How Many Jobs?

A Survey of the Employment Effects of Investment in Energy Efficiency of Buildings

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Preface

The Research published in this report is an extract from a larger piece of research that was commissioned by the Energy Efficiency Industry Forum (EEIF) in order to assess the job creation potential of a particularly important piece of EU Legislation – the Energy Efficiency Directive (EED).

This report restricts itself to an analysis of a number of reputable studies that assessed the potential employment impact of investment in the upgrading of energy efficiency of existing buildings. As such, it does not purport to set out for the reader the full potential that investment in energy efficiency in all sectors will bring.

The key finding of this Study is that, on average, we can expect that investing **€1 million in upgrading the energy efficiency of our building stock will create 19 new direct jobs** in the construction sector and that the vast majority of these jobs will be local and non-transferable, thus jobs that lead to economic vibrancy in the EU. Having revealed the job potential of such investment measures, it is suggested that policy-makers in the EU can rely on using a factor of 19 jobs for each €1 million invested in energy efficient upgrading of buildings when formulating new policies.

It is acknowledged that there will be variations in this number when it comes to assessing the potential in each individual Member State of the EU and some of those variations are evident in analyses of the reports that were studied in the process of compiling this report.

Executive Summary

While every strategy, communication and directive on energy efficiency in the buildings sector makes reference to the impact on jobs, there is very little understanding of what the real impact is. Concurring analysis shows that initiatives to improve the energy efficiency of the building stock (i.e. the building's envelop, heating, cooling and control equipment), can represent a strong driver for job creation and it is clear that job creation is one of the most important co-benefits from improved energy efficiency, particularly in a period of poor economic growth and high unemployment.[1]

Overall, jobs in energy efficiency are of high value, requiring new and innovative skills. While not the panacea to all the economic concerns, energy efficiency deployment in the buildings sector helps answer many of the needs for growth, orienting new generations towards sustainable skills.

The broad context for the analysis in this report is the *Europe 2020* strategy for growth, a strategy that is part of the transition that the EU is undergoing to a low carbon economy. It can therefore be said that regardless of what the final target for carbon reduction in 2050 is, the transition is underway and energy efficiency is a major part of it.

Skilled, local, distributed, strategic

For the most part, jobs created by addressing the wasteful performance of existing buildings are highly skilled with important added value. These skills come from a combination of better education, training and re-training the existing workforce. For the most part, these jobs are also local in nature because improved energy efficiency has to take place where the buildings stand in all regions of member states and not just in cities or industrial clusters.

Europeans need to have local experts and service engineers to audit current installations from an energy stand point and design, and to install new energy efficient technologies. All regions and countries in the EU have the same potential of benefiting from energy efficiency deployment - there is no limitation due to natural resources or infrastructure availability.

Energy efficiency deployment in the buildings sector is a strategic job opportunity. As technology progresses, new opportunities will be found to improve the energy profile of the EU and reduce import dependency. In 2050, European and global demand for skills in energy efficiency of buildings will still be high and permanent – though they will no longer be seen purely as energy efficiency jobs. Rather, they will have become part of the landscape of everyday activity within the low carbon economy.

Jobs have to be seen in terms of business opportunities, many of which are innovative and novel. They exist for energy service companies, for investment funds, for retrofit companies, for sales and distribution, and many more. There will be many more related opportunities in information and communications technology (ICT) as these are incorporated into building management systems.

Of course, in looking at the full range of job opportunities, there is a wide range of skills required. In manufacturing, construction and retrofit, distribution and other areas, alongside highly skilled and technical jobs, there are also many positions available for a less skilled workforce, which currently suffers most from high unemployment rates. For the most part, the labour market is good

[1] Other important co-benefits include, *inter alia*, improved health, lower fuel poverty, increased industrial competitiveness, improved energy security and environmental benefits.

added value to the economy. As US analysis shows, theinstallation of energy efficient elements and technologies tends to be more labour intensive than manufacturing them, so that when policy is looking for areas of growth, the energy efficiency of buildings should be one of the top priorities. Job development in energy efficiency of buildings is a key field where economic growth brings with it reductions in carbon emissions and increased energy security.

Headline Impact

The headline impact in terms of jobs[2] to 2020 is that on average, there are about 19 net jobs generated per €1 million investment in energy efficiency in the buildings sector. This is more labour intensive than for many other sectors of the economy and therefore provides a valuable policy option for stimulating economic activity.

In relation to the specific measures for public buildings proposed by the European Commission in the Energy Efficiency Directive in June 2011, the annual rate of net job creation would be 29,000 full time new direct jobs. Note that this number of jobs is created by addressing just a very small fraction of the total EU building stock.

It can also be concluded that the huge potential for job creation in the buildings sector will not fully materialise spontaneously. Ambitious measures for the entire building stock need to be put in place very soon at both the EU and Member State levels to see quite rapidly a first impact on the job market however the full job creation potential may only be delivered by 2020.

End of Executive Summary

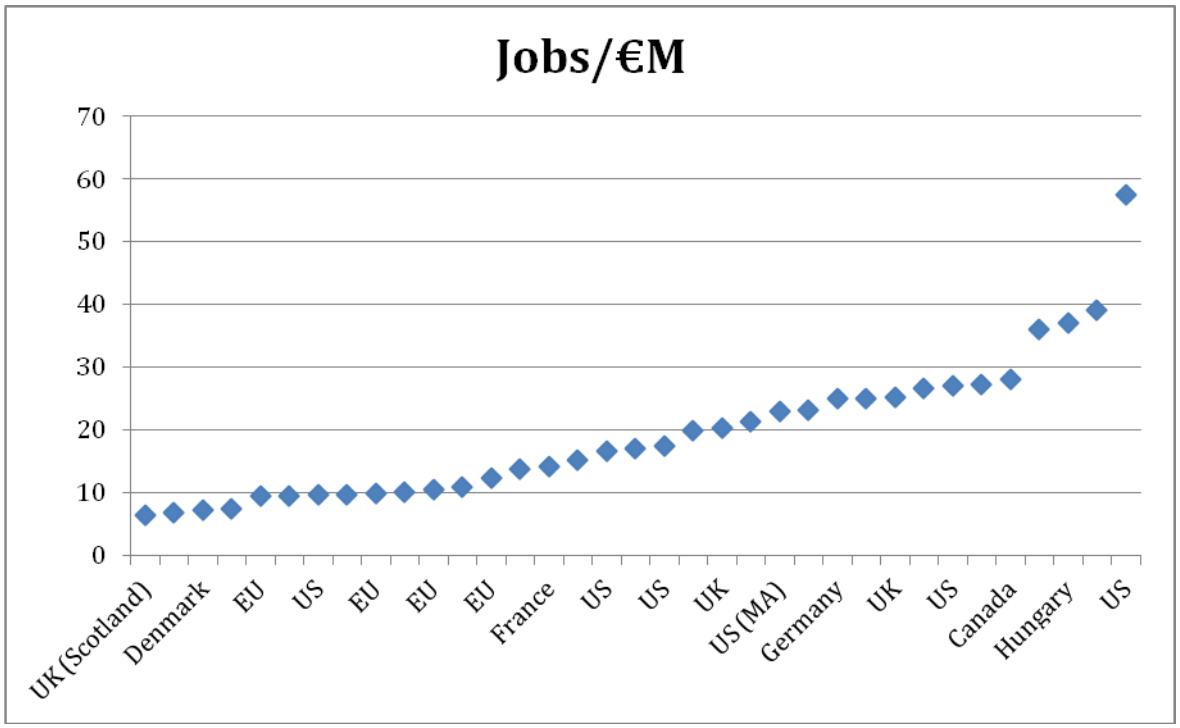
[2] A job is defined as a person-year of employment

Employment Effects of Investment in Energy Efficiency of Buildings

Prompted by the measures put forward by the European Commission in its proposal for an EU Directive on Energy Efficiency (EED) in June 2011, this report seeks to quantify the employment and other impacts that would result from the implementation of the buildings related measures in the Directive. In particular, the proposed Directive put forward the idea that public authorities should lead by example and renovate 3% of its own building stock each year.

In order to determine the employment impact of this specific measure, desk research was undertaken to summarise the available information on the number of jobs resulting from energy efficiency investments in buildings – typically as a result of governmental or regulatory schemes. 35 data points were collated from over 20 different sources spanning Europe and North America. Some authors quantify direct and indirect jobs separately, while others provide a single figure. In the latter case, it is not always clear whether the figure refers to direct jobs, total jobs or net jobs.

The analysis covers programmes dating back to around 1995, though most of the data points are from the period 2006 to 2011. The results are plotted below, while the full list of reference studies is provided in Annex 1.



The first point to observe is the very wide variation in jobs per €M investment – from around 6 to nearly 60. There is no obvious correlation in terms of date or geography to explain this wide variation. Local cost factors will have a bearing, though a bigger factor is likely to be the methodology used – see box.

A detailed analysis of the methodology used in each assessment of job creation, with a view to rationalising the results, is beyond the scope of this short study. It is therefore proposed that the

simple average of the available data be used. We conclude that **an average of 19 jobs is created per €M investment in energy efficiency.**[3]

Methodological approaches identified in the literature[4]

Four main methodological approaches are usually applied on the estimation of employment effects of investments:

1) The scaling-up of case studies is a bottom-up approach that uses recorded job creation figures from completed projects and applies them to the level of the proposed intervention. Known also as the analytical method, it usually accounts only for direct effects, disregarding multiplier effects and thus underestimating net impacts.
2) Input-Output (I/O) analysis is the most often applied methodology for top-down forecasting of the employment impacts of medium- and large-sized investments, including energy efficiency interventions. It has been criticised because of the number of implicit assumptions underlying the calculations.
3) Computable general equilibrium models (CGEM) are capable of exploring the relationship between sectors, consumers and the government and of modelling the more complex dynamic effects of climate policies on a variety of macroeconomic parameters, including employment.
4) Finally, the results transfer approach, which applies the results of previous studies obtained in better studied locations to cases, markets or scales where little data is available. Such transfers are associated with significant limitations due to differences in economic and market environments.

Economic impact of delivering the draft EED 3% public sector renovation rate

Article 4 of the draft EED proposes a 3% per annum renovation target for publicly owned buildings with a total useful floor area over 250m^2. Analysis by BPIE[5] indicates that non-residential buildings account for 25% of the total EU building stock of 21,500km^2, or 5375km^2. Of this public buildings account for some 12%.

There is no reliable information of the number of public buildings, or their floor area, that meet the floor area criterion. On the basis that most public buildings will be larger than 250m^2, it is reasonable to assume the qualifying floor area affected by Article 4 to be around 10% of the EU non-residential total. Therefore, the total floor area of publicly owned buildings meeting the 250m^2 size threshold is estimated to be 537.5km^2.

BPIE reports a prevailing renovation rate of around 1% p.a. The vast majority of renovations currently undertaken are minor – delivering energy savings of up to 30%. Yet the BPIE analysis shows that, if the EU is to achieve the 80-95% CO2 savings figure in the EU 2050 Low Carbon Roadmap, both the rate of renovations and the depth of renovation need to be scaled up very significantly – and fast.

If the public sector is to show true leadership, it should aim to achieve deep renovations (i.e. those delivering 60% or more energy savings) at the target rate of 3% per annum as soon as possible. Article 4 specifies that the 3% renovation rate should be achieved by 2014. This renovation rate would then need to be maintained until 2044 in order to achieve the complete renovation of the

[3] ACEEE Factsheet, *How Does Energy Efficiency Create Jobs, Jobs Analysis 101*, ACEEE, Washington
[4] SOURCE - "Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary", by the Center for Climate Change and Sustainable Energy Policy (3CSEP) of Central European University, Budapest, on behalf of the European Climate Foundation (2010)
[5] "Europe's Buildings under the Microscope"; BPIE, 2011 www.bpie.eu

public sector stock (taking due account of demolitions etc.). It is unrealistic to expect that all renovations will be deep from 2014, given that most are minor today. The analysis underpinning this report assumes a gradual shift over the current decade, such that from 2020, all renovations are deep.

The impact of such a programme of activity, in terms of energy and carbon savings, investment, economic impact and employment, is summarised in the table below, compared with a baseline of continuation at the prevailing rate and depth of renovation.

In headline terms, the public sector renovation policy would result in energy savings of 56% and carbon savings of 86% (including the impact of decarbonising of energy supplies). The investment of €34bn would deliver energy cost savings of €103bn – i.e. a net saving of €70bn, equivalent to a rate of return of 12%. When externalities are included, the total benefits to society amount to nearly €200bn.

The programme would deliver an average annual employment rate of some 29,000 additional jobs, - or some 200,000 person-years of employment by 2020.

RESULTS TO 2050		**Scenarios**	
Description	**Units**	**Baseline**	**3% public sector target**
ENERGY SAVING			
Annual Energy Saving in 2050	TWh/a	9	55
2050 saving as % of today	%	9%	56%
CARBON SAVING[6]			
Annual CO2 saving in 2050	MtCO2/a	18	22
2050 CO2 saved (% of 2010)	%	72%	86%
CO2 abatement cost	€/tCO2	-19	-111
COSTS AND BENEFITS			
Investment Costs (present value)	€bn	6	34
Savings (present value)	€bn	16	103
Net saving (present value)	€bn	10	70
Net saving to society - including externality	€bn	29	192
Internal Rate of Return	IRR	10.1%	12%
EMPLOYMENT IMPACT			
Average Annual Net Jobs Generated		4,500	29,000

[6] Carbon savings includes the impact of decarbonisation of the energy supply system in accordance with the assumptions contained in the EU 2050 Low Carbon Roadmap

ANNEX 1 - Summary of Desk Research into Employment Impact from Investment in Energy Efficiency

Programme/Source	Ref/ Author	Year	Location	direct jobs	indirect jobs	Jobs/€M	Comments
ACEEE blog - How Does Energy Efficiency Create Jobs?		2011	US			27	http://aceee.org/blog/2011/11/how-does-energy-efficiency-create-job
CECODHAS Offer to fight Climate Change	CECODHAS	2009	EU			21.25	figure is for building retrofits
Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary	Ürge-Vorsatz et al	2010	Hungary			37	using the DEEP scenario
EPBD recast Impact Assessment		2008	EU			7.5	Option B1: Quality and compliance requirements for certificates.
EPBD recast Impact Assessment		2008	EU			9.4	Option A3: Abolishing the 1000 m² threshold (all buildings).
EPBD recast Impact Assessment		2008	EU			10	Option A1: Lowering the renovation threshold to 500 m², (all medium sized buildings).
EPBD recast Impact Assessment		2008	EU			10.5	Option A2: Lowering the threshold to 200 m², (all buildings apart from small ones (mainly single family houses)).
EPBD recast Impact Assessment		2008	EU			13.7	Option D1: Specifying EU–wide energy performance requirements.
EPBD recast Impact Assessment		2008	EU			20	Option B2: Requiring that the recommended cost-effective measures of the certificate are realized
EPBD recast Impact Assessment		2008	EU			27.3	Option D2: Introducing a benchmarking mechanism.
Estimating Jobs from Building Energy Efficiency	Sundquist, E.	2009	US	9.7		9.7	This research only estimates the direct jobs involved in energy-efficient retrofits, by examining a small amount of case studies. The paper identies a set of EE measures, estimates cost and amount of labour involved, profits and overhead. The work assumes a crew composed by "7% supervisory, 27% skilled, 36% semi-skilled and 29% entry-level" (in man-hours). 10% of investment goes to profits, 10% to overhead, 45% to materials and 45% to labour.
EU SAVE Programme	Wade, J., Wiltshire, W., Scrase, I.	2000	EU			26.6	Assessment of employment effects of the EU SAVE programme implemented in the mid-1990s in various EU Member States. Wide range of individual - from net job losses to 90 jobs/€M
Europe's Buildings Under The Microscope	BPIE	2011	EU			17	

Programme/Source	Ref/ Author	Year	Location	direct jobs	indirect jobs	Jobs/€M	Comments
Green Collar Jobs in the U.S. and Colorado. Economic Drivers for the 21st Century	Bezdek	2007	US			11	This study tries to give a precise definition of the **Renewable & Energy Efficiency** industries, evaluates their sizes and estimates their growth, with a particular focus on the jobs generated. The figure is the average of 3 growth scenarios
Green Jobs. Examples of energy and climate initiatives that generate employment	Juul, J., Hansen, T., Hansen, V., Ege, C.	2009	Denmark			7.3	This study contains a set of proposals to "restructure" the Danish society in a more sustainable way. The proposals are listed with the annual investments needed, the jobs created (direct and indirect) and the years in which this job creation is sustained. Figure quoted is average of 3 EE scenarios
Home Energy Saving (HES) scheme		2011	Ireland			25	
L'Union Social Pour L'Habitat	MEEDDAT (Ministry for Ecology, Energy, Sustainable Development and Spatial Planning)	2011	France			14.2	Report for the Commission, 16 May 2011.
Massachusetts Utilities Program		2002	US (MA)			22.9	http://www.epa.gov/cleanenergy/documents/suca/napee_report.pdf
National Association of Home Builders	NAHB	2009	US			15.3	figure is for building retrofits
Rebuilding America. A National Policy Framework for Investment in Energy Efficiency Retrofits	Hendricks, B., Goldstein, B., Detchon, R., Shickman, K.	2009	US			17.4	This report focuses on energy-efficient retrofits as an important tool for reducing greenhouse gas emissions, as well as fostering economic recovery. The research studies inherent obstacles (such as financing and worker training) and benefits of energy-efficient interventions, and proposes a retrofit programme scenario and a strategy for the implementation. The study is based on estimates from NAHB, 2009 and Sundquist, 2009.
SAVE: UK Case Studies	Energy Saving Trust	1996	UK			23.2	Similar revision of case studies coupled with an I/O analysis as the one by Wade, et al above. The programmes had a **direct** effect of 17.1 blue-collar and 6.1 white-collar jobs generated per million Euro (1996) invested. The **indirect** effects were estimated at the very high value of 59.4 jobs/M€, bringing the impacts to a total of 82.6 jobs generated per €M invested.

Programme/Source	Ref/ Author	Year	Location	direct jobs	indirect jobs	Jobs/€M	Comments
The case for including energy efficiency investment in the fiscal stimulus package			UK			9.5	a report investigating the cost of alleviating fuel poverty in the UK estimated that the current overall annual investment in energy efficiency in the UK of around £3.6 billion was supporting over 29,100 jobs.
The case for including energy efficiency investment in the fiscal stimulus package		2002-04	Germany			25	an assessment of the German Alliance for Work and the Environment's initiative to retrofit German homes suggested that, for the period 2002 to 2004, the programme supported 140,000 jobs (either new jobs or avoided redundancies). The programme is estimated to support 25,000 jobs for every €1 billion invested
The case for including energy efficiency investment in the fiscal stimulus package			Canada			28	Canadian government estimates suggested that a national-scale energy efficiency retrofit programme could generate 20 jobs for every $1 million invested
The case for including energy efficiency investment in the fiscal stimulus package	A report for Greenpeace by Impetus Consulting Ltd	2009	EU	11	25	36	Across the EU, case studies indicate that an additional €1 million of investment creates between eight and 14 person-years of direct employment, with indirect employment effects contributing a further nine to 40 person years
The case for including energy efficiency investment in the fiscal stimulus package	Ecofys	2005	EU			39	a 2005 Ecofys study of new EU member states called for a programme to retrofit the existing building stock and suggested that investment of €4.7 billion per year could support 185,000 jobs
The case for including energy efficiency investment in the fiscal stimulus package	Energy Supplier Obligation	1994-98	UK			9.7	Each £1M invested in the Energy Efficiency Standards of Performance resulted in 11.4 person-years of direct employment and 87 person-years of indirect employment.
The case for including energy efficiency investment in the fiscal stimulus package	Building Regulations	1995	UK			25.3	Each £1M invested in response to the EE requirements in the 1995 Buildings Regulations resulted in 29.8 person-years of direct employment and 70 person-years of indirect employment.
The case for including energy efficiency investment in the fiscal stimulus package	National Audit Office	1998	UK			20.4	Each £1M invested in HEES thus resulted in 24 person-years of direct employment and 61 person-years of indirect employment. The additional indirect employment effect was so large because the energy efficiency investments carried out on behalf of low income households by the programme were highly cost-effective. Consequently the initial investment generated much larger savings in fuel bills over the 15 year period, so diverting household expenditure away from fuel bills and towards more labour-intensive goods and services.

Programme/Source	Ref/ Author	Year	Location	direct jobs	indirect jobs	Jobs/€M	Comments
The Economic Benefits of Investing in Clean Energy. How the economic stimulus program and new legislation can boost U.S. economic growth and employment	Pollin, R. Heintz, R., Garrett-Peltier, H.	2009	US			16.6	This study assesses employment effects of the clean-energy components of the American Recovery and Reinvestment Act (ARRA) programs and the entire American Clean Energy and Security Act (ACESA) – building retrofits only
The Size of the U.S. Energy Efficiency Market - all EE	Ehrhardt-Martinez and Laitner	2004	US			6.8	The study estimates that the total energy efficiency investments of $300 billion in 2004 would create 1.6 million jobs, giving a rate of 6.76 jobs/€M invested. The investments in residential buildings would be more effective for employment, creating 10.1 jobs/M€ invested.
The Size of the U.S. Energy Efficiency Market - residential buildings	Ehrhardt-Martinez and Laitner	2004	US			10.1	
U.S. National Action Plan for Energy Efficiency (NAPEE)			US			57.5	NAPEE estimates that if utilities were to invest roughly $7 billion a year in energy efficiency, this would leverage another $20–30 million in non-utility investment, yielding annual savings to consumers of some $22 billion by 2017. These investment levels would result in the creation of about 298,000 jobs annually, according to a mid-point estimate. http://www.worldwatch.org/node/5404
Warm Homes, Green Jobs	ACE	2010	UK (Scotland)			6.4	The study concludes that meeting the targets in the Climate Change (Scotland) Act 2009 would need the installation of over 1.5 million efficient boilers, 1.8 million solar panels, 2.2 million draft-proofing strips and 1.5 million loft insulation packages, as well as smaller numbers of wood fuel boilers and insulation for solid wall. The combined cost of the measures was estimated as £13.4bn in addition to current investment plans, which would deliver a gross value added (GVA) to the economy of £4bn and create or safeguard 10,200 jobs over the 10 years to 2020.
Zugravu eceee 2011	ACE	2000	EU			12.4	A study conducted in 2000 by the British Association for the Conservation of Energy (SAVE, 2000) in partnership with 9 national institutes and EU research centres, and financed by the European Commission, concluded that for each million Euros of (public and private) investments in EE programmes in the residential sector, the number of additional jobs created varies on average between 11.3 FTE (88,495 Euros/FTE job/year) and 13.5 FTE (74,074 Euros/FTE job/year).
AVERAGE (all schemes)				**10.4**	**25.0**	**19.3**	

Annex 2
Common Terms Used in Discussing Job Data

***Gross Jobs*:** The total number of jobs supported by an industry and its supply chain.

***Net Jobs*:** The number of jobs created by an industry and its supply chain compared to a "business as usual" reference scenario.

***Direct Jobs*:** Jobs generated from a change in spending patterns resulting from an expenditure or effort (e.g. construction jobs for a retrofit project.

***Indirect Jobs*:** Jobs generated in the supply chain and supporting industries of an industry that is directly impacted by an expenditure or effort.

***Induced Jobs*:** Jobs generated by the re-spending of received income resulting from direct or indirect job creation in the affected region.

Source: ACEEE Factsheet, www.aceee.org

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Brief description of each participant organisation:

CECED represents the household appliance manufacturing industry in Europe. Its member companies employ over 200,000 people, are mainly based in Europe, and have a turnover of about EUR 40 billion. If upstream and downstream business is taken together, the sector employs over 500,000 people. Direct Members are Arçelik**,** Ariston Thermo Group, BSH Bosch und Siemens Hausgeräte GmbH, Candy Group, Daikin, De'Longhi, Electrolux AB, Fagor Group, Gorenje, LG Electronics, Liebherr, Indesit Company,, Miele, Philips, Samsung, SEB and Whirlpool Europe. CECED's member associations cover the following countries: Austria, Belgium, the Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

COGEN Europe is Europe's umbrella organisation representing the interests of the cogeneration industry, users of the technology and promoting its benefits in the EU and the wider Europe. The association is backed by the key players in the industry including gas and electricity companies, ESCOs, equipment suppliers, consultancies, national promotion organisations, financial and other service companies.

EFIEES represents Energy Efficiency Service Companies. These companies ensure an overall management of energy demand to end-users. They provide operational maintenance and management of equipments of their industrial, tertiary and residential customers (collective or individual), public or private: this covers, in particular, sportive installations schools and hospitals. They commit, by long-term contract, on a technical, financial, economic and environmental performance. Their remuneration is based on the performance commitment, defined on compliance with operating quality standards and/or delivery on supply of improvements in energy efficiency. EFIEES' members represent 25 million tons of CO_2 in 13 EU Member States, emitted by district heating networks and by "outsourced" combustion industrial installations they run. They employ 130.000 people across EU with a turn-over of 30 billion of Euros.

The European Copper Institute is a joint venture between the world's mining companies (represented by the International Copper Association, Ltd) and the European copper industry. Its mission is to promote copper's value to modern society, including its essentiality for health, technology and the quality of life. As one example, higher copper usage will be required to meet the recently approved EU Mandatory Energy Performance Standards for electric motors. Full implementation will deliver electricity savings of 135 TWh/year (more than the annual electricity consumption of Finland and Greece) and avoid 63 million tonnes of CO_2 emissions.

ELC Federation - Created in 1985, the European Lamp Companies Federation (ELC) is both the forum and the voice of the lamp industry in Europe. It represents the leading European lamp manufacturers, which collectively directly employ 50,000 people, and account for 95 percent of total European production, with an annual turnover in Europe of 5 billion euros. From the outset, ELC objectives have been to promote efficient lighting practice for a sustainable environment and the advancement of human comfort, health and safety. To this end, ELC monitors, advises and co-operates with legislative bodies in developing European Directives and Regulations relevant to the European lamp industry.

The European Alliance of Companies for Energy Efficiency in Buildings (EuroACE) represents Europe's leading companies involved with the manufacture, distribution and installation of energy savings goods and services for buildings. With a total turnover of 140 billion euros and employing 328,000 people, the EuroACE mission is to help Europe move towards a more sustainable pattern of energy use in buildings.

Eurima is the European Insulation Manufacturers Association and represents the interests of all major mineral wool insulation producers throughout Europe. Eurima members employ directly over 20,000 people across Europe, with the installation of insulation products accounting for an estimated additional 300,000 man-years annually.

European Alliance to Save Energy (EU-ASE) The European Alliance to Save Energy (EU-ASE) was established at the United Nations Climate Change Conference (COP16) in December 2010. Our members are some of Europe's leading multinational companies, a prominent cross-party group of European politicians and energy efficiency campaigners from across Europe. We have come together as a united force to tell the story of energy efficiency. Our message is simple: create an energy efficient Europe now!

Glass for Europe is the trade association for Europe's manufacturers of building, automotive and solar-energy glass, all derived from flat glass. Glass products not only provide light, comfort, style, security and safety, they are also essential to energy-efficient buildings, houses and transport. Windows containing high-performance glass such as low-e insulating glass, which helps keep warmth in, and solar-control glass, which reflects unwanted heat away, help reduce energy consumption, while high-transmission glass used in solar panels helps to provide a renewable source of energy. Glass for Europe has four members accounting for nearly 90% of the EU's flat glass production: AGC Glass Europe, NSG Group, Saint-Gobain Glass and Sisecam-Trakya Cam and works in association with Guardian.

PU-Europe is the European association representing the polyurethane (PU) insulation industry. Its products help to save energy in a wide variety of applications in buildings, district heating, cooling and refrigeration. Its membership comprises both SMEs and large multinational companies. PU insulation products help to save energy in a wide variety of applications in buildings, district heating, cooling and refrigeration, and industrial systems. PU Europe members have a total turnover of Euro 4 billion and provide 17,000 direct jobs.

References/Bibliography

Skip Laitner et al, *The American Power Act and Enhanced Energy Efficiency Provisions: Impacts on the U.S. Economy*, ACEEE Report E103, June 2010

Olga Strietska-Ilina, Christine Hofmann, Mercedes Durán Haro, Shinyoung Jeon, *Skills for Green Jobs, A Global View*, International Labour Organisation, Geneva, 2011

OECD, *Towards Green Growth*, OECD, Paris, 2011

ACEEE Factsheet, *How Does Energy Efficiency Create Jobs, Jobs Analysis 101*, ACEEE, Washington

Center for Climate Change and Sustainable Energy Policy, *Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary*, Central European University, Budapest, June 2010

Jim Sheer and Dr. Brian Motherway*, Economic Analysis of Residential and Small-Business Energy Efficiency Improvements*, Sustainable Energy Authority Ireland, Dublin, September 2011 (update)

Dr. Natalia Zugravu, *Green jobs – a co-benefit of EU climate policies: myths and realities*, paper for eceee summer study, 2011.

Lynn Price and Hongyou Lu, *Industrial energy auditing and assessments: A survey of programs around the world,* paper for eceee summer study, 2011.

Sergio Tirado Herrero et al, *Co-benefits quantified: employment, energy security and fuel poverty implications of the large-scale, deep retrofitting of the Hungarian building stock*, paper for the 2011 eceee summer study.

BPIE*, Europe's Buildings Under the Microscope, A country-by-country review of the energy performance of buildings*, Buildings Performance Institute Europe, Brussels, 2011.

Dr Joanne Wade, Victoria Wiltshire, and Ivan Scrase, National and Local Employment Impacts of Energy Efficiency Investment Programmes, Final report to the Commission, SAVE contract XVII/4.1031/D/97-032, April 2000

Dr. Joanne Wade, Warm Homes, Green Jobs – The economic impacts of the Climate Change (Scotland) Act in the residential Sector, Association for the Conservation of Energy, October 2009

Impetus Consulting, *The case for including energy efficiency investment in the fiscal stimulus package*, Greenpeace, March 2009

Worldwatch Institute, Policymakers Recognize Value of "Green" Job Creation, November 4, 2011, http://www.worldwatch.org/node/5404

Angelica Marino, Paolo Bertoldi and Silvia Rezessy, Institute for Energy*, Energy Service Companies Market in Europe - Status Report 2010*, Joint Research Centre, EUR 24516 EN - 2010