IEA SHC Task 48 7th expert meeting

Quality assurance and support measures for Solar Cooling

# DHW/Cooling hybrid strategy for solar cooling :

# Second Summer monitoring results in South of France

Daniel MUGNIER – Garching, 29/09/2014

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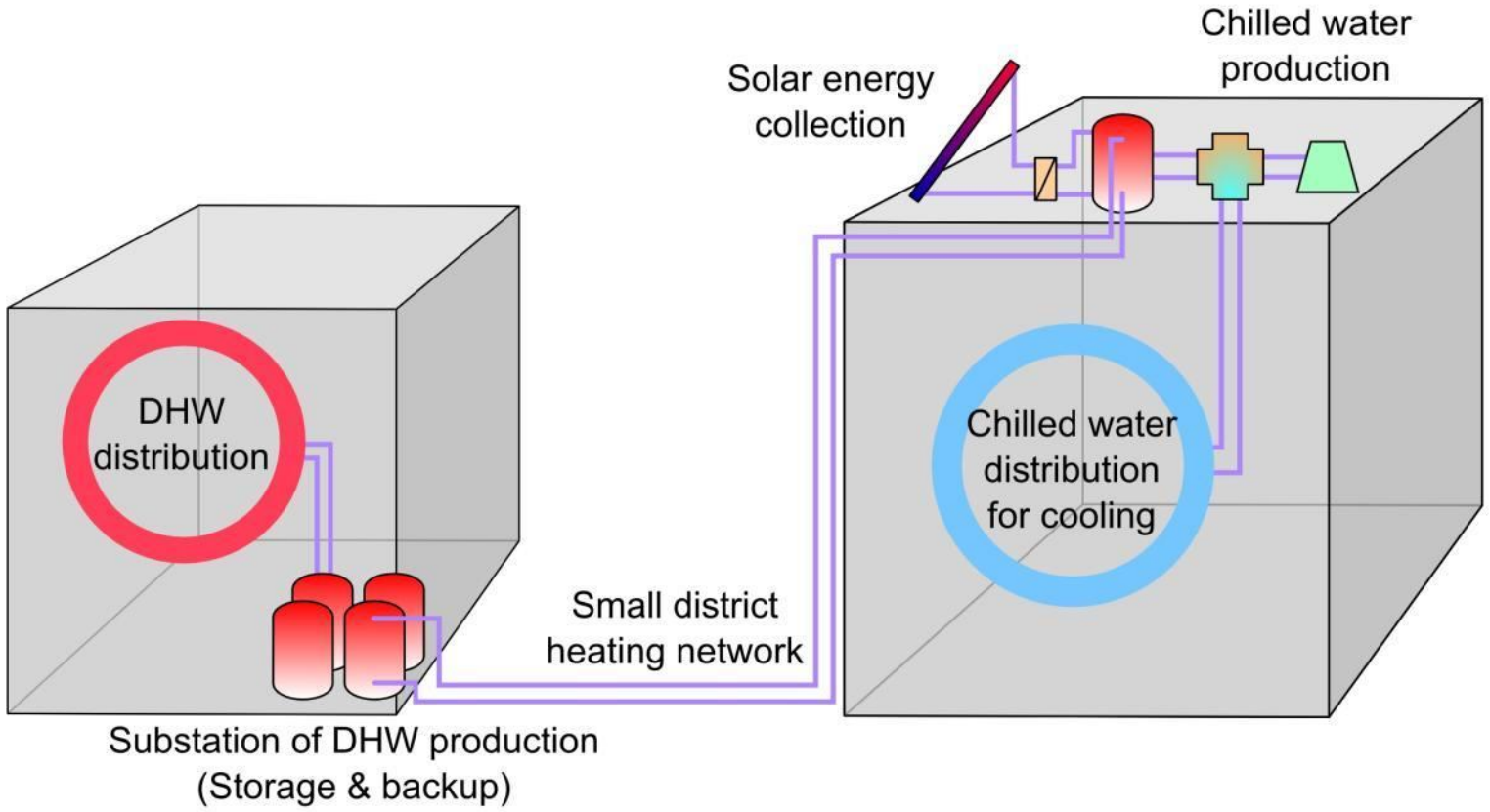
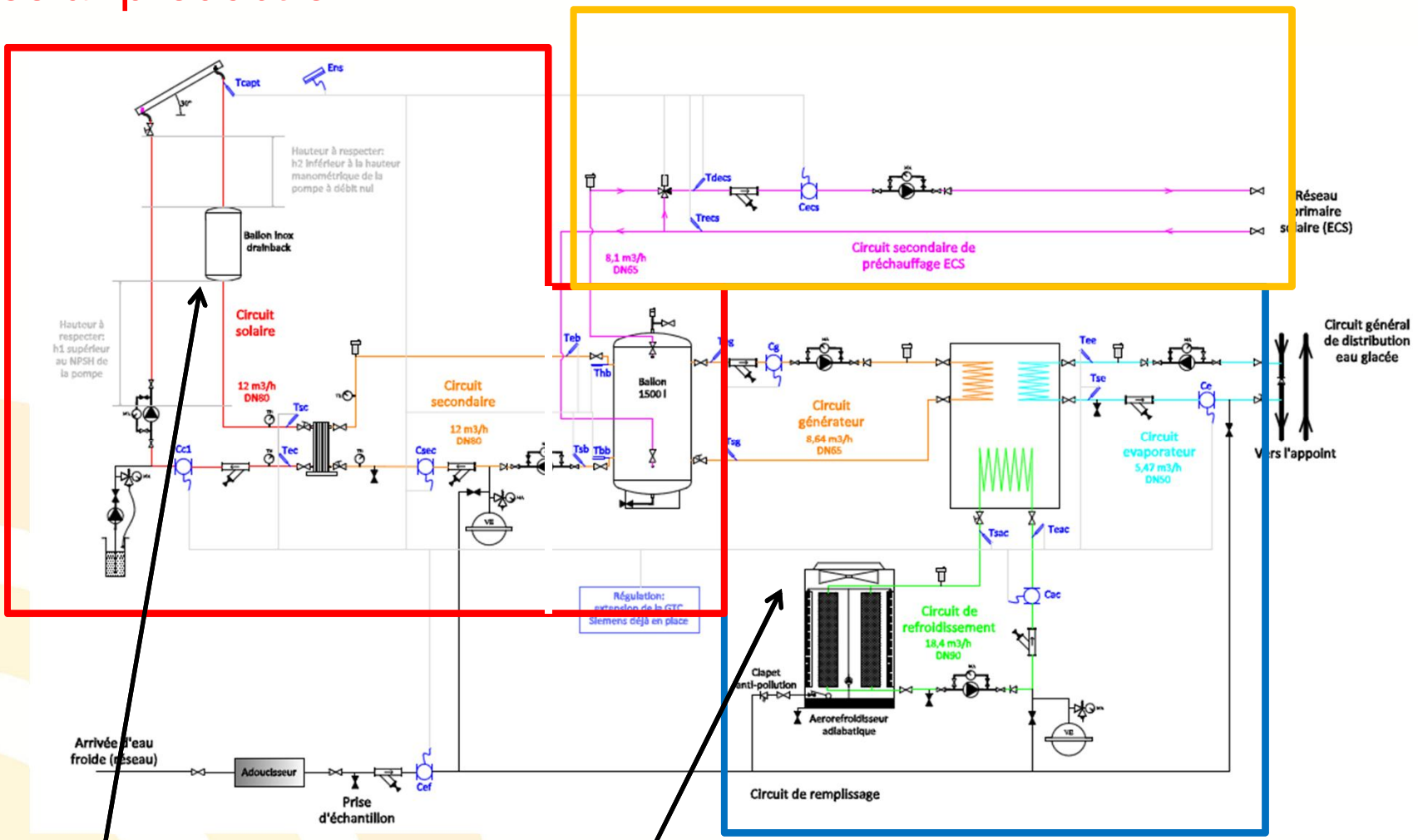
# Hydraulic principle



# Hydraulic scheme

## Solar production

## DHW distribution




Drainback system

Cold production

Anti legionnella adiabatique cooling tower

# Summary of results for Summer 2013

| | Unit | Value |
|---|---|---|
| Irradiation | kWh | 104 000 |
| Useful solar energy | kWh | 30 000 |
| Absorption generator | kWh | 9 800 |
| Absorption evaporator | kWh | 6 000 |
| DHW energy | kWh | 18 000 |
| Electrical energy | kWh | 2 000 |
| **Thermal COP** | **(-)** | **0.60** |
| **Electrical Efficiency** | **(-)** | **12.2** |
| Water Consumption | m3 | 60 |

System important advantage :

=> full complementarity between solar cooling and solar DHW

Simplicity of functionning :

=> No control issue (easy interaction Cooling <-> DHW)

# Full year balance (march 2013/ mars 2014)

| | DHW Production (kWh) | Cooling Production (kWh) | Parasitic elec. Consumption (kWh) | Useful Solar Yield (kWh/m2) | Overal elec efficiency (-) |
|---|---|---|---|---|---|
| from 18/03/2013 | 4 654 | 0 | 110 | 19.4 | 42.3 |
| april 2013 | 11 588 | 0 | 290 | 48.3 | 40.0 |
| may 2013 | 16 478 | 0 | 380 | 68.7 | 43.4 |
| june 2013 | 7 497 | 2 765 | 902 | 42.8 | 13.4 |
| july 2013 | 9 482 | 3 983 | 1 190 | 56.1 | 13.5 |
| august 2013 | 8 628 | 1 970 | 840 | 44.2 | 14.2 |
| september 2013 | 9 316 | 676 | 554 | 41.6 | 18.9 |
| october 2013 | 7 843 | 0 | 240 | 32.7 | 32.7 |
| november 2013 | 4 789 | 0 | 220 | 20.0 | 21.8 |
| december 2013 | 3 851 | 0 | 157 | 16.0 | 24.6 |
| january 2014 | 3 734 | 0 | 190 | 15.6 | 19.7 |
| february 2014 | 6 435 | 0 | 218 | 26.8 | 29.5 |
| march 2014 | 12 860 | 0 | 348 | 53.6 | 30.9 |
| april 2014 | 14 085 | 0 | 360 | 58.7 | 39.1 |
| may 2014 | 12 633 | 281 | 326 | 54.0 | 40.2 |
| june 2014 | 8 847 | 944 | 685 | 39.7 | 15.2 |
| july 2014 | 5 586 | 2 959 | 851 | 26.8 | 12.4 |
| **TOTAL** | 148 308 | 13 578 | 7 861 | **674.5** | **20.6** |

** elec consumption linked to the solar useful production (pumps solar, DHW, generator, evaporator, condensor circuits) without measuring back up elec consumption.*

Global Electrical efficiency of **nearly 21** in average for a full year and a **solar yield of 674 kWh/m².y**

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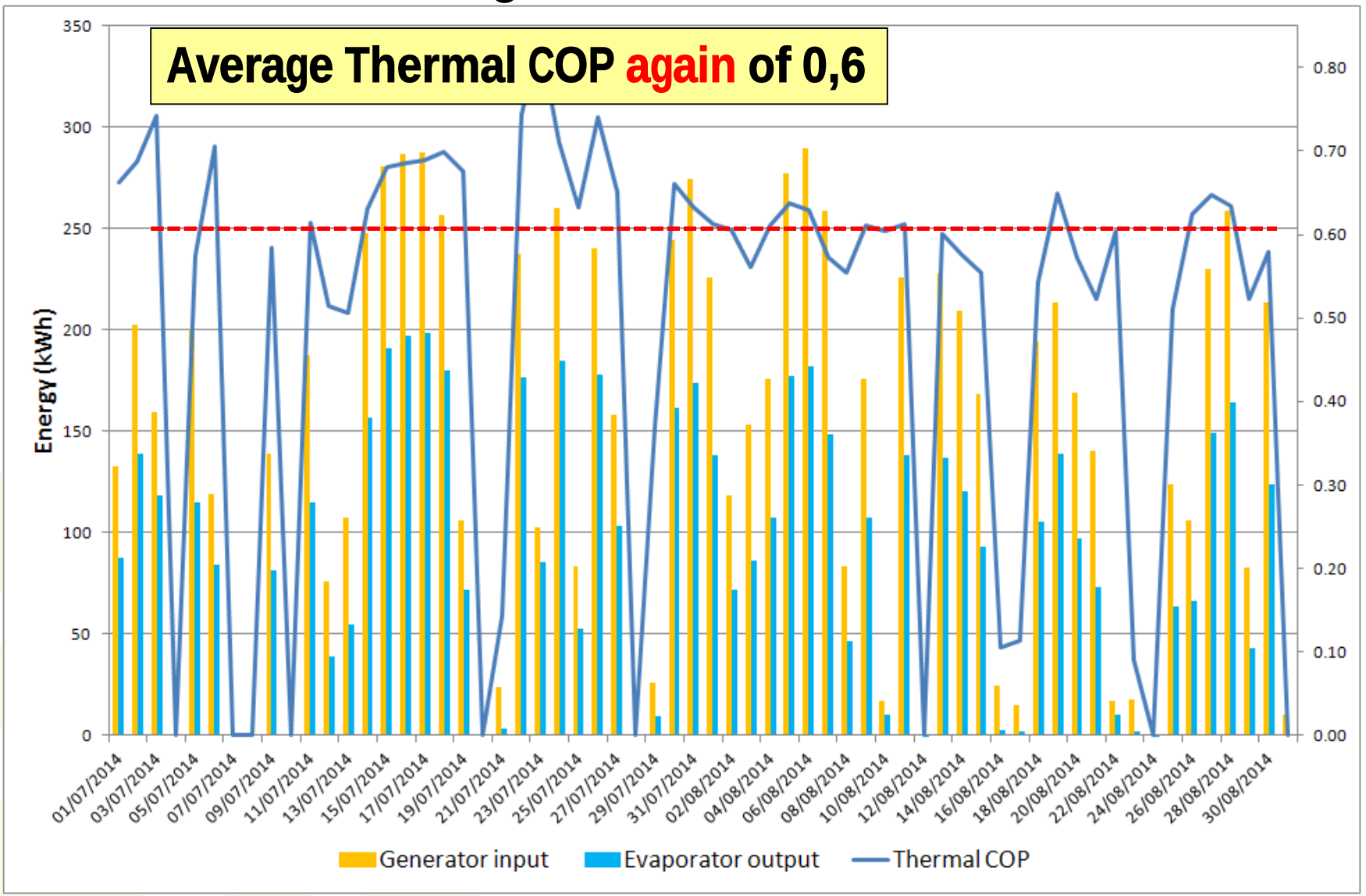
# Monitoring results for Summer 2014



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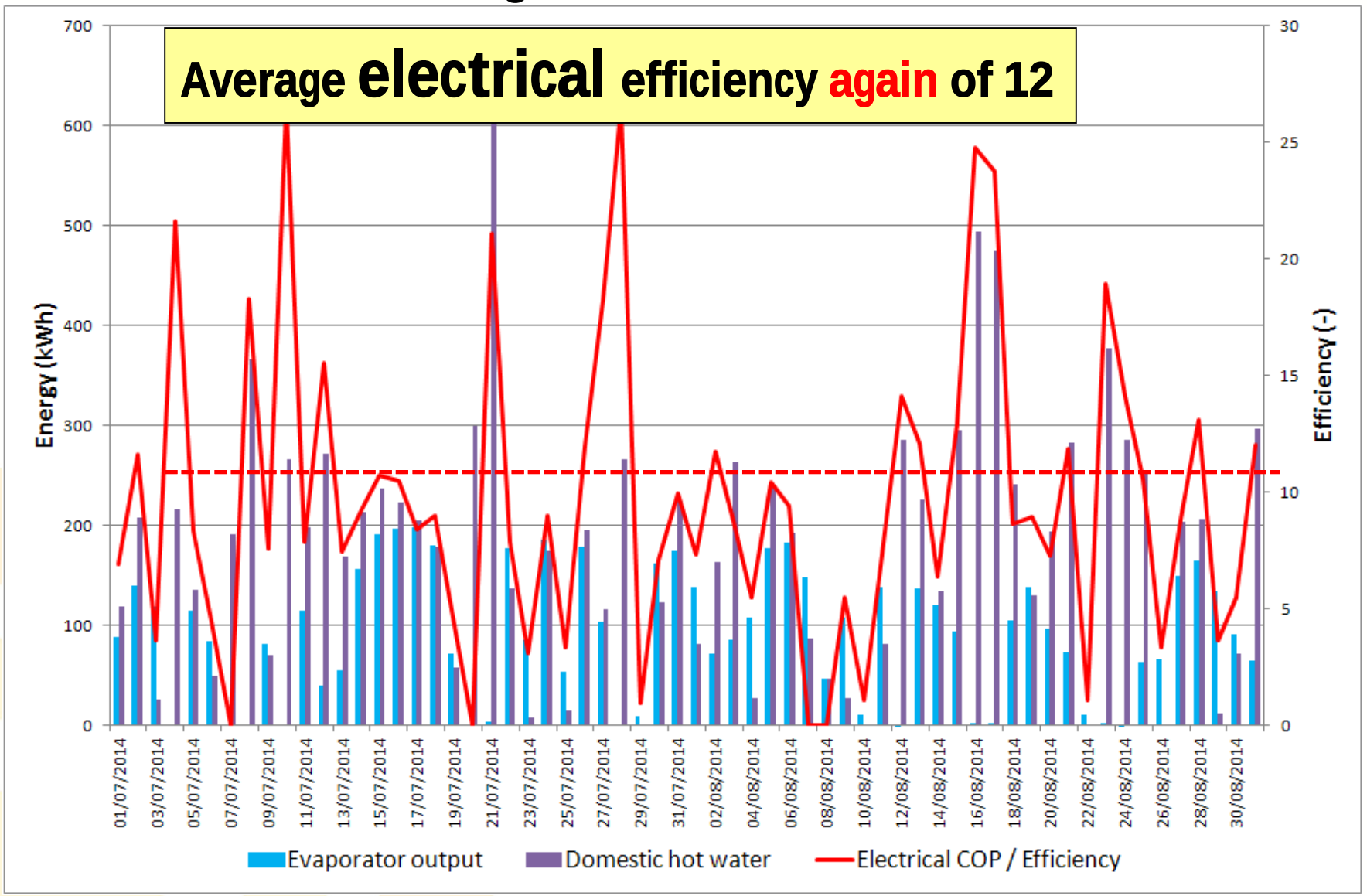
# Monitoring results for Summer 2014

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# Summary of the cooling season 2014

| | Unit | Value 2014 | *Value 2013* |
|---|---|---|---|
| Irradiation | kWh | 24 500 | *30 000* |
| Useful solar energy | kWh | 9 000 | *9 800* |
| Absorption generator | kWh | 5 700 | *6 000* |
| Absorption evaporator | kWh | 11 300 | *18 000* |
| DHW energy | kWh | 1 750 | *2 000* |
| Electrical energy | **(-)** | **0.60** | ***0.60*** |
| **Thermal COP** | **(-)** | **12** | ***12.2*** |
| **Electrical Efficiency** | m3 | 35 | *60* |

**Irradiation in 2014 15% less than in 2013 (bad Summer weather !!)**

**Electrical efficiency still so high** (12)

**IMPROVEMENT : division by nearly 2 of the water consumption**

**Robustness of the installation** (no damage from 2013)

# Thanks for your attention !

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