



ECOCAR CONTROL SYSTEM

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Presentation Contents

- Introduction to EcoCAR Project
- Problem Formulation
- Current Status of Art
- Solution Approach
- Project Management & Verification
- Timeline & Deliverables
- Cost & Resources
- Conclusion



What's EcoCAR?

- Sponsored by GM and the Department of Energy
- Inter College EHV development competition
- The students benefit from this by:
 - Gaining valuable industry insight
 - Gaining experience with industry standard tools and processes
- Education on satisfying customer demand



The Environment and the People Demand What!

A Change

- ▣ How can change begin?
 - By buying a



Problem Formulation- Definition

Improve on the current design of the two-mode hybrid control strategy by:

- Developing efficiently managed control Area Network
- Minimizing unnecessary work from the ICE
- Ensuring maximum output based on the external driving conditions



Problem Formulation- EcoCAR Performance Requirements

- Conform to SAE standard J1711 for Hybrids
- Facilitate acceleration 0-60mph in less than 14s
- Facilitate acceleration 50-70mph in less than 10s
- Facilitate a car start time of less than 15s
- Facilitate a smooth transition between ICE and motor



INPUTS:

Brake booster vacuum; hood open status; isolation fault detection status; battery sensors; PIM temperature; brake pedal travel; high voltage interlock (HVIL) status; Electric resolver, ICE



Controller Area Network



OUTPUTS:

PIM cooling pump; Battery disconnect module; Electric Motor/ Generator; Heater Auxiliary coolant pump; Battery fan, ICE

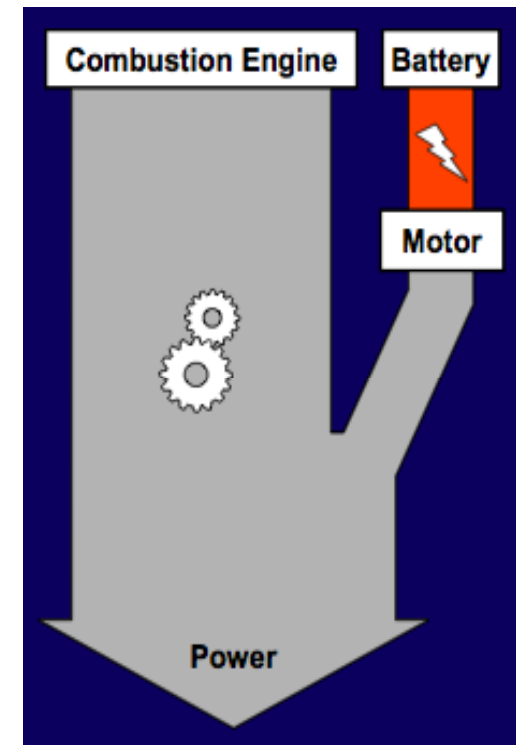
Current Status of Art

- Two-mode control system regulates power/energy flow between energy storage device (ESD) and:
 - The motor/generators
 - The ICE
- Two-mode control system regulates power flow to the planetary gears, as such:
 - Motor 1 or 2 power only
 - Motor(s) and ICE power
 - ICE power only
- Current Two-mode system not designed with EcoCAR performance requirements in mind



Solution Approach

- Control of Power flow through planetary gear system
- Control of Battery Charge levels
- Control of exhaust emissions

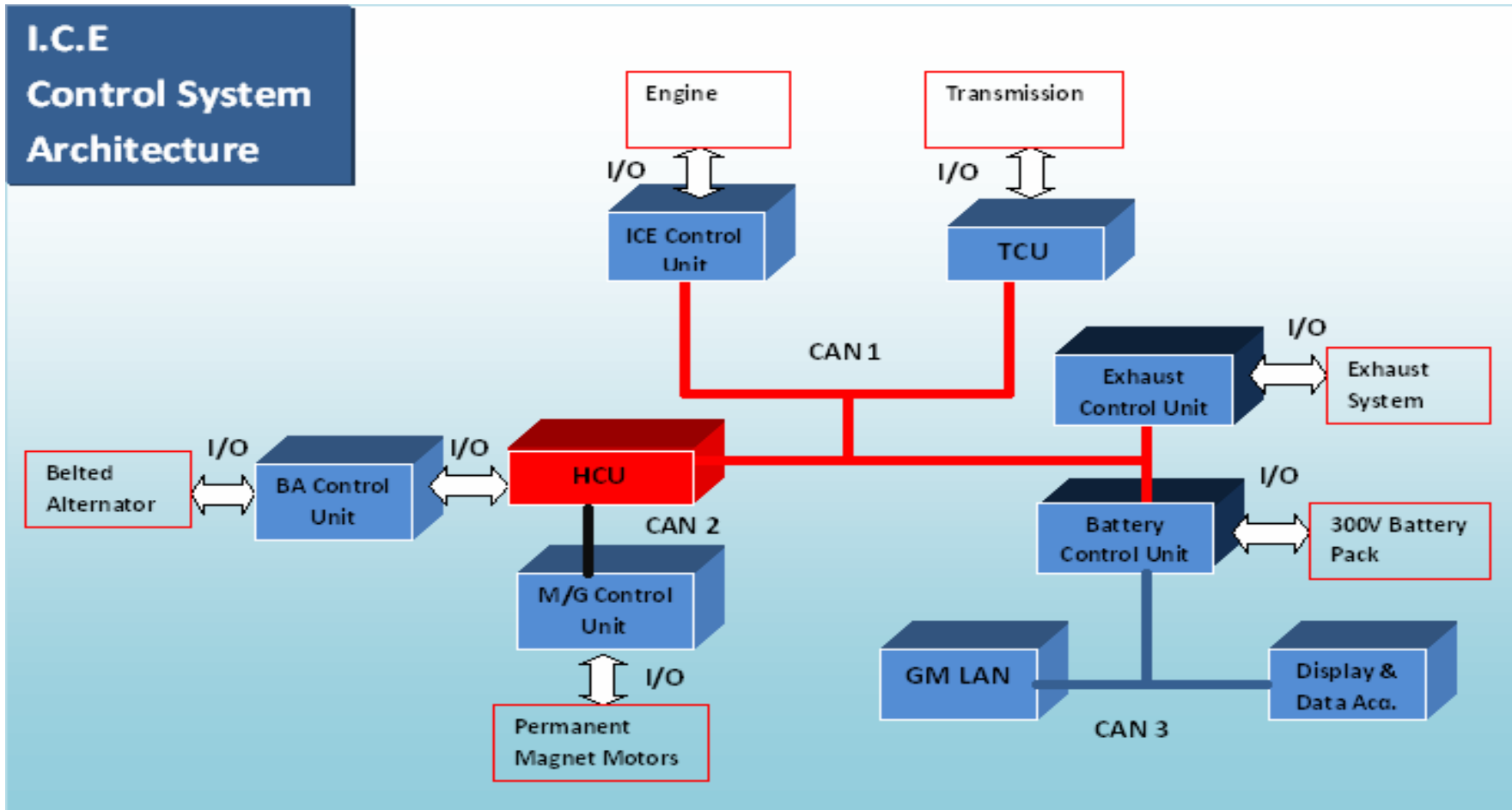


Two Mode System



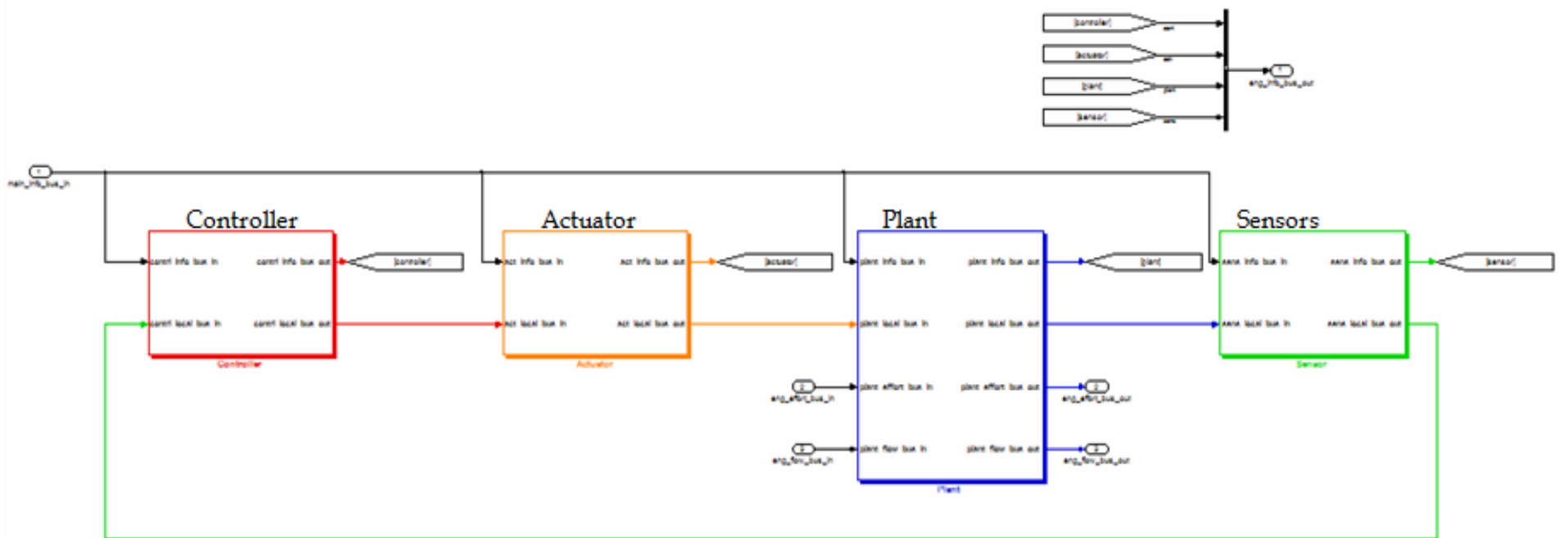
Solution Approach

- Control is achieved via CAN communication

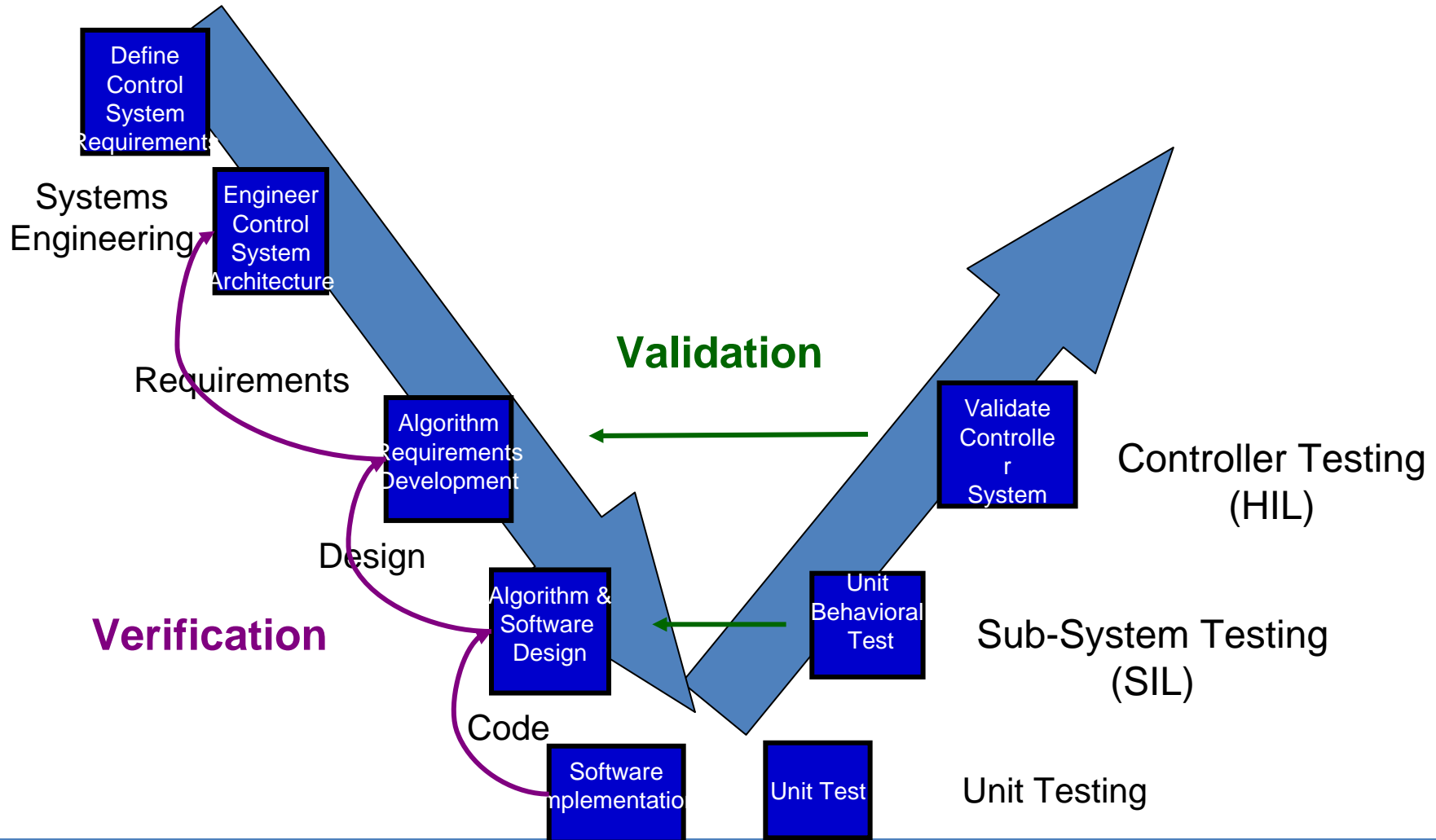


Solution Approach

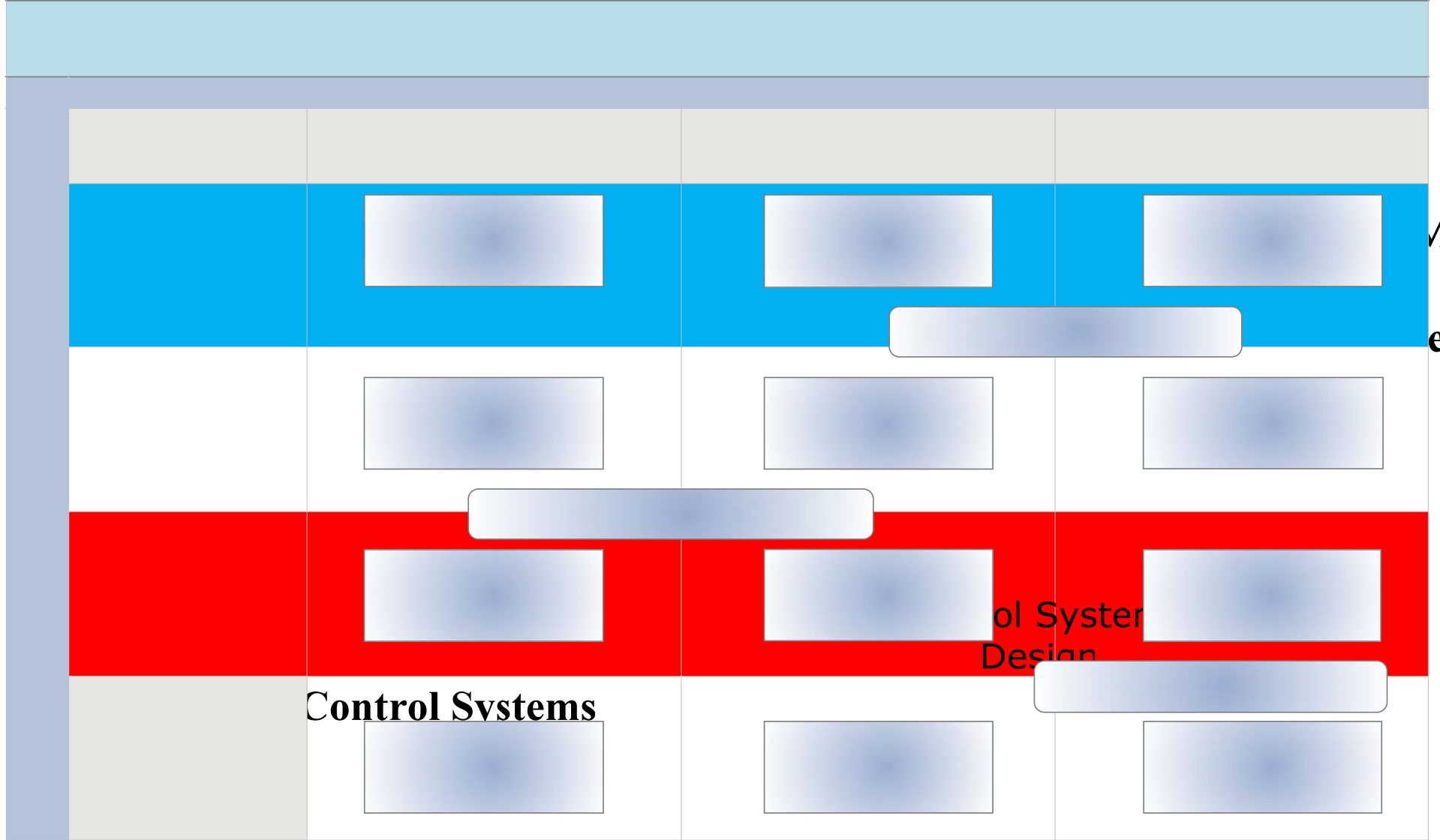
- Control of battery charge and power output



Project Management & Verification Plan



FIRST YEAR DEPLOYMENT CHART



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Control System Design

Control Systems



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Electrical Design



Set Parameters for Challenge
Electrical Needs

Cost & Resources

- Reference Material budget of \$200
 - ➔ Books
 - ➔ Software
- Resources
 - ➔ EECE 414 Linear Controls



Conclusion

- EcoCAR indulges students in real world conditions:
 - ➔ Team Work
 - ➔ Industry standard product development
 - ➔ Use of industry standard tools
 - ➔ Valuable industry insight into automotive control systems

