Rec 2/13/14

1

8

MTSU Clean Energy Initiative Project Funding Request

There are five (5) sections of the request to complete before submitting. See http://www.mtsu.edu/~sga/cleanenergy.htm for funding guidelines.

1. General Information	
Name of Person Submitting Request : Leslie Mayberry	
Department/Office : Energy Services	Phone # (Office) 615-904-8356
MTSU Box # 32	Phone # (Cell) 615-238-7391
E-mail : LMayberr@mtsu.edu	Submittal Date 2-12-2014

2. Project Categories (Select One)			
Select the category that best describes the project.			
X	Energy Conservation/Efficiency		Sustainable Design
	Alternative Fuels		Other
	Renewable Energy		

3. Project Information
a. Please provide a brief descriptive title for the project. **b.** The project cost estimate is the expected cost of the project to be considered by the committee for approval, which may differ from the total project cost in the case of matching funding opportunities. **Any funding request is a 'not-to-exceed' amount. Any proposed expenditure above the requested amount will require a resubmission.** c. List the source of project cost estimates. d. Provide a brief explanation in response to question regarding previous funding.
3a. Project Title : M2G –Boiler Sequencjng Controller (Sam Ingram Building)
3b. Project Cost Estimate : $7,698
3c. Source of Estimate : Greffen System
3d. If previous funding from this source was awarded, explain how this request differs? N/A

4. Project Description

(Completed in as much detail as possible.)

a. The scope of the work to be accomplished is a detailed description of project activities.
b. The benefit statement describes the advantages of the project as relates to the selected project category.
c. The location of the project includes the name of the building, department, and/or specific location of where the project will be conducted on campus.
d. List any departments you anticipate to be involved. Were any departments consulted in preparation of this request? Who? A listing may be attached to this form when submitted.
e. Provide specific information on anticipated student involvement or benefit.
f. Provide information for anticipated future operating and/or maintenance requirements occurring as a result of the proposed project.
g. Provide any additional comments or information that may be pertinent to approval of the project funding request.

4a. Scope: Work to be accomplished

To purchase and install an advanced M2G boiler Sequencing controller.

4b. Scope: Benefit Statement

This controller will reduce natural gas usage and provides a ROI in most cases of less than three years. The M2G not only saves gas but with the reduction of boiler firings it will reduce the amount of carbon that is released into the atmosphere as well as give extended life to MTSU boilers.M2G has been installed at the University of Georgia, South Carolina, Loyola, Texas, and North Carolina with positive results. MTSU will keep track of gas usage to insure the microprocessor performs as advertised. It would be good for MTSU to install this technology.

4. Project Description (continued)
4c. Location of Project (Building, etc.) Sam Ingram Building
4d. Participants and Roles Greffen System
4e. Student participation and/or student benefit n/a .
4f. Future Operating and/or Maintenance Requirements none
4g. Additional Comments or Information Pertinent to the Proposed Project n/a -

5. Project Performance Information
Provide information if applicable. a. Provide information on estimated annual energy savings stated in units such as kW, kWh, Btu, gallons, etc. b. Provide information on estimated annual energy cost savings in monetary terms. c. Provide information on any annual operating or other cost savings in monetary terms. Be specific. d. Provide information about any matching or supplementary funding opportunities that are available. Identify all sources and explain.
5a. Estimated Annual Energy Savings (Estimated in kW, kWh, Btu, etc.) see 5b
5b. Annual Energy COST Savings ($) Projected savings per year is $2,366.Payback for this project will be in 3.25 years. M2G boiler controller is expected to last for at least 15 years giving MTSU an additional $35,490 in savings. See attachment on executive summary from Greffen Systems
5c. Annual Operating or Other Cost Savings. Specify. ($) none
5d.Matching or Supplementary Funding (Identify and Explain) N/A

GREFFEN SYSTEMS

Middle Tennessee State

Executive Summary

M2G Boiler Sequencing Controller

MIDDLE TENNESSEE STATE UNIVERSITY

January 15, 2014

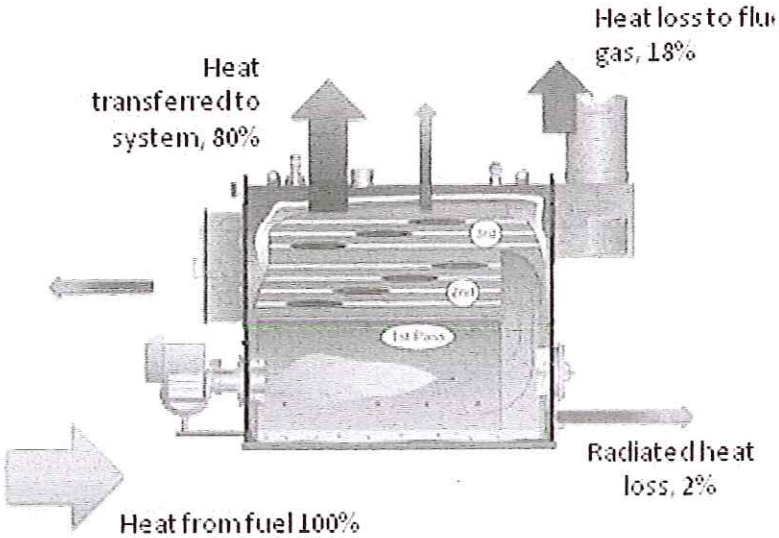
Greffen Systems
770.886.7979

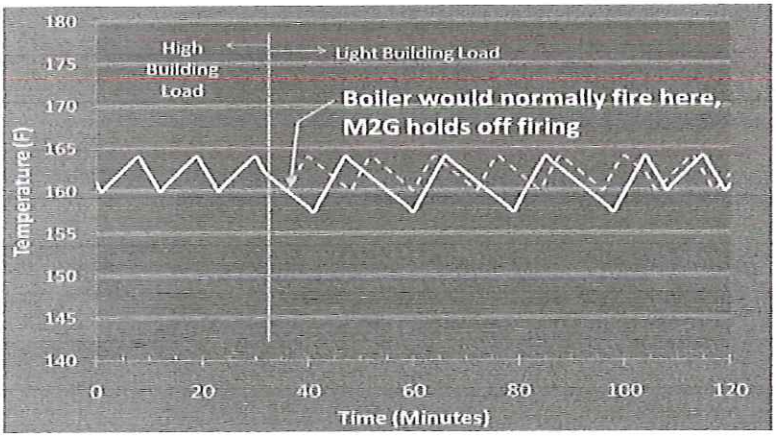
GREFFEN
GREEN EFFICIENT ENERGY SYSTEMS

Challenge

Current Boiler Operation

Closed loop hot water boilers run at all times in a range of between approximately 160 and 180 degrees Fahrenheit. Once this targeted temperature in achieved, the boiler shuts off and cools for a "dead band" period of approximately 2.5 degrees. Once the "dead band" is reached the boiler will purge out all combustible materials as well as any remaining heat in the boiler and fire once again until it reaches the targeted temperature. This recurring boiler firing (cycling) occurs continuously, even on warmer days when no heat is required. This inefficiency increases energy spend due to boiler dry-cycling.





Designed by boiler experts in Europe, the M2G product is a boiler control microprocessor that determines if a real request for heat on the boiler exists, or if the boiler is dry-cycling. If it is determined that a real call exists, the boiler is immediately released to fire. If it is determined that there is a false call for heat, the dead-band is automatically increased from 2.5 degrees to 14.5 degrees or 15 minutes (whichever occurs first) before allowing the boiler to fire. The microprocessor checks for real calls every 10 seconds and dynamically responds to boiler requests. If at any time during the increased dead band cycle, or 15 minute cycle, the boiler receives a real call for heat, the boiler will be allowed to fire. Finally, because real calls for heat from the boiler are not interrupted, the comfort levels of the building occupants are not adversely affected. The interior temperatures remain consistent with those temperatures achieved before M2G installation.

GREFFEN SYSTEMS

MTSU / Ingram Building Executive Summary

It is recommended that MTSU / Ingram Building install Greffen Systems' M2G boiler sequencing microprocessors on their One Rite boiler. The Rite boiler has an output of 2,000,000 BTU/hr. After analysis of the gas bills and boiler equipment, this location is an excellent candidate for the savings provided by the M2G Boiler Sequencing Controller.

Boiler Savings at Ingram Building

Executive Summary	
• CURRENT ANNUAL COST	$15,776.07
• PROPOSED ANNUAL COST	$13,409.66
• SAVINGS	15%
• ANNUAL SAVINGS	$2,366.41
• ESTIMATED PROJECT INVESTMENT	$6,930.00
• PAYBACK PERIOD (Years)	2.93

By implementing the suggested changes, MTSU Ingram Building, is positioned to reduce their energy spend by $2,366.41 per year and generate a 5 year NPV of $2,866.21 with an Internal Rate of Return of 21%

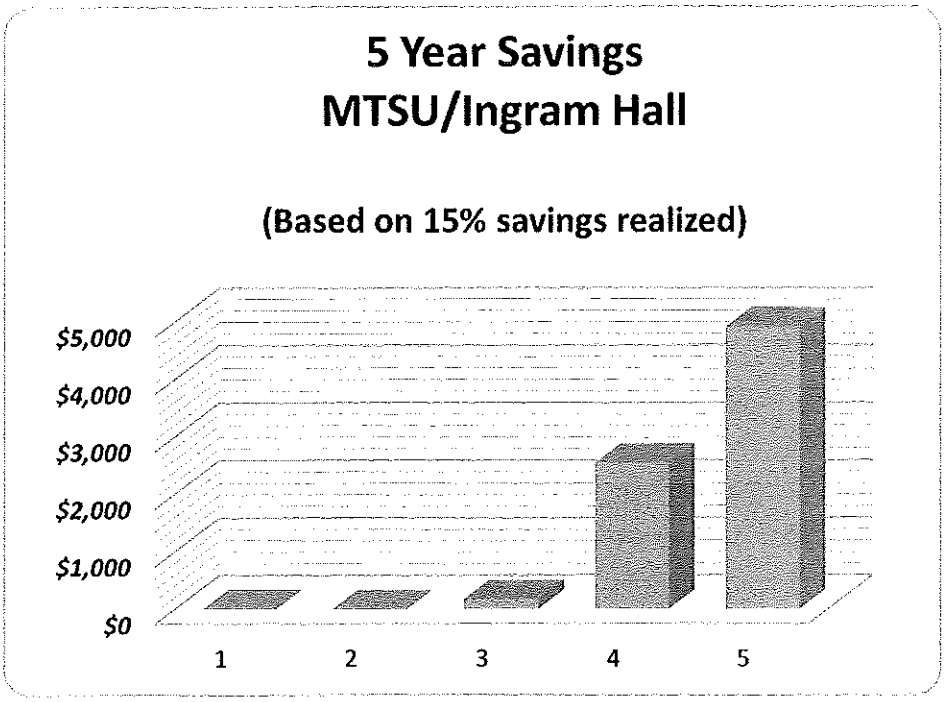
Based on installations of the boiler sequencing device across the United States, it is anticipated that Ingram Building will achieve energy consumption savings between 5% and 25% from this program. Estimates project that at only a 15% savings that Ingram Building will realize a payback of 35.1 months, an Internal Rate of Return of 21% and a 5 year Net Present Value of $2,866.21 by undertaking this initiative at this location. These results are based on an estimated cost of capital of 6% and a capital investment of $6,930.00. In over 4000 installations in Europe and North America the Greffen Systems' boiler sequencing device has seen savings of up to 27%. Savings depend on a number of factors unique to each site. It is expected that Ingram Building will realize an annual savings in the 10% - 15% range.

GREFFEN
GREEN EFFICIENT ENERGY SYSTEMS

Solution

Significant potential exists for savings within Ingram Building. The $7,700.00 installed cost allows Ingram Building to achieve their internal hurdle rates. At only a 15% a year savings, any location that has boiler related energy spend of only $26,000 a year should achieve a Payback Period of close to 24 months.

With a current annual spend of $15,776.07; the payback (with only a 15% savings) is only 35.1 months



GREFFEN SYSTEMS

Benefits

By reducing the dry cycling of each of the identified boilers, a number of benefits will be achieved. The low project cost and high savings rate offers cost savings and yields IRR estimates for the initial location of 21% at just a 15% energy savings. By reducing multiple firings per hour, both the burner and the boiler's lifespan are extended. This occurs by reducing usage (less starting and stopping) and by reducing boiler fatigue (reducing the heating and the cooling of the boiler). Additionally, consuming less natural gas and oil equates to CO2 savings. A 5% to 25% energy savings equates to not only a payback period of 35.1months for Ingram Building, but also a 5% to 25% carbon savings at this location as well. In an era when wind and solar projects are offering ROIs of five to fifteen plus years, we offer an alternative solution with tremendous financial and environmental ramifications.

Alternatives

Generally, most apparent competitors to this technology are actually complementary products which either (a) attempt to save energy by controlling some other aspect of boiler control or (b) target boiler optimization by application of some means of pre-set adjustment to boiler operation. There is no competing product which monitors thermodynamic response of both building and boiler and tailors boiler operation to building demand. In the area of general building management (BMS) and thereunder sub-systems which attempt to optimize energy use; the systems either generally defer to the boiler's own management scheme or attempt to control the boiler with a fixed, rather than dynamic regimen. After-the-fact attempts to recover waste heat going up the stack may be viewed as a competitor of sorts, however, compared to the benefit gained from not wasting the energy in the first place, these systems do not offer a superior solution both in terms of cost and effectiveness.

GREFFEN SYSTEMS

Appendix

Proposed Investment

Ingram Building			
EQUIPMENT PURCHASE	UNIT COST	NUMBER	COST
M2G USA	$7,700	1	$7,700
One Time Discount	-10		-770.00
Cost for M2Gs before tax			$6,930.00

- Client's internal cost of capital is: **6%**
- Payback Period for the client location at a 15% savings: **35.1 Months**
- Net Present Value (NPV) at a 15% savings: **$2.866.21**
- Internal Rate of Return (IRR) at a 15% savings: **21%**

- **Taxes are not included**

GREFFEN SYSTEMS

Appendix

Project Description/Implementation Plan

Upon approval from Middle Tennessee State University, Ingram Building, Greffen Systems will develop a schedule and a timeline for installation. The installation will take approximately three hours per boiler.

Greffen's installation team will review basic information on each boiler. Because of the wide range of Greffen's installation coverage, the one closed loop hot water boiler will be fitted with M2G's. It is anticipated that installation will be completed in 3 hours.

Measurement

We recommend ongoing tracking of energy consumption by tracking monthly energy usage from billing data. The installation date of the M2G technology will provide a watershed date, from which to estimate energy savings as compared with historic data. A more meaningful comparison will be possible with factoring in the period number of billing days and heating demand (degree days) in the analysis. Degree data is available from the utility provider, or can be obtained from a nearby National weather service recording site. Greffen can oversee data collection and generate a performance analysis.