



IENE STUDY: Energy and Employment in Greece

December 2013

Executive Summary

The Energy Sector

The contribution of the energy sector in the Greek economy is considered small, since it corresponds to approximately 4% of the Greek GVA, but its wider economic impact is particularly important. There are two main reasons why the energy sector is of high strategic importance in Greece. The first has to do with the actual energy supply, either electricity, natural gas or petroleum products. The uninterrupted energy supply at competitive prices is a prerequisite for the smooth functioning of the economy. The second reason is that the energy sector is a capital-intensive industry, with economy-wide employment impact. Energy investments have considerable employment benefits, both in the construction and manufacture phase (e.g. construction of thermal power plants, construction and installation of gas pipelines, exploratory drilling for oil or natural gas, installation of RES units, etc.), and the operation phase.

The Study

Over the last 15 years the country's energy system has been constantly changing due to the diversification of the energy mix, an on-going process which is expected to continue at least until 2020, with serious consequences on employment. With the increased penetration of RES and natural gas in the energy balance, employment opportunities are expected to arise, with emphasis in specialties in specific sectors. Furthermore, automation, e.g. in the refining sector, the petroleum products retail sector, as well as in the operation of large thermal units, implies job losses. Therefore, alongside with the differentiation in occupations, in terms of skilled personnel, a reduction in employment is observed in some sectors (e.g. oil refining, power generation), while an employment growth is observed in others (e.g. natural gas, RES, energy efficiency).

Consequently, it is essential to estimate the employed workforce in the energy sector as well as to assess the general trends in terms of new skills and qualifications required in the labour market. The study focuses on the production, transmission and management of energy. Categories such as energy storage, energy meters and electromechanical equipment manufacturing have not been included as they are only indirectly related to the production, transmission and management of energy.

The aim of the current study is twofold: On the one hand it aims to provide an estimate of the total workforce in the energy sector, with 2012 as a reference year, and on the other hand, to highlight the prospects for further employment growth in years 2015 and 2020. Given the mobility exhibited in the energy sector despite the current adverse economic climate, the potential of creating employment opportunities in the various branches of the energy sector, needs to be investigated.

The analysis of the study covered the following parameters:

- (a) An estimation of the employed workforce in the energy sector,
- (b) An identification of the existing employment trends in the various branches of the energy sector,
- (c) An identification and analysis of the emerging perspectives on the employment in the various energy sub-sectors, and the energy sector as a whole.

In addition, the study aims to evaluate the qualitative characteristics of the different branches of the energy sector (i.e. education level, work experience, field of activity). The characteristics of the workforce can contribute in the economic value of the business by enhancing competition. Specific features and skills can contribute in increasing the efficiency of a business and therefore, of a sector.

The research and analysis was based on data collected from Greek and international sources, as well as on questionnaires and interviews conducted with individual companies and business associations. Two types of questionnaire were designed, one for companies and one for business associations. Questionnaires were sent to 142 companies and 22 business associations. Regarding the number of companies and associations in our sample, 43 questionnaires were completed by companies and 9 questionnaires were completed by business associations.

The questionnaires provide basic information about the respective company (size, number of employees over time, gender, age, employee experience, field of activity) – or business association. The employment figures for 2008 and 2012 are provided. Furthermore, the representatives of the companies/ business associations provided estimations on the employment evolution for the years 2015 and 2020, as well as a list of occupations in high demand. A specific part of the questionnaire concerns the intention of the companies or the assessment of the business associations – the activities of which are not based on Renewable Energy Sources – of engaging in "green business"¹ and "green energy"² activities, or the export of goods or services that will increase employment in the business/sector.

Estimation of the employment in the energy sector – Observed trends

After carefully examining the information made available by the Hellenic Statistical Authority and national and European bodies, an estimation of the employment workforce in the energy sector was attempted. It appears that the energy sector in Greece in 2012 employed 93.630 people, from 82.059 it employed in 2008.

Total employment has increased significantly compared to 2008, with the RES sector contributing the largest share of new jobs. For the estimation of RES job positions, it was considered safer to use the employment data provided by the EurObserv'ER barometer, for the year 2011. According to the EurObserv'ER barometer, 11.292 people were employed in the RES sector in 2008, while 32.354 people were employed in 2011. Meanwhile, during the period 2008 - 2012 it appears that job losses have occurred in traditional industries, such as oil refining, petroleum products retail and the generation, transmission and distribution of electricity. In the energy efficiency sector, which was practically non-existent in 2008, it is estimated, based on data from the Ministry of Environment, Energy and Climate Change, that the total number of energy inspectors who were employed on a full-time basis in 2012, was approximately 2.200.

¹ Green Business is the form of economic activity that puts the protection of the environment and nature in general, at the heart of its strategy (RES, recycling, energy efficiency in buildings, waste management and energy recovery, energy conservation etc.).

² Green Energy is the energy produced using renewable energy alone, without the release of substances which are harmful to humans or the environment.

This proves the great potential of the energy industry and the significant employment opportunities it provides, despite the ongoing economic recession, especially in emerging sectors, such as the RES, energy efficiency and natural gas sectors.

Figure 1. Estimation of employment in the energy sector, in years 2008 and 2012.

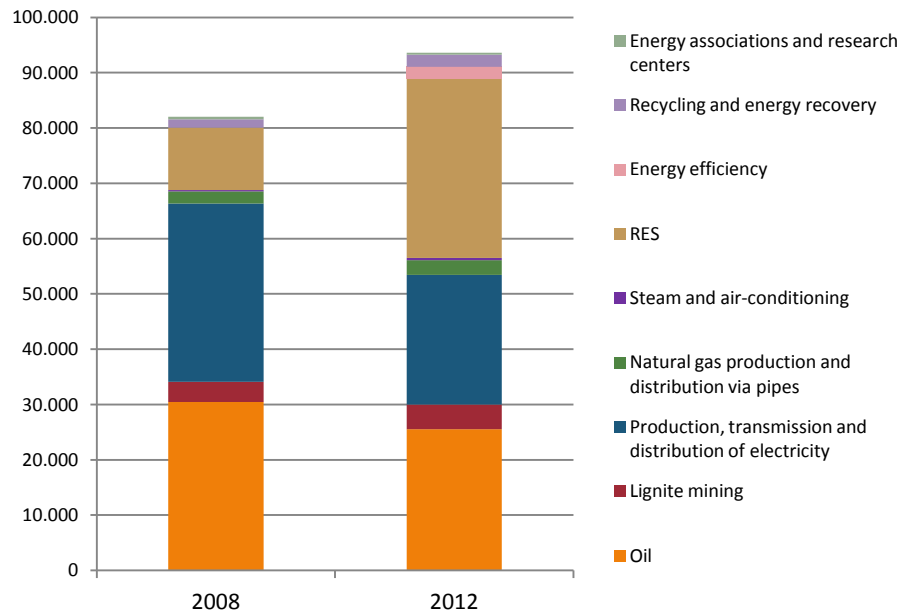


Table 1. Estimation of the employment in the energy sector in Greece.

Sector	2008	2012	Source
Oil	30.487	25.552	
Production	270	297	Energiean Oil & Gas
Oil refining	5.677	4.971	EL.STAT. (quarter average)
Wholesale trade of petroleum products	2.740	2.269	IOBE (SEEPE members)
Petroleum products retail	21.800	18.015	EL.STAT. (quarter average)
Lignite mining	3.605	4.437	EL.STAT. (quarter average)
Production, transmission and distribution of electricity	32.260	23.444	EL.STAT. (quarter average)
Natural gas production and distribution via pipes	2.199	2.674	EL.STAT. (quarter average)
Steam and air-conditioning	217	419	EL.STAT. (quarter average)
RES	11.292	32.354	
Solar thermal	4.000	3.800	EBHE
PV	500	22.000	Euroobserver (2011)
Wind	2.100	2.500	Euroobserver (2011)
Small hydro	542	554	ESMYE
Biomass	3.500	2.750	Euroobserver (2011)
Biofuels	550	550	Euroobserver (2011)
Biogas	n.a.	100	Euroobserver (2011)
Geothermal	100	100	Euroobserver (2011)
Energy efficiency	-	2.200	Εκτίμηση ΙΕΝΕ
Recycling and energy recovery	1.500	2.200	SEVIAN
Energy associations and research centers	500	350	ΙΕΝΕ estimation
TOTAL	82.059	93.630	

In spite of the limited response by the companies and the difficulty in providing estimates under the present economic conditions, in the employment data obtained from the questionnaires completed by companies and business associations, some trends are clearly emerging. It is estimated that the part-time employment will increase in the future, and that the education level of the workforce will be improved. It is considered by the vast majority of companies and associations that participated in the current research that there will be new skill requirements, of higher level. In general, it is expected that a shift in employment qualifications and skills will take place. Moreover, the majority of the occupations in demand provided by the participants is of a technical nature.

Lately the energy sector in Greece is subject to structural changes aiming at harmonization with the EU energy and environmental strategy, in order to reduce CO₂ emissions and complete the European internal energy market. The expected investments in the electricity and natural gas grid, and in hydrocarbon exploration and production, as well as in energy efficiency, will stimulate employment in the energy industry. On the other hand, the employment cost reduction in PPC, the largest company in the energy sector in Greece – as far as the employment is concerned - as well as the increased automation in the oil refining sector and the petroleum products retail sector, are expected to reduce employment. The measures covered by the National Renewable Energy Action Plan (NREAP) in order to achieve 20% contribution of Renewable Energy Sources (RES) in final energy consumption by 2020, include a significant penetration of RES technologies in the electricity mix and essentially imply a transformation of the energy mix.

Job creation due to the Energy System reform

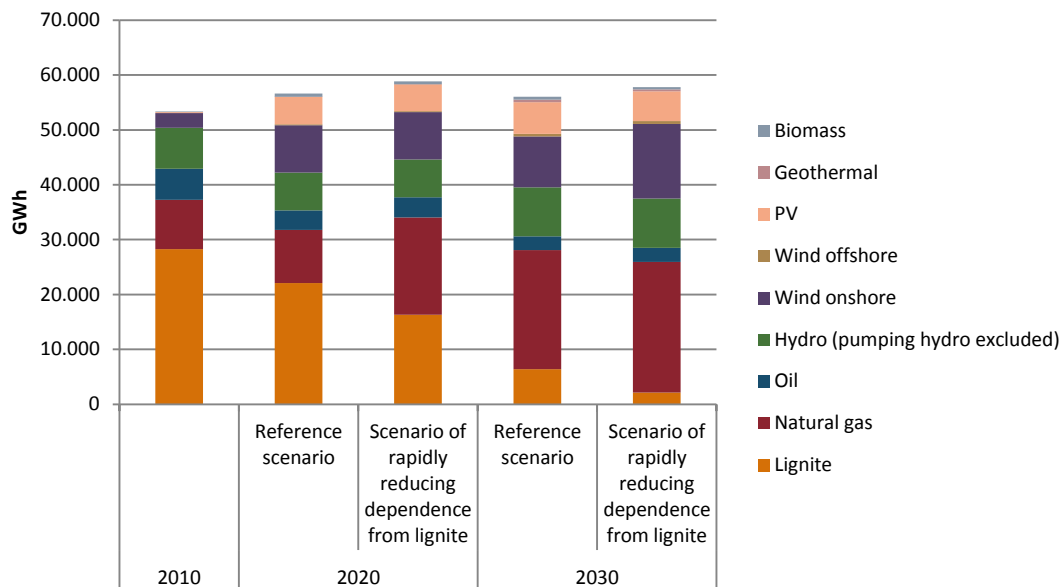
The reform of the energy mix in order to achieve the national energy objectives under the NREAP, is expected to have a major impact on employment in the energy sector. As stated by the International Labour Organization (ILO), “growing numbers of green jobs will be created as the move toward a low-carbon and more sustainable economy gathers momentum. Although winners are likely to far outnumber losers, some workers may be hurt in the economic restructuring toward sustainability”.

A power system based on clean energy can provide greater energy independence, protection against international market volatility, as well as significant environmental benefits, as it leads to greenhouse gas emissions reduction. Moreover, it can stimulate employment. In this context, the employment perspectives in the power sector were estimated, through the use of two electricity production scenarios, provided by the E3Mlab of the National Technical University of Athens, and suitable employment multipliers based on studies. For the **power sector**, the use of scenarios can facilitate comparisons between different technologies in job creation. Regarding the **heat sector**, the employment in renewable energy technologies for heating / cooling in 2020 is estimated based on the objectives set by the National Renewable Energy Action Plan for Greece.

In this context, an analytical job creation model for the Greek power sector from 2010 to 2030 is applied, based on a methodology developed by the Renewable and Appropriate Energy Laboratory of Berkeley, the University of California. In particular, the two scenarios used allow different combinations of fossil fuels and renewable energy sources, in order to examine the direct, indirect and induced employment effects of the reform of the electricity production system. A “reference scenario” and a “scenario of rapidly decreasing dependence on lignite” are used. The annual employment by primary energy source is calculated based on the annual output of energy, in GWh, and the employment multiplier, in job-years per GWh. Both of the scenarios include measures for increasing the penetration of RES technologies in the electricity mix (see Fig.2). The main difference between the two scenarios is that the scenario of rapidly decreasing dependence on lignite assumes a sharp decline in lignite use in electricity production and its replacement by natural gas, as well as greater boost in RES, particularly from 2020 onwards.

It should be noted that the results do not quantify completely the employment impact of the electricity production system. This model provides a framework for comparing job creation from RES and fossil fuels, by calculating *indicative* employment figures by technology, based on bibliography – derived direct, indirect and induced employment multipliers, in job - years per GWh.

Figure 2. Electricity production scenarios.



Results show that total jobs, in terms of direct, indirect and induced employment, increase in 2020 and 2030, as the RES penetration in the electricity mix is intensified. However, jobs are reduced significantly in the lignite sector. Thus, although the net overall employment generation is estimated to be positive, reducing the participation of lignite in the electricity mix will adversely affect employment in the lignite sector and especially in lignite mining.

The technologies with the largest contribution in *direct employment* in 2020, in both scenarios, are lignite, photovoltaics and onshore wind. Towards 2030, in the reference scenario, photovoltaics and onshore wind are gaining ground in terms of employment, while in the scenario of rapidly decreasing dependence on lignite the photovoltaics, onshore wind and large hydro sectors are the technologies with the largest shares of employment (see Fig. 3, 4).

In terms of *indirect employment*, photovoltaics and lignite have the largest participation in 2020, in the reference scenario. Towards 2030 the role of lignite is limited, in both scenarios, and photovoltaics and onshore wind provide the majority of jobs (see Fig. 5, 6).

In terms of *induced employment*, lignite and photovoltaics are the technologies with the largest shares in 2020. Towards 2030, photovoltaics and onshore wind are slowly replacing lignite, more evidently in the scenario of rapidly decreasing dependence on lignite (see Fig. 7, 8).

Comparing the total employment resulting from the two scenarios, it can be concluded that the scenario of rapidly decreasing dependence on lignite yields smaller benefits in terms of employment than the reference scenario. This can be attributed to the low overall employment multiplier of the natural gas (which will replace lignite for base load), compared to the higher corresponding multiplier for lignite plants.

Estimation of employment in the electricity production sector

Figure 3. Direct employment by technology in the Reference Scenario (jobs).

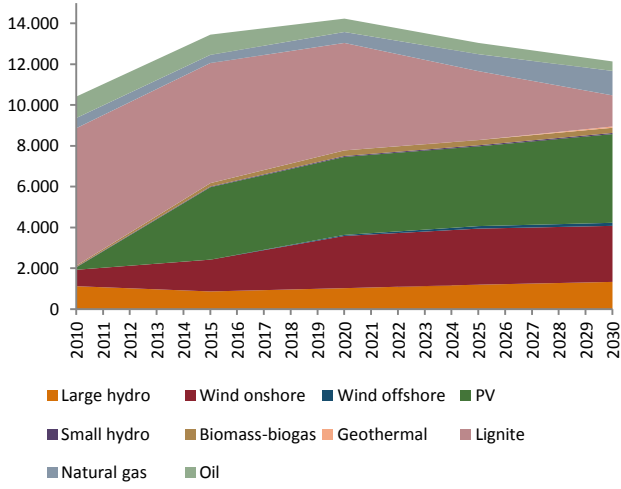


Figure 4. Direct employment by technology in the Scenario of rapidly decreasing dependence on lignite (jobs).

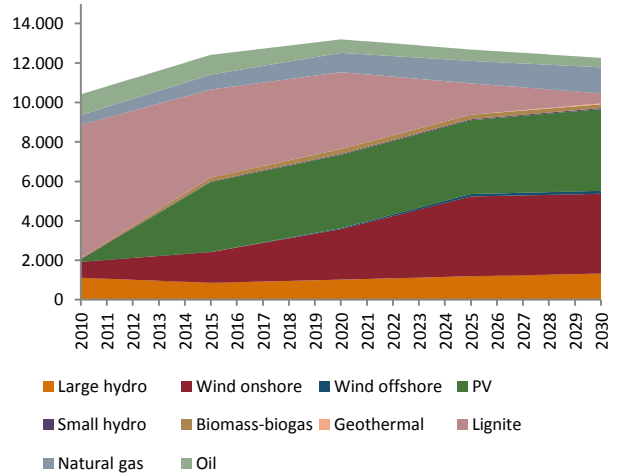


Figure 5. Indirect employment by technology in the Reference Scenario (jobs).

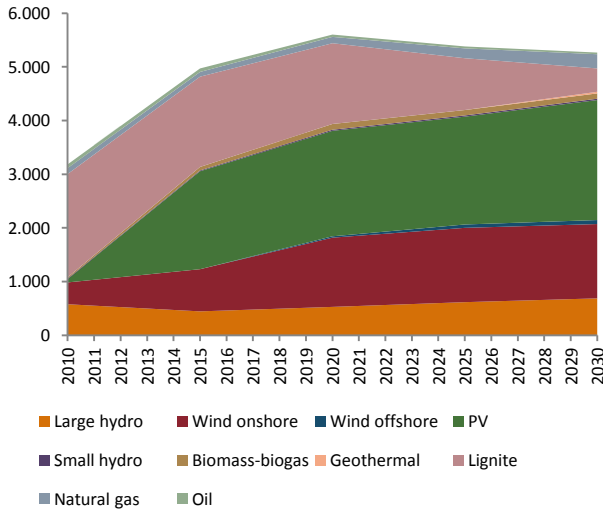


Figure 6. Indirect employment by technology in the Scenario of rapidly decreasing dependence on lignite (jobs).

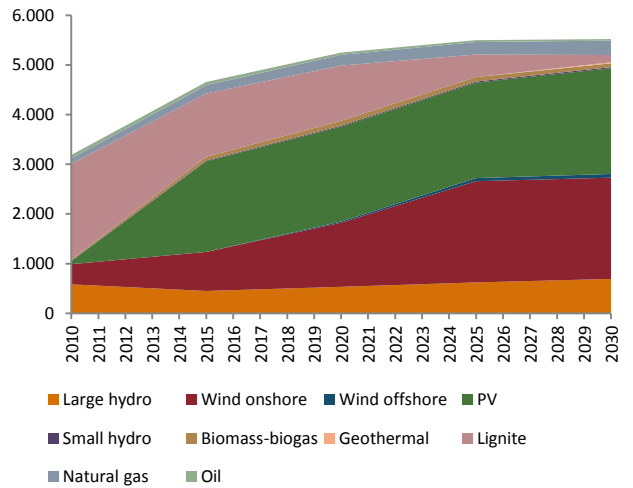


Figure 7. Induced employment by technology in the Reference Scenario (jobs).

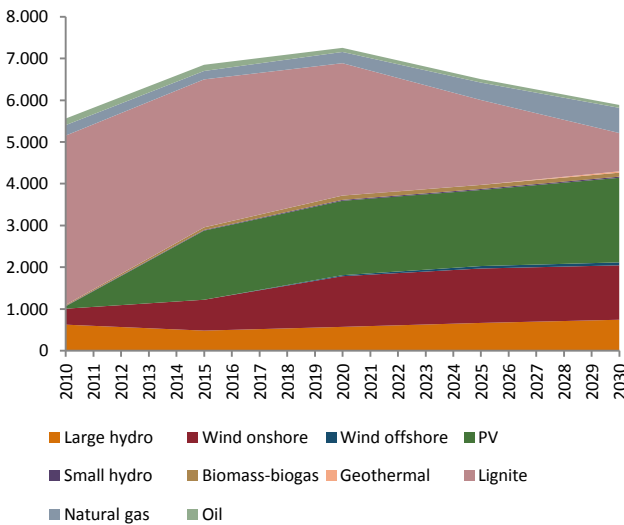
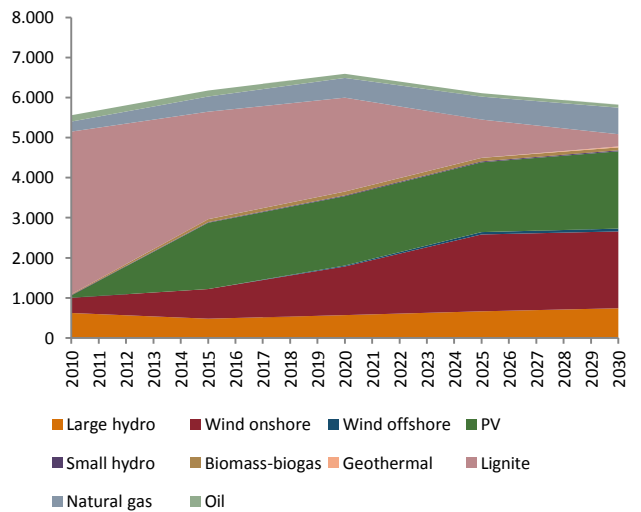


Figure 8. Induced employment by technology in the Scenario of rapidly decreasing dependence on lignite (jobs).



Conclusions

A basic conclusion of the present study is that the reform of the Greek energy system will have quantitative as well as qualitative effects on employment. Moreover, the planned investments on the energy sector are expected to stimulate employment. However, the net gain in employment, as a result of the RES penetration in the electricity mix can change significantly due to the unstable economic environment. As Greece is required to achieve the targets set in the context of EU energy policy, aiming at a transition to a low carbon economy, it is almost certain that there will be a restructuring of employment in the energy sector. The shift of the energy system towards cleaner forms of energy will inevitably cause job losses in some sectors (e.g. lignite, oil). It is therefore the responsibility of the fossil fuel industries, as well as the Greek State, to prepare for this transition.

Investments in the energy sector are bound to offer significant potential for job creation. The photovoltaic industry is a sound example, since during the five-year period 2008-2012 the estimated €3 billion investments resulted in the creation of 19.700 direct jobs in 2012, according to the Hellenic Association of Photovoltaic Companies. The energy efficiency industry is also moving in the same direction.

Another key finding of this study is that the maintenance of existing and the creation of new jobs in the energy sector requires significant investments in the production, transmission and storage of energy. In the period 2008-2012 an estimated total of around €12 billion was invested across a variety of applications in the energy sector, which contributed in a net increase in employment by approximately 11.500 jobs. Therefore, the country's ability to attract investments on an ongoing basis in the energy sector is an important factor in stimulating employment growth.

In years to come, the planned investments in the electricity grid, the natural gas grid, in the hydrocarbon exploration and production, as well as in energy efficiency, are expected to create new job positions and lead to an overall net increase in energy related jobs. However, the employment cost reduction in the largest company in the Greek energy sector – as far as the employment is concerned - as well as the increased automation in the oil refining sector and the petroleum products retail sector, are expected to partly offset this increase. Therefore, it is necessary to periodically and systematically record employment and its specific characteristics over the next few years, as the energy sector is going through major changes which will have an impact on the characteristics of the workforce in the energy industry. Moreover, it would be interesting in the future to estimate employment in related industries, such as electromechanical equipment manufacturing (including electricity and natural gas meters) and batteries.

Finally, this study could be the first step for the creation of an Observatory on Employment in the Energy Sector, which will monitor and analyze the latest developments in the sector. Given the observed hesitation of providing employment data in the Greek corporate culture, which is evidenced by the limited participation of companies in the present study, the argument for the creation of an Observatory is strengthened. The publication of the Observatory reports per calendar year will allow the evaluation of trends and perspectives by the stakeholders and will also contribute in appropriate policy formulation.