

# UMH latest developments

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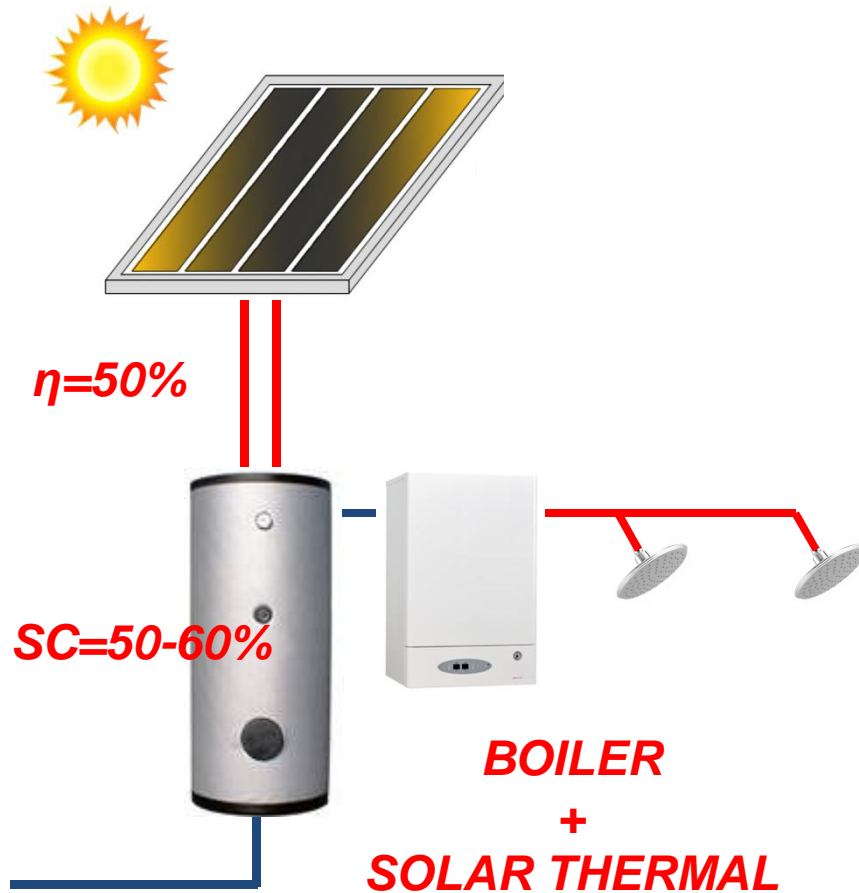


**PV + HP FOR DOMESTIC HOT WATER**

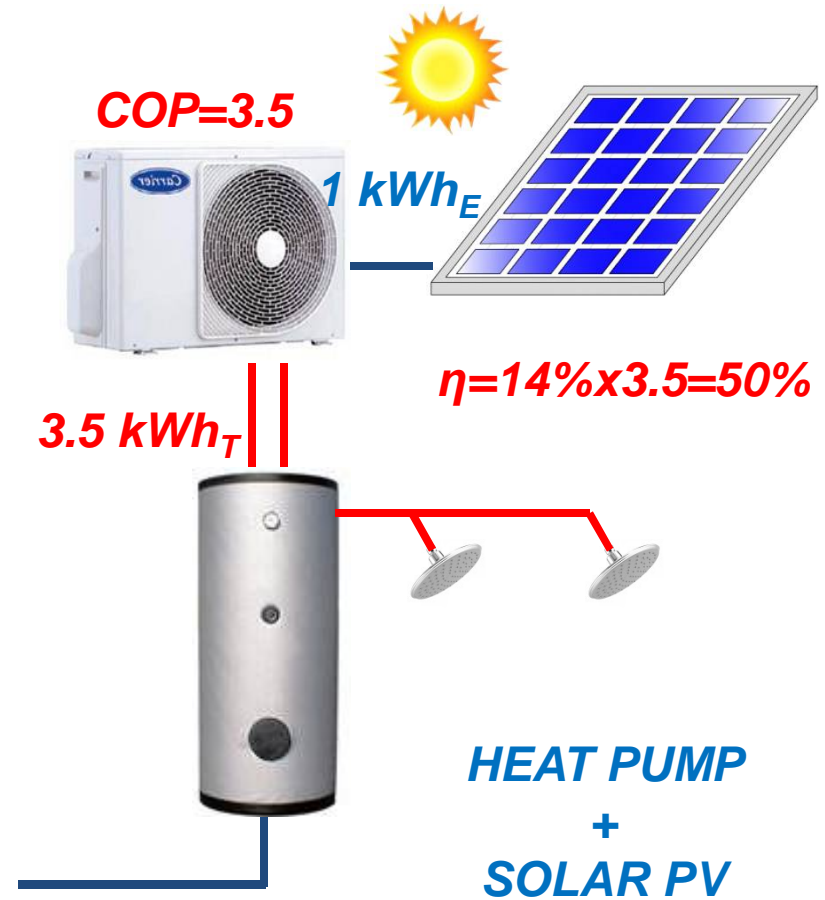
**PV + HP FOR SPACE HEATING AND COOLING**



# BOILER + SOLAR THERMAL vs. HEAT PUMP + PV

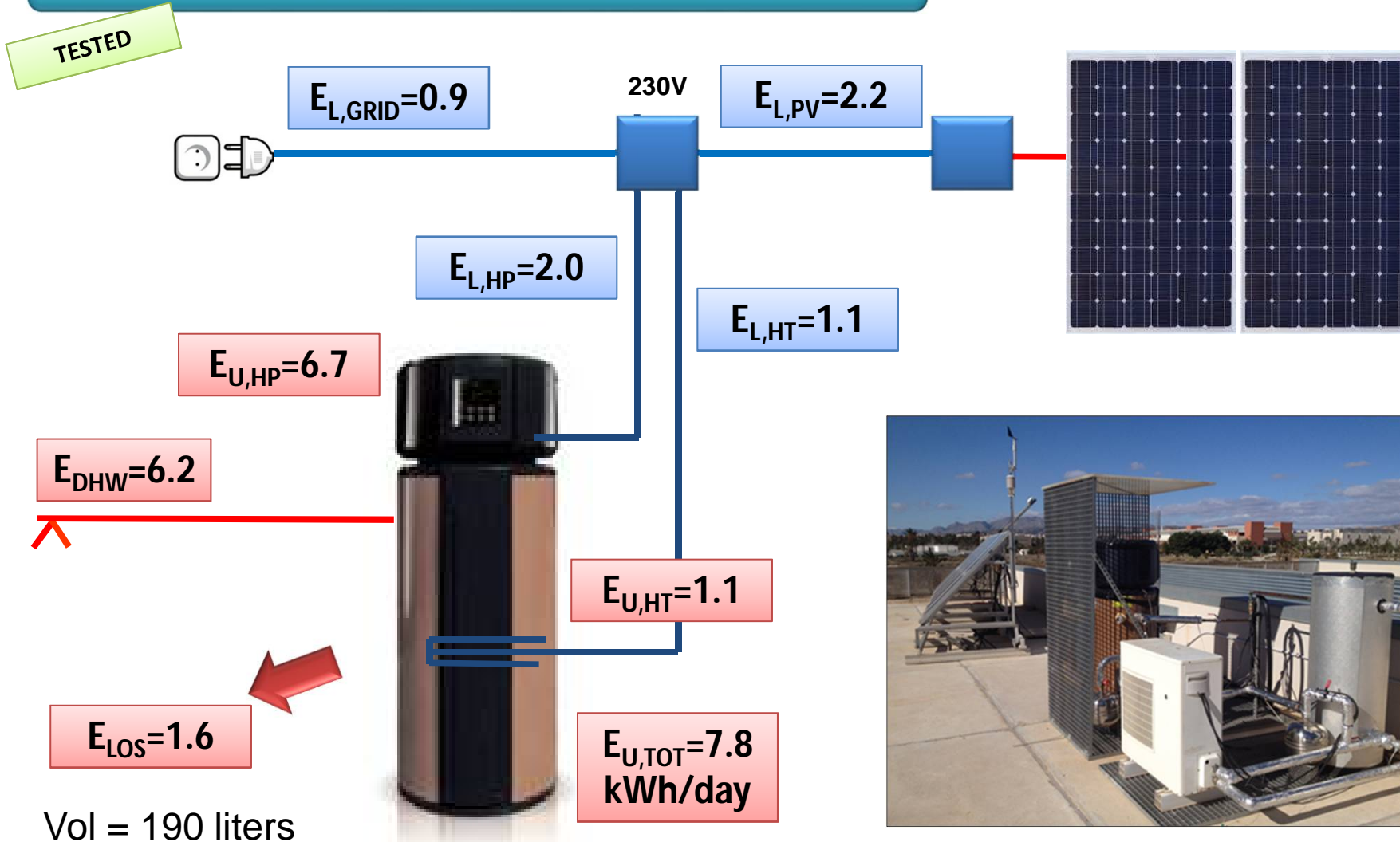


vs.



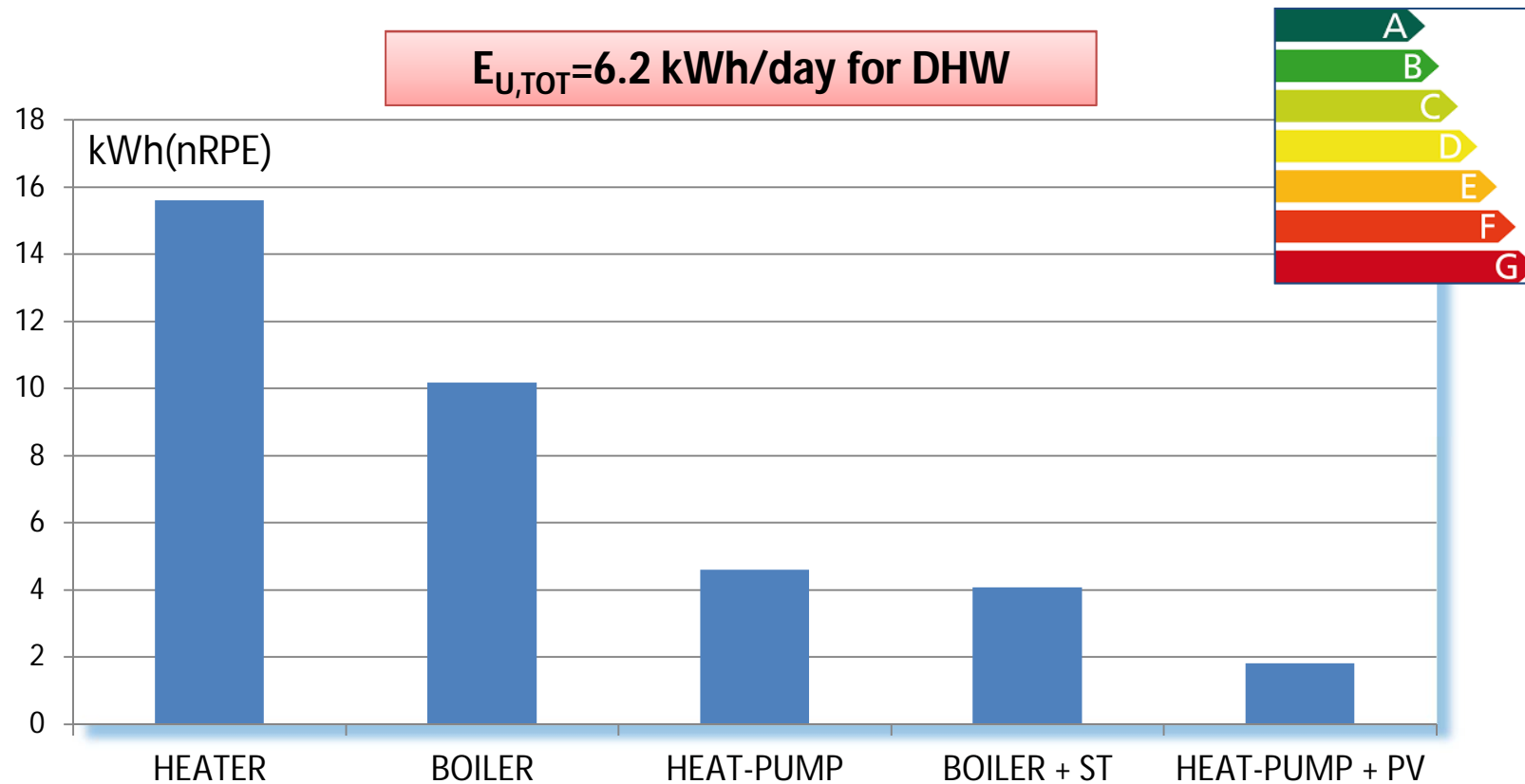


## EXPERIMENTAL RESULTS ON HEAT PUMP + PV





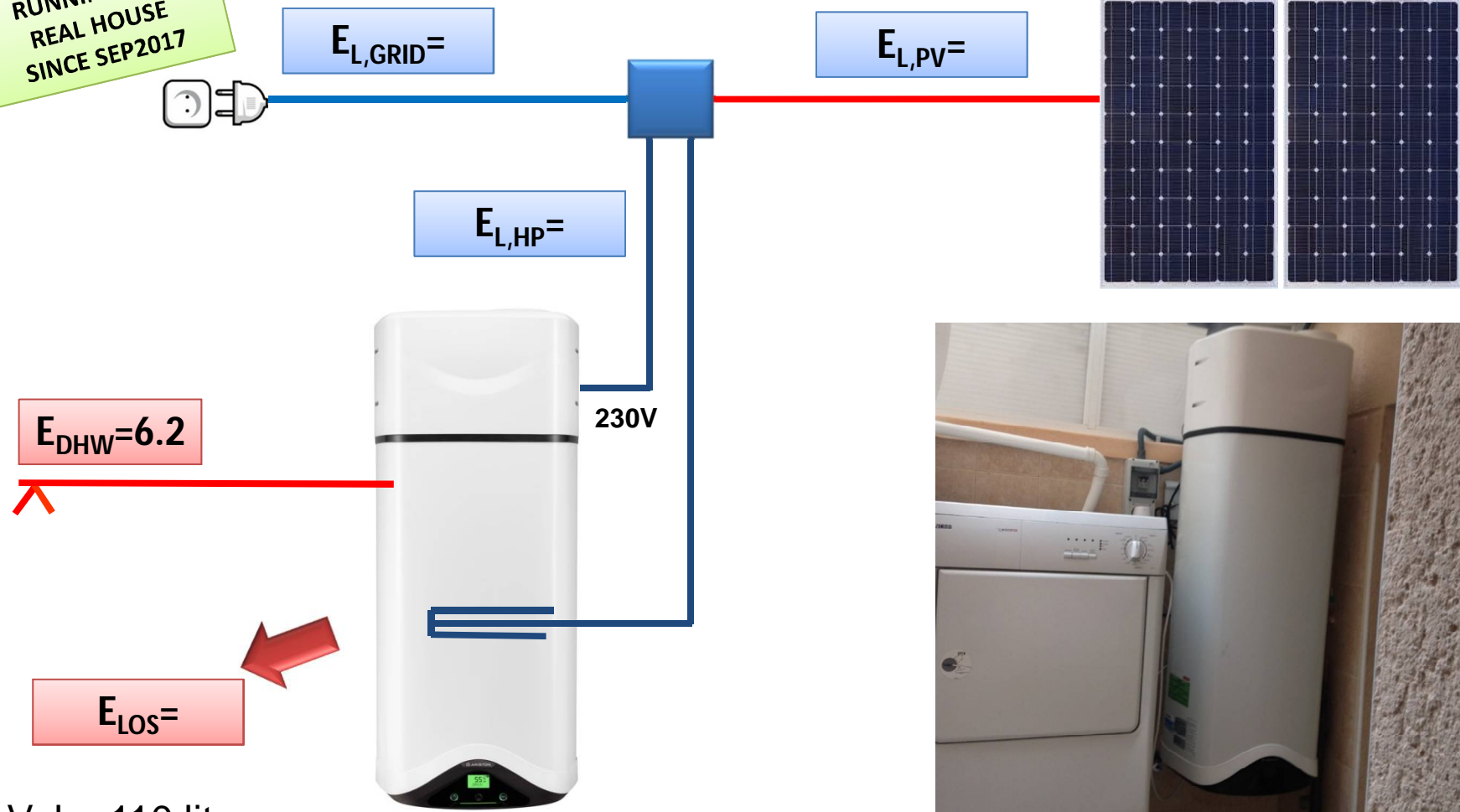
## EXPERIMENTAL RESULTS ON HEAT PUMP + PV





# EXPERIMENTAL RESULTS ON HEAT PUMP + PV

RUNNING IN A  
REAL HOUSE  
SINCE SEP2017



Vol = 110 liters  
HP: 250 W



# EXPERIMENTAL RESULTS ON HEAT PUMP + PV

**RUNNING IN A  
REAL HOUSE  
SINCE SEP2017**

Detalle / **miércoles, 4. abril 2018** /



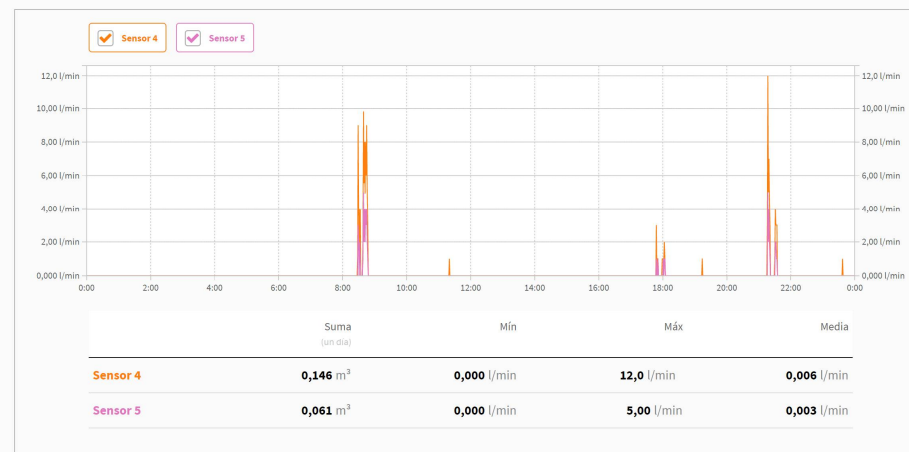
Vol = 110 liters  
HP: 250 W

SC%?  
PF?  
PE\_SAV?

**CONFORT?**

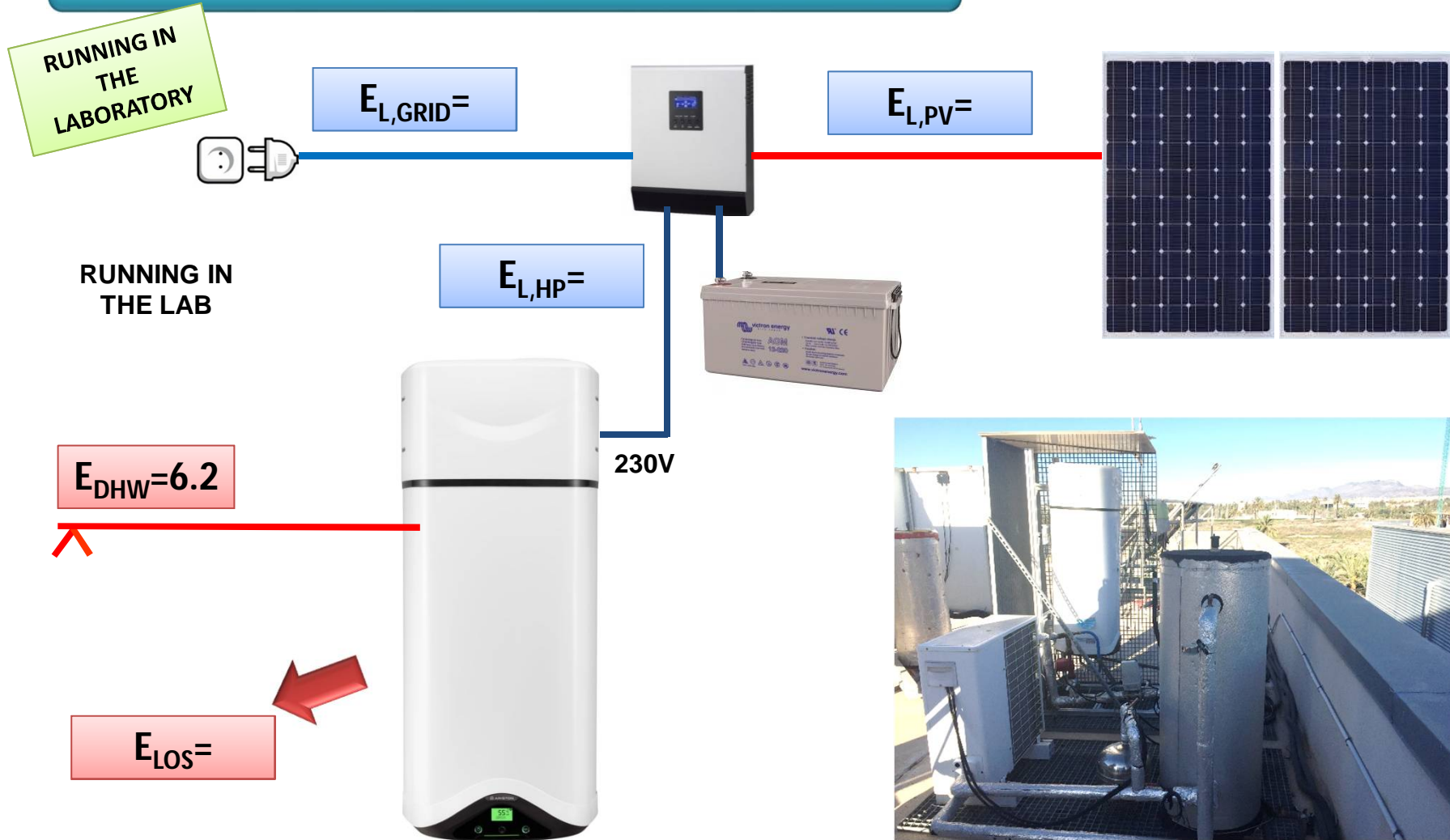


Detalle / **miércoles, 4. abril 2018** /

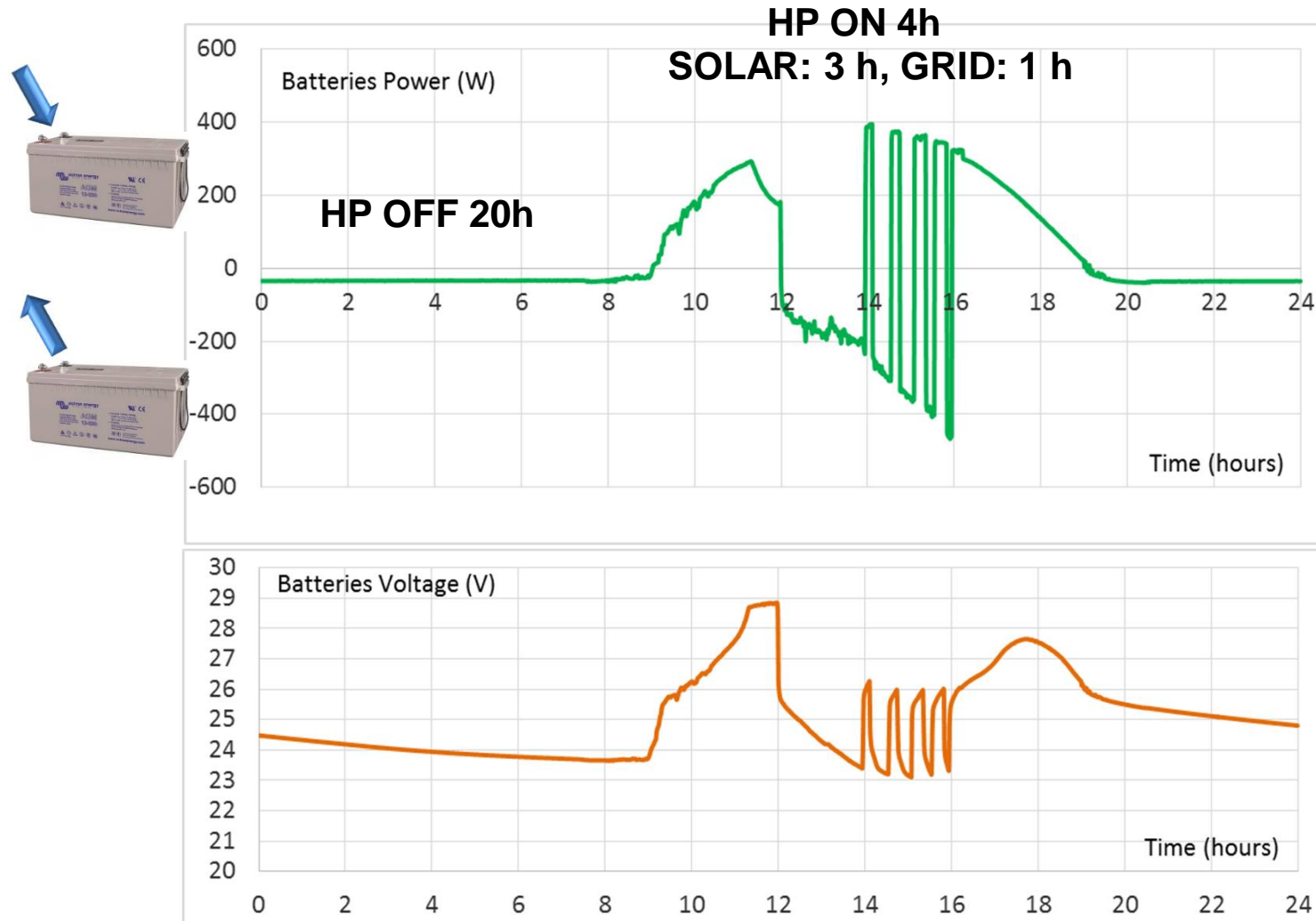




# EXPERIMENTAL RESULTS ON HEAT PUMP + PV



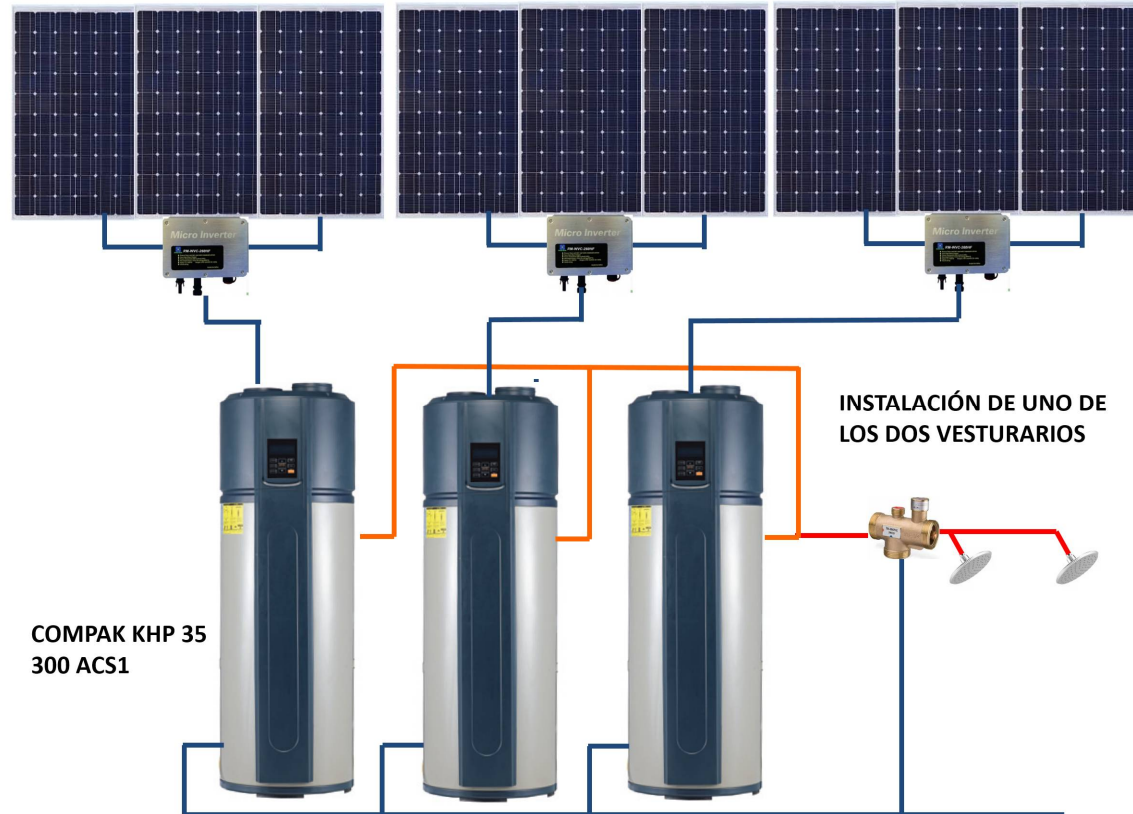






# EXPERIMENTAL RESULTS ON HEAT PUMP + PV

OCTOBER  
2018



COMPAK KHP 35  
300 ACS1

INSTALACIÓN DE UNO DE  
LOS DOS VESTURARIOS



# EXPERIMENTAL RESULTS ON HEAT PUMP + PV

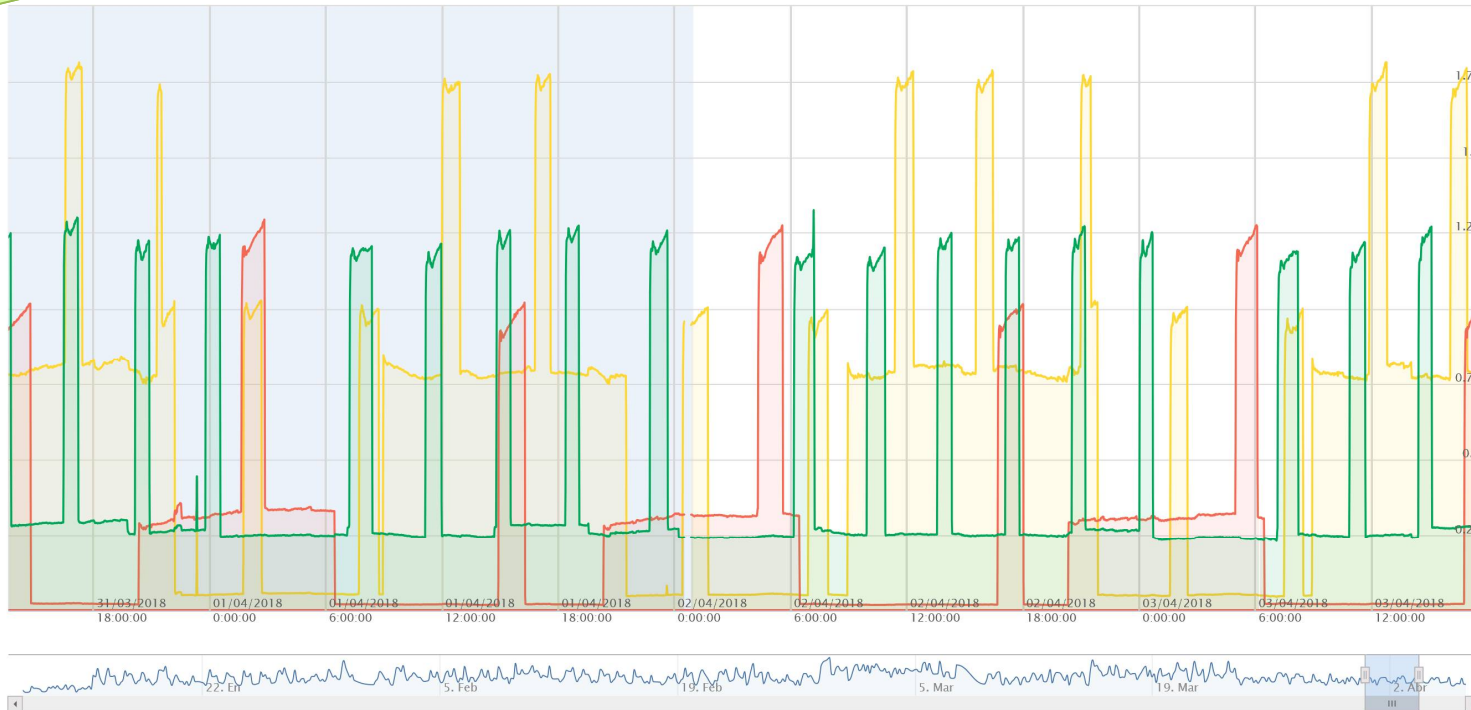
JANUARY  
2018





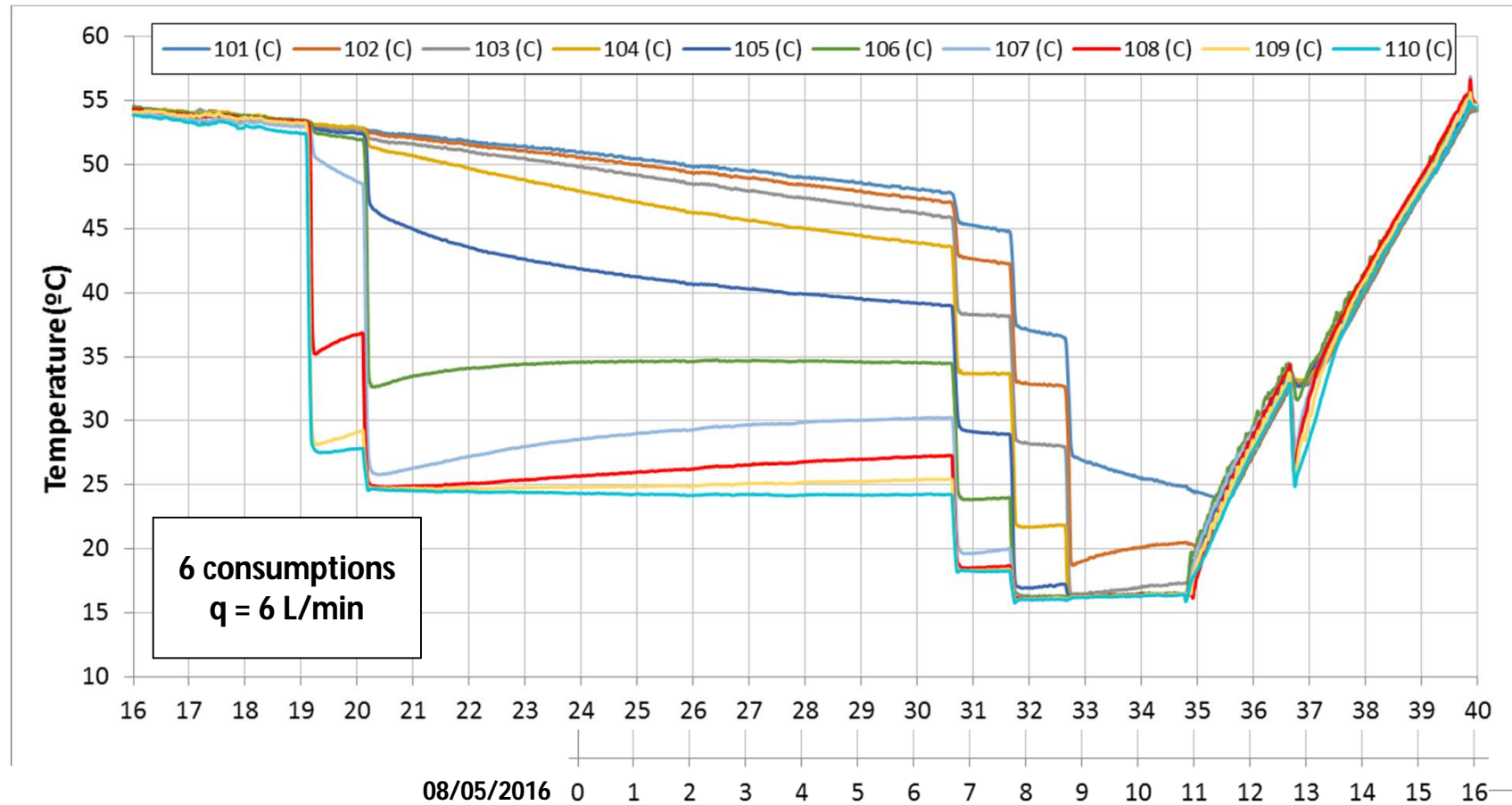
# EXPERIMENTAL RESULTS ON HEAT PUMP + PV

JANUARY  
2018



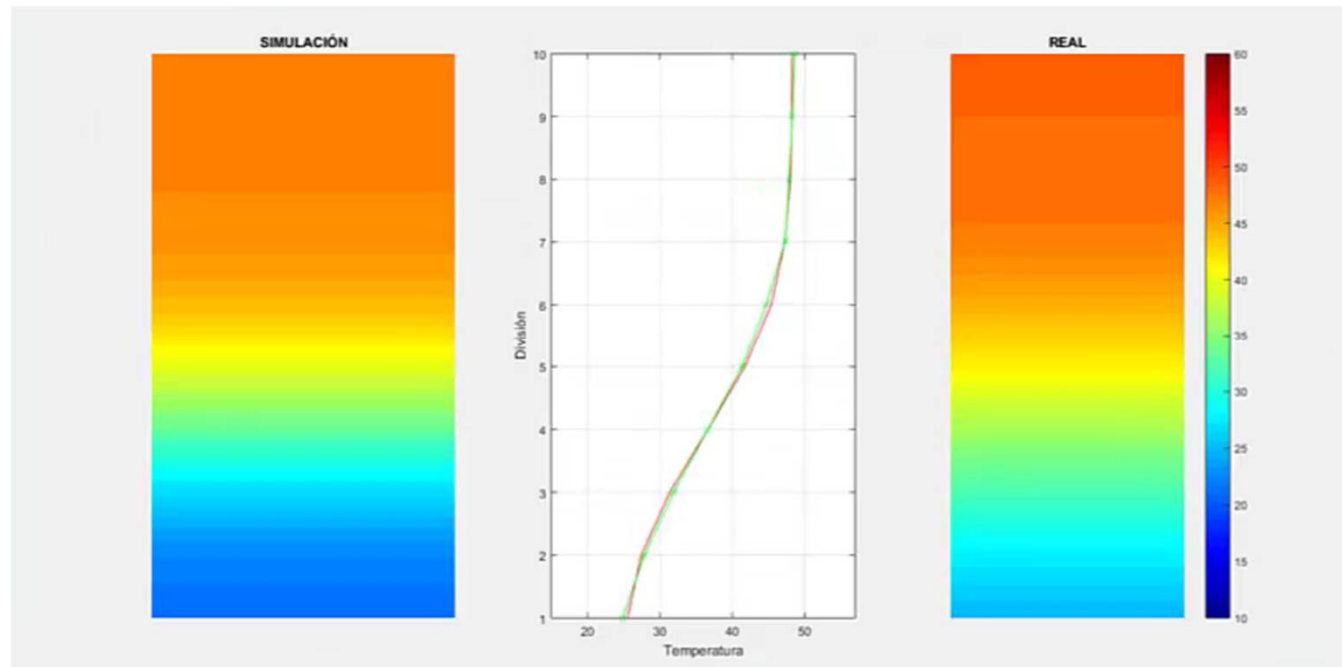


# MODELING THERMAL STORAGE FOR DHW





# MODELING THERMAL STORAGE FOR DHW





**PV + HP FOR SPACE HEATING AND COOLING**





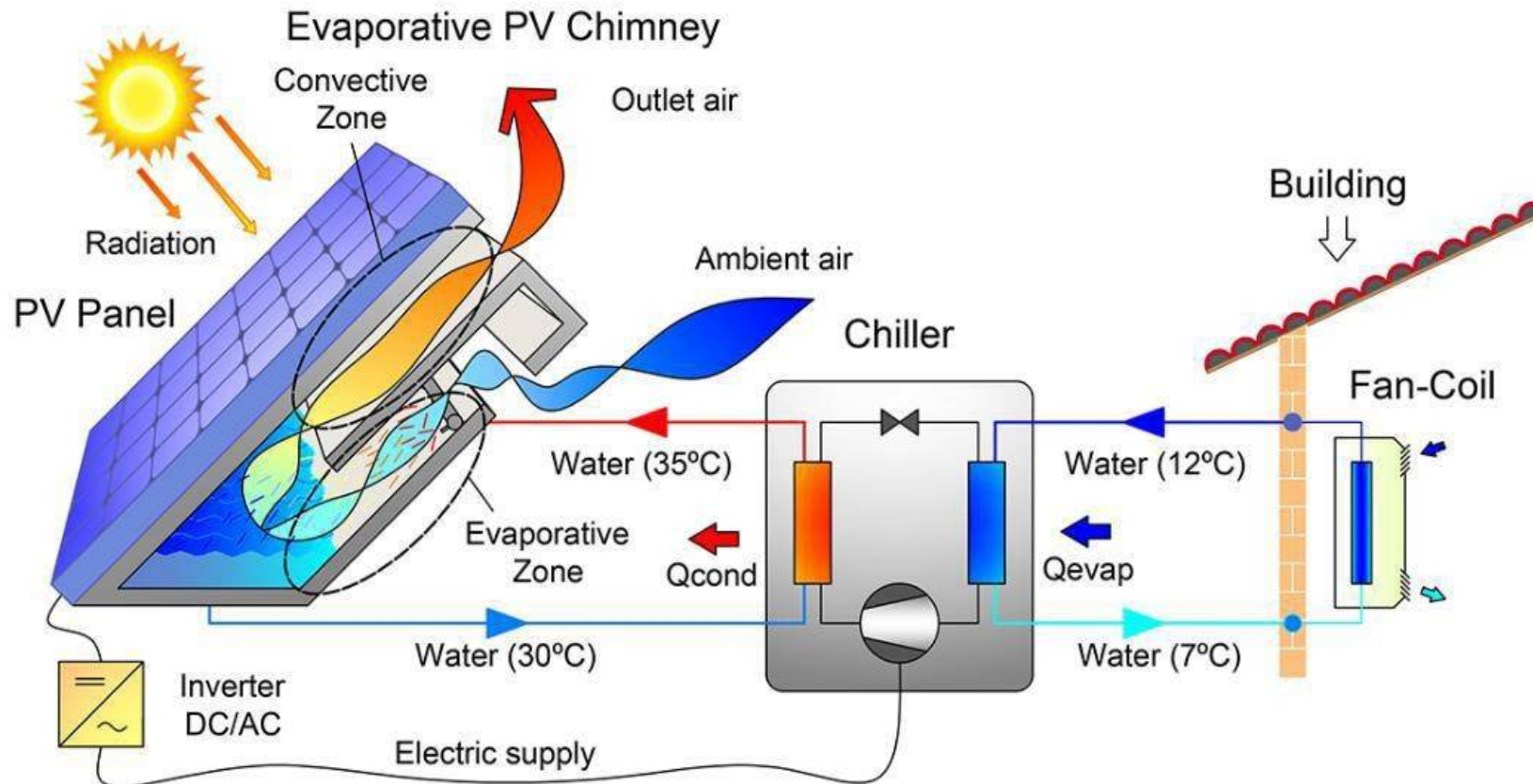
## PV + HP FOR SPACE HEATING AND COOLING





# PV + HP FOR SPACE HEATING AND COOLING

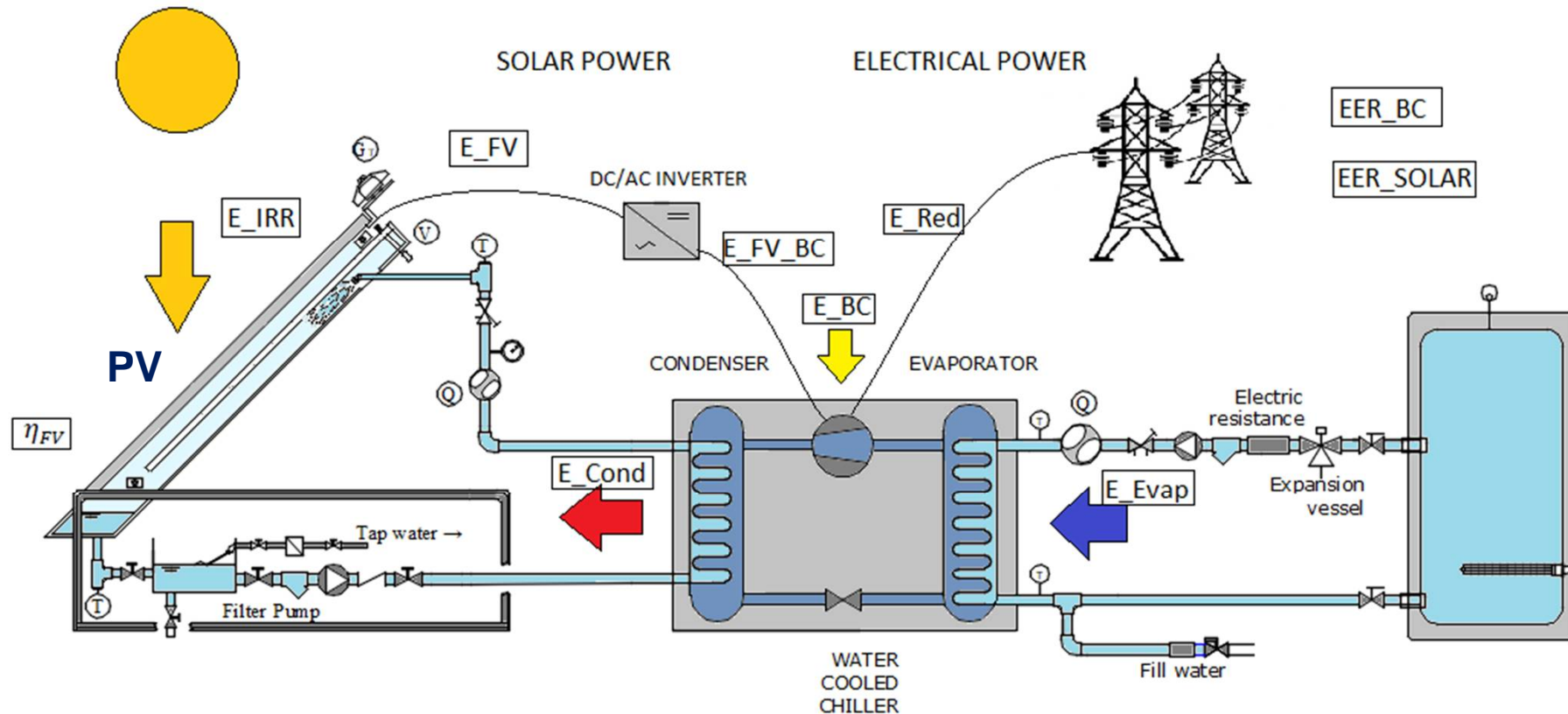
## EVAP4COOLING





# PV + HP FOR SPACE HEATING AND COOLING

## EVAP4COOLING





## PV + HP FOR SPACE HEATING AND COOLING

### EVAP4COOLING

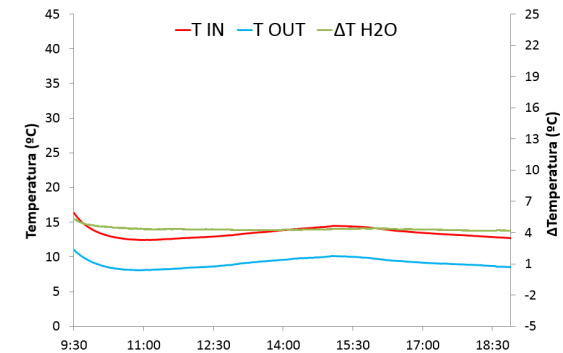
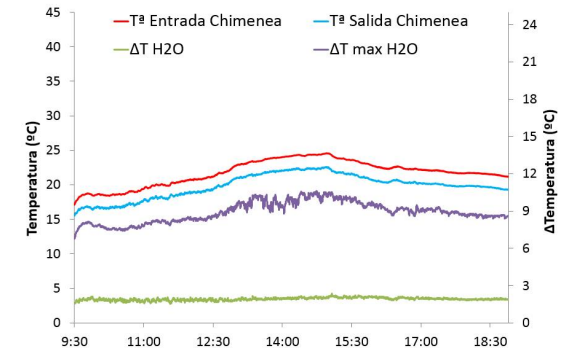
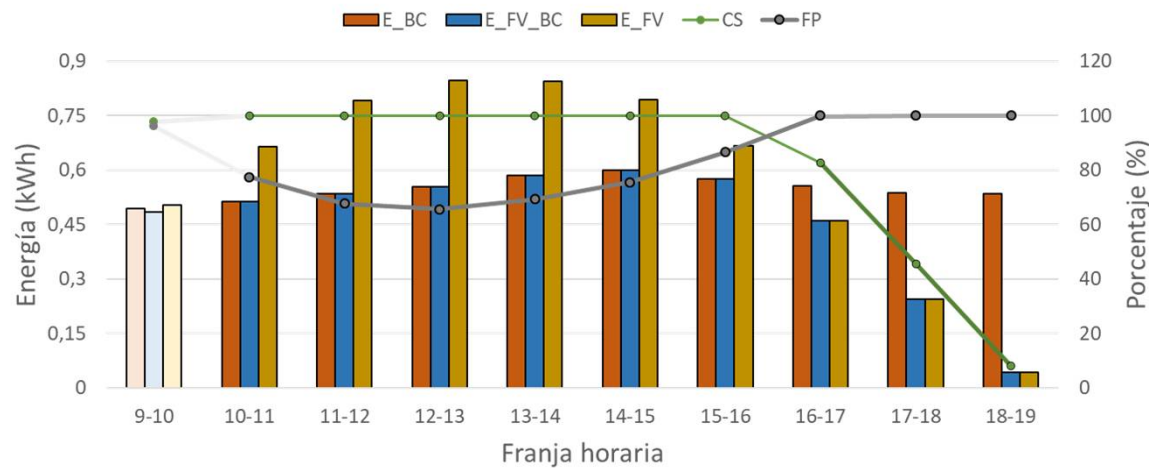






# PV + HP FOR SPACE HEATING AND COOLING

## EVAP4COOLING



$$FP = \frac{E_{FVBC}}{E_{FV}}$$

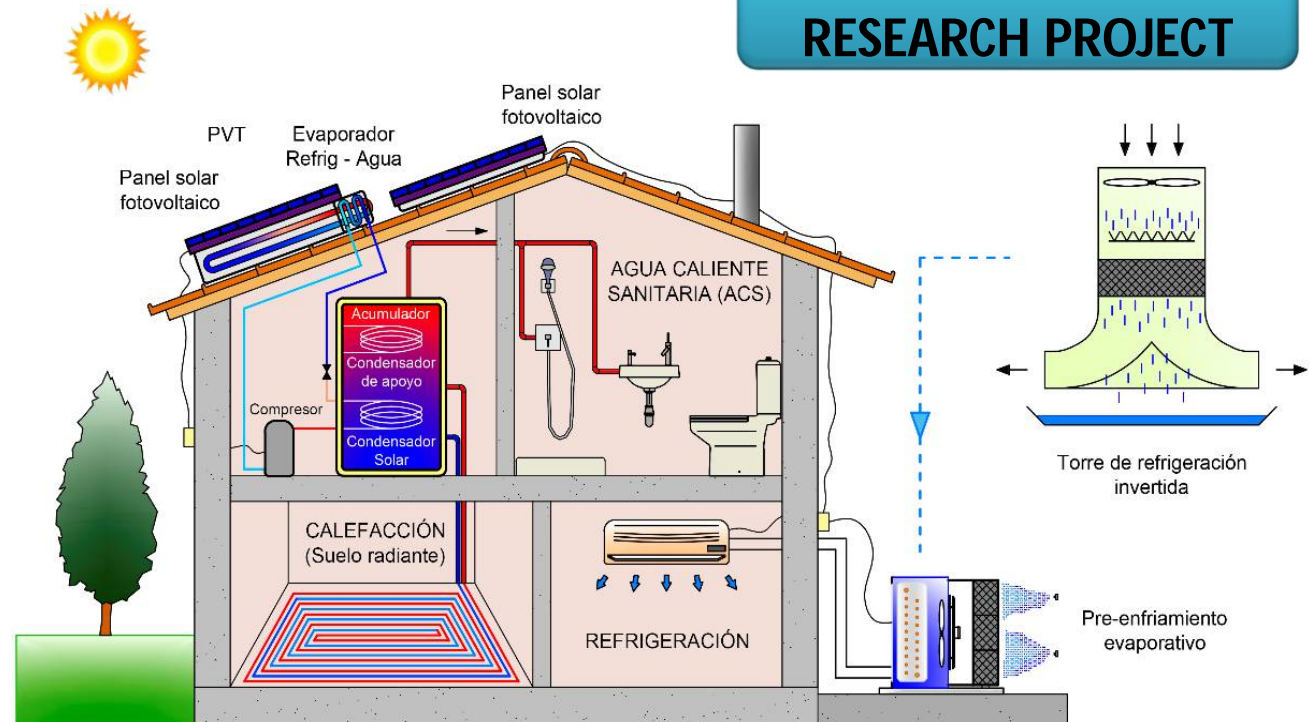
$$CS = \frac{E_{FVBC}}{E_{BC}}$$



# PV + HP FOR SPACE HEATING AND COOLING

JUNE  
2018

## NEW NATIONAL RESEARCH PROJECT



# UMH latest developments

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