



European
Commission

Scientific support to EU
growth and jobs:
efficient **buildings,**
vehicles and equipment

Brussels, 26 March 2013

Conference report

European Commission
Joint Research Centre

www.jrc.ec.europa.eu

<http://www.jrc.ec.europa.eu/>

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ISBN 978-92-79-30792-8 (print), ISBN 978-92-79-30791-1 (pdf)
ISSN 1018-5593 (print), ISSN 1831-9424 (pdf)
doi: 10.2788/12591 (online)

Luxembourg: Publications Office of the European Union, 2013.
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Printed in Belgium

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Joint Research Centre (JRC) Conference: 'Scientific support to EU growth and jobs: efficient buildings, vehicles and equipment'

Introduction

Efficiency is one of the most promising areas for re-launching Europe's economy in a time of financial crisis. It offers the chance for enormous savings in energy and other avoided costs. Led by innovation and science, it will create jobs, economic growth and competitiveness for European industry and business – both within the single market and, crucially, across the global marketplace.

All these themes came together during the JRC's 26 March 2013 conference, 'Scientific Support to EU growth and jobs: efficient buildings, vehicles and equipment.'

Yet why this particular triad of efficiency targets, one might ask? The answer: because the potential energy saving for each is so large.

For example, Europe's existing stock of buildings represents 40 % of the EU final energy consumption, and thus is the single biggest potential sector for energy savings. The automotive sector – which comprises 270 million vehicles – also represents immense opportunities, not only for its potential efficiency but because it is of strategic importance to the European economy: 12 million jobs, 4 % of GDP and a EUR 90 billion trade surplus. It is also the biggest private investor in research and innovation, and thus a prime driver of efficiency in the production of vehicles and their consumption of energy.

As for Europe's lighting and equipment sectors, some simple numbers illustrate the vast savings that higher levels of energy efficiency will offer to Europe's consumers. Lighting accounts for around 15 % of the average home's electricity use. The current electricity cost of 1 billion conventional light bulbs in homes equals EUR 15 billion per year. If these were replaced by LED lamps, that cost would plummet to EUR 3 billion – a staggering EUR 12 billion per year in savings simply by changing the kind of bulb used.

Despite the impressive gains made in many areas in recent years, however, targeted investments and public initiatives are needed to further mobilise consumers, industry and governments to take advantage of efficiently manufactured materials and processes and to use them widely across society.

This means that efficiency objectives must aim for coordination across the scientific community to help generate the innovation, focused policy support regarding regulations, technical standards and certification and, finally, a close partnership between Europe's public and private sectors.

As Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, told the conference in her keynote speech: 'This event takes place at a crucial time. We are at a point where it is important for our society to recover from the economic crisis. Europe faces enormous challenges and the need to re-launch its economy, return to growth and job creation and enhance European competitiveness globally while respecting the environment.'

Emphasising that European efficient buildings, vehicles and equipment are three key sectors with vast potential to trigger investment and innovation, she said 'they will lead to boosting Europe's competitiveness and contributing to economic growth and job creation. These are all aspects which are critical to our recovery from the current crisis.'



Opening session

Opening session

The conference's opening session included speakers from the worlds of research, politics and economic studies – the triangle that circumscribes the energy efficiency challenges facing Europe today. The discussion got off the ground with introductory remarks by **Dominique Ristori**, Director General of the JRC, who told the audience that returning Europe to economic growth and job creation is critical.



*Dominique Ristori,
JRC Director General*

‘We need to ensure financial stability and confidence while at the same promoting targeted investment with structural reforms. Efficiency for buildings, vehicles and equipment is probably the most promising area for re-launching economic growth, long-term stability and quality of life for all our consumers.’

The potential is very high, he said, pointing to the building sector which, as the largest end-user of final energy consumption, demands a holistic approach to inducing energy efficiency. ‘The same is true for vehicles: we need to pay attention to improving engines, materials, design and fuel consumption, among other considerations, while not forgetting that 270 million Europeans use combustion engines in their vehicles. The same approach applies to building equipment: we need to shift to sustainable equipment for the internal market.’

Noting that science and innovation research ‘are absolutely fundamental for our competitiveness and sustainability,’ Ristori called for a wide mobilisation of public and private resources to achieve maximum levels of energy efficiency in Europe.

Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, then gave the keynote speech to the conference by stressing its crucial timing.



*Máire
Geoghegan-Quinn,
European Commissioner
for Research, Innovation
and Science*

‘We are at a point where it is important for our society to recover from the economic crisis. Europe faces enormous challenges and the need to re-launch our economy, return to job creation and enhance European competitiveness globally while respecting the environment,’ she told the audience. ‘And efficient buildings, vehicles and equipment in Europe are three key sectors that represent huge potential to trigger investment and innovation, leading economic growth and jobs.’

This must include a strategic and integrated approach to science to maximise European, national and regional research and innovation potential. Europe must strengthen the links between public and private research with an approach based on mobilising business industries, policy makers and consumers.

For example, the Commissioner pointed to the European Economic Recovery Plan which enabled public-private partnerships (PPPs) to fund research and innovation in three key industrial sectors: manufacturing, construction and automotive. Their goal is to boost competitiveness and support employment, while at the same time significantly contribute towards a more green and sustainable economy.

As for Horizon 2020, Geoghegan-Quinn noted that industrial leadership is one of its three priorities, particularly for investment in advanced manufacturing across existing and emerging sectors. 'Horizon 2020 will invest nearly EUR 6 billion in developing European industrial capabilities in key enabling technologies, which include advanced materials, manufacturing and processing.'

This directly concerns Europe's building sector and related service industries. 'These are at the core of Europe's economy as they represent 10 % of EU GDP, 22 % of industrial employment and 50 % of all materials extracted from the earth,' she said.

To capture growth and employment opportunities in the skilled trades and construction sectors, the production of construction products and professional activities such as architecture, consultancy and engineering, Geoghegan-Quinn supports a strategy for mobilising investment in the renovation of residential and commercial buildings with a view to improving the energy performance of the building stock: 'This is a unique opportunity for sustainable business growth, provided that products and related services for both new and refurbished buildings are affordable and of durable quality.'

Turning to efficiency in vehicles, she noted that transport has become more energy-efficient and electric vehicles and bio-fuels will help meet Europe's twin challenges of reducing carbon emissions and improving energy security. However, the transport sector still depends on oil for 96 % of its energy needs, thus more innovation is vital.

As for Europe's lighting and electric equipment sectors, she said appliance and equipment efficiency 'has enormous potential to reduce energy demand and carbon emissions while lowering energy costs for consumers, businesses, and institutions. Lighting accounts for about 15 % of an average home's electricity use, so it pays to make efficient choices.'

In conclusion, the Commission reminded her audience that efficient buildings, vehicles and electrical equipment are key drivers for European growth. 'They can significantly boost employment and productivity in our industrial sectors, but to achieve this and maintain our competitive advantage, we must continue to invest in research, science and technology. We need to invest smartly – cooperating across borders and across disciplines. Horizon 2020 will help us do just that.'

In his introductory remarks, **Hannes Swoboda**, President of the European Parliament's Group of the Progressive Alliance of Socialist and Democrats, said 'it is a good sign that so many people are here this morning. When I came from Berlin I grabbed all the newspapers at the airport: the subject was, of course, Cyprus and financial markets and the crisis—as if this were our only our future: financial crisis and broken promises. There is no vision in that or in what Europe should be about. So how do we come out of this crisis where savings, lower wages and investments are being cut?'



Hannes Swoboda,
*President of the Group
of the Progressive
Alliance of Socialist
and Democrats in the
European Parliament*

Swoboda said that if savings could be generated in our economy, this would free up funds for investment in science and innovation. If energy prices are too high, then efficiency must be increased while reducing demand for energy as the in-put for producing goods. 'This includes households, buildings and cars. In many European cities there are rising rents and prices for housing due to scarcity of housing in many areas. We could compensate for some of that via lower energy consumption,' he said.

As for cars, Swoboda said industry has to be modern and efficient – but with a balanced approach. 'For example, industry leaders complain that too many of our measures as policymakers are directed

toward industry itself. And they are in a way correct: it is unfair if we don't target consumption as well. We need a more balanced approach. Thus, I am happy that this event is aiming for that — promoting European energy via other areas as well,' he observed.

Nonetheless the MEP said policymakers have an obligation to set benchmarks and standards for the economy, adding that there was a huge and contentious discussion about REACH, the EU's regulation on regulating the safety of chemicals. 'Industry said the chemicals sector would disappear from Europe as a result. It did not. It is doing quite well,' he said. 'What is important about REACH is that US and other regions have taken our leading initiative into account. Thus, it is important that we do this first in Europe in other sectors as well.'

Swoboda gave particular emphasis to placing standardisation within the transatlantic context: 'You cannot have a free trade area agreement without standardisation. If we can get this agreement, then Europe and the US could set standards in many areas such as energy efficiency, safety and the environment for the vehicle sector and many other industries. This does not mean dominating the international market but providing a common vision from its two biggest economic regions.'

Energy efficiency is also about quality of life. 'I am totally convinced – you see it already in China where the air is so bad – that very soon we will have to have even more environmental regulations. If Europe and the US can show examples of how to create jobs while promoting reductions in energy consumption at the same time, and thus CO₂ emissions, this would be a great model for all others. And research is the basic element behind all of this,' he told the conference.

Swoboda ended his remarks by calling for a new and positive vision for Europe's citizens. 'This has to be anchored to another kind of society where energy efficiency is prominent and better housing and transportation are a reality. Let's give this to our citizens,' he said.

The session's next speaker, **William Kennard**, US ambassador to the EU, said the conference's subject was one of high focus in his country, where the US government aims to cut in half the energy used in homes and business within the next 20 years.



*William Kennard,
US ambassador
to the EU*

'We have already made a fair amount of progress in the last five years, in fact,' said Kennard.

The US Department of Energy expects energy use per capita in the country will fall by 15 % through 2040. This is being achieved via two main initiatives: new fuel efficiency standards for cars, which has led to a dramatic drop in foreign oil imports, and via new fracking technologies for natural gas. The latter 'has been a true game-changer in my country,' said Kennard. 'Natural gas prices are now a third the price of that in Japan and half of that in Europe. This is prime example of how science and technology can create new efficiency in the way our economy works.'

What can Europe and the US do together? He said 'we have an incredible amount of momentum in our relationship with Europe. President [Barack] Obama wants a trade agreement with the EU which, if successful, will create the largest free trade area in the world. It is an opportunity to deepen our relationship in many areas: regulations, standards, energy efficiency and many others.'

Referring to his previous years in the private sector, Kennard said the private sector is the most important way to create jobs by attracting people who create jobs. 'Look at the internet: from 1995-to-2005 Silicon Valley attracted skilled immigrants from all over the world, including Europe, which led to fully 50 % of the high-tech businesses being created by immigrants. Intel, Google and E-bay: all were co-founded by Europeans,' he said, adding that innovation will quickly move toward the best environment for commercialising the technology that science produces. 'Thus, it is critical that Europe retains business companies based on its innovation.'

According to Kennard, entrepreneurs want three things: money to build businesses – thus capital formation; the flexibility to hire people ‘which means a labour market that allows hiring and firing’; and finally, most important, a platform for their ideas to scale up. ‘That is why we attracted so many people to Silicon Valley,’ he said.

Noting that the size of their respective ICT markets are roughly the same in the EU and US – about \$1 trillion each – Kennard said Europe is underperforming vis-a-vis the larger size of its consumer market. ‘And that is because there are more regulations here to deal with. If you don’t get that ‘platform’ right, your entrepreneurs, your brightest people, will leave Europe,’ he warned.

In Kennard’s view, Europe can do the same, all the more so because it offers such a big market of 500 million consumers. ‘While there are many domestic issues that each side of the Atlantic has to deal with, there is also a universe where many things intersect,’ he said. ‘The equation is shifting; there will be more benefits from cooperation than just competing, though the two sides of the Atlantic will always compete. If we had a platform of 800 million consumers with common standards, we would create tremendous economic growth! I really hope we get there with the new trade agreement.’



Fatih Birol,
*Chief economist at the
International Energy
Agency*

The final panelist of the opening session – **Fatih Birol**, chief economist at the International Energy Agency – gave his audience a hard-hitting economic assessment of the challenges facing energy efficiency in Europe and the implications for competitiveness. ‘Why is energy efficiency not merely an option but an obligation in order to survive? Well, the global energy map is shifting –

and rapidly – with implications for all players in the world,’ he said.

Birol identified three drivers behind this shifting political and economic landscape:

- a resurgence in oil and gas production in certain countries and particularly the US, Canada and Australia;
- a retreat from nuclear energy in other countries such as Germany, Switzerland and Japan, Japan: they are scaling back their nuclear ambitions;
- increasing policy focus on energy efficiency.

‘This last driver does not get a lot of attention but it has big implications for demand side,’ he said, noting that in the last 18 months there have been new laws that put energy efficiency high on the agenda in the USA, Japan and China. ‘China has a new five-year plan to do this and, unlike other countries, when China defines such a plan it generally reaches its targets.’

But he said there is another – darker – implication for Europe as well. ‘Oil prices are at an all-time high and they are acting as a brake on the EU’s economic recovery. Until about four years ago gas prices were similar in the EU and US,’ he said. ‘But due to shale fracking, US gas prices are five times cheaper than in Europe and eight times cheaper than in Japan. This is a serious situation: I know no other commodity market where such price divergence exists.’

Paradoxically, Birol said CO₂ emissions are increasing, along with extreme weather events, ‘but interest in climate change is decreasing! Where did the second largest coal consumption take place last year after China? Here in Europe. Why?—because of the rising price of gas.’

Birol pointed to the main reason behind Europe’s ‘dirty’ consumption of coal. ‘The United States’ cheap domestic gas is now the dominant fuel for its electricity generation. And where have sales of its steam coal production gone? To Europe,’ he observed.

The IEA economist argued that Europe risks losing the competitiveness of its petrochemical, cement, aluminum and other energy-intensive industries if this trend continues. ‘We have to be very frank:

industries in certain European countries are already moving to the US. This has happened in Austria and it is happening in Germany where one of the country's largest petro-chemical concerns is moving across the Atlantic. They cannot compete against China or the US from their base in Europe,' he warned.

However, he also said Europe has a window of opportunity to change things.

'First, two-thirds of our long-term gas contracts are going to expire in next 10 years. If we can renegotiate them or look for alternatives to get cheaper gas, this would narrow the gap between Europe and the US and others. Second, if Europe can reach its efficiency target of 2020, then its gas imports will fall, particularly for buildings and the transport sector,' he said.

In sum, Birol's final suggestion was the following: there will still be a cost-gap between the US and the EU and it would behoove the latter to use its long term industrial policy to support innovation and new technologies. 'If the US is destined to export gas, then Europe should export energy-efficient products, technologies and processes. The energy sector is passing through a very dynamic period right now and policymakers face critical choices in reconciling energy consumption, environmental objectives and economic growth,' he concluded.



**Scientific support to
efficient buildings**

Session 1

Scientific Support to Efficient Buildings

Focused on scientific support for efficient buildings in Europe, the morning's first working session was moderated by **Carlo Pettinelli**, director of sustainable growth and EU 2020 at Directorate-General for Enterprise and Industry (DG ENTR).



Carlo Pettinelli,
Director of sustainable
growth and EU 2020,
DG ENTR

'One of the greatest challenges facing the EU is how to design its cities. Their building stocks have to be renewed and we need a proper framework for private investment. This is crucial to achieve our efficiency targets by 2020,' Pettinelli said in his opening remarks.

Noting that renovation of existing buildings is the key issue since half of them will still be there in 2050, he said 'we need to accelerate the speed at which buildings are renovated and to raise the level of savings when doing this. If we combine this with smart power generation at the district and urban levels we have an opportunity for the economic transition to a low-carbon economy.'

The construction industry is well aware of this, he added. 'It knows it faces lower CO₂ emission requirements but we need incentives for it and for skills-formation to respond to these challenges. At the same time policymakers must understand the

impact of measures along the whole value-chain, from the use of natural resources to end-of-life construction works,' he said.

Claude Turmes, Vice-Chair of the European Parliament's Greens/EFA Group, was the first of the session's seven panelists to address the subject and he focused nearly the entirety of his remarks on the economic advantages to be derived from energy efficiency.



Claude Turmes,
Vice-Chair of the
Greens/EFA Group
of the European
Parliament

'Energy efficiency and savings offer the biggest way for Europe to get out of this crisis,' he said. 'Yet when do finance ministers ever discuss our trade balance deficit in energy? This is some EUR 400 billion a year – or 4 % of our GDP. It was only 1 % in 2000! How can our economy hope to be in good shape if it loses EUR 400 billion each year. We have no choice to work on efficiency.'

Noting that Europe's geography and geology means that Europe will have to modernise its power lines and power plants, he said 'those who call for freezing electricity prices in Europe have to ask themselves: who will invest in new power plants if you do that? Nobody will invest to make the grid more intelligent. There is only one solution

to improving our competitiveness and investment levels – and that is energy efficiency. We call on the JRC to help do this.’

Turmes also warned about industries’ rush to the exit door from Europe. ‘Why are our steel companies leaving Europe? Part of the reason is the energy price differential, but the biggest reason is lagging demand for steel: it is one-third lower today in Europe than in 2007. Our car production has peaked in Europe and those who think we will retain jobs by selling more are wrong: the market is saturated because citizens have good reasons for no longer owning a second or third car.’

He said Europe should look elsewhere if it wants to stimulate new demand for steel. ‘One wind turbine has the steel content of 500 cars. The roll-out of renewables will be the single biggest source of demand for steel in Europe,’ he said. ‘Also, renovating our existing building stock from 1 % today to 3 % tomorrow to meet our climate target in 2020 will help boost demand too. If we do this with clear policy guidelines, we will create new demand for chemical, wood, steel, cement – and a huge amount of local jobs.’

Turmes concluded by outlining four challenges where the JRC and the science community need to work with business:

- new materials such as super isolation products;
- new ways to manage the entire renovation process where the coordination of renovation of buildings needs to move to universities as a field of focus for knowledge and training;
- financial tools for renovation where new models are needed, such as the Danish saving obligation or the French white certificates [which attest to reductions in energy consumption];
- consolidation of housing at the urban level, which calls for interconnectivity at all levels and bringing mobility into the efficiency picture.

‘As long as finance and prime ministers don’t understand that the message is ‘Efficiency, stupid!’ then we simply won’t get there. We need new thinking on macro-economic policies,’ said Turmes.

The next speaker was **Fabrice Bonnifet**, director for sustainable development at French construction company Bouygues, who drew his listeners’ attention to the stark fact that France’s stock of buildings is the biggest final energy consumer at 46 % of the total yet only 0.1 % is renewed each year.



Fabrice Bonnifet,
Director for sustainable
development at
Bouygues

Noting that some 126 million tonnes CO₂ are emitted from the sector every year – or about 25 % of the total – he argued that ‘if we do not renew this stock, we will not meet any of the EU’s 2020 efficiency objectives. Currently, France carries out approximately 135,000 thermal renovations operations per year but 400,000 are needed if we’re going to have any chance of making that goal.’

He said many obstacles stand in the way of this such as tight public financing a time of crisis, no standard engineering techniques to carry out renovation on a large scale across urban areas, amateurish renovation techniques based on low levels of productivity or ill defined regulatory frameworks regarding energy efficiency.

Bonnifet offered a number of proposals where policymaking and scientific work need to be done. The first, he said, is to create an obligation to carry out energy efficiency tasks. ‘The incentives are not there in France,’ observed Bonnifet. ‘We need regulatory obligations such as those that were imposed on Europe’s car industry a few years ago.’

Second, he said that thermal regulations applicable to existing buildings should be updated. ‘What about an energy ‘passport’ for each building so that all the stock is gradually renovated by 2050?’ he said.

Third, public financing should be reallocated toward the best efficiency measures and materials. 'This is what we have in France, but it needs to be better targeted. Why not third-party financing to finance renovation and to get reimbursement from the savings in energy efficiency?' he said.

Bonnifet's fourth idea would be to structure the offering and the organisation of the industry. 'Europe will have to structure the supply. We can build new passive buildings in a week and Europe leads here. But when it comes to renovation of older stock, it's not the same game. We need to review the use of labels and certificates and to strengthen post-construction checks,' he told his audience. 'Too many companies are not scrupulous enough about actually guaranteeing the energy efficiency they are contractually obliged to supply. And there is need to define technical solutions of reference concerning the introduction of renovation solutions – without having to carry out expensive preliminary studies to achieve this.'

That links to his fifth recommendation of creating the statistical measurements and analytical tools for housing surveys, costs of operations, financing and other metrics needed for developing holistic efficiency solutions.

His sixth and final recommendation targets public awareness. 'We need to deploy solutions to assist households. Here we will need the EU's help because there is a chronic deficit of consumer information about energy efficiency across Europe,' he said, adding that social media could help spread the message. 'There is a huge amount of work that needs to be done in this area in terms of communications.'

Johannes Milde, CEO of Siemens Building Technologies, was the next speaker who focused his remarks on how to boost the efficient insulation and construction of commercial buildings. 'It is not easy to persuade consumer to do this for their own houses even though their energy consumption is huge. However, most were built before 1980 and I wouldn't put a penny into any building that is older than 50 years,' he said.

Noting that his company focuses on renovation of commercial buildings whose age falls in the 20-to-30 year category, he said renovation offers a buildings owners many advantages over above energy savings. 'For landlords, renovated buildings trans-

late into 6 % higher rental rates, 8 % higher occupancy rates and 16 % higher selling prices. Indeed, the average price of an energy efficient building is 10 % higher and if you do the right thing, it can be virtually self-financing.'



*Johannes Milde,
CEO of Siemens
Building Technologies*

To make a commercial building function efficiently, Milde said all the industries within a given sub-sector such as the market for a building's 'envelope' – which can be based on mineral foam, vacuum insulated panels, heat protection glass or other materials – 'have to work together' instead of fighting each other. 'Most of the technologies are already there but they need to be coordinated and organised in a much better way among the suppliers,' he said.

For example, one of the big problems in a country such as Germany, which invests heavily in solar energy, is what to do with the excess energy collected? 'At certain hours of the day we have too much energy which points to the issue of energy storage. Industry could deal with this with water or concrete thermal storage, but that means you've got to jump over the disciplines and get your cement and electricity industries to work together. That's not the case today: they don't talk to one another,' observed Milde.

As for new financial models to support energy efficiency in the construction sector, he urged European governments to reform their procurement and tendering rules. 'Siemens does not invest in industries that live off subsidies and that includes the solar industry because it is falling apart in Europe since there are not enough subsidies to sustain it,' he declared.

‘Yet look at the US where the industry is a four-to-five billion dollar a year business. Why? Because private energy efficiency investors can invest in public building based on win-win solutions,’ he said, pointing to the sharp contrast with rigid European-style tenders. ‘The US approach can be done without subsidies because they allow the investor and the customer to recoup savings over a very short period. But in Europe contracts don’t allow for this. We all need to re-think this model.’

Luis Delgado, Head of Unit for Sustainable Production and Consumption at the JRC, focused his remarks during the panel debate on the potential for environmental improvements to residential buildings in Europe.



*Luis Delgado,
Head of Unit for
Sustainable Production
and Consumption
at the JRC*

‘Currently there is no European legislation that addresses the retrofitting of individual building elements such as windows, walls or roofs outside the natural renovation cycle,’ said Delgado. ‘Such measures could go a long way toward realising the available cost-effective energy savings of buildings. A great share of the improvement potential remains untapped so far.’

To tackle this challenge, Delgado’s unit set itself the task of first conducting a study to identify different types of residential buildings according to age, size, design, materials, total constructed area in various geographical zones, with a focus on three different building groups – single two-family houses, multi-family houses and high-rise residential buildings. The study yielded 72 buildings types, split into 53 kinds of existing Buildings and 19 kinds of new buildings – all of which representing 80 % of the EU’s current building stock.

Noting that high-rise buildings are the most energy efficient and single-family structures the least, he said ‘roofs and walls are where the most improvements are needed. You could generate energy and greenhouse gas savings of 25-to-40 % via reduced ventilation and the refurbishment of roofs and walls.’

According to Delgado, the cost of additional investments by the consumer would be compensated by energy savings after 10 to 15 years, depending on the country. ‘Thus, this scenario leads to negative net costs for consumers and, we think, the total savings in avoided CO₂ emissions in Europe could be the equivalent to 7 % of the EU’s total. Thus, there is great potential for improvements.’

However, he also noted that implementation of such development is blocked by a number of barriers such as building ownership, split incentives, lack of consumer information, problems of financing or high levels of initial investment.

For Delgado, the central challenge facing policy-makers and the scientific community is to define measures that ensure building components are installed at the most optimal cost for insulation when structures are renovated, and with reference to eco-labels, eco-design subsidies, energy taxation and third-party financing. ‘Socio-economic impacts indicate that such measures are feasible with small effects that are positive for a majority of the indicators such as employment, value added and net welfare for society as a whole,’ he said.



*Heinz Ossenbrink,
Head of Unit
for Renewable Energy
at the JRC*

The panel’s next speaker, **Heinz Ossenbrink**, Head of Unit for Renewable Energy at the JRC, focused his presentation on the JRC’s new ‘Knowledge Centre for Energy Efficiency’ (KCEE).

‘Why did we create the centre? Well, one of the big problems today for consumers is that if you ask five separate energy-audit companies to evaluate a building or home, you get five different answers because the norms and standards are not there. It would be far better to have your energy-auditor integrated into the overall team responsible for construction and energy efficiency – and not working for individual consumers. In other words, the sector needs a one-stop service regarding energy efficiency in buildings,’ Ossenbrink told the conference. ‘These are the kind of issues the centre is studying, with the idea of tailoring products to policy, industry or other research centres.’

The overall goal must be to get the same services in the future with less primary energy used. That means reducing losses in consumption via better isolation, increasing efficiency during conversion, generating energy on or near site via renewables, heat pumps or other techniques, he said, noting that the scientific lines of support should concentrate on:

- energy performance: calculation of optimal costs, labeling parameters and data calculation for the Member States;
- energy service companies: progress reviews, new building technologies and market overviews;
- net zero energy buildings: renewables, green building programme and sustainable products.

For example, regarding energy performance Ossenbrink said new kinds of energy labeling are needed that make costs visible on a yearly basis and which address up-front investment problems.

His major message, however, concerned the implications of energy efficiency in buildings for Europe’s innovation and job-creation potential. ‘We calculate the market to be millions of jobs and billions of euros that could be injected into the economy if we could increase the retrofit rate for buildings from 1.5 % [of the EU’s total stock] to 3 % per year and using new technologies for insulation, heat pumps, solar panels as building material and ICT for intelligent and adaptive control systems,’ according to Ossenbrink.

‘The technologies and techniques are already there because we have much knowledge at our disposal from simulation of energy consumption in buildings.

However, all this knowledge has not been integrated on a chip. And that’s a future market! There is a big opportunity for young people wanting to get into this field if they focus on design, modeling and construction techniques geared to energy efficiency in buildings,’ he concluded.

Renovation of Europe’s building stock to boost energy efficiency must go hand-in-hand with the technical standards to guide the work, argued the next speaker, **Artur Pinto-Vieira**, Head of Unit at the JRC’s European Laboratory for Structural Assessment.



*Artur Pinto-Vieira,
Head of Unit at the
JRC's European
Laboratory for
Structural Assessment.*

‘Despite all the economic problems we face today, I have a positive message: one way we can bring success to our region is if we ensure that energy efficiency projects spread all across the EU. Over 80 % our buildings in Europe need to be retrofitted,’ he said. ‘But if we want to create the jobs and growth that go along with that, we must look toward standardisation.’

How to address the problem? ‘This has to be done through legislation, standards for the assessment and retrofit of buildings and by using catalysts – instruments and policies to promote behavioural change by consumers and business – such as access to finance, fiscal incentives, information and concrete examples,’ he said.

A good example is the EU’s ‘Eurocodes’, the set of 10 harmonised European standards for the design of buildings, civil engineering structures and all major construction materials which are currently in use by 31 countries. Pinto-Vieira reminded his audience that ‘these standards represent big changes not only for construction in Europe but as a bridge to

international cooperation, thus creating even more opportunities for European industry.' The JRC is working closely with DG ENTR on the codes' implementation 'not as the sector's 'policeman' but to see where the problems of implementation might be', he added.

Noting that the Eurocodes go beyond energy efficiency to embrace safety and health guidelines as well, Pinto-Vieira said 'we could go further with the codes to cover resource efficiency and emissions of dangerous substances. Combined with the other three this would create a complete set of standards for buildings and their construction.'

Pinto-Vieira argued that Europe's building sector needs clear and stable guidelines along two lines. First, there must be coordination and governance from the EU and its 27 Member states regarding legislation and standardisation – and their implementation. Second, these must lead to technical guidance, training and education programmes, exemplary projects and, ultimately, innovative products and solutions through research and development.

'I hope that in the near future we can translate this dream into reality,' he said.

The floor was then given to **Constantin Ciupagea**, the JRC's Head of Unit for Sustainability Assessment, who said the argument for sustainable buildings 'is exactly the message I want to deliver to you. It is the accent you find in our R&D contribution to this conference today, that is: what are the evaluation and measurements needed for sustainability in buildings?'



*Constantin Ciupagea,
Head of Unit for
Sustainability
Assessment at the JRC*

'Perhaps more than any other region, the EU takes the view that we must have responsible consumers, buildings and construction industries,' he observed, adding that such a policy stance has strategic implications for Europe's relations with the international community. 'Soon we will have to start evaluation from where we import our materials, and asking ourselves: do we induce real economic or environmental problems for the exporters of these materials?'

Noting that the overall goal is to measure the long-term effects of innovations in the sector such as making the consumption of materials and energy more efficient, Ciupagea said 'we have to have a global overview—and this is what my unit does. It is not sufficient to look at one type of or natural resource today. It is about looking at the life-cycle of the entire process, from the moment that natural resources enter the picture until the end-of-life of the product – the building itself – and all the industries involved in that.'

For Ciupagea, the main message is: use of a multi-criteria approach to evaluating sustainability will help the EU avoiding burden-shifting of its environmental responsibility in this sector.

CONCLUSION:

Wrapping up the session, Pettinelli observed that Europe has no choice but to pursue energy efficiency for reasons of the environment and economic competitiveness, but also because of the financial crisis and the need to stimulate growth.

'If we look at the totality of the construction sector in Europe, renovation is the domain where there is the most room for improvement and progress. But we have to renovate with major objectives in mind – not minor results,' he said. 'This must be based on an integrated approach and that means determining what industry can contribute, but also our universities and research institutes.'



Scientific support to efficient vehicles

Session 2

Scientific Support to Efficient Vehicles

Moderator **Malcolm Harbour**, chair of the European Parliament's Committee on Internal Market and Consumer Protection, opened the session, telling his audience that 'for many years I was involved in scientific assessment. I also worked in the automobile industry for many years prior to entering the EP so this conference session on efficient vehicles gives me the rare chance to combine my various areas of experience as its moderator.'



*Malcolm Harbour,
Chair of Committee
on Internal Market
and Consumer
Protection of the
European Parliament*

'This panel is a particularly rich one since we have the practitioners and the representatives of the value-change across the automobile industry, which makes for a great combination of speakers who are well positioned to explore our theme of mobility and connections and automobiles,' he said.

The panel's first speaker was **Reimund Neugebauer**, President of Germany's Fraunhofer Association.

Noting that his organisation is one of the leading applied research institutes in Europe with 80 % of its 66 institutes focused on transport sectors, Neugebauer stated up front in his opening remarks that Europe 'will generate no prosperity without growth, and no growth without innovation.'



*Reimund Neugebauer,
President of Germany's
Fraunhofer Association*

The goal of achieving a truly efficient vehicle in Europe requires 'closing the cycle' of a vehicle's production, operation and re-cycling activities with ambitious reduction targets for each component of the cycle: a 30 % reduction in materials, 50 % for a car's energy consumption and 80 % for its emissions of CO₂.

Most of the gains are to be made in a car's operation, according to Neugebauer who pointed to the CO₂ life-cycle composition of a Volkswagen Golf VI model, for example. 'Only 20 % of the Golf's CO₂ cost is in its production and only 8 % in its fuels, but 70 % lies in its operation,' he observed. 'Even fully electric cars with no [conventional] fuel consumption will leave a significant CO₂ footprint because, conversely, it's their manufacturing where the footprint will be bigger.'

He pointed to Fraunhofer's so-called 'e3 fab' concept for competitive factories where vehicle production facilities would be configured according to a triangle of efficiency, emission reductions and ergonomic engineering principles.

'We think energy efficient and low-emission factories configured this way could slash their current CO₂

levels by 50 %,' he said, adding that his organisation is working on this goal in collaboration with some 50 SMEs and other entities. 'We need a holistic approach if highly efficient combustion engines are to be realised. This also demands special attention given to the task of extending the range of batteries – and to recycling, which will become a mainstream source of rare materials for the automobile industry in the future.'

The 'e3 fab' approach will set new standards for factories via a 30 % drop in energy consumption via optimised production, and 20 % energy savings on total life-cycle management activities, he concluded.

The next speaker was **Jean-Marc Gales**, CEO of CLEPA, the European Association of Automotive Suppliers, whose organisation brings together 103 major corporations, 23,000 partner companies and 5 million employees across Europe.



*Jean-Marc Gales,
CEO of the European
Association of
Automotive Suppliers*

Gales said research plays a very large role in his sector: 'We invest EUR 18 billion a year in R&D and innovation: more than the US and Japan put together. Thus, we have a higher amount of patents than the other two as well.'

About 70 % of CLEPA members' R&D activities are focused on environmental and safety goals. For example, he said EUR 9 billion is spent on making automotive systems more environmentally friendly via reduced CO₂ emissions.

'This is not just a vision. In our project with the German automobile industry and suppliers, for example, we have achieved materials reduction of nearly 30 %. This calls for a system-wide approach

from suppliers and materials companies to the OEMs [original equipment manufacturers],' he said.

While arguing that his organisation is a strong supporter of environmental technologies, Gales also had strong views about future CO₂ legislation in Europe. The Commission's draft regulation of July 2012 calls for cutting average emissions for new cars from their mandatory target of 130 g/km in 2015 to 95 g by 2020, and doing the same for from 175 g to 147 g/km by the same date.

'We consider that these objectives are feasible and our members are spending a lot of money on this. But our position on these laws is that they must be technology-neutral and that eco-innovations should continue to be rewarded until 2020 and beyond. And we would welcome super-credits that support the market introduction of innovative low-emission vehicles without putting into question the environmental integrity of the CO₂ legislation.'

Gales gave special emphasis to the need for innovation regarding engine technologies since, in his view, the internal combustion engine will still be around for a long time to come.

'Electrification [of cars] will certainly come, but we predict they will only be around 9 % of the market by 2025. So that means there is still a lot to do with the classic internal combustion engine and our industry is working extremely hard to make it more efficient,' he said.

However, he said his sector faces two broad challenges: the integration of its value-chain and finding enough skilled workers. 'Europe produces some 140,000 engineering graduates each year but in China they are producing 1 million! This is an alarm bell,' he said. As for the value-chain, Gales said '70 % of the workforce in our sector is found in SMEs and we must integrate them into our development, manufacturing and financing structures.'

Gales' remarks sparked a lively exchange of views from his fellow panelists. In response to Harbour's observation that integration of the sector's supply chain for purposes of reducing CO₂ is a huge challenge since 80 % of the value of automobiles comes from sub-suppliers, Gales admitted that 'we have not integrated SMEs as we should have. This is particularly true for those who are further away from the process – your tier 2 or tier 3 suppliers. Also, being

further down the chain, they are fighting for survival because the price pressure is much higher. We need to integrate them better than we've done in the past.'

One member of the audience wanted to know what the specific barriers were to speeding up the electrification of cars. 'That is the question,' Gales acknowledged.

'First you must have the demand yet only 30,000 were sold in Europe last year. Second, their range is not ideal. We are investigating new energy accumulators and storage systems, for example. There is a lot of research here but no real solutions yet,' he said. 'Nor is the supporting infrastructure ideal for electrics care. Where has the real break-through been? It's been car-sharing in big cities where, unfortunately, people tend to do it because they know they'll get a guaranteed parking slot – and not because it is the green thing to do!'

Gales concluded his remarks with recommendations calling for:

- a restructuring of the sector to deal with global competition;
- smart regulation and stable framework conditions;
- further development of highly skilled workforce to safeguard European technology leadership;
- enhancing the integration of SMEs in the value chain.

Gales then handed over the floor to his fellow panelist, **Inés Anitua**, Director General of AIC, the high-tech Automotive Intelligence Center located near the outskirts of Bilbao which was founded in 2006 as a public-private initiative.

Anitua said the AIC functions as 'a unique value-generation center' for the automotive sector, she said, noting that its design and operations are based on a concept of open innovation where companies boost their competitiveness through cooperation. AIC uses a market-oriented approach to integrate knowledge, technology and industrial development under one roof, she said. The center houses six high-tech specialised laboratories – in metallography, metrology, biofuels, electronics, mechanical testing, manufacturing – for joint or individual projects.

Vehicle electrification and weight-reduction are two areas of focus, for example.



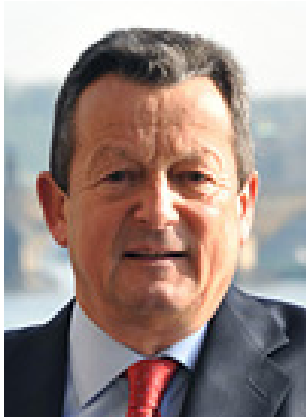
Inés Anitua,
Director General of the
Automotive Intelligence
Center

'Our member companies who are located there can do training or R&D in the same place, using the centre's own equipment. This is a project-oriented structure where 'competitive intelligence' is produced in the form of sector analysis, product design and system integration,' she said.

'Industry represents a strong component in our region's economic health: nearly 30 % of our GDP depends on it,' said Anitua. 'So we have to cater to their needs to foster innovation, growth and jobs. Our centre does that.' Reducing the time-to-market is one of our major goals, while increasing the levels of R&D and reducing the cost for each partner.'

'We still have a technology edge over the world in our sector, but we can only maintain this if we continue to invest heavily in research and innovation to produce growth and jobs,' said the next speaker, **Ivan Hodac**, Secretary General of the European Automobile Manufacturers' Association (ACEA), adding its member companies set aside approximately EUR 26 billion each year for investment in research and development.

ACEA's three main areas of research and innovation (R&I) are efficient propulsion technologies for vehicles, safety and mobility systems, and manufacturing competitiveness. For example, Hodac said his sector's propulsion R&I goals include low-carbon fuels, electrification, vehicle energy and thermal management and the internal combustion engine. Echoing Gales' viewpoint, Hodac said research on latter 'should not be pushed to the side because there is still room for improvement'.



Ivan Hodac,
*Secretary General
of the European
Automobile
Manufacturers'
Association*

Elsewhere, he said the main two policy challenges for competitiveness are to keep automotive products affordable for the consumer while retaining Europe's manufacturing capabilities. This means the R&I priorities should include materials for light-weight vehicles, high productivity of the workforce, energy efficient plants, digital manufacturing and virtual engineering processes.

Among the sources of scientific support for Europe's automobile sector Hodac pointed specifically to Horizon 2020, the EU's next general research programme for 2014-2020.

'A number of priorities and initiatives for Horizon 2020 are necessary for our industry,' he told his audience. 'First of all, the programme should have a suitable budget and we think EUR 80 billion would be the minimum needed for it to be fully effective. This includes its contribution for automobile R&I priorities of EUR 5 billion – or about 7 % of the total Horizon budget, which in fact corresponds to our sector's share of Europe's GDP.'

According to the ACEA official, the other changes needed to Horizon 2020 comprise:

- increased budget shares for key programmes such as transport, and enabling industrial technologies;
- fast-track schemes for time-critical projects;
- simplification of the funding rules and avoiding administrative burdens on Horizon 2020's recipients.

Asked if his industry's effort to decrease the weight of cars had any implications for safety, Hodac gave a nuanced reply.

'As long as policymaker goals are scientifically based we can go along with that and will support it. But when it is politically based, it doesn't work,' he observed. 'We can't always meet all the safety standards and produce the lightest vehicles at the same time. Indeed, the results can go in the other direction due to regulation. The earliest model Golf weighed 750 kg but the latest one now weighs in at 1200 kg due to safety requirements. That is among the reasons why fuel efficiency is so important today.'



Chris Beddoes,
*Secretary General of
EUROPIA*

Indeed, with energy savings and efficiency driving all segments of the economy today, few industries are watched more closely than the energy sector itself. The panel's next speaker, **Chris Beddoes**, explained how his association's member companies rely on science and innovation to deliver the efficiencies required of oil refining today. Beddoes is Secretary General of EUROPIA, whose 43 companies and 100 facilities represent the European petroleum industry.

'We are the third-most innovative sector in Europe, behind pharmaceuticals and the computing industry, and we are keenly aware that cost effectiveness is vital for the whole functioning of Europe's economy,' stated Beddoes.

Arguing that technology 'has a big hurdle to overcome the physical constraints to the replacement of liquid fuels by other energy sources,' he said Europe's future transport energy mix will depend upon technology gains but is still likely to be liquid based. 'Oil will remain the main energy source for transport in 2050 even in the most ambitious IEA [International Energy Agency] scenario' for energy efficiency gains and alternative fuels, he observed.

For example, oil consumption across aviation, marine, road and rail transport modes will still account for half of Europe's energy mix in 2050, according to IEA estimates. If biofuels are added to them, then the proportion rises to 80 %.

Given such a scenario, Beddoes said technology and innovation must rule. 'This has to include not just the bright shiny new technologies, but also continuous improvements to existing ones. That means 'green versus black' technologies is an artificial distinction,' he told the conference.

Noting that technologies must be both environmentally and economically sustainable, he said policy should encourage and promote them but not dictate or mandate their development. 'Policy makers should not choose technology but allow all technologies to compete for greater efficiency and economic sustainability on their merits,' he said.

For Beddoes, that maxim impinges on policymakers to:

- set clear goals based upon outcomes that are technologically neutral with realistic targets that are 'just ahead of economically achievable technology';
- recognise the value of all technologies since existing ones 'have a long way to run' while avoiding solutions built on unsustainable subsidies;
- use 'command and control' measures with great care such as taxing fuels on their true merits;
- acknowledge that infrastructure is precious.

'Do not destroy existing industries and jobs until replacements can economically replace them,' he advised policymakers in the room. 'We think 'well-to-wheel' efficacy should be the measure of reference.'

'If I have any message for you today, it is the following,' said the next panel speaker, **Giovanni De Santi**, the JRC's Director for Energy and Transport.

'First, efficiency is essential. Second, it is very complex because it embraces the whole of our economy, environment and industrial competitiveness. And third, we've got to get a more integrated

approach going in Europe – and that is why the JRC created the Knowledge Centre for Energy Efficiency,' he told his audience.



*Giovanni De Santi,
JRC Director for
Energy and Transport*

De Santi was adamant that Europe should not lose its opportunity to develop new technologies for energy efficiency. 'We must be ambitious and we must work together. This effort must come first in science from which the targets will flow – and not in the reverse order: we do not need pre-defined targets that are unsustainable,' he said.

Pointing to energy efficient road transport to illustrate the centre's activities, he said the JRC is providing support across a wide range of activities: international standardisation, European legislation, cooperation with industries and interoperability via international collaboration. In the area of European legislation, for example, the JRC supports 'Eco-Innovations' such as reduced CO₂ from cars via solar roofs or the use of LED technologies. It also helps the Commission in the assessment of Eco-Innovation verification reports and is involved in the development of test procedures to assess the energy efficiency of mobile air conditioning systems and gear shift indicators to assess their impact on CO₂ emissions in light duty vehicles.

As for cooperation with industry, the JRC is a partner in a 'well-to-wheels' study on energy use and greenhouse gas emissions across a range of potential future fuel and power train options. And it cooperates with ACEA to monitor fuel efficiency in heavy duty vehicles. 'The Americans are collaborating with us to see how this methodology will evolve,' observed De Santi.

Regarding the JRC's international collaboration, he said a letter-of-intent had been signed between

its facilities in Italy and The Netherlands and the US government's Argonne National Laboratories to support a common EU-US approach to electric vehicle standards and to address the interoperability issues between e-vehicles and smart grids. 'This foresees testing facilities for electric vehicles and the related equipment and will ensure a permanent link with the car industries of the EU and US markets,' he said.

De Santi said it was imperative to work with industry on international standards and the electrification of transport. 'We want to study all the different components together such as batteries and how they communicate with smart grid infrastructures, for example. It raises key issues such as how to match energy storage with demand and how to do this in a secure environment. All this will be tested in Ispra, and in cooperation with our US partner. We must have entire systems that work together in this domain,' he said.

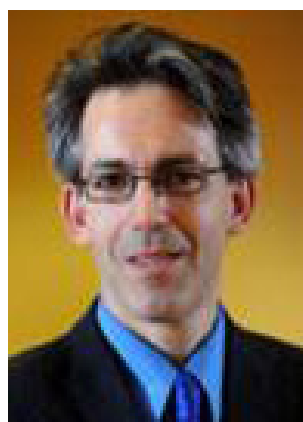
Calling the JRC 'our scientific watchdog,' the next panel speaker, **Olivier Onidi**, Director for Innovative and sustainable Mobility at Directorate-General for Mobility and Transport (DG MOVE), said it was important that 'we should not distract ourselves from long-term, fundamental research in a time when we are all under pressure for quick innovations.'

Noting the amount of attention devoted during the conference to vehicles and the sector's impressive progress in energy efficiency, reminded his audience that vehicles 'do not work in isolation. What makes a sustainable system at the end of the day? There is one important component that tends to be overlooked – and that is infrastructure.'

He said infrastructure is poised to make a significant contribution to resilience, both in terms of energy efficiency and for the recycling of energy burned on the road. 'We also need an efficient transport system. Thus, the vehicle is very much linked to the other modes around it. That is why we focus on inter-modal logistics and IT: these are fabulous areas of innovation where Europe is not only strong but needs to deploy those results to the world,' he stated.

Pointing to the alternative fuels that vehicles can run on, he said Europe is at a turning point. 'Europe needs to give room for these in a coordinated way. First, there is no one-off, magical solution: we don't

know what the winner will be. But we should give an equal chance to all alternative fuels, including bio-fuels: they are not dead and we should continue researching that,' he told his audience.



Olivier Onidi,
Director for Innovative
and sustainable
Mobility at DG MOVE

Second, policymakers should make sure at the EU level that there is room for all forms of technologies, with the proviso that 'future technologies deployed in one member states are compatible with the legacy of those in another. Thus, all the member states need an integrated approach to roll out these new technologies,' he said.

According to Onidi, if there is not a degree of certainty and planning then barriers will stand in way of both the consumer who wants to buy alternative-fuel vehicles and the investor who wants to role out new kinds of infrastructure 'We want to oblige the member states to develop national plans by setting up targets such as re-fuelling stations while reviewing all modes of transport. And just as important: we need technical standards at the EU level to ensure that electric vehicle refueling station plugs work everywhere, for example.'

In his concluding remarks Onidi said the final takeaway message is that 'Europe does have fantastic creativity and skills. Moreover, we have dramatically improved the coexistence between science and policy-making in recent years. We are using all the validators and metrics from science to guide us, while modulating policy to support science.'

The panel's final speaker, **Willy Van Puymbroeck**, Head of Unit for Components at Directorate-General for Communications Networks, Content and Technology (DG CONNECT), addressed the ICT research challenges regarding mobility. 'The potential impact of ICT research and development for the large-scale

deployment of electric vehicles is huge. The link between these two industries – automobile and ICT – is strategic because so many issues are at stake concerning electro-mobility,' he said.



Willy Van Puymbroeck,
Head of Unit
for Components
at Directorate-General
for Communications
Networks, Content
and Technology
(DG CONNECT)

Those issues include: climate change mitigation via GHG reductions; energy security via less dependence on fossil energy and lower final energy consumption; the safety of transport systems, the industrial competitiveness of the EU's automotive industry and the overall competitiveness and innovation capacities of the EU's ICT sector.

'The economic stakes are particularly acute for electronic components and systems, where Europe has a 37 % slice of the world market for automotive semi-conductors, for example. The share is even higher for automotive sensors, where five of the world's 10 leading manufacturers are European, with 45 % of the global market.

Indeed, the implications of ICT research for electric vehicles (EVs) are wide-ranging and will have an impact on the efficiency of components regarding their weight, cost and energy consumption, but also for active and passive EV safety systems and for strategic technologies such as batteries and e-motors – not to mention ICT components' applications for smart transport infrastructures and efficient routing and services.

Some indication of the already-strong-and-growing links between electro-mobility and ICT components can be found in the following facts:

- electronics are an enabler and are estimated to drive some 60 % of current vehicle innovations – and, for premium vehicles, could be as high as 80 %;

- ICT is predicted to account for 40 % of the value in a full electric vehicle (FEV);
- FEVs will transform the automotive value chain;
- Europe could account for 25 % of the estimate global FEV market of EUR 15 billion by 2020, with their roll-out in Europe expected to create net gains in direct employment.

What about the next steps? Van Puymbroeck said Europe's research community and industry need to build on existing efforts such as the Commission's 'European Green Cars Initiative'. Launched in November 2008 as one of three public private partnerships (PPPs) to support Europe's economic recovery, its objective is to support R&D on essential technologies and infrastructures to achieve breakthroughs regarding renewables and non-polluting energy sources, safety and traffic fluidity. The Green Car initiative is expected to generate a contractual PPP within Horizon 2020 based on EUR 1.5 billion from the latter and a matching EUR 1.5 billion contribution from industry.

More recently, his DG has carried out a study on the impact of ICT research and development on the large-scale deployment of EVs. Its recommendations call for:

- fully implementing ICT within FEVs;
- enabling European OEMs to lead the development of third-generation 'ground-up' designed FEVs via revised ICT architecture;
- maintaining Europe's leadership in the research, development and manufacture of automotive semi-conductors and power electronics for FEVs;
- creating a European value chain for the research, development and manufacturing of batteries, their management systems and their integration into FEVs;
- developing expertise in energy-harvesting technologies.

For Van Puymbroeck, the future path of action is unambiguous.

'What is really important is keeping manufacturing in Europe. How do we get across 'the valley of

death' from technology development to the market? We must further strengthen and exploit our components industries; if not, the R&D will go elsewhere and we will lose access to the basic components we need for all our economy,' he warned.

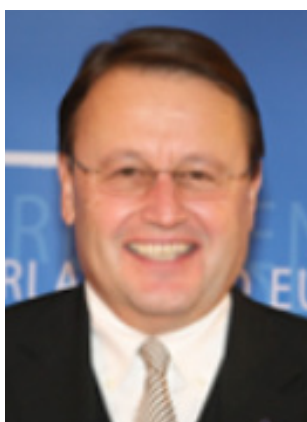


**Scientific support
to efficient lighting
and electrical
equipment**

Session 3

Scientific Support to Efficient Lighting and Electrical Equipment

The conference's third and final session was devoted to scientific support for efficient lighting and electrical equipment. Moderator **Paul Rübiger**, Austrian MEP who sits on the EP's Industry, Research and Energy Committee, set the scene for his panel's debate.



*Paul Rübiger,
Austrian MEP, Industry,
Research and Energy
Committee*

'Energy is obviously a very important issue today and lighting has an enormous impact on Europe's building sector. We need to look at better ways to produce it. Europe imports 50 % of its energy each year, or about EUR 500 billion and this enters the price of our exports in a dramatic way. It makes our products more expensive,' said Rübiger.

'And because our wages are higher compared to many parts of the world, we are going to have to be much more clever in the future to keep our jobs and economy going. This conference will help show the most promising areas where we can perform better,' he said.

The first speaker, **Yves Bamberger** of France's National Academy of Technologies and Academy Member of Euro-CASE, then took over the debate to tell his listeners that 'the easiest wins are to be found in our panel topic. However, when you talk about efficiency for industrial equipment, you must be very clear about the target.'



*Yves Bamberger
of France's National
Academy of
Technologies and
Member Academy Euro-
CASE*

Energy efficiency for equipment means different things, depending on the point of view. Is the target to induce less energy consumption on the in-put side or side of out-put? Or is the primary goal to reduce emissions? And where first: by consumers or by the manufacturers of equipment and lighting?

'If one means energy efficiency in the home, the focus has to be on final energy consumed. But what kind of equipment are we talking about to achieve that?' said Bamberger. 'Aside from power for lighting, there are many other candidate areas for scientific investigation such as air conditioning: we need far more research to show the balance between strong insulation and the supply of expensive air conditioning, for example. Hot water is another issue which is becoming a key point in many countries.'

He also warned about the 'rebound effect' as cheaper sources of energy are developed. 'If you offer cheap heating, for example, people simply use more of it; they are not motivated to conserve its use. Thus, we also need psychologists and sociologists in addition to scientists and policymakers to study these behavioural patterns and how to change them.'

One technology area where scientific innovations could lead to positive knock-on effects for employ-

ment is heat pumps. 'I think this is priority technology to consider, where progress is needed on fluid dynamics and new materials. This should be supported at the European level,' he said. 'Storing heat is not a terribly sophisticated technology but it requires a systematic approach at the regional or district level to increase storage capacity, which means building pumping stations. And we need to give much more attention to accumulation heaters.'

In his conclusion Bamberger fingered two policy inconsistencies across Europe. One is the level of support for efficiency measures. 'Everyone says energy efficiency is the best goal, yet the money we are putting into it is far lower than for the development of renewables,' he said.

The other is overregulation in Europe. 'It's fine that our politicians define the target, but they change the rules so often that citizens cannot know or understand the best investment strategies to make. If we reduce or eliminate these inconsistencies, we will have more money for energy efficiency to add to the tremendous progress we have already made during the past 10 years.'

The next speaker – **Jürgen Sturm**, Secretary General of LightingEurope, the pan-European association of lighting industries – outlined the global trends in his sector and the huge potential energy savings offered by solid state lighting, known as light-emitting diode (LED) technology.



Jürgen Sturm,
*Secretary General of
LightingEurope*

The broad global trends point to rising population growth and demand for energy, increasing urbanisation combined with cities seeking customised lighting schemes to establish their own identity and the growing relevance of connectivity 'with a global

and local scope', with LED technology intersecting across them all.

'Lighting is moving from analogue to digital – with all the consequences that entails – while LEDs are advancing at an unprecedented pace. New waves of LED technology are washing over us every six months. It is truly a disruptive business,' said Sturm. 'But we should not fall into the trap of thinking that LED is only about energy savings: it touches on all phases of the cycle.'

According to Sturm, modern economies are only scratching the surface today of what is possible for creating smart grids across all layers of society. 'Fully 97 % of Europe's industrial infrastructure is 'smart' to the extent it has an off/off switch,' he said. Such infrastructure thus lends itself to smart energy use in the factory, tailored patterns of energy consumption in the home and energy savings for all.

For example, the application of control systems for detecting movement or daylight levels will not only reduce energy consumption inside buildings but will work in tandem with LED systems to produce new effects. Communication and interaction between systems will lead to improved and optimised light quality to enhance domestic, public and road lighting, both aesthetically and in terms of safety.

To be fully successful, however, the forthcoming LED lighting revolution must benefit from the right mix of technological advances, policy framework support, new financing mechanisms and new ways to use the technology to augment communications and system controls.

'Policy frameworks should accelerate the market's adoption of new technologies while driving the phase-out of costly and inefficient technologies that weigh down our environment and our budgets,' said Sturm. That means phasing out incandescent lamps, high-pressure mercury lamps or electromagnetic gear for fluorescent lighting, for example, while stimulating demand for green procurement and implementing minimum energy performance standards for buildings.

Insisting that R&D is a key factor in any scenario aimed at phasing in sustainable technologies, he said Europe's lighting industry expects Horizon 2020 to address research needs in two specific areas: biological efficient lighting and lighting for

horticultural purposes. 'This also calls for better co-ordination between Member States and the EU,' he observed.

As for new financing schemes, Sturm said the characteristics and benefits of LED lighting technology will lead to a change in business models that balance capital and operational expenditures – and to job creation.

'Lighting services are expected to become high value-added activities, leading to the need to deliver integrated solutions. From recurrent revenues of replacement sales to revenues over life by energy savings, requiring new innovative finance models to appropriately accommodate lighting systems and services,' he concluded. 'We think tailor-made solutions will become a growth opportunity for many SMEs who take up the possibilities that new LED technology offers for creative lighting designs and cost savings.'

What are the actual cost benefits for consumers of switching to more efficient lighting technologies such as LED lamps and how to persuade them to do so? The potential cost savings alone are convincing, as panelist **Heinz Ossenbrink**, the JRC's Head of Unit Renewable Energy, told the conference.

Having analysed all the trade and consumer data, his unit's research reveals that Europe's total residential electricity consumption equals some 800 TWh per year or about 27 % of Europe's total electricity consumption. Of this residential amount, lighting takes up about 10 %. The current electricity cost of 1 billion conventional light bulbs equals EUR 15 billion per year. 'If these were replaced by LED lamps, the cost would plummet to EUR 3 billion,' said Ossenbrink.

In other words, consumers could save a whopping EUR 12 billion per year simply by changing the bulbs they use. For such reasons, Ossenbrink said 'the prices of LED products are going down and we think they will take over the market in a few years.'

Indeed, of all the Commission's policies on lighting products, probably the most important for its most visible and immediate effect is the phasing out of incandescent bulbs. The relevant EU legislation on lighting comprises a directive on the energy labeling of household lamps (Dir. 98/11/EC) and two regulations: on the eco-design of 'tertiary sector' lighting

products (Reg. 245/2009) and on the eco-design of non-directional household lamps (Reg. 244/2009).

The JRC has been very active in promoting the use of LEDs. For example, it was involved in promulgating the 'LED Quality Charter' of 2010 and, more recently, has been working on:

- technical references for the public procurement of lighting across the EU27;
- LED projects and economic test cases across Europe;
- accelerating the deployment of solid state lighting;
- providing in-put to the Commission's Green Paper on 'Lighting the Future: accelerating the deployment of innovative lighting technologies'.

To conclude, Ossenbrink insisted that solid state lighting such as LED 'has a very high innovation potential for new materials and electronics. There is strong market growth, prices are decreasing rapidly and it offers high-tech value added compared to fluorescent lamps. While EU policies have been and continue to be market drivers, more standards are still needed regarding the technology's lifetime, characteristics and compatibility with existing infrastructures. There's still work to do, but the future results are very, very promising.'



Monique Goyens,
Director General of the
European Consumers'
Organisation

Monique Goyens, Director General of BEUC, the European Consumers' Organisation, then took the floor to elucidate the consumer aspects to energy efficiency. While praising the considerable sums that industry invests in new technologies and innovation and its need for long-term targets from policymak-

ers in order to make those investments, she also argued that 'it is imperative from the consumers' perspective that energy efficiency has independent research at their disposal. Industry has a research role here of course, but let's be frank, sometimes their research is biased.'

Her second point concerned the non-technical aspects of when research programmes and products are launched. 'It's not just about hard science: consumer acceptance and behaviour count for something very important too,' Goyens told her audience.

Taking smart appliances for the consumer as an example, she observed that 'they are only as smart as the consumer who uses them. This means you in industry must understand whether consumers are willing and capable of buying these devices for the energy efficiency they offer. Well, I can confirm to you with considerable confidence: your typical consumer doesn't want to invest in them. It is really only the high end of the consumer market that is concerned with these devices.'

Goyens outlined many areas where greater research into consumer attitudes and perceptions about energy efficiency is needed. The EU's seven-colour, A-to-D label for rating the energy consumption of white goods and other appliances is one example.

Noting that the EU directive that created the label is now under review, she said 'we think this is the wrong scheme: it does not properly inform the consumer or change their behaviour. We call for research to determine whether the consumer really understands difference between an 'A' rating or a 'B' one. And what about those colours? Do they really generate rational consumer decisions? We don't think they do.'

According to BEUC's own research, consumers are less willing to spend money when it's a question of shifting slightly from category A to A-plus versus moving from one letter to the next, such as from A to B. 'If you want good energy efficiency results, you must take account of this kind of behaviour,' she said.

BEUC also urges a shift in thinking away from the unconnected energy consumption of separate products by the individual to greater consumer awareness and control over energy consumption across

the household. 'Overall household power consumption is rising fast due to the random multiplicity of electronic devices under the same roof. It is not necessary for a consumer to run his TV and his smart phone set at the same time if he is surfing on social networks. Both devices can do this, so one could be shut down. But the consumer needs to be made aware of these economies,' observed Goyens.

Finally, her organisation calls for better research of the eco-design of products. 'There is much more work to be done here. Again, it's a question of consumer behaviour and perception. When consumers switch off their television, for example, they think it consumes no energy. But this is not true, because there is always a 'pilot' circuit that stays on, burning energy. We call for R&D to strong link eco-designs to the life-cycle of a product: it should aim for durability as well,' she said.

For the industry point view – particularly on the vast potential offered by LED technology – the panel's speaker was **Eric Peeters**, Dow Corning Electronics' Vice President Global Business, which spends 5 % of annual turnover on R&D.



Eric Peeters,
*Dow Corning
Electronics' Vice
President Global
Business*

'Everything we do at Dow is based on silicon research and production', said Peeters, who briefly explained the complex structure and mix of high-tech materials and processes that go into a LED bulb and the conversion of its blue point-source light into the diffused natural-like light needed for use in homes, office buildings and factory floors.

'There is a lot of advanced technology required to do this, but the lumens are getting stronger and stronger, which means light intensity is rising along with heat. We need new materials, more resistance and better performance. And we need to get the price down by

a factor of 10 in the next decade or consumers won't buy them,' he informed his listeners.

Another challenge is to reduce the loss of electricity that occurs between the generation of power and its delivery to the final user. This points to the power electronics that govern how energy is transferred from one part of a system to another. Examples include DC to AC conversion such as from fuel cells to electric motors or from AC to DC conversion when electricity is transferred to a computer. But power electronics also enter the picture when converting highly variable energy sources from solar or wind to steady connected power.

'About 70 % of electricity today is lost in generation, transmission, and distribution. This is an unacceptable loss of efficiency. We need new materials for power electronics to reduce that loss – and this can be done,' he said, pointing to Japan's Mitsubishi Corp. which recently demonstrated a 40 % reduction in power loss along one of the country's railway lines. In his view the major applications for new power electronics, in terms of energy savings, will be high-speed trains, big industrial motors and electric vehicles.

Peeters also indicated that any expansion of the use of gallium nitride (GaN) and silicon carbide (SiC) in LED products will increase energy efficiency. 'These can make a real difference,' said Peeters. 'SiC and GaN can reduce losses in power inverters by approximately 40 % compared to existing power devices that use only conventional silicon. They also reduce the size, weight and complexity of components in a system, will all cost reductions that go along with that.'

Wrapping up his remarks, Peeters said new materials play a key role in innovation and the affordability of energy efficiency applications. But he also warned that industry needs a clear and predictable long-term policy strategy.

'Behind all these applications you find material science, which is strategic to our region's competitiveness. Europe's energy roadmap is heavily leveraged on materials, and cooperation between actors and sectors will help accelerate their development. We think that a contractual PPP at European level is the way to do this,' he concluded.

The panel's final speaker – **Thomas Skordas**, Head of the Photonics Unit in Directorate-General for

Communications Networks, Content and Technology (DG CONNECT) – also stressed the forthcoming revolution in lighting techniques and energy savings offered by LEDs.



Thomas Skordas,
Head of Photonics Unit,
DG CONNECT

'LED is a disruptive technology, but the R&D on it is not new; we have a pretty good idea about what is coming,' Skordas said. 'The next generation will be whole surfaces of buildings that will emit light. Thus in five or six years all our walls or windows will be emitting light. This technology is evolving very rapidly.'

On the one hand there are policy issues. The Commission's December 2011 green paper on SSL technology put in place the regulations and standards for this disruptive technology. There has also been more than EUR 120 million of R&D support through FP7, while Horizon 2020 will help industry create jobs and growth in Europe via a PPP in photonics.

Skordas said a strong EU policy on SSL would promote the technologies' many advantages such as lighting quality and visual comfort, its vast range of design and aesthetic options or its innovation and opportunities for business. Taking energy efficiency alone, for example, he noted that 50 % of European cities' power consumption goes into street lighting, most of whose lamps are 25 years old. 'Think of the savings by just changing those lamps!' he said, adding that the Commission is working on a new report to advise cities how to prepare for SSL lighting in their urban settings.

However, LED products are still quite expensive, though Skordas said there are business pilot cases out there 'which we can hold up as examples to get changes going' such as LED4ART. The latter is an EU-supported flagship action launched in January

2012 to promote LED lighting in museums where energy savings of 30 % and more are possible.

‘We will get there, and then we can create the value-chains from citizens to industry and thus capture the potential for innovation in Europe. We are in a leading position with 150,000 jobs already linked to this technology,’ he told his listeners.

On the other hand, there is the problem of market penetration of LED, which is still low. However, it is growing: from 6 % in 2010 it more than doubled to 13 % in 2011, meaning that consumers are moving in this direction quickly. For example, the global market for the SSL sub-sector of lighting services and solutions alone is predicted to explode from less than EUR 1 billion in 2010 to EUR 700 billion in 2020. Similar growth rates are foreseen in other SSL sub-sectors for the same period:

- luminaire and systems: EUR 6 billion to EUR 180 billion;
- lamps and components: EUR 2 billion to EUR 50 million;
- equipment: EUR 6 billion to EUR 20 billion;
- materials: EUR 3 billion to EUR 10 billion.

In his concluding remarks, Skordas outlined two key policy challenges for the LED sector. The first is communications.

‘There’s got to be more education of the public — not just consumers but also electrical installers, who need to be trained how to install SSL technology, and public procurement officials who need to be persuaded so that cities and other government entities buy it,’ he said.

The other concerns financial support. ‘We need new financial models to help deploy this technology. They must be based on helping cities with their public procurement by following what other cities have already done rather than reinventing the wheel,’ he observed.



Conference conclusions

Conference conclusions

To give an overview of the issues reviewed during the conference, **Philip Lowe**, Director General of the Energy Directorate General (DG ENERGY), addressed the audience, noting that ‘there has never been a time when societies are more concerned’ about getting energy at the best prices for their consumers and industry – particularly in Europe, whose energy dependence on fossil fuels has been increasing.



*Philip Lowe,
Director General
at DG ENERGY*

‘This is key issue when other regions are blessed – or cursed – with low-carbon fuel such as the United States, which is transforming its economy [via the fracking of natural gas] and making Europe look like it is at the bottom of the pack.’

For Lowe, it is critical to ensure that Europe has a market that is open to everyone and ready for business, where its 500 million consumers are looked after and where its industries do not flee the region for other parts of the world. ‘The recessionary conditions plead against location here which means the challenge is to buck that trend and make us more competitive,’ he said.

For example, Europe faces serious challenges in moving to a low-carbon economy. ‘The scientific evidence for climate change has strengthened since 2008 but to move to low-carbon energy sources

that are competitive for Europe is a huge challenge,’ he said.

Currently, coal is driving Europe’s electricity prices because it is the most competitive. But US has moved away from coal for power generation to gas, and away from gas-guzzling cars toward fuel efficiency objectives that are similar to those here in Europe.

‘They are also finding more cost-effective uses of lower-carbon fuels in commercial vehicles – something we should have done years ago,’ said Lowe, adding that ‘the US looks at all possibilities and comes up with one thing while we in Europe argue about one thing and it takes us 10 years to reach a decision. We’ve got to change attitudes and speed things up.’

Making better use of expensive energy is absolutely vital to lowering Europe’s need for electricity and thus achieving its efficiency target by 2020, which would cut EUR 193 billion from its fossil fuel bill. ‘For those who say energy efficiency is too expensive to implement, well the huge cost of not doing it translates into increased import bills and building yet more power stations. Is that what we want?’ he said.

Turning to smart meters, which are getting a lot of policy attention these days, Lowe reminded his audience that these devices ‘will not save the world. If we get 80 percent of bidirectional smart meters implemented by 2018 that will be a very good thing. But do we have to wait until then to get more efficiency? No: there are plenty of systems, methods, technologies and sensors to use, even before we get to the perfect world of smart meters,’ he said. ‘For example, our surveys showed that one-third of large companies do not have dedicated energy performance systems: they are not measuring their energy consumption intensity. We need to do as the

US and Japan are doing with performance contracting for companies, organisations and households.'

Above all, Lowe said policymakers must ensure that the regulations and money are there to support more efficient forms of heating, lighting and energy in industry, and to improve energy consumption in our agricultural and transport sectors.

'How do we get to cost-effective buildings when the capital costs are as important as the operational costs? Our financial sector, however wounded it might be, needs to wake up to the possibilities of investing in energy efficient measures and to provide the financing mechanism for all those who participate in them,' he said. 'We can't look at this in a narrow sense: we need to take a systems approach, including full information for consumers. This is perhaps the biggest asymmetric element in this whole equation.'

Taking the floor to close the conference, the JRC's **Dominique Ristori** agreed with Lowe that efficiency is the most promising area for re-launching the economy and that targeted investments and public initiatives are needed to mobilise the private sector.

But he also stressed the role of research in promoting not only technical innovations but technical standards. 'These are fundamental to buildings, vehicles and equipment and they must incorporate the international dimension via global standards. Our first partner is the United States, and we will develop a common approach to energy efficiency with them,' he said.

Turning to the building sector, Ristori said 'in my view, the present trend in Europe is focused too much on new buildings. Given that existing buildings represent 90 percent of total, this has to be our first target, starting with passive measures such as the insulation of windows and walls and then moving to active ones such as smart meters and thermostats.' He called for more active cooperation between key actors, public and private, to create new jobs at the local level and common guidance at the central level.

As for energy efficiency in vehicles, the JRC Director General said Europe should open new possibilities for EVs, particularly in urban areas, while not neglecting innovations for conventional combustion engines.

'There are 270 million cars in Europe, meaning the improvement of fuel quality and engines must be among our primary goals. If we can shift from consumption of six liters per 100 km to four or even three, this will offer a big advantage to business and domestic consumers by dramatically reducing our energy bill,' he said. 'These kinds of R&T efforts should be incorporated into a strategy, including the use of all the tools and instruments within Horizon 2020.'



Green light awards

Green light awards

Prior to the Session II, the agenda shifted briefly to the '2013 GreenLight' awards ceremony, officiated by Giovanni De Santi, Director of the JRC's Institute for Energy and Transport, and Paolo Bertoldi, Scientific officer at the Institute.

The voluntary GreenLight programme was launched by the Commission in 2000. Managed by the JRC, its winners are selected each year on the basis of the largest reduction in electricity consumption, the largest amount of absolute energy savings generated and the technologies adopted.

For 2013, there were nine winners: three from Belgium (AB Inbev, Brussels Airlines NV, Gijbels

Group); three from France (Banque de France, Vinci Park and France Quick SAS), one from Germany (WinTO GmbH), one from The Netherlands (ABN AMRO bank) and one from Spain (Bayer Hispania S.L.). Together their energy savings equal the yearly electricity consumption of 1200 households.

Forty-nine new partners joined the GreenLight programme in 2012, bringing the total to 736 by year-end. The total energy savings achieved so far by all the GreenLight partners is more than 315 000 MWh per year – roughly equal to the electricity consumption of a city of 250 000 inhabitants.



European Commission
Joint Research Centre

Luxembourg: Publications Office of the European Union

2013 — 40 pp. — 21.0 x 29.7 cm

EUR 26012 - Scientific support to EU growth and jobs: efficient buildings, vehicles and equipment Conference report

ISSN 1018-5593 (print), 1831-9424 (online)

ISBN 978-92-79-29835-6 (print)
ISBN 978-92-79-30791-1 (pdf)

doi 10.2788/12591 (online)

Abstract:

Report following the high level conference organised by the JRC on 'Scientific support to EU growth and jobs: efficient buildings, vehicles and equipment'. The proceedings include detailed descriptions of the sessions and overall conference conclusions.

As the Commission's in-house science service, the Joint Research Centres mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

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ISBN 978-92-79-30791-1

