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CITADEL lighting program targets LED longevity

PARIS, FRANCE--Partly inspired by the U.S. Department of Energy CALiPER initiative (www.ssl.energy.gov/caliper.html), a new program called CITADEL intends to provide physical measurement protocols and benchmarking analyses for light-emitting diode (LED)-based lighting. A major deliverable of CITADEL will be to determine aging methods (climatic and endurance) in order to assess the real life expectancy of LED lighting products. The durability problem will be treated together with life-cycle analyses and total cost of ownership aspects.

An important R&D initiative subsidized by the French Environmental Agency (ADEME), the CITADEL consortium is led by the French Center for Building Science and Technology (CSTB; Paris, Grenoble, and Nantes, France), and includes the major academic lighting laboratories in France (CEA-LETI, LNE, ENTPE, and LAPLACE), as well as the French branch of Philips Lighting (Miribel Center, near Lyon, France). The \$1.9 million dollar project is slated to begin in February 2009, with a scheduled duration of three years. The CITADEL program is part of the innovation program of the "Cluster Lumière"--the French lighting Cluster based in Lyon.

The field of lighting is currently in the midst of a technological revolution, unique in its history, with the advent of new generations of systems based on LEDs. Significant progress achieved by semiconductor specialists has led to robust and compact light sources, offering attractive control capabilities. In laboratory conditions, white LEDs reach luminous efficacies greater than those of most lamps used in lighting, and, above all, they exhibit far greater life expectancy.

Despite all these advantages enthusiastically put forward by the semiconductor industry, it is commonly reported that the use of LEDs in buildings is slowed down by a certain number of deep problems. The requirements for successful building integration are very specific and often unrecognized by LED

manufacturers. Several types of constraints occur in building applications: visual comfort, performance sustainability in time, real life expectancy, total cost assessment, compliance with building standards and codes.

The objective of CITADEL is to promote the optimal integration of LEDs in buildings through research, with a view of supplying crucial information to all those concerned by lighting. The goal is to fully characterize LED lighting products, keeping in mind the specific needs of buildings and of those who use them. In this way, we shall define new measures of visual comfort and color rendering, specific to LEDs.

The optical and electrical measurement methods will be devised in such a way as to supply results that present the true performance of LEDs at their real working temperature. Aging procedures will then be developed depending on the usage frequency of the products and the environmental factors which act upon them. Applying these procedures will enable us to analyze and identify, while adhering to a rigorous methodology, the diverse physical mechanisms of LED breakdown, allowing us to determine and optimize the life expectancy of LED products and establish the total lighting cost.

The CITADEL partners have complementary skills and specialize in a key aspect of LED lighting and building integration. In the CITADEL program, laboratory measurements will be carried out using several types of metrology, microanalysis, and aging setups. The project also includes numerical simulations, focus groups, economic calculations, as well as a complete environmental analysis. Please do not hesitate to contact me at christophe.martinsons@cstb.fr if you have questions on the project.

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