STOCKTON UNIVERSITY
ANNUAL REPORT FOR
2020 INITIATIVES PROJECT

PROJECT LEADER(S):	**Mark E. Mallett & Daniel Wright**
PROJECT TITLE:	**Green Lighting Initiative in the PAC**
DATE:	July 30, 2019
CC:	

- *The boxes below expand as needed to accommodate your notes. You may also include/submit appendices or attachments, if needed.*
- *Email a copy of this completed form to Jessica Kay, Senior Planning Analyst at:* ***2020@stockton.edu*** ***or*** ***Jessica.Kay@stockton.edu****.*

Please provide a summary of the project and your experience.

The object of the project was to: a) survey the electrical loads consumed by the theatrical (stage) lighting system of the Performing Arts Center over a performance-season duration; b) analyzing the demands of specific elements of that system (i.e., specific categories of equipment in the inventory); and c) identify and reduce such non-equipment costs as labor and consumables like lamps and color media to shape and guide a purchase of an inventory of specific LED-based lighting instruments.

With assistance from Stockton's Sustainability program, a comprehensive electrical-load census was conducted. Together with detailed historical information of how different elements of the PAC inventory were arrayed and engaged in performance contexts of great variety, we identified those elements that were most egregious in demands of redundancy (i.e., separate groups of similar instruments for different color purposes) and attendant labor costs.

Once identified, replacement of the older equipment indicted by our review was begun through utilization of the granted funds to purchase lighting instruments and related equipment (cables, mounting hardware, etc.). This was accomplished by the end of the grant's first year. The second concluding year saw the integration of the new instrumentation into the PAC inventory. The results were, artistically, beyond expectations. And while a longer-term review is ongoing, initial results suggest that the savings hoped for in terms of labor and consumables are already recognizable and expected to grow.

Please attach a copy of your original proposal or list your stated objectives and expected outcomes.

Please see attached below.

Please describe the results of your project and compare them to your original expectations. Elaborate on how well your objectives were met and how they might have changed. Note any particular obstacles that may have prevented your achieving full satisfaction on desired outcomes.

The equipment acquired through this grant meets or exceeds our expectations, both in terms of performance/utility and of those costs arising from installation and upkeep of the individual instruments in the inventory. The new instruments' capacity for producing specific colors of light on demand has virtually obviated the need for multiple installations of identical instruments, differing only in the color-generation expected of each, allowing fewer instruments to fulfill these needs. And by extension, fewer instruments allows for labor savings; there is an expectation that such savings will continue to grow as PAC stagehands become more familiar with the new instruments and their use.

Moving forward, the first Lighting Design class (THTR 2285) will incorporate the new instrumentation in its syllabus, meeting a final objective of our proposal: raising an awareness of and addressing "green" issues inhering in theatrical production, and making such awareness an element of the course syllabus/curriculum.

Please list any follow-up actions (publications, presentation venues, etc.)

Are you recommending the continuation of this project? If so:

- **What are the next action steps you foresee or recommend?**
- **What are the expected budget requirements going forward?**
- **Please identify the program, department, or division you should be working with to secure continuation of funding for your project.**

[Note: continuation proposals must be approved and incorporated into the appropriate budget process. This report will not constitute a request for permanent funding.]

Based on one year's acquaintance with and employment of the items acquired under this grant, the results strongly suggest continuing the essential objects of this proposal: acquiring and integrating contemporary technologies to more efficiently and economically support the theatrical presentations of the Performing Arts Center. Recommendations for further development of this initiative include upgrades to the PAC power-distribution network and dimmer-control system. We also recommend an ongoing program of equipment upgrades for the PAC (and by extension, the Experimental Theatre), and expect similar long-term savings as a result.

Such an extension of the Green Lighting initiative would require approximately $50,000, though not necessarily as a single outlay. Funding to upgrade specific categories of instrument in a kind of rolling investment.

Given the unique nature of the PAC as a quasi-academic/quasi-administrative entity, attempting to identify future funding sources is somewhat problematic. As one of the principal academic-program users of the PAC, Studies in the Performing Arts should certainly be in the van of potential funders; offices of Student Life, SET and similar all-campus organizations are similarly regular users and might reasonably be levied as a source of funds.

FINANCES: Based on your proposal, please outline below how the award has been spent.

	Amount	**Notes/Comments**
Beginning Budget Balance as of:	**$ 35,000**	
Salary Expenditures		
• Stipends	$ 0	

• Full-time staff salaries	$ 0	
• Full-time faculty salaries	$ 0	
• TES salaries	$ 0	
• Fringe Benefits	$ 0	
Total Salary and Fringe Expenditures	$ 0	
Non-Salary Expenditures *(supplies, travel, etc.)*		
(20) ETC Color Source Par Deep Blue Array	$ 11,500.00	
(20) Diffuser Frame MED	$ 440.00	
(20) Diffuser Frame WIDE	$ 440.00	
(20) 20 Amp. PowerCon Extension Cable	$ 640.00	
(4) ETC ColorSource Relay	$ 756.00	
(4) Color Source Pipe Mount Kit	$ 66.00	
(7) Altman Spectra Cyc 200	$ 13,223.00	
(7) Altman Yoke Kit	$ 340.20	
(4) Chauvet Rogue R2 Wash	$ 4,480.00	
(5) Blizzard Powercon Combo Cable	$ 145.75	
(1) Altman Ghost Light	$ 479.36	
(4) Altman Work Light 130w	$ 2,478.04	
Total Non-Salary Expenditures	$ 34,988.35	
Total Salary + Non-Salary Expenditures	**$ 34,988.35**	
Ending Budget Balance as of:	**$ 11.65**	

If there are remaining expenditures required to complete the project, and your project was approved for multiple fiscal years, please itemize them with expected amounts and timing for payment.

IMPORTANT: ***Unused funds reverted to the general 2020 Initiative Fund at the end of the fiscal year 2019, if not approved and encumbered for project costs in the next FY.***

Item	Expected Amount	Expected Timing for Payment
Total		

Green Lighting Initiative in the PAC

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2020 Sustainability Project Proposal

Additional Details

Narrative

This project, a Sustainability initiative, is seeking funding to replace significant parts of the Stockton Performing Art Center's (PAC) stage lighting, now mainly done with incandescent and halogen-lamped instruments, with energy efficient LED (Light Emitting Diode) technology. Over the past few years, the performing arts industry has undergone a remarkable set of transformations, as theatre/performing arts facilities, theatre companies and producers have developed an awareness of the ecological or environmental costs associated with presenting a theatrical production. This project alights with that increased environmental awareness in society and in the theatrical industry.

Stage lighting, in particular, incurs environmental costs that are both direct – i.e., the charges for electrical service and heating and cooling systems – and indirect, most notably in a theatre's waste stream. Contemporary theatrical lighting – the lighting employed in conjunction with and part of a theatrical performance – requires a number of lighting instruments, each individually controllable in terms of on/off state, mounting position and aim at a particular part or section of the stage, and intensity or brightness; color is achieved using mylar-based plastic color media(gel). The illumination from such instruments is produced by incandescent or halogen lamps rated at 500-1,500 watts, and together often comprise an inventory of over one hundred individual units.

For general, or "wash" illumination (i.e., large areas such as backdrops or quadrants of the stage space), this means that each specific color requires a unique set of instruments, gels and electrical circuits or dimmers; a second or third color each requires its own second or third inventory of instruments. Lighting a full-stage backdrop, for instance, typically employs three different washes, which when mixed together at appropriate intensities produce any of a broad range of colors and intensities/brightnesses. Employing LED technology would cut the number of required instruments by at least one third.

Capable of creating specific and unique colored light as well as intensities, the lamps in the new LED instruments use considerably less electrical energy that a traditional incandescent lamp, generate less heat, and are markedly longer-lived. By way of example, running 60 500w lighting instruments (a relatively standard configuration) in washes for 16 hours/week at $0.13/kWh costs around $93.60, or $2,808 over a 30-week performance year; LED instruments would cost $18.72/week or $561.60 for the 30-week season. Using the same example, 102,360 BTUs of heat are generated, versus 6,824 arising from one third the number of LED instruments.

In addition, the life-span of the LED array means that lamp replacement might be needed every 20,000 hours, rather than the 200 hours expected of contemporary incandescent lamps, and obviates the need for disposable color media, reducing the overall waste stream

significantly. The longer usable lifespan of the LED instruments and reductions in waste also promise, through the financial savings, to not only pay for themselves but provide a return on the purchase investment as well.

This project has two fundamental objectives. First, and most critical, is the realization of savings and/or reductions in electrical load (primary metric), as well as overall inventory of equipment required, labor hours, consumables (lamps, color media) and the heat generated by the lighting instruments. The second purpose is directed at the Learning leg: the introduction of "green" concerns as a component of the Performing Arts curricula. Students will necessarily engage with issues of environmental concern, fostering an awareness of the environmental impacts of such facilities as theatres or performing arts centers, future theatre professionals will understand their responsibilities as stewards of finite resources. They will also gain opportunities for practical experiences with the new technology, and so be better prepared to enter the professional arena.

The method for assessment of the expected energy and cost savings are also, in the main, already established. In Spring 2017, the theater staff, working with members of the Sustainability Program, participated in an initiative to install “loggers” which were then used to obtain sample measurements of the electrical loads drawn by the PAC stage in different configurations. Thus this existing instrumentation is already set up, this facilitating the gathering of clear and objective evidence of the extent of energy savings realized from this project. The direct involvement of the students, which is expected to continue through the implementation of this project, will contribute to Stockton’s educational mission as well.

The PAC is a university wide resource with the following Mission Statement:

> The Stockton Performing Arts Center of Stockton University seeks to provide audiences from across the region with the opportunity to experience a wide variety of cultural programming by professional touring companies of regional, national and international stature. By showcasing companies of artists whose established or emerging reputation within the areas of music, dance and theatre reflects the highest artistic standards, the Center is able to occupy a unique position among multidisciplinary organizations serving not only the southern New Jersey Shore Region but also the multi-state area of New Jersey, Pennsylvania, New York and Delaware. The Center is committed to contributing to Stockton University's educational mission and to engaging students in the performing arts and other disciplines through its quality and diverse programming.

Thus this project will not only have university wide impact, as required for this funding, it will in some sense have regional impacts as well. In summary, this project will enable the PAC to continue to pursue its wide ranging mission and programming, with lessened environmental impact, at a lower cost, and in fact with enhanced artistic and technical capabilities due to the versatility of the new generation LED instruments.

Assessment Plan

This project will involve replacement of the existing incandescent “General Illumination” lighting instruments in the PAC inventory with LED-based instruments. Specifically, the instruments to be replaced will include the sixty-three cyclorama lighting instruments (Cycs) and forty-eight PAR instruments currently used.

This project will assess three areas: (1) energy savings, (2) cost savings, and (3) student involvement and learning.

Energy Savings: The loggers installed to establish the base-line electrical-load data will remain in place, and data will continue to be harvested. The electrical loads drawn by these instruments will be monitored over the course of the project, which will enable us to provide clear and objective evidence of the direct energy savings resulting from the use of the more energy efficient LED lights.

Cost Savings: Beyond the energy savings, the LED instruments have much longer bulb lives, and no longer need color media other similar consumables. They will require less labor to use and maintain. An analysis of these related expenses will be performed at the end of the project by comparison the post-LED expenditures with the expenditures the previous (pre-LED) fiscal years, thus again providing clear and objective evidence of the direct cost savings of this project.

Student involvement: Data on student involvement will be collected as part of this project, such as numbers of students involved, time estimates of their involvement, related reports or other assignments produced by the students, and self-assessment via student questionnaires.

Additional Details

This project requires a one-time, up front initial investment. Without even factoring in the energy savings, the longer usable lifespan of the LED instruments and reductions in waste promise sufficient financial savings to not only pay for themselves but provide a return on the purchase investment as well.

The purpose and scope of this project has been discussed with Dean Honaker (ARHU), who is supportive. It was Dean Honaker who generously helped to underwrite the acquisition of the loggers already employed to measure electrical loads in the PAC theatrical stage lighting.