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# Photonics21 considerations regarding the EU SSL Green Paper questionnaire

## **(1) How would you propose to overcome the challenges outlined in the Green Paper chapter 2 for the wider market penetration of Solid State Lighting (SSL) technologies in Europe?**

In general the wider market penetration of Solid State Lighting (SSL) will be stimulated by a clear recognition of the potential contribution of the *total* value chain of Solid State Lighting in Europe. This supported by dedicated programs and actions on the supply side as well as on the demand side.

The specific issues or challenges as mentioned in chapter 2 of the green paper need to be solved with following corrective actions:

### *Low quality LED products:*

Next to setting clear standards and regulations, a well functioning, EU wide surveillance scheme by responsible national and local authorities has to be established with possible support and help of the industry (e.g. documentation, training ...).

LED solutions today do not completely fulfill user expectations in terms of colour rendering (CRI), form factor, efficiency (as compared to discharge lamps), luminance and last but not least price. In order to provide SSL solutions with high performance, reliability and quality additional investments in R&D are needed encompassing the full value chain from materials and components to integrated solutions.

### *High initial purchase cost:*

The total costs of SSL products and systems are relatively fast coming down, mainly driven by the present volume increase. Specific R&D programs addressing high-throughput automated manufacturing and novel innovative processing on the one side and better materials on the other side will largely contribute to the acceleration of the present cost-down scenario. Next to actions ongoing on the supply side, the demand side could be stimulated by dedicated measures varying from energy performance contracts in the professional channels towards subsidy schemes by energy suppliers and/ or retailers in the consumer channels.

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Superior design of LED based products will largely contribute to the fact that lighting is no longer seen a commodity, but rather as a must have product. Such products may be fostered through design contests or workshops with architects, lighting designers and other stakeholders from the lighting industry.

*Awareness & information:*

By setting clear standards and regulations – including appropriate labeling- awareness of consumers and end users will increase. Using clear and workable criteria – also within regulations –will help consumers’ and end-users to compare product alternatives on a like for like basis.

Awareness campaigns are required in order to inform and educate the public, because the paradigms from the past based on incandescent lamps do no longer hold in the age of digital lighting. Consumers need to be informed through classical as well as social media and retailers should be trained in supporting people in their buying decision. For professional customers, including municipalities and public authorities, dedicated seminars and web based criteria catalogues are needed. A comprehensive approach by the lighting industry would be highly instrumental in this respect.

Further measures, supported by the EU, to create more awareness are pilot actions and large scale demonstration and validation actions showcasing the latest innovations in SSL technology.

*Concerns on biological safety:*

The growing concerns on the biological safety ,e.g. blue light hazard, urgently calls for a clear statement by a credible and independent entity on the safety of artificial light and LED in particular . The EU is in a perfect position to facilitate such a process with its existing instruments.

The EU should further support “beyond general illumination” research, targeting both negative aspects as well as the positive contribution of Solid State Lighting to “health and well being”

*Technology obsolescence and missing standards:*

The dilemma of rapid performance increases of SSL products, hindering a quick spread in the market today, stipulates the need to support the “good is good enough” approach especially in relation to lifetime (lifetime versus cost and efficiency). SSL in any case and in any form will already today bring tremendous savings in energy and a reduction of the environmental impact. A midterm changeover to a replacement product will balance with the benefits of the

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technological improvements over time. There where still gaps do exist in proper standards on safety and/or performance, the initialized industry driven EU supported standardization mandate should be executed including support to running global programs (IES, CIE, Zhaga). EU SSL standards and regulation should be based on the industries capabilities. but should also carefully consider users' demand. Therefore, all parties in the generic SSL value chain should team up in this industry led effort.

*Up front investment costs (outdoor) lighting:*

Changed business models with the start up of dedicated service companies, like ESCO's, will help to overcome the burden of the relatively high investment costs of Solid Sate Lighting installations. Typically the implementation of energy performance contracts will be supportive to these new businesses. There where these new business models do not yet materialize, or in addition to these models, opening up of typical EU support funds, similar to the Structural and Cohesion Funds, for innovative technology such as LED outdoor and indoor lighting, will facilitate the further expansion of LED lighting in the market.

Municipal infrastructure officials are quite hesitant to embark in SSL, this in view of the conflicting reports and existing skepticism about cost, performance, lifetime and health & safety issues of LEDs. This hesitation can only be overcome by the generation of validated economical and ecological data and of credible testimonials by independent third parties based on real life demonstration actions.

*The landlord-tenant conflict:*

Specific tax measures as well as mandatory rent uplifts will reduce the difference of interests between the one who rents, and the one who invests. Dedicated lighting efficiency regulations for buildings will further support this, taking clearly into account the potential benefits, intelligent digital lighting systems do offer in combination with Solid State Lighting.

**(2) Which *additional* challenges do you see for a wider SSL market penetration in Europe and which solutions would you propose to resolve them?**

*Lack of transparency and coordination of existing programs, leading to a fragmented approach along member states and across the EU:*

At present the European Union does not have an overall and coherent policy on SSL. It is our expectation that the publication of the EU Green Paper on SSL becomes the framework for an active approach in which the objectives and opportunities, as well as the generic conditions for achieving these objectives, have been laid down as a consistent basis for action for all involved

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Directorates Generals of the European Commission leading to binding implementation measures for all member states. Speed in the implementation of instruments and measures is of the utmost importance, in particular to reach sufficient mass to create leverage.

*Lack of cross regional benchmarking:*

Leading countries of the world such as USA, China, Korea and Japan, have recognised the potential contribution of SSL in achieving their overall objectives in areas of energy and environment. This has been laid down in national policy documents and is accompanied by local supportive measures, targeting R&D, manufacturing and market validation. A similar European approach is not (yet) available.

While in other regions there is a clear emphasis on SSL to drive green public procurements, such actions are not found in Europe. This is clearly a missed opportunity, because in his role of launching customer the European public authorities could lead the way for the private sector as well as for its citizens.

Lighting is not widely considered in the buildings management solutions, smart metering or smart grid concepts. Implementation of SSL into the existing programmes on, smart cities and energy-efficient buildings is desperately needed.

*Scarcity of a number of materials and the lack of potential substitutes:*

Material scarcity might drive the cost of LED technology up in the coming period, off-setting the cost-down efforts responding to the market needs. This notably holds for arsenic, europium, gallium, indium and yttrium, for which materials no viable alternatives are available. This even holds for aluminum, largely used in heat sinks, although in this case alternative materials with a competitive cost performance ratio are available.

While SSL is green for its energy saving potential and it does not use hazardous materials like mercury or lead solders in the interconnects, there are still many opportunities for further greening of SSL production processes.

*Fear for a rebound effect due to ubiquitous integration of LED's in materials and components:*

This integration of LEDs in other materials will result in the development of a new but relatively small market segment, at best comparable to the architectural lighting segment, equaling 7% of the total lighting market<sup>1</sup>. The lumen packages applied in this application will be much lower

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<sup>1</sup> "Lighting the way: perspectives on the global lighting market", McKinsey & Company July 2011

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than for the existing market segments, resulting in an expected rebound effect of less than 5%. Irrespective of the rebound effect, the IEA comes to the conclusion that the demand for lighting will nearly triple between 2010 and 2050. This not only holds for the emerging markets, but also in the OECD countries. Due to the advent of the 24/7 economy the demand for lighting will also increase in these countries, be it at a somewhat lower rate<sup>2</sup>.

**(3) What can EU member states do to reinforce market surveillance of product performance and safety in the area of SSL lighting products?**

This topic – often referred to in relation to many issues linked to the further uptake of SSL – should be directly addressed to the responsible authorities within each member state. In each of them it should be ensured that the necessary priorities, competences, resources and power are in place. The European lighting industry is committed to provide necessary support in terms of documentation, training and any other relevant information. Also local custom authorities should be actively included in all these activities related to market surveillance.

**(4) What could the lighting industry do to ensure the performance of SSL products?**

To ensure a proper performance of LED products in the market, Photonics21 is fully supporting a fast implementation of realistic LED requirements and energy labeling. The lighting industry is also committed to provide all necessary support to implement an effective and efficient market surveillance program in the member states. The lighting industry is supporting a redefinition and review of the EU Eco-label program for lighting products in order to properly facilitate the inclusion of (future) LED products under this scheme.

An increase of industries innovation effort is a precondition to ensure outstanding performance, meeting customer's expectations in a rapidly changing market. EU funded projects, which support collaboration of various partners across the value chain, would largely be instrumental in achieving this goal. Alignment of activities can be safeguarded through Photonics21.

Standardized testing methods for SSL products needs to be set up by industry to ensure a fair comparison between products (see question 6 also).

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<sup>2</sup> "Light's labour lost, Policies for Energy Efficient Lighting", International Energy Agency 2006

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**(5) What can be done to raise awareness of consumers and professional users to SSL technologies and which specific measures and incentives would you propose for accelerating SSL uptake?**

Marketing, awareness and education campaigns need a joint EU and industry approach. An effective market surveillance scheme should be in place as well as a workable Criteria Catalogue, defining comparable and truthful product performance requirements.

The Lighting Industry believes that a joint approach of EU and industry is required to better inform the market (and all players therein) on the changes and new performance criteria and units. An active information and communication approach is necessary to accompany the market change-over to new SSL product solutions if we want to achieve the overall EU objectives in the area of Energy and Environment. It is also suggested to install a clear measurement protocol and standardized set of parameters and representations to create a clear set of verifiable performance indicators allowing end users to compare products easily.

Large scale demonstration and validation actions should be implemented, providing credible data on economic (total cost of ownership) and ecological (energy, carbon footprint) savings realized with SSL technology. The assessment of running European LED demonstration projects clearly shows that only 30% of the cases economic data are projected and in less than 5 % the energy performance is actually monitored.<sup>3</sup> The present CIP-ICT instrument designed for pre-competitive market demonstration and validation of limited size is not suited for the implementation of the large-scale actions envisioned by both the EU and industry. The Structural and Cohesion Funds might be an instrument far better suited to reach the goals set for market validation actions in a real life competitive environment.

The low awareness of the users on the capabilities of LED technology to improve their health and well being asks for scientific studies addressing its “biological efficiency”: extending light quality beyond today’s standards. An effective in-road to public awareness is through educational incentives about efficient lighting aimed at schoolchildren, efficiency becoming part of their mandated curriculum. The kids will teach their families, who will respond accordingly to safeguard the future of their descendants.

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<sup>3</sup> LED projects and economic test cases in Europe – JRC 32182-2011-2NFPISP-INF50.G5(2011)2783810

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**(6) What could be done to overcome the landlord-tenant conflict?**

(See also question #1)

Specific tax measures as well as mandatory rent uplifts will reduce the difference of interests between the one who rents, and the one who invests. Dedicated lighting efficiency regulations for buildings will further support this, taking clearly into account the potential benefits, intelligent digital lighting systems do offer in combination with Solid State Lighting

**7) Which *additional* measures to the ones listed in the Green Paper could help accelerate SSL deployment in buildings?**

The use of SSL in buildings can be accelerated by ensuring intelligent digital lighting systems (SSL and controls) become an integral part of an Energy Performance of Buildings Directive. Photonics21 strongly supports dedicated lighting efficiency regulations for buildings which take into account the potential benefits intelligent digital lighting systems do offer in combination with Solid State Lighting. The claim on future efficacies of 150-200 lm/W at the LED die level should be put in the right perspective<sup>4</sup>. The thermal, optical and electronic losses in the engine will easily amount to 30% or more, resulting in efficacies of 105-140 lm/W at the light source level. Therefore, R&D breakthroughs across the whole chain from materials to components and systems are required in order to reach efficacy levels well beyond the one of the present discharge technologies. The fact that LED's are easily switched and dimmed makes them ideally suited to be combined with control electronics, bringing light when and where needed. In this way additional energy savings between 20 and 50% are anticipated depending on the application envisioned.

All new functionalities of SSL light sources: dynamics in intensity, colour temperature and aiming angle, must be exploited in the future. Based on its profound knowledge in static lighting design, the European lighting industry is a perfect position to take the lead in dynamic digital lighting as well.

**(8) What measures, beyond the ones listed in the Green Paper, could *further* support research and innovation and the reinforcement of the SSL value chain in Europe?**

Reinforcement of R&D in Europe on SSL can be further achieved by supporting "beyond general illumination" research, targeting both negative aspects as well as the positive contribution to "health and well being" of Solid State Lighting. Also facilitating a reach out and

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<sup>4</sup> EU Green Paper "Lighting the future" COM(2011)889 final

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collaboration of various industry partners along the value chain is supporting further strengthening of SSL in Europe. IP sharing schemes on basic control inventions for LED-based luminaires through licensing have been established over the last years. By providing access to patented technologies all lighting players have the possibility to enter into new and promising markets. The call for an increased cooperation between large industry and SME's to cross-license IPR at favorable conditions is consequently well recognized by industry. More than 160 companies have joined this IP licensing Program, about 90% being SME's.

**(9) Which *other* actions beyond the ones listed in the Green Paper could be taken by industry to reinforce sustainable SSL manufacturing capacity in Europe?**

Photonics21 is convinced LED lighting will further create qualified jobs all over Europe through the need for knowledgeable, R&D capable and innovative resources. Additional jobs will be created by catering for fashion needs through innovative design of LED based luminaires. The European industry will tap into tremendous additional opportunities by expanding its focus from light sources to the broader field of lighting *solutions*. This holds especially for small and medium enterprises.

Further down the lane, the next opportunity to reinforce the lighting industry in Europe rests with the manufacturing of OLEDs. OLED manufacturing is much closer to the process industry, a traditional strength of the lighting industry in Europe.

R&D programmes focusing on production equipment and processes are needed to stay competitive with respect to low-wage countries. It is a European strength to provide high quality complex products. Also in SSL we should build on this strength to keep its manufacturing in Europe.

In general, also measures to boost the macro-economic investment climate in the EU and its Member States need to be taken into consideration.

**(10) Which *additional* actions to the ones listed in the Green Paper can reinforce cooperation along the value chain, in particular with architects and lighting designers, electrical installers and with the construction and building industry? What should be the role of the Member States and the EU in making this happen?**

Cooperation along the value chain can be stimulated if not enforced by implementing innovative green procurement programs, supporting the use of intelligent digital lighting systems in refurbishment of public buildings.

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**(11) Are there gaps in standardization today which hamper SSL innovation and deployment? If yes, where are such gaps and how can they be addressed?**

Development of relevant standards for SSL products is of immense importance. As a guiding principle Photonics21 calls for standards that facilitate a clear and undisputable comparison of conventional and SSL product solutions to be monitored via active market surveillance.

Gaps still do exist in the safety and performance standardization. The industry driven EU standardization mandates, backed by the EU commission, should be executed and additional EU support to running global programs (IEC, CIE, Zhaga) is needed.

**(12) Which actions should Member States and the industry take to support education, vocational and lifelong learning and training on SSL and to address the adaptation of educational curricula to include the latest lighting technologies?**

European industry is experiencing a shortage of highly qualified and skilled workforce in the field of Photonics and the situation is expected to become increasingly critical in the future. The problem is mainly related to the insufficient number of students accessing Science, Technology, Engineering, and Mathematics (STEM) degrees in general, and Photonics related degrees in particular. The Photonics21 work group on “Research, Education and Training” has defined two focal areas for Europe, i.e.: outreach and long-life learning.

To stimulate the young minds and attract them, specific actions have to be undertaken involving the scholar system at the primary and secondary level. Suitable support material for experiments (tools and guidelines) needs to be used, and specific training of teachers is needed. Inquiry based learning (IBL) has proven to be a suitable approach to raise the interest and enthusiasm of students and foster essential analytical and scientific skills.

Another major problem facing the European photonics industry, and mainly affecting SMEs, is the insufficient number of training programs. Indeed, while large industries can easily support internal training, this is unsustainable for SMEs. On the other hand, SMEs are a major player in photonics and should thus be strongly supported in terms of training. Consequently, it is mandatory to organize and manage a network that will operate pan-European training programs in photonics. Research institutes will be highly instrumental in this knowledge transfer to SME's.