



MathWorks® Hackathon

Microgrid on Mars Challenge

Instructions for Getting Started

This guide has detailed steps to help your team use MATLAB® to design your microgrid. We have also included templates that you can use for each task of the challenge.

Good luck!

Table of Contents

Getting Started.....	3
Challenge Statement.....	3
Getting Started with MATLAB.....	3
Setting up the Project	4
Example Model:	4
Challenge Files	4
Instructions & Challenge Overview.docx:	5
ScoringRubric.docx.....	5
Submitting your Results	5

Getting Started

Challenge Statement

You are an engineer stationed on Mars and have a rather urgent design task ahead of you. A rogue meteor has rendered the original solar array inoperative - the microgrid system now has only battery power and time is running short. You must design a new microgrid system that will provide uninterrupted power over a seven sol period (1 sol = 24 hrs 37 minutes). The system must also keep voltage between 500V and 520V at all times, as various sensitive pieces of life-support equipment cannot tolerate voltage levels outside these bounds. You have 4 Earth hours to complete your design.

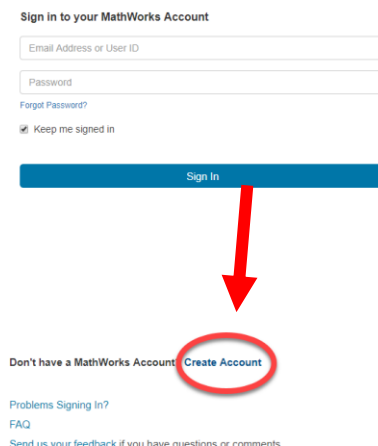
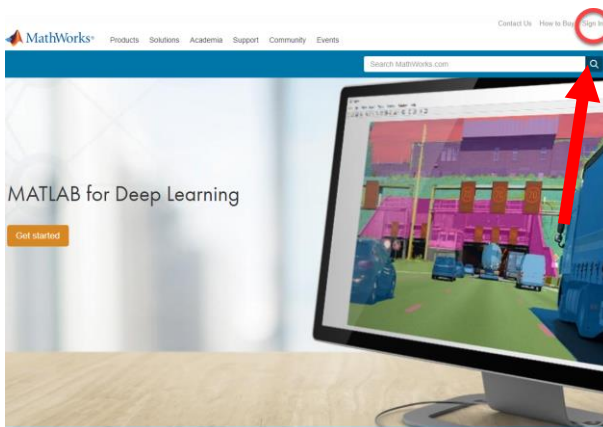
This challenge is broken up into the following tasks:

1. Design Space Exploration
2. Determine Maximum Power Transfer
3. Develop Maximum Power Point Tracking (MPPT) Control
4. Tune Battery Voltage Control
5. Integrate and Test the Full System

Getting Started with MATLAB

1. Create a MathWorks account

- Go to <https://www.mathworks.com/>
- Click 'Sign In' in the upper right corner of the page
- Click 'Create Account'
- Fill out page and then press 'Create'



2. Access MATLAB Online™

- Go to <https://matlab.mathworks.com/>
- Log in Using MathWorks account

Resources

The MathWorks ‘Awesome MATLAB Hackathons’ GitHub repository has a plethora of getting started resources for a variety of topics. If you’re not sure where to start or feeling stuck, check it out to see if there’s a resource for you!

<https://github.com/mathworks/awesome-matlab-hackathons>

Setting up the Project

In the directory of your choice, double-click on the MATLAB archived project ‘Microgrid_on_Mars.prj’. The project will be installed, and you will see the following folder structure:



And the following data in the workspace:

Workspace	
Name ^	Value
irradiance	168x1 double
loadPower	168x1 double
t	168x1 double
Ts	0.1000

Then double click on ‘microgrid_on_mars.mlx’ to open it. This file will contain instructions for you to follow along with. To save any changes you make to this file or any other file, click on the ‘Save’ button in the top left of the screen or use the keyboard shortcut Ctrl+s.

Example Model:

As part of the documents provided for this competition, we have provided a template that should be used when developing your solutions. Here is a list of the files and folders included as part of the example:

Challenge Files

This folder contains the instructions, templates, and examples for the challenge. All MATLAB and Simulink® files are in here.

1. Impedance Match: This folder includes example materials for Impedance Matching and Maximum Power Point Tracking.
 - impedance_match.mlx contains instructions and an explanation of this concept

- impedance_match.slx is the simulink model you can use to follow along with the example outlined in 'impedance_match.mlx'
2. Resources: This folder contains resources for the MATLAB project, do not modify this.
 3. microgrid_on_mars.mlx: A MATLAB Live Script with instructions on how to complete the challenge. **Start here!**
 4. Microgrid_on_mars.prj: A MATLAB Project that will set up the environment for you. Double-click on this before you begin making changes or running any files.
 5. profileData.mat: A MATLAB data file that contains variables that will be used in the Simulink models for various tasks. These are automatically loaded when you open the MATLAB Project.
 6. Several Simulink files that start with Task: The simulink files you should use to create your solutions for each task.

[Instructions & Challenge Overview.pdf](#)

This file outlines the instructions for the hackathon and contains some resources to help you get started

[ScoringRubric.pdf](#)

This document provides the grading rubric that judges will be using for the challenge.

Submitting your Results

Once you have finished your model, you will have to create a submission for your team. Teams are encouraged to be creative when demonstrating their efforts and follow the grading rubric available in the provided documents when developing their submission. Further instructions on how to deliver the submission will be shared with teams at the event.