# **REQUEST FOR NON-BUDGET FUNDING**

#### **Proposal and Presentation**





## WHY THIS PROJECT IS IMPORTANT

- "The College strives to develop students'...and their capacity for creative endeavor"
- "One of the hallmarks of a Lafayette electrical and computer engineering degree is the involvement of students in exciting projects."
- "to develop systems of values that include an understanding of personal, social, and professional responsibility"





## WHY WE NEED IT

- Proper pack testing requires realistic load (i.e. the proposed motor)
- To further along the LFEV progress must be made.
  Purchasing the motor is a large milestone
- This project proposes many obstacles towards its completion. We'd like to eliminate this one.





## WHY WE CAN'T WAIT

- Time is of the essence. As soon as the pack is ready, it needs to be tested under realistic load.
- Next years team has a lot of work to do. Purchasing the motor assures they will have time to test it and design the car around it.
- Last years team picked out a motor and controller. If we don't make the purchase this semester, next years team will have to waste valuable time doing work that has already been done.
- The LFEV would like to compete in 2015. This motor has to be purchased now if that will become a reality.





## WHY IT'S IN OUR SCOPE

- Both the motor and controller are electrical components.
  Knowledge about both of those things are gained in ECE classes.
- Testing the motor requires an electrical input which can be best provided within the ECE department.
- As much as possible should be studied about the motor before integration with the chassis, especially the electrical parameters.





## MOTOR - HPEVS AC 5X 27.28

Weight: 85 lbs. Horsepower: 71 hp Torque: 120 ft.-lbs. Voltage: 96 V Current: 650 A Max RPM: 6500 rpm







## MOTOR POWER GRAPHS



ELECTRICAL & COMPUTER ENGINEERING







## MOTOR SIMULATION

- Motor model designed in Simulink.
- Simulation derived from Kevin Schmid's model during the 2013 project.
- Adapted for use with HPEVS AC-50 Induction motor.
- Used lookup tables along with graphs from manufacturer to derive motor behavior





#### SIMULINK DIAGRAM







#### SIMULATION GRAPHS







#### SIMULATION GRAPHS







## MOTOR CONTROLLER - CURTIS 1238R

Max Power Rating (2 min): 73.6 kVA<sub>RMS</sub>

Voltage: 72-96 V Max Current: 650 A<sub>RMS</sub> Torque: 115 ft. lbs.







#### MOTOR AND CONTROLLER WIRING DIAGRAM





#### DYNAMOMETER - HUFF HTH-100

Power: 120 VAC @ 10 A (standard wall outlet) Torque Capacity: 150 ft. lbs. Max RPM: 11250 rpm Water Use: Self Contained







HUFF

#### POWER SUPPLY – MAGNA POWER TSD100-250/208

- DC programmable power supply
- Output: 0-100 Vdc; 0-250 Adc; 25kW
- Digital front panel for ease of use
- Can use outlet already installed in room 401
- Provides necessary ranges to operate motor at realistic power







# WHAT THIS WILL COST

HPEVS AC 50 Motor Kit w/ Curtis 1238R Controller = \$4,150 Huff HTH-100 Dynamometer = \$9,975 TSD100-250/208 PSU = \$15,115 Installation and Matainance = \$5,000 Total = \$34,240 Budget Request: \$35,000 Other possible costs: Water pump for extensive testing Dedicated 120VAC main circuit Pipes for dynamometer

• Installation / Maintenance costs

ENGINEERING



#### WHERE THIS WILL GO / WHO IS IN CHARGE

- Room 401 has provided 208 Vdc 3-phase outlet required for power supply.
- Dynamometer is self contained and does not required external cooling.
- Can be stored in Room 401 when not in use. Has no student access.
- The ECE department has agreed to take responsibility for the assembly.





## WHAT WE'RE ASKING FOR

\$35,000 to cover the full cost of:

- Motor and Controller
- Test stand and dynamometer
- Power Supply
- Parts required for assembly and upkeep
- Potential Installation costs
- PC dedicated to test stand (data acquisition)





#### WEBSITES

- HPEVS AC 5X 27.28 <u>http://www.electriccarpartscompany.com/</u>
- Huff HTH-100 <u>http://www.huff-tech.com/</u>
- Curtis 1238R http://curtisinstruments.com/
- Magna Power TSD100-250/208 <u>http://www.magna-power.com/</u>



