

**Multidisciplinary Senior Design  
Project Readiness Package**

Prepared by Art North on June 13, 2019  
Updated by Marcos Esterman, Bill Nowak, Ken Mihalyov on August 5, 2020

<b>Project Title</b>	Solar Powered, Portable 3D Power Cart v2
<b>Project Number</b>	P21462
<b>Primary Customer</b>	Marcos Esterman
<b>Sponsor</b>	Marcos Esterman
<b>Faculty Champion</b>	Marcos Esterman
<b>Other Support</b>	Bill Hard Fund
<b>Project Guide</b>	To be assigned by MSD
<b>IP Considerations (must pick one)</b>	Team retains ownership, no additional requests for use at this time

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<https://goo.gl/forms/J3G8G2jhTUFuJCYe2>

# Project Information

## Overview

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In 2017 a Solar Powered 3D printer was developed in MSD. The main subsystem that was developed was the power management system that included a battery, solar cells and grid power to allow the system to be powered in a variety of circumstances. This product was delivered to an NGO in Colombia by the MSD students (<https://edge.rit.edu/edge/P18462/public/Home>).

In 2018 MSD students worked on the reliability of the power management systems to integrate a better user interface as well as the ability to accept pellets instead of a bead. The team was asked to explore the integration of additional functionality (e.g. drilling), to enable increased utility for the NGO) (<https://edge.rit.edu/edge/P19462/public/Home>).

In 2019 MSD students focus on the power cart itself. The goals of this project were to develop a solution and identify opportunities to switch between multiple power sources seamlessly, be portable and compact, improve reliability and ease of use, disassembly, and transport, and fail gracefully without power. However, the project was unable to be completed due to COVID-91 (<https://edge.rit.edu/edge/P19462/public/Home>).

In P21462 MSD students will complete the solar power/grid solution, assuming that deep-discharge batteries cannot be sourced locally, and enhance portability. Furthermore, they will add 2 more alternative extensions that the cart can switch between.

## Preliminary Customer Requirements (CR)

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Portable  
Compact  
Reliable  
Easy to Use  
Seamless Switching Between Solar, Grid Powered & the two additional alternative energy extensions  
Easy to disassemble and transport  
Easy Packaging for Transport to Colombia

## Preliminary Engineering Requirements (ER)

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The P20462 requirements will be a great starting point.

## Constraints

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Limited financial, material and technological resources at the site of the system's use.

## Project Deliverables

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Minimum requirements:

RIT Kate Gleason College of Engineering  
Multidisciplinary Senior Design

Project Readiness Package  
Template Revised Fall 2018

- All design documents (e.g., concepts, analysis, detailed drawings/schematics, BOM, test results)
- Working prototype
- Technical paper
- Poster
- All teams finishing during the spring term are expected to participate in ImagineRIT

Additional required deliverables:

- User Manual
- Tear-Down and Set-Up Instructions
- In-Country Field Test Plan

## **Budget Information**

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Bill Hard Fund plus some funding from Esterman

## **Intellectual Property**

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Team retains ownership, no additional requests for use

## **U.S. Citizenship**

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No known U.S. Citizenship requirements.

## **Travel Opportunities**

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Students working on this project may have the opportunity to travel to Colombia at the conclusion of the project.

## Project Resources

### Anticipated Student Staffing by Discipline

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Department	Expected Activities
Computer Engineering	Solar powered/grid powered software control scheme
Electrical Engineering	Energy and hardware control system
Industrial & Systems Engineering	Process control, problem management
Mechanical Engineering	Design & fabrication of transportable system, materials issues — ME with a controls background could complement the EE assignment
Other	

### Required Resources

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<b>Faculty</b>	Marcos Esterman, some EE support
<b>Environment</b>	Need to find space.
<b>Equipment</b>	May want to do some shock and vibration testing in the CET (formerly known as CAST) packaging labs
<b>Materials</b>	All materials to finish last year's build available. Will need to purchase/fabricate remainder for the alternative energy add-ons
<b>Other</b>	