



Bridging the industrial energy efficiency gap – Assessing the evidence from the Italian white certificate scheme



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ARTICLE INFO

JEL codes:

D22
D82
L14
L97
Q48

Keywords:

White certificates
Energy efficiency obligations
Policy evaluation
Energy Service Companies (ESCOs)
Industrial energy savings
Market barriers

ABSTRACT

The Italian white certificate scheme is the main national policy instrument to incentivise energy efficiency of the industrial sector, with savings from white certificates amounting to 2% of Italy's 2012 primary energy consumption. The mechanism sets binding energy-saving targets on electricity and gas distributors with at least 50,000 clients and includes a voluntary opt-in model for participation from other parties. This paper investigates and assesses the elements of the scheme that help overcome several barriers to deliver industrial energy efficiency. Results from a survey conducted among leading experts indicate that the Italian system provides a strong financial incentive to energy efficiency investments, covering a significant share of investment costs and thus reducing payback time. Moreover, the scheme fosters the development of energy service companies (ESCOs), which are key to developing, installing and arranging finance for projects on the ground. In conjunction with other policies, the mechanism also raises awareness of energy efficiency investment opportunities, thus helping overcome the market failure of insufficient information. Core challenges remain, including tackling regulatory uncertainty and improving access to finance.

1. Introduction

Improving energy efficiency is one of the most cost-effective ways to curb greenhouse gas emissions and improve energy security. The EU Energy Efficiency Directive (EED) sets a 20% energy savings target by 2020, and energy efficiency is one of the five dimensions of the EU's Energy Union Strategy (EC, 2015). Despite being a central pillar of European energy and climate policy, many barriers have been found to prevent the implementation of an economically efficient level of energy efficiency investments.

The Italian white certificate scheme is an instrument designed and introduced to help overcome this 'energy efficiency gap' (Jaffe and Stavins, 1994). Through energy efficiency obligations (EEOs) it imposes binding energy efficiency targets on obligated parties over a given period of time. Achieved savings are then credited with certificates, which can be traded on a market. Energy efficiency measures can potentially be carried out in all end-use sectors. Italy's 2014 National Energy Efficiency Action Plan (NEEAP) establishes the Italian white certificate mechanism as the main instrument to comply with the Energy Efficiency Directive (MiSE, 2014). The industrial sector is at the

heart of the Italian white certificate scheme – it is expected to deliver 94% of the energy savings under the white certificate scheme up to 2020. EEOs are also gaining importance across the EU – six European countries have already implemented energy efficiency obligations and ten others are planning their introduction (ENSPOL, 2016, 2015).

In recent years, Italy has succeeded to shift the majority of energy efficiency measures within its white certificate scheme from the residential and tertiary sector to industry, a sector responsible for 25% of EU final energy consumption (Eurostat, 2014). Despite the economic downturn, Italy is still the EU's fourth largest economy and its second biggest manufacturing power. At the same time, Italy has the highest electricity prices of the major European economies and an energy dependency rate of more than 75%, well above European average (Eurostat, 2015a, 2015b). Consequently, improving competitiveness of the Italian industrial base through energy efficiency measures is an important national strategic priority (MiSE and MATTM, 2013).

The goal of this paper is to identify the factors that explain the success of the Italian white certificate scheme and to develop recommendations for other countries that consider introducing policies to

Abbreviations: AEEGSI, *Autorità per l'energia elettrica il gas ed il sistema idrico* (Italian energy market regulator, formerly AEEG); DSO, Distribution system operator; EED, Energy Efficiency Directive; EEO, Energy efficiency obligation; EGE, *Esperto in Gestione dell'Energia* (Energy Management Expert); ESCO, Energy service company; ESP, Energy service provider; ESPC, Energy service provider company; ETS, Emissions Trading System; FIRE, *Federazione Italiana per l'uso Razionale dell'Energia* (Italian Federation for the Rational Use of Energy); GSE, *Gestore dei Servizi Energetici* (manages white certificate scheme); M & V, Measurement and verification; NEEAP, National Energy Efficiency Action Plan; SME, Small and medium-sized enterprises; SSE, *Società di servizi energetici* (Energy Service Business); Toe, Tonne of oil equivalent

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<http://dx.doi.org/10.1016/j.enpol.2017.01.031>

Received 13 July 2016; Received in revised form 27 December 2016; Accepted 20 January 2017

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Table 1
Taxonomy of barriers to industrial energy efficiency.

Barrier	Explanation
Short payback periods	Firms do not carry out investments with payback times longer than 2–5 years due to risks associated with the investment
Limited access to capital	Insufficient own capital (equity), access to external financing difficult as banks are unwilling to lend
Imperfect information	Lack of credible information, e.g. due to search costs or low trustworthiness of the information source
Lack of skilled personnel	Maintaining internal competences for energy management and training personnel is costly
Low priority of energy efficiency measures	Organisations focus on core production activities, neglecting energy efficiency investment opportunities (bounded rationality)
Regulatory uncertainty	Ambiguities of existing regulation, undefined long-term policy goals

address the energy efficiency gap. The analysis is primarily based on a survey conducted amongst leading experts during the annual conference on the Italian white certificates taken place in Rome on 19–20 March 2015. The survey highlights, first, a range of drivers incentivising industrial energy efficiency investments within the scheme, as well as remaining barriers. Moreover, it was possible to quantify the scale of the monetary incentive as the share of investment costs typically covered by white certificates and to identify the reduction in payback time of investment projects. A third focus is the role of energy service companies (ESCOs) in Italy. ESCOs are part of the energy services sector, which has so far achieved the majority of energy savings in the Italian white certificates mechanism.

The paper is structured as follows. Section 2 develops a taxonomy of barriers to industrial energy efficiency investments and illustrates the role the energy services sector can play to overcome the energy efficiency gap. Section 3 describes how white certificates systems work and analyses their implementation in Italy. Section 4 assesses the drivers for industrial energy efficiency investments in Italy, building on an analysis of the results of the survey carried out at the high-level conference in Rome. Section 5 develops policy recommendations and concludes.

2. Overcoming barriers to energy efficiency with the energy services industry

Past research has shown that the number of energy efficiency measures carried out is consistently below of what seems to be economically efficient, due to a range of different investment barriers (Thollander and Palm, 2013).

2.1. A taxonomy of barriers to industrial energy efficiency

Table 1 presents a taxonomy of barriers to energy efficiency investments that are relevant in the Italian industrial sector, subdivided into the three categories financial, informational/behavioural/institutional and external.

Within financial barriers, the use of **payback time** as a relatively simple investment criterion is widespread among investors and lending institutions – in industry, payback times are generally below five years (IEA, 2012). Short payback periods imply that only highly profitable projects are carried out and reflect uncertainty about market conditions in the medium term. For the Italian industrial sector, a survey among 115 companies that have carried out energy efficiency investments has revealed an average payback time of 2–3 years, constituting the main investment barrier (ES, 2012). Moreover, difficult **access to capital** is among the major barriers to energy efficiency investments in the Italian industrial sector (EC JRC, 2005; ES, 2012).

Energy efficiency investments may not take place due to **imperfect information**. Companies may lack sufficient information about energy efficiency opportunities due to search costs, especially small and medium-sized enterprises (SMEs). 22% of the Italian businesses interviewed by Energy & Strategy Group have had difficulties to convince their top management to base investment choices on energy efficiency criteria because of insufficient knowledge about investment opportunities (ES, 2012). Information may also be imperfect due to a

low quality of the information source (Sorrell et al., 2000; Thollander and Palm, 2013). In Italy, Trianni and Cagno (2012) find scarce and low-quality information to be among the primary investment barriers for Italian non-energy intensive SMEs. The shortage of adequate information is also caused by a **lack of skilled personnel**. In the Italian government's 2013 National Energy Strategy, the scarce availability of internal expertise and skilled personnel needed for complex efficiency measures are mentioned as principal barriers to energy efficiency in the industrial sector (MiSE and MATTM, 2013). Finally, a **low priority of energy efficiency** measures, reflected in a strong focus on core production activities, has been found to be a relevant barrier to energy efficiency investments. In Italy, 25% of businesses do not attribute strategic importance to energy management. This number rises to 40% when only SMEs are considered (ES, 2012). Similarly, Trianni et al. (2013) and Cagno and Trianni (2014) find that different investment priorities are the main barrier to energy efficiency investments for Italian SMEs.

The barrier of **regulatory uncertainty** – an ambiguous regulatory environment or undefined long-term policy goals, for example – raises the implicit discount rates of energy efficiency investments due to an increased riskiness (Schleich, 2009). Regulatory uncertainty thus increases a focus on short-term projects and may deter potential beneficiaries of an energy efficiency incentive scheme from participating in the mechanism. In a recent survey among 161 Italian businesses from the Italian energy efficiency industry, a clarity of norms and a reduction of bureaucracy have emerged as the two most important investment drivers (ENEA, 2015).

2.2. The energy services industry

The energy services industry, in particular energy service companies (ESCOs), is hailed by many experts as a promising means of overcoming many of the barriers to industrial energy efficiency (e.g. Sorrell et al., 2000). Strengthening the energy services industry and developing 'green' supply chain is also an explicit goal of Italy's National Energy Strategy (MiSE and MATTM, 2013).

Energy service contracting involves the outsourcing of energy services¹ to a third party (Sorrell, 2007). This third party, the energy service provider (ESP), is defined in Article 1 (24) of the EU EED as a "natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises" (EP, 2012). This fairly general definition encompasses two types of actors (see Fig. 1).

ESCOs have three main characteristics (Bertoldi et al., 2006):

- ESCOs carry out energy efficiency improvement measures (e.g. installation of new energy conversion equipment), and guarantee either a particular amount of energy savings or the same level of services from energy at lower cost (performance guarantee).
- Their remuneration is tied to the achievement of the contractually

¹ The European standard EN 15900:2010 provides the first common definition of an energy service as an operation to measurably improve energy efficiency, delivered on the basis of a contract (Backlund and Thollander, 2011).

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