



EJ Solar Spark

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Solar Energy in Schools: White Paper on the
Integration of Solar Power at East Jordan High School

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Executive Summary

East Jordan Middle/High School (EJMHS) largely relies on the burning of fossil fuels for its grid-supplied energy. This grid reliance presents negative financial and environmental consequences. However, there is a great opportunity to help lessen our dependence on the grid and positively impact our school and community. To initiate this pursuit, the EJ Solar Spark team is proposing the integration of a 30-kilowatt (kW) solar array to help power EJMHS. In addition, we will implement an educational curriculum about solar energy and its benefits. Solar power will play an important role in students' futures, from climate change mitigation to professional opportunities. For these reasons, it is important to connect students with this emerging technology. Our proposed 30-kilowatt solar array will connect EJMHS students with solar power, providing significant benefits to their education and their futures. The project will reliably reduce the school's energy expenses by ~5.5%¹ and reduce its CO₂ output by ~5.5%. Total funding needs are \$70,000 dollars.

Problem Definition

Energy cost is a leading annual expense at East Jordan Middle/High School. Currently, 100% of the school's energy demand is met via the grid, at a cost of approximately \$0.12 per kilowatt hour (kWh). According to quotes from the school, its energy usage in the year 2019 was 666,000 kWh, which, resulting in a cost of \$78,700 (See Figure 1).

Figure 1

	East Jordan Middle/High School Annual Energy Usage Record (2019)
kWh Used	666,000 kWh
Cost Per kWh	~\$0.12 (\$0.118)
Total Cost	~\$78,700

The cost of grid-supplied energy, however, is not isolated to financial expense. The energy of Michigan's grid is predominately sourced from coal, a greenhouse gas-producing fossil fuel (See Figure 2), which is responsible for 46% of carbon dioxide (CO₂) emissions worldwide, and accounts for 72% of total greenhouse gas (GHG) emissions from the electricity sector.

¹~\$109,250 to \$131,100 over system's lifetime.

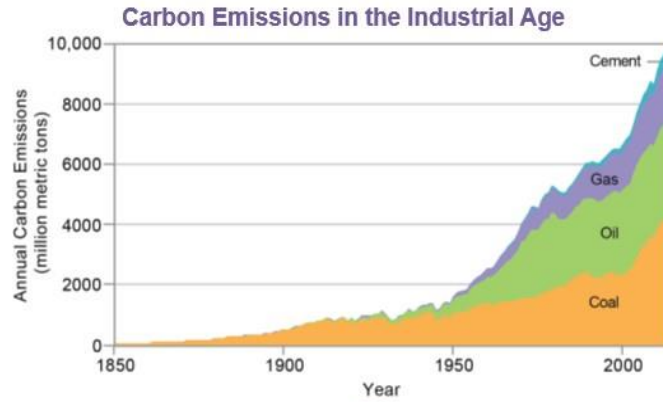


Figure 2

According to the Environmental Protection Agency's (EPA) Power Profiler, East Jordan Middle/High School's 2019 energy usage equates to a yearly emission level of approximately 916,850 pounds of CO₂ into the atmosphere.

On a global scale, the advent of clean, sustainable energy, due to its role in curbing climate change, has been identified by the United Nations as one of the most critical events in the protection of current and future generations of people. CO₂-emitting processes, such as the burning of fossil fuels, do not possess a long-term future within the world's economies. This conclusion can be deduced from the GHG emissions goals of the Paris Accord, which will predictably require net CO₂ emissions to become zero, or possibly negative, after the year 2040. Meanwhile, students are growing up during the course of these developments, and it is vitally important that they are included in this process, both in educational curriculum and in their daily lives, so that they can better understand and better prepare for the future they face.

Effective investment into sustainable energy, along with its supporting educational components, largely begins with local schools such as East Jordan Middle/High School. The two primary factors that support this assertion are the schools' role in providing education and their current need and potential to convert to sustainable energy.

Solution Overview

The most inexpensive and abundant energy source in the world is solar energy. Solar power technology works by absorbing the energy from the sun's light and converting it into usable electricity, which is achieved through the use of a device called a solar cell (also called a photovoltaic cell). Solar cells are combined together in groups to make individual solar panels, which can then be set up side-

by-side in a system known as a solar array. The resulting power that is directly generated through these solar panels is 100% clean and renewable, thus virtually eliminating the long-term emission of greenhouse gases into the atmosphere. The only GHG emissions released in the use of solar panels is in their initial manufacture, but this quantity is minimal, equating to just 24 grams of emitted CO₂ per kWh of energy produced. Solar power systems require little to no maintenance, with the small exception of cleaning debris or snow off the faces of the panels. As a one-time expense for purchase and installation, the energy produced by the solar panels after the conclusion of their payback period will be virtually free for the remainder of their 25-30-year lifetime². With the field of solar photovoltaic installation being the fastest-growing occupation in the United States (See Figure 3), solar power possesses major economic and career opportunities, which will continue to grow as the national economy transitions away from fossil fuels and continues its adoption of solar photovoltaic power systems (See Figure 4). In the United States, the solar power industry added jobs 75% faster than the overall economy from 2015 to 2019, which included a 5,600 job increase from 2018 to

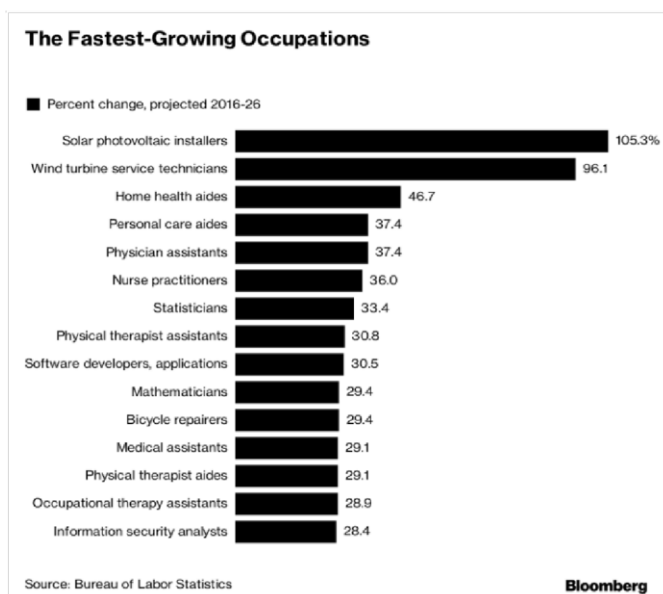


Figure 3

2019. Furthermore, over the past decade, American solar jobs have increased by 167%, equating to an increase of 156,000. Presently, the United States has close to 250,000 solar workers.

The economic outlook for solar energy lends support to the idea of using schools as installation sites for solar power systems, the reasoning being that the promotion of the subject will expand students' knowledge of growing career opportunities. Fundamentally, learning about solar energy will provide them with the needed preparation in order to prosper in their changing world.

² Solar panels typically output power at high efficiency for 25-30 years, with diminishing returns in the following years.

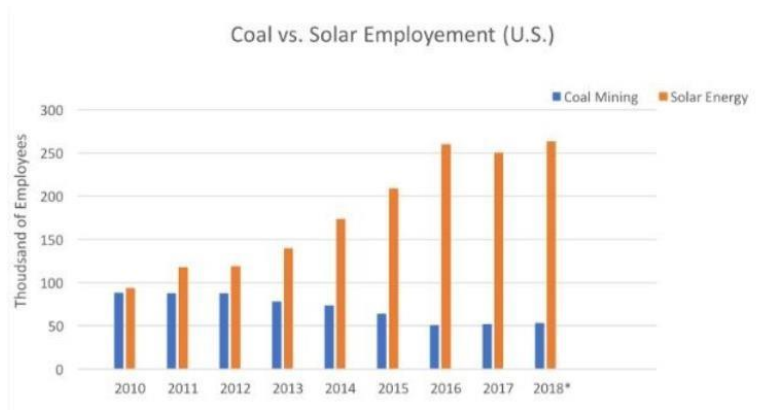


Figure 4

Proposal

Based on an evaluation of potential financing opportunities, the team behind EJ Solar Spark has set a minimum target of installing a 30-kilowatt (kW) solar array, which will be activated on Earth Day in the Spring of 2021 to help power East Jordan Middle/High School. The solar panels will measure about 6.6 and a half feet tall, 3.2 feet wide. The system is intended to be installed on the slanted roof off the side of the school’s auditorium. Each year, a 30-kW system will produce approximately 37,000 kWh of electricity. The resulting annual energy savings for the school will be \$4,370. East Jordan Middle/High School’s energy provider, Consumers Energy, forecasts that their energy cost per kWh will have a compound annual growth rate of 1%, consistently, for the next 5 years. The company stated that, as the rate of inflation increases, their price for energy will follow the same trend. Extrapolating this prediction over the next 30 years, the rising energy rates could result in the school paying \$115,000 for one year’s worth of electricity by the year 2050. However, the rising rates also indicate that the amount of money saved by the 30-kW solar array will grow in the same proportion. Given the 25-30-year lifespan of the system, the accumulated cost savings will fall between \$109,250 and \$131,100 (See Figure 5). All told, *the project’s return on investment will range from a minimum of \$40,000 at 25 years to a likely \$61,000 at 30 years, with an average at \$50,500.*

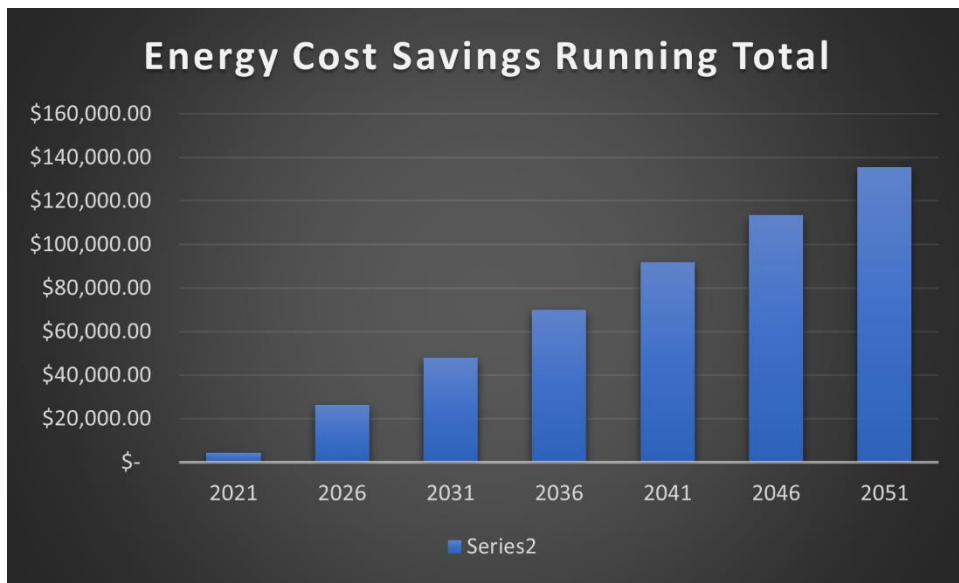


Figure 5

Furthermore, as a result of the decreased grid-reliance of ~37,000 kWh per year, the school is expected to reduce its annual carbon footprint by 5.5%³.

In addition to generating solar power, our proposal includes the integration of education about the subject into the school curriculum, in collaboration with the non-profit organization, Groundwork (For more info, visit groundworkcenter.org). For the 2021 school year, the intended time frame for providing this education to students will fall around the installation period of the solar array, which is expected to be completed within the space of a week. The curriculum, coursework, and educational items/materials, which will be developed and provided in partnership with our installer, will be presented in multiple seminar periods at the Middle/High school and in core classes at both the Middle/High and elementary schools, providing direct, focused engagement between students and the new solar development taking place at their school. East Jordan Shoe Club members will assist in this process at the elementary school. A final component of the long-term interaction between the students and the project will be the installment of a live feed monitor of the solar array's performance, which will be on display in the Middle/High school.

Education and communication about the project and the subject of solar energy will grow beyond the student body into the wider community as well through the project's announcement video for a March crowdfunding campaign. This video was created by the EJ Solar Spark team and primarily features East Jordan Shoe Club members, who are representing the student body of EJMHS. This initial

³~50,880 pounds of CO₂ per year, and ~1,272,000 pounds of CO₂ over 25 years.

video is focused on promotion and the seeking of donor. Upon conclusion of the project, a final video will be made that would reflectively showcase the overall development of the mission since its initial launch, as well as the success it has had within the school, and finally a recognition of all who contributed to and supported the project. Beyond the creation of our launch video, community outreach includes presentations to local organizations, a webpage dedicated to the EJ Solar Spark project, and a planned community night to educate the people of our region about our mission.

To initiate the solar array installation process, the East Jordan Middle/High School administration released a Request for Proposals (RFP) in January 2021, which invited solar installers to submit competitive bids for the solar array. For a 30-kilowatt array, our chosen installer, Solar Winds, provided a quote of \$69,500.

The installation of the 30-kW solar array has, at this time, received significant financial support from East Jordan Public Schools, Great Lakes Energy, the Malpass Foundation, and the EJ Lions Club, with several pending, but committed, donations from individuals. The combined donation sum between these organizations has already secured \$28,500 toward our \$70,000 total fundraising goal. The official, public launch of EJ Solar Spark will occur at the beginning of March 2021.

Summary

The financial and environmental cost of grid-supplied energy at East Jordan Middle/High School is a significant annual expense. Because Michigan's grid is largely sourced from coal, a greenhouse gas-producing fossil fuel, reliance on the grid contributes negatively to the global process of climate change, according to the Fourth National Climate Assessment (pg. 22). It has been globally recognized by the United Nations that the threat of climate change, along with its respective call for the transition to clean, sustainable energy, is the most critical event in modern history for the security of current and future generations. Consequently, it is the young students growing up while these developments are occurring that must be invested in.

Solar power provides a clean, economical solution to the global need for sustainable energy. It generates power through the conversion of light energy into usable electricity. The solar industry has grown exponentially since its creation, while the price of solar power has decreased in the same manner. This presents a substantial opportunity to expose young students to the growing career opportunities of their future. In order to promote these benefits and best prepare students for the modernizing world they live in, solar power systems must be installed at the sites of schools, along with a curriculum to educate students about the energy source.

The team behind EJ Solar Spark is proposing the installation of a 30-kW solar array at East Jordan Middle/High School in the Spring of 2021. In collaboration with the non-profit organization, Groundwork, and our installer, Solar Winds, we also plan to provide course materials and curriculum to be taught to Middle/High school students in their seminar classes, and to Middle/High and elementary students in core classes. The EJ Solar Spark team has created an announcement video detailing the project ahead, and intends to develop a project conclusion video to showcase the progression of the mission, the final results after installation, and a recognition of all who contributed to the project. Through this and our presentations to local organizations and the wider community, our team will maintain active communication and inclusion of all of East Jordan. This solar development will yield great financial, environmental, and educational benefits to the students and community of East Jordan, and it will better prepare generations of students for their futures.

Our Request

The EJ Solar Spark team is seeking financial support for our proposal. In order to install a 30-kW solar array for East Jordan Middle/High School, we must reach our target funding goal of \$70,000, which includes a small portion of the fund dedicated to the project’s additional expenses, such as spare system components (See Figure 6).

Figure 6

Cost Analysis	
Per Watt (Average)	\$3.17
Per Watt (Quote)	\$2.27
Cost for 30-kW	\$69,500.00