

CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

Awardee Summary

CCITF PROGRAM	Clean Technology Development
PROJECT TITLE	Secondary optics for LED lighting
SECTOR	Energy Efficiency
ORGANIZATION	University of Alberta
PROJECT LEAD	Xihua Wang
AI PROJECT ADVISOR	Babatunde Olateju
GRANT AMOUNT	\$25,000
START DATE	TBD
END DATE	TBD

PROJECT OBJECTIVE: To tailor LED lights with good secondary optics designs to greatly improve to the energy efficiency of LED lighting.

PROJECT PROFILE: In the proposed project, we aim to improve the efficiency of LED lights through secondary optics design. Secondary optics design in LED lighting is important, since these LED chips on the market are pre-packaged for efficient light extraction and heat dissipation. It is the secondary optics design that fit the same LED chip into different lighting applications, from street lighting to in-door lighting. Those secondary optics involves many types of lens and mirror designs, such as reflector cavities, Fresnel lenses, and pillow lenses. A good secondary optics design can modify the output beam of the LED, so that the output beam of a LED will efficiently meet the desired photometric specification while consumes less energy. Thus innovations on secondary optics design can advance LED lighting technologies, and achieve high-efficiency lighting to reduce energy consumption which is equivalent to reduction of GHG emissions. For the technology development, we will apply the freeform lens design and optical filters to control the spatial and spectral distribution of LED lights. Currently, general purpose LED lights are used in most lighting applications, and tailoring LED lights with good secondary optics designs can greatly improve to the energy efficiency of LED lighting. In the end, we will work with our industrial partner – Lumican – to demonstrate high-efficiency LED lights for street lighting application, and then bring the technology to other applications using high-efficiency LED lights.

The high efficiency and directional nature of LEDs makes them ideal for home and industrial uses. According to a recent report by U.S. Department of Energy, by 2027, widespread use of LEDs could save about 348 TWh (compared to no LED use) of electricity: This is the equivalent annual electrical output of 44 large electric power plants (1000 megawatts each), and a total savings of more than \$30 billion at today's electricity prices. Therefore, LED is the future of lighting technology. According to a recent report titled "Global LED Lighting Market & Forecast by Applications, Regions, Companies" from Renub Research, the global LED lighting market will surpass US \$100 Billion by 2024. Therefore, advancing LED lighting

technologies will bring great benefits to our society, especially in energy efficiency and reduction of GHG emission.

GHG EMISSION REDUCTION SUMMARY: