DEPARTMENT OF GENERAL SERVICES (DGS)

SMALL GESA-2 RFP

TECHNICAL SUBMISSION

THADDUES STEVENS COLLEGE

July 14, 2016 – 11:00 a.m.

A. Proposal Signature

Proposer's Representations and Authorizations. Proposer by signing on the signature page and submitting its proposal understands, represents, acknowledges and certifies that:

a. All information provided by, and representations made by, the Proposer in the proposal are material and important and will be relied upon by the Issuing Office in awarding the contract(s). Any misstatement shall be treated as fraudulent concealment from the Issuing Office of the true facts relating to the submission of this proposal. A misrepresentation shall be punishable under 18 Pa. C.S. § 4904.

b. No attempt has been made or will be made to induce any firm or person to refrain from submitting a proposal on this contract, or to submit a proposal higher than this proposal, or to submit any intentionally high or noncompetitive proposal or other form of complementary proposal.

c. The proposal is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive proposal.

d. To the best knowledge of the person signing the proposal for the Proposer, the Proposer, its affiliates, subsidiaries, officers, directors, and employees are not currently under investigation by any governmental agency and have not in the last four (4) years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding or proposing on any public contract, except as disclosed by the Proposer in its proposal.

- See statement attached to Noncollusion Affidavit as Exhibit 1.

e. To the best of the knowledge of the person signing the proposal for the Proposer and except as otherwise disclosed by the Proposer in its proposal, the Proposer has no outstanding, delinquent obligations to the Commonwealth including, but not limited to, any state tax liability not being contested on appeal or other obligation of the Proposer that is owed to the Commonwealth.

f. The Proposer is not currently under suspension or debarment by the Commonwealth, or any other state, or the federal government. If the Proposer has received, within three years of the issuance of this RFP, a Notice of Default from the Commonwealth, other state or the federal government, then the Proposer shall submit, as part of the Technical Submission, seven copies of a written explanation of why such Notice of Default was issued. This written explanation shall not exceed 1 sheet (2 pages) and shall not count towards the sheet and page limit established for the Technical Submission of the proposal.

g. The Proposer has not, under separate contract with the Issuing Office, made any recommendations to the Issuing Office concerning the need for the services described in the proposal or the specifications for the services described in the proposal.

h. Each Proposer, by submitting its proposal, authorizes all Commonwealth agencies to release to the Commonwealth information related to liabilities to the Commonwealth including, but not limited to, taxes, unemployment compensation, and workers' compensation liabilities.

i. Until the awarded GESA Contractor receives a fully executed and approved written contract from the Issuing Office there is no legal and valid contract, in law or in equity, and the GESA Contractor should not begin to perform.

j. The total energy savings projected in the final scope of work will be at least 95% of the savings projected in the proposal and that the project will be self-funded over the financial term of the project (maximum term of 20 years.)

k. Proposer agrees and certifies in accordance with the enclosed Commonwealth of Pennsylvania:

- Nondiscrimination/Sexual Harassment Clause
- Tax Liability Certification
- Americans Disabilities Act
- GESA Contractor Integrity Provisions
- GESA Contractor Responsibility Provisions
- Environmental Statement
- Compliance with State and Federal Statutes, Rules and Regulations
- Non-Collusion Affidavit

I am authorized to sign this proposal on behalf of the Proposer and I agree and state that The Efficiency Network (TEN) understands and acknowledges that the above representations are material and important, and will be relied upon by the Department of General Services in awarding the contract(s) for which this proposal is submitted. I understand and my firm understands that any misstatement shall be treated as fraudulent concealment from the Department of General Services of the true facts relating to the submission of this proposal.

Signature

Troy T. Geanopulos
Chief Executive Officer
The Efficiency Network. Inc.

B. Non-Collusion Affidavit

NONCOLLUSION AFFIDAVIT

DGS Project Number: DGS Small GESA-2

State of Pennsylvania:

County of Allegheny: s.s.

I state that I am the Chief Executive Officer of The Efficiency Network and that I am authorized to make this affidavit on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the prices(s) and the amount of this proposal.

I state that:

1. The price(s) and amount of this proposal have been arrived at independently and without consultation, communication or agreement with any other contractor, proposer, or potential proposer.

2. Neither the price(s) nor the amount of this proposal, and neither the approximate price(s) nor approximate amount of this proposal, have been disclosed to any other firm or person who is a proposer or potential proposer, and they will not be disclosed before the proposal submission date.

3. No attempt has been made or will be made to induce any firm or person to refrain from proposing on this contract, or to submit a proposal higher than this proposal, or to submit any intentionally high or noncompetitive proposal or other form of complementary proposal.

4. The proposal of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive proposal.

5. The Efficiency Network its affiliates, subsidiaries, officers, directors, and employees are not currently under investigation by any governmental agency and have not in the last four years been convicted or found liable for any act prohibited by state or federal law in any jurisdiction, involving conspiracy or collusion with respect to proposing and/or bidding on any public contract, except as follows:

   - See statement attached as Exhibit 1.

   Exhibit 1 - The U.S. Attorney's Office for the Eastern District of Pennsylvania has commenced an investigation of government officials in Allentown, Pennsylvania. On December 10, 2015, the Company received a grand jury subpoena seeking documents relating to a bid the Company submitted to Allentown. The Company does not believe it is the target nor subject of the investigation and is providing documents in response to the subpoena.

I state that The Efficiency Network understands and acknowledges that the above representations are material and important and will be relied upon by the Department of General Services in awarding the contract(s) for which this proposal is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from the Department of General Services of the true facts relating to the submission of this proposal.

Signature

Troy T. Geanopulos
Chief Executive Officer

SWORN TO AND SUBSCRIBED
BEFORE ME THIS 8TH DAY OF
JULY, 2016

Notary Public Christopher P Niemiec

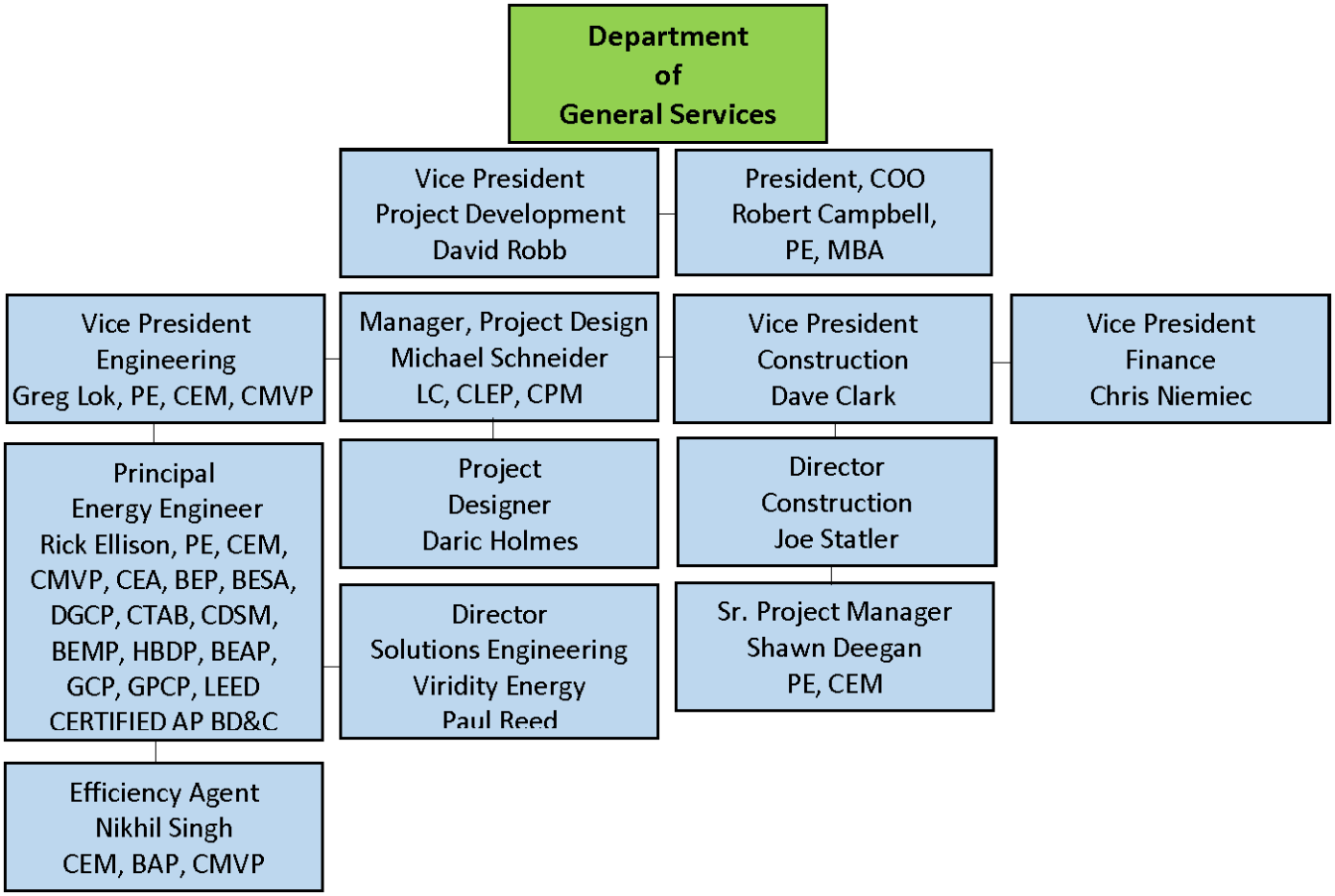
My Commission Expires 07.03.2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Christopher P. Niemiec, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires July 3, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

C. DISCUSSION OF METHODOLOGY FOR DESIGN/IMPLEMENTATION OF ECMS FOR THIS PROJECT

Project Management Team / Core Project Team Members

The Efficiency Network is comprised of professional staff, most of whom have been active in energy management for more than twenty years. TEN has a staff of experienced professionals who are very familiar with the unique aspects of designing and constructing Energy Services Projects in numerous settings and have collective project experience in excess of $500 million. TEN takes a comprehensive approach to designing and constructing energy savings projects and performs all energy engineering and construction management in-house. In certain instances, where a unique skill set is required we will augment the project team with retained professionals overseen by our Professional Engineering managers. This comprehensive, in-house approach is one way we proactively utilize integrated project delivery and lean construction concepts inherent to our automated energy efficiency platform to deliver exceptional value to our clients. The core team identified below was selected from TEN's current staffing of 30 employees specifically dedicated to our energy efficiency business. Should additional resources or specialized experience be required, TEN can easily draw from these additional employees or retained professionals as may be needed. All of the core project team members are physically located in our Pittsburgh and Philadelphia locations.



All the identified core team members have a successful history of developing and implementing projects together. In fact, very specifically, all but one have previously delivered similar projects to those contemplated here for the Commonwealth under previous employment. TEN is also the ESCO for the DGS Small GESA-1 project which not only demonstrates our team's comfort level working within state government facilities but also our familiarity with the current Small GESA energy audit, construction and M&V requirements. These past projects, although in

different buildings, also encompassed the diversity of Energy Conservation Measures (ECMs) contemplated here. As such, our team has specific experience negotiating and sub-contracting with Johnson Controls for building automation system enhancements which should prove the most cost effective approach at Thaddeus Stevens College of Technology (TSCT). We also plan to utilize the same Small Diverse Business electrical lighting labor sub-contractor overseen by our team on previous projects ensuring similar continuity in that discipline as well.

Due to the nature of the Core ECMs selected by the Department of General Services (DGS), we don't anticipate the need for retained professionals on this project (apart from PJM frequency regulation battery storage support) as TEN possess all of the auditing, energy engineering, design, construction management, commissioning and measurement & verification professionals necessary to fulfill this scope of work in house. Should additional scope be identified by DGS during the Energy Audit that would require a retained professional, we would first seek to include those with whom TEN or DGS has a previous working relationship. Several of these professionals and their specific expertise were outlined in TEN's original AFQ submission. TEN will engage Viridity Energy, a Philadelphia based firm with expertise in PJM (grid level) energy storage programs in order to maximize TSCT's revenue potential under the Guaranteed Energy Savings Agreement (GESA) in association with ECM 4.2.

We will provide additional information about TEN qualifications, experience and performance at the end of this section.

Work Plan

TEN's methodology for selecting energy conservation measures (ECMs) begins with a meeting with TSCT and DGS to discuss their goals and objectives. In this case, DGS specifically identified the following core ECMs for inclusion in the project:

1. Facility Thermal Building Systems
   - 1.1 Window mounted air conditioning unit replacements in Mellor, Kreider, Leonard, Woolworth, Snyder
   - 1.2 Window repair/replacement in Armstrong Hall and Jones Dining Hall
2. HVAC Measures
   - 2.1 Temperature Control Upgrades
   - 2.2 Steam Trap Replacement
   - 2.3 Exhaust Hood Demand Controlled Ventilation in Jones Dining Hall
   - 2.4 Operational/procedural improvement of the boiler operation.
   - 2.5 Exhaust Fan Management – Motion Sensors, Night Setback
3. Plumbing Measures – Campus-wide Water Conservation
4. Electrical Measures
   - 4.1 Campus-wide LED Upgrade
   - 4.2 Electrical Distribution System Transformers and Upgrade Opportunities
   - 4.3 Submeters

As such, our initial energy audit phase began by investigating and developing these ECM objectives for the Commonwealth. During this process the energy consuming systems, equipment, and provided documentation were analyzed to understand their potential for energy savings either by retrofitting or replacing the existing equipment, and by further developing equipment and utility revenue strategies to make the overall business operation of the facilities more financially solvent. TEN's cost structure and approach to business typically allow us to deliver a greater amount of scope for our customer's available savings and utility revenue opportunities. This said, we quickly noted that the Core Energy Conservation Measures identified by DGS and TSCT were broader in scope than could be funded by energy savings alone. Rather than disappoint TSCT, TEN has enhanced the electrical transformer upgrades with battery storage features to generate electric utility revenue to help fund the core ECM improvements as provided for in the PA Guaranteed Energy Savings Act definitions (3752) and contract provisions (3754). This can be most notably achieved via the enhanced Electrical Distribution System Transformers and Upgrade Opportunity ECM and more specifically through connected battery storage enhancements. The electric utility revenue would be generated to support the GESA through the PJM frequency regulation program and guaranteed under program. TEN has partnered with Viridity Energy, a Pennsylvania based company that specializes in storage solutions on this as well as other projects to bring this innovative solution to our clients. We believe this

also presents a unique opportunity to incorporate this emerging technology into educational programs taught on campus. Providing DGS and TSCT wants to further develop this solution in the Energy Audit, TEN and Viridity will complete an Interconnection Study with PJM during the Energy Audit stage to solidify participation value details of this asset with the PP&L region of PJM.
TEN will address the core energy conservation measures (ECMs) in the proposal with the supporting funds from the electric utility (PJM) revenue provided via the Electrical Distribution System Transformers and Upgrade Opportunity (including connected battery storage). We'll discuss our planned solutions in greater detail in the ECM and cost submission.

If selected for the Energy Audit, TEN looks forward to reviewing our initial design recommendations with the Commonwealth and receiving your feedback to ultimately optimize the best value project to meet your objectives. Key to our work will be application of the standards contained in the **DGS Design Manual** as well as adherence to **DGS General Conditions and Administrative Procedures**. Similarly, we will conduct the energy audit and deliver the report as outlined in section 1-25 and Appendix L of the RFP. Where acceptable to the Commonwealth we will also introduce tools that TEN has developed to aid our clients in more easily evaluating and communicating information about their projects. Many of these tools, some of which are discussed in this section, also streamline development and reduce project costs.

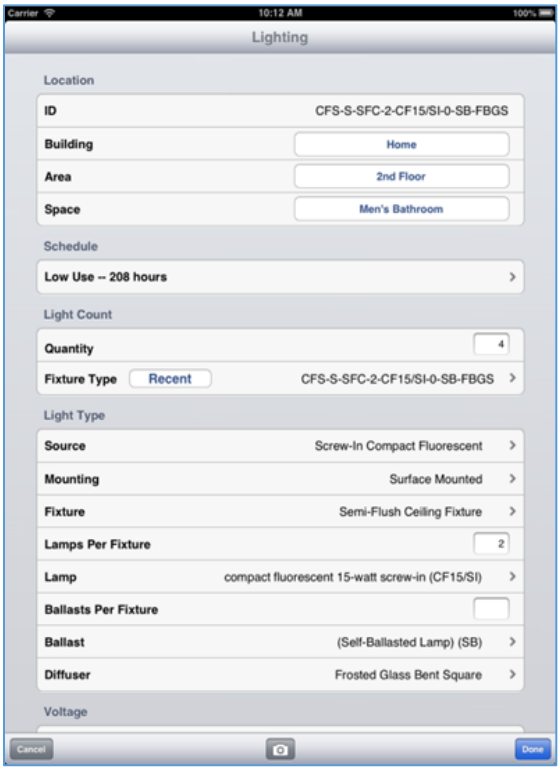
To verify the feasibility of the selected ECMs, experienced energy engineers, auditors, construction managers, project developers, and finance professionals from TEN all collaborate together analyzing the energy/water efficiency opportunities and ultimately assuring DGS that the proposed ECMs have been explored in a prudent and professional manner and in accordance with the DGS Design Manual. This then results in a detailed summary of the final ECM opportunities being recommended for each project. As you would expect, we review and solicit feedback on our findings and recommendations with DGS during pre-established progress meetings during the forty-five day Energy Audit to ensure the final Energy Audit Report is on target. **The following steps are integral to taking the proposal cost and savings from 90% and 95% accuracy to guaranteed contract values.**

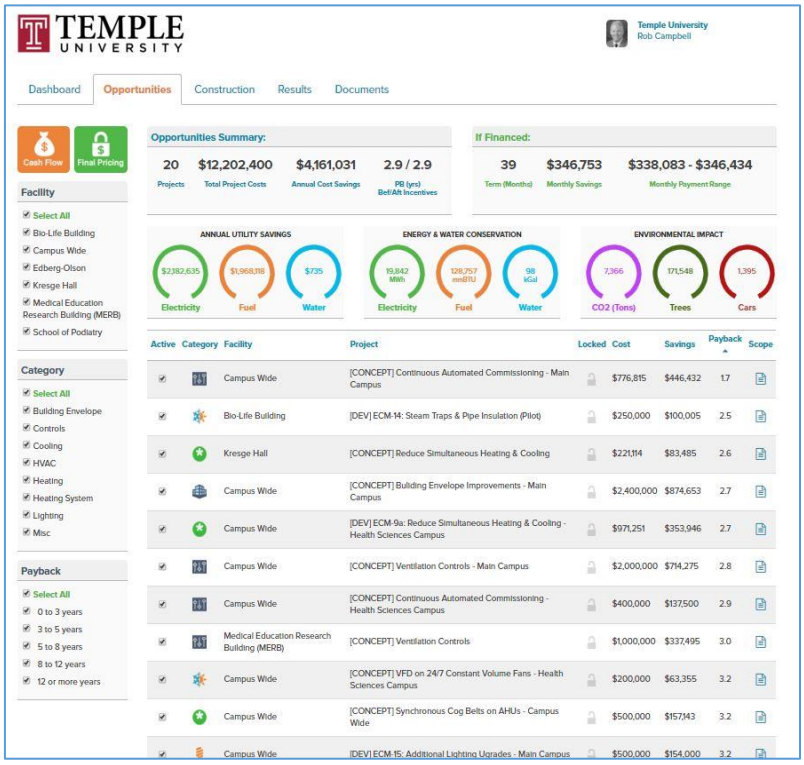
Approach & Objectives
TEN will further quantify both end-use consumption and energy-usage patterns for each facility to further identify the variety of ECMs that will conserve energy and reduce utility-related expenses once each project is implemented. The ECMs presented in this report will generate sufficient energy savings to meet and/or exceed all project debt service and TEN on-going costs. TEN's team will also work diligently to develop ECMs that will correct related comfort and facility operational issues, all funded by the guaranteed project savings dollars. This final set of proposed ECMs will be the foundation of a worthwhile project that has been built upon a logical balance of sound economics and realistic expectations.

Audit Methodology
The ECM selection process involves site visits, interaction with the facilities staff, as well as a detailed analysis of the existing equipment and systems, the current utility consumption and all available logs and profiles. Examination of utility use patterns, operating conditions, and interviews with the facilities personnel are all valuable and necessary sources of information that contribute greatly to this effort. TEN will take into consideration the valuable input that facility personnel typically provide and will meet the various infrastructure needs of DGS through the proposed ECMs.

Report Overview
Recognizing the needs of DGS, TEN will then provide ECM-related information as specific as possible to enable the evaluation of each ECM. As a follow-up to our collaborative effort, we will generate a consolidated Cash Flow for each proposed project. The intent of this report is to provide the technical and financial background information of the proposed ECMs and their effects on DGS's overall utility consumption. A major aspect of the technical portion of the report will be an ECM-specific, "Measurement and Verification (M&V) Plan." The M&V Plan will describe the various methodologies, standards and concepts that will be utilized to quantify the base-year utility use, the post-ECM utility use, and the guaranteed savings for each project. The guiding constraint for arriving at the M&V Plan will be to keep it simple and inexpensive without ignoring any variables that could have an effect on utility savings for an ECM.

Additionally, the financial specifics of each project, including all implementation/ construction issues, will be outlined and referred to throughout the report. Relevant product specifications, a general listing of operating assumptions, and other related technical data will be included for review and informational purposes.





With extensive energy efficiency experience and a very unique set of qualifications, TEN is positioned to provide three most important qualifications: (1) the energy efficiency expertise, (2) the proven design-build turnkey experience and (3) utilization of integrated project delivery and lean construction concepts resulting in the best cost structure.

TEN's unique, innovative approach driven by cutting-edge technology and automation, streamlines processes and reduces the costs of developing and delivering proven solutions, adding further value.

TEN'S proprietary technology significantly automates the process, including facility audits, construction cost estimating, incentive and utility rebate acquisition, and project finance, when needed. These value added processes, information and resources may be utilized in the future to evaluate additional opportunities to save energy and improve Energy Star ratings, as more fully described below.

First, information is gathered via a proprietary iPad audit app by our energy auditors and engineers **(screen shot above on left)**. Then TEN's expert systems and machine intelligence identify cost-effective energy savings opportunities, which are later reviewed by our experienced energy engineers and designers.

In this manner straight-forward solutions are addressed more quickly while ensuring complex solutions get the additional time they deserve. Our uniform platform also streamlines the documentation process enabling us to present solutions in a much shorter period of time.

If desired by the Commonwealth, any additional energy efficiency opportunities could be quickly populated into a highly interactive dashboard that TEN customizes for each customer **(sample shown above on right).** TEN's

secured web-based dashboards and project portals could be used to track progress for each piece of a project and our web-based systems can make collaboration and design reviews easier and quicker to accomplish.

This dashboard can give unprecedented control over the scope and phasing of any potential energy savings projects, and will dynamically display key financial, energy (kWh, KW, therm, water), and sustainability metrics (CO2, equivalent trees planted, equivalent cars removed from road). In this way, DGS could further leverage this tool to track the progress of multiple projects in multiple facilities and instantly see the effects on the financial payback and environmental impacts of the total program as it expands in the coming years.

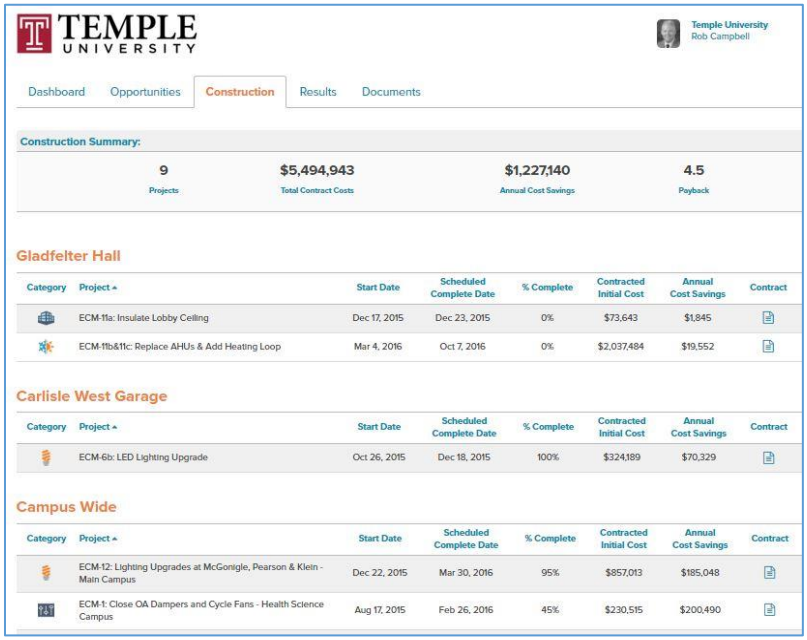
Additionally, TEN can update the dashboard in real-time as new energy saving technologies are introduced, or important factors such as utility rates and rebates change. This feature keeps our clients ahead of the curve in regard to new opportunities, and lets every customer know when projects that previously were close-to but did not originally meet the financial investment criteria become viable.

Once the initial project(s) are selected for implementation, TEN will competitively bid and in this case also negotiate scopes of work with prequalified contractors to obtain absolute final pricing. TEN will then ensure the projects are constructed on-time and on-budget.

During installation, we will utilize our automated construction application to provide progress reports as a means of prompt communication with Commonwealth personnel and as a quality control measure.

When the project is complete, TEN's electronic systems can produce as-built documents in electronic or paper formats and in accordance with the Design Manual. Because our inventory data starts on a tablet, and is stored and manipulated within a secure web-based system which was designed for simple data exchange it takes minimal manual work for TEN's inventory items to be translated to electronic data exchange formats.

Other construction phase documents including submittals, as-built drawings, operating and maintenance manuals and other information are also electronic and can be supplied in native formats for further use and manipulation or its engineering, design and construction partners in the future.



After projects have been installed, TEN's system periodically re-evaluates remaining potential energy efficiency based on available new technologies and incentives and makes new recommendations, if desired by the client. We ensure accountability between design and installation by overseeing the entire process, ourselves.

Our automated IT-enabled platform coupled with our in-house engineering, project management and commissioning services, are examples of how TEN will deliver a collaborative, integrated, successful project.

TEN believes that clear communication and meeting the customer's expectations every step of the way through the construction process is key to successful project implementation. TEN will partner with the customer to ensure that the project is implemented on-schedule and as budgeted. TEN's project implementation experience fits extremely well with the types of facilities found within the Commonwealth's portfolio of buildings and specifically Thaddeus Stevens College of Technology.

Because so much of our work is performed in existing, operational facilities, the phasing of construction projects and collaboration on design is a skill utilized by TEN's engineering and construction teams on a regular basis. As a result, we can certainly appreciate the challenges of our customer's design and implementation teams on similar projects.

When TEN is invited to assist in optimizing equipment selection and system design, our team goal is purely to serve the end customer with a high quality project implementation which saves operating costs (utilities and maintenance) while delivering optimal comfort and other required environmental conditions. TEN's independence from any particular manufacturer enables us to provide the most appropriate solutions that efficiently address specific needs.

In these instances, TEN's engineers have been able to diplomatically work with traditional MEP engineers and Building Automation System vendors to help in the selection of equipment and systems that can deliver lower life cycle cost as well as environmental controls sequences that go beyond the typical 'worst-case scenario' sequences we still find specified on some projects.

When all parties ensure the target is higher end-user satisfaction and lower operating costs then good dialog occurs and enhanced solutions are found.

Critical Path Schedule - The major general steps of a TEN implementation plan are as follows**:**

A draft Critical Path Method (CPM) schedule is attached at the end of the Technical Response. In addition to the more general narrative below, it sets forth the logical progression of the proposed project including notice of energy audit award, duration and submission date of the energy audit, full execution of the GESA contract, permits submission and approval dates, durations of on-site work, commissioning and training. Also addressed are coordination with local utilities, subcontractors, equipment suppliers and DGS/TSCT facility personnel. Our construction team uses both Primavera (for DGS projects) and MS Project (which is preferred by many of our customers). If TEN is selected for this project, we commit to utilizing Primavera software and submitting all future project schedules in that format.

Initial Project Startup / Notice of Award
Immediately upon award of the project, TEN will further develop the partnership approach with the customer and further identify the personnel required to efficiently execute this project among core team members, and subcontractors. Once all the members of the project team are identified, the expectations for the project and its implementation will be clearly outlined. The project's implementation milestones will be established in the contract and in more detail in the project's regular construction meetings and via Primavera Project Planner as required in Article 7 of the General Conditions. These milestones will be confirmed regularly through clear lines of communication which have been established to facilitate a successful project implementation. At this point, we will coordinate with DGS/TSCT on specific details such as site operations and logistics including lay down areas during construction.

Procurement
As each ECM submittal is approved by the customer, purchase orders will be issued for materials and subcontracts entered into for installation. TEN will carefully evaluate the pre-identified subcontractors to determine the most appropriate fit for the energy savings project scope. TEN's independence from any particular subcontractor or manufacturer ensures that it is able to provide the most appropriate solutions that efficiently address specific needs. As a result, TEN can develop an objective and unbiased partnership with each customer by implementing the equipment and system upgrades that generate maximum returns. This approach also gives our customers the flexibility to select M/WBE contractors to meet their desired minority participation goals.

Construction
Regular meetings will be held with the customer to establish construction guidelines and TEN will work with each customer to minimize the impact of the construction activities on the facility's operations. Standard project management tools will be used to track progress. TEN's team is familiar with Primavera Project Planner and the Critical Path Method. TEN prides itself on a proven track record of successful project implementations in varied

settings which include everything from "after-hours" installations in offices and public areas to special access situations in restricted zones.

Construction services would be sourced through mutually agreed upon specialty subcontractors – whether mechanical, electrical or HVAC Controls who are additionally vetted based on the quality of their work and safety record. All subcontractors perform their work under the direction of our in-house construction project manager(s). TEN's local construction project managers would collaborate with our internal engineering team on specific design issues. Our project management team would also be responsible for assisting in obtaining all necessary occupancy permits, training of all DGS/TSCT personnel, compiling and distribution Operations and Maintenance (O&M) manuals, and overseeing project commissioning.

Inspections & Reporting
As part of our Quality Control program, continuous inspections during construction are performed to ensure compliance with the scope of work, customer's requirements and safety. TEN's project managers and engineers along with the customer's representatives will inspect the construction of the energy conservation measures. Progress will be tracked on a daily and bi-weekly basis, depending on the project scope and complexity, and the results shared with the customer and the Project Team. (See Quality Control section)

Project Commissioning Process
Commissioning is one stage of TEN's quality control process. Commissioning will verify that the related systems are installed and functioning in accordance with the design intent. Commissioning assures that what has been purchased by the customer has in fact been provided. Proper commissioning is a key component of all energy conservation measures, but is particularly critical to achieving the desired results of control system installations or upgrades. This includes verification of accurate end device operation.

Commissioning for Phased Construction Projects
The issues of commissioning in phased construction tend to be those of interaction and staging of the commissioning process. Often a new system needs to temporarily interact with another system in a manner which may not represent its permanent or seasonal condition. In this regard commissioning in phased construction can be somewhat challenging and even frustrating because aspects of certain systems may need to be commissioned more than once over the course of a long construction contract as its interactions and seasons change. A key example of this exists with the Air Conditioning, Temperature Control Upgrades, and Steam Traps measures planned for this project. Proper commissioning of these changes should occur in both the heating and cooling seasons to ensure full system functionality and occupant comfort.

It is vital that commissioning be properly phased to maintain and improve comfort. Phased commissioning also makes fine-tuning adjustments possible along the way – we typically perform an initial commissioning as each phase is completed, rather than delaying what we've found to be a critical aspect of a successful install. Were we to postpone the full commissioning until all elements of a large project were complete, the risk of costly and difficult changes may increase (which is one of the points that commissioning is attempting to avoid).

Approach to Commissioning
Under the proposed scope of the various ECMs, TEN will implement a comprehensive commissioning exercise to introduce a systematic performance testing and quality control process designed to verify that newly-installed equipment and systems operate according to the design concept. Project Commissioning is an essential component of a successful performance contracting project to ensure that the energy savings and performance goals of the project are met to the satisfaction of all involved entities.

Commissioning begins during the project design phase and continues after construction is complete. It requires thorough documentation of system design, construction quality, functional performance tests, and operation and maintenance requirements. The training of building operators and staff also is a key component of building commissioning since staff may be responsible for some equipment maintenance.

It is a well-known fact that, without commissioning, building energy-systems rarely function to their full potential. Poor communication of design intent, inadequate equipment capacity, inferior equipment installation, insufficient maintenance, and improper system operation all reduce energy cost savings. Typical problems in non-commissioned energy projects include –

- Unbalanced air flows
- Poor documentation of project installation and operational requirements
- Under-utilized energy management systems for optimum comfort and efficiency
- Incorrect lighting and equipment selection
- Inappropriate or inactive critical cooling and heating sequences
- Improperly installed or missing equipment
- Controls not-calibrated
- Poor sensor placement
- Inadequate operator training
- Short-cycling
- Malfunctioning economizers

Many of these conditions can be avoided in a typical operation with comprehensive commissioning. An investment in commissioning usually pays for itself in one to three years because it can reduce future equipment repair costs, downtime, and replacement by 15% or more. Identifying equipment problems while under warranty also can reduce downstream exposure to repair and maintenance costs by making equipment manufacturers and vendors pay to remedy their deficiencies. Additional benefits derived from commissioning typically include the following –

a) Increased in-house knowledge and improved equipment operation
b) Better planning and coordination for smoother equipment start-up
c) Better up-front performance accountability
d) Improved building control and performance

A detailed Commissioning Plan will be submitted for approval prior to project implementation. The commissioning phase will consist of the following for each ECM –

a) Submittal Review
b) Construction/Commissioning Meetings
c) Clarification/Reviews
d) Installation or Programming Observations and Documentation
e) Functional Testing
f) Participation in Owner Training
g) O/M Documentation Verification
h) Commissioning Report
i) Warranty/Seasonal Phase Tasks

Project Acceptance

TEN's Project Manager will work in conjunction with the customer's personnel to make sure all measures are performing as designed. Any deficiencies will be identified as punch list items and will be used to track and correct the deficiencies. Once the customer and Project Manager have signed off on the completion of the Project, it is technically turned over to the facilities operation personnel.

The Project Acceptance date marks the start of the workmanship warranties and the savings measurement period. Often initial savings are confirmed at this point and savings performance reviewed with the customer.

In addition, a functional O&M Manual would be provided to help optimize facility operation in order to provide significant energy savings and comfort benefits. TEN views its O&M Plan as a risk reduction strategy, which will help equipment run efficiently, function properly, and deliver its full life expectancy.

Operation & Maintenance Plan:

TEN's partnership approach continues throughout the contract term after the project's implementation to ensure that the savings guarantee and equipment operating parameters are realized. The ECM warranties will be well-documented in the project-specific operating manuals and TEN stands ready to assist the Commonwealth on any warranty issues. TEN's approach to cost-effective maintenance of the project is to train DGS's staff whenever possible.

In order to guarantee efficient functioning of all installed equipment, and the energy management goals of the customer, a customized preventive operations and maintenance plan (O&M Plan) shall be delivered by TEN after project completion.
The development of this plan starts during the Energy Audit Report phase of the project. TEN carefully evaluates operating procedures and building characteristics so that equipment sizing and selections closely match anticipated loads. This process yields benefits because the equipment can then be operated at the highest level of efficiency.

In addition, a functional O&M Manual will be provided to help optimize facility operation in order to provide significant energy savings and comfort benefits.

TEN views its O&M Plan as an additional risk reduction strategy, which will help equipment run efficiently, function properly, and deliver its full life expectancy.
The Preventative Maintenance (PM) portion of the plan would consist of a checklist of tasks that are performed at manufacturer-recommended intervals (usually measured in hours of equipment run time). This checklist will be kept in a form of a log and updated manually by the building operators when tasks are performed. The PM Plan for each piece of equipment would include the following fundamental information, gathered during the Energy Audit Report process –

- Installed Equipment
- Manufacturer's name;
- Vendor's name and contact information;
- Date installed;
- Warranty information;
- Recommended Parts Lists;
- Design-Builder Maintenance;
- Owner/Agency Maintenance;
- Maintenance Checklist;
- Facility Training;
- Shop Drawings and As Built Drawings, when applicable.

Training
Training is an important aspect of TEN's offering. On site personnel need to understand the objectives of the energy savings program and equipment operation to meet those objectives. In that light, comprehensive training is usually held on-site, during the construction phase to familiarize the staff with the new systems. The majority of training is focused on familiarizing the facility personnel with the new equipment being installed, the equipment / system operation and regular maintenance. Most of the training takes place during start-up of the equipment, the commissioning process or at project completion. All training is coordinated by the project manager(s) and the operations representative.

Measurement and Verification (M&V)
TEN will provide a customized M&V plan for new / existing equipment in accordance with the International Performance Measurement Verification Protocol (IPMVP). Our experience with all options (A, B, C and D) enables us to delineate the cost and benefits of each approach which may help the customer in its determining the optimal structure of the M&V plan. In general, it's viewed as more cost effective to invest in comprehensive M&V strategies for those ECMs that pose the greatest overall savings risk to the customer.

Safety Plan and Monitoring

In addition to pre-qualifying sub-contractors with regard to their safety records, TEN will provide an individual experienced with safety programs in construction to serve as the Commonwealth's agent and representative in matters of construction safety, specifically one with experience which directly relates to state and local safety laws, including statutes, rules, regulations, and ordinances. Tasks will include the following:

a) Review the timeliness of safety and accident prevention procedures and review and accept Contractor Safety Programs;

b) In the event certain individuals are found to be continually in violation of safety requirements, direct the contractor to remove the individual employee, or to invoke any other contractual remedy deemed appropriate;

c) Observe and monitor Contractor compliance with OSHA, the Commonwealth, and local and state laws and regulations;

d) Periodically schedule and attend Foremen's 'tool box" safety meetings and evaluate effectiveness;

e) Review and accept Contractor emergency and safety plans and procedures;

f) Organize and participate in periodic site inspections and report on findings;

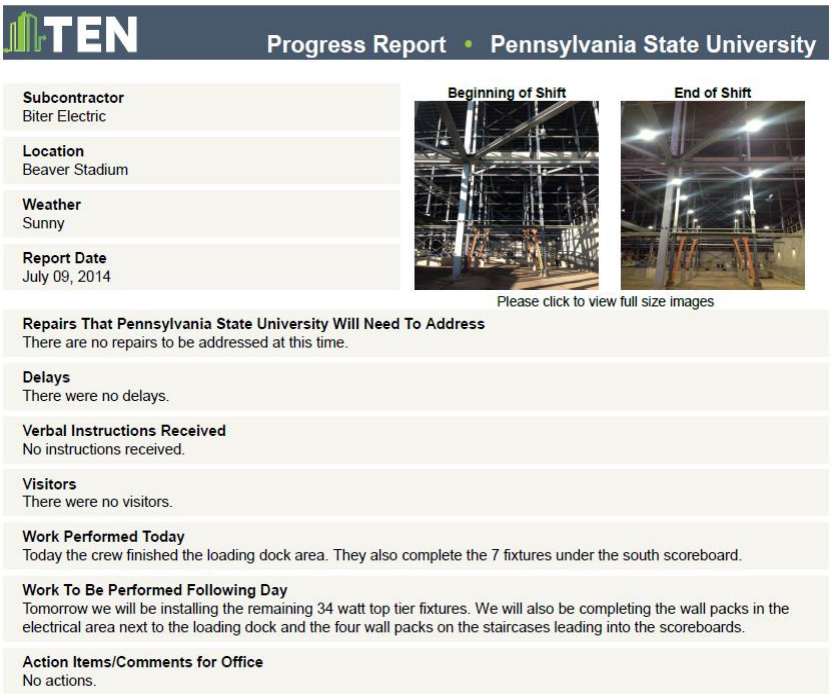
g) Coordinate the Commonwealth's general and specific safety concerns with the Project; and

h) TEN's involvement in the safety of the project shall in no way relieve or decrease a contractor's obligation for safety.

QUALITY CONTROL

TEN believes that quality control starts in the development stage and continues all the way through construction and measurement and verification. An effective energy savings program requires a delicate balance between engineering and construction management. We establish this balance by involving the construction team during the development phase of the project to ensure the constructability of the solutions we propose. The ultimate success of any energy savings project is measured by the ability of the installed systems to achieve the projected savings targets and to meet environmental and comfort expectations, while the success of a brilliant design is predicated by its ability to be constructed. TEN takes a comprehensive approach to development and engineering to establish this critical balance. This approach is possible because TEN utilizes in-house engineering and construction management.

Our engineering and construction teams work closely with each other to develop the scopes of work that are competitively bid (or negotiated) to the customer's qualified vendors and contractors to ensure that the design intent is met, the project / system can be installed properly and maintained, and the construction team is very familiar with the project before installation begins. This seamless and transparent hand-off to construction ensures quality control. TEN's team is also open to our subcontractors' input when it improves the design and/or lowers the cost to provide a better solution each customer.


TEN Progress Report • Pennsylvania State University

Subcontractor
Biter Electric

Location
Beaver Stadium

Weather
Sunny

Report Date
July 09, 2014

Beginning of Shift

End of Shift

Please click to view full size images

Repairs That Pennsylvania State University Will Need To Address
There are no repairs to be addressed at this time.

Delays
There were no delays.

Verbal Instructions Received
No instructions received.

Visitors
There were no visitors.

Work Performed Today
Today the crew finished the loading dock area. They also complete the 7 fixtures under the south scoreboard.

Work To Be Performed Following Day
Tomorrow we will be installing the remaining 34 watt top tier fixtures. We will also be completing the wall packs in the electrical area next to the loading dock and the four wall packs on the staircases leading into the scoreboards.

Action Items/Comments for Office
No actions.

Reporting to The Efficiency Network's (TEN) Director, Construction Services, the on-site 30-hour OSHA Certified Project Manager is accountable for the management of all assigned project construction activities taking place in the buildings. The Project Manager (PM), through their on-site management, will ensure that the worksite is safe, supervised and managed in an effective

and efficient manner. Maintaining and managing communications with and directing the activities of all subcontractors is key to the success of the project. Our project managers utilize our cTEN application to quickly and efficiently report progress (frequency based on size and complexity of the project), concerns and work scheduled to be performed the following day. This communication is shared with both our Director of Construction Services and the customer as another procedure to monitor quality control. Pictures of our mobile application and a portion of the report automatically generated are **shown to the right**.

1. **Measurement and Verification Methodology**

   Energy savings for an energy conservation measure (ECM) is determined by comparing annual energy use before and after the implementation of the measure. The objectives of the M&V process are to document the annual energy and water savings achieved by the project. Energy use patterns are studied before and after the implementation of each ECM, and the annual energy savings are calculated as the difference between energy use before and after implementation (base year and post-retrofit energy use). The calculation of energy savings may require adjustments to restate conditions of the base year and reporting periods under a common set of conditions, such as to normalize for occupancy, weather, required ventilation, and other special circumstances at the facility that influence energy and water consumption.

   In general, routine occupancy, design conditions (i.e. interior temperature settings, etc.) and scheduling are documented so that both pre- and post-implementation energy use rely on the same sets of variables. In fact most of these items are already delineated within the Small GESA.

   Unless directed otherwise, Measurement & Verification for performance upgrades are planned for the duration of project financing. If the owner is sufficiently confident that the promised savings are materializing as projected, the owner may exercise their option to discontinue the M&V procedures, with the attending reduction in project expenses before the contract period is complete.

   Specifics of the typical M&V approach for certain ECM's are described in the table below and are based on the M&V options more generally described in the ECM and Cost Proposal as well as Section F of the originally submitted AFQ.

Sample M&V plans for typical ECMs

Energy Efficiency Project	IPMVP Option	Pre-Variables	Post Variables
Thermal Building Systems - Window AC Conversion	B	Existing equipment efficiencies	New equipment efficiencies and DDC run-time trends data
Thermal Buildings Systems - Window Systems	D	Existing Window Performance data, Trane Trace Energy Model	Installed Window Performance data
HVAC – Temperature Control Upgrades - (Energy Management System)	D	Calibrated model from End-use model based on master meter data	Calibrated model based on actual sub- meter data and DDC run-time trend data
HVAC - Steam Trap & Bare Steam Line Repair	A	Bare pipe and Trap surveys	Trap surveys on operational systems with thermal gun and actual steam system operational hours
HVAC – Exhaust Hood Control	D	Calibrated model from End-use model based on master meter data	Models updated on actual sub meter data and DDC run-time trends data
HVAC- Exhaust Fan Management	A	Survey of existing fans	Verification of occupancy operation and DDC run-time trends data
Plumbing Measures	A	Detailed survey of existing fixtures; Flow measurement of sample set of existing fixtures	Flow measurement of sample set of new fixtures
Electrical – LED Lighting Upgrade	A	Sample kW & Sample Hours Based on a Predefined Statistical Sampling Plan with DGS	Sample kW & Use Pre-Hours
Electrical – Distribution Transformers and Battery Storage	C	Survey of the existing transformers with manufacturer's help and end-use estimate	Actual transformer efficiencies and transformer loading based on sub-meters. Detailed instrumentation on battery usage and monthly payments from PJM.
Electrical – Sub Meter Installation	A	Verification of correct installation	No savings included

2. Guaranteed Savings Reconciliation Practices

Generally the frequency of reconciliation of the energy savings takes place on an annual basis, based upon the measurement and verification protocol determined by the customer. However, if a specific reconciliation frequency is desired, TEN usually recommends nothing longer than one year or shorter than six months (except in circumstances whereby a more frequent reconciliation on a particular measure or measures is desired).

If TEN is unable to reconcile missed savings during a reconciliation period then TEN will undertake, at its own expense, to bring that measure into compliance with the savings guarantee - including making necessary adjustments to the missed savings measure, repairing equipment (or replacing the equipment

altogether) – to comply with the guaranteed savings expectation. If these efforts do not result in savings compliance, then TEN will pay the missed savings amount directly to DGS for each reconciliation period during the term of the contract. Alternately, as suggested in the Small GESA Contract, DGS may direct TEN to pay this amount directly to the Qualified Energy Financing Provider.

Qualifications, Experience and Past Performance

This section is intended to expand upon the organization chart and historical working relationship of the core project team members discussed on pages 5 and 6. This core team has extensive experience in implementing energy and resource saving measures including a comprehensive approach to designing and constructing energy savings projects **- performing all energy engineering, lighting and water conservation design, and construction management in-house**. The TEN team consists of industry veterans that each have 10 to 25 years of experience in the energy services industry. TEN's team members have worked for leading Energy Services Companies (ESCOs) such as CLT Efficient Technologies Group, Constellation Energy, Chevron, NORESCO, AMERESCO, Cinergy and Helios.

A brief description of Core Project Team assigned to this project and their relevant qualifications and experience follows.

As not to be repetitive, we've summarized our core team member's qualifications and experience with LED conversions and HVAC controls projects immediately below.

- **LED Conversion** – TEN completes its own auditing, design and typical material procurement in-house. In this manner, we are able to ensure the application of the most appropriate, current and cost effective lighting solutions for our clients. This includes negotiating pricing directly with manufacturers or their representatives in order to reduce layers of markup. In fact, this approach typically provides our clients with better than industry paybacks on lighting, in particular LED. TEN advocates for the use of external drivers for T8 LED lamp retrofits because it's safer, more energy efficient and provides for longer system life. These are many examples where TEN excels at interior LED lighting, however you may find it relevant that we have also become experts in LED street lighting for municipalities including projects for the Cities of Harrisburg, Bethlehem and Baltimore.

- **HVAC Controls Projects** – TEN is vendor agnostic when it comes to building controls instead preferring to audit, design and install solutions that optimize our client's current building automation system investment, should they already have one. Nearly all TEN projects include some level of HVAC controls. The most relevant example of this are previous control system enhancements effectuated by our team for the Department of General Services and most recently in conjunction with TEN's Small GESA-1 project at the Capitol. These strategies required close coordination with Automated Logic and Johnson Controls and were similarly the result of our team's auditing and design work, Greg Lok's oversight and implementation by Dave Clark. It should be noted, that TEN's initial assessment is that it would be most cost effective to expand TSCT existing investment in Johnson Controls.

Greg Lok, (P.E., CEM, CMVP), Vice President of Engineering, Mr. Lok's responsibilities include managing the engineering group including design and M&V, developing the scope, cost and savings. As an industry-recognized energy efficiency engineering expert he is a proven team leader and project manager, adept at developing creative and cost-effective engineering solutions for a broad range of building types. Mr. Lok previously managed Constellation's MUSH (Municipal Governments, Universities, Schools, Hospitals) Energy Services team with over 35 professional designers and engineers encompassing projects from coast to coast.

Role for this project: Mr. Lok will be managing the engineering team as well as reviewing engineering designs and energy savings calculations. Mr. Lok will assist the engineering team when needed.

Mr. Lok has worked on Dauphin County, PA State Capitol, and Temple University, DPW-Polk Center, with various project team members including Dave Clark, Daric Holmes, Joe Statler and Rob Campbell.

Daric Holmes, Project Designer, audits, designs, and oversees field installations and testing of high-quality, cost-effective lighting and water conservation measures. His extensive field experience allows him to improvise and revise designs in order to best meet all situations. Having managed the electrical labor sub-contractor on previous DGS lighting upgrades, Mr. Holmes has a strong appreciation for what is required for this project and has incorporated it in his current role. With over 20 years of experience in lighting industry, including eight years of military service, Mr. Holmes is a strong asset to effective, well designed projects.

Role for this project: Mr. Holmes will be responsible for the audit and preliminary design of the LED lighting upgrades and lighting control opportunities.

Mr. Holmes has worked on the PA State Capitol, Dauphin County and DPW-Polk Center projects with various project team members including Dave Clark, Joe Statler, Rob Campbell, and Greg Lok.

Mike Schneider, CPM, CLEP, LC, Manager of Project Design, researches, designs, and oversees field installations and testing of high-quality, cost-effective lighting and water conservation measures along with various energy saving and capital improvement measures. His extensive field experience allows him to improvise and revise designs in order to best meet all situations. Having worked with nearly 60 lighting manufacturers during his 15 years in the energy field, he knows the products, how they work, and the best applications for each option.

Role for this project: Mr. Schneider will be responsible for the design of the LED lighting upgrades and lighting control opportunities.

Mr. Schneider has worked on the City of Harrisburg, Kutztown University, Cheyney University and Rachel Carson State Office Building with various project team members including Dave Clark, Joe Statler, Rob Campbell, Greg Lok, and David Robb.

Richard Ellison, (PE, CEM, CMVP, CEA, BEP, BESA, DGCP, CTAB, CDSM, BEMP, HBDP, BEAP, GCP, GPCP, LEED CERTIFIED AP BD&C) Principal Engineer, Mr. Ellison is an industry-recognized energy efficiency engineering expert - a proven team leader and project manager who is adept at developing creative and cost-effective engineering solutions for a broad range of building types. At TEN, Mr. Ellison provides leadership and mentorship in audit, analysis, design and engineering, measurement and verification.

Role for this project: Mr. Ellison, will be responsible for developing energy baselines, auditing the facilities, identifying and developing Thermal Building Solutions including, developing engineering designs and scopes of work, performing energy savings calculations, and review bid results / pricing. These responsibilities will also extend into the construction phase due to the close coordination required by engineering and our BAS subcontractors to ensure proper commissioning of these improvements.

Mr. Ellison has worked on multiple phases of Temple University with various project team members including Dave Clark, Joe Statler, Dave Robb, Nikhil Singh, Rob Campbell, Shawn Deegan and Greg Lok.

Nikhil Singh, (CEM, CMVP, BAP, LEED GREEN ASSOCIATE,) Efficiency Agent, is an engineering and technical specialist with core skills in energy modeling, HVAC and controls re-tuning, data analysis, field testing and inspection of buildings, and energy audit report writing. He leads post-construction customer site audits, verifying energy efficiency strategies and calculating and reporting project performance.

Role for this project: Mr. Singh will be assisting the Lead Engineers (Mr. Ellison and Daric Holmes) and Greg Lok with implementing the measurement and verification plan.

Mr. Singh has worked on City of Harrisburg, City of Bethlehem, Temple University and United Steel Workers with various project team members including Dave Clark, Joe Statler, Mike Schneider, Rick Ellison, Shawn Deegan and David Robb.

Dave Clark, Vice President of Construction, is responsible for directing the project management staff, working on the development of new project design concepts and constructability, preparing scopes of work and bid specifications, and overseeing the project health and safety program.

In addition to Mr. Clark's 30+ years of experience working in commercial and industrial facilities, he has accumulated in excess of 2000 hours of related education and training in professional management; building construction; mechanical, electrical and energy management systems and services; numerous college courses in business management. He also retains a national certification for General Contractor licensing in the states of AL, AK, GA, LA, MS, NC, SC, TN & WV.

Role for this project: Mr. Clark will collaborate with the engineering team on the development of project design concepts, constructability and maintenance; review scopes of work and bid specification, review subcontractor pricing and oversee the selection of subcontractors and construction management team.

Mr. Clark has worked on PA State Capitol, DPW-Polk Center, Temple University and Dauphin County, with various project team members including Rob Campbell, Greg Lok, Joe Statler, Dave Robb, Nikhil Singh, Shawn Deegan, Rick Ellison and Daric Holmes.

Joe Statler, Director of Construction Services, is responsible for all aspects of project construction, including but not limited to cost-estimating, coordination of subcontractors, inspections and commissioning, quality assurance and quality control. He also manages relationships with supplier and contractors and is responsible for the installation and commissioning of all energy conservation measures.

Mr. Statler has over 13 years in project managing energy efficiency projects, from on-site project management to managing the site project managers.

Role for this project: Mr. Statler will be responsible reviewing project costs; coordination of subcontractors (including subcontracts and scopes of work); procuring material; overseeing the project management, project quality and safety inspections; and commissioning.

Mr. Statler has worked on PA State Capitol, City of Harrisburg, Dauphin County, Temple University and DPW-Polk Center, with various project team members including Dave Clark, Rob Campbell, Greg Lok, Nikhil Singh, Shawn Deegan, Rick Ellison and Daric Holmes.

Shawn Deegan, (P. E., CEM, DGCP), Sr. Project Manager, is responsible for all onsite project management and subcontractor supervision during construction. He ensures the worksite is safe and supervised in an effective and efficient manner. Mr. Deegan is the liaison between the construction team, engineers, and designers and the owners and stakeholders. In this role, he facilitates effective communication, safety decision-making and problem solving. With over 16 years of experience in construction, Mr. Deegan is adept at project supervision, customer service, project development and management, building and installing.

Role for this project:
In conjunction with the Director of Construction, Mr. Deegan plans, coordinates, implements and concludes projects according to specifications, deadlines and budget, with an overall objective of customer satisfaction.

Mr. Deegan has worked on multiple phases at Temple University with various project team members including Dave Clark, Joe Statler, Rob Campbell, Mike Schneider, Nikhil Singh, Rick Ellison and Daric Holmes.

David Robb, Vice President, Business Development, is responsible for leading TEN's development efforts and will serve as Program Manager for DGS Small GESA projects. With over 20 years of energy efficiency experience, he has a valuable combination of skills and expertise: a master's degree as well as hands-on experience in building construction management. He has extensive knowledge of facility auditing, performance measurement and verification, payback analysis and project development.

Role for this project: Mr. Robb will be DGS's program manager and main point of contact throughout the duration of the project. Mr. Robb's responsibilities will include working with DGS Representatives throughout the entire project from development through construction to M&V to ensure overall customer satisfaction. He will also coordinate the engineers, contract administrators, financial analysts, project managers and M&V specialists to execute deliverables and successful solutions for DGS.

Mr. Robb has worked on City of Harrisburg, Kutztown University, Temple University and Cheyney University with various project team members including Mike Schneider, Daric Holmes, Joe Statler, Rob Campbell, Dave Clark, Nikhil Singh, Shawn Deegan and Rick Ellison.

Rob Campbell, PE, MBA, President and Chief Operating Officer, is responsible for the day to day operations at TEN and manages the strategic planning and development goals of the clients. Mr. Campbell's primary responsibilities will involve coordination and assignment of resources and project personnel/subcontractors to ensure construction and engineering audit timelines are met. In this capacity, Mr. Campbell draws upon his over 25 years of energy efficiency experience in rolls from engineering, operations as well as financial and strategic management.

Role for this project: Mr. Campbell will be responsible for overseeing the overall construction and performance of the project. As the President and CEO, he has the authority to execute quick decision which enables TEN be to creative, flexible and responsive to client's needs.

Mr. Campbell has worked on City of Harrisburg, Dauphin County, PA State Capitol, Temple University and DPW-Polk Center, with various project team members including Dave Clark, Joe Statler, Greg Lok, Daric Holmes, Nikhil Singh, Rick Ellison, Dave Robb and Shawn Deegan.

Paul Reed, Director Solutions Engineering, Viridity Energy: Mr. Reed joined Viridity Energy in 2010, and has played an integral role in the evolution of the company as Director of Solutions Engineering. This versatile role involves interaction with all aspects of a young, start-up technology company, including partnership management, storage project development, sales engineering, industrial business development, and financial analysis. Currently, Paul is focused primarily on the expansion of Viridity's battery storage fleet, along with the development of strategic commercial partnerships. Prior to joining Viridity, Paul worked for a sales engineering consulting firm, where he focused on a project study of the Canadian power sector for rail regenerative braking technologies. Paul's background also includes process engineering in a body armor manufacturing plant.

Role for this project: Mr. Reed will lead the representation of Viridity's services for this battery energy storage project. This will include economic savings & PJM market assessments, financial proformas, operational planning, integration, registration, & settlements.

Paul has a Bachelor of Science in Chemical Engineering with minors in Physics/Economics from the University of Delaware (UDel), along with a MBA with a focus on Finance & Entrepreneurship, also from UDel. While at UDel, Paul worked for the Office of Economic Innovation & Partnerships to develop & license Vehicle-to-Grid (V2G) electric vehicle technologies, among other UDel Intellectual Property.

Diversity Policy

It is the policy of The Efficiency Network (TEN) to ensure equal employment opportunity in accordance with the Ohio Revised Code 125.111 and all applicable federal regulations and guidelines. Employment discrimination against employees and applicants due to race, color, religion, sex (including sexual harassment), national origin, disability, age (40 years old or more), military status, or veteran status is illegal.

More specifically, TEN maintains a diverse workplace including the employment of two veterans, one of which is assigned to this project (Daric Holmes).

Retained Professionals

Due to the nature of the base Core ECMs selected by TSCT and DGS, we don't anticipate the need for retained professionals on this project as TEN possess all of the auditing, energy engineering, design, construction management, commissioning and measurement & verification professionals necessary to fulfill this scope of work in house. This includes Professional Engineers and Certified Measurement and Verification Professionals (CMVP) as TEN employees six PEs and three CMVP professionals. Should additional scope be identified by TEN or DGS during the Energy Audit that would require a retained professional, we would first seek to include those with whom TEN or DGS has a previous working relationship. Several of these professionals and their specific expertise were outlined in TEN's original AFQ submission and include Ken Lovorn, P.E. and Kathleen Conrad, P.E. of Lovorn Engineering and Jeff Olander, P.E. from Olander Engineering and Kevin Warren, P.E. and Amir Haghighat, CEM, CMVP, BPI from Warren Engineering.

Since we don't have a general need for retained professionals on the base Core ECMs, we can't comment on the readiness, commitment of personnel and policy on workforce diversity and veterans in this area but only on that of TEN (identified above).

The Core ECM project includes Electrical Distribution System Transformers and Upgrade Opportunities to which TEN has proposed inclusion of a battery storage system to provide significant electric utility revenue allowing TSCT and DGS to realize the full potential of the program and implement the much needed core ECMs identified in the core list. Should TSCT and DGS elect to select TEN for this project, TEN plans to engage Viridity Energy as a retained professional in the field of battery storage and revenue opportunities associated with PJM's frequency regulation market. Chad Von Eck, VP of Energy Storage, Paul Reed, Director of Solutions Engineering, Raj Chudgar, President are Viridity staff already engaged with TEN on other storage opportunities and are ready to support a similar revenue generation opportunity for TSCT. Viridity Energy is based in Philadelphia with many notable projects in the region including an 8.75 MW energy storage project for SEPTA developed with the same PA Guaranteed Energy Savings Act (GESA) enabling legislation. www.viridityenergy.com

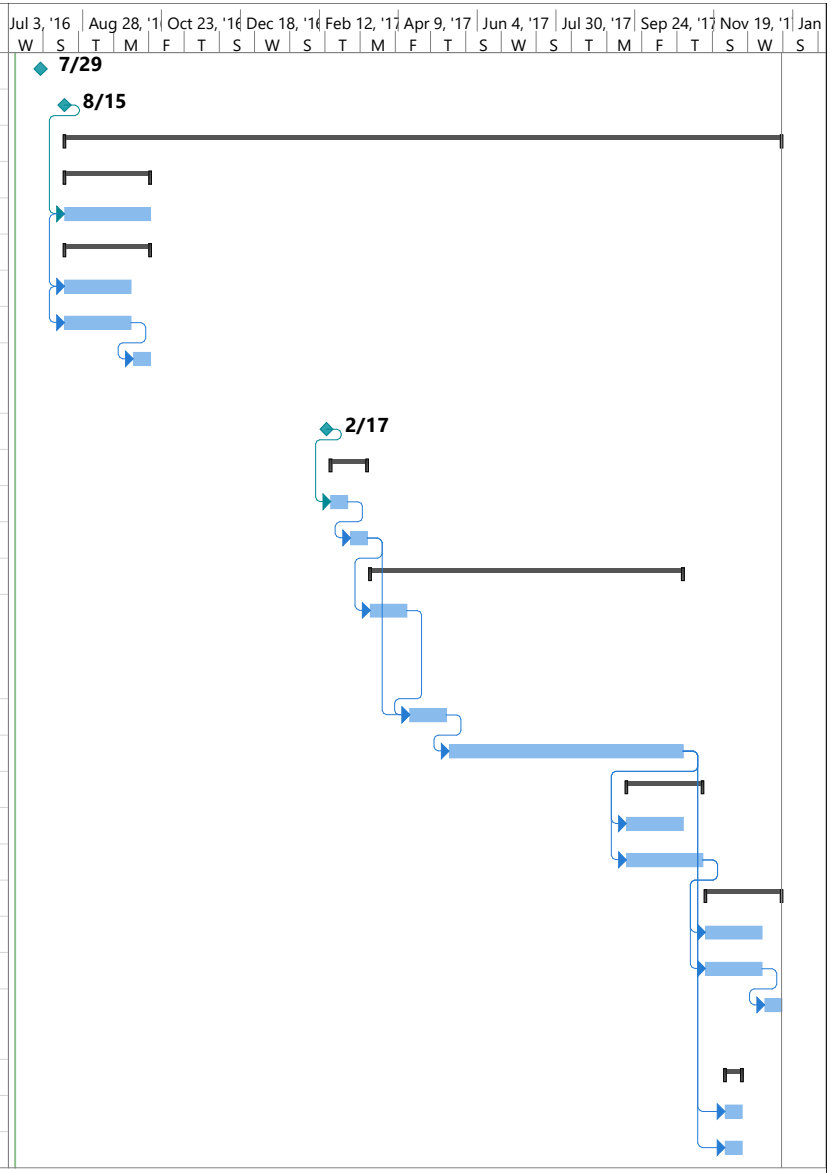
Subcontractors

The ability of our planned subcontractors to complete Small GESA projects with the team identified in this proposal is clear. The currently anticipated list of subcontractors includes Johnson Controls and Hunt Consulting with whom our team has worked successfully in other DGS buildings including the Capitol Complex in 2010 and again in 2016. Hunt Consulting will complete the lighting installation work in conjunction with TEN's auditing and design team. Similarly, Environmental Construction Services, Inc. is planned to support HVAC and Plumbing solutions in the same manner they have successfully worked with TEN at Temple University while Pro Electric, LLC is planned to support various electrical solutions.

Johnson Controls is a Fortune 500 company with established policies on workforce diversity and veterans. Similarly, Hunt Consulting, Environmental Construction Services Inc. and Pro Electric LLC are certified Small Diverse Businesses with their own policy on workforce diversity and veterans. All four subcontractors are ready and committed to supporting this project with the necessary personnel to make it successful.

Draft CPM schedule – (follows on the next page)

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Notice of Award**	0 days	Fri 7/29/16	Fri 7/29/16	
2		**Energy Audit Begins**	0 days	Mon 8/15/16	Mon 8/15/16	
3		**Project Execution**	**365 days**	**Mon 8/15/16**	**Fri 1/5/18**	
4		**Energy Audit**	**45 days**	**Mon 8/15/16**	**Fri 10/14/16**	
5		Measure Designs	45 days	Mon 8/15/16	Fri 10/14/16	2
6		**M&V Pre-Measurements**	**45 days**	**Mon 8/15/16**	**Fri 10/14/16**	
7		Lighting & Plumbing	35 days	Mon 8/15/16	Fri 9/30/16	5SS
8		HVAC, Electric, Thermal	35 days	Mon 8/15/16	Fri 9/30/16	7SS
9		Prepare/Submit Pre-M&V Report	10 days	Mon 10/3/16	Fri 10/14/16	8
10		**GESA Contract Award**	0 days	Fri 2/17/17	Fri 2/17/17	
11		**Submittals**	**20 days**	**Mon 2/20/17**	**Fri 3/17/17**	
12		Prepare & Submit	10 days	Mon 2/20/17	Fri 3/3/17	10FS+1 day
13		DGS Review & Approval	10 days	Mon 3/6/17	Fri 3/17/17	12
14		**Project Implementation**	**160 days**	**Mon 3/20/17**	**Fri 10/27/17**	
15		Coordination w/DGS Facility Personnel, Vendors, Subcontractors	20 days	Mon 3/20/17	Fri 4/14/17	13
16		Material Acquistion	20 days	Mon 4/17/17	Fri 5/12/17	13,15
17		Installation	120 days	Mon 5/15/17	Fri 10/27/17	16
18		**Commissioning**	**40 days**	**Mon 9/18/17**	**Fri 11/10/17**	
19		Lighting & Plumbing	30 days	Mon 9/18/17	Fri 10/27/17	17FS-30 days
20		HVAC, Electric, Thermal	40 days	Mon 9/18/17	Fri 11/10/17	17FS-30 days
21		**M&V Post-Measurements**	**40 days**	**Mon 11/13/17**	**Fri 1/5/18**	
22		Lighting & Plumbing	30 days	Mon 11/13/17	Fri 12/22/17	20
23		HVAC, Electric, Thermal	30 days	Mon 11/13/17	Fri 12/22/17	20
24		Prepare/Submit Post-M&V Report	10 days	Mon 12/25/17	Fri 1/5/18	23
25		**Training**	**10 days**	**Mon 11/27/17**	**Fri 12/8/17**	
26		Lighting & Plumbing	10 days	Mon 11/27/17	Fri 12/8/17	17FS+20 days
27		HVAC, Electric, Thermal	10 days	Mon 11/27/17	Fri 12/8/17	17FS+20 days



THADDEUS STEVENS COLLEGE
Preliminary Schedule
July 11, 2016

Task	Inactive Task	Manual Summary Rollup	External Milestone
Split	Inactive Milestone	Manual Summary	Deadline
Milestone	Inactive Summary	Start-only	Progress
Summary	Manual Task	Finish-only	Manual Progress
Project Summary	Duration-only	External Tasks	