CESI

THE MARKET OF ENERGY EFFICIENCY
Nature and measurement of the commodity

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WHAT IS EFFICIENCY ?

End-use energy efficiency is a measure of the level of end-use energy services (eg. heating, cooling, lighting, or motive power) that can be delivered per unit of energy ‘consumed’.

WHAT IS AN ENERGY SERVICE ?

Energy

Technology

Energy Service

ATTRIBUTES OF AN EFFICIENCY MARKET

Commodities: Energy Efficiency Certificates, represent metered and verified quantities of saved energy

Buyers: obligation-bound parties, voluntary (ethical) buyers

Sellers: parties that are able to undertake energy efficiency actions that can be measured and verified in order to create certificates

Others : Financial Brokers

THE SCOPE OF AN EFFICIENCY MARKET

To reward participants for undertaking energy efficiency actions that result in measured ‘energy savings’

To give obliged parties the option to buy the Certificates instead of implementing the projects

THE NATURE OF THE COMMODITY

The Certificate represents a property right to a public good, in this case the public environmental, energy security and perhaps welfare ‘goods’ derived from increased energy efficiency.

The Certificate obtains value through:

- government imposed obligations on relevant parties
- voluntary ‘green consumer’ preferences.

THE NEED FOR A QUALITY CHECK

Why ?

Intangible commodities, quality not directly verifiable:

Sellers of poor products are encouraged to enter the market.

Buyers are in a market only because of legislated obligations:

Lack of interest in the 'quality' of the product (all efforts aimed at seeking out the lowest prices)

A non-selective market penalises good products and subsidises poor products, … so?

"Lack of quality" → Less actual savings

QUALITY ASSURANCE

Problems to solve:

- to identify energy efficiency actions that are actually motivated by the energy efficiency programme, and are *additional* to what would otherwise have happened (according to a *base line*)
- to separate changes in energy consumption due to energy efficiency actions from all the other possible factors that can change consumption
- to measure a product which has no real physical existence

THE ASSESSMENT OF ENERGY SAVINGS

Procedures for the quantitative assessment of Energy Savings (AEEG, Decision n. 103/03):

a) Default method; — Ex-ante

b) Analytic methods;

c) Metered baseline method.

(b and c) — Ex-post

Energy Efficiency Certificates are issued according to the evaluation made by means of an approved procedure

REQUIREMENTS OF THE ASSESSMENT RULES

- Reasonable trade off between simplicity, technical coherence, and accuracy
- Transparency
- Easiness of on-site verification (random checks are foreseen)

DEFAULT METHOD (1)

- Gives directly the energy savings per physical unit of equipment
- Typically available for “mass” projects where reliable averages can be determined

DEFAULT METHOD (2)

Applicable when:

- phenomena driven by few “key factors”
- cause and effect relationship clearly individuated
- common equipment items such as domestic appliances and electric motors are being installed
- “on field” energy performances are known for the considered technologies

DEFAULT METHOD (3)

Problems:

- *Baseline* selection
- Analysis of the energy process and determination of the correlation among relevant variables
- Algorithm definition

Note: all technical and safety rules are to be observed by designer(s) and installer(s).

ANALYTIC METHOD (1)

- An “open” default method
- Savings are assessed after metering of relevant parameters
- Justified for peculiar projects having relatively large unit size (cogeneration, VSD pumping systems, etc.)

ANALYTIC METHOD (2)

Problems:

- Engineering model definition
- Selection of parameters to be metered on field
- Metering criterion (little intrusive, simple, reliable, not expensive)

METERED BASELINE METHOD (1)

Used when energy savings are the results of measures (also "non energy") involving complex interactions among several different variables and equipments

Savings are based on the difference of measured energy consumption 'before' and 'after' the implementation. Baselines may be normalized to other process variables.

Recommended for very large projects

METERED BASELINE METHOD (2)

Problems:

- Individuation of the energy flows, materials flows, metering points
- Selection of metering criteria (little intrusive, simple, reliable, not expensive)
- Meters selection (precision, utilisation field)
- Need for adjustments

WALL/ROOFINGS INSULATION

Physical reference unit:	Unit of insulated surface (m^2)					
Gross specific savings of primary energy which can be obtained for a single building	**RTL = RSL x S (toe 10^{-3}/year/building)** **(S = surface of insulated walls/roofings)**					
Gross specific savings of primary energy per unit of insulated surface (RSL):	**Building sector:** **<u>residential</u>**					
	RSL **(toe 10^{-3}/year/m^2 of insulated surface)**					
	K of the structure before the EE measure **(W/ m^2/ K)**					
Climatic zone	*0.7÷0.9*	*0.9÷1.1*	*1.1÷1.3*	*1.3÷1.6*	*1.6÷1.8*	*>1.8*
A, B	0.3	0.4	0.6	0.7	0.9	1.1
C	0.7	0.9	1.2	1.5	1.9	2.4
D	1.3	1.7	2.3	2.8	3.6	4.4
E	2.2	3.1	3.9	4.8	6.2	7.7
F	3.5	4.8	6.2	7.6	9.8	12.0

K= Thermal Transmittance of the structure before the EE measure.

A climatic zone is a conventional cluster of municipalities sharing a value of degree-day (e.g. averaged over the year) within a given range. Italian regulations consider 6 climatic zones.

WALL/ROOFINGS INSULATION

Gross specific savings of primary energy per unit of insulated surface (RSL):	**Building sector: <u>offices, educational, commerce</u>**					
	RSL (toe 10^{-3}/year/m^2 of insulated surface)					
	K of the structure before the EE measure ($W/m^2/K$)					
Climatic zone	*0.7÷0.9*	*0.9÷1.1*	*1.1÷1.3*	*1.3÷1.6*	*1.6÷1.8*	*>1.8*
A, B	0.3	0.4	0.5	0.6	0.8	1.0
C	0.6	0.8	1.0	1.3	1.7	2.1
D	1.1	1.5	2.0	2.5	3.2	3.9
E	1.9	2.6	3.3	4.0	5.2	6.4
F	2.8	3.9	4.9	6.1	7.8	9.6

WALL/ROOFINGS INSULATION

Gross specific savings of primary energy per unit of insulated surface (RSL):	**Building sector: <u>hospitals</u>**					
	RSL (toe 10^{-3}/year/m^2 of insulated surface)					
	K of the structure before the EE measure ($W/m^2/K$)					
Climatic zone	*0.7÷0.9*	*0.9÷1.1*	*1.1÷1.3*	*1.3÷1.6*	*1.6÷1.8*	*>1.8*
A, B	0.6	0.8	1.1	1.3	1.7	2.1
C	1.0	1.4	1.8	2.3	3.0	3.7
D	1.7	2.3	3.0	3.7	4.8	5.9
E	2.6	3.6	4.6	5.7	7.4	9.0
F	3.8	5.3	6.7	8.3	10.6	13.1

WALL/ROOFINGS INSULATION

Class	K ($W/m^2/K$)	Typology of structures
0.8	0.7÷0.9	Homogeneous hollow brick wall with a 3 cm insulating panel (12 cm) Concrete hollow block wall with a 3 cm insulating panel Horizontal brick-concrete roofings with a 3 cm insulating panel Sloping brick-concrete roofings + not insulated tile-concrete garret floor
1.0	0.9÷1.1	Installed concrete wall + 3 cm insulating panel Cavity wall made of hollow brick without insulation Concrete cavity wall + 3 cm insulating panel Cavity wall made of brick-concrete without insulation Light panel with 4 cm insulating panel
1.2	1.1÷1.3	Lightened concrete wall (20 cm) Cavity wall made of hollow or solid brick without insulation Sloping roof tiling + brick-concrete garret floor without insulation
1.4	1.3÷1.6	Solid concrete wall (35 cm) without insulation Natural rock (50 cm) without insulation Horizontal brick-concrete roofings without insulation Wood slab with air space
1.7	1.6÷1.8	Solid concrete wall (25 cm) without insulation
2.0	> 1.8	Monolithic wall (12 cm) without insulation Concrete wall without insulation Concrete hollow block wall (30 cm) without insulation Concrete cavity wall without insulation

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