STUDENT SUSTAINABILITY COMMITTEE

Final Report

Thank you for your commitment to green initiatives at the University of Illinois. One of the final steps in completing the terms of the funding agreement for your project is the submission of a Final Report with key information about your project. You will also need to submit a detailed report of expenses (if you don't list it within this document) as well as supporting photos to showcase your project.

Please be as accurate as possible in describing the project (including possible setbacks or challenges in meeting the initial goals of the project). Not fully meeting your project's goals will not disqualify you from making future funding requests as long as your reports are as complete and accurate as possible. If you have any questions, please contact the Student Sustainability Committee, at sustainability-committee@illinois.edu.

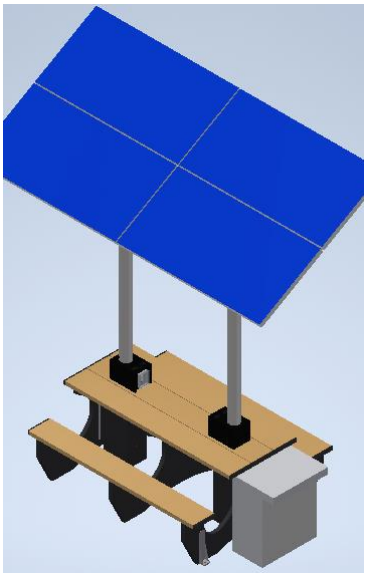
Project Name: InSPIRE Solar Powered Outdoors Table (SPOT) Project (formerly, InSPIRE Solar Charging Station)

Date of Report Submission: 7/29/2022

Project Purpose:
Promote solar energy and off-grid PV by installation of a picnic table retrofitted with solar panels and outlets. Expose the public to solar energy with solar panels right in-front of them. Also educate the public on the creation of solar PV systems.

Project Summary:

The SPOT project is a completely student designed and implemented outdoors table retrofitted with solar panels used to charge an off-grid solar energy system. It is a place that provides students in UIUC a space to sit and study outside while charging their devices (cellphones, tablets, laptops etc.) using solar energy. It also better promotes solar energy by allowing students to interact with the energy produced by solar panels they can clearly see in-front of them. Lastly, there is a QR code on the SPOT which will direct students and RSOs to a website detailing the design and construction plans for the project. This allows students and other RSOs to replicate the project -or parts of it- in their own endeavors. The website will also include instructions to create a simple off-grid solar energy system that can be integrated to other student projects.



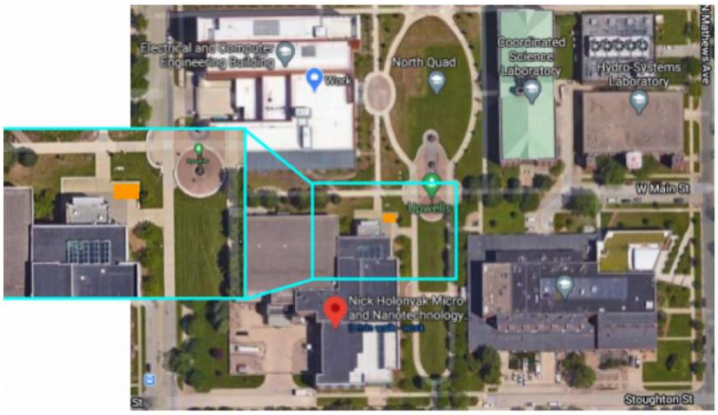
Model of SPOT

Construction finished on the summer of 2022

The student team has worked with multiple professionals, including …

- Engineers and other technical staff from UIUC F&S
- A professor from the ECE department
- A volunteer civil engineering consultant not affiliated with UIUC

The location for the project is on the northeast of the Holonyak Labs and is marked with an orange rectangle. This location is approved by the College of Engineering, the Facility Manager of Holonyak Lab and the Architectural Review Board in UIUC F&S.



Location of SPOT

For more information of the SPOT, please visit inspireuiuc.com
For any questions, please email inspireuiuc@gmail.com

Summary of Project Expenditures:
Expenditures include equipment and Materials. Among the materials purchased, a portion where not used on the final product, but instead used for practice session and prototyping. Materials also included the purchase of a commercial picnic table and electrical components. Among the electrical components is a fully functional charge controller & inverter as well as batteries. Solar panels were not purchased, but instead donated by the ECE building. As for the equipment purchased specifically for this project, they include both hand tools and power tools. All equipment purchased will be owned by InSPIRE for other projects.

A complete list of expenditures using the SSC grant is attached.

Timeline and Milestones
The milestones indicated in the original application is no longer relevant. The table below provides a complete summery of the actual project timeline.

Timeline		
Major Milestone	**Approx. Time Completed**	**Description**
Creation of Project Design Concept	Fall 2017	Decided on a picnic table fitted with solar panels and outlets to charge laptops and cellphones
Found Sponsor and Funding	Early Spring 2018	Gained funding from Student Sustainability Committee, and sponsorship of prof Erik Benson
Found Technical Support for Electrical System	Late Spring 2018	Found technical advice and support from Philip T. Krein for the design of an off grid solar PV system
Proof of Concept	Fall 2018	- Created Functional Prototype Solar Energy System - Initial 3D model of design completed - Gained an “ok” from Craig P. Grant and Joseph Y. Youakim regarding the structural design.
Technical Knowledge Preparation	Early Spring 2019	- Gained approval and permission to start building the solar PV system (SES) from Philip T. Krein - Began learning and gaining skills related to concrete/masonry work
Electrical System	Late Spring 2019	- Purchased electrical box and electrical parts - Began assembly of the electrical system
Electrical System Construction	Summer 2019	- Completed Electrical System and began testing
Structural Design	Fall 2019	- Finalized structural design of the project - Compiled purchase list of parts for the structural system - Gained permission from Concrete Canoe RSO to share concrete workspace

Attained Approved Space for Installation	Spring 2020	- Gained Permission from the UIUC F&S Architectural Board and local Facility managers in the college of Engineering for a permanent location northeast of the Holonyak Labs
Hiatus	Spring 2020 to early Spring 2021	- Hiatus due to COVID pandemic
Preparation for construction	Spring & Summer 2021	- Completed plans and necessary permissions for construction
Began Construction & Finished Draft of Signage	Fall 2021	We finished… - Assembly of the table - Anchoring of the table - Installation of one of the poles Finished draft of signs and graphics to be placed on the project
Finish Construction	Spring & Early Summer 2022	- Installation of the second pole - Installation of off-grid PV system - Exterior Signage
Post Construction	Summer 2022	Start of Periodic inspections

Problems/Challenges Encountered

- Insufficient pre-planning: Since none of the members in the team had prior project management experience in the beginning of the project, the quality of planning was poor. Especially when estimating the amount of time, a task would need to finish, resulting in multiple underestimations and delays.
- Costs related to trial and error: Much planning and design was done prior to the purchase of items; however, some plans and designs didn't work during tests or implementation, needing us to make changes and additional purchases.
- Shipping delays: Some items arrived much later than expected, causing delays
- COVID 19 Pandemic: Lack of in-person meetings and significant drop in membership during the pandemic quarantine period resulted in a delay of 1-2 years.

Student Involvement and Outreach to Date:

Student members were responsible for the fallowing.
- Overall design of the table including what major components will be commercially bought and what will be created from scratch.
- Cooperating with professionals for consultation on the design, construction and compliance with local campus codes as well as statewide & national codes.
- Construction
- Marketing
- Creation of signs
- Creation of the website with the design documents available to the public

Marketing and Promotion Efforts to Date:

For the SPOT project specifically, we've conducted social media posts and placed informational signs on the SPOT itself.

We also included a model of the SPOT in our usual RSO promotional posters for the purpose of gaining additional members. These posters did not specifically advertise the SPOT project,

Diversity, Equity, and Inclusion:
All members are welcome with no arbitrary discrimination.
All recruitment efforts where towards the entire general body with a focus on environmental sustainability and engineering students. No other form of discrimination was made.

Additional Comments:
Construction has been completed and the PV system has been tested. For more information about the project, please see out full report through the link bellow or upon request
https://drive.google.com/file/d/1BuT5QpkBQeDmxCt7x9zo5WQu7r8XX4E2/view?usp=sharing

Pictures of the project after construction (but before turning on the outlets) are shown bellow






Est. Expenditures from SSC Grant (2019)

* Reciepts not collected
* Prices may not reflect actual purchase costs

21-Jan-19			
Item	Quantity	Price/Unit	Price
DC Circuit Breaker #1	2	14.55	$29.10
Ground Faults Protection Device	1	$51.23	$51.23
MPPT Charge Controllers	1	$399	$399
DC Circuit Breaker #2	1	$28	$28
Battery Bank	1	$99.99	$99.99
Inverter	1	$642.08	$642.08
AC Circuit Breaker	1	$8.94	$8.94
Outlets	2	10.5	$20.99
Low Voltage Disconnect	1	$55.50	$55.50
Total	11		$1,334.62

12-Feb-19			
Item	Quantity	Price/Unit	Price
Battery Bank	1	$107.96	$107.96
AC Circuit Breaker	1	$9.20	$9.20
Strike anchor	1	$57.35	$57.35
Orange ASA 3D printing Material	1	$38	$38
Total			$212.51

14-Feb-19			
Item	Quantity	Price/Unit	Price
30amp DC circuit breaker	2	$12.25	$24.50
Electrical Enclousure	1	$931.27	$931.27
Rebar Bundle	2	$17.44	$34.88
Total			$990.65

20-Mar-19			
Item	Quantity	Price/Unit	Price
100% Plastic Board	1	$106	$106
Total			$106.00

20-Apr-19			
Item	Quantity	Price/Unit	Price
DC Circuit breaker box	1	$49.88	$49.88
Two Hole Conduit Strap (8mm)	1	$8.73	$8.73
16mm Drill Bit for Metal	1	$15.11	$15.11
Cable Glands	1	$9.99	$9.99
1/2 screws	1	$5.25	$5.25
10 Gauge Silicone Wire	1	$16.48	$16.48
MC4 Connectors	1	$9.99	$9.99
Power Strip	1	$12.45	$12.45
Temperature Controller	1	$34.99	$34.99
Total			$162.87

10-Dec-19			
Item	Quantity	Price/Unit	Price
Cam Lock	1	$14.65	$14.65
Solar Mounts	2	$259.20	$518.40
4in Pipe Nipple	1	$32.75	$32.75
4in dia drill bit	1	$22.55	$22.55
Table grounding Clamp	2	$13.50	$27.00
Total			$615.35

11-Dec-19			
Item	Quantity	Price/Unit	Price
Grounding Rod Clamp	4	$2.35	$9.40
6 awg bare solid grounding wire	1	$20.96	$20.96
Normal grounding lugs	3	$3.15	$9.45
Bus Bar	1	$3.99	$3.99
12 awg stranded wire	1	$7.77	$7.77
Total			$51.57

Initial Amount	5800
Est Sub-Total Expenses (excluding shipping & taxes)	**$3,473.57**
Est Total (w/ shipping, no taxes)	$4,168.28
Est Remaining	$1,631.72
Confirmed Remaining Amount (As of March 16 2021)	$1,752.41.

Expenditures From SSC Grant (2021)

Reciept	Item Name	Cost/unit	Qt	Subtotal
21/01/04 Amazon	Stainless Flat Head Phillips Wood Screws	6.01	1	6.01
	Stainless Steel L Brackets	9.59	1	9.59
	Foam Seal Tape	10.35	1	10.35
21/01/15 Amazon	Loctite Self Mixxing Epoxy Syringe	3.59	6	21.54
	Screw Post Fasteners	17.18	1	17.18
21/01/22 Amazon (1)	HDPE Recycled Plastic Sheets 1/8" x 24" x 48"	15.60	2	31.20
21/01/22 Amazon (2)	HDPE Recycled Plastic Sheets 1/4" x 12" x 24"	44.99	1	44.99
	Stainless Steel Hinges	11.99	1	11.99
	White Paint Pen	10.99	1	10.99
	HDPE Recycled Plastic Sheets 1/2" x 12" x 24"	23.99	6	143.94
21/02/12 Amazon	HDPE Recyclpled Plastic Sheets 1/4" x 12" x 24"	44.99	1	44.99
21/04/13 Belson	Recyclpled Plastic Picnic Table	891.00	1	891.00
21/04/13 Home Depot	Grounding Rod	11.85	2	23.70
	Grounding Rod Clamp	2.70	2	5.40
21/05/08 Amazon (1)	Movers Dolly	20.99	1	20.99
21/05/08 Amazon (2)	Cam Lock	12.00	1	12.00
21/05/08 Amazon (3)	Adjustable wrench	5.99	1	5.99
	Self Adhesive cable Labels	5.99	1	5.99
	10 AWG wires	52.73	1	52.73
	Y Branch MC4 Solar connectors	7.99	1	7.99
	Carbide Scraper	25.11	1	25.11
	Multimeter	21.99	1	21.99
	Hammer Drill Bit	6.54	1	6.54
	Grounding Pipe Clamp	20.90	2	41.80
	MC4 Solar Connectors	20.89	1	20.89
21/06/30 Amazon	Battery Equalizer	19.66	1	19.66
21/07/13 Amazon	Tile Grout	10.99	1	10.99
	1/2" Diameter Rope	19.99	1	19.99
		Totals:	42	1545.53
		Total Shipping Cost		209.69
		Grand Total		**1755.22**

** The above expenditures where made by RSO members and reimbursed using SSC funds. The reimbursed amount did not exceed the remaining SSC available funding.

Expenditures From SSC Grant (2022)

Reciept Date	Item Name	Cost/unit	Qt	Subtotal
22-03-05	UPG 12 Volt 50 Ah SLA AGM Battery - 2pc	242.72	1	242.72
	3-Step Compact Step Ladder	34.97	1	34.97
	Husky 22 in. Connect Rolling System Tool Box	89.98	1	89.98
22-03-15	Square Tubes - 2pc	35.48	1	35.48
22-03-19	4 Piece Clamp Set	24.97	1	24.97
	1/2" PVC Coupling SXS	0.73	5	3.65
	1/2" PVC EL 90D SXFPT	0.81	1	0.81
	1/2" PVC Male Adapter SXMPT	0.71	1	0.71
	1/2" PVC Street EL 90D SXSPG	1.57	5	7.85
	1/2" PVC Female Adapter SXFPT	1.06	1	1.06
	Wood Screw Zinc PHL FLT #8	1.28	2	2.56
	Loctite Power Grab ULT Clear	11.78	2	23.56
	NM In-Use Cover 1-Gang Clear	9.67	1	9.67
	1/2" x 10' PVC40 PE Pipe	4.96	3	14.88
	Hex Bolt Stainless Steel 5/16 x 2-1/2 (BTS)	1.64	8	13.12
	Flat Washer Stainless Steel 5/16 (AFC)	0.30	18	5.40
	Hex Nut Stainless Steel 5/16 (ANF)	0.43	9	3.87
	Lock Washer Galv 5/16	0.21	10	2.10
	Storewide Promo	-5.00	1	-5.00
22-04-03	5" Sanding Disc Kit	9.97	1	9.97
22-04-24	MNDC-GFP 63 Amp DC GFP	65.82	1	65.82
22-05-03	Empire 8" x 12" Steel Carpenter Square	5.47	1	5.47
	10" Compact Hack Saw	15.97	1	15.97
	Hex Nut Gr-8 5/16 Zinc	1.08	1	1.08
	Hex Bolt Gr-8 5/16 Washer	1.31	1	1.31
	5/16 Lock Washer Zinc	1.17	1	1.17
	Hole Plug 5/8	2.26	5	11.30
	Flat Washer Stainless Steel 5/16 25pc Pack	6.37	1	6.37
	5/16 Flat Washer Gr-8 Zinc	1.36	1	1.36
	Hex Nut Stainless Steel 3/8 (AWM)	0.58	5	2.90
22-05-04	1/2" Schedule 80 PVC Pipe - 5ft	6.34	10	63.40
	1/2" Schedule 80 PVC Male Adapter	2.53	1	2.53
	1/2" Schedule 80 PVC Coupling	2.17	10	21.70
	1/2" Schedule 80 PVC Elbow - Socket	1.16	6	6.96
	1/2" Schedule 80 PVC Female	1.97	1	1.97
22-05-12	LED PUCK Light	11.97	1	11.97
	Duct Tape	10.88	1	10.88
	Fuze It Max Construction Adhesive	10.97	1	10.97
	Supreme Silicone Clear	13.98	1	13.98
	Solid Cupper Bare Wire 25'	14.98	1	14.98
	Solid Copper Bare Wire 50'	28.00	1	28.00
	Duplex Outlet Kit	16.28	1	16.28
	1/4" Top Beam Clamp	3.54	1	3.54
	Hex Nut Galvanized 5/8	0.61	1	0.61
	Hex Nut Zinc 5/8	0.47	1	0.47
		Totals:	129	843.32
		Total Shipping Cost		43.99
		Grand Total		**887.31**

** The above expenditures where made by RSO members and reimbursed using SSC funds.