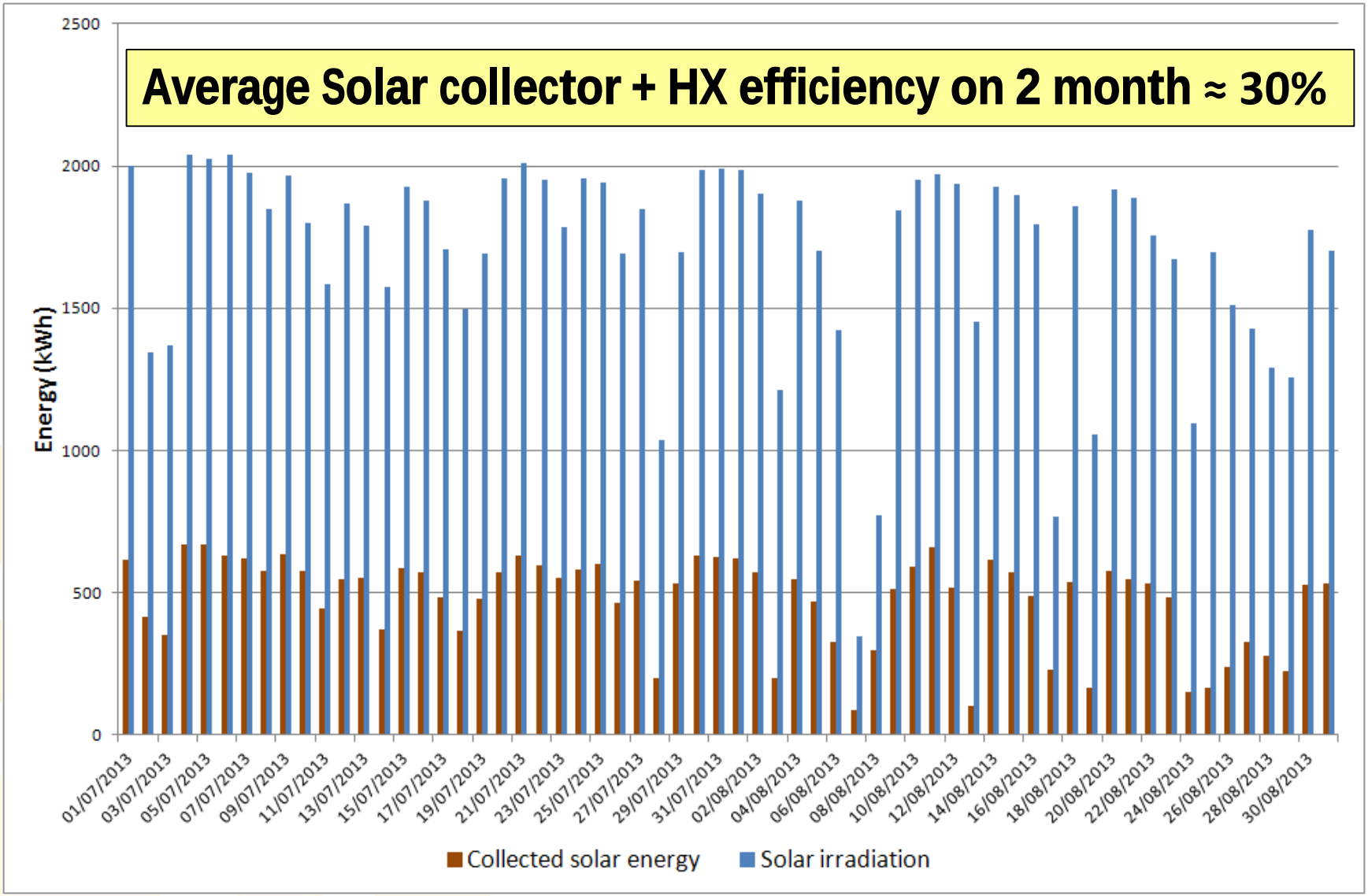
Monitoring results for Summer 2013



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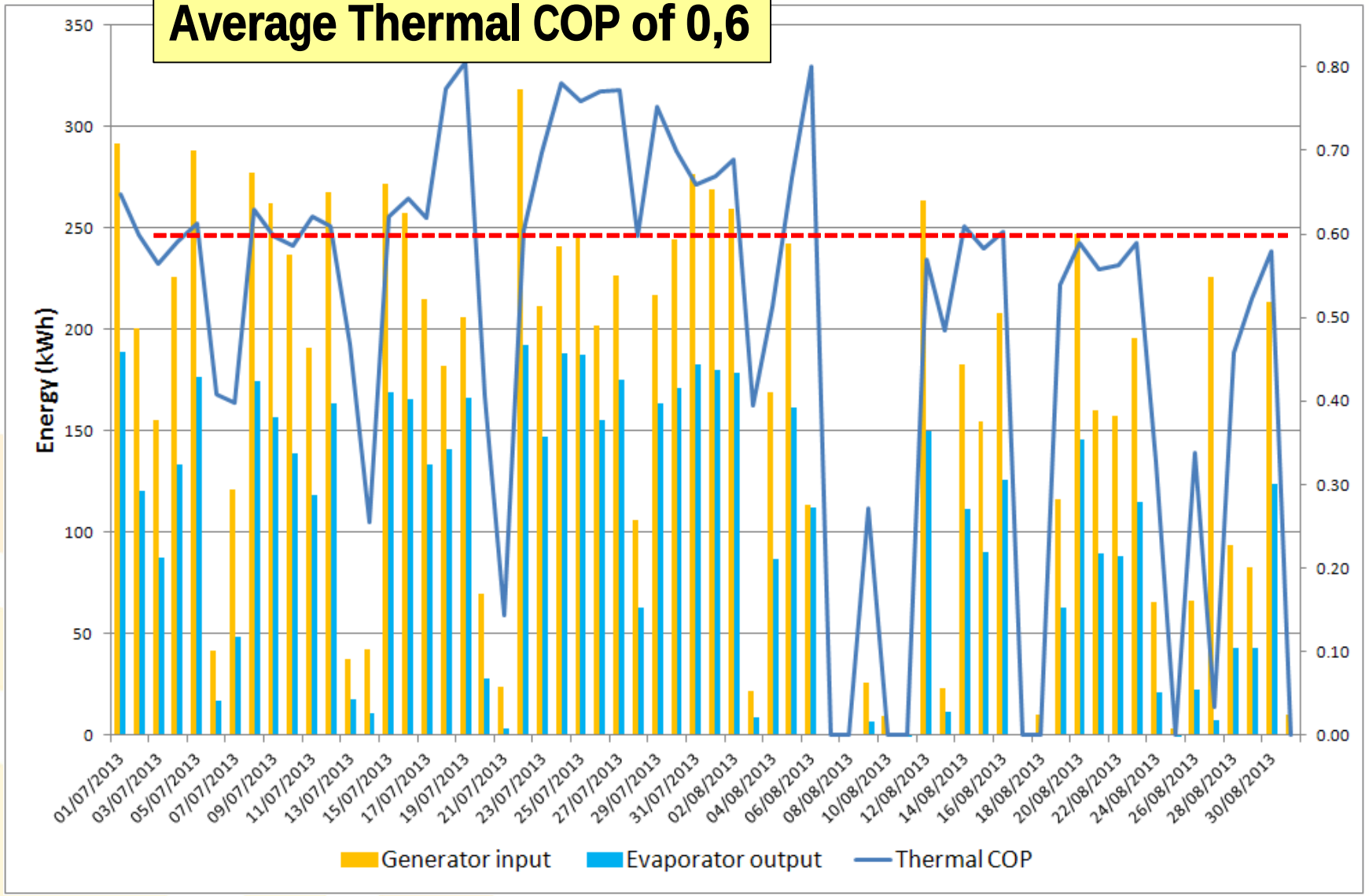
Monitoring results for Summer 2013

Average Thermal COP of 0,6



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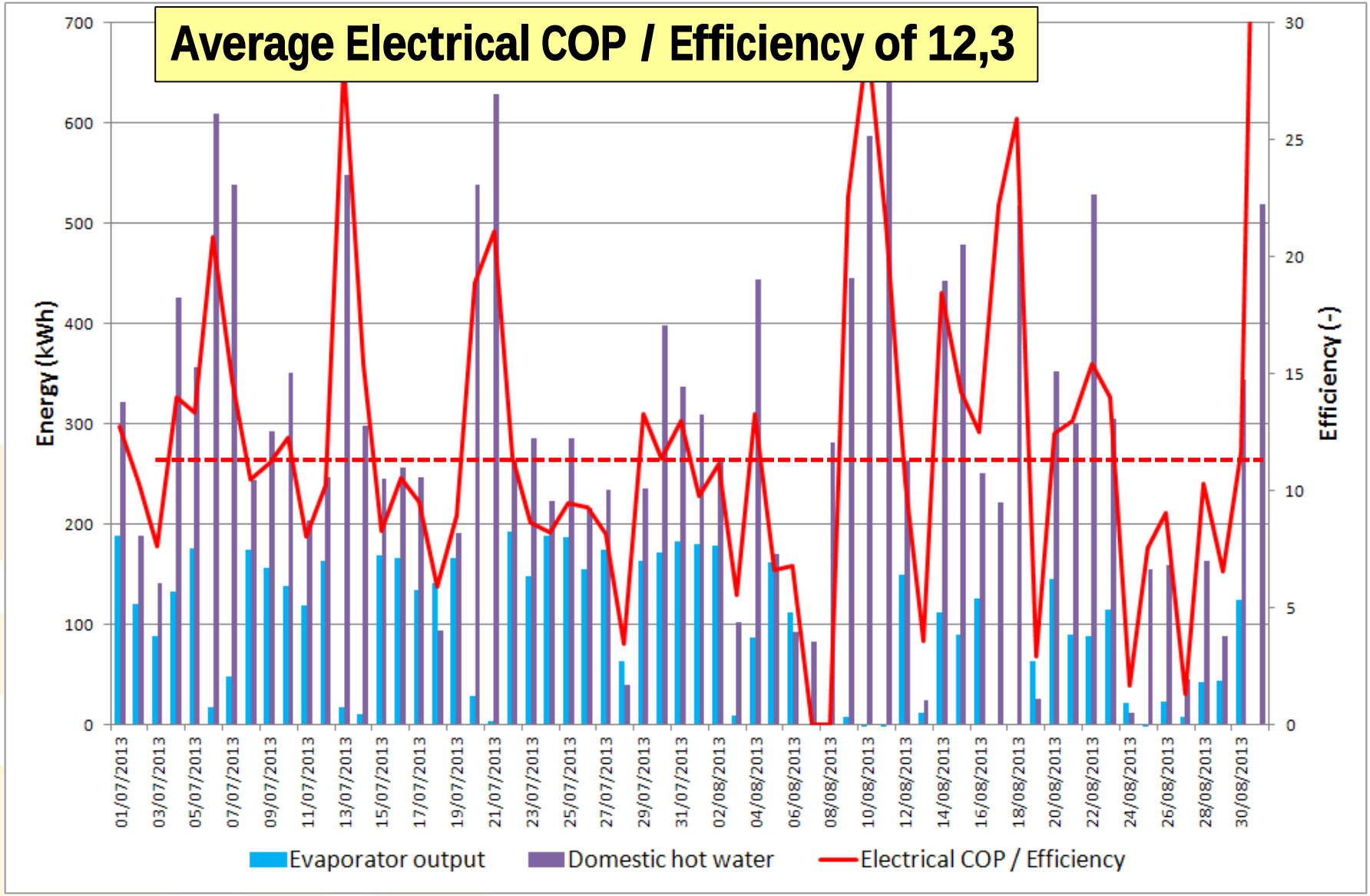
Monitoring results for Summer 2013



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Summary for the 2013 cooling season

	Unit	Value
Solar irradiation	kWh	104 000
Collected solar energy	kWh	30 000
Generator input	kWh	9 800
Evaporator output	kWh	6 000
Domestic hot water	kWh	18 000
Electricity consumption	kWh	2 000
Thermal COP	**(-)**	**0.60**
Electrical Efficiency /COP	**(-)**	**12.2**
Water consumption (m3)	m3	60

Big advantage of this system : complementarity between cooling & DHW function

Simplicity of functionning : no issue on the control (Cooling -> DHW)

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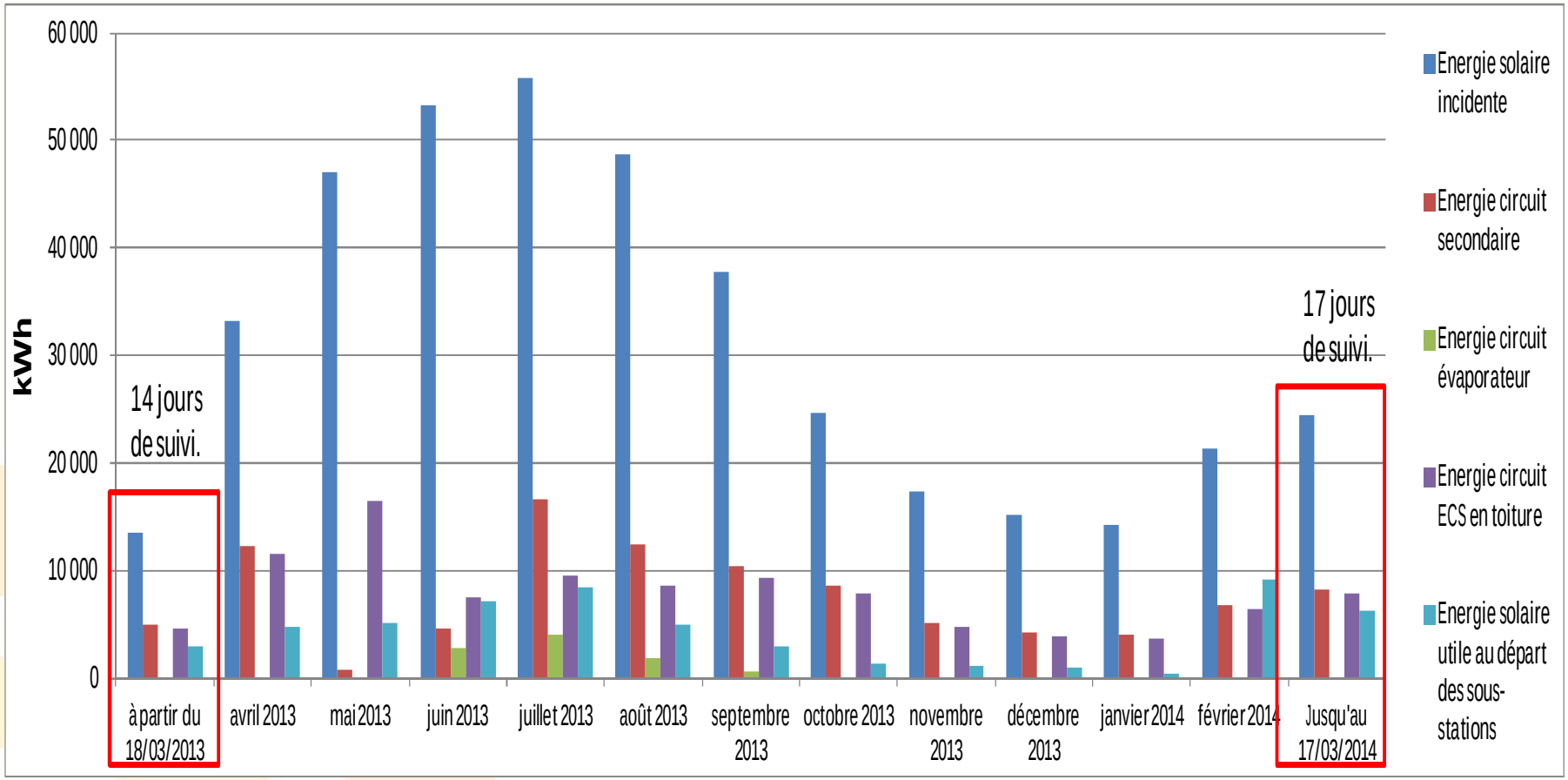
Summary for the 2013-2014 cooling/DHW year



Good performance of the DHW function out of Summer

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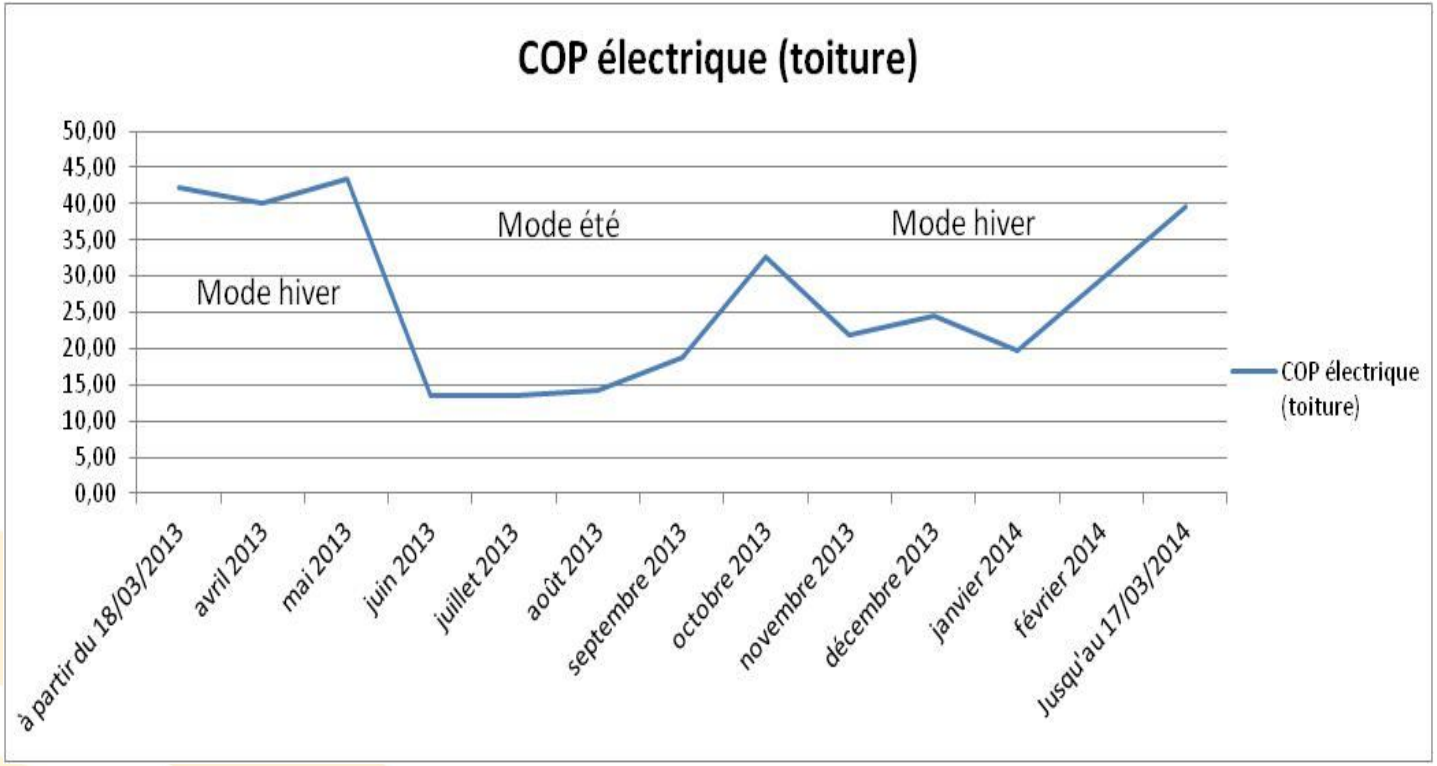
Summary for the 2013-2014 cooling/DHW year



Evolution of the electrical efficiency of the system leading to...

An average yearly COPelec of.. 27 !!

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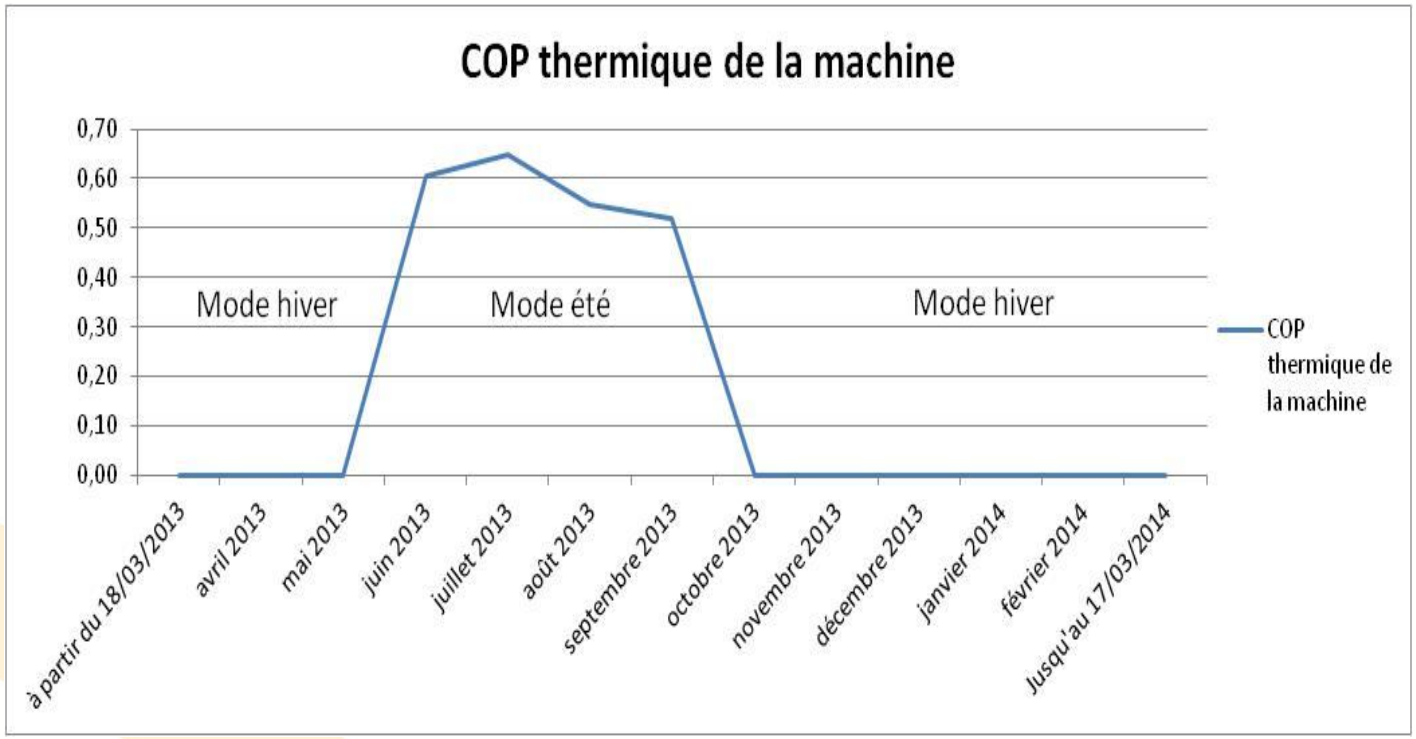
Summary for the 2013-2014 cooling/DHW year



Evolution of the thermal COP of the Yazaki chiller

Quite good…!

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Expected results

	DHW production (kWh)	Cooling production (kWh)	Electric consumption (kWh)	Solar productivity* (kWh/m²)	Electrical COP (-)	Solar fraction (%)
January	2 476	0	256	10,3	9,7	7,7 %
February	4 694	0	371	19,6	12,7	19,1 %
March	11 073	0	566	46,1	19,6	22,2 %
April	16 252	228	723	68,7	22,8	17,3 %
May	18 556	1 843	892	85,0	22,9	18,7 %
June	14 002	3 033	938	71,0	18,2	16,8 %
July	12 083	7 348	1329	81,0	14,6	9,8 %
August	11 583	6 281	1207	74,4	14,8	11,6 %
September	7 939	1 340	661	38,7	14,0	9,2 %
October	8 896	0	547	37,1	16,3	25,6 %
November	3 450	0	293	14,4	11,8	12,7 %
December	2 077	0	234	8,7	8,9	6,6 %
TOTAL	**113 080**	**20 073**	**8 017**	**554,8**	**16,6**	**13,9 %**

** Solar productivity: Calculated in winter as the distributed hot energy divided by the collector surface, and in summer the distributed cold energy is divided by the collector surface but also by the thermal COP of the chiller.*

Emergence program : mini annual thermal performance levels to reach

- Solar yield is estimated to 554,8 kWh/m².year **>> 350 kWh/m².year**
- **Electrical COP** is estimated to **16,6 >> 5**

⇒ **Project which could get money from the Emergence funds**

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Measured results in 2013-2014

	Production ECS (kWh)	Production CLIM (kWh)	Conso. élec. des auxilaires (kWh)	Productivité solaire (kWh/m2)	COP électrique (-)
à partir du 18/03/2013	4 654	0	110	19,4	42,3
avril 2013	11 588	0	290	48,3	40,0
mai 2013	16 478	0	380	68,7	43,4
juin 2013	7 497	2 765	902	42,8	13,4
juillet 2013	9 482	3 983	1 190	56,1	13,5
août 2013	8 628	1 970	840	44,2	14,2
septembre 2013	9 316	676	554	41,6	18,9
octobre 2013	7 843	0	240	32,7	32,7
novembre 2013	4 789	0	220	20,0	21,8
décembre 2013	3 851	0	157	16,0	24,6
janvier 2014	3 734	0	190	15,6	19,7
février 2014	6 435	0	218	26,8	29,5
Jusqu'au 17/03/2014	7 850	0	198	32,7	39,7
TOTAL	102 145	9 394	5 489	464,7	27,2

Less for solar yield but better for Electrical efficiency

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Thanks for your attention !

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