

CURBING ELECTRICITY DEMAND. SAVINGS POTENTIAL IN ITALY THROUGH EFFICIENT MOTORIZATION

CESI Ricerca, Via Rubattino 54, 20134 Milano, Italy
capozza@cesiricerca.it, grattieri@cesiricerca.it

Overview

Quite a remarkable amount of the Italian yearly electricity demand (about 70%) must be ascribed to the electric motors. Focusing the industrial sector, the electric motors are responsible of about 75% of the consumes. If we consider the currently commercialised typologies of electric motors such as:

- Asynchronous single-phase
- LV asynchronous three-phases
- MV asynchronous three-phases
- Fed by direct current
- Others

predominance occurs of LV asynchronous three-phases squirrel cage motors (about 78% of the total motor consume) with nominal power in the range 0,75 - 90 kW. Energy savings policies in such an energy intensive sector, based on widespread exploitation of high efficiency motors, are then bound to be particularly effective and actually they are being considered with continuously growing attention.

A voluntary agreement is under way under EC aegis among the main constructors of electric machinery (CEMEP agreement, see ref. **Errore. L'origine riferimento non è stata trovata.**), relevant to classes *eff3*, *eff2* and *eff1* of progressively growing efficiency as a function of the nominal power (see **Errore. L'origine riferimento non è stata trovata.**).

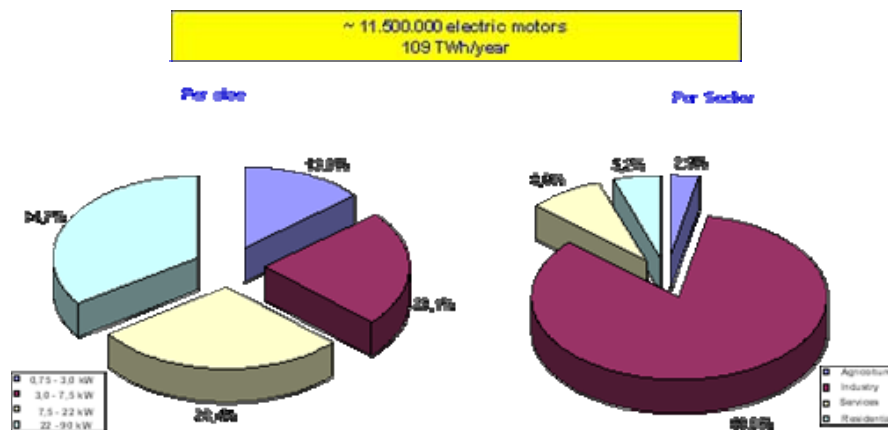


Fig. 1: national reference set of electric motors for energy savings evaluations

The present market in Italy involves mainly *eff2* motors (about 720,000 units per year), whereas the use of more efficient *eff1* motors is still occasional.

This paper describes the studies performed in the frame of the publicly funded research framework for the Italian Electricity System (see ref. **Errore. L'origine riferimento non è stata trovata.**). These studies were aimed at a better understanding of items such as:

- the potential for use of higher efficiency motors
- the savings which can be attained
- the barriers which hamper a wider exploitation of such a potential
- the instruments to remove these barriers

Methods

The present potential in Italy for the substitution with *eff1* electric motors was firstly considered, together to the evaluation of the relevant cumulated energy savings and of the time horizon to realistically achieve these savings.

The main actors of the Demand-Side Electricity System (Energy Managers, constructors of equipment, trade associations, ESCO, policy makers) were confronted systematically, on the base of interviews/questionnaires and of focused workshops. The main goals of this approach was diffusion of information/awareness and investigation of the main barriers against a wider exploitation of *eff1* motors.

Instruments were finally suggested to remove the singled out barriers of economic and psychological nature; in the former case, policies were recommended of institutional subsidies or tax exemption; in the latter case, informational processes were suggested, possibly based on results of experimental campaigns finalised to efficiency assessment on *eff1* motors existing on the present market.

Results

On the above bases, evaluations were performed on a national reference set of LV asynchronous three-phases squirrel cage motors (see

Fig. 1). In the extreme case of immediate and complete substitution of the whole of existing motors with *eff1* ones, these evaluations showed a cumulated (and theoretical) electric energy savings potential of about 7 TWh/year. Conversely, a more realistic scenario of gradual penetration was considered, which corresponded to substituting every out-of-order motor with an *eff1* one and to adopting new motors only in *eff1* class; this would entail a total market of *eff1* motors of about 1,000,000 pieces/year.

On this latter assumption, incremental energy savings of about 0.4 TWh/year could be attained, which would allow to match the theoretical cumulated savings of 7 TWh/year within about 17 years.

Some of the pointed out barriers to a wider diffusion of *eff1* motors are of practical kind, in the sense that the assortment of these equipment (in terms of adopted materials and overall dimensions) is still too limited to fulfil the very *variegated* range of requirements of the customers.

Other evidenced barriers belong to a psychological side. Some end-users showed a scarce confidence on how actual efficiency of a motor fulfil the requirements of the class of efficiency declared by the constructor (though this class at present has not been assumed yet as a formal and standardised energy label). To this purpose and in answer to this kind of perplexities, a campaign of experimental tests on efficiency was performed on samples of *eff1* motors, with the aim of statistically checking the conformity to the CEMEP agreement of the motors marketed in Italy. The result of the campaign, though performed on quite a

limited number of samples, showed substantial compliance with CEMEP requirements (see **Errore. L'origine riferimento non è stata trovata.**).