**Project Overview**

The Class A RV industry is lacking innovation and quality with poor customer experiences. Recreational vehicles need a large Internal Combustion Engine (ICE) to propel the vehicle. ICE consume large amounts of fuel, they are inefficient, and pollute the environment. Our team has designed a four-wheel drive electrical drive system for a class A Recreational vehicle. Four Permanent Magnet AC electrical motors will power the vehicle. Electrical motors are more efficient than ICE, they are more reliable, cheaper to build, they are lighter and required minimal maintenance. These improvements will increase the durability and quality of the vehicle to give and overall greater customers experience.

**Systems Operation**

The four-wheel drive system configuration provides better vehicle stability since electric motors can accurately control individual wheel torque. The rapid dynamics of electrical motors, enables accurate control of wheel torque, thereby achieving better handling performance. This configuration also allows safety control systems such as collision avoidance, traction control, and vehicle stability control to perform faster, resulting in a safer vehicle.

The Fully Electrical RV (FERV) runs on electrical energy stored in the battery module. The battery is charge using the electrical grid via a charger by solar panels, and by regenerative braking. The controller takes power from the DC batteries and delivers it to the electrical motor. The inverter takes in the direct current from the battery pack and converts it into a maximum of 240V alternating current.

**Systems Engineering**

AC Permanent Magnet Motor

Charge Port

Battery Pack & Thermal Pad

Ford Eliminator Electric Motor

Peak Power: 210 KW

Peak Torque: 430 Nm

Gear Ratio: 9:05:1

Weight: 205 lbs

800V Battery Module

Panasonic 21700 Cells

Aluminum Heatsink

25ft: 667 kWh

+5ft: +148 kWh

Solar Panels

Perovskite Panel

Up to 29% efficiency

Addition of 90kW/day

+5ft: +20kW/day

**Vehicle Specifications**

<table>
<thead>
<tr>
<th>RV Length</th>
<th>Gross Vehicle Weight</th>
<th>Power (kW)</th>
<th>Power (HP)</th>
<th>RV Battery Capacity</th>
<th>Estimated Solar Energy (generation per year)</th>
<th>Estimated Vehicle Range</th>
<th>Estimated Vehicle Cost</th>
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</thead>
<tbody>
<tr>
<td>25 ft</td>
<td>3917 lbs</td>
<td>284</td>
<td>393</td>
<td>66.7 kW</td>
<td>336 kWh</td>
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</table>

**Wall Assembly**

**Major Components**

**Team F.E.R.V.**

Philip Alberti

Manufacturing Engineer

Justin Legaspi

Supply Engineer

Rami Gapuz

RV Wall Engineer

Rene Navarro

Powertrain Engineer

Ryan Sternberg

Team Leader

Energy Engineer

**SPRING 2022**

Sponsor: Mechanical Engineering Department, SDSU

Advisor: Dr. Scott Shaffar