

2018-2019

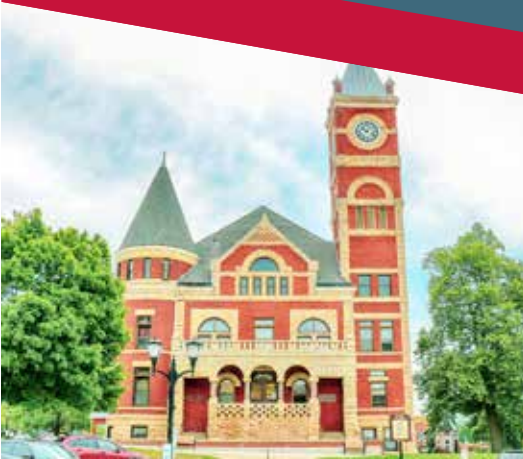
FINAL REPORT

UniverCity Year

Better • Places • Together

Procuring a solar energy system for Juda School

MARKETING 724: STRATEGIC GLOBAL SOURCING



Project Overview

Juda School, located in a small town with a population of 357 in southcentral Wisconsin, teaches grades Pre-K through 12th grade (Figure 1A & 1B). In recent years, it has made great strides in developing a more sustainable school by upgrading to efficient fixtures and installing 36 rooftop solar panels. Juda School has requested students in UW-Madison's UniverCity Year program to design and procure a renewable energy system capable of offsetting current energy consumption costs by 20%. Annually, Juda School uses approximately 39,000 cubic feet (CCF) of natural gas for heating and 615,000 kWh of electricity. In 2017, Juda School spent nearly \$100,000 on energy. Reducing this annual expense by 20% will significantly reduce the school's environmental footprint. The client also requested a payback period of seven years or less.

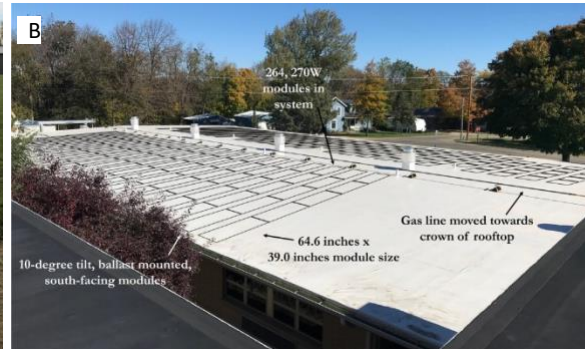
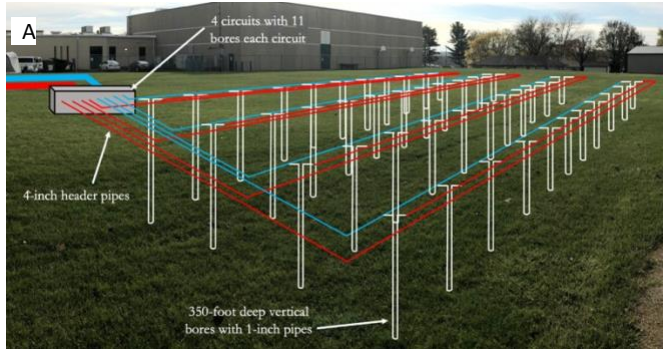


Juda School worked first with the BeEco Engineering team and received an initial design proposal which includes solar PV power panels and a geothermal system. Since the geothermal system is expensive to implement, our team in the Grainger Center for Supply Chain Management in the Wisconsin School of Business has decided to investigate procuring the solar panel system.

Initial Project Design

This project initiated with the BeEco Engineering team working with the Juda School District to design a renewable energy system. That team came up with the following proposal:

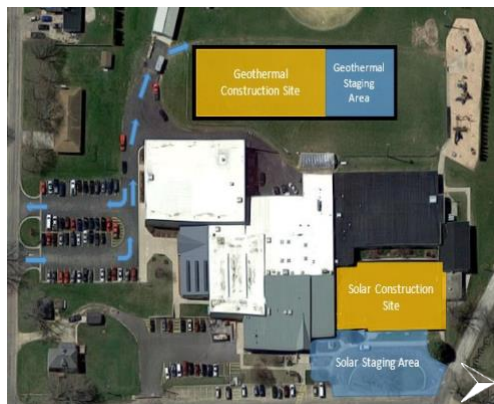
1. 75-ton geothermal energy system
2. 71 kW dc solar power system



The project design included a blend of geothermal and solar energy to fulfill the requirements for renewable energy sources.

BeEco Engineering developed a design that integrates a 75-ton geothermal energy system – which includes 44, 350-foot vertical wells – with a 71 kWdc photovoltaic solar array system – which includes 264 south-facing ballasted solar panel modules. This design would offset Juda School's energy costs by 40% by producing 98,000 kWh and reducing the school's consumption of natural gas by 28,000 CCF annually.

The location of BeEco's geothermal and solar power systems are as following:



Construction sites and staging areas.



Aerial view of geothermal well

Modified Project Proposal

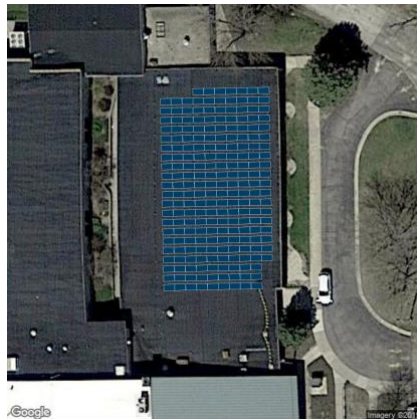
BeEco Engineering's proposal could not be continued for the following reasons:

- Lack of funds for the geothermal system
- Lack of initiation for non-solar power projects
- Inability to raise funds
- Cost of the project
- Return on investment for geothermal project

Our team worked on the alternate proposal to focus on the solar power of 71 kW dc power due to the following reasons:

- Ease of finding suppliers/ providers
- Juda School's precedence in solar power projects
- Availability of existing supplier pool with Juda School
- Ability to secure funding for solar projects

Instead of blending the geothermal and solar power system, the proposed system is as follows, with just the solar power system with solar panel arrays on the roof:



Project Timeline

Since we modified the project from a geothermal-solar blend to only solar, it also modified the project timeline. The project included the following steps:

- Kick-off meeting with all UCY faculty, staff : February 4, 2019
- Collect supplier information: February 22, 2019
- Request for information: February 24, 2019
- Receive Quotations: March 10, 2019
- Analyzing Quotations: March 17, 2019
- Request for proposal to supplier: March 20, 2019
- Receive proposal from suppliers: April 3, 2019
- Negotiate with suppliers: April 10, 2019
- Final negotiated proposal from supplier: April 17, 2019
- Finalize contract terms and prices: April 19, 2019
- Discuss and finalize contract with school: April 26, 2019

Since the project scope was modified, this project included an extensive search for suppliers to support the project for a scale of a 70 kW system. For the most part, we were able to adhere to the proposed timeline and the only delay we experienced was due to the delay from suppliers to visit the Juda School facility to finalize the proposal.

Identification of Suppliers

Our team at the Wisconsin School of Business initially looked for potential suppliers in the state of Wisconsin. The criteria used for selecting the suppliers were:

- Previous experience and past performance with the product/service to be purchased
- Relative level of sophistication of the quality system, including meeting regulatory requirements or mandated quality system registration (e.g., ISO 9001)
- Ability to meet current and potential capacity requirements on the desired delivery schedule
- Financial stability
- Technical support availability and support in developing and optimizing processes
- Track record for business-performance improvement

Using the above-mentioned criteria, the team identified the following potential suppliers of solar energy systems:

1. Sunpeak Power, 440 Science Drive, Madison, WI 53711
2. Synergy Renewable Systems, PO Box 58, Stoughton, WI 53589
3. Arch Electric Inc. 1237 Pilgrim road, Plymouth, WI, 53073
4. Sunvest Solar Inc. N27 W24025 Paul Ct, Suite 100 Pewaukee, WI 53072
5. All Energy Solar, 1264 Energy Lane, Saint Paul, MN 55106

Request for Information

After identifying the suppliers, on 03/05/2019 our team requested the suppliers provide information about their services and products within a response time of two weeks. The information requested concerned suppliers' capabilities to design and install photovoltaic arrays for the generation of electrical power. This Request for Information (RFI) was not a competitive bidding process for obtaining services or for installing solar arrays. The team intended to use the

information provided from RFI submissions to determine which suppliers were best qualified to receive a formal Request for Proposal (RFP).

To simplify the evaluation process and obtain the maximum degree of comparison, the team required the firms to submit information in a specified format. Responses were asked to be submitted electronically (in PDF file format) to Scott Anderson at the following email address:

sa@judaschool.com

Information Requested

1. Company Profile	
A	Details of company location, history and ownership
B	Sales information from the last three years
2. Services Offered	
Briefly provide information or describe any services related to:	
A	Design
B	Installation
C	Warranty
D	Operation and maintenance
E	Acquiring permits
F	PPA
3. Experience	
A	Describe the local and/or regional office's experience with photovoltaic electricity generation of the required capacity on public schools and any other facilities in the last five years.
B	List the names, address, and telephone numbers of three (3) clients who may be contacted for references
C	Safety record
4. Personnel and Qualifications	
A	Identify the supervisors (partner, manager) and the staff who have worked on this

	response. Provide resumes (which may be included as appendices) showing relevant past experience, education, training, etc.
B	Quality certifications if any
5. RFP Advisory Information	
A	If your company is asked to submit a committed proposal for the development of the Juda School Solar Project, what information do you consider most critical to the completion of that proposal?

RFI Response

Two firms responded to the Request for Information within the awarded time. The firms are as follows.

1. Synergy Renewable Systems, PO Box 58, Stoughton, WI 53589
2. Arch Electric Inc. 1237 Pilgrim Road, Plymouth, WI, 53073

Synergy Renewable Systems

The RFI response by Synergy Renewable systems matched the requirements of the team and the team decided to go ahead with the firm for the RFP.

Arch Electric Inc.

Even though Arch Electric Inc. responded to the RFI, the firm offered a consultative approach to design and implementation of this solar electricity project. The following were the terms and conditions put forth by Arch Electric Inc.

- In lieu of a partner or contractor relationship, many clients choose to hire Arch Electric to complete a full analysis of their building's solar potential. Our design is based upon

roof/ground space, utility requirements, and current/future electricity consumption. The consultant fee-based structure works best when a government or corporation requires a competitive bid process. We have found that most clients require the steps below to be completed before a competitive bid process can occur. Arch Electric consultant fees are charged at \$175/hour. The consultant fee-based structure does not require the organization to move forward with Arch Electric as the solar contractor.

Consultant Fees:

Step 1 - Budgetary Proposal Design: Professional Courtesy

Overview: No Site Survey, 12-month utility bill review/interval demand data, Google Earth imagery-based design and budgetary quotation, complete financial overview

Step 2 – Complete Interconnection Agreement with WI Utility: 12 hours

Overview: Complete Site Survey, one-line wiring diagram for complete solar system plus interconnection point, complete and submit all paperwork to utility for review and acceptance

Step 3 – Structural Building Review, PE Stamp: \$0.10/square foot

Overview: Structural building review may be required for permitting purposes by your municipality for a commercial solar installation

Step 4 – Roof Inspection: Estimated at 10 hours

Overview: 1-page written roof report documenting condition of existing roof, core samples for R-value insulation study, and a visual (picture) report detailing problem areas

Step 5 – Federal and State Grant Writing: If awarded 10% of total grant(s) worth

Overview: Complete paperwork necessary to submit Federal and State grants as they become available

Step 6

-Provide Bid Specification: 4 hours

Overview: Submit Bid Specifications that allow contractor to bid a system that provides owner with quality assurances

-Provide Savings and Performance Contract: 6 hours

Overview: Submit Savings and Performance Contract so owner is provided with savings assurances.

Includes Monitoring and Verification plan on solar system

-Provide Turn-key Financing Options: 10 hours

Overview: Provide owner with 3 financing options for solar installation project, work with lender and owner to secure preapproval on preferred financial arrangement

These terms and conditions put forth by Arch Electric Inc. did not match with the background, structure and procedures of the procurement process the team was following and therefore the team decided to not move ahead with this supplier.

Request for Proposal

The team selected Synergy Renewable systems to proceed with the RFP and subsequent processes. The firm was sent a request soliciting proposal to design, fabricate, deliver, install,

and maintain a roof top utility-interactive solar photovoltaic system with the below mentioned schedule.

RFP Schedule

Project Milestone	Date/Time
RFP Advertised/Released	04/15/2019
Mandatory Site Walk/Pre-Proposal Conference	04/19/2019
Notice of Intent to Submit Proposal	04/20/2019
Proposal Due	04/29/2019

The RFP required the supplier to follow the following format:

- **Cover/Transmittal letter:** Cover letter must be addressed to Mr. Scott Anderson and signed by a legally authorized representative of the respondent. Cover letter must summarize key provisions of the proposal and must include name, address, phone and email of the respondent contact.
- **Executive Summary:** Include key provisions of the proposal, including understanding of Juda School's goals, pricing, the respondent's role on the project, a brief description of the proposed system, financing, relevant experience of the respondent/company, and key timeline dates.
- **Company Profile:** Years in business, description of respondent/company background, applicable state licensing, OSHA background and safety protocol, insurance, quality assurance/quality control documentation.

- **Project Experience:** Include projects completed in the last 3 years similar in scope and size to the proposed project. Include project name, system size, location, and brief 2-3 sentence project description. Highlight companies permitting and interconnection experience with the local utility.
- **References:** Provide 3 project references with direct phone numbers.
- **Project Team:** Organizational chart and bios (length of time with firm, key projects) of key team members, capability to perform work/workload capacity. Please only profile individuals who will directly work on this project. Clearly identify the project manager.
- **Technical Solution/Scope of Work:** Describe your technical approach to the design and construction of the solar project including:
 - Technical Approach, Design, Equipment, Installation
 - Panel, inverter, racking specifications
 - Equipment and workmanship warranties
 - Exhibits showing proposed layouts and system single line diagrams
 - PVSYST Report indicating production of the proposed system
 - Proposed monitoring system/solution
 - Operations & Maintenance Plan offered for the project.
- **Production Guarantee:** Provide at least a 95% kWh guarantee for year 1, degrading by a maximum of 0.7%/year for 20 years. Performance guarantee should be measured and damages should be paid on an annual basis.
- **Price Proposal:** Provide a cash purchase price for the system. Submit an electronic version of Exhibit G.

- Present year 1 and 20-year financial savings
 - Present the NPV using the avoided cost provided by Juda School.
- **Safety** – Include a brief description of the safety practices of your firm, as well as the OSHA Reporting Indicators for the last 3 years.
- **Proposed Schedule** – Identify key project milestones and include any necessary review periods for Juda School.

Proposal Comparison

The RFP response by Synergy Renewable Systems satisfies all the terms and conditions required in the RFP which enabled us to move ahead with the supplier for the next stage of the project.

We were able to compare the prices of the proposal with the proposal from BeEco Engineering for the 71 kW system. The prices quoted by BeEco Engineering and Synergy Renewable Systems are as follows:

Cost	BeEco Engineering*	Synergy Renewable Systems	External Sources (Market research)
128 Nos. Solar Modules	\$ 36,000	-	\$45,000
Inverter	\$ 6,000		\$3495
Mounting	\$ 13,000		\$3066
Other costs (monitoring system, Electrical materials)	\$ 16,000		\$11,000 approx
Total material cost	\$ 71,000	\$ 62,900	\$61,561 (without shipping) \$66,000 approx.
Electrical work cost	\$ 13,000	\$ 16,400	
Design and Installation cost	\$ 33,000	\$ 12,775	
Total cost	\$ 117,000	\$ 92,075	

*- BeEco Engineering prices were provided by a reputable solar power system supplier in Madison

As noted above, a comparison of the total cost of the BeEco Engineering proposal and the Synergy proposal shows that Synergy is \$ 24,925 less expensive. After thorough market research, it was found that the material cost is around \$66,000 which is nearly \$3,100 higher than the quoted price by Synergy Renewable Systems. It was also found through an online national

survey that the average project completion cost (design, planning, material, permit and installation costs) is in between \$2.5/watt and \$3.22/watt. Considering the minimum cost of \$2.5/watt, the total project completion cost for a 70 KW Solar panel installation project is \$175,000. The survey also mentioned that the costs may go down as the system size (KW) increases. So, there is a different table for the larger size (KW) solar installations.

System Size (KW)	Average Price (\$)	Expected price range (\$)
25	50,211	43,750 - 56,350
50	100,423	87,500 – 112,700
100	200,846	175,000 – 225,400

The table indicates that a 70 -75 KW Solar project can cost in the range of \$110,000 to \$175,000.

The quoted price of Synergy renewable systems is \$92,075 which is lower than the above mentioned costs.

The panels, inverter and mounting were comparable, and this gave us the option to move ahead with Synergy Renewable Systems since their total cost of installation is priced lower than BeEco Engineering's initial proposal and the national average expected cost.

Recommendation

After a thorough evaluation by the team, we recommend an award be made to Synergy Renewable Systems. Synergy Renewable Systems can provide the services with equal expertise at a lower overall cost. Based on their proposal and experience, Synergy Renewable Systems offers the best value in support of the solar panel installation needs of Juda School District.

Appendix

Inverter price links

<https://www.wholesalesolar.com/9900121/solaredge/inverters/solaredge-se14.4k-inverter>

https://www.ecodirect.com/SolarEdge-SE14-4K-USR28NNF4-14-4-kW-Inverter-p/solaredge-se14-4k-usr28nnf4.htm?gclid=Cj0KCQjw5J_mBRDVARIsAGqGLZByYMSZ2xW3TOFU3cAiFZ2c34BvoIFdI3PS3o1XnGD7wL0OSRvM47AaAv2OEALw_wcB

108 SolarEdge P730 Optimizers

https://www.ecodirect.com/SolarEdge-P730-730W-Commercial-Power-Optimizer-p/solaredge-p730-5.htm?gclid=Cj0KCQjw5J_mBRDVARIsAGqGLZA110j1h-UeGIV7NxPq_111IZP95cBlkuzCmToG7ET02NBWnc0huRsaAtLLEALw_wcB

<https://www.solaris-shop.com/solaredge-p800p-800w-optimizer-add-on-box/>

PV Panels

<https://www.enfsolar.com/pv/panel-datasheet/crystalline/38416>

https://www.homedepot.com/p/Live-Solar-300-Watt-Monocrystalline-Solar-Panels-4-Pack-1200-Watt-LSMO4P300W/306246926?MERCH=REC--PIPHorizontal2_rr--206365811--306246926--N

SolarBOS AC Combiners and Disconnectors

<https://www.civicsolar.com/product/solarbos-240vac-300a-ac-combiner-box-acct400-5-70-n4>

<https://www.civicsolar.com/product/square-d-d324nrb-200a-ac-disconnect-fusible-3-pole>

Mounting

https://www.neobits.com/ecolibrium_solar_eco_002_207_ecolibrium_solar_eco_p12952238.htm?atc=gbp&gclid=CjwKCAjwwtTmBRBqEiwA-b6c_5r8doqc_nGy4rPpjWBxNq60bXl0CXiz6UKZmDb2OAECu6hWGVjvkBoC7RwQAvD_BwE

Monitoring System

<http://www.freecleansolar.com/Autobox-Pre-Wired-Revenue-Grade-Meter-300A-p/deck-monitoring-a277c300.htm>

National Average

<https://news.energysage.com/commercial-solar-benefits-for-business/#comments>

About UniverCity Year



UniverCity Year is a three-phase partnership between UW-Madison and one community in Wisconsin. The concept is simple. The community partner identifies projects that would benefit from UW-Madison expertise. Faculty from across the university incorporate these projects into their courses, and UniverCity Year staff provide administrative support to ensure the collaboration's success. The results are powerful. Partners receive big ideas and feasible recommendations that spark momentum towards a more sustainable, livable, and resilient future. Join us as we create **better places together**.



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