The SMART WORLD

Making Europe smarter and more competitive

Solutions proposed by Europe's electrical engineering & electronics industries

Electra >>
we can do it

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Preface

In June 2008 the Electra report was launched. Its aim was to determine what conditions needed to be met to ensure that the EU's electrical engineering and electronics industry, one of Europe's leading manufacturing and export sectors with an output in 2006 of some 320 billion euro and employing some 2.8 million people, should continue to grow, and at an even higher rate. Written by a team of experts from the electrical and electronics industry, CENELEC, the European Commission and the European Metalworkers' Federation under the joint chairmanship of Mr. Günter Verheugen, Vice-President of the European Commission and Pr. Edward G. Krubasik, former President of Orgalime, the Electra report was cited in the conclusions of the Competitiveness Council of May 2009 and, at the end of October in the same year, the European Commission issued a Communication 'Electra' (COM(2009)594 final).

Now, with this new Electra report "The Smart World", the electrical engineering and electronics industry represented through Electra aims to:

- Briefly analyse the results of the first Electra report, looking at those areas where progress has been achieved and at those where more needs to be done.
- Outline the changes that have arisen following the 2008-2009 economic crash, as well as the impact of this on Europe's electrical and electronics industry.
- Re-examine the challenges at societal level that Europe faces today and present proposals which are both supportive of European policies and ensure that the industry continues to grow and invest in Europe, in short making Europe smarter and more competitive.

This report, its annexes and other related material are available on-line:
http://www.orgalime.org/positions/electrical.asp

Chapter 1. Smart Society

We have been "good", we have been "better", now we are on our way in Europe to becoming "smart". A smart society is one that is ready to face the challenges of the future, such as demographic change and developing a health system that caters for the needs of an elderly population; further shortages of raw materials and therefore the need to achieve greater resource efficiency; a smart grid that can cope with the increased use of renewable energy sources; climate change, the shortage of energy and the consequent need to use energy more efficiently; integrated transportation infrastructures that meet the mobility demands of the next generation; a safe and secure place to live and work; and the concentration of more and more people in and around large urban areas. And of course, a society that is capable of adapting its manufacturing sector to ensure that the benefits arising from providing solutions to these challenges accrue to its economy, providing jobs and growth in Europe.

European policy-makers have recognised the challenges of the future and are consequently working to meet them. The "Europe 2020" initiative outlines the major challenges and steps to be taken by the European Union during the coming years. With various "flagship initiatives", the EU has roadmapped the policies necessary to invest more in people, skills and ideas; to make sure that these "innovations" are put into the market here in Europe first; that the deployment of future technologies enjoys the optimal regulatory framework conditions in Europe; and that we increase the overall competitive position of Europe in the global market. In the field of the EU's Energy Policy, the first steps have been taken to consider the long-term future, for example, via the recent EU Communications on the energy infrastructure package, the "EU Energy Roadmap 2050" and concrete EU-funded projects on the energy networks of the future.

However, much more needs to be done: policy-makers and industry need to work closely together during the next few years in order to "smarten" Europe's approach. The EU-Communication on an "integrated Industrial policy for the globalisation era" recognises the need for a strong industrial base for Europe, as well as internationally. Here, the aims are to make Europe a more attractive destination for people, talents and investments and in order to create globally strong industrial players to generate new wealth, jobs and growth here in Europe. The European electro-technical and electronics industry is a key partner to the European Union for achieving these goals because it is this industry that produces the technologies needed to make Europe "smarter".

The situation of the electrical engineering industry[1] can be described as follows:

- The industry, particularly in the most industrialised countries, has been severely hit by the economic crisis of 2009.
- World production (the world market) has grown by 33% between 2005 and 2010, with great differences between regions / countries; China has gained market share at the expense of nearly all other countries:
  - China: +121% (market), +117% (production).
  - EU27: +12% (market and production).
  - USA: -13% (market), -12% (production).
- Most important sub-branches regarding production (in 2010 this was almost the same as in 2005 – there were no significant structural shifts):
  - Worldwide: (1) electronic components and systems (ECS); (2) automation; and (3) consumer electronics.
  - EU27: (1) automation; (2) ECS; and (3) power engineering.
- Within the EU27 group, Germany is both the biggest market and the largest producer.

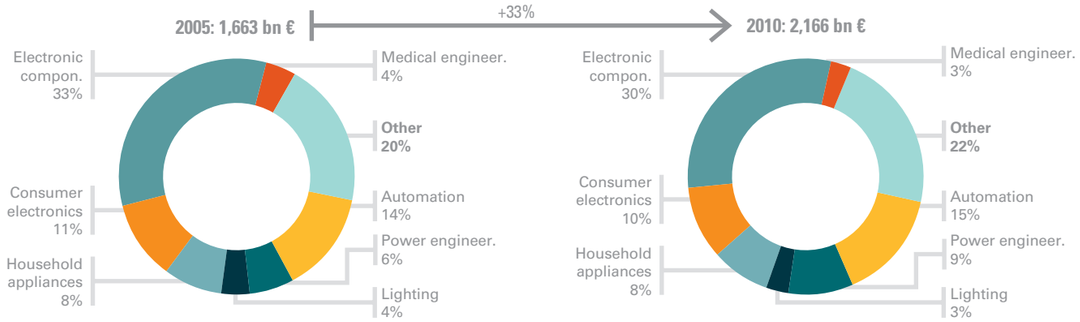
Electra – overview EU27

	2005	2010
Market (billion €)	322	358
Production (billion €)	323	361
Exports (billion €)	361	388
Imports (billion €)	360	385
Share of total industrial production	9.3%	7.9%
Share of GDP	2.9%	2.9%
Employees (1,000)	2,845	2,841*

*2008
Source: ZVEI

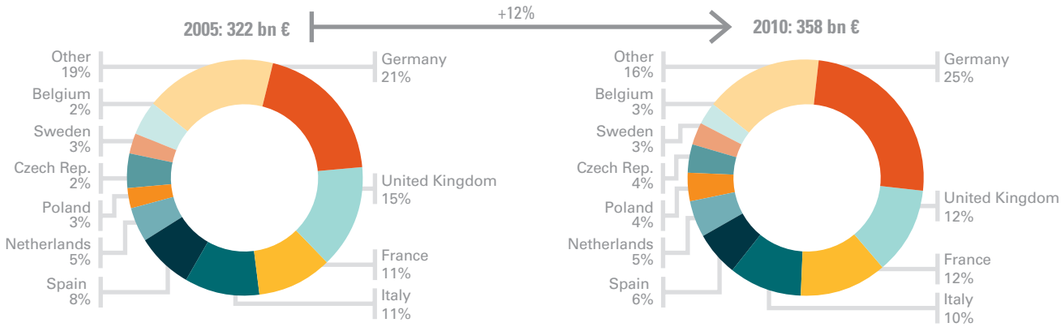
1. For the purpose of this report, the electrical engineering industry covers Nace Rev.2 codes 26 (26.1, 26.40, 26.51 and 26.60 partially), 27 (27.11, 27.12, 27.20, 27.31, 27.32, 27.40, 27.51, 27.90), 29.31, 32.50 partially, and 33.20 partially.

Electra – global market (= global production) by sub-branches



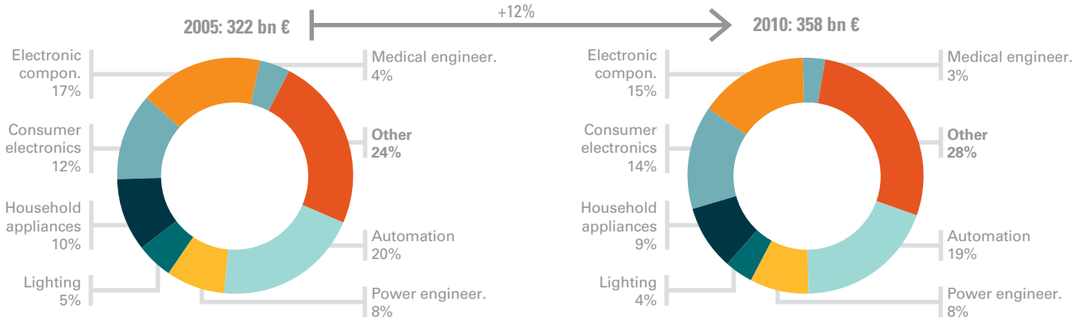
Source: National Statistical Offices and ZVEI's own calculations

Electra – apparent consumption within the EU27 by regions



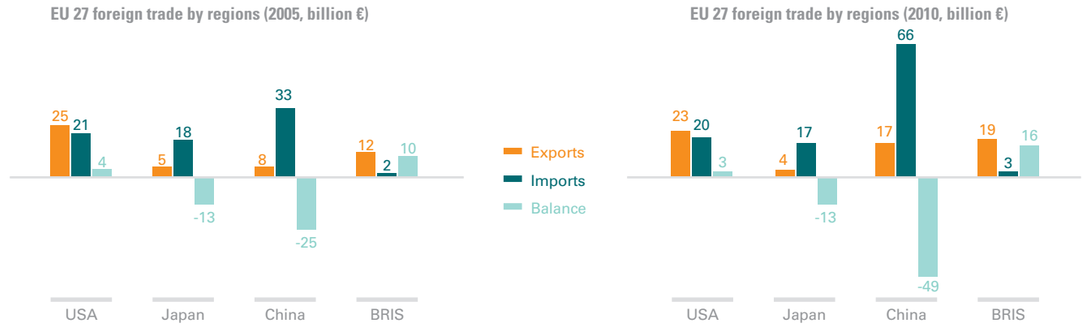
Source: National Statistical Offices and ZVEI's own calculations

Electra – apparent consumption within the EU27 by sub-branches



Source: National Statistical Offices and ZVEI's own calculations

Electra – EU27 trade balance



Source: National Statistical Offices and ZVEI's own calculations

- EU27 trade balance: In both 2005 and 2010, there was a surplus in trade with the USA and the BRI (Brazil, Russia and India) countries and deficits in trade with Japan and China. While the trade surplus with the USA and the trade deficit with Japan did not change from 2005 through 2010, the deficit with China in this period doubled and the surplus with the BRI countries has risen by 60%.

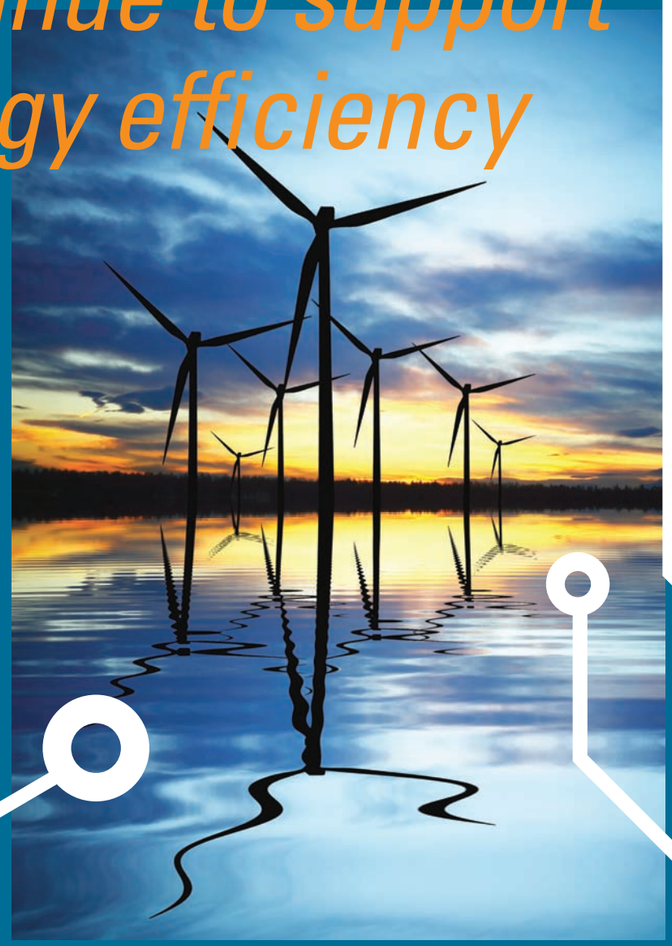
The European electrical engineering industry makes the technologies that are needed to create a living environment which is more conducive to the quality of life of a maturing society faced with diverse challenges. It is these industries that provide the technologies (e.g. network transmission and distribution technologies, transformers, cables) needed to achieve the political goals of becoming more energy- and resource-efficient and to establish the best energy infrastructure possible. Furthermore it is this industry that brings together all the energy efficiency technologies around a "smart home" or a "smart building" (e.g. by combining intelligent household and consumer electronics with the building infrastructure and energy system). It is also this industry that creates the road and transportation technologies that generate intelligent traffic and mobility management systems (e.g. by combining the best features of the different transportation modes such as road, air and rail traffic with local urban public transportation and electromobility concepts). The European electrical engineering industry thinks in terms of, and believes in, systems and network technologies with the aim of finding the best technical solution to a particular demand or societal challenge. To conclude then, Europe's electrical and electronics industry is a strong player both within the EU and globally.

In 2008, after two years of collaboration between the European Commission, led by Commission Vice President Günther Verheugen, and Europe's electrical engineering industry, led by the Orgalime President Edward Krubasik, the Electra report entitled "Twenty solutions for growth and investment to 2020 and beyond" was published.

With this Electra II report, the industry represented in Electra aims to:

- Briefly analyse the results of the first Electra report.
- Outline the changes that have arisen following the 2008-2009 global economic crash as well as the impact of this on Europe's electrical and electronics industry.
- Re-examine the challenges that Europe faces in 2012 and ahead, present proposals to support European policies in its energy- and resource-efficient growth- and jobs-agenda, and outline the steps that need to be taken to make Europe a "smart world".

Regulation must continue to support energy efficiency



Chapter 2.
Review Electra

Using "traffic light" symbols, the implementation of the 20 recommendations of the first Electra report is evaluated below, using traffic light symbols (green: implemented; orange: ongoing; red: no progress).

Electra 20 recommendations	
1. The EU should refocus its policies more on developing growth and jobs through its programme for CO_2 reduction, including developing incentive schemes and policies other than the Emission Trading Schemes (ETS) to mobilise the economically attractive investment potential in the buildings, industry and other sectors. *Whereas initiatives such as the SET-Plan, the EU Energy Roadmap 2050, and the Energy Efficiency Directive proposal are setting the right direction, funding those initiatives remains to be consolidated.*	●
2. Bringing about the perception that energy efficiency must be tackled everywhere, massive information and education campaign aiming at raising the general awareness of all actors – architects, contractors, and the general public – must be launched. *Initiatives have been taken at EU level, such as the Covenant of Mayors, the Smart Cities & Communities Initiative or the Sustainable Energy Week, but improvements are still required towards achieving better coordination and benchmarking of national initiatives and specific campaigns to increase public acceptance.*	●
3. Regulation must continue to support energy efficiency: in buildings and homes, to include the active energy part, in products and systems by progressively introducing appropriate minimum energy efficiency requirements, which evolve over time. *Some progress has been made with regards to legislation supporting energy efficiency, but improvements are required with regards to voluntary agreements or the deployment of ICT in energy intensive sectors.*	●
4. Ensure the leadership of public authorities with ambitious and visible investment plans in public infrastructures and buildings using where appropriate public private financing to drive the investments. *With both the European Energy Recovery Plan (EEPR) and a proposal for energy infrastructures, the EU is investing substantial amounts of public money in the public infrastructures. Improvements are needed with regards to using public procurement to boost innovation and the simplification of permit allocation.*	●
5. Foster R&D programmes, define technology roadmaps and an innovation policy to support early demonstration projects and maintain or create lead customer markets to foster early development and application of new technologies in Europe first: for instance in e-health, automation, energy efficiency, renewable energy, mega-cities. *The Lead Market Initiative and the SET-Plan are major initiatives which now need to be properly financed (SET-Plan) and focused on e-health, energy production and transportation (including smart grids), e-Mobility and transport infrastructures (Lead Markets).*	●
6. Develop benchmarking and the sharing of good practices, introducing Europe-wide harmonised performance criteria or metrics for measuring energy efficiency for different sectors (energy passports / ratings for buildings, energy labels for consumer products). *The EU is working on specific product measures within the framework of the Energy Performance of Buildings and the Eco-design directives; work should move on to systems and applications, and additional, mandatory ecology footprint labelling should be avoided.*	●
7. Set overall energy efficiency targets for each Member State and enforce national binding roadmaps and / or action plans (e.g. the National Energy Efficiency Action Plans – NEEAPs under the Energy Services Directive) independently of the current energy mix, based on an exhaustive inventory of the current local environment and stimulating smart metering and intelligent power management. *Smart metering and smart grids are subject to EU roll-out actions, but energy efficiency targets at EU and national levels are still missing.*	●
8. Encourage investment and renovation with energy efficient products and systems, fostering replacement of obsolete, energy efficient products, closing down and replacing the least efficient installations and ensuring proper maintenance through launching long term fiscal policies and financial incentive plans adapted to each sector. *The main improvement required is for the Member States to ensure consistency and long-term stability of actions, particularly fiscal and financial schemes.*	●

9. Modernise high-tech infrastructures in the EU, through fostering the development of EU lead customer markets, based on society trends and demand, improving the competitive environment and attracting both public and private funding and investment.

An EU plan is described in the Flagship Initiative "A Digital Agenda for Europe" and subsequent documents such as the European Broadband communication. Investments have to be guaranteed by the inclusion of proposed financial instruments in the EU 2014-2020 financial perspectives.

10. Initiate a number of lighthouse projects, similar to Galileo, such as the digital EU identity card and passport, EU electronic payment technology, an EU-wide high voltage direct current-grid, cross-EU high speed transport lines, EU-driven health and government and security solutions.

The European Economic Recovery Plan has set up three public-private partnerships and a plan to invest in broadband Internet in rural areas, which should be completed by the identification of new Lead Markets.

11. Ensure stable and predictable regulatory framework conditions, especially at the levels of regulatory certainty and consistency for incentives and return on investment, to promote sustainable investment by customers in the energy infrastructure markets.

This seems to be one of the most difficult tasks for the EU and the Member States to perform, and, while the Flagship Initiative on "An Integrated Industrial Policy" proposes to reinforce the impact assessment procedure of proposed EU legislation, the respect by the European Parliament and the Council of the Inter-institutional Common Approach on Impact Assessment has to be improved. Furthermore the Member States also have to ensure the consistency and long-term stability of their legislative frameworks.

12. Set up a regulatory framework through smart regulation, stimulating investments in, for example, new digital media (Digital Rights Management Systems, copy protection), and allocate frequencies for mobile broadcasting and HDTV in Europe.

The EU work plan is described in the Flagship Initiative "A Digital Agenda for Europe", completed by the Commission Communication on "European Broadband" of January 2011 but improvements are required in the areas of network security, e-government, the completion of the Internal Market and, at international level, of the WTO Doha Round and the expansion of the ITA.

13. Aim at achieving that all EU countries should send at least 50% of students through tertiary education and to attract at least 25% of tertiary education students into technical, engineering and science education.

Most of the actions are to be taken at national level, where a number of Member States have taken significant initiatives.

14. With large investments needed in the EU to foster the integration of Europe, generate more growth through the use of regional funds to build high-tech infrastructure, by stimulating public-private partnerships, and by taking energy efficiency into account in public procurement through the use of voluntary and incentivised lead standards.

The EU regional funds are under revision as part of the financial perspectives 2014-2020 and the [EU's] goal is to focus these funds on a focused set of priorities. Improvements required include further and better coordination between EU, national and private financial instruments.

15. Develop access to capital in the EU through the progressive capitalisation of pension funds, facilitating access to private capital and, in particular, venture capital.

Discussions on both the recast of the directive on Energy Performance of Buildings and the proposal for an Energy Efficiency Directive demonstrate the will of the EU but also the strong resistance to the necessary / desirable changes by some Member States and sectors.

16. Ensure that the New Legislative Framework brought about by the marketing of goods package, recently adopted by the EU institutions, effectively leads to a real improvement in market surveillance in the EU to ensure safe products and fair competition.

The New Legislative Framework is now being implemented directly in new legislation and scheduled revisions, and via the Alignment package but the issue of market surveillance remains stuck at the level of the Member States, some of which are even reducing their budgets.

17. Achieve a far greater consistency and coherence of EU environmental and eco design regulation, so as not to unnecessarily duplicate regulation, which only penalises manufacturers in the EU.

There is a clear failure of the EU institutions to achieve this goal: each legislative review leads to a revision providing legal instability, and the coherence of the Eco-design directive is undermined by the continual change of its scope.

18. Motivate our trading partners to align their own legislation, particularly environmental, to the EU's as far as possible and to apply a lighter certification regime in particular for low-risk products.

Work is moving on with the USA, but at an excessively slow pace, and with other countries via the negotiation of FTAs. Results of such actions have to be further monitored.

19. Improve patent regulation in the EU with a balanced and affordable patent system, and, in the context of international trade, make the respect of Intellectual Property Rights (IPRs) a key element of trade discussions and agreements.

The proposal for an EU patent (via the enhanced cooperation mechanism) is a step in the right direction, whereas the respect of IPR, especially by China, remains a significant challenge.

20. Develop regional clusters in order to foster cooperation between science and industry. Start an EU-wide cluster benchmarking initiative. Transfer experience and best practise sharing between clusters. Use the European Institute of Technology (EIT) as the brainpower-network for Europe's future.

The EIT has found a proper role in the EU R&D landscape and proposals made by the European Clusters Advisory group should now be followed up.

Chapter 3.
Smart Infrastructures

3.1. Introduction: Smart Infrastructures for Smart Living

The modernisation of European infrastructures has become a key objective of the European Union. Under its growth-strategy "Europe 2020", the European Commission has listed a number of flagship initiatives and activities such as the Digital Agenda, the Innovation Union, and the "Industrial policy for the era of globalisation". It has proposed guidelines for trans-European energy infrastructures and measures on resource efficiency, including energy policies ("Energy 2020"), as well as the EU Transport White Paper and the eHealth Action Plan.

The electrical engineering industry in Europe can provide answers to many of these European infrastructure policy initiatives. It is this industry that produces the technologies and systems needed for the modernisation of Europe. Our common aim with European policy makers is to develop future technologies in Europe, deploy them here first, and then showcase our solutions to the rest of the world. This will increase Europe's global competitiveness, make the European Union the most attractive place to live and work in the future, attract the best brains and talents from around the globe, and help the European industries succeed in international markets.

3.2. Opportunities and Challenges

Opportunities

- *Create a smarter Europe:* Give Europe the energy, digital, transport, health and building infrastructure it needs to be competitive.
- *Strengthen Europe's electrical engineering industry:* Enable Europe's electrical engineering industry to deploy and showcase its technologies, thus stimulating growth and technology leadership.

Challenges

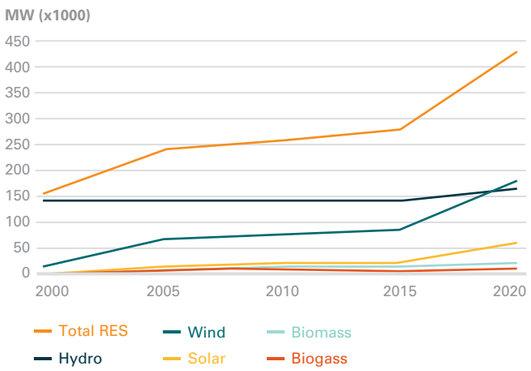
- *Lengthy permitting procedures:* Infrastructure projects at Member State level and notably when cutting across borders are often subject to lengthy permitting procedures. Streamlining these is a key requirement for modernising Europe's infrastructure.
- *Financing:* Infrastructure projects require considerable funding. Particularly during times of economic crisis, funding and access to credit needs to be made available and facilitated at EU level.
- *Public acceptance of infrastructure projects:* Public acceptance will determine the success of many of the key infrastructure projects we envisage for Europe. It is important to drive those projects from the beginning in a transparent way, including thorough discussions with all stakeholders involved.

EU 27	2000	2008	2009	2010	2009/2008	2010/2009	2020
Nuclear	136,847	132,842	132,861	130,538	19	-2,323	127,496
Fossil fuel fired	319,306	445,428	454,155	426,173	8,727	8,018	382,074
Hydro	135,626	141,694	142,905	142,726	1,211	-179	160,974
Other renewables	21,942	94,748	111,561	133,940	16,812	22,379	264,297
Of wich Solar	82	10,102	15,244	22,981	5,142	7,738	55,735
Wind	12,808	64,034	74,614	83,819	10,581	9,204	177,809
Biomass	3,940	9,852	10,019	10,071	167	52	17,086
Biogas	975	3,799	3,092	3,891	-707	799	5,795
Not specified	440	1,198	1,143	1,144	-55	1	1,162
Total installed capacity	686,161	815,910	842,624	870,521	26,714	27,896	936,004

Source: Eurelectric

Note: Regarding the table above, it must be noted that whereas the aggregated figures for type of primary energy used are fairly complete, the breakdown into RES subtypes might not always take into consideration all EU-27 countries. Nonetheless, the figures still provide some good hints on the last developments of generating capacity and on expected future developments.

RES generation capacity in the EU 27 (MW) present and future trends



Source: Eurelectric Power Statistics Dec 2011 – Targets Renewable Energy 2020 in EU

- Integration and accommodation of renewable energies
- Rising electricity demand
- More cross-border energy trade
- High regional electricity prices
- Energy security concerns
- Stability improvement

Source: ENTSO-E

3.3. Recommendations and Key Messages

3.3.1. Energy infrastructures

Energy infrastructures in Europe are outdated. In its Infrastructure Guidelines published in October 2011, the European Commission states: *"Electricity networks must be upgraded and modernised to meet increasing electricity demand due to a major shift in the overall energy value chain and mix. The grids must also be urgently extended and upgraded, including through electricity highways, to foster market integration and maintain the existing levels of system's security, but especially to transport and balance electricity generated from renewable sources, which is expected to more than double in the period 2007-2020. At the same time, reaching the EU's 2020 energy efficiency and renewable energy targets will not be possible without more innovation and intelligence in the networks at both transmission and distribution level, in particular through information and communication technologies."*

To upgrade and modernise energy networks, political action and rapid implementation is needed. Commissioner Oettinger has in 2011 stressed that now is the time for another "historical investment": we need smart grids across Europe now.

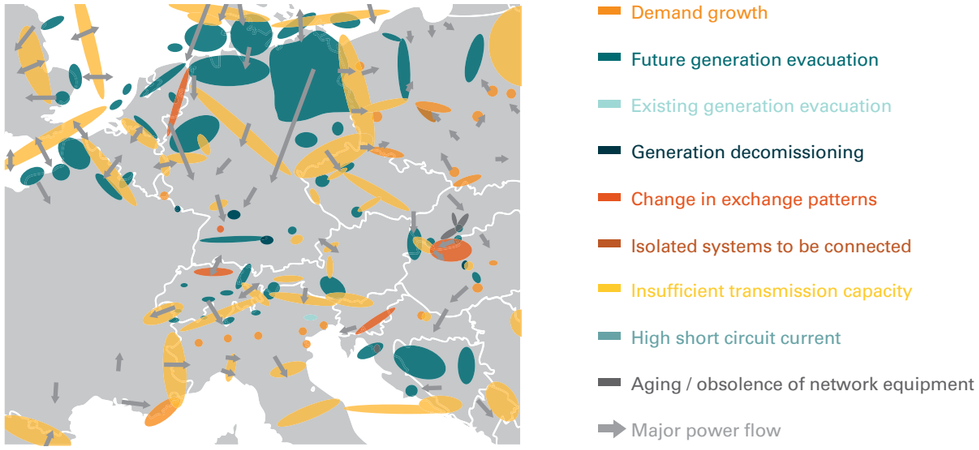
The electrical engineering industry in Europe can provide the technology for many possible changes in the European electricity infrastructure network, notably by offering the technology to:

- Upgrade and expand the existing AC distribution and transmission networks, by increasing voltage levels and power loads, reducing losses through reactive power compensation and reduction of equipment losses or by introducing hybrid systems – that are installed partially underground.
- Create a DC overlay network to transfer high amounts of electricity over long distances, by developing switchgear technology or changing AC lines to DC.
- Develop an emergency concept (cyber security, reliability, fire load etc.).
- Implement a common power management system throughout Europe.
- Establish a charging infrastructure to support the expected growth of eVehicles.

High and extra high voltage transmission networks

Europe's meshed alternating current (AC) grid network has reached its current limits and requires short-term upgrading. AC overhead line technology has been and will remain the main technology for high and extra-high AC voltage transmission lines (220 – 400 kV). That said, in sensitive areas, partial undergrounding may be applied to address local concerns.

ENTSO-E 10 year Network development plan



Source: ENTSO-E

In addition, Europe is setting is setting out to create a High Voltage Direct Current (HVDC) grid structure to transport high power loads over long distances with minimal losses. HVDC overhead technology is compatible with HVDC underground cables. Meshed grids / networks will require the use of DC circuit breakers with high power breaking capacity.

A hybrid transmission system consisting of HVAC 400 kV+ and HVDC overlay network will require state-of-the-art patterns of operation, monitoring and interoperability including converter stations.

Concrete recommendations – transmission networks:

- RD&D is to take a two-stage approach, the first stage dealing with short and medium-term achievable targets and a second stage targeting the longer-term.
- As foreseen by the Commission's Infrastructure Guidelines, permitting procedures are to be streamlined, financing is to be secured and public acceptance is to be addressed from the outset of project consideration.
- Deployment of new technologies is to be enabled including:
  - Integration of partial undergrounding in upgrading of 400kV grid.
  - Complementing 400kV grid with additional HVDC overlay grid via DC breakers and converter stations.
- Lighthouse projects should be identified for the deployment of new technologies in a larger framework.

Smart low-to-medium voltage distribution networks

With more and more renewable energy sources coming on stream, an increasingly decentralised electricity grid will be needed to allow active power distribution. Power distribution is more obviously, though by no means exclusively, impacted by the changes implicit in the basket of developments often referred to as the "smart grid".

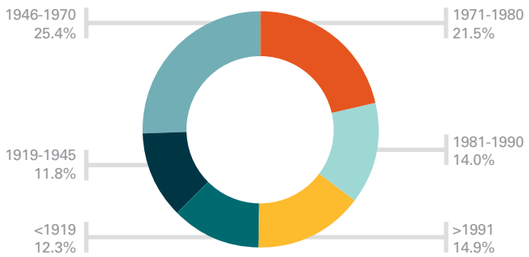
Concrete recommendations – distribution networks:

- Distribution system operators (DSOs) need to gain more experience and be supported for R&D spending in this field by appropriate regulation.
- System operations in distribution will have to evolve to a new standard in reliability as well as functionality to ensure proper reliability of supply.
- The current approach, using only cost-analyses to assess risk, penalises the highly technological changes that are required, for instance, to integrate small-to-medium sized renewable energy sources. Recommendations from the EEGI (European Energy Grid Initiative) will speed up the knowledge-sharing process among the different DSOs. For mid-to-long term objectives, what is actually indicated in the SRA 2007 should be applied.

3.3.2. Smart buildings – building installations

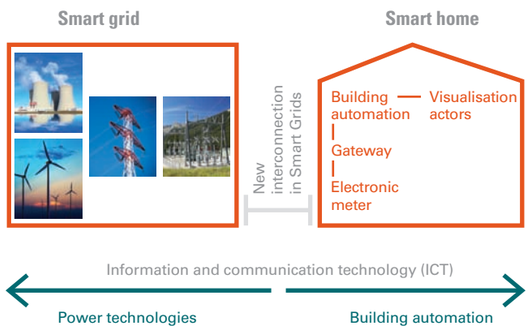
There are ever more demands on the electrical installation of smart buildings and such installations must be capable of meeting these challenges and requirements. The electrical installation will comprise the

Construction year of dwellings in Europe (27 Member States)



Sources: IGNES:based on NCB&ECB calculation, BPIE survey 2010, European Copper Institute, G&P estimates, European Environment Agency, OTB Research institute)

Demand response: One important driver for smart cities



Source: T&D Europe

energy and communication networks for the building. It has to connect new types of loads e.g. LED-lamps, heat pumps and also the re-charging of electric vehicles. Moreover it also has to connect new sources of electric energy, such as photovoltaic and fuel cell sources to the grid. These are just a few examples; the future will see more new integrated producers and consumers ("prosumers") of electrical energy emerging, which will all need to use the new electrical installations, both to connect to the grid and to provide the means to communicate with and control such systems.

Moreover, taking into account the future age pyramid, the electrical installation will have to be able to support residents who want to remain in their home for longer whilst remaining safe. The task of the forthcoming electrical installations will be to provide safe energy and vital communications.

The majority of existing installations are not able to meet these requirements!

In Europe, 75% of the dwellings stock is more than 30 years old. When a building is renovated, the focus is on energy efficiency and saving which means that the heating installation is renewed, the windows are changed and the walls are insulated. But, in most cases, the electrical installations remain untouched despite the fact that over the past 30 years the number of electrical appliances has significantly increased. The result is that many of these old installations are working at their limit.

These installations must be checked and, where necessary, updated with safe products compliant to modern European standards. This is required to ensure the safe use of electrical energy with the communications necessary for:

- Future prosumers.
- Improved protection against electric shock and fire with reduced damage and injuries or deaths.
- Supporting ambient assisted living and reducing its cost so that people are able to stay at home longer.
- Connection to the Smart Grid.

Last, but not least, making this change possible will also create jobs for European manufacturing industry and many more amongst the SME's in the electrical contracting and associated industries.

Concrete recommendations – building installations:

- Establish an appropriate legal framework for updating electrical installations (renovation & conformity assessment) with effective transposition at country level.
- Elaborating European Requirements for Electrical Renovation of Buildings.
- Require periodic control of electrical installations.
- Take into account financial support for renovation.

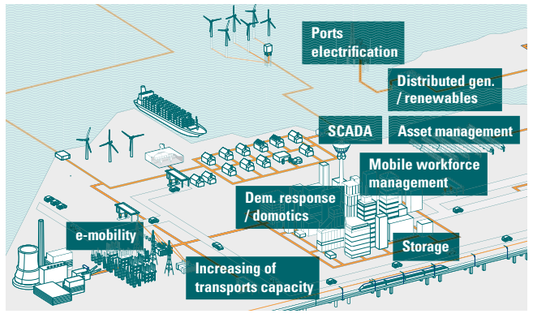
3.3.3. Safety and security infrastructures

Living, working and moving safely and securely is one of the principal concerns of each European citizen. While the European Union is a relatively safe and secure place compared to other regions in the world, greater mobility, critical infrastructures, urban developments, major events and the peaceful coexistence of many people from different origins require a political framework and actions to assure European citizens of their legitimate interests.

The planned EU Communication on the "Security Industrial Policy – Towards a strong Security Initiative" as a follow up to the recent EU-Communication on Industrial Policy recognises the strong role the security industry in Europe has to play in assuring utmost safety and security. The following has to be taken into account:

- Europe has to place greater emphasis on norms and standards and to implement them more speedily.
- Previous mental demarcations have to be overcome when analysing security matters, including questions of defence.
- An example of an as yet unsuccessful integration is the draft programming mandate addressed to CEN, CENELEC and ETSI in order to establish Security Standards, dated October 18, 2010.
- An example of a successful integration is the Notification of the Commission dated October 20, 2010 on a draft timetable for establishing the joint information scope for monitoring the maritime sector.
- EU standards and industrial policies have to take greater account of service-related considerations; these have been focused on products and systems to date.
- Establishment of a "One-Stop-Testing, One-Stop-Certification" approach in Europe where there is a requirement for such intervention.
- Putting life into the Security Label approach, proposed by ESRIF together with industry.
- Research & Development, time to market: security research should be coupled with an industry-related approach. For example, the "European Guideline Market for Security" aims to achieve a more effective inclusivity of public and private users and consumers in order to avoid erroneous technological and economic development, to promote a more intensive interlinking of research, innovation and industrial policies, including norms and standardisation as part of an innovation-oriented public acquisition policy.
- A comprehensive and systematic definition of security in industrial policies and research.
- Ensuring the transferability of research achievements.
- No security research without the participation of industry and either public users or consumer groups.
- Development of related matters (e.g. urban security) in research clusters in order to avoid fragmentation.
- Promotion of research and research establishments.
- Political support for foreign / large projects / export promotion.

Smart grid and smart city



Source: T&D Europe and ABB

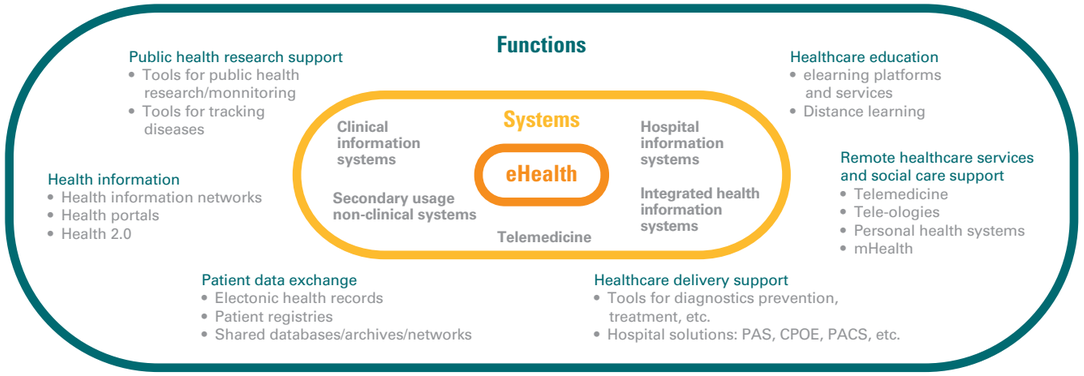
3.3.4. eHealth (including telemedicine and mobile health)

The benefits of eHealth are multiple. The European Council Conclusions on the "Safe and Efficient Healthcare through eHealth" (December 2009) recognise the "importance of eHealth as a tool to improve quality and patient safety, to modernise national healthcare systems, to increase their effectiveness and make them better adapted to meet the individual needs of patients, health professionals and the challenges of an ageing society." In addition, eHealth also improves the quality of life of patients and has the potential to reduce costs through a more efficient use of scarce resources.

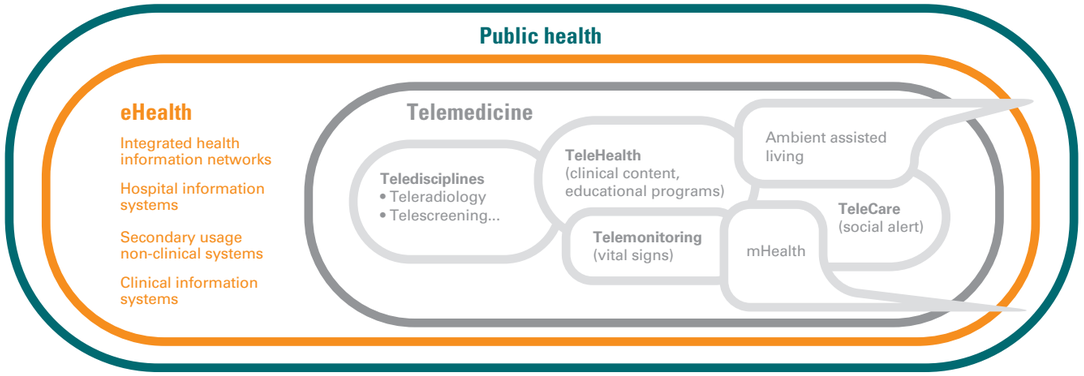
Despite these promises, eHealth in Europe remains in the starting blocks, with low deployment, limited adoption by patients and doctors and insufficient investment. Funding for eHealth is a major obstacle to its deployment. The WHO Global Observatory on eHealth report stresses that "even the most progressive eHealth policies are at risk if not supported by an adequate and complementary funding environment". The current payment systems often do not encourage care providers to invest in eHealth and do not reward providers for improving the quality of care via ICT. In addition, the costs and benefits of adopting new technologies are not shared equally among the stakeholders.

To move from the starting phase to the next level, some measures are needed:

- Define a sustainable business model for eHealth sharing the costs and returns on investment evenly among the stakeholders.
- Create an open market by fostering international user-driven standards and interoperability.
- Enable market development by providing legal clarity, building citizens' IT skills and empowering patients.



Source: COCIR



Source: COCIR

Telehealth is a growing segment of the eHealth market and presents many benefits for a better management of chronic diseases (which represent 60% of healthcare costs in Europe). Therefore, this field deserves particular attention from authorities and European Institutions.

Concrete recommendations – eHealth:

In order to foster the deployment of telemedicine across Europe, the following actions are recommended:

- Establish an appropriate legal framework to foster users' trust and confidence in telehealth.
- Strengthen cooperation between healthcare stakeholders to integrate telehealth into routine clinical practice.
- Finance large-scale projects with health economic evaluation to assess the impact of telehealth solutions.
- Ensure interoperability of telehealth solutions.
- Establish a sustainable economic model for telehealth by starting a dialogue between healthcare stakeholders (e.g. enabling the reimbursement of costs for telehealth services).

3.3.5. Information and communication infrastructures

The "Digital Agenda for Europe" is one of the seven flagship initiatives of the Europe 2020 Strategy, set out to define the key enabling role that the use of Information and Communication Technologies (ICT) will have to play if Europe is to succeed in its ambitions for 2020[2]. It restates the objective endorsed by the European Council to bring basic broadband to all Europeans by 2013 and adds a more ambitious target: by 2020 all Europeans should have access to internet speeds of 30 Mbps or above, with 50% or more of households subscribing to connections of 100Mbps.

Fibre to the Home (FTTH) broadband communications is a key technology to achieve the above objectives. FTTH offers the highest possible speeds of internet access downstream (from the network to the end user) as well as upstream (from the user to the network).

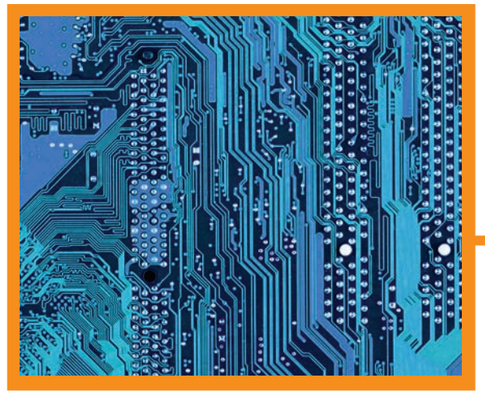
FTTH deployment will also be an enabler, providing considerable social, environmental and economic benefits. Examples of potential benefits that FTTH networks can generate include:

- Boosting economic growth and increasing the competitiveness of the community's business base.
- Enhancing a community's ability to attract and retain new businesses.
- Increased efficiency in the delivery of public services, including education and healthcare.
- Enhancing the overall quality of life of the community's citizens by increasing the opportunities for communication.
- Reducing traffic congestion and pollution.

Concrete recommendations – information and communication infrastructure:

In order to enable information and communications infrastructure technologies to leverage their full potential, we recommend focusing on the following items:

- Wide deployment of Fibre to the Home (FTTH) broadband technologies.
- Removing the fragmented digital markets.
- Addressing the lack of interoperability.
- Responding to rising cybercrime and risk of low consumer trust in networks.
- Increasing network investment.
- Increasing research and innovation efforts.
- Increasing digital literacy and skills.



2. The Digital Agenda is built upon wide consultations, in particular on inputs from the Digital Competitiveness Report 2009 – COM(2009) 390; the Commission's 2009 public consultation on future ICT priorities; the Conclusions of the TTE Council of December 2009, the Europe 2020 consultation and strategy; and the ICT Industry Partnership Contribution to the Spanish Presidency Digital Europe Strategy: the own-initiative report of the European Parliament on 2015.eu and the Declaration agreed at the informal Ministerial meeting in Granada in April 2010. All these are available at: http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm.

Smart cities combine

COMPETITIVENESS, SUSTAINABILITY AND QUALITY OF LIVING

Chapter 4. Smart Cities

4.1. Introduction

Increasing urbanisation is one of the great megatrends of our time. By 2050 there will be an additional three billion people on Earth, 70% of them living in cities[3], and these cities will be generating 80% of global emissions and accounting for 75% of the world's energy consumption. Today, many urban infrastructures are reaching their limits, for example, in relation to secure energy supply, transport, buildings, healthcare provision, safety and security, water and waste management. Given that this increase of urbanisation will predominantly (or almost exclusively) happen outside Europe with a focus on emerging countries in Asia, Africa and Latin America, a key question is how far such global development will impact the position of European industry and how the inevitable requirement to make all cities smarter can create new opportunities for European industry.

The European electrical engineering industry is developing a wide range of solutions and systems to rapidly support Europe's progress towards smarter and more sustainable, efficient and inclusive cities. Since the European Union has decided to address societal challenges in its EU2020 Strategy and Flagship Initiatives, the electrical engineering industry is committed to work with the European Commission to define the right strategies and to design the right tools to meet future challenges. Cities and urban areas will only be competitive, green and liveable when they are smart. To achieve this will require new technologies and approaches as well as the upgrading of old or obsolete systems in the fields of buildings, homes, lighting, safety and security, infrastructures (grids), transportation, health and living, water and wastewater management and other largely public services. Smart cities combine competitiveness, sustainability and quality of living, the three elements being intimately entwined. A smart city will be a "System of Smart Systems" addressing the different areas listed above.

The development of a smart city needs a collaborative approach in terms of governance and technologies. The electrical engineering industry believes that cities are where there is the closest link between government, firms, universities and citizens, and this justifies the involvement of industry in supporting the development of the "Smart Cities" objective for Europe.

4.2. Opportunities and Challenges

Opportunities

- Inclusive, competitive and sustainable cities.
- Smart SMEs.
- Sustainable growth in Smart Cities, creating business opportunities for the European electrical and electronics industries both in Europe and globally: by supporting the development of better places in which to live and work, more productive business etc…

Challenges

The challenge is how to make cities and urban areas competitive, through different vectors:

- European cities are generally mature and largely require the renovation of existing infrastructures in all domains and associated appropriate funding.
- The complexity of working around existing infrastructures is one of the main challenges.
- Available space in cities is usually constrained and noise and security are key issues.
- Many urban infrastructures have reached their limits, for example in relation to secure energy supply, transport, buildings, safety and security, water and waste management and healthcare.
- Significant improvement of large data management infrastructures requires higher intensity on ICT with the aim of achieving real-time control of cities.
- ICT networks with high-speed broadband connections are needed to underpin information flows and boost city economies.

4.3. Concrete Recommendations – Key Messages

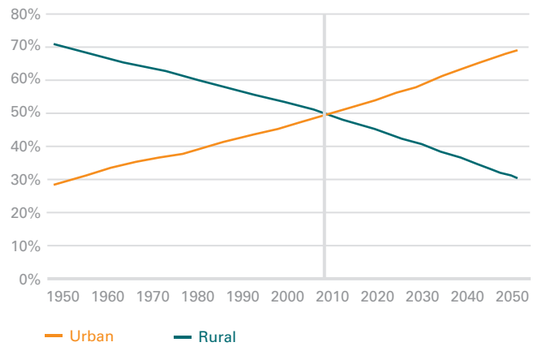
4.3.1. Built environment

Developing Smart cities in Europe and across the wider world requires attention to the "built environment" and not only buildings themselves.

Smart buildings

Europe is today the leader in green building technologies and has a fair chance of increasing its presence on a global scale. New "intelligent" building management systems help to reduce energy costs and CO_2 emissions by 20-30%. Building automation systems

Percentage of world population



Source: United Nations

3. Increased urbanisation is a fact that sets the world at a cross road. The partition between urban and rural population will tilt towards cities with a steep increase of urban populations in the upcoming decades, leading to tremendous challenges including energy security in cities, transportation, waste management, and access to water. It is self-evident that meeting these challenges will require cities to become "smart" and to apply a whole new range of actions to accommodate such changes in an environmentally and socially sustainable way.

(BAS), intelligent networks of electronic devices, that monitor and control the energy supply, lighting systems, heating, air and water management as well as security systems (e.g. concerning fire safety or toxic substances) in an integrated network are significantly reducing maintenance and energy costs. In addition, Smart financing instruments, such as performance contracting, allow the financing of relatively ambitious minimum requirements in terms of energy performance of buildings.

Concrete recommendations:

- Europe must address existing buildings' needs by setting a clear roadmap of renovation targets to be achieved by 2020, 2030, and 2040, respectively, notably for public buildings.
- Encourage convergence and harmonisation of calculation methodologies and criteria (KPIs).
- The regulatory framework in Member States, especially in relation to public procurement, as well as administrative structures proposed by the European Commission for improved capacity building must be improved so as to make use of the full potential of performance contracting.
- Foster certification of minimum cost-effectiveness via life-cycle cost controlling, focusing especially on the management of different types of energy usage.
- In the context of safety and security, harmonisation of building codes / codes of practice and the introduction of standardised application guidelines should be promoted.

Smart home

A smart home not only means being connected to the Internet, providing remote access to and control of domestic systems, or having a smart meter. What makes a home "Smart" is the possibility of having devices that can receive externally input data and instructions, from both inside and outside the home, and transform this into useful functions and information for end-users or other devices and systems that may be present in the home. Smart Homes can provide benefits in several areas, such as active energy management, technology-assisted living, flexible homes with fully functional home office and the integration of electric vehicles:

- *For active energy management of the home,* we consider that better-informed consumers will behave more responsibly towards their energy consumption[4,5]. A smart home with the right kind of devices, able to anticipate energy consumption patterns, can play a key role in increasing the level of awareness of consumers and thereby in contributing to a reduction in energy consumption. It is also expected that load shifting and differentiated tariffs can lead to reducing energy costs for the user. Managing energy consumption is heavily dependent on the creation of an interoperable system, which allows electronic home or building systems present in the smart home to communicate with the external world. Information and communication technologies (ICT), and especially software, are the embedded link mechanisms to ensure interoperability of different solutions available to the end user.
- *Technology Assisted Living at home:* the number of people aged over 65 will increase significantly over the next 20 years. Technology can assist them to live in their own home for longer. Assisted Living depends on much the same technology and equipment as is used for home automation for security, entertainment and energy conservation, but tailored to elderly and disabled individuals.
- *Flexible homes, fully functional home office, and electric vehicles:* homes need to be organised in a flexible way and be able to meet the needs of all ages and family compositions. Working from home is increasingly popular and avoids transport energy and emissions. Moreover the expected development and growth of the eVehicle in Europe will equally require appropriate infrastructure in homes and will need adaptations in some homes for smart and safe charging.

4. As exposed in the European Commission's Communication on Smart Grids, consumers tend to change behaviour and save energy if exposed to their energy consumption.
5. ESMIG report Empower Consumers

Concrete recommendations:

- Set minimum requirements for the energy performance of new public and private dwellings.
- Promote renovation of existing dwellings.
- Stimulate the emergence of open, interoperable and safe communications protocols (including data models) to facilitate the integration of electrical features in homes (European standards as foreseen by mandates 441 and 490).
- Promote the deployment of Demand Response and Time-of-Use tariffs to take full advantage of the benefits offered by Smart Grid and Smart Homes.
- Europe's housing stock is ageing and the current electrical installations are largely insufficient. To realise capacity and peak power improvement, increased control of the energy flows and electrical safety, Member States should encourage renovation and upgrading of the electrical installation in homes. This should integrate new electrical applications and functions offering better energy management, comfort and safety.
- Ensure that smart financing tools are available to support investments in smart technologies and products for the home.

4.3.2. Lighting

Lighting and lighting control technologies have undergone major evolutions in the past decade offering cities new perspectives and possibilities for, the development of their urban lighting strategies. Natural daylight is essential for life. In cities, artificial light is needed to help citizens fulfil their visual tasks, since daylight is not available everywhere and at any time. Light affects our mood; improves well-being and biological processes. Light stimulates productivity and accommodates the 24-hour-lifestyles, ensuring safety and comfort for all age groups, including the ageing population.

Concrete recommendations:

- *Use lighting only when it is needed thanks to intelligent lighting systems,* which can improve citizens' quality of life and help cities to save more than 40% of energy. Intelligent lighting systems are exploited best when the lighting is properly designed, installed, operated, maintained and controlled.
- Increase the renovation rate of existing indoor and outdoor lighting in cities with the latest intelligent lighting technologies, systems and solutions as the annual refurbishment rate is slow at typically 5%[6] and the existing schemes are inefficient and old[7].
- Accelerate the switch to the latest LED (Light Emitting Diodes) lighting technology. In order to achieve implementation of the EU Green Paper "Lighting the Future, accelerating the deployment of innovative lighting technologies" (COM (2011) 889 final), we recommend the launching of a European Solid State Lighting network including the whole value chain.

4.3.3. Safety & security

Urban areas are faced with specific problems concerning safety and security, including crime and violence, fire, terrorism, forced eviction and insecurity of tenure and natural disasters. In the event of an urban infrastructure emergency, the optimal measures need to be taken in order to minimise negative impacts on citizens, assets and the economy. This focus is especially relevant to public alert and mass notification systems and the provision of detailed information on the incidents causes and effects.

Industry and others have put considerable effort in establishing pan-European standards for products, systems and services which allow pan-European certification and conformity assessment where this is a requirement. Moreover, the quick adoption of a single market-based EU-wide testing and certification scheme may be necessary. Public-private partnerships with tailored liability terms for the protection of critical infrastructures should also be considered in this context. What is more, regulations for training and practice exercises for safety and security system providers and operators are key. Like a vehicle testing certificate, building systems' safety and security installations and operations may be audited and serviced regularly.

Concrete recommendations:

- Promoting pan-European standards for products, systems and services and of the integration of all infrastructure information systems.
- Encouraging the introduction of a Europe-wide testing and certification scheme where the markets requires such procedures.
- Give industry the responsibility for taking care of maintaining and adapting the installed systems.

4.3.4. Smart grids

A Smart City cannot be smart without properly addressing the smart grid process. Many areas in cities require state-of-the-art technical and integrated solutions. The management of smart grids and associated services needs to be planned in advance and also the competencies of those bodies designated to run future systems.

We consider that the issue of smart grids must be tackled with a holistic approach that not only focuses on individual components but on the whole, integrated system. It is essential then that there is overall strategic legislation guaranteeing that all grid components can communicate with each other with the aim of reducing GHG emissions, increasing energy efficiency and making cities truly smart. Smart grids can provide benefits in several areas such as:

6. 7% for indoor lighting and 3% for outdoor lighting.
7. 75% of existing lighting installations in buildings are older than 25 years & 33% of existing street lighting technology is older than 40 years.

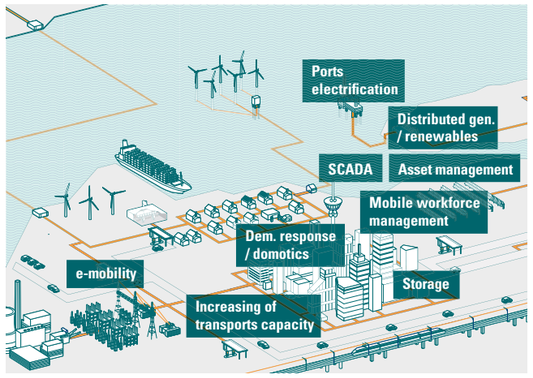
- The balancing of the whole energy system (high, medium and low voltage), especially via energy storage capacities. Balancing all the distributed consumption / generation units will require a flexible, intelligent and optimally-controlled grid connected to smart buildings, homes, lighting, transport systems in a new bi-directional energy system.
- Current energy requirements in a smart city will impose on future electrical systems the need to fulfil, at any energy demand conditions, the following conditions: capacity, reliability, efficiency and sustainability. Battery Energy Storage Systems (BESS) provide such an ability to balance power demand and supply, thus contributing to the stability of the network parameters like reduction of electric surges and sags, maintenance of power frequency and ensuring power remains available for critical loads when power outages occur.

In addition, certain applications can also provide enough power to maintain operations until systems can be systematically shut down or provide enough power until backup or alternative generation comes on-line. Energy storage solutions[8] additionally afford several strategic benefits such as improved flexibility for grid operators, increased national energy security, and reduced environmental impact.

Concrete recommendations:

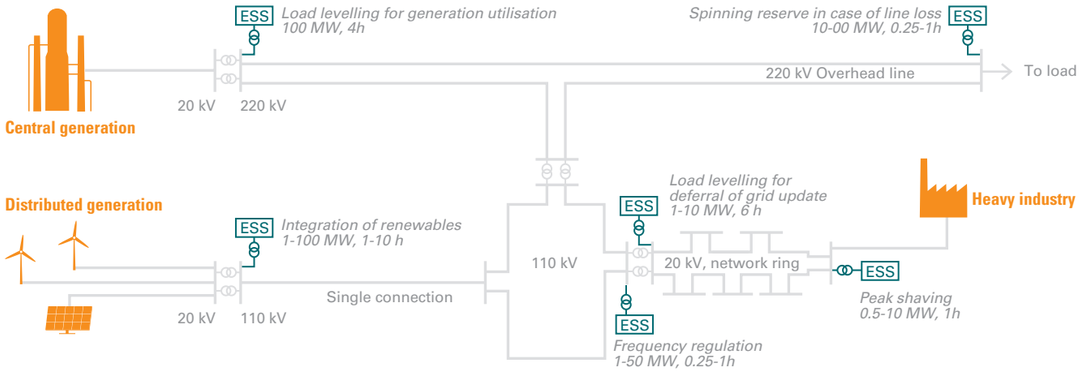
- Extend demonstration pilot projects connecting smart grids with smart cities projects, supported by public financing, identified in the EEGI (European Electricity Grid Initiative) and sponsored by DG Research and Innovation.
- Encourage politics, industry, citizens and civil society to cooperate on agreement for a hard commitment to infrastructure changes.
- Major education and training programs to be established across the EU.
- Sponsor standardisation for interoperability of SCADA (Supervisory Control and Data Acquisition) and allow for economies of scale, including a regulatory framework for inserting current proprietary communications protocols into future interoperable Smart Grids.
- Promote Electrical Energy Storage technology that enables the effective integration of Distributed Renewable Energies with consequential dispatch of distributed resource so allowing true demand response, satisfying both peak demand and the end user needs.

Smart grids



Source: T&D Europe and ABB

Battery energy storage systems, applications in transmission and distribution grids



Sources: ABB

8. Hydrogen fuel cells may be considered as battery energy storage systems. See: The written declaration on establishing a green hydrogen economy and a third industrial revolution in Europe, through a partnership with committed regions and cities, SMEs and Civil Society Organisations, 12/02/2007, European Parliament.

4.3.5. Transportation

Urban mobility

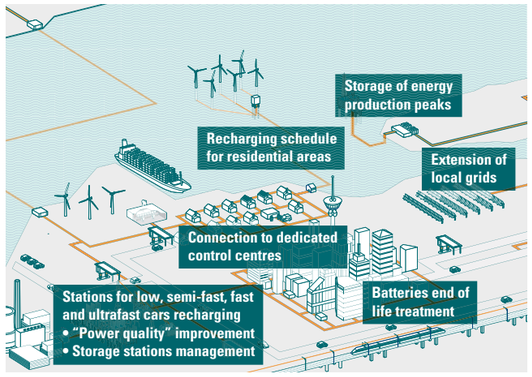
Urban mobility is essential to productivity, health and quality of life within a city[9]. Cities need an improved network of intelligent transport systems that are accessible, secure, reliable and sustainable, without curbing people's mobility. There is however still a strong need for public funding and standardisation in transport to create a truly integrated single market in transport. Europe is well-placed in worldwide competition in the electrified mobility sector, but to retain this position Europe must launch further major research programs, especially in the area of electrified transport, including rail and eMobility. Electrification of transport also has the biggest potential in the short-distance environment of a city.

A significant advance in battery technology is essential to lower the cost and increase the performance of eVehicles in future years, as is the build-up of electrical energy infrastructures and charging systems. An electric car can simultaneously serve as both a means of transport and as a mobile energy-storage device.

Concrete recommendations:

- Clear and overall emission reduction targets should set the primary goal for transport policy.
- To meet the requirements of operators regarding product liability, it is necessary to open the maintenance market to reinforce competitiveness of the rail industry.
- "Horizon 2020" should prioritise appropriately the technological challenges of e-mobility, both in road transport and railways.
- Governments can accelerate the transition towards eVehicles by creating economic incentives for consumers and supporting research capabilities, including SMEs.

eVehicles

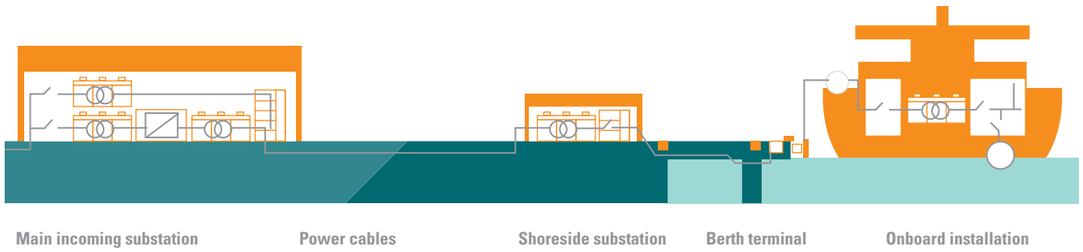


Source: T&D Europe and ABB

- The CEF (Connecting Europe Facility) is the right tool to push for the further development of eVehicles. It is important that the future eVehicle is able to connect with smart grids.
- The large numbers of eVehicles expected in cities will demand the planning and installation of dedicated energy infrastructure and service systems. The connections between the existing systems with the new areas requiring investment (see figure above) create a need for future infrastructures based on Smart solutions, assuring energy efficiency and proper quality standards. To achieve this, it is envisaged that there will need to be smarter cooperation with the industry sector investing in the dedicated areas supported by dedicated demonstration projects.

9. In Europe, traffic congestion costs the EU over 1 percent of GDP, or over €100 billion per year. Moreover, about one quarter of the EU´s greenhouse gas emissions in 2008 was caused by Transport, of which 71.3% can be attributed to road traffic.

Smart ports & harbours



Source: ABB

Smart ports & harbours

Ports and harbours are the main economic assets for many cities, irrespective of their dimensions. Over 90% of the world's goods are transported by sea, and the efficiency of the European ports will be a positive asset for the future European integrated economic system. Large cities are addressing the issue of better and more competitive ports. Getting "Smart harbours" may be an asset and may have an impact on local pollution (especially for health and noise) if specific measures in terms on CO_2 emission and energy efficiency are addressed.

Depending on the size and the traffic of a harbour, it may be regarded as a small factory in terms of electricity consumption. There is now an answer to the challenge of mitigating emissions from ships whilst they are in port. Instead of running diesel generators onboard, ships should draw power from a connection at the quayside. The port load itself can be used to help stabilise the grid system in Europe if there is a dedicated Integrated Transmission System for renewable energies.

Concrete recommendations:

- Disseminate the best practices of energy efficiency and CO_2 emission in harbours across Europe.
- Stimulate necessary investments in the electrical infrastructure to cope with the new elements of a smarter grid.

4.3.6. Water & waste management

Water

The issue of "water" must be seen predominantly in the context of resource efficiency, driven also by the linked issues of energy efficiency and climate change. First, water supply and treatment are major users of energy[10]: The electrical energy used in water distribution pump systems represents about 7% of electrical energy used in a city. As many systems are outdated and obsolete, there is a potential energy saving of 30%-50% by using the latest high efficiency technologies for motors and drives. Second, cities are also major users of water and as pressure on water resources around the world increases, there is a growing need to reduce water usage and increase water re-use, including in the usage of technologies and energy production.

The European electrical engineering industry is a leading provider of water and wastewater solutions for industries and municipalities to help them reduce energy consumption, recycle and reuse water, minimise water leakage and reduce life-cycle costs. The European electrical engineering industry thus helps to achieve the targets of the Waste Water Treatment Directive[11] and related legislation and consequently increases secondary and tertiary level wastewater treatment. There are increased levels of secondary and tertiary level waste water treatment in response to the Directive but much remains to be done.

10. Approximately 30%-35% of pumps globally are sold to the water industry and there are large potential energy savings to be in water pumping systems. Energy represents 60% of the cost of water pumping stations, 45% of water treatment plants and 50% of waste water treatment plant – Figures from ABB.
11. Council Directive of 21 May 1991 concerning urban waste water treatment (91/271/EEC).

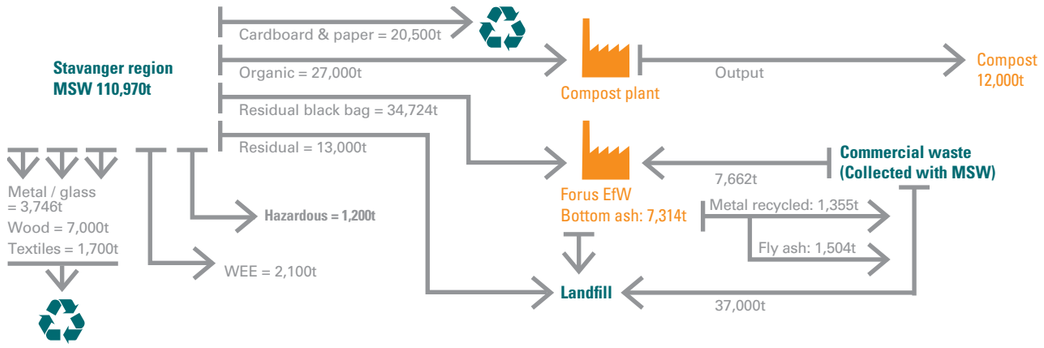
Waste

Cities contain a majority of the population and produce a majority of the waste[12]. Increasingly, cities are looking to collect waste and sift out what can be recovered or recycled and burn the remainder to provide heat and power. The objective of these schemes is to maximise the re-use of what were once waste streams and minimise the flow of waste to landfills[13]. Such a policy would reduce our dependence on imported raw materials whilst adding value to waste streams. Businesses do not expect governments to control the prices of raw materials and must accept and deal with those risks. However, it is vital that, as cities become increasingly interconnected and depend on complex interactions between business streams, then city authorities will need to regulate in a holistic manner and consider the effect of their regulations on all aspects of the city infrastructure.

Concrete recommendations:

- The water system in a city is of vital importance and needs to be addressed with proper management policy and attention to its efficiency in a broader sense.
- City authorities should actively promote zero waste schemes and engage positively with the companies developing them. This would include support for planning consents and placing contracts granting access to waste streams.
- The Commission, governments, local authorities and regulators must consider changes to regulations in a coordinated fashion and ensure that changes to policies do not have unintended consequences.
- The effectiveness and value of such waste projects is increased if waste is collected via kerbside, dry recycling techniques. This requires local authorities to organise waste collection appropriately and promote these to the public.
- The requirements of the Urban Wastewater Treatment Directive should be fully met across all EU27 countries and energy costs should be minimised by requiring a life cycle approach to the resign and refurbishment of this plant.

Waste flows



Source: ENER-G Holdings plc

12. According to Eurostat figures, there was 256 mt of municipal waste from the EU 27 in 2009; 95 mt of this went to landfill and 51 mt was incinerated, 41 mt with energy recovery. Increasingly this waste stream is seen to be a resource, rather than a problem (See Zero Waste Edinburgh and Midlothian and Zero Waste York for examples).
13. This approach has been recognised by the European Parliament which called for the Commission "To have a consistent policy of urban mining that aims to recover and to make available such a resource of valuable raw materials and to promote the new skills and jobs related."

Sustainable transportation systems *rely far less on* **fossil energy** *and more on electricity produced from* **clean and low-carbon sources**

Chapter 5. Smart Mobility

Smart mobility enables the movement of people and goods in an efficient and comfortable way while minimising the environmental impacts (energy consumption, air emissions, noise, use of space, safety). Different modes co-exist and are used at their optimum: aircraft for long distance travel, railway systems for high-capacity traffic to connect cities together and create the backbone of urban transportation systems, buses for public transportation with smaller flows and individual transportation (cars) for journeys where public transport is not efficient as well as to reach the stations and complete the "last kilometres". Soft modes such as cycling will also be developed with the reallocation of public spaces for usages other than road.

The optimum utilisation of a transport system is achieved through the development of efficient communication and information systems that allow passengers to make good decisions in real-time based on the options available at that moment. The increased use of smart phones and mobile communication systems will support this move.

Sustainable transportation systems rely far less on fossil energy and more on electricity produced from clean and low-carbon sources. The local energy mix and means of production can vary significantly and influence the impact of electricity use for transportation.

The scenarios presented by the International Energy Agency (IEA) to halve the CO_2 emissions from transportation rely essentially on a modal shift to public transportation, significant improvement in energy efficiency for all types of vehicles and systems and the emergence of new fuels (such as biofuels, hydrogen, electricity from low carbon sources and hybrid energy).

Public transportation systems allow a significant reduction in the energy consumption, the space used and the CO_2 and other emissions per passengers. They are also key to containing the environmental impacts of increased demand for goods and passenger mobility. Reliability, cost and comfort are key to providing attractive options and allowing public transport to play its role in passenger traffic solutions.

Energy efficiency improvements are still required:

- At the vehicle level (motors, weight reduction, auxiliaries like air-conditioning).
- Through improved operational conditions (consumption reduced in sleeping modes, eco-driving).
- At the system level, through the maximisation of recovered energy like braking energy for electrical motors and the reduction of losses in the infrastructures.

Furthermore systems that collect and analyse data efficiently will allow traffic operating conditions to be adjusted on a continuous basis to further improve energy efficiency.

Concrete recommendations:

- Standards should be set for the energy efficiency of vehicles and systems: all types of vehicles and systems (cars, buses, planes, trucks, railways) should have energy efficiency targets that are regularly updated and that are flexible enough to allow continuous development. These modes should be supported by energy efficiency measurement standards that allow the benchmarking of available market solutions and which support buyers in integrating energy efficiency into their decision-making.
- The use of the environment and public space should be priced: charges for pollution, congestion and safety should be encouraged as a way to support the development of the transport options that have less impact.
- The development of infrastructures should be supported: infrastructure costs often prevent the development of the most efficient public transportation solutions. Funding schemes should enable cities to develop their public transportation projects optimally. Environmental and social criteria could be integrated into the selection criteria for publicly funded projects.
- Smart mobility innovations should be supported: innovation is key to finding solutions that deliver the best mobility services with the minimum impact on the environment. Initially, energy-efficient solutions, alternative fuels, innovative information systems will have a market price that will prevent their development. Fiscal deductions and bonuses for switching vehicles or systems (to more energy-efficient choices) will be a strong incentive in the early stages of the development of new products and help them reach maturity and achieve a viable economical price through increased sales volumes and competition.

Other topics to be addressed include:

- Telematics.
- Hybridisation of highways.
- High-speed trains.
- Galileo satellite navigation system.
- Combination of different mobility solutions (plane, train, car, eMobility).

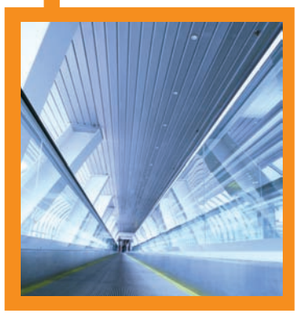
eMobility

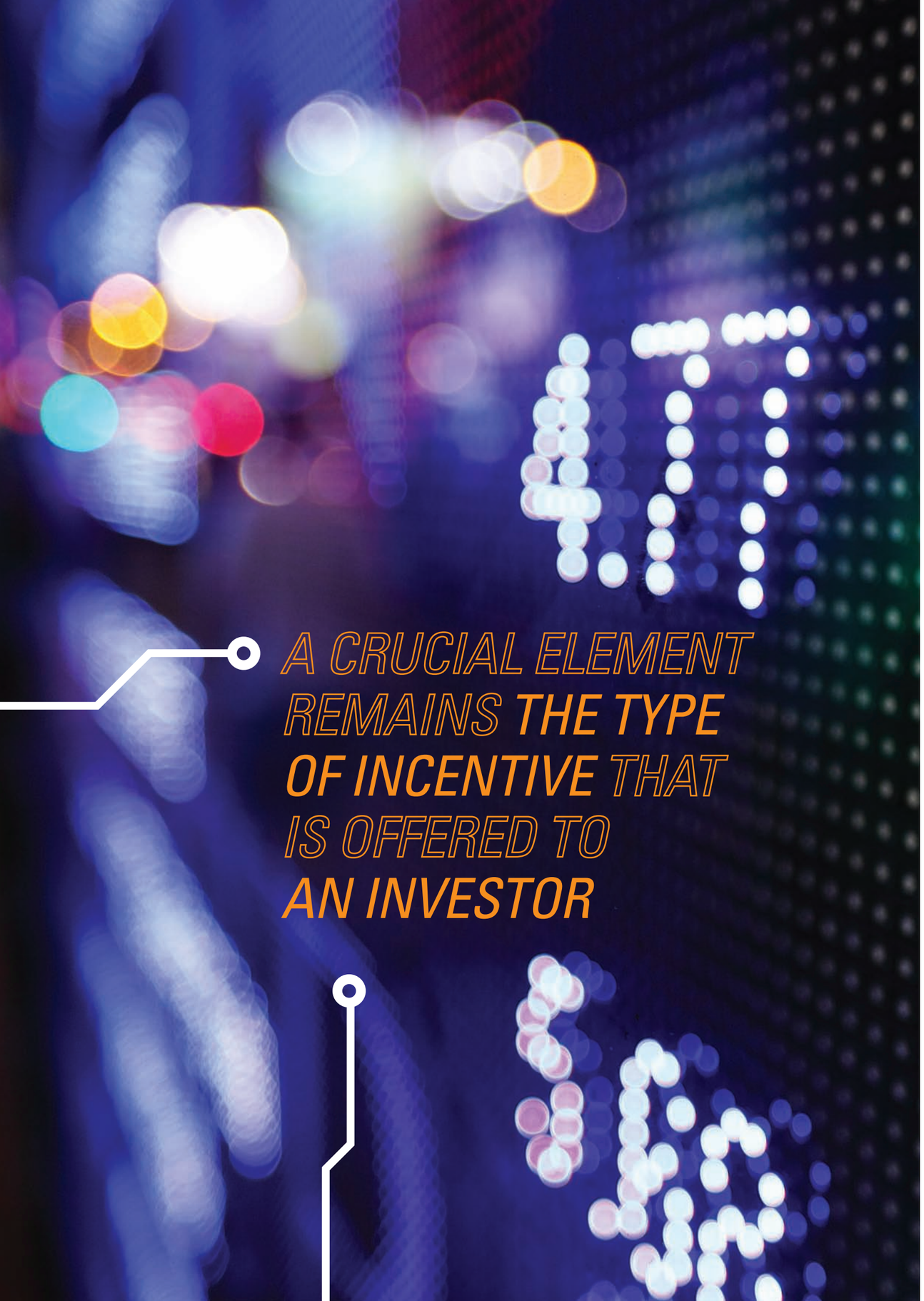
eMobility is one of the key solutions for our modern times. EU policy makers see the opportunity to combine several political objectives in this area: climate protection and energy efficiency, stronger independence from other regions in the world, cleaner cities and cleaner vehicles, and creating future infrastructures in Europe while at the same time enhancing Europe's international competitiveness. A number of recent EU documents and policies refer to eMobility: the Europe 2020-strategy, the Industrial Policy-Communication, the EU Transport White Paper, EU energy and smart grid policies, the EIP Energy Infrastructure Program, the Clean Vehicles Strategy, and several EU funding programmes. Moreover, the Cars21-initiative of the European automotive industry provides further input into the debate.

The electrical engineering industry is the only industrial sector involved that possesses system level expertise in all parts of the electromobility system chain – from power generation and the transport and distribution of electric power and batteries, to the control-and-drive elements fitted to vehicles. The electric car is part of the new world of energy. eVehicles and the electric charging infrastructure must be regarded as part of this whole new system. Electromobility, as such, is a new concept of mobility, including electric vehicles, eBikes and a new infrastructure, which together give Europe an opportunity to combine the strengths of different transportation modes. eMobility is also the test case for the smart grid in Europe.

The issues are:

- Mobility trends and visions for the future.
- Economic impacts of eMobility.
- Battery technologies.
- Charging infrastructure solutions for Europe.





Chapter 6. Smart Financing

6.1. Introduction

6.1.1. General

If the financing dilemma remains the core restraint on the modernisation of infrastructures using low carbon technologies, one of the less obvious supplementary problems is energy efficiency – but even where the technologies for achieving this exist, investment is rather limited. This is all the more surprising because, in most cases, the payback period for such investment is fairly short and, typically, much shorter than the lifetime of the assets needed to achieve energy efficiency. In respect of this, money is part of the solution, but not all of it.

A crucial element remains the type of incentive that is offered to an investor: infrastructure investment in its widest sense is concerned not only with theory, but also with actual behaviour change among leaders and citizens: so incentive frameworks are especially important. Creating proper incentives, including taxes and subsidies, information on how to operate effectively in a private-public partnership mode, etc involves defining new concepts that are economically viable and that effectively align the goals of policymakers and private partners. In the present analysis we consider the overall perspective in the EU but we also go into more detail in Annex, which deals at a microeconomic level with the so-called "smart city" concept, which, besides elements such as education, security and e-health, includes those areas that are in the focus of this report: buildings, electricity production, electricity distribution, vehicles and transport infrastructure.

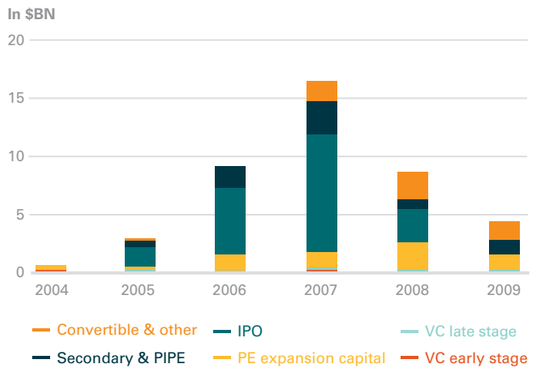
6.1.2. What are the drivers for financing the smart city?

The key issues for encouraging the development of the smart city are clearly policymaking and its impact both on the supply of goods and services in the market and demand for these created by pricing policy.
As a consequence, the amount of capital available for developing Low Carbon Technologies (LCT) has risen sharply and we can see that a significant shift in venture capital investment towards cleantech is underway. However, financing of LCT is volatile and shows a high degree of correlation to investor confidence and the global economic outlook.

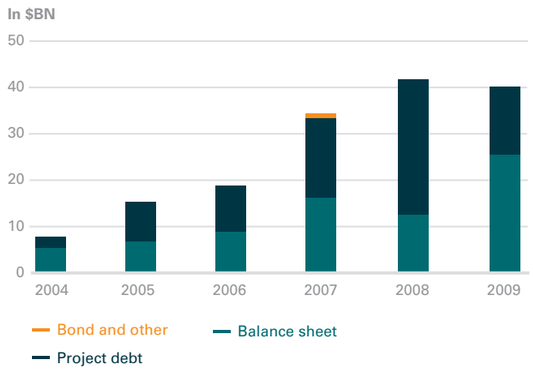
6.1.3. What are the challenges?

The prime challenge that the move to the LCT involves is the sheer volume of investment required, which is estimated at 2.9 trillion euro for the period 2011-2020. As a result, existing models for financing infrastructure investments are inadequate. So, new models and approaches are necessary. In this chapter we will examine and propose different elements of the solution, notably the integration of both public and private money with other public funds – which today is in short supply – acting to a large extent as the catalyst for private investment through the establishment of public-private partnerships. This is already happening – although not yet to the extent necessary to reach the 20:20:20 policy goals set by the EU. For example, since 1990, more than 1.400 public-private partnerships, representing nearly €260 billion in capital, have been established across the European Union in support of the goals of Smart Cities[14].

Development capital ($BN) in Europe between 2004 and 2009, by financing stream – Europe (EU25) only



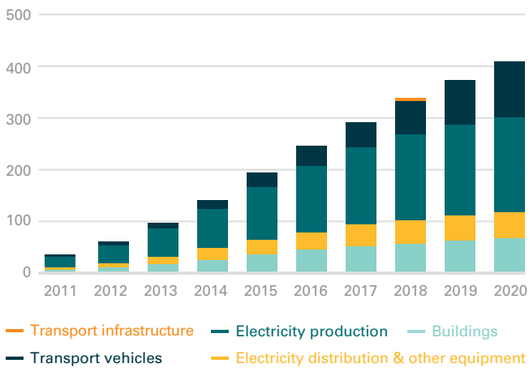
Capital raised to fund assets($BN in Europe between 2004 and 2009 by financing stream – Europe (EU25 only)



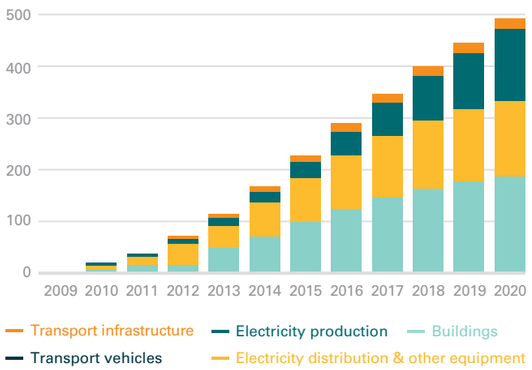
Source: Accenture

14. Andreas Kappeler and Mathieu Nemoz, "Public-Private Partnerships in Europe – Before and During the Recent Financial Crisis," European Investment Bank, Economic and Financial Report 2010/04, July 2010

Cumulative annual emissions savings ($MT\ CO_2e$) – in Europe (EU25)



Cumulative annual cost savings ($BN) – in Europe (EU25)



Source: Accenture

Among the principal challenges to be faced are:

- Unlocking access to LCT finance through capital markets and "green bonds".
- Financing energy-efficient and micro-generation assets through leases.
- Creating new investment vehicles for LCT asset management.
- Investing equity in LCT assets and developers.
- Developing advisory services to improve LCT sector risks and assessments of opportunities.
- Providing a long-term and stable commitment to incentives that support the commercialisation of LCT.
- Leveraging public funding to stimulate private sector investments.
- Developing standards for asset-backed securities funding LCT assets and "green bonds".
- Developing the capabilities to provide LCT asset-backed securities.
- Setting up dedicated investment funds to give investors strategic exposure to the LCT sector.
- Increasing primary equity and debt contributions in LCT assets and developers.
- Providing debt financing for energy-efficient and micro-generation asset leases.
- Developing technical, regulatory, financial and commercial expertise to support the risk assessment of LCT assets and developers.

6.1.4. What are the savings from 2011-2020?

Electricity production from low carbon sources is expected to drive emissions reductions in the first half of this decade as uptake is growing rapidly. By contrast, the second half of the decade is likely to see an acceleration in savings from technological advances in alternative fuel and electric vehicles as adoption becomes more widespread. At the same time investment in the modernisation of buildings should continue steadily.

6.2. The Sources of Capital

LCT financing is generally segmented between Development capital and Procurement capital:

- Development capital is associated with financing the operations (R&D, production and commercialisation) of companies developing technologies. Development capital includes banks' provision of equity and debt, for example to a company whose products or services are core to the LCT value chain.
  Development capital is necessary to drive innovation, product enhancement and operational efficiency in LCT. In general, development capital only attracts interest from corporate and investment banks when companies reach growth stage, i.e. commercialising products for the mainstream market. Earlier financing streams rely on venture capital and private equity investment primarily from dedicated companies.
- Procurement capital is associated with financing LCT asset procurement. It refers to financing the purchase and installation of LCT assets.

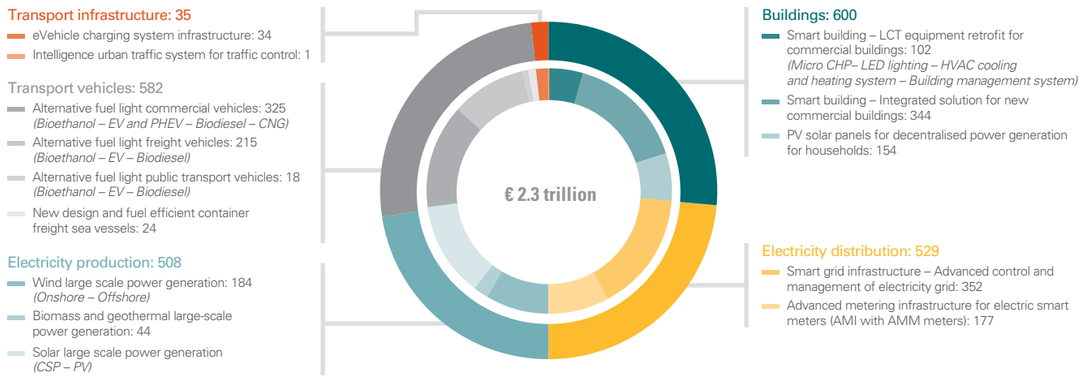
Creating supply and demand for these two types of capital requires different stimuli and support measures.

6.3. Capital Needed

6.3.1. General

What is the capital needed to deploy a range of LCT in Europe between 2011 and 2020 to realise the "smart

Cumulative procurement capital 2011- 2020



Source: Accenture – Carbon capital financing the Low Carbon Economy in the European Union

city" and what are the associated carbon and energy savings? This is best summed up in a chart:

In Europe (EU 25), between 2011 and 2020, the above commercially-viable LCT applications would, according to Accenture, require a total of €2.3trillion in procurement capital and €0.6trillion in development capital. This will enable carbon savings equivalent to 2.2 Gt CO_2e and cost savings equivalent to €261bn cumulative over the period 2011 to 2020.

6.3.2. Procurement capital

The largest share of capital needs to be allocated to buildings for retrofitting LCT equipment, constructing smart buildings and decentralising energy production. This is due to the high cost of retrofitting buildings and the fact that smart buildings command a premium price (estimated between five to seven per cent of total construction costs). In addition, the cost of generating power from decentralised solar PV is expected to remain high, given the premium of installing roof-mounted PV over large-scale solar projects (estimated at 25 per cent of non-roof-mounted PV) and the high per MW cost of producing energy from solar.

Solar PV is the most capital-intensive technology within the range of LCT reviewed, and will require up to €365bn invested in procurement. This is driven from a high cost of technology (five times more expensive than onshore wind), a low ratio of production to capacity and a high adoption rate forecast.

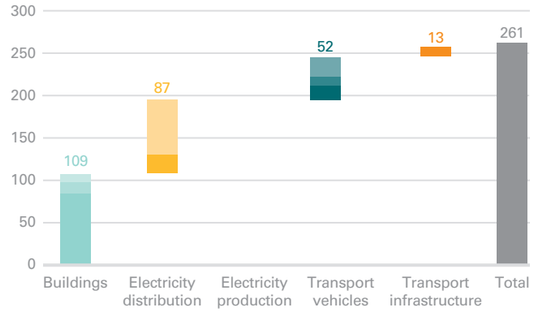
Smart grids, essential for managing intermittent power and decentralised energy production, will require €352bn in investment. The cost of smart grid infrastructure is spread across back-up electricity storage units, upgrading electricity substations, implementing central information management systems and additional network improvements.

We expect the uptake of eVehicle charging to be concentrated in dense urban areas and estimate that €34bn will need to be invested to fund the infrastructure.

6.3.3. Development capital

Alternative energy from wind and solar will require an overwhelming 66 per cent share of all development capital required by the sector.

Cumulative cost savings on energy 2011-2020 (€bn) – in Europe (EU25)



Source: Accenture

In other less mature sub-sectors, development capital will remain essential to help emerging technologies to reach a more mature stage. Investment in these sectors is likely to be dominated by venture capital, private equity and initial public offerings.

6.3.4. Markets

In the long version of the report we provide comments on the above breakdown with a focus on the following areas:

- Buildings.
- Electricity distribution.
- Electricity production.
- Transport vehicles.
- Transport infrastructure.

6.4. Financing Technology Development and Procurement

6.4.1. General

Of the €2.3 trillion of procurement capital required, an estimated 73 per cent will be funded externally by entities purchasing LCT equipment or infrastructure, with most of this external funding being provided by corporate and investment banks, either directly or acting as intermediaries.

The provision of primary debt through asset leases, asset finance – term loans and project finance debt will apply to an estimated €1.4 trillion of procurement capital, representing 61 per cent of the total investment required for purchasing LCT.

Equity provision to support the growth and development of LCT providers is expected to provide €348 bn in development capital – 59 per cent of the total development capital required. The remaining development capital will originate from debt.

6.4.2. Analysing existing capital flows to forecast future growth

Channelling €2.3 trillion of procurement capital and €0.6 trillion of development capital into LCT in Europe between 2011 and 2020 represents a major financing challenge as well as a significant opportunity if supportive policy frameworks, reduced technology risk and investor appetite combine to create a favourable environment for deploying capital for this purpose.

6.4.3. Barriers to capital provision

The inflow of capital remains markedly below the minimum level expected will be necessary to achieve widespread adoption of smart cities in Europe.

There are significant barriers that are preventing capital provision at the levels required across the whole spectrum of financing sources, from early-stage companies developing innovative technology, through to large infrastructure assets with mature technologies such as onshore wind. Two of the most significant barriers are policy uncertainty and restrictions on capital lending:

- Policy uncertainty: the public sector has invested heavily in LCT at both local and national levels. In the $537bn European stimulus package set out in 2009, $54bn, or 10 per cent, was allocated to "green" initiatives and infrastructure. However, stability and long-term public commitment of LCT incentives and carbon policies, whilst critical, are yet to be achieved. Moreover national governments are under pressure to reduce sovereign debt, which has led to drastic cutbacks in public spending, impacting on LCT investments.
- Restrictions on capital lending: governments have been encouraging aggressive lending targets for banks to support economic growth, e.g. SME lending targets. However, at the same time, banks are also under intense pressure to reduce risk and build their deposit base in order to ensure there is enough capital to satisfy new or anticipated regulation. The requirement for banks to improve Tier 1 capital, which will increase under Basel III, is likely to further limit balance sheet lending. New regulations may also prevent banks from investing directly in private equity and numerous other types of privately offered funds. This is likely to restrict banks' ability to fund the development of early stage LCT companies.

Finally, the financing the retrofitting of energy-efficient and micro-generation equipment in buildings, for example, is often highly fragmented with the additional difficulty of the assets being often attached to the properties in which they are installed. Several European cities are struggling to achieve sufficient critical mass in their retrofit programmes to attract private sector finance.

In the Annex to the report we go into more detail on the expected breakdown between development capital and procurement capital as well as on our detailed recommendations on means to increase capital flows, notably through:

- The emission of green bonds providing the securitisation of long-term LCT loans and leases as asset-backed securities.
- Lease financing for energy efficiency investments or micro-generation facilities.
- Direct banking sector investments to finance the early and growth stages of LCT.

We also give a more detailed view of the public financial instruments that are available, notably through the European investment Bank (which are particularly supportive of the work of the Covenant of Mayors), the R&D 7th Framework Programme funding, Structural and Cohesion Funds and the Connecting Europe Facility and the Future Internet Public Private Partnership initiative.

Chapter 6:
Smart Financing

Concrete recommendations:

For policymakers, both EU and national

- Policy stability is a priority.
- General policy on tax incentives.
- Leveraging public funding.
- Support the introduction of emerging low carbon technologies.
- Standardisation of "green bonds".
- Local government infrastructure initiatives.

For corporate and investment banks

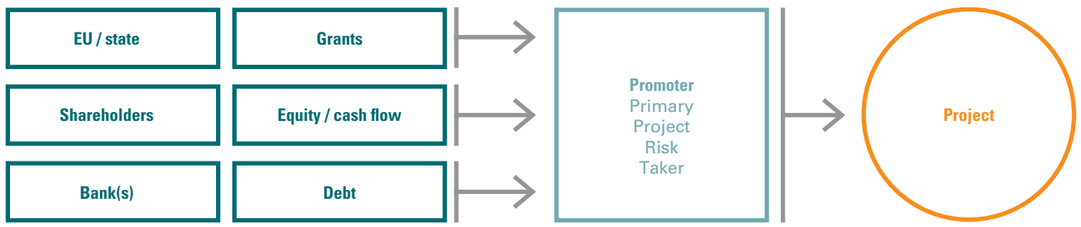
- Green bond securitisation.
- Providing debt finance for energy-efficient and micro-generation asset leases.
- Using equity to provide capital for development.
- Integrated project finance.
- Structured LCT investment products.
- Understand, as a financial institution, the technical solutions and benefits of the LCT.

Guidelines for cities

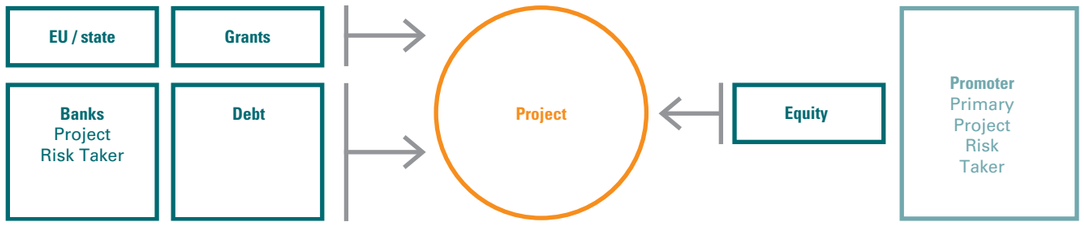
We highlight hereafter some of the essential recommendations for cities which are given in more detail in the Annex.

- City councils must take the lead, steer and coordinate the transformation into a smart city.
- They have to create a clear vision.
- It is essential that they acquire insight into the legal opportunities, impediments, and financing resources.
- Setting benchmark dates and monitoring the progress.
- Look for local financial partners.
- To investigate all possible financial constructions, including notably the following models:
  - In the Corporate Finance Model, the financing partners (e.g. the EIB) provide funding to the promoter – which can be a company, a consortium of companies or an institution – on the basis of its financial strength. The financing partners are thereby exposed to the credit risk of the promoter, not of the project.
  - In the Project Finance Model, the project is realised and financed via a legally and financially stand-alone (i.e. ring-fenced) project company (SPV = Special Purpose Vehicle) with the promoter(s) being a strategic partner (e.g. stakeholder).

Corporate finance model



Project finance model



THE MAIN CHALLENGE FOR INNOVATIVE SMES WITHIN THE ELECTRONICS SECTOR SEEMS TO BE CONSTRAINED ACCESS TO PRIVATE EQUITY TO FINANCE THEIR GROWTH

Chapter 7. Smart Industry

7.1. Smart SMEs –Think Small First

7.1.1. Introduction

In the first week of October 2011, the European Commission presented its Small and Medium-sized Enterprises (SMEs) report "Are EU SMEs recovering from the crisis?" (from 2010) as part of the SME Week that was held throughout Europe from 3rd to 9th October. The report confirmed that SMEs remain the EU's economic backbone. The Report commented / concluded: "SMEs represent more than 99% of all businesses and employ more than 90 million in Europe. They are the engine behind our economy and must be kept strong, competitive and innovative".

According to the Report in 2010, there were almost 20.8 million SMEs in the EU non-financial business economy, of which 19.2 million were micro-firms with fewer than 10 employees. Altogether SMEs provided more than two-thirds (87.5 million) of all employment opportunities in the private sector in the EU and 58.4% of the total gross value-added, compared to the 43,000 large businesses that represent only 0.2% of EU enterprises. SMEs will be pivotal in attaining the EU employment target of 75% by 2020; however, as of March 2012 the current economic crisis is not over and SMEs continue to have to operate in an uncertain economic climate: some 3.25 million jobs in SMEs have been lost, which further underlines the need to restore the job-creating power of SMEs.

Between 2008 and 2010, the European Commission and EU Member States implemented actions set out in the Small Business Act (SBA) to alleviate administrative burden, facilitate SMEs' access to finance, and support their access to new markets. Although most initiatives foreseen by the SBA have been started, a review of implementation so far reveals that conditions worsened in the area of "access to finance" and that more must be done to help SMEs.

Furthermore, whilst all SMEs are relevant, inter alia, it is necessary to stress additional specificities of research-intensive SMEs producing high-tech products, which has not yet been analysed in depth and addressed, so far. The definitions contained in the Small Business Act are too general and do not address the high-tech sector, which needs targeted provisions in order to respond properly to the specific needs of this sector. Taking as an example the electrical sector, according to the ELECTRA Communication, the electrical engineering sector consists mostly of SMEs. The main challenges for high-tech SMEs are access to finance, availability of skilled workers (in particular engineers), access to markets, counterfeiting, RTD / innovation and an innovation-friendly regulatory environment. The main challenge for innovative SMEs within the electronics sector seems to be constrained access to private equity to finance their growth.

Of special relevance are fast-growing SME's that have seen an increase in employment of more than 60% over the past three years. These businesses are disproportionately active in engineering and innovation. The average percentage of fast-growing SMEs in Europe is 12%, compared with 18% in the US, however Italy has a figure of 23% and it is important to understand this sector better and learn how national policies and practices impact on it.

7.1.2. European policy context

The Small Business Act (SBA) is the first comprehensive SME policy framework for the EU and its Member States. Since its adoption in June 2008, considerable progress has been made through actions to strengthen SMEs in a number of areas:

- 100,000 SMEs have benefited from the financial instruments of the Competitiveness & Innovation Framework Programme, creating more than 100,000 jobs.
- Through the Late Payment Directive, public authorities are now required to pay their suppliers within 30 days, improving the cash flow of businesses.
- In most EU Member States the time and cost of setting up a company has been considerably reduced, lowering the EU average for a private limited company.
- Streamlined online procedures and opportunities for joint bidding have made participation in public procurement easier for SMEs.
- The new EU SME Centre in China helps SMEs access Chinese markets.

Although all Member States have acknowledged the importance of a rapid implementation of the SBA, the approach taken and the results achieved vary considerably between Member States. The review underlines that Member States have to increase their efforts to promote entrepreneurship in SMEs in today's difficult economic climate.

As stated in the latest Commission Communication on "A strategic vision for European standards" – COM(2011)311, standardisation can also play a supporting role in innovation and can help to bring new technologies to market. When starting research on a topic, it is recommended that project partners should perform, as a first step, a "mapping of the state-of-art", including relevant standards.

In the context of the EU Horizon 2020 Common Strategic Framework for Research and Innovation, the Commission intends to encourage a much greater focus on bringing research results to market. Horizon 2020 seeks to combine the present Framework Programmes, the Competitiveness and Innovation Programme (CIP) and the European Institute of Technology within a single framework. Improvement in the links between research and innovation projects and standardisation needs to be integral to this process.

CEN and CENELEC have established a Research Integration Unit, and European standards organisations are in discussion with the Commission to ensure workable arrangements are put in place for Horizon 2020. However this push also needs commitment on the part of the research authorities to ensure that standards needs are reflected in research work programmes and calls for proposals and that project proposers receive correct advice.

7.1.3. SMEs and standardisation

Despite the fact that adequate stakeholder participation is essential to the European standardisation process, it appears that the representation of SMEs in European standardisation activities is often inadequate.

To facilitate SMEs' access to standards work, CEN, the European Committee for Standardisation, and CENELEC, the European Committee for Electro Technical Standardisation, have agreed to combine their efforts to improve access to European Standardisation for SMEs. The ultimate aim is to provide solutions to improve the value added by standardisation and standards for SMEs and to reduce their financial impact. A considerable number of actions have in the meantime been undertaken to facilitate SMEs' access to standardisation, such as:

- **SME Helpdesk**
  The CEN-CENELEC SME Helpdesk is a one stop service point to introduce SMEs to the benefits of European Standards and to the business tools required to access the European Standardisation System.
  The CEN-CENELEC SME Helpdesk works with the support of the national SME Helpdesks, which are service centres, established by the CEN and CENELEC members to provide direct national support to SMEs.
- **The CEN-CENELEC SME web portal**
  A further step towards SMEs' involvement and integration in the standardisation process (a CEN-CENELEC web portal) was launched at the end of 2011 to help Small and Medium Enterprises work with standards and achieve a greater benefit for them.
- **SME Standardisation Toolkit**
  The SME Standardisation Toolkit (SMEST) is an external visibility and promotion project to assist SMEs in Europe. The project will define a platform where knowledge, information and best practices can be shared. It also reflects the need to support national SME associations (e.g. professional organisations or trades unions) at European and national level to improve their roles in terms of raised awareness of, information about and participation in standardisation processes.
- **Guidance for standards writers**
  CEN-CENELEC Guide 17 "Guidance for writing standards, taking into account micro, small and medium-sized enterprises' (SMEs) needs" aims at raising awareness on the issues that may be of importance to SMEs in the development of standards and to overcome possible non-representation of SMEs in standardisation work. The document is available in 22 languages, free for download.
- **Scope of standards**
  The scope of standards is made freely available from the CEN and CENELEC websites.

7.1.4. Benefits for the people and challenges

The best-performing SMEs are characterised by a high degree of collaboration and networking with suppliers, customers, competitors, and external sources of knowledge about service innovation. The SMEs use this model to position and reposition themselves in the emerging value chains. These SMEs need to compete on qualities such as service / production flexibility and customisation of services / production. Moreover, specialisation in niche markets in terms of specific technologies, sectors and processes has proven to be an optimal strategy internationally. Electronics companies are often midsized-to-large entities acting globally with sophisticated supply chains. In their supply sourcing they usually depend on a large number of SMEs. Many of the steps in the value chain are made by SMEs (highly specialised). Therefore these SMEs have a very innovative influence on the industries they support.

Consequences of R&D done in the EU

Positive	Negative
Lower costs	EU conducts expensive research – other countries exploit it later
Flexibility	IPR branches (esp. China)
High speed	EU is losing technology
Introduction od competition to the domestic supplier base	Jobs lost
Better access to emerging markets	

So far, the role of manufacturing and innovative SMEs producing electronic goods in supply chains has not been analysed in depth. Electronics sector SMEs have an important role in the value chain and form an integrated part of the industry's ecosystem and its innovation capacity. Close cooperation and networks between SMEs and global players, in manufacturing, services and applications, is therefore important for the EU's competitiveness.

Due to the well-established global supply, sourcing and value chains of multinational companies in the area of electronics, intra-company trade and global sourcing plays a large role, which has an impact on trade flows, regulatory needs, rules of origin, and the companies' European or global interests in general. A common trend is for such multinational companies to manufacture lower and middle-end assemblies and components in Asia, with subsequent higher-level assembly, configuration and services performed in the local (EU) market. But it can also be the other way round, e.g. high-end components such as specialised semiconductors being produced in Europe and then assembled into products in Asia.

What is the importance of value chains for European companies? The European Commission says: "We want attention refocused on the central importance of a strong, competitive and diversified industrial manufacturing value chain to enhance the EU's competitiveness and job creation potential."
In the past, value chains have been subdivided into many small, specialised links, performed by different companies (fragmentation) with many of the manufacturing parts of the value chain being outsourced to non-EU countries (internationalisation). Research and development (R&D) is, however, mostly done in the EU.

The consequences of this are shown in the table above.

Moreover, sophisticated supply chains also create a challenge for trade statistics. Traditional trade figures give an increasingly misleading picture because they mainly consider bilateral flows between one country and all of the others. However, electronic goods for instance are made up of components sourced from many different countries, based on designs and research from other places, and assembled elsewhere before being sold worldwide. Measuring where value is added at each stage gives a more precise picture of who is buying what from whom, and for how much.
There are current initiatives to try to make more added-value based assessments (such as by the UN, Eurostat, WTO and UNCTAD conference of February 2011, which posed the question – and was entitled "Do we have the right numbers?" View at http://unstats.un.org/unsd/trade/s_geneva2011/geneva2011.htm).

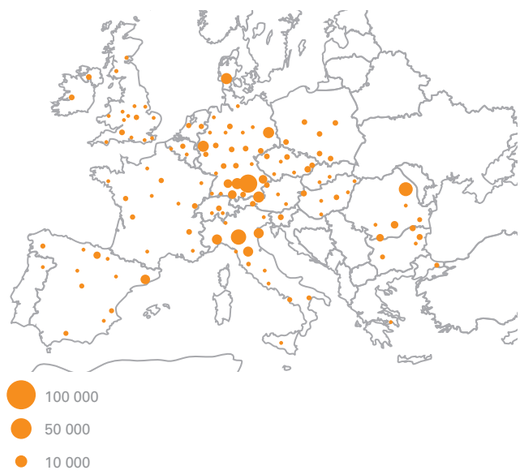
7.1.5. Clusters

Silicon Saxony – business case

Silicon Saxony is one of Europe's most successful associations for the semiconductor, electronics, software, photovoltaic and microsystems industries. Established in 2000 as an initiative of 20 partners around Dresden, Germany, it now links 290 commercial enterprises, research institutes, universities and colleges.

Silicon Saxony comments, "The competencies of our member companies together represent the entire value creation chain of the microelectronics industry. From the design and cooperation with suppliers, from silicon to the wafer, from ultramodern manufacturing processes to the individual chip, all the way to complete applications, the members of Silicon Saxony provide innovative services, premium quality, and state-of-the-art technologies. In addition, the member companies are increasingly entering fast-growing related sectors such as the photovoltaic and solar industries."
Due to the exceptional commitment of employees, members and sponsors, Silicon Saxony has developed into a continuously-growing, efficient and vital competence network.

Power generation and transmission regional clusters in Europe



Source: 2010 Basarsoft, Geocentre Consulting, PPVVK, Tele Atlas, Transnavicom

Lombardy Energy Cluster (LEC) – business case

"An industrial cluster for energy; a network made by firms for firms; a bottom-up cluster"

This is the industrial cluster for power generation, transmission and distribution established in the Lombardy region in Italy. LEC is supported by several important firms that work to create an integrated supply chain in different fields of energy plant investment, and to aggregate small and medium-sized enterprises.

Among the regional groups in the European Union, LEC constitutes the second largest cluster in terms of number of employees in the power generation and transmission sector.

Cooperating with international clusters, the Lombardy Energy Cluster strives to support Europe's 20-20-20 [environmental] strategy by continuously evolving its innovation capacity.

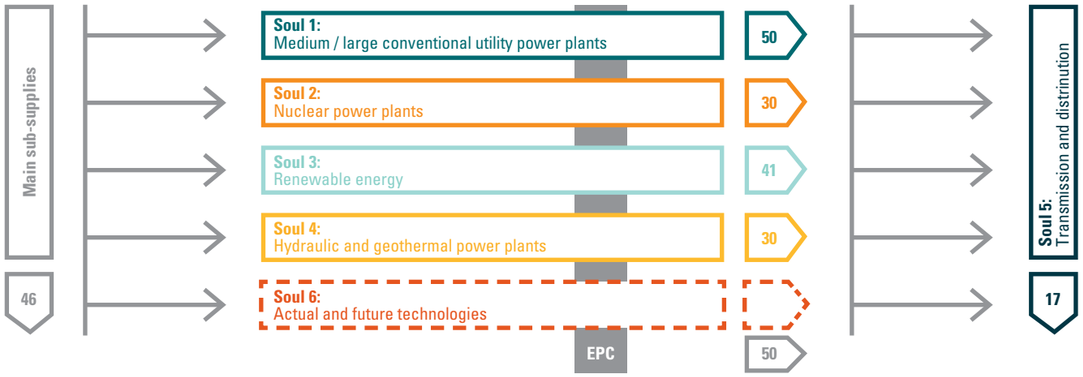
As well as being a cluster organisation, LEC is also a network, and is recognised as a supplier of quality products and services.

The LEC comprises companies from the Lombardy Region, which manufacture, or contribute to the manufacturing, of products used for the generation of and distribution of energy.

Lombardy Energy Cluster is built upon the triple-helix model. This allows for 100 small and medium-sized companies, eight universities and research centres, 10 public sector organisations as well as not-for-profit bodies and industrial associations to represent the energy industry through one single platform: LEC.

This collaboration brings together a number of different actors in the task of creating an extended laboratory in which research, innovation and training projects can be developed for both actual and future technical expertise, to be captured and consolidated in the Lombardy Energy Cluster network.

The LEC's Board consists of nine companies, all of which are leaders in the field of energy. All cluster decisions are made by the Board.



The cluster comprises members belonging to one or more fields of production, also referred to as 'souls', as illustrated in the diagram above.

The mission of the LEC is to support member companies in becoming more competitive by operating in the market with a wide portfolio, putting to use the support of academic institutions, involving R&D institutions and satisfying customers' needs by:

- Operating as a network to reinforce and develop the member companies through continuous improvement of both product quality and of human resources.
- Promoting international visibility, market knowledge, competencies and the ability to operate in international markets.
- Consolidating excellence in power generation, transmission and distribution business by increasing synergies among all institutions and companies in the region and realising worldwide cooperation with other cluster organisations.

The development of the Lombardy Energy Cluster is arranged along five strategic lines:

- Added-value integration.
- Internationalisation.
- Facilitation.
- Matching.
- Lobbying.

The UK Manufacturing Advisory Service
The new service, which will be delivered by the Manufacturing Advisory Consortium (MAC), is expected to help create an estimated £1.5bn improvement in economic growth, result in 23,000 new jobs and the safeguarding of 50,000 jobs. The Manufacturing Advisory Service will deliver a national service to all manufacturing businesses in the United Kingdom with a specific focus on: driving business growth through strategic and technical support for SMEs; developing advanced manufacturing capabilities and creating high-value jobs; enabling business improvement with manufacturers operating in global supply chains and linking SMEs with the apprenticeship programme delivering a minimum of 1,250 engineering and manufacturing apprenticeships annually.

7.2. Smart Skills and Education

The first Electra report contained a single, but ambitious, recommendation: to have in all EU Member States 50% of all students completing tertiary education, and 25% of students in tertiary education choosing technical, engineering and science courses.

Whereas the EU's competencies on education are rather limited (Article 165 of the TFEU), this public policy is tackled in at least two of the flagship initiatives of the Europe 2020 strategy, "Youth on the Move", notably focusing on higher education for the knowledge economy and "An Agenda for new skills and jobs", developing proposals on vocational training and lifelong learning. In September 2011, the Commission also launched a strategy for modernising higher education and, in the framework of the 2014-2020 financial perspectives, will further propose to merge the funding programmes in education and training into a single programme.

The training and recruitment issue remains acute in the electrical engineering industries, where the gap between job opportunities and skills availability remains very high.

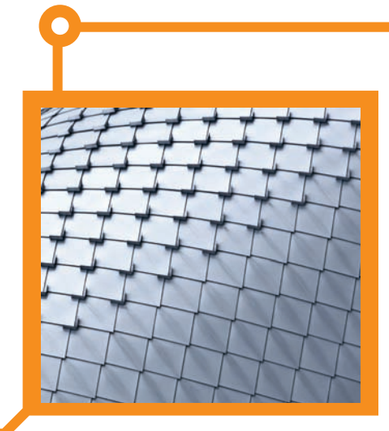
Initiatives should be launched to increase the attractiveness of science and technology to the age groups around 10-12 and 16-17 years, when youngsters are deciding on their education orientation and studies choices. These initiatives should be supplemented by extra-curricular activities (visits to companies and laboratories), and by specific initiatives towards teachers.

More generally, based on the EU's Eurydice Network findings[15], benchmarks could be developed on the measures taken by the Member States to improve and foster science teaching and learning, such as:

- EU inter-school maths and science competitions should be launched across Europe to promote excellence.
- An annual Eurostat enquiry should be launched to better analyse the skill gaps, mapping employer perceptions with regards to skills needed in the three to five years.
- Structural funds should be used to improve electrical and electronic engineering training in specifically defined key areas.

Focus should be on "permeability", namely facilitating an exchange between vocational education and training (VET), and higher education (HE) activities, which together should be seen as an overall system, which is mutually inclusive, with bridges linking both sides. Both VET and HE should benefit from each other's experience, particularly in the areas of work-related and continuous education.

As requested in the Final report of the High Level Experts group on Key Enabling Technologies, a European Technology Research Council should be established, with the aim of promoting individual excellence in technology-focused engineering research and innovation. The goal would be to set up a world class cadre of engineers and technologists.



15.Eurydice "Science Education in Europe: National Policies, Practices and Research", October 2011

Concrete recommendations:

- A complementary tool to the SBA needs to be elaborated for easier access to research funds (ICT) for research-intensive SMEs producing high-tech products. The EU Commission needs be aware that:
  - Competitive aid regulation is often unfair to the local actors vis-à-vis the outside world.
  - Investment aid regulation is obsolete in a world where all nations tend to defend their strategically-important businesses.
  - For the future it is important not only to support innovative companies, but also those (mostly SMEs) who supply the market with mature technology while creating new and innovative jobs in the EU.
- To improve SMEs' access to funding, the Commission has to help SMEs:
  - Through a strengthened loan guarantee scheme, that will support investments, growth, innovation and research.
  - By making EU funding programmes more accessible to SMEs by further simplifying procedures.
  - Present an action plan for improving SMEs' access to finance, including access to venture capital markets as well as targeted measures aimed at making investors more aware of the opportunities offered by SMEs.
  - Explore options for setting up an intellectual property rights valorisation instrument at the European level, in particular to ease SMEs' access to the knowledge market.
- Standards, as a peer-assessed codification of best engineering practices, establish a basis for the interoperability of products. In this sense, they facilitate innovation since they allow new solutions to be functional with given product or service definitions. On the contrary, externally imposed standards at the early stages of innovation may be counterproductive: a key element of innovation is thinking beyond the current status quo.
- A more strategic use of clusters and business networks to support the internationalisation of European SMEs in markets outside Europe, especially in emerging industries where cluster cooperation would have the highest impact, should be better explored in the future.
- There is a need to promote research-driven clusters, also improving different policy fields relevant for clusters, such as industrial cooperation, RTD cooperation and cultural cooperation, for cluster cooperation in the field of cultural and creative industries.
- Better consistency of product legislation on technology level: manufacturers are faced with an ever more complex legal environment, often inconsistent and therefore creating burdens for research-intensive SMEs. It is therefore important to develop consistent legislation and avoid duplication, legal uncertainty and unnecessary administrative burden.

The smart life of the future requires a ***complete renovation*** of our existing infrastructures in Europe

Chapter 8.
12 Key Electra Recommendations

8.1. Smart Life

The smart life of the future requires a complete renovation of our existing infrastructures in Europe. The vision of a smart life together with the deployment of modern technologies in the context of large infrastructure projects in Europe will only be a success if the public buys into and supports this direction. Policymakers at all levels together with stakeholders from industry need to engage in a general debate with society as a whole and run concrete infrastructure projects from the very beginning in an open and transparent way. Good ideas are nothing if they are not communicated well.

8.2. Smart People

Initiatives should be launched to increase the attractiveness of science and technology to the age groups around 10-12 and 16-17 years, when youngsters are deciding on their education orientation and studies choices. More generally, based on the EU's Eurydice Network findings[16], benchmarks could be developed on the measures taken by the Member States to improve and foster science teaching and learning.

Focus should be on "permeability", namely facilitating an exchange between vocational education and training (VET), and higher education (HE) activities, which together should be seen as an overall system.

As requested in the Final report of the High Level Experts group on Key Enabling Technologies, a European Technology Research Council should be established, with the aim of promoting individual excellence in technology-focused engineering research and innovation. The goal would be to set up a world class cadre of engineers and technologists.

8.3. Smart Cities

Cities are of fundamental importance for the people in Europe. For European cities to become "smarter", it will largely require the renovation and further development of existing infrastructures and appropriate funding methods. Many urban infrastructures have reached their limits, for example in relation to developing a secure energy supply, transport infrastructure, buildings, healthcare, safety and security, and water and waste management; technologies and systems already exist to significantly improve these features and offer opportunities to mayors to improve and develop their cities smartly. Smart electrical networks and installations as well as modern data management infrastructures (ICT) are needed to provide real time control of cities. Creating jobs and competitiveness are also fundamental objectives of a Smart City. Thanks to appropriate investments in technologies and infrastructures (transportation systems, high-speed broadband connections, smart grids etc.), European cities will become more attractive destinations, especially for SMEs, and more competitive at a global scale.

8.4. Smart Grids

Europe needs smart grids now. The implementation of the EU's energy policies needs to focus on creating a pan-European electricity grid infrastructure for the future that is capable of interconnecting and integrating large-scale energy streams from a variety of renewable sources. Concrete bilateral or multinational "lighthouse projects" need to be set up. For the deployment of the technologies needed, such projects should use methods and KPIs (key performance indicators) that identify the benefits with respect to the EU 20/20/20 targets. The issue of smart grids must be tackled with a holistic approach, which not only focuses on individual components but on the whole, integrated system. It is essential that there is overall strategic legislation to ensure that all grid components are able to communicate with each other with the aim of reducing greenhouse gases emissions, increasing energy efficiency and, particularly, to contribute to making European cities truly smart.

8.5. Smart Buildings

Today's electrical installations often do not offer the flexibility to meet the electricity needs of the future. New and even more powerful electricity loads will be interconnected to an even greater extent. Installations need to be updated quickly in order to allow new use-models such as electro-mobility charging to become a daily activity in average households. Today's consumers and users need to be supported in their development to become "prosumers" (simultaneous producers and consumers of energy).

8.6. Smart Lighting

Lighting plays a crucial role in a better quality and more energy-efficient environment. Intelligent lighting systems can improve the quality of life of citizens and help cities to save more than 40% of energy. Lighting needs to be properly designed, installed, operated, maintained and controlled. Smart Cities need to invest in new intelligent public lighting systems with latest technology such as LED (Light Emitting Diodes) in order to meet their energy efficiency and sustainability targets and to improve the quality of life.

8.7. Smart Mobility

Mobility needs of the people require new solutions and a system of different mobility options that can be individually combined. Cities need an improved network

16.Eurydice "Science Education in Europe: National Policies, Practices and Research", October 2011

of intelligent transport systems that are accessible, secure, reliable and sustainable. Emission reduction targets will be necessary to boost urban mobility, as will emphasis on the electrified transport sector – including rail and eMobility – in future EU research projects and programs. Respective policies in relation to eVehicles need to focus in particular on their seamless and intelligent integration into smart grids and their attractiveness to the customer.

There should be standards for the energy efficiency of vehicles and systems: all types of vehicles and systems (cars, buses, planes, trucks, railways) should have energy efficiency targets that are regularly updated and that are flexible enough to allow continuous development. These modes should be supported by energy efficiency measurement standards that allow the benchmarking of available market solutions and which support buyers in integrating energy efficiency into their decision-making. The use of the environment and public space should be priced: charges for pollution, congestion and safety should be encouraged as a way to support the development of the transport options that have less negative impact. The development of infrastructures should be supported: infrastructure costs often prevent the development of the most efficient public transportation solutions.

Funding schemes should enable cities to develop their public transportation projects. Environmental and social criteria could be integrated into the selection criteria for publicly-funded projects. Smart mobility innovations should be supported: innovation is key to finding solutions that deliver the best mobility services with the minimum impact on the environment. Initially, energy-efficient solutions, alternative fuels, innovative information systems will have a market price that will prevent their development. Fiscal deductions and bonuses for switching vehicles or systems will be a strong incentive in the early stages of the development of new products and help them reach maturity and achieve a viable economical price through increased sales volumes and competition.

8.8. Smart Safety and Security

There is a great need for harmonised norms and standards in safety and security infrastructures across Europe. Safety and security are no longer merely a national issue. Threats and risks need to be assessed and dealt with at the European level in order to achieve maximum safety for European citizens. CEN, CENELEC and ETSI are developing a working programme for European security standards. If it is required, third-party certification should take into account the "one-stop-testing, one-stop-certification" approach in Europe.

8.9. Smart Financing

The financial services industry is still facing multiple challenges in recovering from the financial crisis. Financing Low Carbon Technology (LCT) represents a unique opportunity for banks to benefit from the significant growth of the LCT sector whilst demonstrating a positive contribution in tackling climate change. At present, there is insufficient investment to fund the transition to a low carbon economy, with the gap between the capital required and what is available widening. There are significant barriers that are preventing capital provision across the whole spectrum of financing sources. Three of the more significant barriers are: policy uncertainty, restrictions on capital lending, and technology uncertainty. Policy and regulatory stability and predictability are a priority to encourage investment. There also needs to be support for the introduction of emerging LCT that is not yet commercially viable. Also, local government infrastructure initiatives to stimulate the demand for Low Carbon Technology, integrated project finance in projects, and the inclusion of equity rather than simply debt. City councils must take the lead, define a clear vision, steer and coordinate the transformation. They have to look for a local, financial partner and investigate together all sources the European Union can provide to finance the smart-city projects.

8.10. Smart Health

The ageing population in Europe requires the establishment of an eHealth infrastructure. A European eHealth Action Plan should outline concrete steps on how to measure the non-financial impact of eHealth to make informed funding decisions, provide financing schemes for the deployment of eHealth and develop reimbursement mechanisms for eHealth services. Telemedicine pilot projects should also be started.

8.11. Smart SMEs

SMEs represent more than 99% of all businesses and employ more than 90 million in Europe. They are the engine behind our economy and must be kept strong, competitive and innovative. SMEs are the leading job creators in the EU. They provide two-thirds of private sector jobs in the EU and will be pivotal in achieving the EU's employment target of 75% by 2020. However, due to the economic crisis some 3.25 million jobs in SMEs have been lost, which further underlines the need to restore the job-creating capacity of SMEs.

Furthermore, if all SMEs are relevant, inter alia, it is necessary to stress the difference between SMEs per se and those research-intensive SMEs that produce high-tech products. The definitions contained in the Small Business Act are too general and do not address the high-tech sector, which needs diversified provision in order to respond properly to the high-tech sector's specific needs.

The main challenges facing high-tech SMEs are: access to finance, availability of skilled workers (in particular engineers), access to markets, counterfeiting or RTD / innovation and an innovation-friendly regulatory environment. The main weakness of innovative SMEs in the electronics sector seems to be the constrained access to private equity to finance their growth.

The best-performing SMEs are characterised by a high degree of collaboration and networking with their suppliers, customers, competitors, and external sources of knowledge about service innovation. They use this model to position and reposition themselves in the emerging value chains. These SMEs need to compete on qualities such as service / production flexibility and customisation of services / production.

- A complementary tool to the SBA needs to be elaborated for easier access to research funds (ICT) for research-intensive SMEs producing high-tech products. The EU European Commission needs be aware of that:
  - Competitive aid regulation is often unfair to the local actors vis-à-vis to the outside world.
  - Investment aid regulation is obsolete in a world where all nations tend to defend their strategically important businesses.
  - For the future it is important not only necessary to support the innovative companies, but also to support those (mostly SMEs) who that supply the market with matured technologies.
- To improve SMEs' access to funding, the Commission has to help SMEs through a strengthened loan guarantee schemes, that will support investments, growth, innovation and research; make EU funding programmes more accessible to SMEs by further simplifying procedures; present an action plan for improving SMEs' access to finance, including access to venture capital markets, as well as targeted measures aimed at making investors more aware of the opportunities offered by SMEs; explore options for setting up an intellectual property rights valorisation instrument at the European level, in particular to ease SMEs' access to the knowledge market.
- There needs to be a more strategic use of clusters and business networks to support the internationalisation of European SMEs into markets outside Europe, especially in emerging industries where cluster cooperation would have the highest impact, which should be better explored in the future.
  We need to promote research-driven clusters, improving also different policy fields relevant for clusters, such as industrial cooperation, RTD cooperation and cultural cooperation, for enhanced overall cluster cooperation in the cultural and creative industries.

8.12. Smart Standards

Despite the fact that adequate stakeholder participation is essential to the European standardisation process, it is evident that the representation of SMEs in European standardisation activities is often inadequate. To facilitate SMEs' access to standards work, CEN, the European Committee for Standardisation, and CENELEC, the European Committee for Electro technical Standardisation, have agreed to combine their efforts to improve access to European Standardisation for SMEs. The ultimate aim here is to develop solutions to improve the value-add of standardisation and standards for SMEs and to reduce their financial impact. A considerable number of actions have been undertaken to facilitate SMEs' access to standardisation, such as:

- CEN-CENELEC's SME Helpdesk, which is the one-stop service point to introduce SMEs to the benefits of European Standards and to the business tools required to access the European Standardisation System.
- The CEN-CENELEC web portal will be launched at the end of 2011 to help Small and Medium Enterprises work with standards and achieve a greater benefit for them.
- SME Standardisation Toolkit (SMEST) is an external visibility and promotion project to assist SMEs in Europe.
- CEN-CENELEC Guide 17 "Guidance for writing standards taking into account micro, small and medium-sized enterprises (SMEs) needs" aims at raising awareness on the issues that may be of importance to SMEs in the development of standards and to overcome possible non-representation of SMEs in standardisation work.

Standards, as a peer-assessed codification of best engineering practices, establish a basis for the interoperability of products. In this sense, they facilitate innovation since they allow new solutions to be functional with given products or services. On the contrary, "imposing" standards at the early stages of innovation may be counterproductive: a key element of innovation is thinking beyond the current status-quo.

Chapter 9.
Key Projects

The Annexes of this Electra II report contain a description of key projects which could be launched in the framework 2012-2014 to support the implementation of the set of messages and recommendations. Each will concern a societal challenge, indicate which solutions the European electrical engineering industry can bring, describe roles and responsibilities of the main actors (companies, industry associations, public authorities, social partners and other stakeholders), and propose a timeline for the completion of the projects.

These selected projects are:

- Cross-national smart grid project.
- Check-list for mayors "How to become a smart city".
- Electrify your smart building – brochure.
- Smart SME "European Working Cluster".
- Partnership "Smart Mobility model region".
- EU Conference on public acceptance of infrastructure projects.
- FIEEC Investment Fund (FIMIEEC – Fonds d'Investissement pour la Modernisation de l'Industrie Electrique, Electronique et de Communication).
- Alliance for Digital Trust.

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