

Solar Urja Lamp (SoUL) Competition

For AICTE institutions

*Come participate in the most exciting solar challenge and win upto INR. 1,00,000!
INR. 50,000 from IIT Bombay & INR. 50,000 from AICTE*

Background

Energy access has been a critical issue wherein billions lack access to clean cooking and electricity, while on the other hand, excessive use of energy by few has led to catastrophic climate change. The International Energy Agency (IEA) has reported that energy is the golden thread that weaves together economic growth, human development & environmental sustainability. Policymakers have attempted to make a balance between the grid and off-grid solutions, however, grid extension to the geographically isolated communities are not viable due to natural, environmental, infrastructural and financial constraints. Moreover, extending grid electricity has severe environmental and financial implications.

Solar off-grid interventions work well as an alternative way of powering remote areas, however, its improper implementation has led to failure and lack of confidence in rural communities. For successful implementation and sustainability of solar photovoltaic interventions, the involvement of local communities is crucial, involving them at each level of operation including manufacturing, assembly, distribution, and after-sales service. On similar lines, the Indian Institute of Technology Bombay has designed the Solar Urja through Localization for Sustainability (SoULS) Initiative, which is primarily based on involving local communities in all the operations relating to the deployment of the solar technology.

The SoULS initiative (www.soulsiitb.in), a flagship program of IIT Bombay has evolved the 'Localization-Affordability-Saturation (LAS)' model, which offers a localized solution involving local communities (localization) and ensuring the transition from a 'program-driven model' to 'market-driven model'. It has the potential to strengthen the overall rural economy by generating technology-based livelihood opportunities through local solar manufacturing units. It ensures accessibility to a wide range of solar off-grid products at affordable prices that allow it to reach the vast population that is deprived of clean energy access (saturation). The SoULS Initiative embarked in the year 2013 as The Million Solar Urja Lamp Program (MSP) disseminated 1 million solar study lamps to rural students. After the success of the 1 MSP, the Ministry of New and Renewable Energy (MNRE) sanctioned the distribution of 70 lakh solar study lamps. The SoULS Initiative has been successfully rolled out in 346 operational blocks with over 9,000 local people have already been trained, benefiting more than 6 million students. Furthermore, Durgapur Renewable Energy Technologies Private Limited (DURGA Energy) has been formed which is fully operated by tribal women.



With the successful inception and implementation of the SoULS Initiative, the idea of Energy Swaraj has been conceptualized, wherein local communities can generate and consume their own energy needs. The advancement of solar technology and decreasing prices of solar PhotoVoltaic (PV) modules, the decentralized manner of energy generation and consumption is now possible! Energy Swaraj ensures accountability within the communities, with fewer chances of overexploitation, thus mitigating climate change.

As a further step towards decentralization and localization, IIT Bombay has been releasing all the designs of solar products in the public domain. These products are available for anyone to study, modify, distribute, make, and sell the design or hardware based on that design. The hardware's source, the design from which it is made, is available in the various preferred formats. People can make modifications to these designs to cater to the needs of the people in their vicinity. Right now, the solar study lamps distributed under the 70 lakh solar study lamp scheme and the Million SoUL Program have been made available in the public domain on the website <http://openhardware.soulsiitb.in>. The files that are available for download are as follows:

- 1) Technical specifications of the components
- 2) Printed Circuit Board (PCB) Gerber Files
- 3) Controller Code: Hex Files
- 4) Circuit Schematic and layout
- 5) Source File
- 6) Bill of Material
- 7) Lamp Body Design (IGS and STL files)

Students: As the Ambassadors of Solar Energy

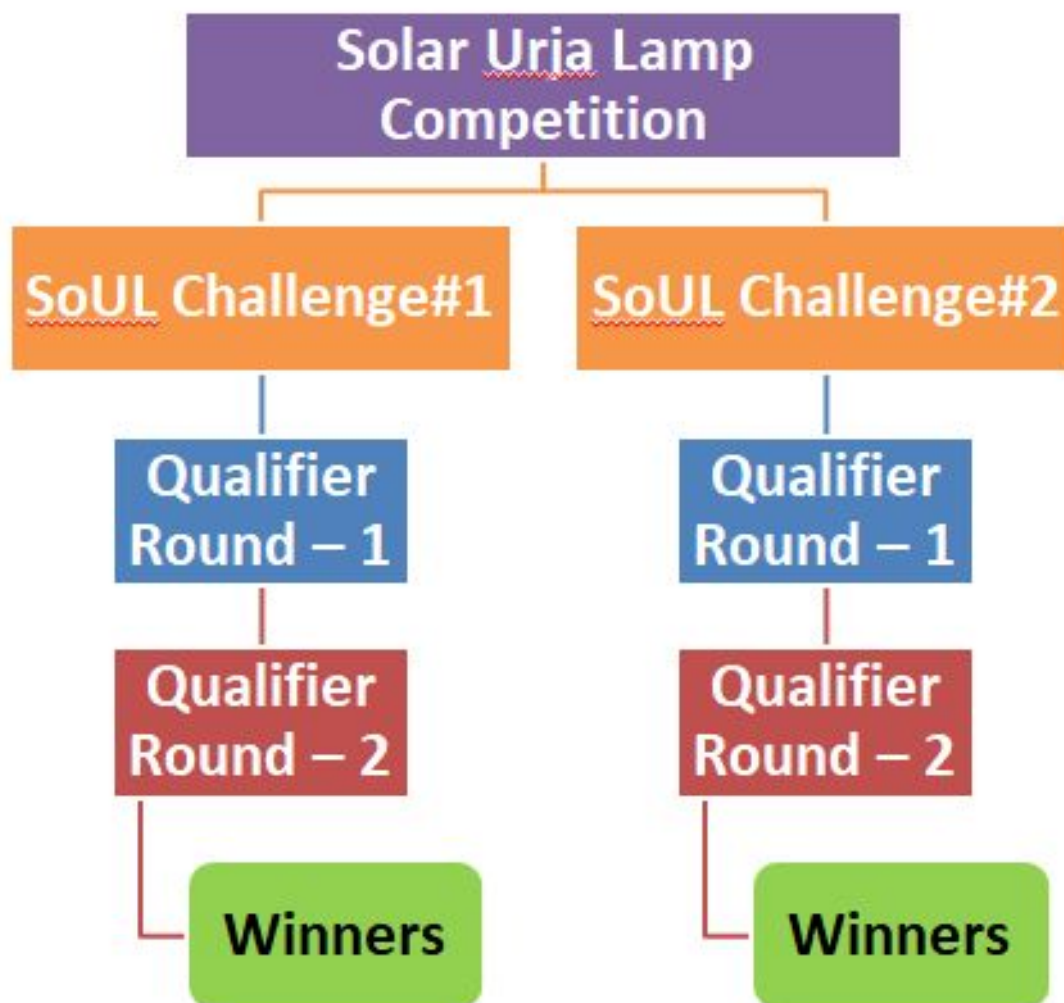
Students will be the future bearers of the energy and will bear the maximum brunt of climate change. Hence, the students have to be an integral part of taking the idea of Energy Swaraj forward and in the transition from fossil fuel-based energy to renewable-based energy. In this regard to make the Students as the Ambassadors of Solar Energy, IIT Bombay is taking two main initiatives:

- **Gandhi Global Solar Yatra (GGSY, www.ggsy.in)** is planned not only in India but across the globe to promote the idea of Energy Swaraj. This yatra will culminate with **Students Solar Ambassadors Workshop**, on the 2nd Oct. 2019, marking the 150th Birth Anniversary of Mahatma Gandhi.
- IIT Bombay in collaboration with the All India Council for Technical Education (AICTE) is organizing a solar challenge, referred to as the Solar Urja Lamp Challenge. The challenge has been categorized into two problem statements. By participating and winning the challenge, one has a chance to win upto INR. 1,00,000.

This document will overlay the norms, rules and regulations, and the overall procedure to participate in the Solar Urja Lamp Challenge.

Challenges under the Solar Urja Lamp Competition

The challenge has been broadly categorized in two major problem statements. These problem statements have been defined in such a manner that the overall efficiency and the efficacy of the Solar Urja Lamp (SoUL) can be increased so that the students do not face any problems while studying under the SoUL. It is upto the participating teams to participate in either one of the challenges or both the challenges. Winning individual challenge will lead the participating team to the prize money of INR. 50,000. The team who can solve both the challenges with a working prototype of the lamp will be awarded **INR 1,00,000 and a certificate from the SoULS Initiative!**





Problem statement #1: The load efficiency of the current circuit is 82%, it is calculated by measuring the voltage and current of both battery and load LED. The ratio of output power (P_{load}) and input power (P_{bat}) is the efficiency of the circuit. The PCB of the lamp is designed to be robust, but over a long period if the lamp is not used and not charged, the battery voltage goes down to a deep-discharged state (<2.4V). The PCB that is designed for SoUL lamp is unable to revive the battery when the voltage goes to the deep-discharged state

SoUL Challenge#1: Design a circuit with at least 2% higher efficiency than the current value. All other parameters like cut-off voltages and idle/leakage current should not be compromised while designing the circuit. It should be able to revive the battery even from the discharged state (<2.4V), by not compromising on any other technical parameters of the circuit.

The participants are free to use any circuit topology or any electronic components. But the overall performance of the PCB should adhere to the technical specifications mentioned on the website.

Evaluation Method:

Qualifier Round - 1

Participants should simulate their circuit design in MATLAB-Simulink2018 or earlier versions. If using a particular electronic component, use the data from its datasheet in the simulation (basically simulation parameters should match with the actual parameters of the datasheet).

- Requirements:

The participants need to upload the following for qualifying in the qualifier round - 1:

1. Simulation Files
2. Abstract (300 words)
3. Covering Letter (150 words)
4. A document highlighting the schematic of the circuit

- Document Inclusions:

The participants need to submit the document (point 4 in the above list) has to contain the schematic of the circuit. This document should explain the simulation parameters used in the MATLAB Simulink. Also, this document should contain the Bill of Material (BoM) of the circuit designed, mentioning the name of the component, number of the components, value & units (like ATtiny85, 10-kilo-ohms, 47 microfarads). If there are any active components used, please mention it's the approx price as well.

- **Assessment Criteria**

Top 10 entries based on the efficiency is based on simulations with the highest efficiency will be shortlisted for the next round. In addition to the efficiency of the PCB, it should be cost-effective and less no of components is recommended. Pricing of the current circuit components can be given as the base reference. Pricing should be for quantity of 1lakh units or 100ku.

- **Shortlisting Criteria**

Shortlisted candidates will be informed via mail, and they have to submit a prototype PCB so that the IIT Bombay team can evaluate the performance of the physical PCB.

Qualifier Round - 2

After qualifying the first round, the shortlisted teams will have to follow the processes:

- **Requirements:**

The participating teams needs to submit the following for participate in the second qualifying round:

1. Declaration Letter stating that PCB is of their own design or has been sourced from the free-to-use (royalty-free) design.
2. Prototype PCB of their design

- **Assessment Criteria**

The assessment criteria will depend on the efficiency of the PCB and on the pricing of the components. The physical testing of the PCB will be done. We use our own battery & LED for the evaluation.

- **Winning Criteria**

The participating team which wins the competition will win a prize of INR. 50,000. Winning team will be informed via email, and they have to submit a prototype PCB so that the IIT Bombay team can evaluate the performance of the physical PCB. We use our own battery & LED for the evaluation. Most efficient and the cheapest PCB that falls in our cost bracket will be the winner (the cost bracket will be fixed based on the BoM cost mentioned in level 1 competition). Winning team will also receive a certificate from the SoULS Initiative.



Problem statement #2: The body of the lamp is made of ABS plastic which houses circuit, battery and LED. The lamp design is very robust and easy to use. The head of the lamp is connected to the base via gooseneck and can be tilted in any direction. The lamp with the help of gooseneck can be hung anywhere in the room and can be kept steadily on the table as well. But since plastic is not environmentally friendly, an alternative to the body needs to be devised.

SoUL Challenge#2: Design the body of the SoUL lamp that houses circuit, battery and LED in a manner that it is made out of environment friendly materials, keeping the basic functionality and the features same. The body should be able to get manufactured at large scale, in any part of the country. (reducing the dependency on imports). The participants should propose alternative materials or manufacturing methods, but shouldn't change the dimensions of the lamp body.

Evaluation Method:

Qualifier Round - 1

The participants should suggest new materials and processes (not changing the dimensions of the lamp body) that can be used in the 3D model available on the SoULS website.

- Requirements:

The participating teams need to submit the following for participation:

1. A document highlighting the lamp body, in all views, mentioning the materials of it. (Eg. Arrow mark to the lamp base bottom mentioning it as anodized aluminium, as proposed material).

- Document Inclusions:

The participants should mention the list of materials proposed for the lamp body and the reason for preferring that material. The annexure of this document should contain the data sheets or CoA of the material. It would be appreciated if the cost of the material is mentioned in a table.

- Assessment Criteria

The evaluation will be done by a panel of 4 experts, and will be blind rating. The evaluator will consider the density of the materials, safety, pricing, durability and ease of recycling. Based on these ratings, 10 teams will be shortlisted for level-2.

Qualifier Round - 2

After qualifying the first round, shortlisted teams will have to follow the following process to win the competition.

- Requirements:

In Qualifier Round 2, the teams have to send prototypes of the lamp body, in the proper dimensions. (as mentioned in the website).

- **Assessment Criteria**

These prototypes will be tested in our labs and based on the tests, the final winner will be announced.

- **Winning Criteria**

The participating team which wins the competition will win a prize of INR. 50,000. Winning team will be informed via email (or sms).

Registration Process:

The entire portal description of the registration process is given the Annexure of this document. The summary of the process is given below:

- 1) An institute shall be allowed to send only ONE nomination. Once submitted no change in the application/ data/ options shall be permitted.
- 2) Institutions can register in the group of up to 10 students and upto 3 teachers/mentors
- 3) The Institutes may register at <<https://ggsy.in/souls-challenge.php>>

Guidelines for competition

- 1) The institutes are required to refer to the Solar Urja Lamp (SoUL) Design which are available on <<http://openhardware.soulsiitb.in/soul-design-wo-mchrg-t2.html>>
- 2) The design of SoUL has to be modified to solve all the problem statements mentioned above.
- 3) The participating institutes are required to make a working prototype of the proposed design and submit it to IIT Bombay on the address mentioned below:

608, 6th Floor, Dept. of Energy Science and Engg,
Near Kendriya Vidyalaya, YP Road, IIT Bombay,
Powai, Mumbai-400076

For any related queries, kindly write us to training@ggsy.in

The institutes have to ensure proper packaging of the prototype to ensure that there is no damage during the transit.

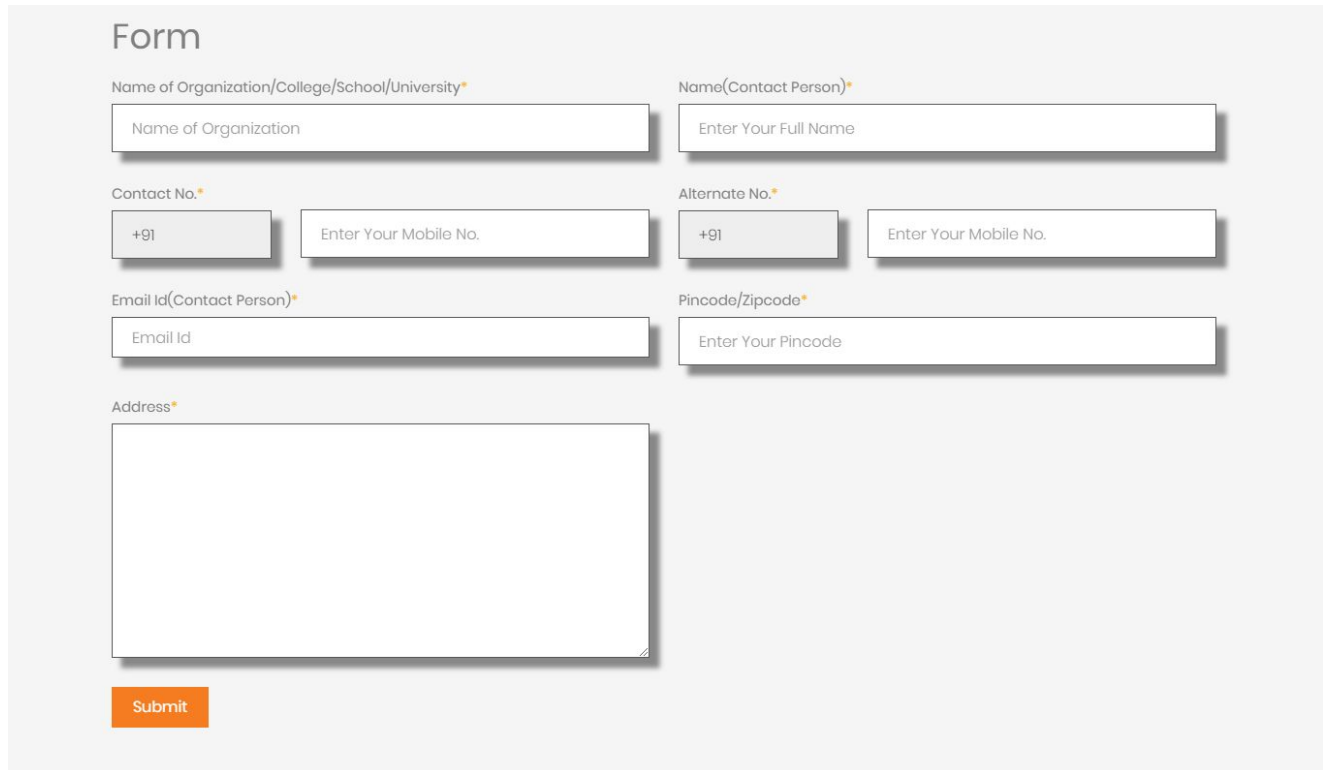
- 4) The below mentioned documents must be uploaded by institutes on the web portal:
 - a) Proposal with covering letter
 - b) Test reports and certificate from an accredited testing agency of the working prototype (optional)
 - c) Simulation results and in-house test reports. Formats for the above documents will be provided
- 5) The prototype will be tested at IIT Bombay by following the standard method for efficiency test, under the supervision of jury members.

Timeline

- Registration and submission start date: **26th July 2019**
- Registration end date: **5th August 2019**
- Submission last date (Level 1): **14th August 2019**
- Announcement of shortlisted candidates for Level 2: **22nd August 2019**
- Last date for receiving the prototypes (Level 2): **13th September 2019**
- Result Announcement: **25th September 2019**
- Prize distribution: **2nd October 2019**

- **Step 1**

For registration visit to <https://ggsy.in/souls-challenge.php>



The image shows a registration form titled "Form" with the following fields:

- Name of Organization/College/School/University* (Text input: Name of Organization)
- Name(Contact Person)* (Text input: Enter Your Full Name)
- Contact No.* (Text input: +91, Text input: Enter Your Mobile No.)
- Alternate No.* (Text input: +91, Text input: Enter Your Mobile No.)
- Email Id(Contact Person)* (Text input: Email Id)
- Pincode/Zipcode* (Text input: Enter Your Pincode)
- Address* (Text area)
- Submit (Orange button)

- **Step 2**

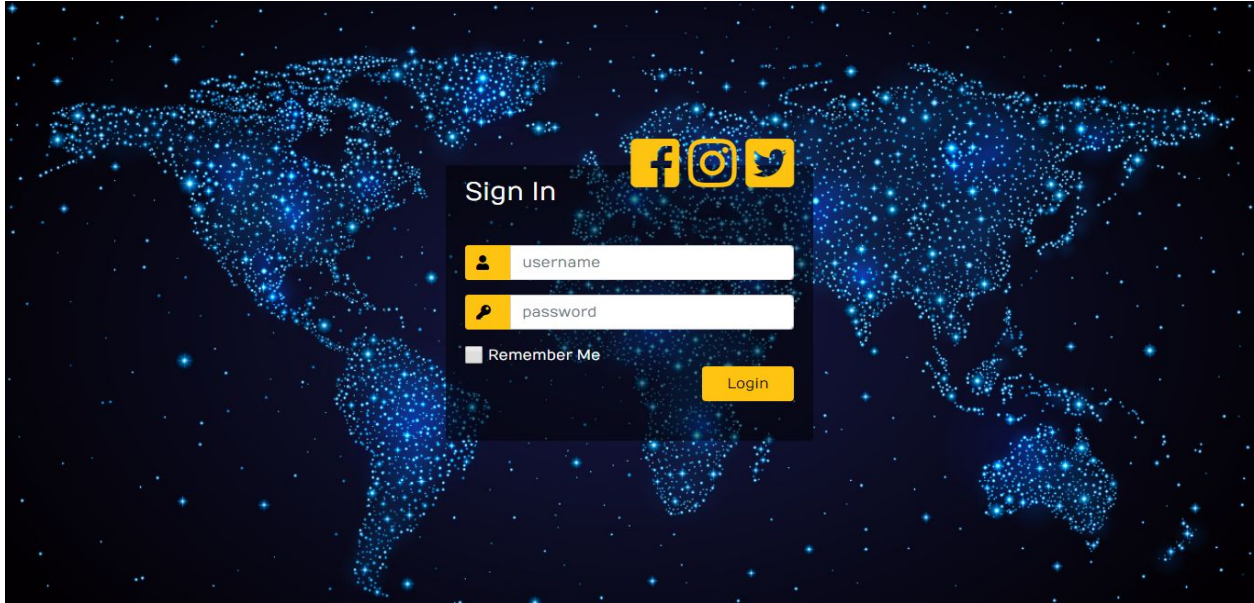
You will receive a thank you message and login id and password through email.

Thank You!

We have received your details.

- **Step 3**

Login on <https://ggsy.in/login.php> using the login and password received on mail



- Step 4

Enter the mentor and students details here.

Mentor Details

Logout

Mentor Name	Mentor Email	Mentor Phone
<input type="text" value="Enter Mentor Name"/>	<input type="text" value="Mentor Email Id"/>	<input type="text" value="Enter Your Mobile No."/>
<input type="text" value="Enter Mentor Name"/>	<input type="text" value="Mentor Email Id"/>	<input type="text" value="Enter Your Mobile No."/>
<input type="text" value="Enter Mentor Name"/>	<input type="text" value="Mentor Email Id"/>	<input type="text" value="Enter Your Mobile No."/>

Student Details

Student Name	Student Email	Student Phone
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- Step 5

Challenge 1 for the participants

Challenges for the Participants

[logout](#)

The participant can take part in either one or both the challenges as per their preferences.

[Challenge 1](#) [Challenge 2](#)

SoUL Challenge 1

Sr No	Requirements	
1.	Simulation Files	<input type="button" value="Choose File"/> No file chosen
2.	Abstract (300 words)	<input type="button" value="Choose File"/> No file chosen
3.	Covering Letter (150 words)	<input type="button" value="Choose File"/> No file chosen
4.	A document highlighting the schematic of the circuit	<input type="button" value="Choose File"/> No file chosen

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Incase of any queries kindly mail us on training@ggsy.in.

- Step 6

Challenge 2 for the participants

Challenges for the Participants

[logout](#)

The participant can take part in either one or both the challenges as per their preferences.

[Challenge 1](#) [Challenge 2](#)

SoUL Challenge 2

Requirements

The participating teams needs to submit the following for participate

A document highlighting the lamp body, in all views, mentioning the materials of it. (Eg. Arrow mark to the lamp base bottom mentioning it as anodized aluminium, as proposed material).

Your PDF file

No file chosen

[upload](#)

Note: The participants should mention the list of materials proposed for the lamp body and the reason for preferring that material. The annexure of this document should contain the data sheets or CoA of the material. It would be appreciated if the cost of the material is mentioned in a table.

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