

Kawerak Inc., Native Village LED Lighting Demonstration Project

Prepared For

Alaska Energy Authority
813 West Northern Lights Blvd.
Anchorage, AK 99503

Submitted By

Kawerak Inc.,
PO Box 948
Nome, AK, 99762

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PARTNERS:	Cree Lighting Inc., Kawerak Inc. + 20 Regional Tribes
TOTAL PROJECT COST:	\$ 459,587.19
GRANT FUNDS REQUESTED:	450,655.71
MATCH COMMITTED:	8,931.48

Project Manager & Administrative Contact

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PROJECT SUMMARY AND DESCRIPTION

Kawerak Inc., located in Nome, AK, is an Alaska Native non-profit serving 20 federally recognized tribes in the Bering Strait. Kawerak proposes to utilize Alaska Emerging Energy Technology Grant funding to assist IRA Council buildings across the region to retrofit existing 48" linear fluorescent fixtures with Cree CR series Light Emitting Diode (LED) luminaires.

A 2009 DOE publication entitled "Performance of T12 and T8 Fluorescent Lamps and Troffers and LED Linear Replacement Lamps" ¹concludes 4-ft linear replacement lamps are more expensive, produce less, lower quality light, and are less efficient than 48" linear fluorescent tubes. The study goes on to say LED luminaires have more promise: "well-designed LED luminaires can more effectively take advantage of LED directionality and can better accommodate LED thermal management to maximize efficacies." Technology has advanced since 2009.

Cree, a worldwide leader in LED technology, announced the availability of the CR series of luminaires in April 2011. Cree luminaires replace the entire fluorescent fixture. They are engineered to fully leverage the inherent benefits of LED technology. They produce higher quality light, are more efficient, and require substantially less maintenance than the best fluorescent technology available.

Retrofits are currently underway at the Pentagon, foreign embassies, and military installations worldwide using Cree technology, but the benefit/cost equation is different here. Higher transportation and labor costs make the retrofits more expensive. High electricity rates, on the other hand, help retrofits pay for themselves more quickly. We will demonstrate Cree CR technology is viable under these conditions.

Kawerak will utilize innovative techniques to conclusively demonstrate state-of-the-art Cree luminaires outperform linear fluorescents in terms of energy efficiency, reduced maintenance, environmental friendliness, and end user acceptance. This will promote the widespread adoption of this technology.

PROJECT ELIGIBILITY

This project satisfies three Emerging Energy Technology Grant Fund eligibility criteria:

1. It deploys existing technology not previously demonstrated as viable in Alaska.
2. It demonstrates savings through increased energy efficiency.
3. It reduces the demand for electricity, which is produced using hydrocarbons in our region.

PROJECT INNOVATION

Kawerak will use innovative data collection techniques and analysis methods developed by higher education and private industry, and recently demonstrated by the state (see below). We will use these methods to conclusively demonstrate LEDs' are superior to linear fluorescents in a real-world setting.

Referring to the Technology Readiness Level (TRL) table in the RFA, Cree luminaires are currently at TRL eight, defined as being proven to work in their final form and under expected but limited conditions. This project will advance the technology through TRL nine, defined as having been demonstrated by multiple applications in final form under actual deployment conditions.

Cree claims "***We are the innovators, the pioneers, the dreamers. We are the LED Lighting Revolutionaries.***" The LED chips Cree manufactures, and the luminaires engineered to optimize

¹ "Performance of T12 and T8 Fluorescent Lamps and Troffers and LED Linear Replacement Lamps, CALiPER Benchmark Report" Jan 2009, Prepared for US Department of Energy under Contract DE-AC05-76RL01830

their performance, are cutting edge technology. The CR series luminaires we propose to install deliver more than 100 lumens per watt with a color rendering index above 90. Products currently available are engineered to last 50,000 hours; they have a five year guarantee. Even higher efficiency Cree CR series luminaires, guaranteed for seven years, are scheduled to become available in mid 2012. Kawerak has installed and tested both linear 48" LED retrofit tubes, and a CR series luminaire. The CR series is innovation at its best.

PRIORITY

This project qualifies for priority treatment under grant guidelines. Kawerak is an Alaska organization. The project is supported by an in-kind match from Kawerak. This project accomplishes the Emerging Energy Technology Grant Fund goal of accelerating the commercial adoption of an emerging energy technology that will be viable within five years. It will demonstrate energy savings, reduced exposure to environmental pollutants, and enhanced quality of life in a real-world setting. This is the last step before widespread commercial adoption.

Protecting the environment is a priority in our region. Native Village residents practice a subsistence lifestyle, and have expressed concerns about mercury the contained in fluorescent tubes. Non-financial benefits of LED technology include reduced vulnerability to potentially harmful mercury.

Independent research supports Cree's performance claims. Photometric reports produced by Luminaire Testing Laboratory Inc. (LTL), an independent source of photometric test reports for the lighting industry, also authorized to test lighting products for the EPA Energy Star Program, verify Cree CR24 luminaires outperform T8 linear fluorescents. (LTL Test #22421)

Further, the DesignLights consortium (DLC), a nationwide collaboration of utility companies and regional energy efficiency organizations, claims the Cree CR series luminaires are the most efficient, and have the highest color rendering index (CRI) of any products rated in their Linear Panel category. Cree manufactures the *only* DLC qualified LED luminaires.

TECHNOLOGY VALIDATION AND RESEARCH METHODOLOGY - PROJECT OBJECTIVES

Our overall objective is to demonstrate LED lighting is a preferred substitute for T8 linear fluorescent fixtures. We will demonstrate increased energy performance, lifespan and reliability, reduced operation and maintenance costs, and increased workforce acceptance.

PROJECT METHODOLOGY

We will establish baseline electricity demand and as-is installed conditions, estimate retrofit costs, and project retrofit benefits. We will compare post retrofit electricity usage to projected savings to validate and refine the accuracy of our estimates, and we will determine how cost effective the retrofits actually were. We will survey and track end user responses at each IRA building. We will publish a report at the end of this study which will clearly illustrates the benefits and costs of LED retrofits in remote isolated communities.

The following has been completed:

- Inventory existing fixtures and establish baseline physical conditions.
- Estimate project costs, benefits, and simple payback using accepted methods.

Prior to submitting a complete proposal:

- Collect historic billing records and establish baseline energy usage conditions.

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- Obtain endorsement and commitment from tribes and Kawerak’s board of directors.
- Obtain firm commitments for matching funds and in-kind contributions from all partners.

If this project is funded we will:

- Coordinate fixture purchase and distribution from Kawerak in Nome. 4 weeks
- Coordinate installation in Villages with local labor or electrician from Nome. 1 wk/village
- Coordinate with disposal or re-use of mercury laden fluorescent tubes.
- Update estimated cost data with actual cost data as we progress.
- Track post-retrofit electricity usage at each location to verify savings estimates.
- Survey end-user acceptance at each location. 4 weeks
- Monitor project for possible longer-term maintenance and quality control issues.
- Publish a detailed project close-out report. By week 24

SUMMARY OF PROJECT SCHEDULE

Weather, and other factors beyond our control, make planning and logistics difficult in our region. If things go smoothly, this project might be completed in six months or less. Allowing for unknowns, we believe it is reasonable to expect project closeout within one 1 year of award announcement. The project can start any time, since air transport is not constrained by the short construction season. Installation when there is plenty of daylight is, however, still preferred, as lighting systems will need to be powered down while the retrofits are taking place.

Line Item	Unit Cost	Building	Project Total
Fixtures (296.07/unit)X(45 fixtures)X(20 bldg)	\$ 296.07	\$ 13,323.11	\$ 266,462.26
This project will retrofit 20 buildings in the region (one for each federally recognized tribe), each building having an average of 45 fixtures. The per unit price was derived from a weighted average required fixtures as per Cree sales listings.			
Installation (88.61/unit)X(45 fixtures)X(20 bldg)	\$ 88.61	\$ 3,987.23	\$ 79,744.50
Each unit will take 1.5 hours to install and is budgeted at the Davis Bacon rate for the Bering Strait Region. The time estimate is based on the experience of installing a similar fixture at Kawerak's Nome Offices.			
Freight (46.20/unit)X(45 fixtures)X(20 bldg)	\$ 46.20	\$ 2,078.96	\$ 41,579.15
Based on advertised freight rates on Northern Air Cargo and Bering Air			
Sub-Total (430.87/unit)X(45 fixtures)X(20 bldg)	\$ 430.87	\$ 19,389.30	\$ 387,785.92
Travel		\$ 1,762.73	\$ 35,254.67
Using Kawerak's negotiated Bering Air rate, \$120/night lodging, \$60 per diem, and the days required to complete each job.			
Indirect rate (5%)		\$ 1,380.76	\$ 27,615.13
Kawerak's negotiated pass-through indirect rate.			
Grant Funding Requested			\$ 450,655.71
Kawerak in-kind contribution			\$ 8,931.48
Project coordination by Kawerak's Energy Specialist, based on 25% total hours required of electrician to install fixtures.			
Total Project Cost			\$ 459,587.19

SUMMARY OF PROJECT BUDGET

The project will be financed through a combination of Emerging Energy Technology Grant funding, and a labor contribution from Kawerak. Cree management is considering assisting with the project. The budget shown has been simplified due to page constraints. A more detailed budget will accompany the full proposal.

Energy efficiency is the first step along the Alaska Energy Authority's pathway towards energy independence. Efficiency retrofits pay back more quickly at locations where energy is expensive; they put money back in consumers pockets. Since IRA

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Council buildings are not eligible for Power Cost Equalization, they feel the full impact of high electricity prices. Therefore these sites are ideally suited for a project that enhances lighting efficiency.

There are many unknowns, but our initial estimates suggest a simple payback on this project between 3.8 (2009 electricity rates) and 4.5 years (2010 rates) based on energy savings alone. Beyond electricity savings, benefits including reduced maintenance, an improved workspace environment, and reduced exposure to environmental pollutants might be substantial. One of our project goals is to ground truth estimates like these.

PROJECT TEAM QUALIFICATIONS

Kawerak Inc. has solid project management experience and robust accounting policies and procedures, and continues to successfully administer grants from numerous federal and state agencies.

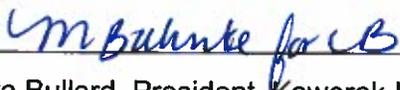
Walter Rose received an MBA and an MIS from Claremont Graduate University in 2004. He has been with Kawerak for more than two years as the Energy Specialist. Earlier in his career, he handled all domestic purchasing and shipping for Amada Manufacturing, a Japanese manufacturer of CNC Turret Punch Press Machines. He is experienced in all phases of product procurement including purchasing, receiving, inspecting, authorizing payment, and post-receipt in-house tracking.

Cree is a US manufacturer of LED chips, semiconductors, and lighting fixtures. The CR series of luminaires meet federal made in the USA requirements. Kawerak believes the CR series is the first commercial lighting product capable of effectively competing against comparable fluorescent fixtures.

DISCUSSION OF COMMERCIALIZATION OF FUNDED TECHNOLOGY

According to the Department of Energy, 48" fluorescent fixtures produce 80% to 90% of the lumens consumed in our country. LED penetration into the commercial and industrial 48" fluorescent sector in the lower 48 is currently less than 2%. ²We anticipate this figure is even lower in Alaska. Cree LED luminaires have been shown to save 22% relative to the most efficient T8 fixtures available. Savings increase to nearly 75% when older T12 fluorescent fixtures are replaced. The commercial adoption of LED lighting in this sector has tremendous potential for electricity savings in Alaska. This study will validate Cree's claims, and should clear the way for this technology statewide.

By signing this application, I certify that we are complying and will comply with the amount of matching funds being offered.



Loretta Bullard, President, Kawerak Inc.

²"2010 U.S. Lighting Market Characterization" prepared for: Solid-State Lighting Program Building Technologies Program Office of Energy Efficiency and Renewable Energy U.S. Department of Energy by Navigant Consulting Inc.. Jan 2012