

**Interreg
Europe**



European Union | European Regional Development Fund

Empower
ENERGY MONITORING, REGULATION AND MANAGEMENT
Technical Workshop

Energy monitoring in hospitals in Tuscany



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EMPOWER
Interreg Europe



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AR AGENZIA REGIONALE
RECUPERO RISORSE

TUSCANY IS ...

Wine & Food



Cultural Heritage



Amazing Landscapes



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**SISTEMA SANITARIO TOSCANO
«TUSCANY HEALTHCARE SYSTEM»**



«Healthcare above all»



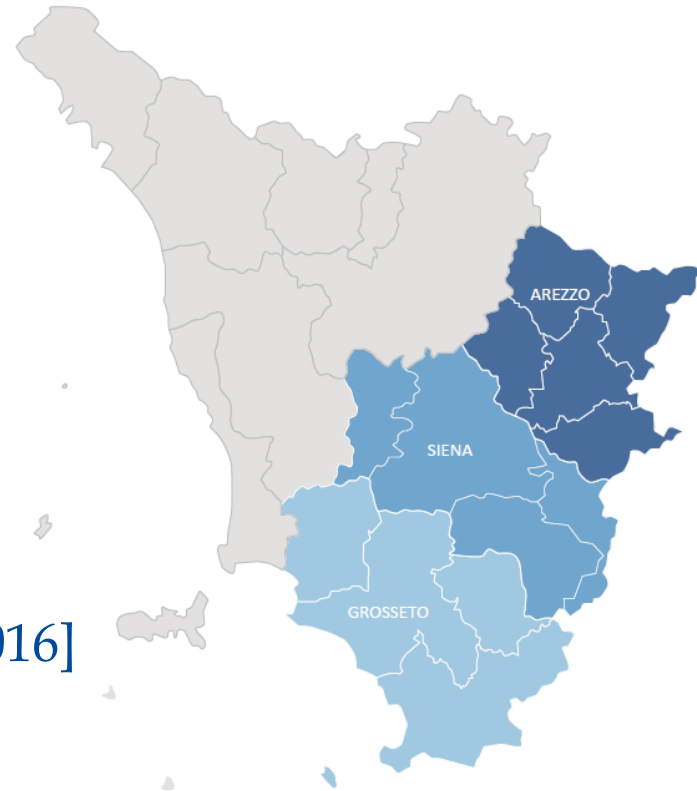
Hospitals
n 13

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

101 Comuni di cui 39 montani 20 parzialmente montani e 1 isolano



TECNOLOGY PLANNING AREA

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



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



HOSPITAL: FROM A MEDICAL PERSPECTIVE

HEALTH



HOSPITAL: FROM A TECHNICAL PERSPECTIVE



ELECTRIC ENERGY



FUELS
(Gas, Liquid ...)



POTABLE WATER

HEALTH



ATMOSPHERIC EMISSIONS



SOLID WASTE



MEDICAL WASTE



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

TOTALE T.O.E. **21.103,4** di cui

SIENA AREA **5.357,6**

AREZZO AREA **10.117,3**

GROSSETO AREA **5.628,5**

ELECTRICITY REQUIREMENTS **70.079.294 kWh**

ELECTRICITY PURCHASED **57.012.970 kWh (11.400.000 €)**

ELECTRICITY PRODUCED WITH PHOTOVOLTAIC SYSTEMS

249.416 kWh (0,3% del totale)

ENERGY PRODUCED WITH CHP PLANTS 12.816.908 kWh (18% del totale)

NATURAL GAS **10.713.677 smc (6.000.000 €)**

DIESEL FUEL **361.820 Ltr**

LP Gas **9.016 Ltr**

PETROL (for automotive) **190.527 Ltr**

**Overall Energy Costs
on 2017**

€ 17.917.919



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
2017
(with CHP PLANTS)**

€ 17.917.919



**27% of Electricity
Produced in our
Hospitals by CHP**

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

€ 20.444.482,82



AREZZO HOSPITAL COGENERATION PLANT

TOTAL COST
€ 1.502.949,89

ANNUAL SAVING
€ 431.043,13

GENERATED ELECTRIC ENERGY
6.135.929 kWh/Year

CO2 EMISSIONS AVOIDED
1.448 CO2 TONS/ Year

PAY BACK PERIOD
3,49 Years



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



PROGETTO OSPEDALE VERDE «GREEN HOSPITAL PROJECT»

Economic Framework

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



OUTCOMES

Energy requirement 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

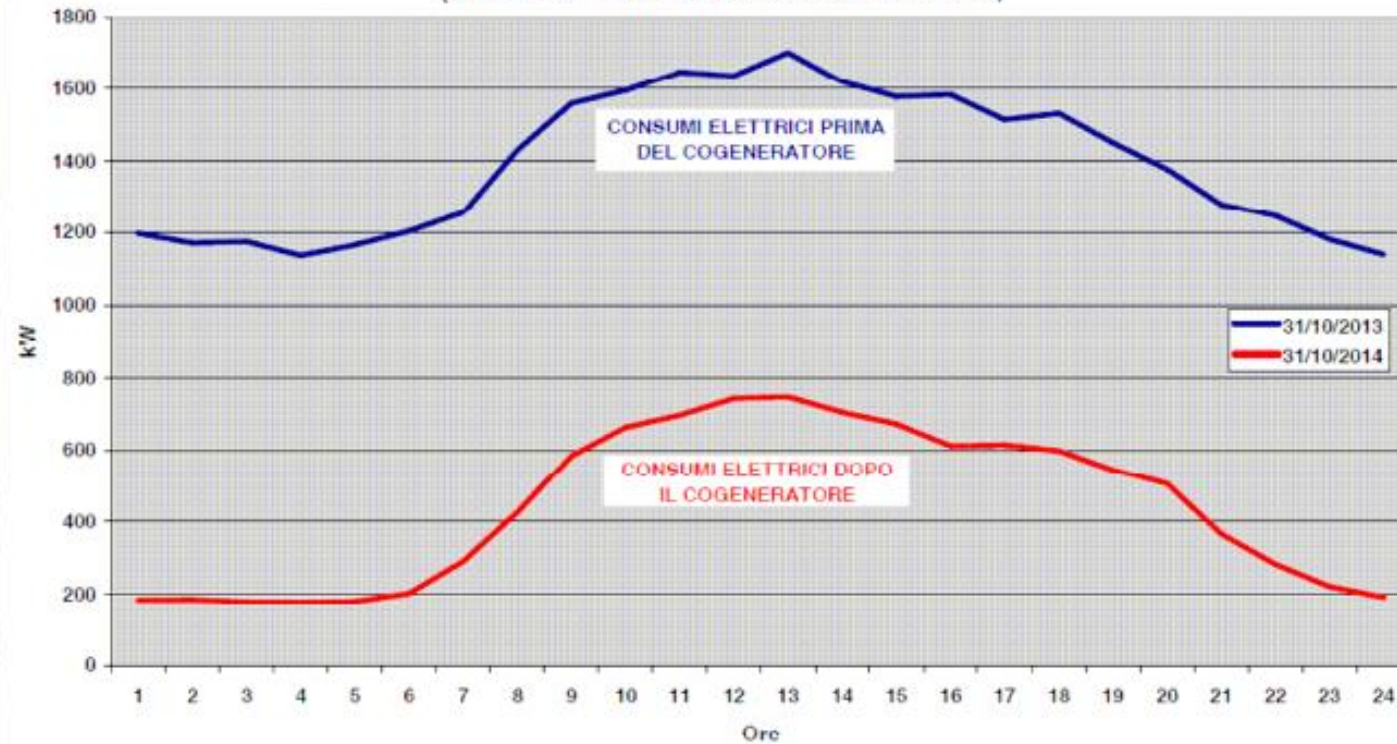


«GREEN HOSPITAL PROJECT»



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)



«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 components of the Green Hospital Project was the installation of Building Management Systems particularly in Hospitals

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





«GREEN HOSPITAL PROJECT»
The Control Room

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

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



Scalable

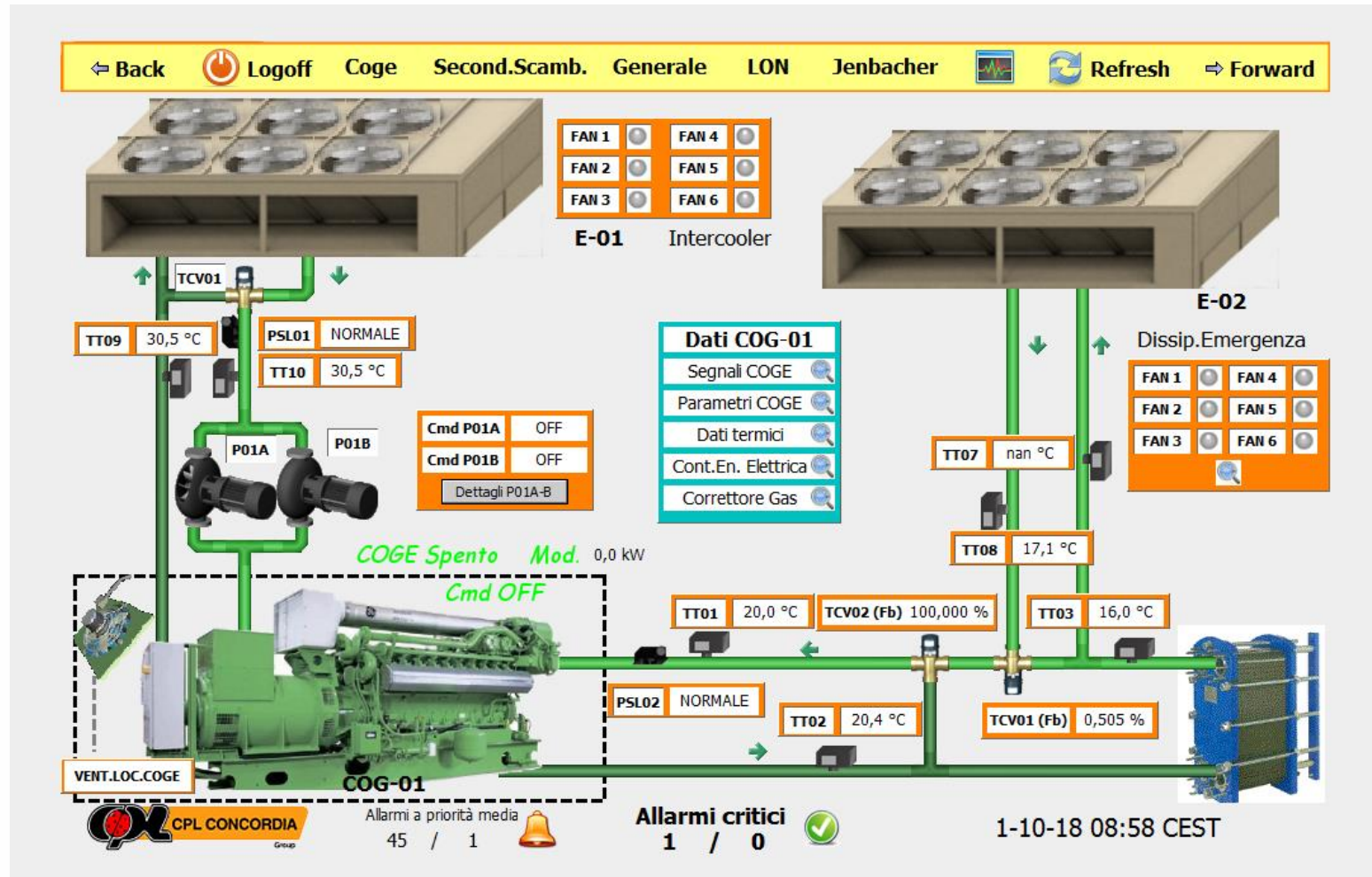


Integrable



WEB Monitored





Correttore Gas Metano (Icarus) - Stato Dispositivo: NORMALE			
Volume Misurato	5728861 m ³	Vol. Misurato Giornaliero	0 m ³
Vol. Misurato Mensile	0 m ³	Vol. Misurato in Allarme	0 m ³
Volume Base	6486838 m ³	Volume Base Giornaliero	0 m ³
Volume Base Mensile	0 m ³	Volume Base in Allarme	0 m ³
Energia	239182224,0 GJ	Coef. C	1,144
Densità	0,578	PCS Base (MJ/mc)	38,317
CO2	0,3 %	H2	0,0 %
Temperatura Base	288,15 K	Pressione Base	1,0 bar
Temperatura Misurata	17,6 °C	Pressione Misurata	1,2 bar
Portata Misurata	0,0 m ³ /hr	Portata Base	0,0 m ³ /hr
Volume Misurato: misura lorda, non corretta, da misuratore meccanico			
Volume Base: volume corretto			
Volume in allarme: volume misurato in condizioni di funz. anomale (es. sonda pressione guasta, etc)			
PCS = Potere Calorifico Specifico			
Temperatura/Pressione Base: valori di riferimento per logica Icarus			
Portata Base: portata corretta. - Portata Misurata: portata lorda, da contatore meccanico			
Ultimo Ping OK	01-10-2018 09:13 CEST		
Ultimo Ping Fallito	04-04-2018 08:06 CEST		
Causa	pingFail		



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
SYSTEM 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



OUR GOAL:

***TO REDUCE ENERGY
CONSUMPTION TO IMPROVE
HEALTH CARE***

THE END



Thanks to: **Mr. Gilberto Cristofolletti**

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