

## DOE SBIR/STTR SUCCESS



Lucent Optics' advanced light coupling technology allows for injecting light from LEDs into thin light-guiding sheets, producing low-cost, large-area, flexible lighting panels.

## LUCENT OPTICS, INC.

**B**uildings account for more than 75% of all U.S. electricity use and more than 40% of all U.S. energy use. Almost 30% of that energy is consumed by interior lighting. In commercial buildings, 80% of all lighting fixtures use fluorescent lamps to produce light. These linear fluorescent lamp (LFL) fixtures or luminaires account for about 1 billion units installed in the commercial and industrial lighting base in the U.S., costing ratepayers around \$27 billion annually. These legacy lighting products are commonly associated with poor light quality, flicker, lack of dimming, short lifetime, environmentally hazardous breakage and disposal, lack of compliance with current building codes, and very limited design choices.

### FACTS

#### PHASE III SUCCESS

After only one DOE SBIR Phase II, Lucent Optics has raised \$1.9M in State funds and private investments. Lucent Optics is working with several industry players towards technology licensing and supplying key components.

#### IMPACT

Lucent Optics' CoreGLO™ technology addresses a market need for low-cost, surface-emitting panels that can provide high light output at a low cost and that can be flexed with ease.

#### DOE PROGRAM/OFFICE

Solid-State Lighting (SSL)/  
Energy Efficiency &  
Renewable Energy (EERE)

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Creation of thin, flexible, efficient and aesthetically pleasing light-emitting surfaces has been a focus of manufacturers' worldwide who support the nearly \$20 billion general illumination industry in North America alone. In addition, ultra-thin and flexible lighting forms are the next big development for illuminated electronic displays and signs. Solid-State Lighting (SSL) technology would provide unprecedented lighting design opportunities, convenience, and considerable energy savings. Nevertheless, several challenges have thus far prevented such a revolutionary idea to materialize in U.S. commercial, industrial and residential buildings. With the help of SBIR funding from the Department of Energy (DOE), Lucent Optics has developed a new platform technology (CoreGLO™) for making thin, flexible and highly efficient luminaires at a low cost and in quantities sufficient to satisfy the global market demand. Based in Sacramento, CA, Lucent Optics was founded in 2012 by Dr. Sergey Vasylyev, an inventor with a strong academic background in physics and mathematics and two-decades of working in the renewables and Clean Tech sectors, specifically in the areas of information technology, solar concentrators and photovoltaics, daylighting, solid-state lighting, electronic displays, and backlights and photonics.

DOE has invested significant resources to research and develop innovative SSL sources which are much more energy efficient and versatile than legacy lighting technologies including fluorescent lamps. The most common type of SSL source is a light emitting diode (LED). Thanks in large part to the DOE's investments, LEDs are now a commonplace in many types of lighting fixtures saving 50% or more in energy with lifetimes exceeding 50,000 hours of operation. However, the adoption of LEDs in linear lighting products is still very low (about 6%), which is mainly due to the cost associated with replacing or retrofitting the existing fixtures and limitations of conventional luminaire designs.

Through the DOE SBIR/STTR Programs, Lucent Optics has developed and is now licensing the LED-based CoreGLO™ technology for general lighting applications. CoreGLO™ luminaires employ a thin plastic sheet to very efficiently distribute light produced by commercially available LEDs without disabling glare. Today, edge-lit panels lack the desired thinness: In order to achieve the brightness required by most applications, the panel's thickness needs to be large enough to accommodate high-power LEDs coupled to an edge of the light guide. Organic LEDs (or OLEDs) overcome this problem as they can be made using quite thin and flexible substrates. However, OLEDs are currently very expensive, which limits their adoption to luxury product categories. The CoreGLO™ technology allows for injecting light using high-brightness LEDs while dramatically reducing the material demand and thus the panel thickness, which translates directly into reduced cost and reduced lighting energy consumption. Importantly, such a design reduces environmental impact associated with replacement lamps and luminaires. It also encourages fresh new luminaire designs based on the ultra-thin, flexible forms represented by this innovation.

In order to achieve the remarkable high efficiency of CoreGLO™, Lucent Optics solved several long-standing technical problems that stalled the development of practical and cost effective thin-sheet 2-dimensional luminaires. One of these problems was coupling the output of high-power LED sources to a very thin plastic sheet so their light could be distributed and reemitted from a large surface without glare. Another problem was how to extract that light from the thin sheet without losses and without the need of additional optical structures that could compromise the cost and material efficiency of the CoreGLO™ design. As a result of the successful research supported by DOE's Office of Energy Efficiency & Renewable Energy (EERE), CoreGLO™ is now available in the form of 2D thin and flexible, wide-area lighting panels possessing the industry's lowest weight and use of raw materials.

Lucent Optics has been granted more than 15 U.S. patents for CoreGLO™ with several more patents pending. After only one Phase II SBIR award from DOE, Lucent Optics has been able to secure a \$1.9M follow-up funding from non-Federal sources. The bulk of this funding comes from the State of California/California Energy Commission (CEC) with a small percentage financed from a private seed-investment entity in the form of cost matching to the CEC funds. The State of California/CEC award is being made through a new program called Bringing Rapid Innovation Development to Green Energy (BRIDGE), which competitively awards follow-on funding for the most promising energy technologies that have previously received an award from an eligible CEC or U.S. federal agency for applied research and technology demonstration/deployment. More specifically, the purpose of BRIDGE is to fund applied research and technology demonstration and deployment energy efficiency projects that will allow researchers to continue their technology development without losing momentum or pausing to fundraise from private sources. In order to get interest from private entities, Lucent Optics participated in the Cleantech Open Accelerator program and made several pitch presentations at various events with investors participation. The funds will be used to further develop and scale-up the CoreGLO™ technology. Lucent Optics is also currently working with several leading U.S. lighting manufacturers and startups towards incorporating its LED sheets into a variety of lighting fixtures for general lighting applications and making CoreGLO™ the technology of choice for replacing and retrofitting linear fluorescent lights in commercial buildings.

The advent of CoreGLO™ empowers individuals, businesses and communities to upgrade their outdated linear fluorescent lights to SSL technology at a fraction of the cost of a typical SSL fixture. Because of providing thin, ultra-lightweight and flexible forms, it also enables lighting manufacturers and architects to design a variety of aesthetically appealing, innovative luminaires, which is expected to accelerate the adoption of SSL a global scale.