Biennial International Workshop

Advances in Energy Studies

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Boosting energy efficiency in Public Administration. Study case: “Palazzo della Farnesina”

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Ministry of Foreign Affairs and International Cooperation

Energy futures, environment and well-being

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Partners & Context

Farnesina
Ministero degli Affari Esteri
e della Cooperazione Internazionale

DGAI 02

FE federesco

Palazzo della Farnesina (1959)

A few figures…

Max length (facial): 169 mts
Max width: 132 mts
Floors: 9 (total)
Height: 51 mts
Volume: 729,000 cubic mts
Rooms (virtual) 2,074
Rooms (effective) 1,200
Total Corridor length: 6.5 Km

One of Italy's biggest complexes

Historical and Cultural constraints (2009)

Partners & Context

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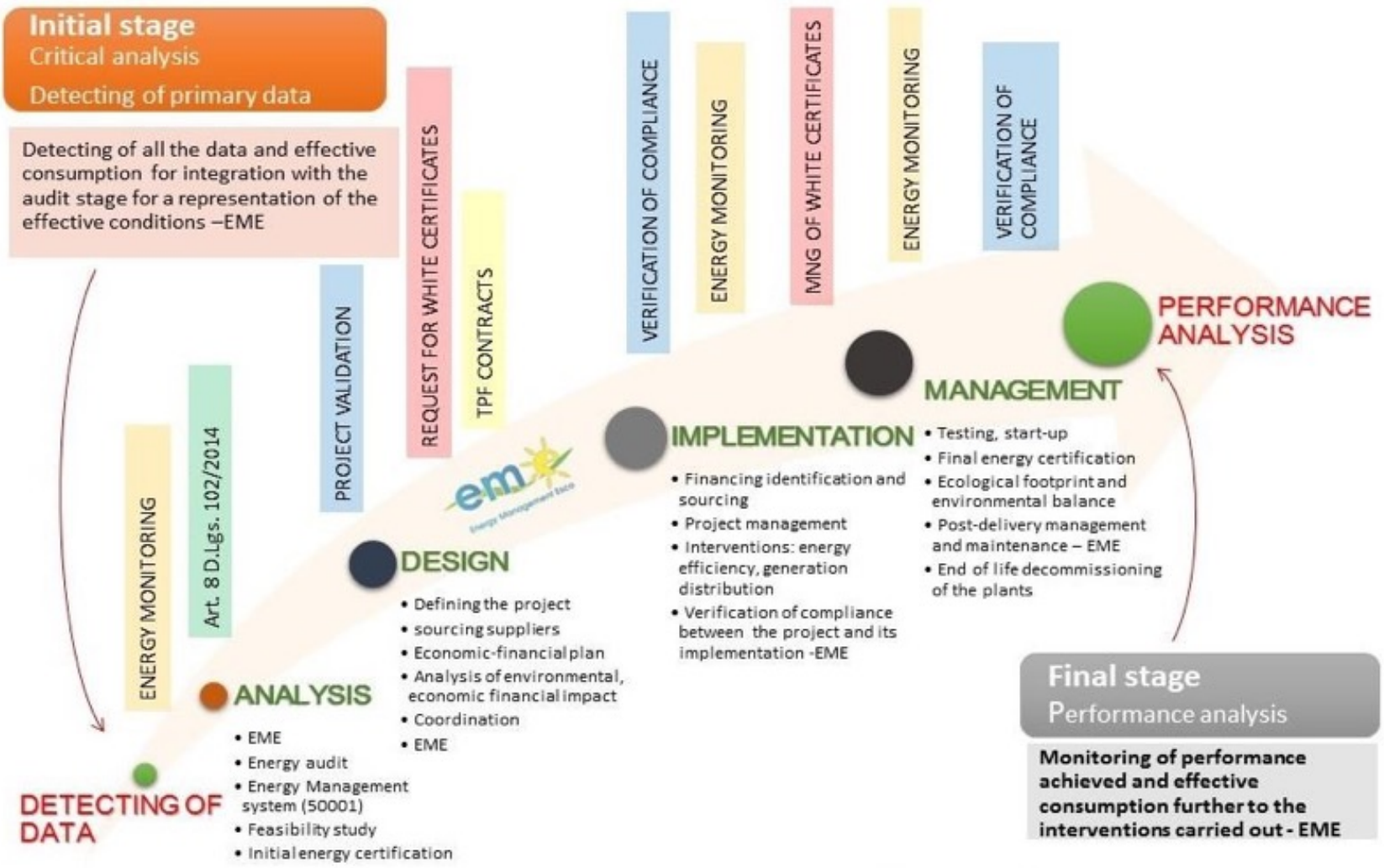
DGAI

Directorate-General for Administration and ICT
Units I, III, IV – Budget & Real Estate (Europe, Africa, ME, Americas)
Unit II – Central Administration real estate management
Unit V – Reserved Communications and Diplomatic Courier
Unit VI – Welfare & Social Affairs
Units VII, VIII – ICT Infrastructure & Security/Digitalization

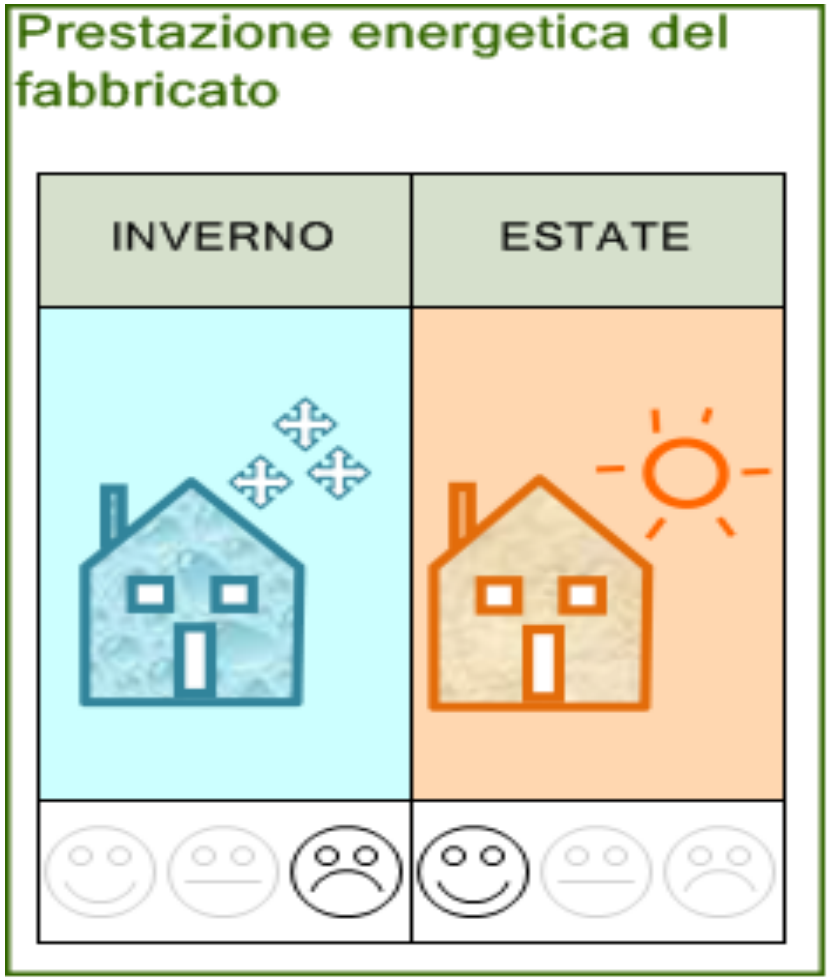
Unit II in charge of:
Estate management, Safety at work issues, Support services
Energy management

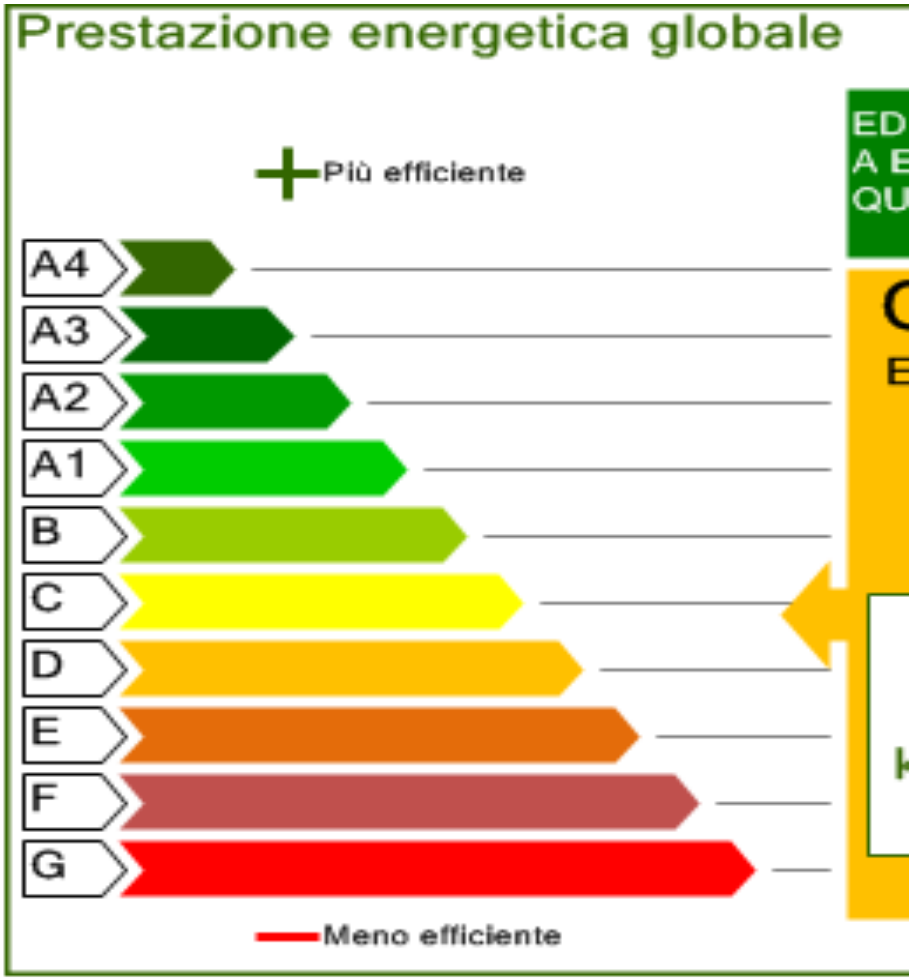
Process flow chart



Farnesina: Current state

Farnesina Energy Score in base of Italian regulation





Project for Improving Energy Efficiency

Energy Efficient Windows

Lighting System

Trigeneration Power Plant

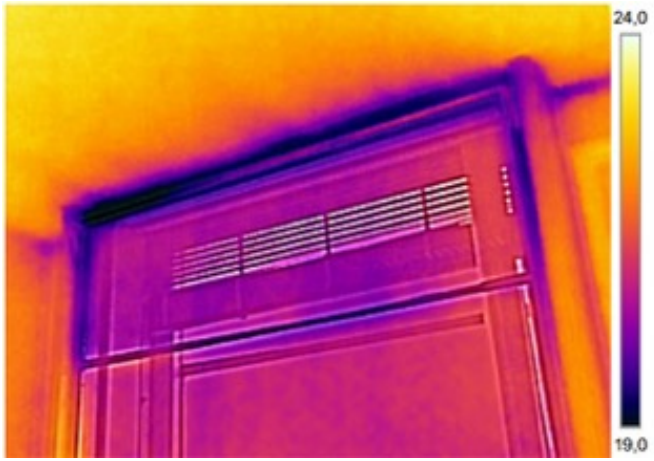
Regulation of the Heating System

Domotic System

Centralized Cooling System

Windows Frame Substitution

Total existing glazed surface: 9,400 m^2 (12% of the dispersing surface).



	Current	Proposed
Glazing type	Single	Low emissivity glazing or triple glazing
Frame type	Metal without thermal break	Aluminum with thermal break
Shading devices	Internal side	Integrated with the window
Glass thermal transmittance [W/m^{2}K]	5,60	1,00
Frame thermal transmittance [W/m^{2}K]	7,0	1,25
Window thermal transmittance [W/m^{2}K]	5,82	1,10

Lighting System

Substitution of various type of lights with **LED lights.** 2 Solutions:

- All the lights. Installed power reduction: 342 kW
- Only second floor lights (with domotic system). Power reduction: 48 kW

LED power (10-36 W)

High power LED with heat sink (58-232W)

Domotic System

BACS – Building Automation and Control Systems + LED lighting system installed in the second floor of the Farnesina (pilot project).

Systems managed:

- lighting,
- heating,
- air conditioning.

Controlling variables:

- internal temperature,
- windows (open/closed),
- presence,
- luminosity

Motion and luminosity sensor

Power supply

Thermostat

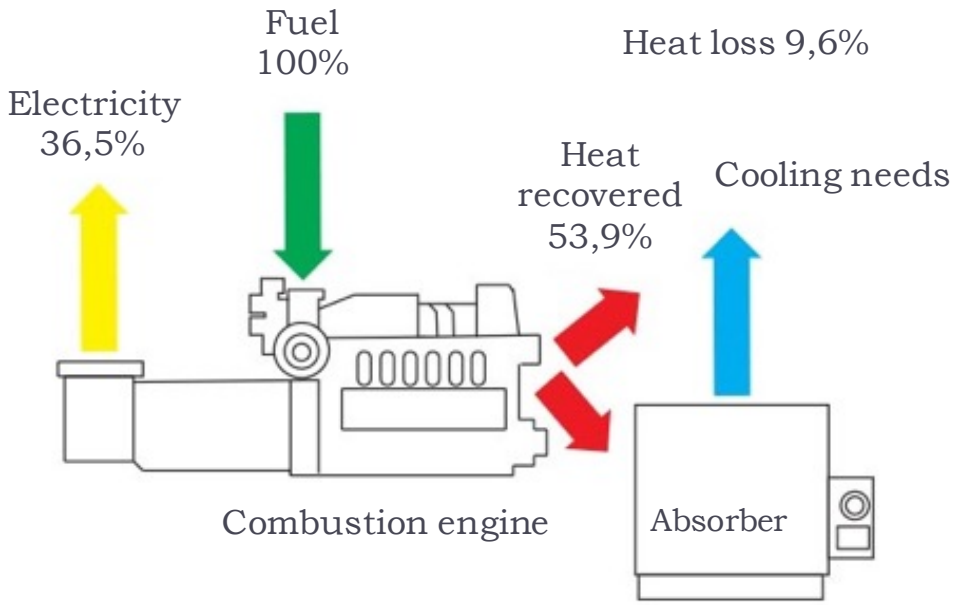
Temperature sensor

Building automation class (EN 151232) from worst (D) to best (A)

Tri-generation power system

Electricity + cooling from the exhaust gas heat.

Cooling energy used for the Electronic Data Processing area, which has a flat cooling need all year long.



Net power output [kW_e]	211,00
Total heat recoverable [kW_t] (tolerance ± 7%)	267,00
Fuel Input [kW] (tolerance ± 5%)	540,00
Electric efficiency [%]	38,80
Thermal efficiency [%]	50,50
Overall efficiency [%]	90,30
Cooling Power [kW_{frig}]	232
Absorber Coefficient of performance	1,01

Regulation of the heating system

- Thermostatic valves on each radiator
- Dynamic balancing valves on each vertical column of the distribution system
- Replacement of the existing pump with **electronical variable speed pump**

Thermostatic Valves

Balancing Valves

Main benefits:

- Improvement of the overall efficiency of the heating system
- Elimination of thermal and hydraulic displacement
- Reduction of pump power consumption

Cooling system centralization

Centralization of the cooling system of the frontal facade: **170** external units.

Main benefits:

- Higher Efficiency (COP)
- Centralized Regulation (reduction of unneeded uses)
- Esthetic Renovation

Summary of Proposed Solutions

		Investment Cost [€]	State incentive	€ savings [€/year]	PBT [years]
1	Energy Efficient Windows	8.035.964	-	165.706	48,5
2	Lighting substitution	1.851.670	C.T. 2.0 70.000 €/year	283.720	6,3
3.1	Domotic system only 2° floor (or)	283.292	C.T. 2.0 50.000 €/year	14.654	15,9
3.2	Domotic System (or)	506.887	C.T. 2.0 120.000 €/year	36.952	10,5
4	Trigeneration power plant	467.884	TEE 22.500 €/year (5 years)	196.800	2,4
5	Regulation of the Heating System	288.567	T.B.D.	33.500	8,0
6	Centralization of the Cooling System	520.048	-	71.430	7,3

Energy and environmental benefits

		Toe saved/year	tCO_2 avoided/year
1	Energy efficient windows	**54,7**	**283**
2	Lighting system	**91,0**	**530**
3.1	Domotic system only 2° floor (or)	**6,9**	**29**
3.2	Domotic System (or)	**17,5**	**72**
4	Trigeneration power plant	**59,8**	**57**
5	Regulation of the Heating System	**27,6**	**143**
6	Centralization of the Cooling System	**19,8**	**81**
	TOTAL PERFORMANCE	**270/260**	**1.166 (1.123)**

It is equivalent to: **1.847 x**

5.700 new

Project Financing and Next Steps

- State incentive: Conto Termico (regulation reference: D.M. 16/02/2016; D.lgs 102/2014; Dlgs 28/2011);

Note: Incentives are payed with economic resources coming from quotas of Carbon emission rights, not from general taxation. (virtous circle)

- State financing: MATTM call for projects (Dlgs. 102/2014 art.5.3)

Next steps for our Project:

1. *Preliminary Plan: drafted and presented to The Ministry of the Environment and Protection of Land and Sea (MATTM) (Accomplished)*
2. *Plan to be validated by Technical Public Bodies reporting to MATTM (Accomplished)*
3. MATTM to assess and decide financing of the project (total/part)

«It's almost impossible until it's done»

Thank you for your attention

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