www.uslsudest.toscana.it
#salutetoscanasudest

Empower
ENERGY MONITORING, REGULATION AND MANAGEMENT
Technical Workshop

# Energy saving and monitoring in a Tuscany hospital



## Almada 25 oct 2018

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it
Tel +39 0575 254221 cell +39 335 6894572

AREZZO
Via Curtatone 54, 52100
Centralino 0575 2551
P.I e C.F 02236310518
SIENA
Piazza Rosselli 26, 53100
Centralino 0577535111
GROSSETO
Via Cimabue 109, 50100
Centralino 0564485111

SST Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# TUSCANY IS …

## Amazing Landscapes

## Cultural Heritage

## Wine & Food

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# BUT TUSCANY IS ALSO …

SISTEMA SANITARIO TOSCANO
«TUSCANY HEALTHCARE SYSTEM»

«Health above all»

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

www.uslsudest.toscana.it
#salutetoscanasudest

# L'AZIENDA USL TOSCANA SUD EST
# «THE HEALTHCARE COMPANY of SOUTH-EST of TUSCANY»

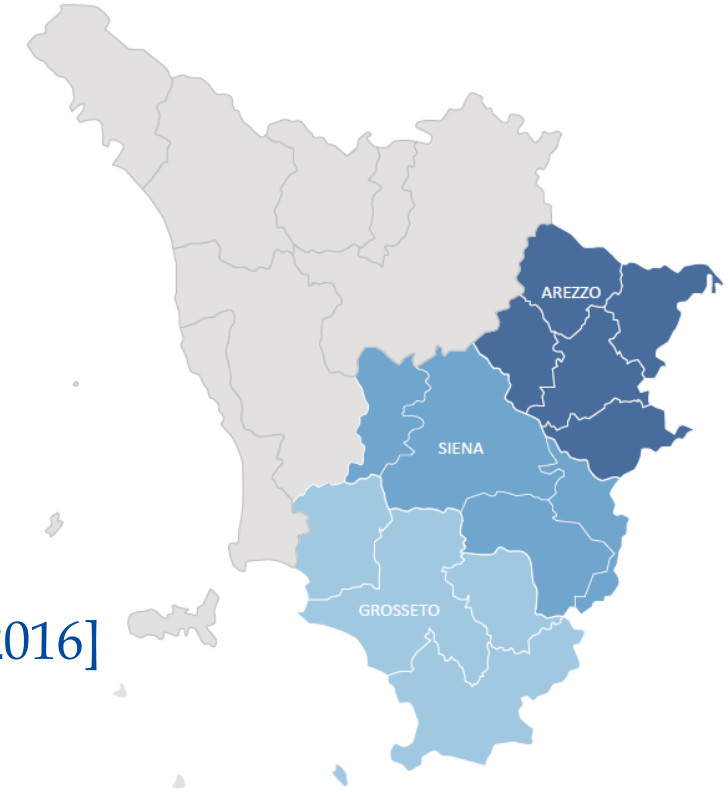
## Hospitals
n 13

## Surface
approx. 11.560 km²

## Population [Source Istat 01/01/2016]
circa 838.150 ab

## Population density [Source Istat 01/01/2016]
72,50 ab./km²

## Municipalities
n. 101 (39 on the mountains areas and 1 on the island)




### TECNOLOGY PLANNING AREA

1. Planning purchases of electromedical equipment
2. Donation and test of goods
3. IT Management
4. Energy Management

**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# Bloomberg Health Care Efficiency

| Rank | Rank 1Y Ago | Chg | Economy | Efficiency Score | Life Expectancy | Relative Cost % | Absolute Cost $ |
|---|---|---|---|---|---|---|---|
| 1 | 1 | - | Hong Kong | 87.3 | 84.3 | 5.7 | 2,222 |
| 2 | 2 | - | Singapore | 85.6 | 82.7 | 4.3 | 2,280 |
| 3 | 3 | - | Spain | 69.3 | 82.8 | 9.2 | 2,354 |
| 4 | 6 | 2 | Italy | 67.6 | 82.5 | 9.0 | 2,700 |
| 5 | 4 | -1 | S. Korea | 67.4 | 82.0 | 7.4 | 2,013 |
| 6 | 7 | 1 | Israel | 67.0 | 82.0 | 7.4 | 2,756 |
| 7 | 5 | -2 | Japan | 64.3 | 83.8 | 10.9 | 3,733 |
| 8 | 10 | 2 | Australia | 62.0 | 82.4 | 9.4 | 4,934 |
| 9 | 12 | 3 | Taiwan | 60.8 | 79.7 | 6.2 | 1,401 |
| 10 | 9 | -1 | U.A.E. | 59.7 | 77.1 | 3.5 | 1,402 |

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# HOSPITAL: FROM A MEDICAL PERSPECTIVE

## HEALTH

**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# HOSPITAL: FROM A TECHNICAL PERSPECTIVE

**ELECTRIC ENERGY**

**FUELS**
(Gas, Liquid …)

**POTABLE WATER**

## HEALTH

**ATMOSPHERIC EMISSIONS**

**SOLID WASTE**

**MEDICAL WASTE**

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# ENERGY CONSUMPTIONS OF AZIENDA U.S.L. TOSCANA SUD EST ON 2017

TOTAL T.O.E. 21.103,4

ELECTRICITY REQUIREMENTS 74.001.272 kWh

ELECTRICITY PURCHASED 54.617.648 kWh **(10.923.530 €)**

ELECTRICITY PRODUCED BY PHOTOVOLTAIC SISTEMS 315.124 kWh

**ENERGY PRODUCED BY CHP PLANTS 19.068.500 kWh**

NATURAL GAS 11.840.907 smc **(5.328.408 €)**

DIESEL FUEL 293.451 Ltr

LP Gas 11.011 Ltr

PETROL (for automotive) 210.500 Ltr

**Overall Energy Costs on 2017**

**€ 16.948.587**

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# CHP PLANTS in Azienda USL Toscana Sud Est

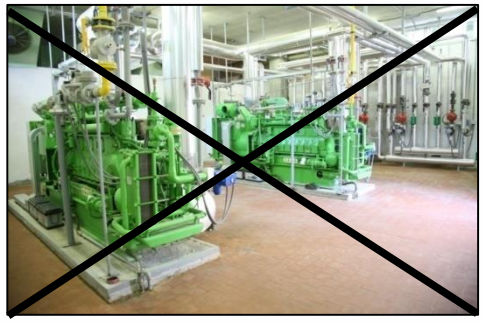
AREZZO AREA
AREZZO and VALDARNO HOSPITALS: **Overall Power 1.897 kWe**

GROSSETO AREA
GROSSETO, MASSA MARITTIMA and CASTEL DEL PIANO HOSPITALS: **Overall Power 1.540 kWe**

SIENA AREA
ABBADIA SAN SALVATORE HOSPITAL: **Power 30 kWe**

**ENERGY COST SIMULATION 2017 (WITHOUT CHP PLANTS)**

**€ 19.520.796**



**26% of Electricity Produced in our Hospitals by CHP**

**ENERGY COST 2017 (with CHP PLANTS)**

**€ 16.948.587**

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# AREZZO HOSPITAL COGENERATION PLANT

TOTAL COST
€ 1.502.949,89

ANNUAL SAVING
€ 781.189,16

GENERATED ELECTRIC ENERGY
6.135.929 kWh/Year

CO2 EMISSIONS AVOIDED
1.448 CO2 TONS/ Year

PAY BACK PERIOD
1,92 Years

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# PROGETTO OSPEDALE VERDE
# «GREEN HOSPITAL PROJECT»

(Realized with Environment Ministry funds)

## Project's objectives

- **To build n°2 CHP Plants in Arezzo and Valdarno Hospitals**
- To implement the energy upgrade of heating and refrigeration system of Hospitals and health districts
- To build n°2 Photovoltaic Systems in Arezzo and Cortona Hospitals
- **To install Building Management Systems (B.M.S.) in Hospital and health districts**
- To experiment the relamping for parts of the indoor illumination with LED technology in Arezzo Hospital

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# PROGETTO OSPEDALE VERDE
# «GREEN HOSPITAL PROJECT»

## Economic Framework

| EXPECTED COSTS | REAL COSTS |
|---|---|
| Total Expected Costs<br><br>€ 3.929.007,52 | Total Cost<br><br>€ 3.830.604,25 |
| Public financing (Ministy of Environment)<br><br>€ 2.917.931,09 | Public financing (Ministy of Environment)<br><br>€ 2.844.850,56 |
| Economic fund AUSL TSE Health Company<br><br>€1.011.076,43 | Economic fund AUSL TSE Health Company<br><br>€ 985.753,69 |

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# «GREEN HOSPITAL PROJECT»

## OUTCOMES

Energy purchased reduction equal to 2.976,09 TOE/Year (-26,8%)

Energy cost reduction equal to 1.608.853,06 €/Year (-26,4%)

CO2 emissions reduction equal to 7.386 Tons/Year (-27,1%)

## PAYBACK TIME

The Green Hospital Project costs will be regained with lower energy costs in **2,38 Years**

## BUILDINGS

The project involves energy efficiency in 39 buildings (Hospitals, Healthcare districts, ecc.)

## DURATION OF THE WORKS

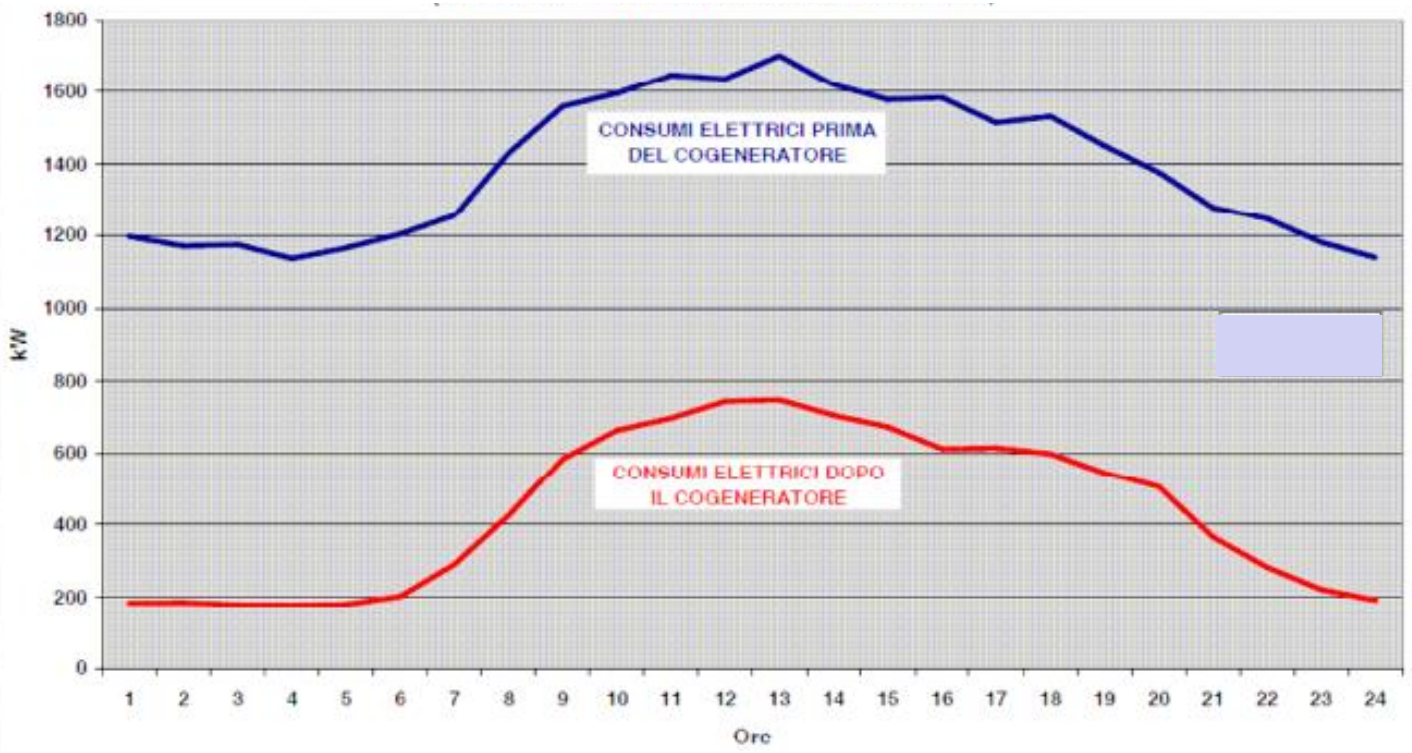
Works have started on 19/03/2014 and were closed on 21/02/2017

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# COGENERATORE OSPEDALE SAN DONATO AREZZO

Comparison of electricity consumption from national grid in Arezzo Hospital
31/10/2014 Vs 31/10/2015
(before and after CHP Plant)




**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# COGENERATORE OSPEDALE SAN DONATO AREZZO

**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# «GREEN HOSPITAL PROJECT» BUILDING MANAGEMENT SYSTEMS (B.M.S.)

In order to achieve a more efficient energy consumption, monitoring plays a fundamental role

One of the most important components of the Green Hospital Project was the installation of Building Management Systems (BMS)

B.M.S. allows to manage and control the operation of the CHP and HVAC plants, but also to collect data about electricity and natural gas consumption

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# «GREEN HOSPITAL PROJECT»
# BUILDING MANAGEMENT SYSTEMS (B.M.S.)

MAIN FEATURES OF B.M. Systems installed in the Project

Scalable

ASHRAE BACnet™

Integrable

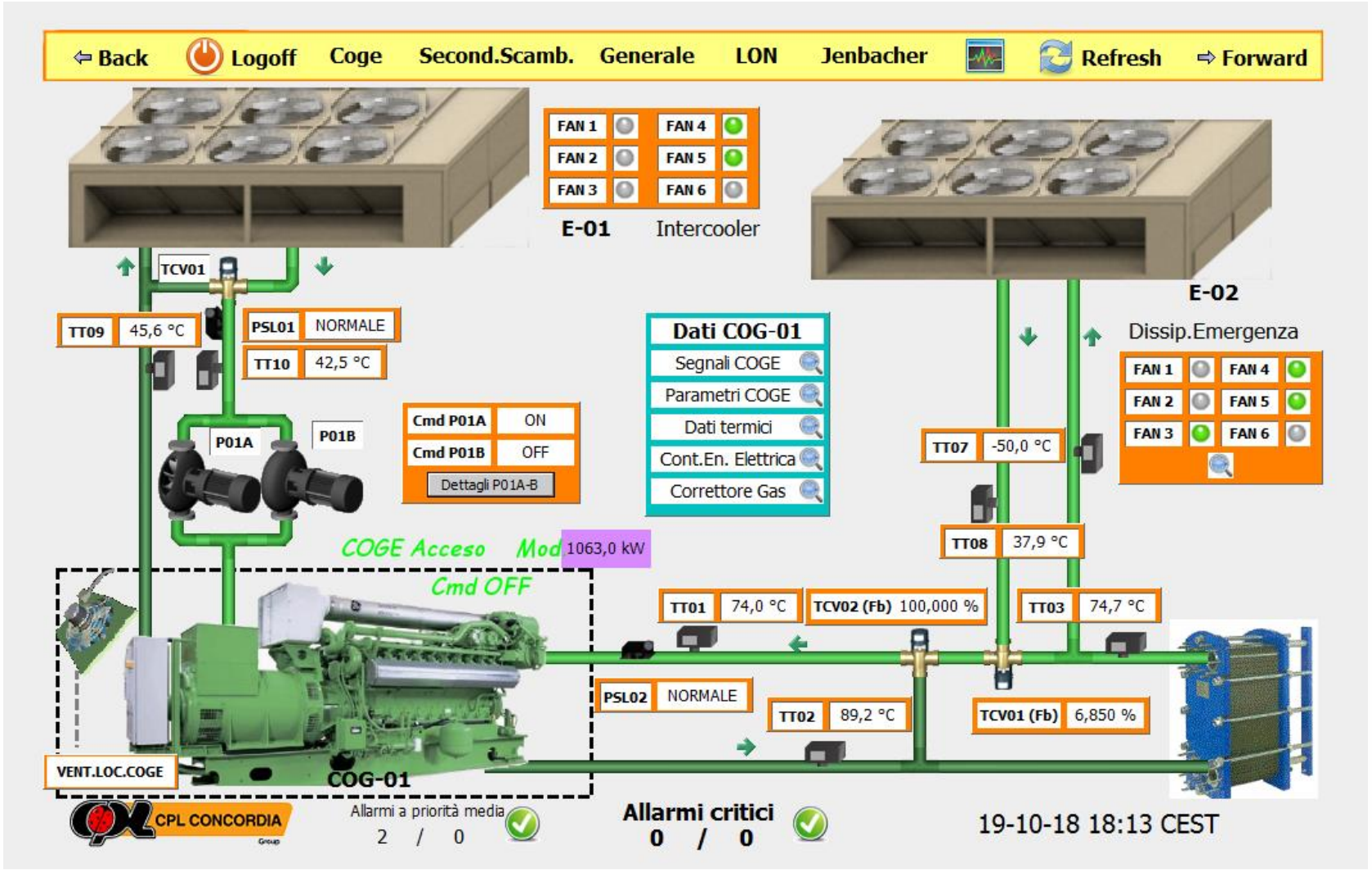
WEB Monitored

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# BUILDING MANAGEMENT SYSTEMS (B.M.S.)

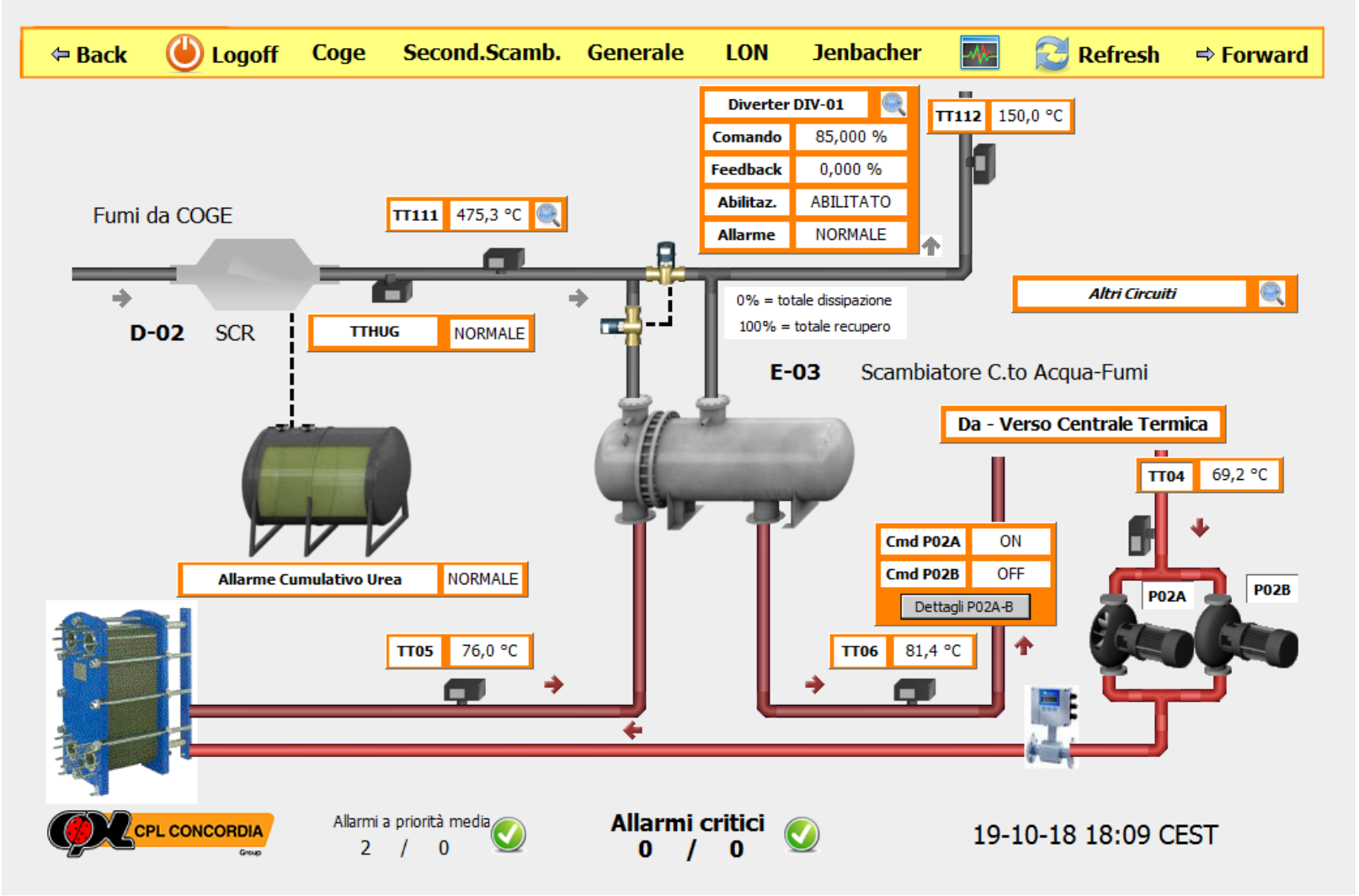
Engine and Energy parameters page




Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# BUILDING MANAGEMENT SYSTEMS (B.M.S.)

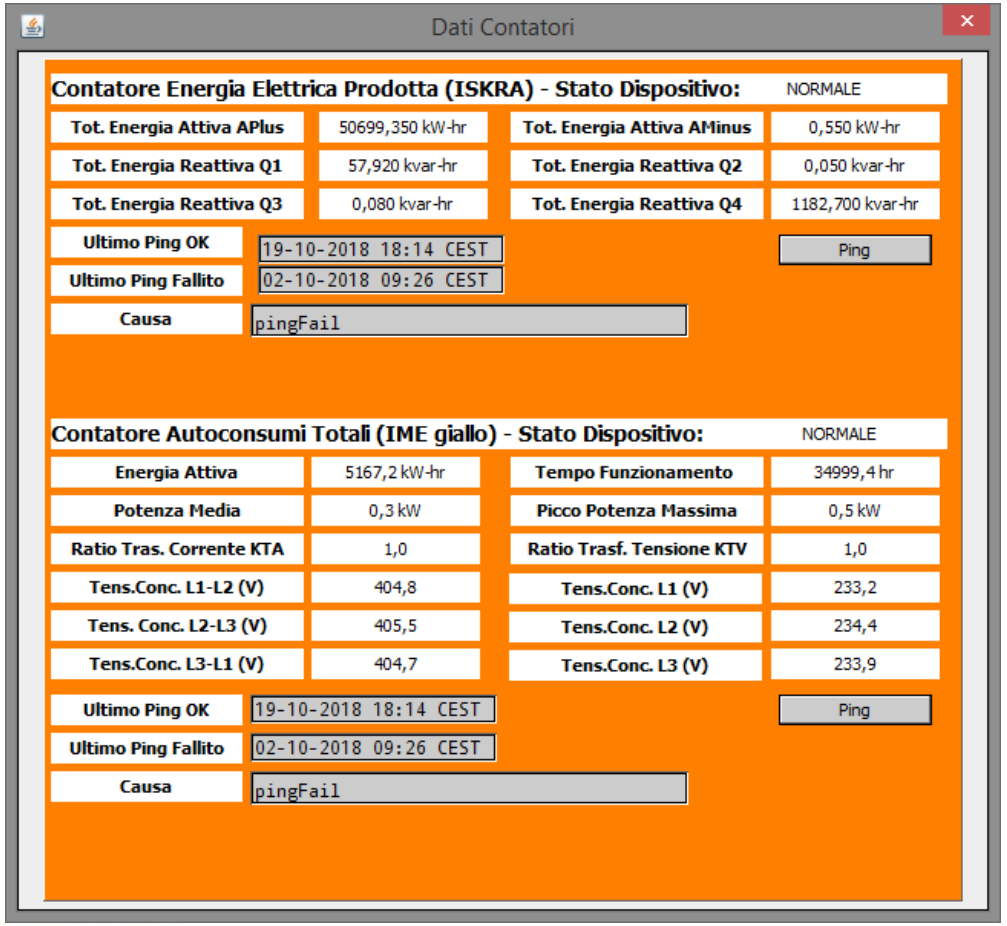
Hot Water and Exhaust Gas Heat Exchangers page



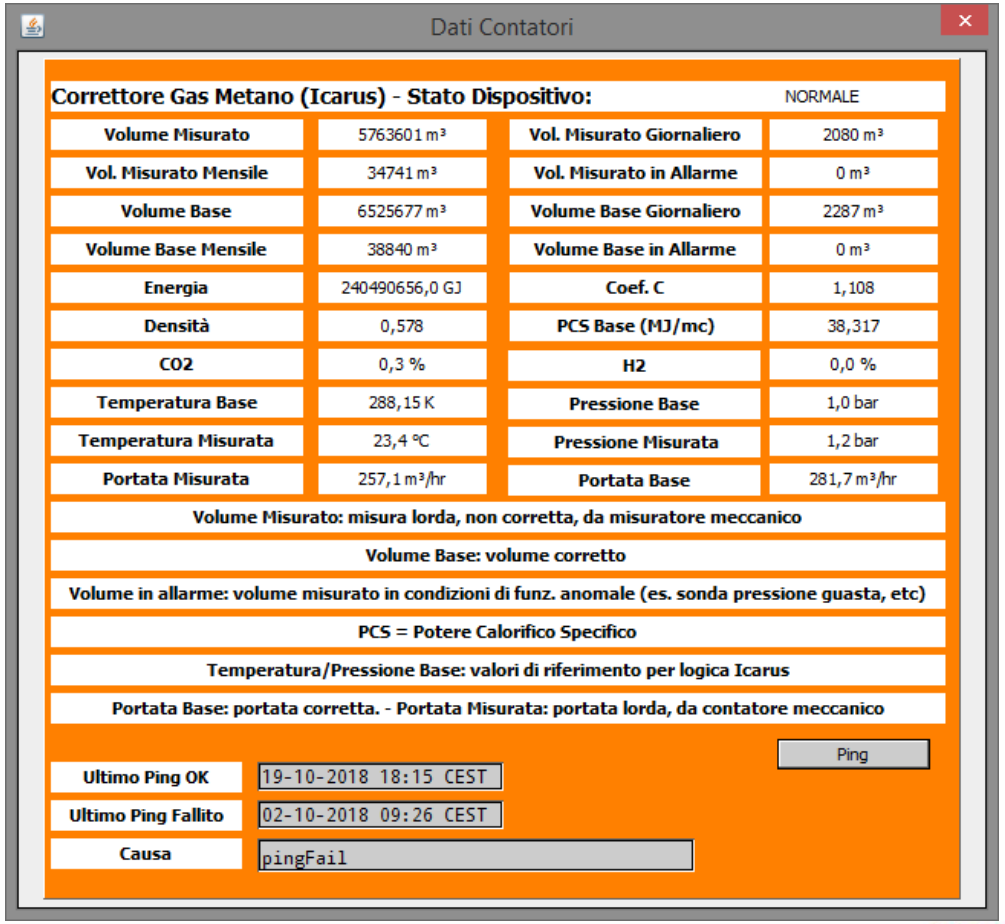

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# BUILDING MANAGEMENT SYSTEMS (B.M.S.)

## Electricity Production




## Natural Gas Consumption




Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

www.uslsudest.toscana.it
#salutetoscanasudest

# CHP Arezzo HOSPITAL

## GAS CONSUMPTION AND ENERGY PRODUCTION

| Timestamp | Value ($m^3$) |
|---|---|
| 18-Sep-18 12:00:00 AM CEST | 6439368 |
| 18-Sep-18 6:00:00 AM CEST | 6440765 |
| 18-Sep-18 12:00:00 PM CEST | 6442140 |
| 18-Sep-18 6:00:00 PM CEST | 6443505 |
| 19-Sep-18 12:00:00 AM CEST | 6444893 |
| 19-Sep-18 6:00:00 AM CEST | 6446286 |
| 19-Sep-18 12:00:00 PM CEST | 6447654 |
| 19-Sep-18 6:00:00 PM CEST | 6449022 |
| 20-Sep-18 12:00:00 AM CEST | 6450405 |
| 20-Sep-18 6:00:00 AM CEST | 6451794 |
| 20-Sep-18 12:00:00 PM CEST | 6453156 |
| 20-Sep-18 6:00:00 PM CEST | 6454519 |
| 21-Sep-18 12:00:00 AM CEST | 6455901 |
| 21-Sep-18 6:00:00 AM CEST | 6457291 |
| 21-Sep-18 12:00:00 PM CEST | 6458654 |
| 21-Sep-18 6:00:00 PM CEST | 6460013 |
| 22-Sep-18 12:00:00 AM CEST | 6461392 |
| 22-Sep-18 6:00:00 AM CEST | 6462784 |
| 22-Sep-18 12:00:00 PM CEST | 6464155 |
| 22-Sep-18 6:00:00 PM CEST | 6465515 |
| 23-Sep-18 12:00:00 AM CEST | 6466895 |
| 23-Sep-18 6:00:00 AM CEST | 6468287 |
| 23-Sep-18 12:00:00 PM CEST | 6469655 |
| 23-Sep-18 6:00:00 PM CEST | 6471019 |

THIS DATA ARE DAILY
GENERATED BY BMS
AND SENT WITH E-MAIL

| Timestamp | Value (kW-hr) |
|---|---|
| 18-Sep-18 12:00:00 AM CEST | 50.084.852 |
| 18-Sep-18 6:00:00 AM CEST | 50.094.461 |
| 18-Sep-18 12:00:00 PM CEST | 50.104.090 |
| 18-Sep-18 6:00:00 PM CEST | 50.113.719 |
| 19-Sep-18 12:00:00 AM CEST | 50.123.352 |
| 19-Sep-18 6:00:00 AM CEST | 50.132.969 |
| 19-Sep-18 12:00:00 PM CEST | 50.142.590 |
| 19-Sep-18 6:00:00 PM CEST | 50.152.219 |
| 20-Sep-18 12:00:00 AM CEST | 50.161.852 |
| 20-Sep-18 6:00:00 AM CEST | 50.171.480 |
| 20-Sep-18 12:00:00 PM CEST | 50.181.102 |
| 20-Sep-18 6:00:00 PM CEST | 50.190.730 |
| 21-Sep-18 12:00:00 AM CEST | 50.200.359 |
| 21-Sep-18 6:00:00 AM CEST | 50.209.988 |
| 21-Sep-18 12:00:00 PM CEST | 50.219.609 |
| 21-Sep-18 6:00:00 PM CEST | 50.229.238 |
| 22-Sep-18 12:00:00 AM CEST | 50.238.871 |
| 22-Sep-18 6:00:00 AM CEST | 50.248.488 |
| 22-Sep-18 12:00:00 PM CEST | 50.258.121 |
| 22-Sep-18 6:00:00 PM CEST | 50.267.750 |
| 23-Sep-18 12:00:00 AM CEST | 50.277.379 |
| 23-Sep-18 6:00:00 AM CEST | 50.287.012 |
| 23-Sep-18 12:00:00 PM CEST | 50.296.629 |
| 23-Sep-18 6:00:00 PM CEST | 50.306.262 |

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

# CHP Arezzo HOSPITAL

## GAS CONSUMPTION AND ENERGY PRODUCTION on 2017

| | |
|---|---|
| Energy Consumption (Natural Gas) | 15.576.000 kWh |
| Electricity Production | 6.136.000 kWh |
| Thermic Energy Production | 7.127.000 kWh |
| **Energy Efficiency** | **85.15%** |

Mr. Gilberto Cristofoletti
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

# TO REDUCE ENERGY CONSUMPTIOM
# TO IMPROVE HEALTH CARE

**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it

Azienda USL Toscana sud est
Servizio Sanitario della Toscana

**Mr. Gilberto Cristofoletti**
Head of Technology Planning Area
gilberto.cristofoletti@uslsudest.toscana.it