

IMPACT OF END-USE ENERGY EFFICIENCY ON THE DISTRIBUTION NETWORK

Anna BROGI - Christian D'ADAMO
 Enel Distribuzione S.p.A – Italy
anna.brogi@enel.it – christian.dadamo@enel.it

INTRODUCTION

Energy efficiency is crucial for modern electricity markets. The attention to efficiency, sustainability and corporate social responsibility is a key issue for utilities worldwide. This paper summarizes the approach of the Italian electricity sector to end-use energy efficiency, intended as the reduction in electricity consumptions through actions which are addressed to the final customers.

Since 2004, annual energy saving targets have been established by the Italian Regulator, with the institution of Energy Saving Companies (ESCOs), the definition of White Certificate for energy savings and the implementation of a dedicated White Certificates trade mechanism.

Enel, due to its important market position and commitment or a sustainable development, will play a strategic role for the achievement of national targets and for promoting a rational use of energy.

THE ITALIAN ENERGY EFFICIENCY TARGETS

End-use energy efficiency is being promoted in many Countries across the European Union and worldwide. It represents a way for the sustainable development of modern society. Many national legislations are supporting end-use energy efficiency projects.

The Italian energy efficiency system is based mainly on political directives:

- the implementation of Kyoto protocol: Italy is committed to reduce its emission by 6.5 % between 1990 and 2008-2012;
- the need to comply with the European Directives (96/92/CE and 98/30/CE) on the liberalization of the electricity and gas market and with the Decree no. 79 of 16th March 1999 (called Bersani Decree) and the Decree no. 164 of 23rd May 2000 (called Letta Decree) which establish that Concessions for the Distribution Companies shall contain actions to increase energy efficiency and end uses, according to quantitative targets to be set by the Minister of Industry jointly with the Minister of the Environment;

According to these rules, a new Decree dated 20th July 2004 definitely established the quantitative targets in terms of primary energy, the suitable actions to fulfil them and the mechanism of White Certificates trading.

Targets are set as a gradually growing annual value

expressed in million of tonnes of equivalent oil per year (Mtoe/year) of absolute saving of primary energy. The target doubles every year and is shared between the electricity utility sector and the gas utility sector, according to fig.1.

The obligation interest only the electricity and gas Distribution Companies with more than 100,000 customers as of Dec 31st 2001. Reference parameter for apportionment is the ratio of own electricity/gas distributed to the total in the previous year.



Fig.1 Italian Energy saving targets

The energy efficiency actions must be performed in the period 2005-2009. Within this period, there are five annual deadlines to be respected, and the targets will be verified for each year by May 31st of next year, starting from 2006.

Possible candidates to implement energy saving projects to final customers are:

- Energy (power and gas) distributors
- Their controlled company or subsidiaries
- Private ESCOs (Energy Saving Companies)

To achieve the annual target Distribution Companies can either promote energy efficiency actions for their costumers or buy efficiency titles (so called “**White Certificates**”) on a dedicate trading market.

The maximum lifetime of most eligible projects is conventionally set at 5 years (it is extended to 8 years for a restricted set of measures on buildings).

White Certificates

The purpose of White Certificates (1 white certificate = 1 tonne of equivalent oil) is to:

- provide an accounting tool to prove that the

corresponding amount of primary energy has been effectively saved; at the end of each compliance period distributors will have to submit to the Authority for Electricity and Gas a number of White Certificates corresponding to their annual obligation;

- allow to establish a trading mechanism to steer also private companies (ESCOs) to implement energy saving actions and sell their White Certificates to a pool

Three kind of certificates are established:

- type 1: certify the achievement of primary energy savings through reductions of electricity consumption
- type 2: certify the achievement of primary energy savings through reductions of natural gas consumption
- type 3: certify the achievement of primary energy savings through reductions in the consumption of other fossil fuels

The duration of these certificates is dependent on the duration of the related energy savings (generally 5 or 8 years).

White Certificates trading mechanism and trading rules

The parties involved in White Certificates trading are essentially the project implementers to whom the certificates will be awarded (Distribution Companies and ESCOs). Joint operation of the Authority for Electricity and Gas and of the Electricity Market Operator will occur in the trading frame according to the below fig.2

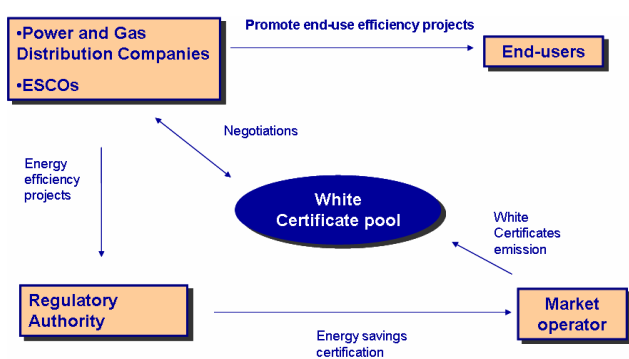


Fig.2 Parties involved in the trading mechanism and their functions

White Certificates are issued to the promoter of the project by the Market Operator once the related energy savings are approved by the Regulator Authority. The Regulator Authority verifies the implementation of the projects and gives the approval to the Market Operator to recognize a corresponding amount of certificates. White Certificates may be negotiated both via bilateral

contracts and in the marketplace organised and managed by the Market Operator.

In the White Certificates market:

- Distribution Companies may purchase certificates if the savings achieved through their own projects are below the yearly target in order to fulfil their obligation;
- Distribution Companies may sell their own certificates if the savings achieved through their own projects exceed their yearly target, making a profit by selling their surplus;
- ESCOs may sell the certificates that they have obtained through independent projects, as they are not required to fulfil any obligation, and may thus make a profit by selling their certificates to Distribution Companies.

The marketplace provides sessions once a week. During the trading sessions, market participants shall enter their trading orders into the order book, specifying the type of certificates to be traded, their quantity and their price.

As compensation for the project carried out, the Distribution Company earns 100 Euro per redeemed White Certificate. Based on the request and the offer of White Certificate, the spot price in the marketplace could be either less or more than the recognized cost of 100 Euro.

If the annual efficiency target is missed by more than 50 % each year, a penalty must be paid by the Distribution Company. The exact amount of the penalties is still under definition.

Comparison among base principles of Great Britain and the Italian scheme

Since the energy efficiency Certificates market model is similar to the one established in the UK, there are some differences to be pointed out:

- recognized costs for energy saving projects is not stimulating ESCO operation (100 €certificate in Italy vs 230 €certificate in the UK);
- Energy savings are calculated on 5 years basis and not on real expected life of equipment, as in the UK;
- Savings are calculated on market available equipment and not on real ones.

RESULTS DELIVERED AFTER FIRST YEAR

The Italian Decree establishes that the efficiency target should be fulfilled by electricity and gas Distribution Companies, according to their market share.

On this basis, the total target for 2005-2006 was 151,911 tep of which:

- 97,854 tep for the electricity sector
- 58,057 tep for the gas one.

According to that, in June 2006 the Italian Regulator has verified the accomplishment of the obligations: all the Distribution Companies have fulfilled the target, with the exception of 3 electricity utilities and 2 gas ones.

Between January and June 2006 the Regulator has certified an energy saving of 286,837 tep, asking the Market Operator for issuing the following amount of White Certificates:

- 214,244 type 1: primary energy savings through reduction of electricity consumption (75% of total);
- 62.826 type 2: reduction of natural gas consumption (22%);
- 9.767 type 3: reduction in the consumption of other fossil fuels (3%);

In total, the amount of White Certificate issued has exceeded the target fixed for the first year (+184%). For that reason, the spot price for White Certificates negotiated on the marketplace was lower than the recognized cost.

The transactions on the marketplace were relatively few. This happens as the major Distribution Companies produced themselves the amount requested in 2005.

Provisions say that in future the spot price will rise considering that the target to be achieved doubles every year from 2005 onwards.

Bilateral contracts and direct negotiations between Distribution Companies and ESCOs were preferred. In total, the White Certificates contracted were 120,381, of which:

- 104,498 type 1;
- 15,713 type 2;
- 170 type 3.

THE EXPERIENCE OF ENEL DISTRIBUZIONE

Enel Distribuzione, the largest Italian electricity distribution company tackle the end-use energy efficiency target at different levels by:

- promoting energy efficiency programs to end-users with the active collaboration of all the other business division of the Group;
- promoting energy efficiency initiative and devices, as well as offering advice and services to residential and business customers;
- adopting and implementing energy efficiency technologies on its network and on its main offices

(such as combined heat and power schemes, photovoltaic cells, etc);

- fostering the development of a cleaner and more efficient energy technologies;
- studying methods to quantify the energy savings derived from the adoption of innovative solutions.

The specific projects which Enel has undertaken to achieve the efficiency targets and to fulfil them are:

- **Free distribution to consumers of Fluorescent Compact Lamps (FCL):** FCL have 80% less consumption than traditional ones and their technical life is up to 8 times higher. Enel distributed over 2 million high efficiency lamps in 2005 and over 5 millions in 2006.
- **Efficiency projects for the public lighting system:** Enel operates 1.800.000 spot lights in 4.100 Municipalities. Saving projects consists in replacement of old lamps with high efficiency ones and installation of flux intensity regulators.
- **Enel Club:** Enel launched a special card offered to 1 million Enel customers which provides a 10% discount on class A domestic appliance purchase. Thanks to this card in 2004 and 2005 it was sold around 37.000 A class domestic appliances.
- **Use of geothermal sources for domestic and civil heating:** geothermal heat is available in some Italian regions (primary Tuscany) and is used to produce renewable electric energy. The direct use of geothermal resources is a proven, economic, and clean energy option that saves money and reduces pollution. Geothermal reservoirs of low to moderate temperature (20°- 150°C) are used for heating homes, offices, and green houses and a variety of other applications.

All efficiency projects have been supported by informative campaigns and education at schools.

The result achieved in 2005 is about 59,000 ktoe saved with direct action according to the below fig.3, achieving 100% of the target.

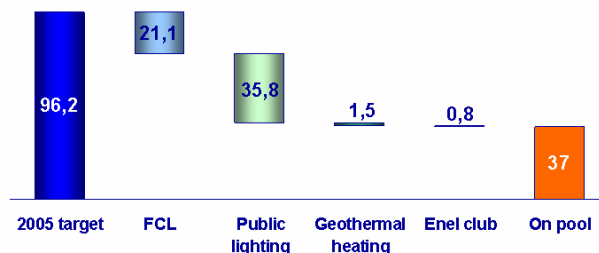


Fig.3 Enel Energy saving in 2005: results delivered

In 2006 the energy efficiency projects continued to focus on high efficiency devices (FCL, domestic appliances, etc) and also involved hot water economizers which provide energy savings of up to 60% on hot water consumption and gas burning. Enel has promoted the free distribution of over 1 million of hot water tap economizers and of about 100,000 shower economizers.

Electronic Metering and AMM system

In order to further promote the end-use energy efficiency Enel is committed to explore the opportunities made available by the smart metering technology.

As of 31st December 2006, 30 million old metering devices have been replaced with new Digital Meters and an Automatic Meter Management system (called *Telegestore*) has been fully implemented.

The technology is based on 3 main devices:

- 30 million digital meters (metering and data collection)
- 350,000 concentrators (data aggregators and communication gates)
- a central system (processing, billing and remote operation).

Enel is currently investigating the possibility to provide customers with intelligent home displays which will allow the customer to be informed, as an example on actual consumption and historical ones, tariff schemes and other contractual parameters. This to the aim of increasing the awareness and consciousness of consumption, thus reducing energy wastes.



Fig.4 The Automatic Meter Management system

CONCLUSION

This paper provides a quick overview on the Italian energy efficiency system and incentive scheme.

Since 2005 onwards, Distribution Companies must provide a fixed amount of White Certificates (1 certificate = 1 tonne of equivalent oil of primary energy saving). The target doubles every year.

The Distribution Company (electricity and gas ones with more than 100,000 customers) may either produce their own certificates, promoting energy efficiency to their customers, or buy certificates from ESCOs, with bilateral contracts or from the market place established to this aim.

Enel reached 100% of the 2005 target and is committed to fulfil the future ones relying on a advanced technology and innovative instruments.

Promoting energy efficiency to end-users involve many task, from technology to communication and education, but it's a way for a sustainable development and should be pursued with all forces.