

# Towards Net Zero: Dispatchable solar thermal process heat for industry

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# Scope of presentation

Protarget AG



About Protarget AG

About KEAN

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Solar thermal technology

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# About protarget AG

Protarget AG



## Who we are:

- Founded in 2009, Protarget AG is a Cologne based company that specialises in Solar Thermal systems and equipment
- Projects in Germany, Cyprus, Greece, Saudi Arabia, India, Spain and Brazil
- Our technology has been tested at the German Aerospace Centre (DLR) with specific designs approved by TÜV Germany
- Protarget is an approved welding organisation to EN ISO 3834

## What we do:

- Parabolic Trough Systems (PTC) to supply steam and process heat for industrial applications
- Vacuum Tube Systems (CPC) providing hot water for industrial applications
- Solar power plant engineering and test equipment for CSP projects worldwide

➤ Germany



➤ India



➤ Cyprus



➤ Brazil



# About KEAN

## KEAN

- KEAN Soft Drinks Ltd, founded as KEA, the 'Cyprus Soft Drinks Company', in 1949, with the aim of extracting juices, essential oils and other natural ingredients from fresh citrus fruit
- KEAN is a top exporter to the European Union market and beyond
- Over the years, KEAN Soft Drinks Ltd expanded and grew to its present size despite competition from international brands.
- The juice production process is highly sophisticated and sizes range from 250 ml and 375 ml to 1 litre. All lines are fully automated with complete auxiliary equipment for straws, recaps and multi packs
- Abiding by its history and tradition, as an active member of society, KEAN is adapting to the challenging environment looking with optimism into the future



# About KEAN

## KEAN's energy requirements

- The KEAN factory's energy needs - Typical for an industrial process heat consumer
- The plant requires saturated steam at 10Barg
- Steam is mainly used for pasteurisation and juice extraction
- Conventional steam boiler burning light fuel oil
- Boiler feedwater tank temperature - Circa 45°C
- The plant generally runs a single shift operation 04:00 to 14:00 to Friday
- Peak energy demand is highest for the first three months of the year – Fruit harvesting season
- Many skilled maintenance staff on site – Boiler runs unsupervised



# Solar thermal energy solutions

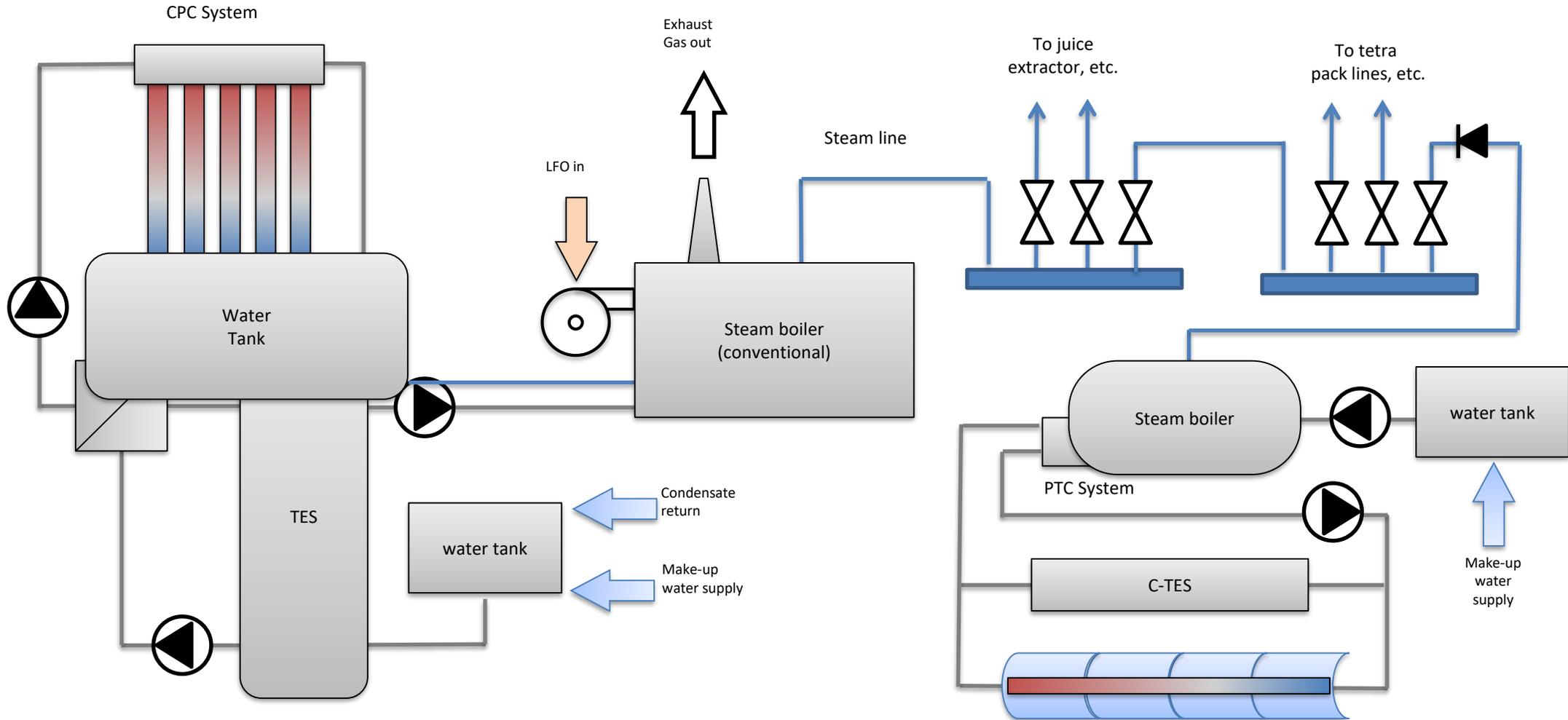
## Process heat and steam

- 2016 - KEAN approached by Cyprus University of Technology to take part in EDITOR project
- 2018 - PTC system installed, commissioned, initial running
- 2019 – Automatic scheduled running mode operational
- System delivers 10 bar saturated steam direct to process
- CPC system was commissioned in April 2020
- CPC system heats feed water for the conventional boiler to 95°C
- Both systems equipped with storage – Thermal energy dispatch in accordance with the plant's operating schedule



# Solar thermal energy solutions

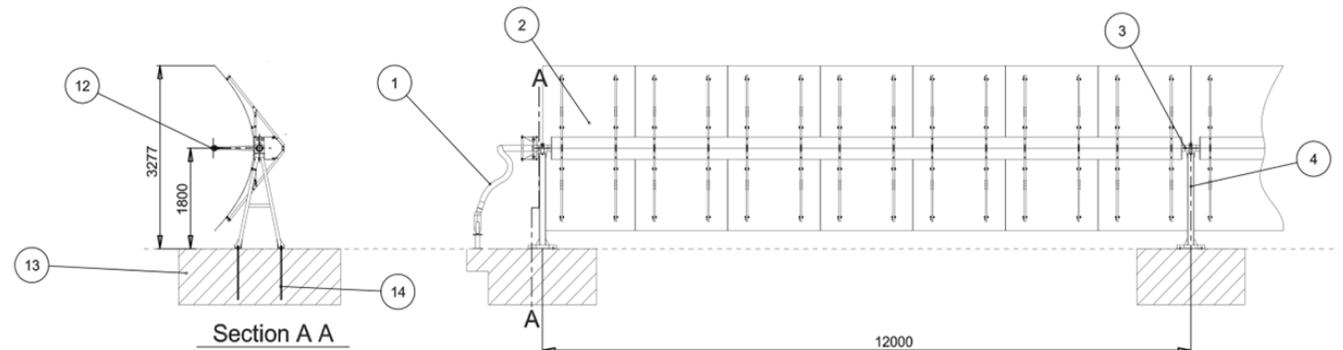
## Plant layout



# Solar thermal technology

## PTC and Concrete Thermal Energy Storage (CTES)

- Solar collector – Two rows of Protarget’s CF100 parabolic trough collectors
- Each row 48m long – Total mirror area 280m<sup>2</sup>
- Thermal oil system operates to 420°C
- Innovative HTF – Wacker Chemie - Helisol XA
- Steam boiler feeding saturated steam directly into plant
- Concrete Thermal Energy Storage – CTES from project partner CADE
- Complete plant and storage in 3 x 20 ft sea containers
- System fully compliant with relevant norms and standards - CE marked



# Solar thermal technology

## CPC system

- Solar collector – 11 rows of 6 x PT1518 Compound Parabolic Concentrators
- Total nominal collector area 225m<sup>2</sup>
- Primary circuit – Pressurised water at 110°C
- System heats boiler feedwater to 95°C
- Fully automatic control system
- Thermal energy storage – Thermocline water tank
- Collectors are certified by TÜV Rheinland and in accordance to DIN EN 12975-2
- Performance characteristics very different to PTC



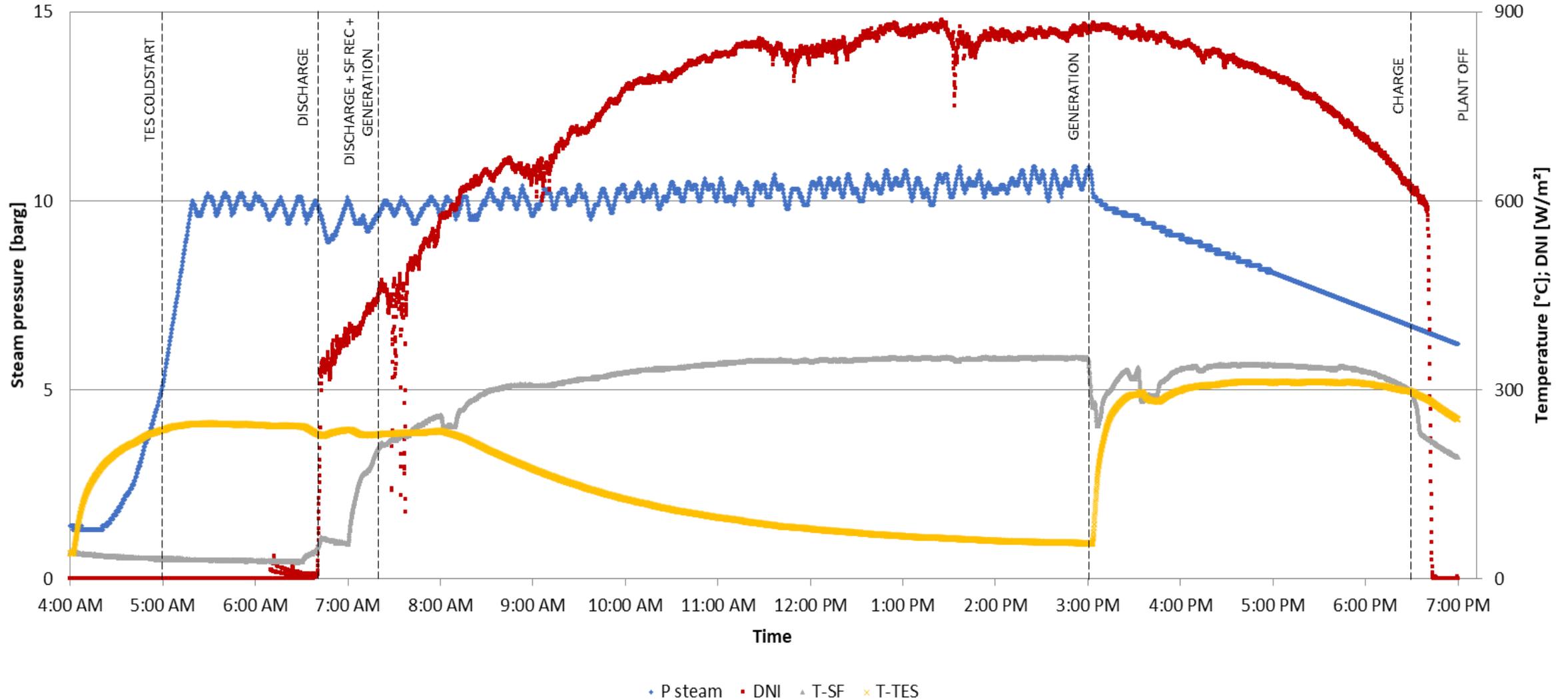
# Fully automated operation

## Plant schedule and dispatchability

- Steam boiler - 04:00 start-up
- Steam boiler – 14:00 shut down
- 2 tonnes of feed water on start-up
- Long warm up time
- CPC to heat thermocline water storage tank
- Significant reduction in start-up time = Increased plant utilisation
- Weekends generally not worked = Opportunity for fully charging PTC system storage
- System/s must operate without operator supervision

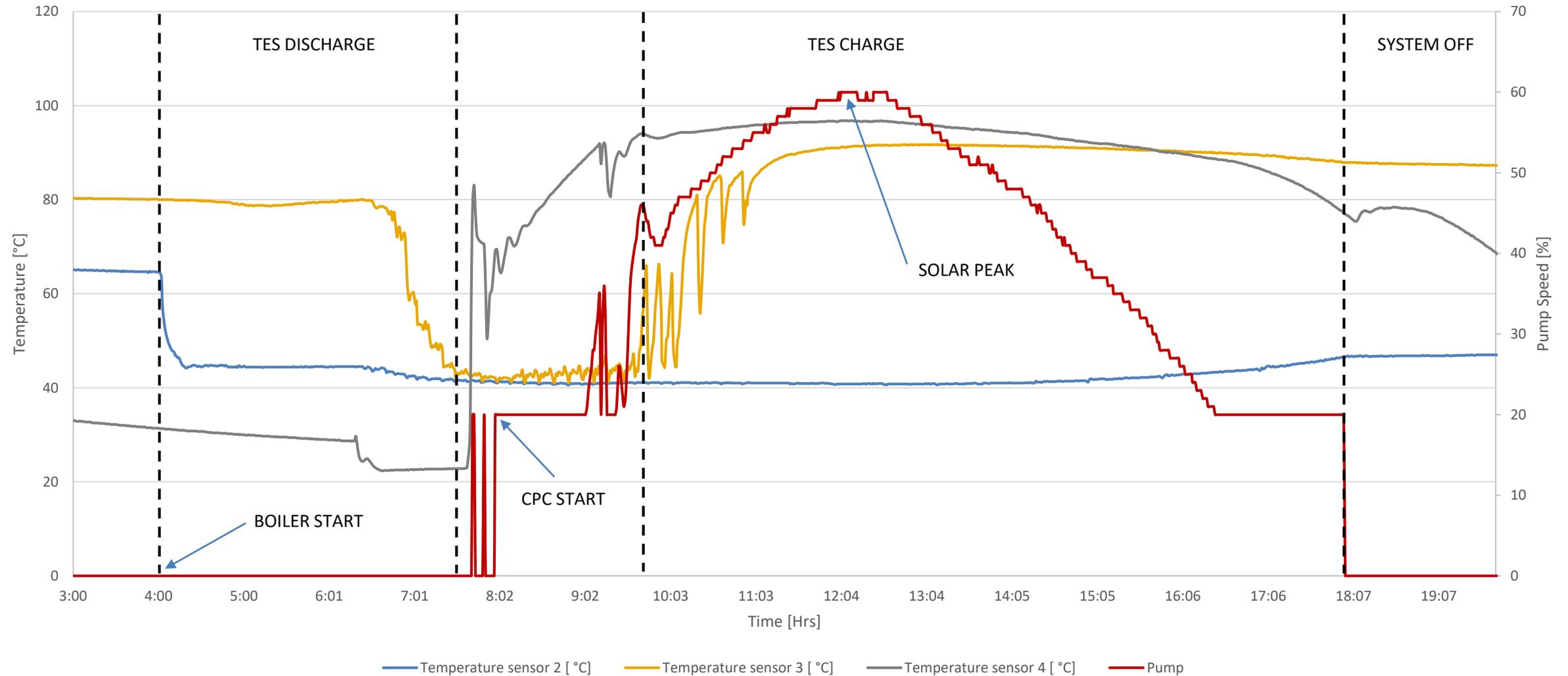
# Fully automated operation

PTC - System



# Fully automated operation

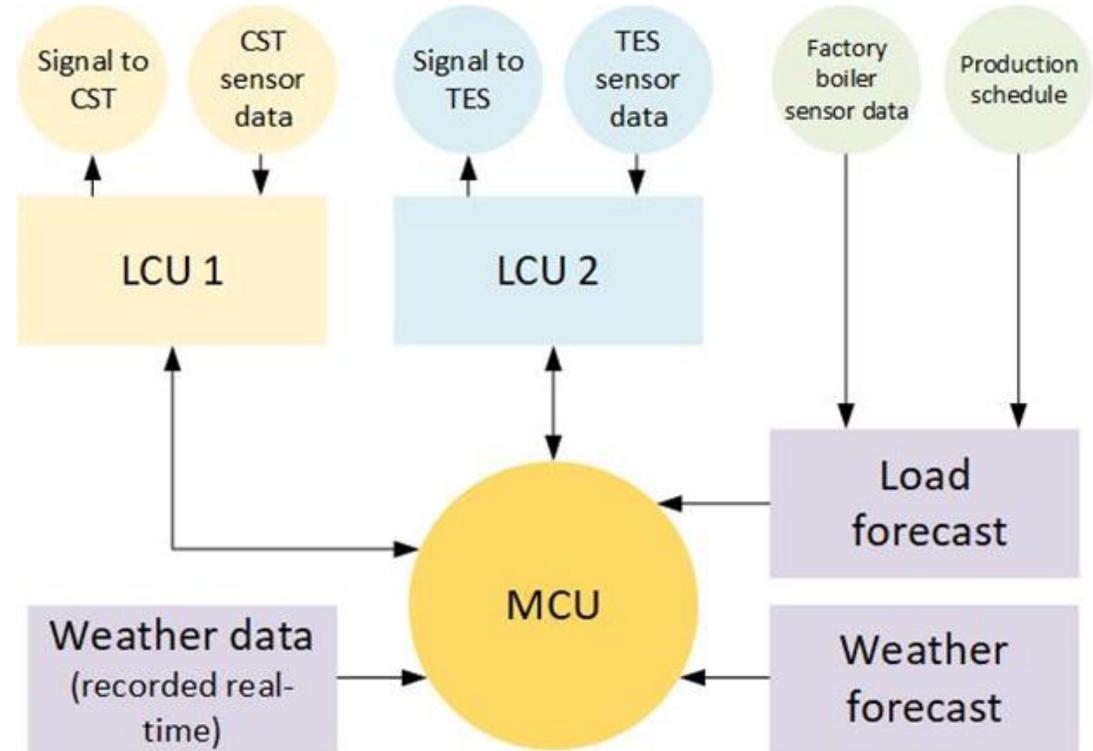
CPC - System



# Fully automated operation

## Smart Solar System – S<sup>3</sup>

- Next generation Smart Solar system
- Solar-era.net project
- Partners – DLR, Solar institute Jülich, University of Patras
- With support from KEAN, Cyprus University of Technology and CADE
- Development of CSP control system featuring:  
Integration with plant production schedule,  
Use of actual and forecast weather data,  
CST plant condition and CTES energy level
- Improved automatic reporting from system
- Aligned with the goals of Industry 4.0



# Summary & Conclusions

- KEAN – Typical application for industrial process heat
- Protarget has supplied systems providing both steam and hot water
- PTC system to be further developed as smart solar test bed
- Increased focus on industrial process heat – 60% of energy consumed by industry
- A significant part of this energy can be provided through solar thermal systems
- But, solar thermal systems have to become as convenient for the customer as the alternatives
- And this means collecting solar thermal energy when it is available and delivering it when required
- And for this any system must feature not only fully automatic operation, but also be smart and connected

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ANY QUESTIONS?

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