Chapter 16
Intelligent Information Systems for Strengthening the Quality of Energy Services in the EU: Case Study in the Greek Energy Sector

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ABSTRACT

Nowadays, taking into consideration the prevailing situation of price fluctuations, the rapid population increase and the technology’s evolution, the energy efficiency unexploited potential is considered to be extremely significant as a means of partly tackling energy dependence and climate change. This potential can be utilised through the provision of energy services, with the support of intelligent information systems. In particular, up to date several researchers, have proposed energy management tools and methodologies that provide specialized energy management services. However, the majority of the known energy tools are limited to a single equipment type, fuel, or locality. The present paper introduces an intelligent information decision support system, addressed to Energy Service Companies (ESCOs) for assessing an operational unit’s (building or industrial sector) energy behaviour and suggesting the appropriate interventions. Its overall scope is to facilitate the ESCO in reaching a decision quickly and accurately, by simulating the whole unit’s energy behaviour.

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INTRODUCTION

Current Status and Needs for Enhanced Energy Services

Buildings and industry have become two of the fastest growing energy consuming sectors especially in the European Union (EU) countries, following shortly behind the transport sector. According to statistic data available through Eurostat (2008), the amount of the energy consumed in the EU buildings reaches 42% of total energy consumption, around two thirds of which is used in dwellings. In the current decade, according to EC Directorate (2003), energy demand of the tertiary and residential sectors are increasing with 1.2% and 1.0% per annual respectively. As a result the European Environment Agency (2004) states that energy usage in the above sectors is responsible for approximately 50% of the union’s Greenhouse Gas (GHG) emissions that contribute to climate change.

Nowadays, taking into consideration the prevailing situation of price fluctuations, the rapid population and the technology’s evolution, the energy efficiency unexploited potential is considered to be extremely significant as a means of partly tackling energy dependence and climate change. Based on the European Commission’s (EC) Green paper (2005), it is estimated that by 2030, on the basis of present trends, the EU will be 90% dependent on imports for its oil requirements and 80% dependent on gas. Total consumption is currently around 1.725 Mtoe. Estimations indicate that, if current trends continue, consumption will reach 1.900 Mtoe in 2020. Moreover, it is estimated that if no measures at all were taken, at this moment the EU-25 would be facing a primary energy demand of approximately 2.550 Mtoe. This clearly highlights the important results achieved till now in the energy consumption’s reduction for the period after the first oil crisis through energy efficiency as well as the huge unexploited energy efficiency potential.

According to the EU Action Plan for Energy Efficiency (2006) the Commission considers the energy savings in these sectors will reach 27% and 30% respectively for the residential and commercial buildings (tertiary sector), as well as 27% for the manufacturing industry. Indeed, energy efficiency according to Lechtenböhmer (2005) and Blok (2004) could contribute to the reduction of the current energy consumption by at least 20%, which is equivalent to the savings of 60 billion euros annually. Moreover, the same studies conclude that an average EU household could save between 200 and 1.000 euros per year in a cost effective manner, depending on its energy consumption. On the other hand, Ecofys (2003) states that the energy efficiency industry’s boom will result in the creation of high quality working opportunities that directly or indirectly may even reach 1 million jobs. It is indicatively mentioned by the Association for the Conservation of Energy (2000) that only in the United Kingdom, where there is a wide range of energy efficiency programmes and initiatives, the last decade more than approximately 55.000 new jobs have been created. Moreover, according to the Green Paper (2005) the R&D budget dedicated by EC for energy efficiency’s promotion for the period 2007–13 through the programme ‘Intelligent Energy–Europe’ reaches 780 million euros, creating significant employment opportunities.

Especially for Greece, Eurostat (2008) states that the use of energy in buildings, such as public and private buildings, schools, hospitals, hotels and athletic facilities, constitutes of 30% of total national energy demand and contributes of about 40% of the national carbon dioxide emissions. Paravantis (1995) and Athanasakou (1996-97) indicate that heating and refrigeration of buildings consume the largest part of energy expended in domestic uses. As regards the industrial sector’s participation in the energy consumption, according to Eurostat (2008), it seems that it covers approximately 20% of the final energy