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Evaluation methodology for energy efficiency measures in industry and service sector

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Abstract

Directive 2012/27/EU, transposed in Italy with Decree of 4 July 2014 No102, a common framework of measures for the promotion of energy efficiency in European Union, is an innovative tool for improvement of energy efficiency and also necessary to undertake main objective of European Union (save 20% of primary energy consumption by 2020). Large enterprises and energy-intensive firms, except those having an energy management system (EnMS) according to ISO 50001 or compliant with EMAS Eco-Management and Audit Scheme or ISO 14001 fall under obligations and must be carry out energy audits every 4 years starting by December 2015 having "SMART" requirements: be Specific, Measurable, Accessible, Realistic, Time related. The analysis on a sample of Italian companies, mainly of small and medium enterprises (SME) in industry and the service sector, was conducted. Energy audit was carried out to identify Energy Company Profile, rationalize energy consumption to increase energy efficiency, assessing potential for energy savings and reducing of environmental impact. For any business context a series of energy efficiency measures has been proposed, selecting high profitability energy saving options by applying a priority criterion. Technical and economic indicators were reported on best practices focusing on tertiary sector and also industry. The study, starting from the feasibility assessments, aims to establish a possible correlation between energy performance indicators (EnPIs) and a limited number of parameters of the energy systems, in terms of production, operation and power consumption. Comparative assessment of energy-saving measures provides an useful method for assessing applicability of standard energy-saving measures in similar contexts and cost-effectiveness of solutions, as a function of a limited number of parameters.

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1. Introduction

The Legislative Decree No.102/2014 acknowledges the European directive 2012/27/UE which defines a series of measures for the promotion and improvement of energy efficiency aimed at reducing the energy final consumption on national territory. To achieve this goal it introduces a series of measures and identifies some tools like Energy Audit (EA) and Energy Management Systems (EnMS). The EA is a systematic procedure capable of supplying a proper knowledge of the energy meter of a building or group of buildings of a business or industrial plant or public/private services and then identify and quantify the energy saving opportunities according to a cost-benefit analysis. The purpose of EA is that of providing a description of energy system of an Organization and then highlighting the possible interventions to improve efficiency and work out the actual saving. Decree 102/2014 makes obligatory the EA every 4 years for a number of subjects: large companies; enterprises with over 250 staff and yearly turnover more than 50 million EUR or total annual balance sheet over 43 million EUR; energy-consuming businesses: manufacturing firms consuming more than 2.4 GWh/year and whose energy cost accounts for at least 3% on the yearly turnover. The Decree obligations, besides the fulfilment of EA, also comprises the implementation of interventions for energy efficiency following their actual spotting. Large enterprises adopting EnMS in compliance with EMAS and ISO 50001 or EN ISO 14001 regulations provided that they include an EA carried out in accordance with Annex 2 of Decree. Although SME are exempted according to this Decree: they can get incentives for the EA and for the adoption of EnMS as well as ISO 50001 certifications through the publication of a specific notice from MiSE (Ministry of Economic Development) [1]. EA must be in compliance with Annex 2 of Decree 102/2014 and with ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) forthcoming guidelines; carried out by qualified entity: “Società di Servizi Energetici” (ESCo) UNI 11352 certified, Experts in Energy Management (EGE) UNI 11339 certified and energy auditors [2].

2. Energy consumption in industrial and tertiary sectors in EU

Total final energy consumption in industry (EU28) was 272,487 ktoe (2013) [3]. This accounts for 25% of total EU28 final energy consumption (1,103,813 ktoe) in 2013 [3]. Final energy consumption is projected to reduce for most sector groups based on a literature review of economic indicators, market statistics, energy consumption trends. Process heating remains the most significant energy use. There are a good range of economically viable Energy Saving Opportunities (ESOs). Significant innovation is required on current and emerging technologies to realise further industrial energy reduction potential. Market competitiveness remains the strongest driver for energy efficiency solutions. Internal barriers to uptake of ESOs are not well understood. In tertiary sector retail and wholesale trade buildings are the largest consumers of energy among non-residential buildings in Europe. Retail and wholesale trade accounted for 28% of total energy consumption in the non-residential building sector, which amounted to approximately 19 Mtoe (2012) [3]. Electricity consumption accounts for close to 70% of total energy consumption [3]. Accommodation and food service activities accounted for 11% of total energy consumption in the non-residential building sector (2012), amounting to approximately 10.5 Mtoe [3]. Information and communications equipment is estimated to consume approximately 14.7 Mtoe of energy in 2012 [3]. Financial and insurance activities: office buildings are the second largest consumers of energy among non-residential buildings in Europe accounting for 23% of total energy consumption in the non-residential building sector, which amounted to approximately 19 Mtoe in 2013 [3].

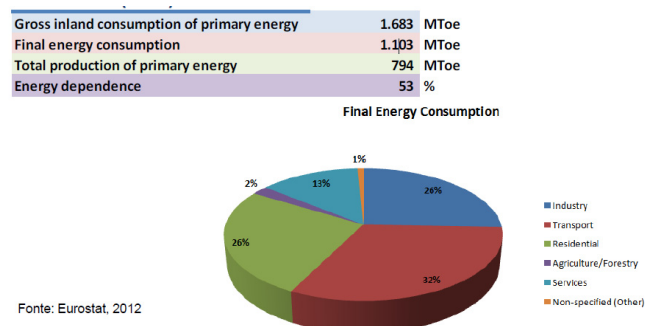


Figure 1 – Final energy consumption in Italy (source: Eurostat, 2012)

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