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Assessing the impact of the economic crisis on energy poverty in Greece

Athanasios Dagoumas, Fotis Kitsios

Abstract

The paper aims at assessing the impact of the economic crisis on energy poverty in Greece. It monitors the electricity consumption per capita, its relationship with the economic growth and its comparison with other European countries. Moreover, the paper provides new indicators and information, monitoring data related to the capability of people to pay their electricity bills, the power cuts made due to the economic crisis and the social policy of the government for sensitive social groups. Results show that the standard of living in Greece has been increased considerably compared to other countries and that people require time to respond to the new economic conditions and to change their habits. It provides evidence that the economic crisis has considerable effect on the electricity consumption and on the capability of people to pay their bills. However, the power cuts depict mainly the unwillingness of customers to continue paying bills for properties that they don't use or don't provide any revenue for them. The incapability of customers to pay the electricity bills on time, create serious liquidity problem for the Public Power Corporation, which enables the danger of transforming an energy poverty issue to an energy security issue.

Keywords: Economic crisis, Energy poverty, Electricity consumption, Indicators, Power cuts, Greece

1. Introduction

Over the last decade, two challenges –namely economic crisis and climate change- have been prioritized in the political and scientific agenda. The economic crisis and the inequalities among

different economic quintiles have raised the issue of energy poverty, namely the lack of access to modern energy services. Modern energy services are crucial to human well-being and to a country's economic development; and yet globally over 1.3 billion people are without access to electricity and 2.6 billion people are without clean cooking facilities (IEA, 2010). The lack of access to modern energy services is a serious hindrance to economic and social development, and must be overcome if the UN Millennium Development Goals are to be achieved.

Energy is addressing many of today's fundamental challenges, like poverty, inequality, climate change, food security, health and education. It is very important effective tools to be conducted in order to support the monitoring and reporting of progress towards widespread energy access is thus instrumental (Nussbaumer et. al., 2011). Energy poverty usually concerns developing countries. However, the economic crisis has affected significantly several developed countries raising questions on energy poverty issues. Greece is already facing a 6^{th} year of recession, while the Greek government has adopted a number of fiscal measures that affect the energy prices, the citizens income and their capability to pay the energy bills.

A number of studies have assessed the different dimensions of the impact of the financial crisis in Greece, focusing mainly in their distributional effects. Matsaganis and Leventi (2013) study the effects of the Greek recession and associated policies taken to reduce fiscal deficits between 2009 and 2010. Using a tax–benefit model they find that these immediate effects, comprising a combination of falls in labour market incomes and austerity measures, were spread widely across income groups – overall income inequality was quite stable, and relative income poverty rose slightly but by far less than absolute income poverty. Moreover it could be argued that the absolute poverty threshold not only is determined by similar if not identical factors as the value of labour power at a certain point in time, but also that the two measures are closely correlated as far as their movement over time is concerned (Maniatis, T., Bassiakos, Y., Labrinidis, G., Passas, C. 2010).

The effect of the global financial crisis and resulting austerity measures in Greece is depicted in the average household income that was significantly reduced, leading to changes in the distribution of annual household income. Figure 1 shows the evolution over the period 1995-2012 of the income (in Euros) for the income group that is below 60% of the median equivalised income. In two years-period 2010-2012 the decrease is about 30%.

To protect vulnerable groups, the government also introduced social electricity tariffs for residential consumers. These give a discount of up to 42% on annual consumption of up to 5000 kWh, compared with the normal household bill. Such an initiative, however, distorts prices by de-linking energy from its cost, as social objectives would be better pursued via the tax-transfer system (Koutsogeorgopoulou et al. 2014).

Mountainous areas are especially vulnerable to energy poverty because their thermal energy needs are especially high and their economic environment is not a particularly prosperous one. The economic performance of the alternatives and their contribution to combating energy poverty shown, that utilizing locally produced biomass and applying energy-saving measures can bring households below the “energy poverty limit”. Moreover, dependence on diesel oil and electricity for heating purposes can be reduced to a very low level by applying financially viable energy practices (Katsoulakos, 2011).

<Insert Figure 1 about here>

The lower-income households are the ones that fuel poverty policies should target, so that the 13.87% fuel poor proportion of this group is controlled as best as possible, given the financial crisis in Greece (Santamouris et al. 2013). In Greece, Santamouris et al. (2007) concluded that

energy policies addressed to the dwelling sector should set as a priority the improvement of the envelope quality of residents where low-income people are living. Low-income households paid nearly 67% higher electricity cost per person and square meter than high-income households. Furthermore 1.63% of the households suffered from fuel poverty and 0.35% from severe fuel poverty (2004 values). Fuel poverty in low-income groups, was in the region of 16%. Severe fuel poverty, in the low-income group, was calculated close to 4%. Concerning energy poverty, the average percentage of the households spending more than 10% of their income for energy was close to 11.3%, while 2% spent more than 20%. Almost 40% of the low-income group, called the energy poor, spent more than 10% of their income for energy while almost one fifth of the poor households, called the severely energy poor, spent more than 20% of their income for energy. Fuel and energy poverty reached quite high levels in the low-income groups, with a dramatic increase attributed to the fuel prices. It was concluded that energy policies addressed to the dwelling sector should set as a priority the improvement of the envelope quality of residents where low-income people are living.

The above-mentioned studies have provided significant insights in the impact of the economic crisis in Greece, focusing –among others- on poverty and energy poverty issues. However, the economic crisis in Greece provides new fields for research, as a number of fiscal and other governmental policies are unique, such as the property tax to be paid through the electricity bills. Therefore, it creates new research questions, and space for the development of new aspects and indicators of energy poverty. This paper aims at assessing the impact of the economic crisis on energy poverty in Greece, by examining and selecting well established indicators while providing new indicators and information, monitoring data related to the capability of people to pay their electricity bills, the power cuts made due to the economic crisis and the social policy of the government for sensitive social groups.

The sections of the paper are organized in the following way. The literature review and the methodology adopted in the paper are described in rest parts of Section 1. Section 2 reports the results and the policy implications, while the concluding remarks are provided in Section 3.

1.1 Energy Poverty Indicators

The use of indicators is widespread in development research and practice. Indicators are useful to quantify and analyse performance, also provide basic information for strategic planning and policy analysis. Indicators are essential tools for communicating issues related to regional sustainable development to policymakers and to the public, and for promoting institutional dialogue among groups of interesting (IAEA, 2005). A review of selected metrics in the sustainable development and energy space was conducted and identified three broad categories to classify the type of metrics: single indicators; set of individual, non-aggregated indicators; and composite indices (Bazilian et al., 2010a; 2010b).

Single indicators are easy to operate. Although they provide a clear, unbiased message that is very simple to perform and interpret especially to one specific dimension phenomena, they present a narrow picture of the issue measured. They are appropriate many times for measurable economic data cases but often unsuitable for less tangible issues, such as poverty or sustainable development. But there are more complex issues that require special handling. Issues such as human resources require multidimensional analysis and prior identification of critical factors to be explored. A number of initiatives aim to provide a set of individual indicators. As an example Nussbaumer et. al., (2011) mentioned that the Millennium Development Goals Indicators programme helps track progress on the commitment made in the United Nations Millennium Declaration with a battery of over 60 indicators. That shows a more comprehensive representation of the issue.

Composite indicators represent a set of variables and expressed in a single number. The concept of many times may seem unclear. The price will eventually get will reflect the aggregate value for of the representing dimension. The multicriteria analysis can solve various issues of asymmetry as well as varying importance and significance of the criteria to take part in composite indicator development also in analysis and interpretation of the results. The rationale for developing composite indices lies in the need for aggregating information to a level that makes analysis convenient. They have proven to be useful for benchmarking performance, for example between countries. A large number of institutions are producing composite indices in a wide variety of research problems and fields (OECD 2008, Nussbaumer et. al., 2011). The disadvantage of composite indicators is that often require simplifications imply that the conclusions can be misleading especially when analysis results are too simplistic and / or when the index is poorly constructed.

Much debate is about whether there should be criteria significance weights which are the indicators or not. The process of including or excluding criteria, even without weight, is a value judgment per se on the relative importance of the variables. In line with this thinking, the aggregation procedure needs to be non-compensatory where weights are used with the meaning of importance coefficients (Nussbaumer et. al., 2011).

The use of indicators and indices is widespread in practice also in research. However, some concepts, such as poverty, are relatively intangible in nature and therefore more challenging to be measured and identified. Composite indices concern for their methodological soundness and aggregation models compatible due to the loss of information. Ultimately, the selection of the appropriate method depends primarily on the objective of the index and the target audience (Nussbaumer et. al., 2011).

It can be easily taken out that there are different approaches to measuring energy poverty (Pachaury et al., 2004). The list of energy indicators in use is inexhaustible (IAEA, UNDESA, IEA, EUROSTAT, EEA, 2005; EEA, 2005; DTI, 2006; Nussbaumer et. al., 2011, Mirza and Szirmai, 2010). Most existing indicators and composite indices focus on assessing the access to energy, on the degree of development related to energy and on the deprivation of access to modern energy services. IEA has developed an Energy Development Index (EDI) to measure progress in the transition to cleaner cooking and heating fuels and the degree of maturity of energy end use. The index, first appeared in World Energy Outlook 2004, has been updated and modified. It monitors the access to electricity and cleaner cooking fuels and the overall electricity generation per capita, emphasizes the disparity in energy poverty. It is constituted be three main indicators:

- The share of households using cleaner, more efficient cooking and heating fuels (liquefied petroleum gas, kerosene, electricity and biogas)
- The share of households with access to electricity
- Electricity consumption per capita.

The above indicators of IEA are useful for examining energy poverty issues among developing countries. However, when focusing on developed countries, only the third indicator is useful, as the other two indicators very rarely can provide any sign of existence of energy poverty. The third indicator is used to capture the level of overall energy development. As an example, it captures the penetration of new energy technologies, such as the hybrid electric cars, which lead to the electrification of the transportation and therefore to electricity consumption growth. Therefore, for the developed countries, when examining energy poverty issues, it is important to capture the interactions between electricity consumption and economic growth.

1.2 Electricity consumption and economic growth

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The relationship between electricity consumption and economic growth has been subject of intense research and of great interest to economists as well as to policy makers. Although, the empirical evidence in a study over 100 countries (Ferguson et. al., 2000) show a strong correlation between them, this does not necessary imply a causal relationship. The evidence concerning the causality (Granger, 1988) is ambiguous, from bi-directional (in both directions) and uni-directional (from energy consumption to economic growth or the opposite) to no causality. Another extensive study (Payne, 2010) provides a survey of the international evidence on the causal relationship between energy consumption and economic growth, where the empirical results are again mixed concerning the causality, even for a specific energy carrier such as the electricity. The variation in results may be attributed to variable selection, model specifications, time periods of the studies, different institutional, structural frameworks in the countries examined, and econometric approaches undertaken (Hondroyannis et al, 2002; Payne, 2010). The causality between energy consumption and economic growth is ambiguous among countries (Ozturk, 2010; Payne, 2010; Yemane Wolde-Rufael, 2004) or even among studies for the same country, as each country has its own institutional, structural characteristics, different exposure in foreign energy resources and therefore different exposure in energy supply crises, different climatic conditions and behavioral patterns.

Over the last decades a number of empirical studies for the Greek economy, investigated energy demand relationship with economic growth and prices. They have shown mixed results, either observing falling income and price elasticities of energy demand (Samouilidis and Mitropoulos 1984), either concluding that elasticities behave as a cluster against energy demand (Mitropoulos et al. 1982), either showing that energy demand is rather inelastic with respect to prices (Donatos and Mergos, 1989; Christodoulakis and Kalyvitis, 1997; Zonzilos and Lolos, 1996) or showing a bi-directional causality between energy demand and economic growth (Hondroyannis et. al., 1996). Other studies (Polemis, 2006; 2007) have examined this causality between energy demand and economic growth, but focused on specific sectors of the economy.

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1.3 Assessing energy poverty in Greece

This paper does not intent to provide an updated econometric analysis on the causality between electricity consumption and economic growth, in order to report the effect of the economic crisis in Greece. .This would be anyway difficult through an econometric analysis, due to the small number of samples. Therefore, a "bottom-up" approach is adopted, aiming at providing more detailed data and reporting well specified indicators of energy poverty. From the above mentioned indicators of the IEA's Energy Development Index, only the third indicator has been selected to be monitored in order to report the overall electricity consumption evolution for Greece. The first indicator could be of great interest, as during the current winter, a new phenomenon (smoky fog) raised over most major cities in Greece. This environmental degradation is attributed mainly to the fiscal measures taken by the Greek government by imposing a heavy tax on the heating oil, leading people to search for alternatives for heating e.g. electricity, wood and biomass. However, the non-availability of data, concerning the mix of different fuels for heating purposes, does not enable the monitoring of this phenomenon.

The austerity measures, taken by the Greek government have not only affected the fuel mix in heating, but also the capability of people to pay their bills. Besides increasing the special consumption taxes on all energy products, the government has imposed a property tax. Due to the opposition of the people and the incapability of the public services to collect this tax, the government has decided that this tax will be collected through the electricity providers, and therefore mainly through the Public Power Corporation S.A. (PPC). This has affected the number of electricity bills that have not been paid and led the PPC to power cuts. Therefore this paper, by collecting data from official announcements from the PPC and other resources, provides more detail on the impact of the economic crisis on the customers' capability to pay the electricity bills

over the last period. This paper provides new indicators and information, monitoring the number of power cuts that have been done to unpaid electric bills, the share of power cuts in the total number of customers, the share of power cuts in the total number of notices sent due to unpaid bills, the decrease rate in the number of customers at different regions and the share of customers eligible for social tariffs with low electricity prices. Those indicators are indirectly connected with the second indicator of the IEA's EDI, namely the access to electricity, but not related to infrastructure problems overseen in developed countries but due to the economic crisis.

2. Discussion of Results

This section includes two parts. The first one concerns the monitoring of variables related to the overall electricity consumption of the country, aiming at covering the third indicator of the IEA's EDI. The second part provides further detail on the effect of the economic crisis on energy poverty, including the number of power cuts made, their share in total number customers, the evolution of unpaid electricity bills and other related variables, aiming at depicting the capability of customers paying their bills on time and having access to electricity, which is second indicator of the IEA's EDI.

2.1 Overall electricity consumption

This section aims at providing evidence on energy poverty issues due to the economic crisis, related to the overall electricity consumption. For this purpose the evolution of other two variables, the Gross Domestic Product and the population are also used, in order to provide linkages of the economic growth and the electricity consumption. Figure 2 presents the evolution of the electricity consumption per capita and of the Gross Domestic Product (GDP) per capita over the period 1960-2012. There is a strong correlation among electricity consumption and economic growth, which is

supported by a number of studies (Polemis, 2007; Hondroyannis et. al., 2002; Payne, 2010). However, the shape of the electricity consumption per capita figure is more linear, over the examined period up to 2008, depicting the relevant increase of the well-being of the people. The GDP per capita figure follows a similar trend, with the exception of the 1980s where the growth rate was more modest. The effect of the economic crisis is obvious for both the GDP and the electricity consumption figures. There seems to be a lag in the effect of the economic crisis on the electricity consumption, as the GDP is decreased since 2007, while the electricity consumption since 2008.

Figure 3 aims at examining in more detail the evolution of the electricity consumption by sector. The commercial and public services demand shows the highest growth rate, especially beyond 1980, while the industrial electricity demand growth rate is becoming modest. This depicts the transformation of the Greek economy, characterized by the de-industrialization and the fast evolution of the tertiary and public sectors. The residential electricity demand is also increasing very fast, since the 1970, depicting the increase of the standard of living. The effect of the crisis is more obvious for the tertiary and public services, depicting the sharp cuts in public operating costs. The industrial demand is also affected significantly, while the residential demand shows a more modest decrease. This evidence, together with the lag in the effect of the economic crisis on the electricity consumption, mentioned in previous paragraph, depicts the fact that people require some time to respond to the new economic conditions and to change their habits and lifestyle.

<Insert Figure 2 about here>

<Insert Figure 3 about here>

As, both Figures 2 and 3, provide data up to 2010 for electricity consumption, alternative resources have been used to monitor the latest trend of the electricity consumption. Data from the

Independent Transmission Operator S.A. (ADMIE), which is responsible for the interconnected electric system, are presented in Figures 4&5. The interconnected system is responsible for almost 90% of the electricity consumption of the whole country, which also includes the non-interconnected islands. Therefore the trend of the electricity consumption in the interconnected system can be considered indicative of the trend for Greece. Figure 4 presents the annual electricity consumption of the interconnected system for the period 2003-2012. There is a sharp decrease, more than 6%, between 2008 and 2009, while beyond 2009 the decrease rate is stabilized at about 2% per year. The electricity consumption in 2012 has been decreased at lower levels than that of year 2004, when the Olympic Games took place in Athens. Considering that the economic recession is expected to remain for 2013 and possibly for 2014, according to Eurostat estimates, and also that there seems to be a lag in electricity consumption compared to economic growth, it is expected that the electricity consumption of the country will be at the level of the first years of the previous decade. Figure 5 presents the evolution of the monthly electricity demand of the interconnected system, over the period 2003-2012. The effect of the crisis is obvious for all months, both for peak and low demand months. An important outcome is that the electricity consumption for November and December 2012, although the winter is mild, show an increase compared to the relevant months of previous years. This is attributed to the considerable increase of tax for heating oil, leading to an increase of use of electricity for heating purposes.

<Insert Figure 4 about here>

<Insert Figure 5 about here>

The economic crisis has affected not only the Greek economy but the whole Europe. Therefore, it is interesting to monitor the evolution of electricity consumption over the last years for each Member State. Table 1 presents the evolution of electric consumption per capita over the period 1995-2010, showing that the crisis has influenced most of the Mediterranean countries and of the

New Member States. Is has influenced also other countries, such as United Kingdom and Ireland, that faced economic recession but also Malta. The effect of the economic crisis might be less if a more detailed analysis for those countries take place, considering (besides the economic crisis) other factors such as: weather conditions, tourism effects or energy saving projects, taking place among Europe as those are considered no regret options (as they provide gains in the macro-economy) towards meeting mitigation targets. Estimates of the effects of no-regrets efficiency policies have been reported by the International Energy Agency (IEA WEO, 2006), showing the potential of considerable energy savings through well specified policies.

Table 2 presents the evolution of the electricity consumption per GDP over the period 1995-2010. For all countries the growth rate of the GDP is higher than that of the electricity consumption, being also influenced by the rationality of the energy use over the last years due to environmental awareness. Moreover, one of the obvious points is the fast economic growth of most of the New Member States compared to other European countries. Greece has a similar trend in the electric consumption per GDP trend, compared to that of the EU27 region. However, from Table 1, the per capita growth rate for Greece is much higher than that of the EU27. This finding supports the argument that the standard of living in Greece was increased considerably, since its entrance into the Eurozone, compared to other countries.

<Insert Table 1 about here>

<Insert Table 2 about here>

2.2 Electricity bills

This section aims at providing more detail concerning energy poverty, complementary to the analysis of the previous section that focuses at macro level. Therefore, a number of different

resources have been used in order to collect the latest and informative data. More specifically, there have been used data from official announcements of the Public Power Corporation (PPC), from official responses of the PPC to relevant questions made by Greek Parliament Members (PPC Responses, 2012), data published by the trade union of PPC's workers (GENOP DEI), data published from the Independent Transmission System Operator S.A. (ADMIE), the Electricity Market Operator S.A. (LAGIE), the Regulatory Authority of Energy (RAE) and information published in the press (the Energypress portal and the Naftemporiki newspaper, which are both considered unanimously as credible mass media resources).

Figure 6 presents the monthly power cuts of the Public Power Corporation customers, due to unpaid bills over the period 2011-2012, based on announcement of the GENOP DEI. Those power cuts, consider about 0.5% of the customers, as Figure 7 shows, combining information from the GENOP DEI and PPC (PPC Responses, 2012). A considerable increase in power cuts between those two years is obvious. This increase is partly explained by the fact that during the last months of 2011 and early months of 2012 the power cuts have been "frozen" due to the uncertainty arose concerning the right of the PPC to proceed in power cuts for unpaid electricity bills that included the property tax. Moreover, several customers were unwilling to pay the property tax and together and electricity bill, as there was a strong opposition from citizen movements and political parties. The decision 1972/2012 of the Council of State (Simvoulio tis Epikrateias) has delinked power cuts with the payment of the property tax. Information published in the press, mentioning access to PPC data, reports that the power cuts in January, February, March and April of 2012 were much lower: 6978, 8152, 25256 and 19523 respectively.

<Insert Figure 6 about here>

<Insert Figure 7 about here>

However, the same information mentions that the power cuts made in 2012 were 300.000 compared to 100.000 for year 2011, depicting even more the seriousness of the problem. However this value for year 2011 is in contradiction with the trend in Figure 6. In any case, the increase between 2012 and 2011 seems to be considerable. However, according to information in the press, mentioning access to PPC data, about 54% of the power cuts are reconnected at the same day, 75% within 5 days and there is only a 10% that is not connected in the medium-term. Those power cuts are mainly related to empty shops, offices and apartments and to second homes. Therefore, the power cuts does not depict exactly the restriction to access to electricity but mainly is related to the willingness of customers to stop paying electricity bills for properties that they don't use or don't provide any revenue for them, due to the economic crisis.

The increased number of the power cuts has led the Ministry of Energy and Climate Change to adopt suggestions made by RAE, to enhance amicable settlements, to protect customers with health, and socio-economic problems especially during the winter and summer, with extreme weather conditions. Moreover, the time required for a power cut to take place since the sending of the notice for unpaid electricity bills to customers, has been extended from 25 to 40 calendar days. Moreover, in this number of days, another 85 days from the issuing of the electricity bill is added, based on official response of PPC to Parliament Members' question (PPC Responses, 2012). Therefore, the available time for customers to pay their bill is about 4 months. Figure 8, combining data from different sources (PPC, GENOP DEI, press) show the share of power cuts finally made in the total number of notices sent for the customers of Public Power Corporation with unpaid electricity bills, over the calendar months of year 2012. It is obvious, that due to the flexibility provided by the PPC, only about 10% of the customers with unpaid bills are finally restricted from access to electricity.

The Public Power Corporation has shown understanding in the power cuts, considering the socio-economic situation. As a result, the number of amicable settlements has been increased from about 400,000 in year 2011 to about 700,000 in year 2012, based on official response of PPC to Parliament Members' question (PPC Responses, 2012). Moreover, the PPC offers a Social Tariff for customers with specific characteristics. According to the official response from the PPC to Parliament Members' questions (PPC Responses, 2012), the number of customers that have applied are about 400000. The customers that are eligible for this tariff, that offers about 30-35% discount, are those that belong in the following categories: a) having family salaries lower to the untaxed level, b) being unemployed for long-period and having family salary lower than the untaxed level, c) having more than 3 children and family salary lower than the untaxed level and d) having disability problems and family salary lower than the untaxed level. Figure 9, combing data from different sources (PPC, ADMIE, RAE, press) show the mix of the eligible customers, which sum up at about 7% of the total customers.

<Insert Figure 8 about here>

<Insert Figure 9 about here>

Figures 10&11, using further data from the ADMIE, present the decrease (in %) in the number of customers in low and medium voltage, between 2011 and 2010. Considering that the share of the PPC in total electricity supply in the interconnected system is about 99%, the information provided in Figures 10&11 can be considered indicative for both PPC and the sum of suppliers. The same graphs provide disaggregated information for the different regions in Greece, where it can be seen that the bigger cities, mainly Athens and Piraeus, included in the Attica region, and secondly Thessaloniki, included in Macedonia-Thrace region, have been affected more. The more remote areas, such as Peloponnese and Epirus are affected less. Those Figures are the only indicators in

the paper, providing evidence for urban poverty issues. However, all the other outcomes in the paper can be considered indicative for the Greek cities.

<Insert Figure 10 about here>

<Insert Figure 11 about here>

This incapability of customers to pay their electricity bills has created important liquidity problems for the PPC. Table 3 presents the debt of customers to the PPC, due to unpaid bills, according to data published by GENOP DEI combined with data published in the press. This Table shows that the debt has been significantly increased, almost doubled in one year, although there was a temporal decrease. Considering the debt from medium and high voltage customers, the debt is raised at 1.27 billion Euros at the end of November 2012, according to the press. The high increase rate and the magnitude of the debt, creates an important problem in the electricity market as it may affect the payments to the Electricity Market Operator S.A. (LAGIE), influencing consequently the payments to the production of natural gas units, influencing consequently the payments to the Public Gas Corporation S.A. (DEPA) and finally to the natural gas importers and transmission operators, such as the Russian Gazprom and the Turkish BOTAS. Therefore, an energy poverty issue can be easily be transformed into an energy security issue.

<Insert Table 3 about here>

3. Conclusions

The economic crisis and the inequalities among different economic quintiles have prioritized in the political and scientific agenda the issue of energy poverty, namely the lack of access to modern energy services. Modern energy services are crucial to human well-being and to a country's

economic development. Energy poverty is an issue examined mainly for developing countries. However the extend of the ongoing economic crisis in Greece, has raised the question over its effect on energy poverty issues. From a number of available indicators of energy poverty, the most appropriate for developed countries is the electricity consumption per capita. This indicator together with more detailed analysis of the evolution of the electricity consumption and of the economic growth are provided and compared to those of other European countries. The relationship between electricity consumption and economic growth has been subject of intense research and of great interest to economists as well as to policy makers. The paper does not intent at providing an econometric analysis, but on providing more detail on the effect of the economic crisis on electricity demand and on energy poverty issues.

The results show that there seems to be a lag in the effect of the economic crisis on the electricity consumption, which depicts the fact that people require some time to respond to the new economic conditions and to change their habits and lifestyle. The electricity consumption in 2012 is at lower levels than that of year 2004, when the Olympic Games took place in Athens. The effect of the crisis is obvious for all months, both for peak and low demand months. An important outcome is that the electricity consumption for November and December 2012, although the winter is mild, show an increase compared to the relevant months of previous years. This is attributed to the considerable increase of tax for heating oil, leading to an increase of use of electricity for heating purposes. The economic crisis has affected not only the Greek economy but most of the Mediterranean countries, countries in deep recession and most of the New Member States. The effect might be less if a more detailed analysis for those countries take place, considering also other factors such as: weather conditions, tourism effects or energy saving projects. Moreover, there is evidence supporting the argument that the standard of living in Greece was increased considerably, since its entrance into the Eurozone, compared to other countries.

The paper provides further detail concerning energy poverty, complementary to the analysis that focuses at macro level. Combing data from several resources, it introduces new indicators/information, monitoring data related to the capability of people to pay their electricity bills, the power cuts made due to the economic crisis and the social policy of the government for sensitive social groups. It provides evidence that the economic crisis has considerable effect on the electricity consumption and on the capability of people to pay their bills. The increasing incapability or unwillingness of customers to pay their bills is strongly related to the Government's decision to incorporate the property tax into the electricity bills, as there was a strong opposition from people and political parties. The increasing number of power cuts concern mainly related to empty shops, offices and apartments and to second homes. Therefore, the power cuts do not only depict the incapability of the customers to pay the electricity bills but mainly their unwillingness to continue paying bills for properties that they don't use or don't provide any revenue for them, due to the economic crisis.

The increased number of the power cuts has led the Ministry of Energy and Climate Change to adopt suggestions made by RAE, to enhance amicable settlements, to protect customers with health, and socio-economic problems especially during the extreme weather conditions, and to increase the time period for a power cut to take place since the sending of the notice for unpaid electricity bills to customers. This has led to an important increase in the number of amicable settlements has been increased. Moreover, the PPC offers a Social Tariff for customers with special social characteristics, offering about 30-35% discount and being eligible for almost 7% of the customers. Moreover, the effect of the crisis, concerning reduction in electricity consumption and the number of customers, is more obvious in bigger cities, mainly in Athens and Piraeus and secondly in Thessaloniki. The more remote areas, such as Peloponnese and Epirus are affected less. Finally, the incapability of customers to pay their electricity bills has created important liquidity problems for the PPC, by increasing considerably the debt of the customers to the PPC.

This creates a domino effect in the whole energy market, affecting liquidity for producers, the Natural Gas Corporation (DEPA), the natural gas importers and transmission operators. This enables the danger of transforming an energy poverty issue to an energy security issue.

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Figures

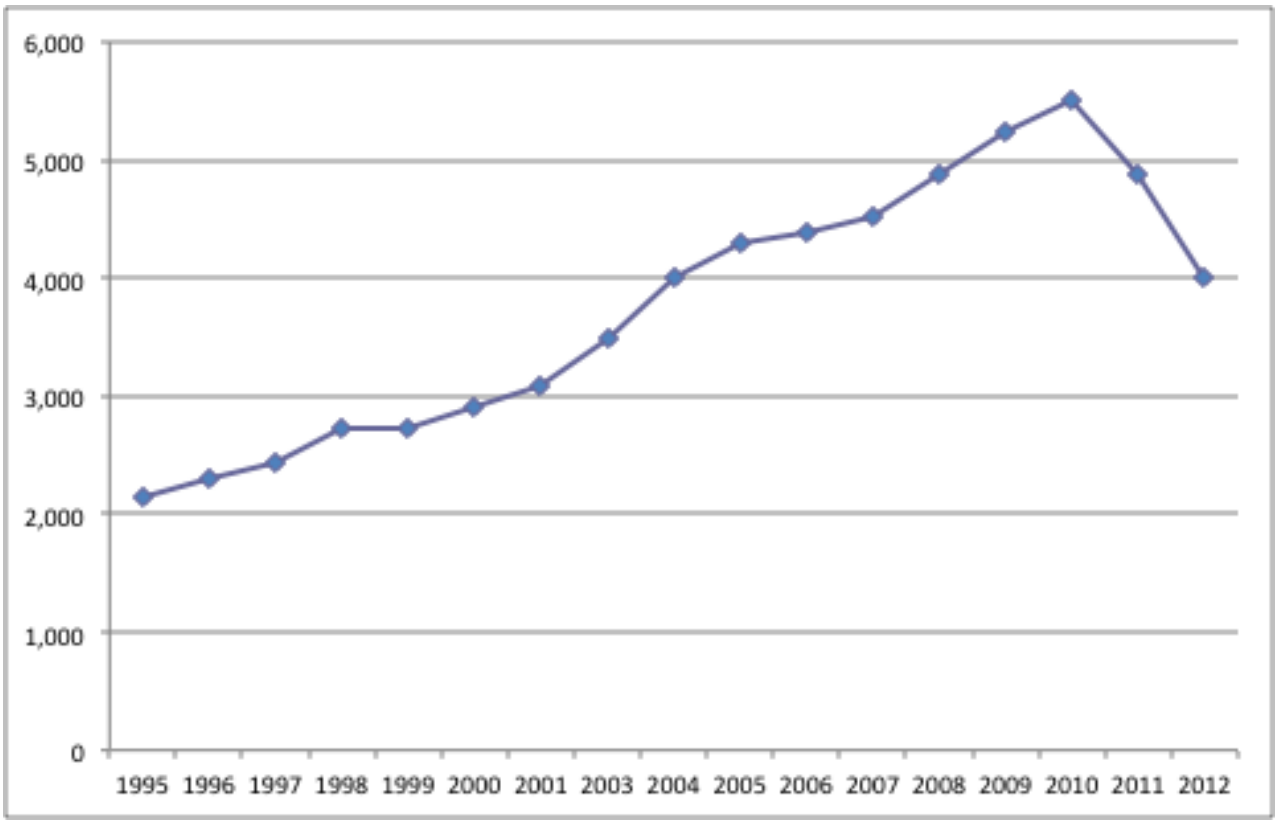

Figure 1. Income evolution in Euros, for the income group that is below 60% of the median equivalised income, for the period 1995-2012 (sources: Eurostat).

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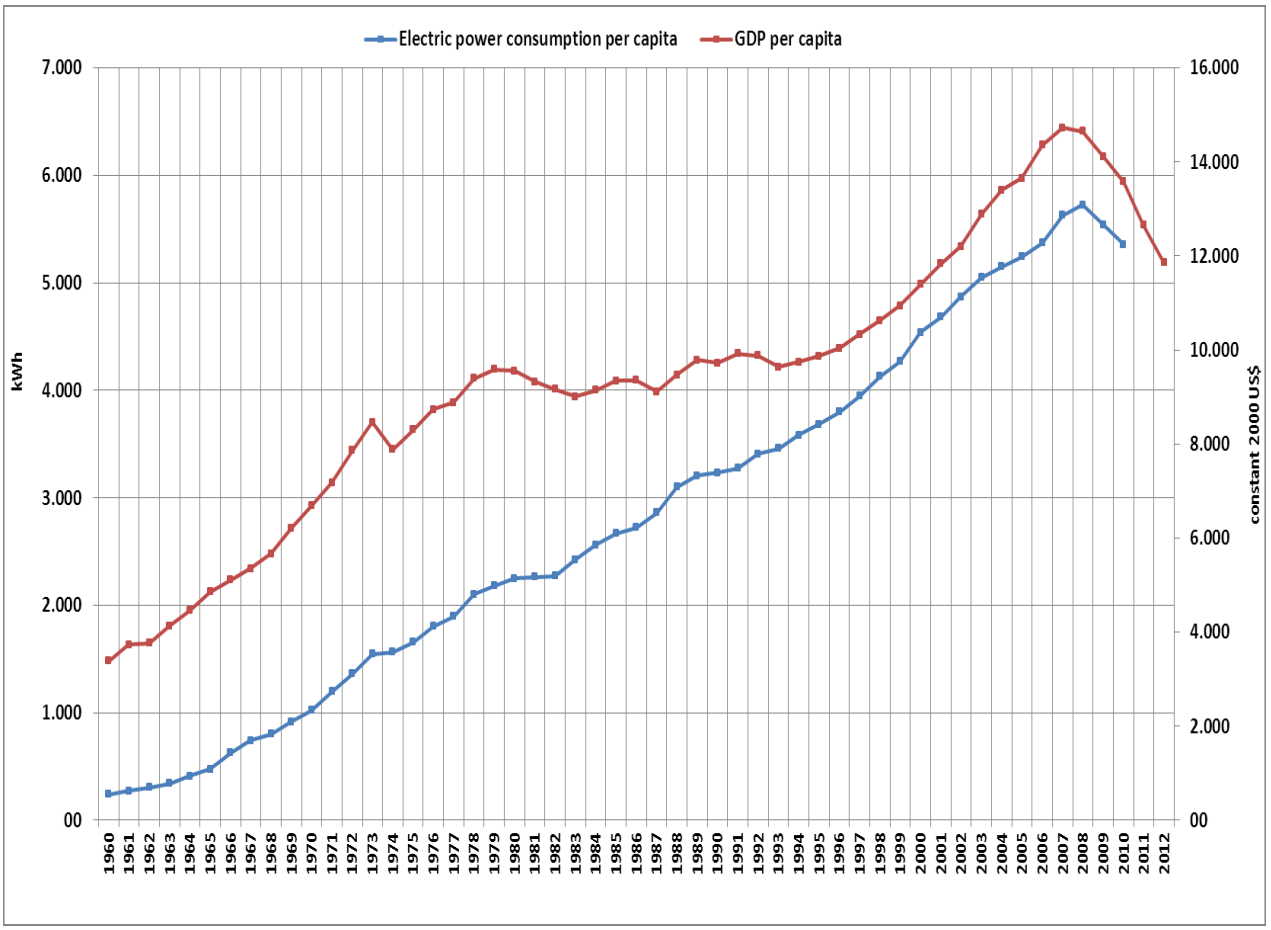

Figure 2. Electricity consumption per capita (in kWh per capita) and Gross Domestic Product per capita (in constant US2000$ per capita) for the period 1960-2012 (sources: Eurostat, IEA).

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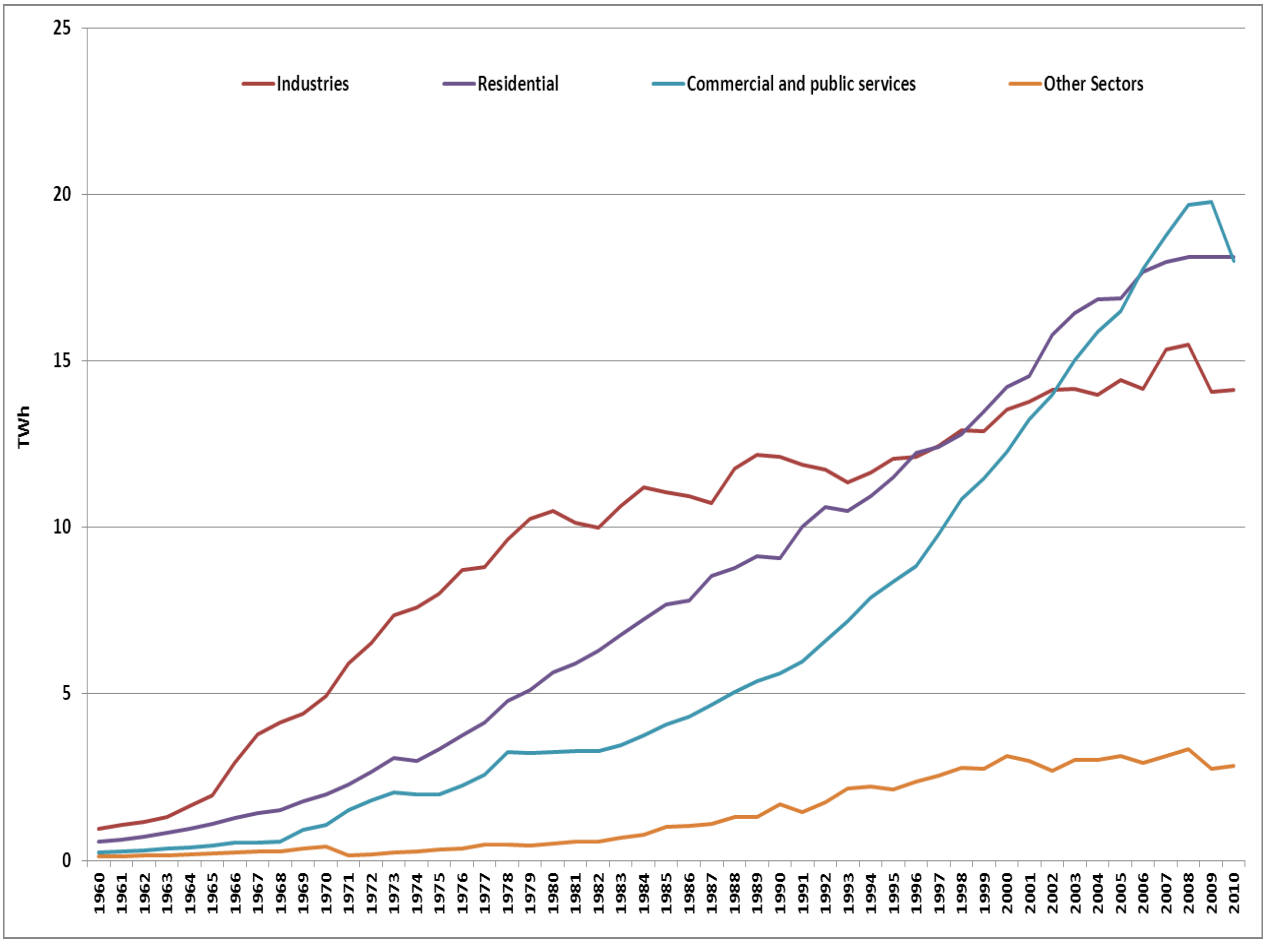

Figure 3. Electricity consumption per sector (in TWh) for the period 1960-2010 (sources: Eurostat, IEA).

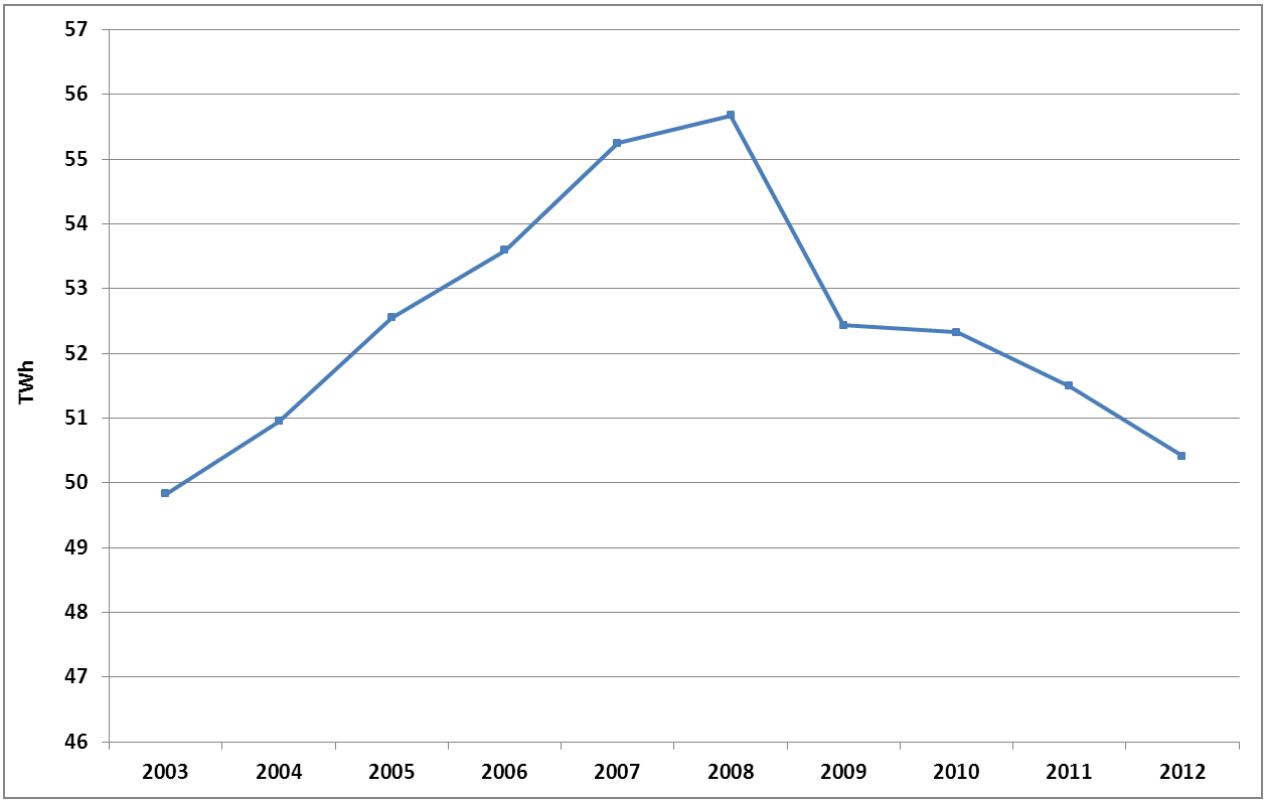

Figure 4. Annual electricity consumption (in TWh) for the Interconnected System for the period 2005-2012 (source: ADMIE).

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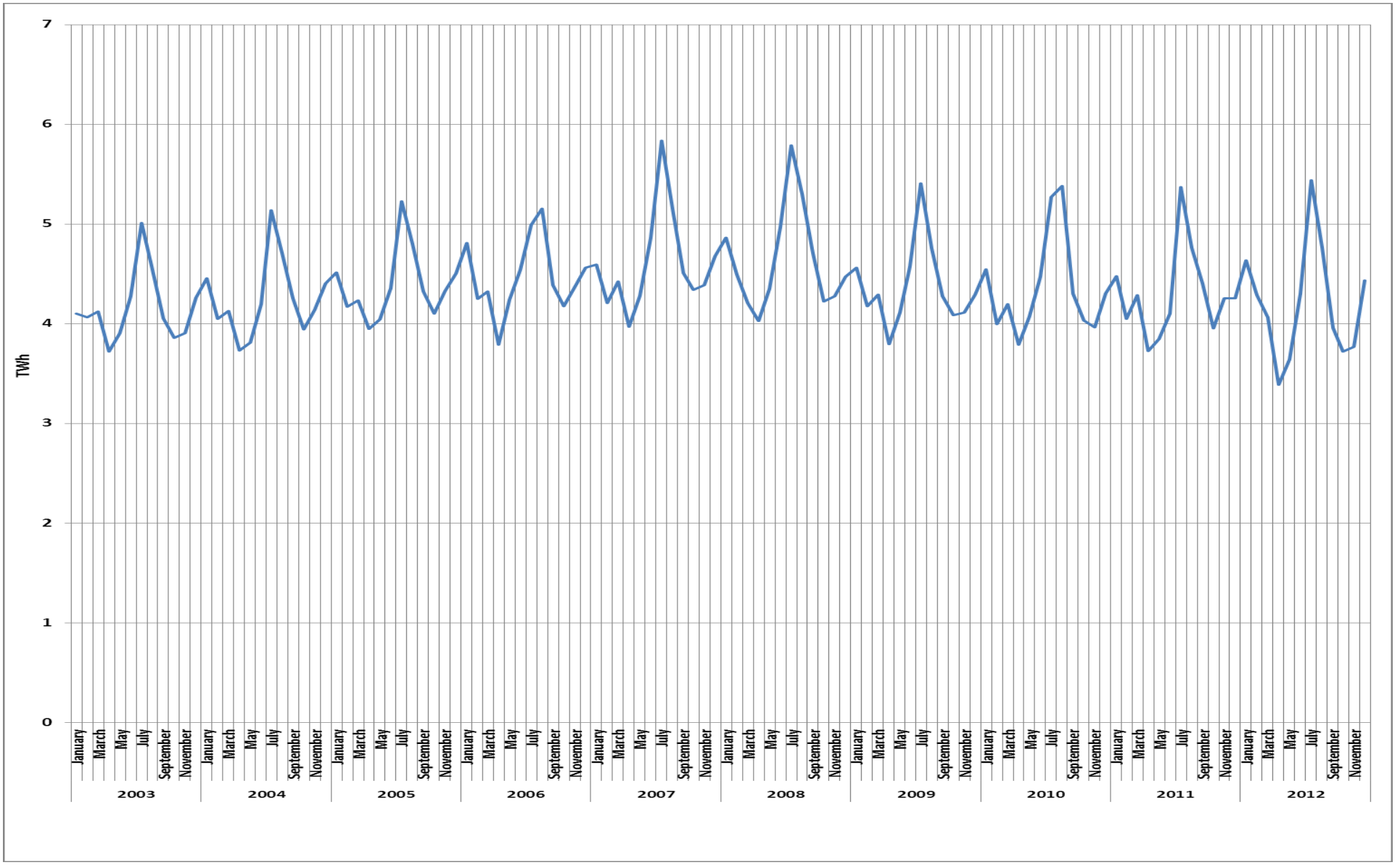

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Figure 5. Monthly electricity consumption (in TWh) for the Interconnected System for the period 2005-2012 (source: ADMIE).

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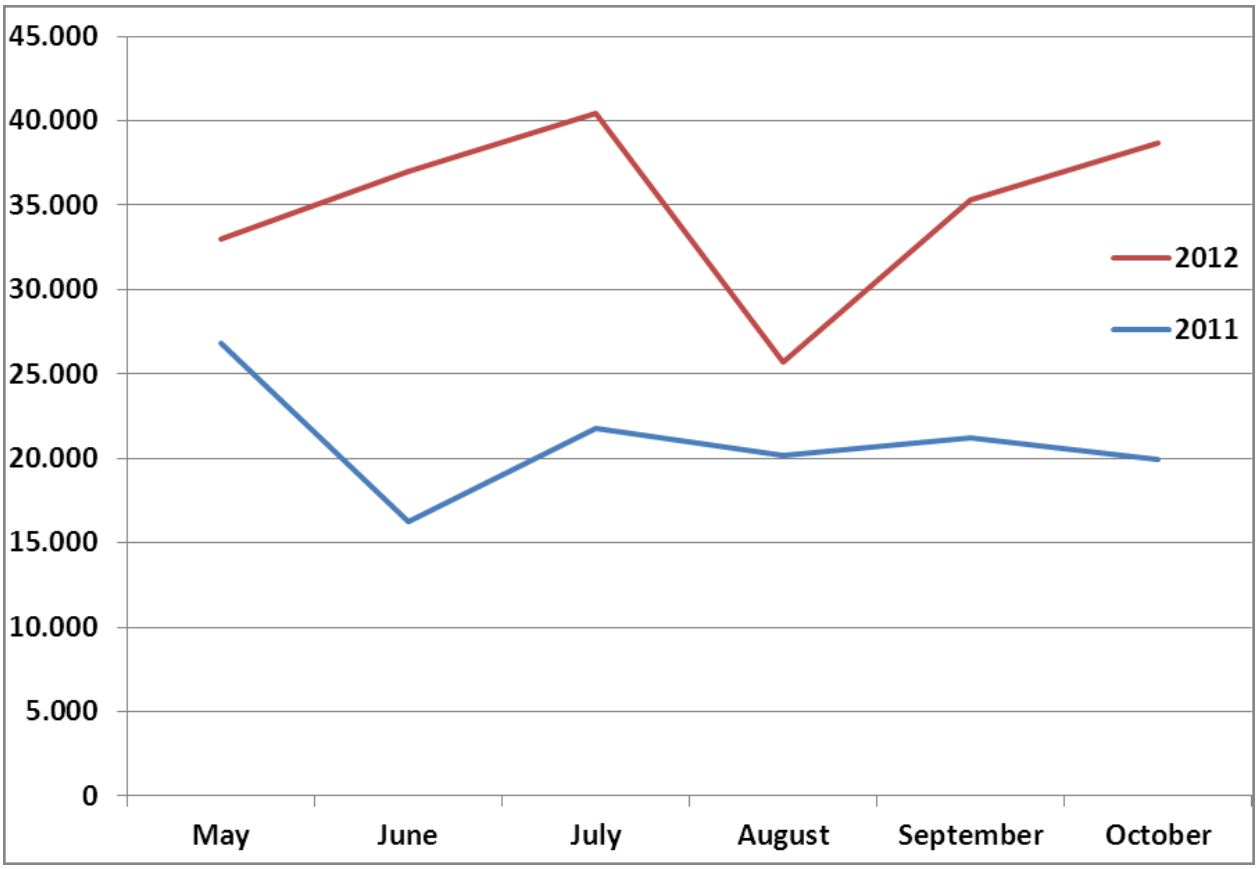

Figure 6. Monthly power cuts of Public Power Corporation Customers, due to unpaid electricity bills for the period 2011-2012 (source: GENOP DEI)

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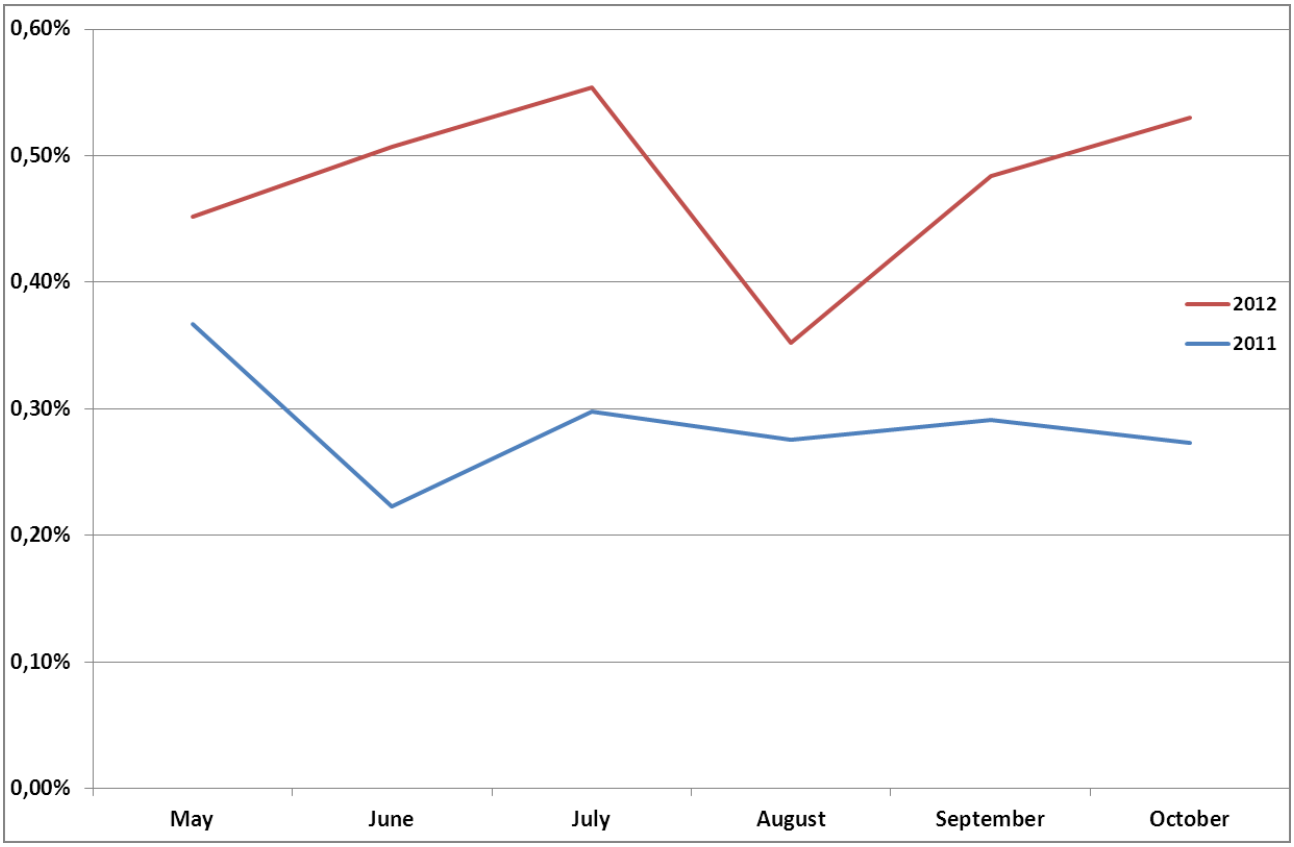

Figure 7. Share (%) of monthly power cuts, due to unpaid electricity bills, in the total number of Public Power Corporation Customers, for the period 2011-2012 (sources: GENOP DEI and PPC)

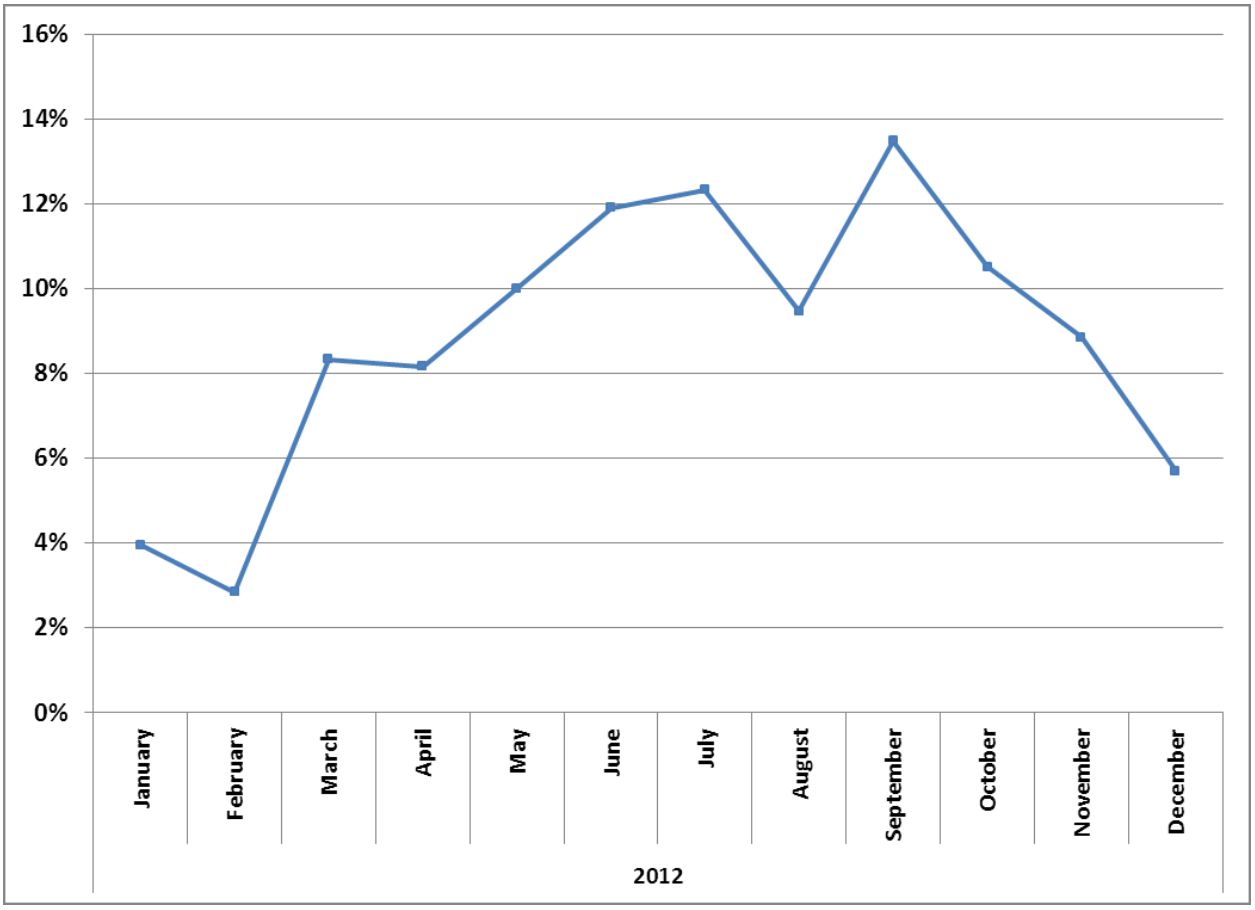

Figure 8. Share of power cuts made by the Public Power Corporation (PPC) in the total number of notices sent for the customers of PPC with unpaid electricity bills, over the calendar months of year 2012 (sources: PPC, GENOP DEI, press)

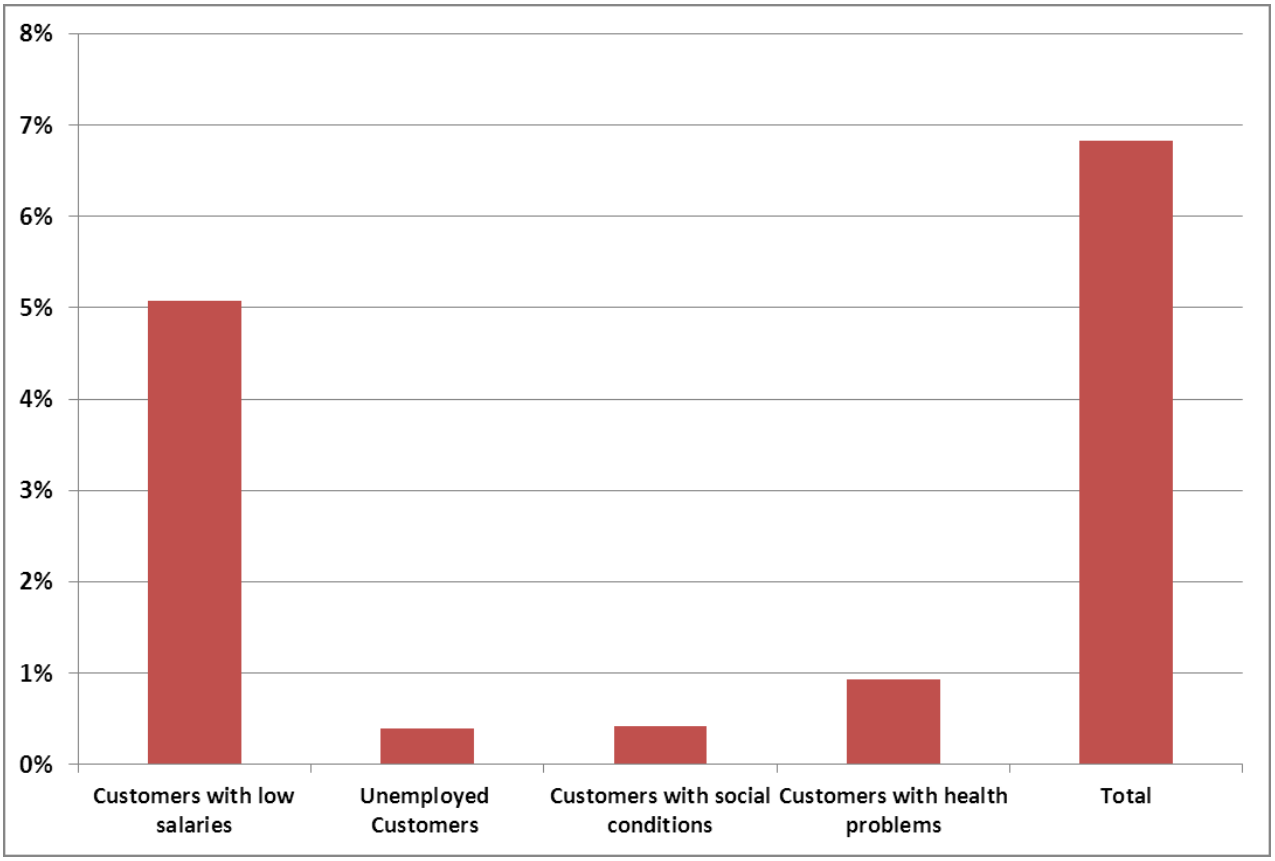

Figure 9. Share of Public Power Corporation customers eligible for the Social Electricity Tariffs in the total number of customers, for year 2011 (sources: PPC, RAE, press)

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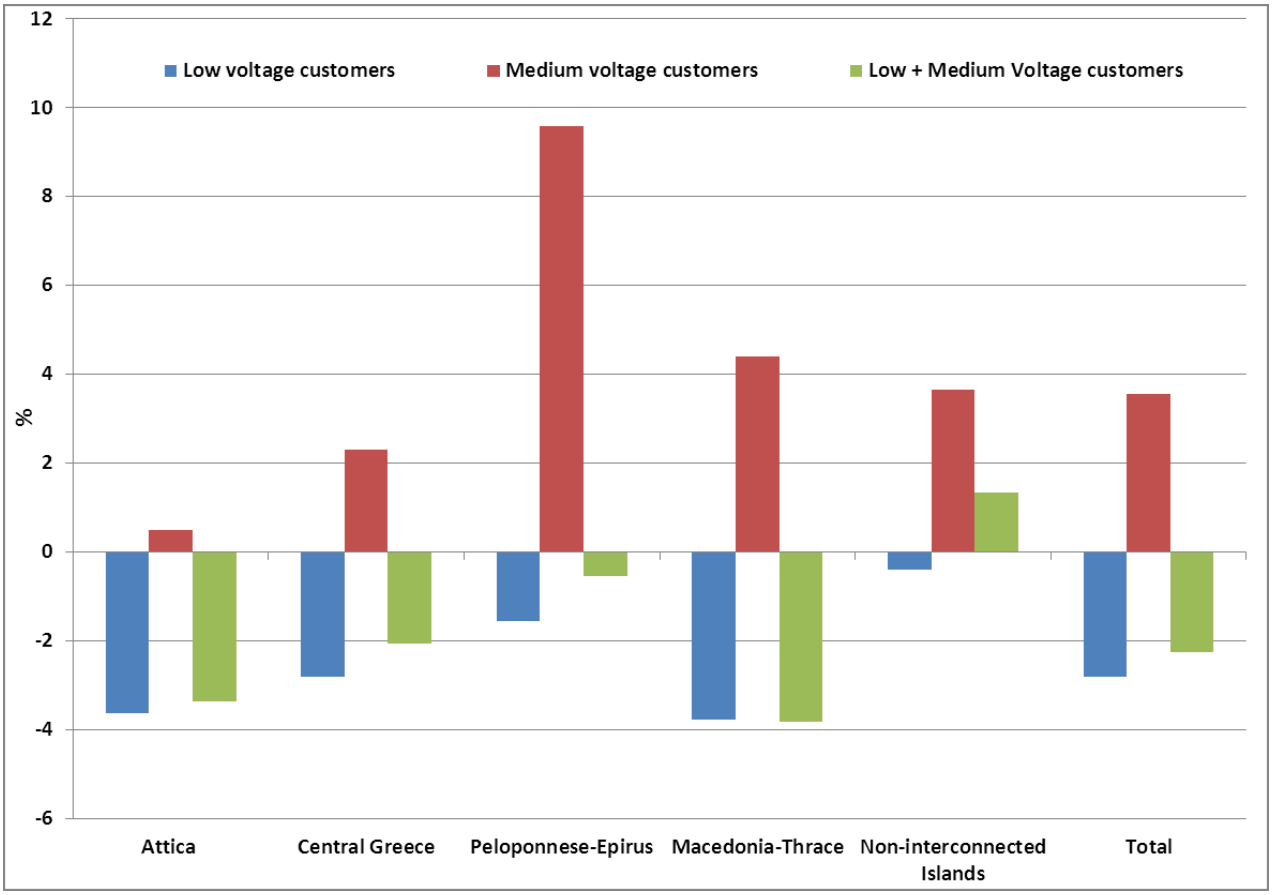

Figure 10. Decrease (%) of low and medium voltage customers, over different regions in Greece in the interconnected system and the non-interconnected islands, between 2011 and 2010 (sources: ADMIE, PPC, GENOP DEI, RAE)

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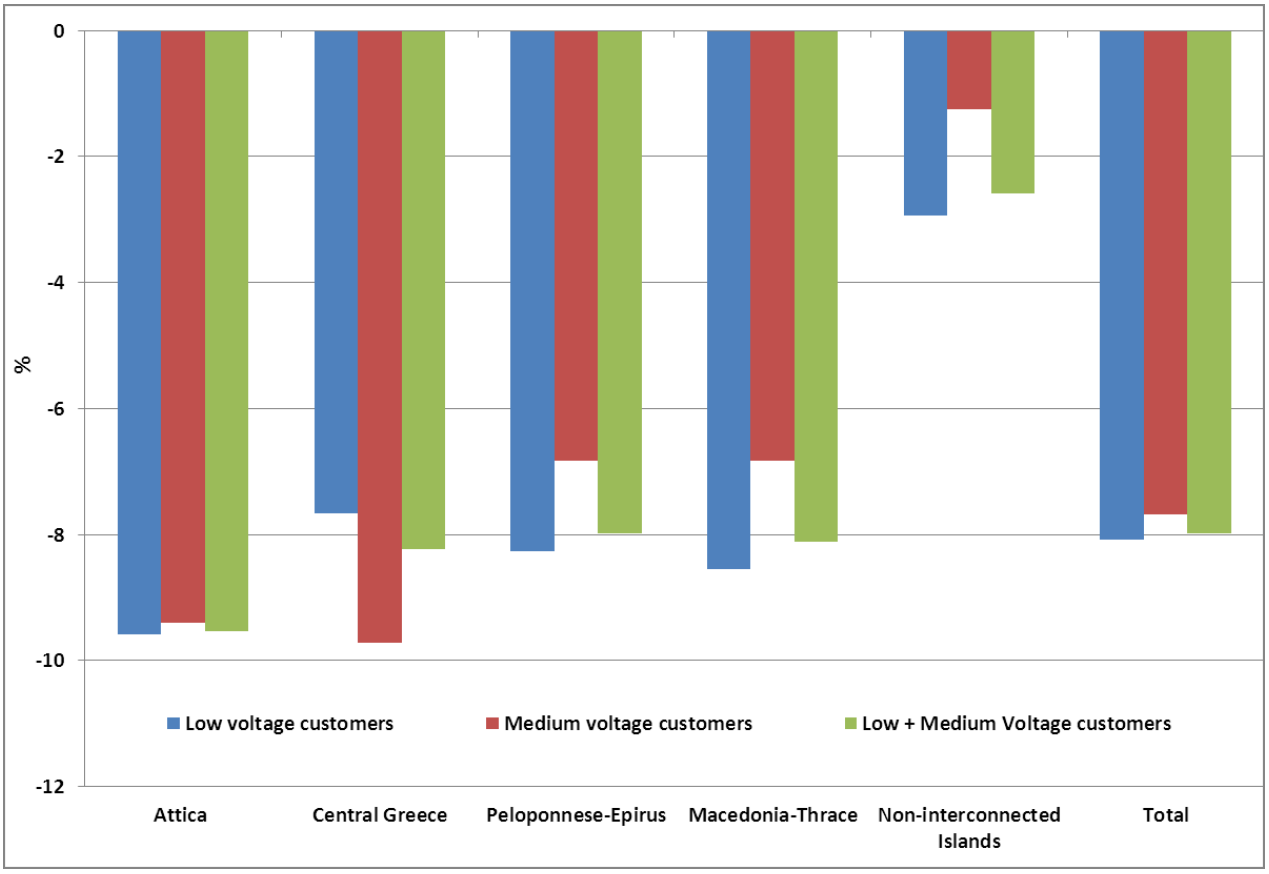

Figure 11. Decrease (%) of electricity supplied to low and medium voltage customers, over different regions in Greece in the interconnected system and the non-interconnected islands, between 2011 and 2010 (sources: ADMIE, PPC, GENOP DEI, RAE)

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Tables

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EU-27	100	103	104	106	108	111	113	114	116	119	120	122	122	122	115	120
Euro Area	100	102	104	106	109	112	118	119	122	124	125	127	128	128	122	128
Belgium	100	102	105	107	108	112	113	113	114	115	114	116	116	115	106	114
Bulgaria	100	105	95	93	85	87	89	90	94	94	97	102	104	110	104	105
Czech Republic	100	105	103	102	101	103	107	107	110	113	116	120	120	120	113	117
Denmark	100	102	102	102	102	103	103	102	102	103	104	105	104	102	96	98
Germany	100	101	102	103	104	106	109	111	112	114	114	115	116	116	109	117
Estonia	100	111	119	118	110	115	120	125	132	138	142	153	160	165	157	163
Ireland	100	106	111	116	122	130	133	135	141	139	143	149	145	147	136	136
Greece	**100**	**104**	**108**	**113**	**116**	**123**	**127**	**132**	**137**	**140**	**143**	**147**	**154**	**157**	**151**	**146**
Spain	100	104	112	116	124	131	139	140	146	152	157	164	165	166	154	158
France	100	103	103	106	108	110	112	111	114	117	117	117	116	117	112	119
Italy	100	101	104	107	110	114	116	118	121	122	123	125	125	124	115	118
Cyprus	100	102	104	112	118	126	129	139	148	149	153	158	163	170	173	173
Latvia	100	94	96	104	104	105	109	117	125	130	139	150	162	163	151	155
Lithuania	100	103	108	109	106	101	106	111	119	127	133	142	150	154	143	143
Luxembourg	100	97	99	102	104	108	108	108	112	114	108	114	114	111	101	107
Hungary	100	104	104	105	105	107	112	115	115	117	119	123	125	127	123	127
Malta	100	106	107	109	118	121	118	123	133	131	143	134	133	133	121	114
Netherlands	100	103	107	110	112	115	116	115	116	120	120	121	124	124	118	120
Austria	100	103	104	106	108	110	114	114	117	119	121	126	127	125	120	125
Poland	100	106	108	108	107	110	111	110	114	118	119	125	129	133	127	134
Portugal	100	105	110	116	124	131	135	140	144	148	153	157	161	158	157	163
Romania	100	110	106	101	94	94	101	102	108	112	112	118	119	121	109	120
Slovenia	100	102	106	108	112	113	117	125	129	134	136	140	140	136	118	124
Slovakia	100	108	105	96	104	100	107	104	105	110	105	108	112	113	105	110
Finland	100	102	107	111	113	114	117	120	121	124	121	128	128	122	113	122
Sweden	100	101	100	101	101	103	105	104	102	103	103	102	102	99	94	99
United Kingdom	100	105	105	106	108	110	111	111	111	112	114	112	111	110	103	104
Iceland	100	100	109	126	145	155	159	165	163	167	166	188				
Norway	100	99	99	104	103	102	104	101	95	99	101	97	99	99	94	99
Switzerland	100	100	99	101	105	105	108	107	109	110	111	112	110	111	108	111
Croatia	100	105	115	115	120	123	126	134	137	145	152	159	163	171	164	168
FYROM	100	104	106	107	100	101	97	96	111	112	121	124	130	133	123	130
Turkey	100	108	118	125	127	135	132	139	149	159	169	183	206	212	203	220

Table 1. Indicator of the evolution of annual electricity consumption per capita (100 for year 1995) for European countries over the period 1995-2010 (source: Eurostat).

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	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EU-27	100	98	94	92	89	86	84	82	83	81	78	76	72	72	72	72
Euro Area	100	99	99	98	96	94	93	92	92	90	88	86	82	81	80	82
Belgium	100	102	104	103	99	98	96	93	92	88	84	82	78	76	72	74
Bulgaria	100	146	105	78	67	60	55	49	48	43	39	35	31	28	27	26
Czech Republic	100	90	87	79	76	71	65	56	57	54	49	44	40	35	36	35
Denmark	100	98	95	93	89	84	82	79	77	75	73	70	66	63	63	61
Germany	100	102	104	102	101	101	101	102	102	101	100	97	93	91	89	91
Estonia	100	85	75	66	57	51	47	44	41	39	34	31	27	27	30	30
Ireland	100	95	81	79	73	67	63	58	57	54	52	51	48	52	54	56
Greece	**100**	**96**	**92**	**95**	**91**	**92**	**90**	**88**	**83**	**79**	**78**	**74**	**73**	**72**	**70**	**71**
Spain	100	97	102	100	99	97	96	91	90	89	86	84	81	80	78	80
France	100	101	99	98	96	94	93	89	90	89	86	83	79	79	78	80
Italy	100	88	85	85	84	83	80	79	79	77	76	75	72	71	69	70
Cyprus	100	99	97	98	96	95	92	96	99	94	92	90	87	85	89	89
Latvia	100	79	65	62	55	45	42	42	45	41	38	33	27	25	28	29
Lithuania	100	80	61	54	51	40	38	36	35	34	31	28	25	23	25	24
Luxembourg	100	96	98	97	87	83	82	78	76	74	64	62	56	56	54	52
Hungary	100	99	88	85	80	73	65	56	53	49	46	47	43	41	45	44
Malta	100	101	92	90	90	81	79	80	88	87	90	80	75	70	65	57
Netherlands	100	101	102	100	95	91	86	83	82	83	79	76	74	71	70	70
Austria	100	102	104	102	100	97	98	95	97	94	93	92	88	85	83	84
Poland	100	91	83	75	72	63	55	55	63	61	51	48	44	38	43	40
Portugal	100	99	98	96	95	94	93	92	94	93	94	93	90	88	89	90
Romania	100	108	96	77	79	66	63	58	56	50	38	33	26	24	25	26
Slovenia	100	98	94	89	85	84	82	82	80	79	76	73	66	59	54	58
Slovakia	100	97	83	73	82	69	69	60	54	49	41	37	31	26	25	25
Finland	100	101	100	96	93	88	85	85	85	84	79	80	73	68	69	72
Sweden	100	90	87	87	81	75	81	76	72	70	68	64	60	60	66	58
United Kingdom	100	97	78	73	69	63	62	60	62	58	57	54	50	57	62	58
Iceland	100	94	91	93	98	92	102	100	97	91	75	85	0	0	0	0
Norway	100	90	82	89	80	66	64	59	57	57	50	43	42	39	43	40
Switzerland	100	101	103	101	103	96	94	90	95	95	94	91	89	84	80	73
Croatia	100	95	91	84	91	86	79	76	73	71	68	65	60	58	59	60
FYROM			100	106	92	83	81	77	83	80	80	76	70	64	59	59
Turkey	100	99	94	71	76	66	87	83	82	76	66	67	64	64	70	61

Table 2. Indicator of the evolution of annual electricity consumption per Gross Domestic Product (100 for year 1995) for European countries over the period 1995-2010 (source: Eurostat).

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	Million Euros
November 2011	388
January 2012	507
February 2012	641
March 2012	763
April 2012	629
September 2012	696

Table 3. Low voltage Customers' debt to the Public Power Corporation, due to unpaid electricity bills, over the year 2012 (source: GENOP DEI, press)