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LED lighting to save $1.8 trillion, study says

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PORTLAND, Ore.—Solid-state lighting that replaces incandescent and fluorescent bulbs with light-emitting diodes can reap enormous savings in cost, natural resources and pollution, according to a recent study by Rensselaer Polytechnic Institute. RPI's Troy, New York-based Smart Lighting Engineering Resource Center claims that over the next 10 years savings of more than $1.8 trillion will eliminate the need to burn almost a billion barrels of oil in power plants that would otherwise produce 10 gigatons in the carbon dioxide emissions.

"Such enormous savings will result from replacing 80 percent of traditional lighting with LEDs over the next 10 years," said professor Jong Kyu Kim. "And besides replacement, there are also new capabilities possible in this lighting revolution—such as controlling the spectrum and spatial emission pattern, the polarization of the light, and temporal modulation."

RPI's Smart Lighting Engineering Resource Center recently received $18.5 million from the National Science Foundation (NSF). Together with Boston University and the University of New Mexico, the Smart Lighting Engineering Resource Center will over the next five years develop novel optical materials, new device technologies, and applications of smart lighting technologies.

Kim and Schubert claim that the LED is to lighting technology, what the transistor was to the vacuum tube. Namely, transistors began as a simple replacement technology for vacuum tubes, but evolved into a revolution in integrated circuits. Likewise, Schubert and Kim claim that the LED will begin as simple replacements, but will evolve into integrated lighting systems with functions as diverse as transistors have provided for ICs.

Simple replacement results in a 20-time savings in energy over of incandescent bulbs and a five-time savings when compared to compact fluorescent bulbs. Beyond replacements, however, LEDS promise to enable new applications that RPI's Smart Lighting Engineering Resource Center is concentrating on developing. The three top candidates being developed by RPI are: control of the light spectrum for medical applications, control of temporal modulation for wireless optical networking, and control of the polarization of light for improved display technologies.

Spectrum control, according to RPI, will enable lighting to change color during the day to positively influence the mood of workers, as well as cure some medical problems that are caused today by poor lighting conditions.

Modulating LEDs at rate too fast to see, will enable light fixtures to also serve as wireless access points that directly link different data streams to individual devices, instead of forcing all devices to share the same channel like RF-based wireless technologies do today.

Control of the polarization of the light coming from LEDs will enable liquid-crystal displays to eliminate the passive polarization filters they use today, greatly increasing the brightness of displays while simultaneously lowering the amount of power they consume.

Other smart lighting applications being developed at RPI include rapid biological cell identification, interactive roadways, boosting plant growth, and reducing the risk of certain types of cancer.