**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 customer experience.

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

Ryan Sternberg  
Team Leader  
Energy Engineer

Justin Legaspi  
Supply Engineer

Ramil Gapuz  
RV Wall Engineer

Rene Navarro  
Powertrain Engineer

Philip Alberti  
Manufacturing Engineer

**Systems Operation**

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.

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.

**Systems Engineering**

AC Permanent Magnet Motor

Charge Port

Battery Pack & Thermal Pad

Major Components

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

**Wall Assembly**

TEMPERATURE DIFFERENCE:  
OUTSIDE: 100 F  
INSIDE: ~74.4 F

NOISE DIFFERENCE:  
OUTSIDE: 100 Db  
INSIDE: ~82 Db

**Vehicle Specifications**

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<tbody>
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<td>25 ft</td>
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<td>284</td>
<td>384</td>
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Shown is the estimated vehicle specification per specified length. Class A RVs range from 25-45ft, thus increments of 5ft were chosen to simplify the customer experience. With this powertrain design, each vehicle will be able to reach a minimum of 350 miles per charge, and has sufficient solar power to supplement cabin power consumption. The usage of per wheel motors ensures capable performance to counteract the significantly higher vehicle weight.