UWA Renewable Energy Vehicle Project
Available Projects: 2\textsuperscript{nd} Semester 2005

Time commitment values are an approximation only. Most projects can be scaled to either a 6-point unit or a Final Year Project/Thesis.

For more information on projects, email the Project Manager Greg Dick (dickg01@student.uwa.edu.au) or the group leader for the respective group.

To select your project, email the Personnel Manager Lisa Stevens (leessar@yahoo.com.au). All project selections must be authorized by the REV Project management.

Manufacturing and Assembly manager (1 or more students)- Large time commitment
   \textit{To Suit: Engineer (Any type, pref. Mechanical, Mechatronic or Electrical)}
   1) Work with Technical Manager and CAD modeller to determine finalized vehicle design
   2) Work with Project Manager to determine timelines and personnel allocation
   3) Investigate required manufacturing techniques
   4) Identify and coordinate with workshop and outside manufacturing firms
   5) Collect manufacturing plans from team members
   6) Oversees manufacture of parts, including quality control
   7) Coordinate assembly of vehicle with Group Leaders

Workshop Manager and Safety Officer (1 or more students)- Medium time commitment
   \textit{To Suit: Engineer (Any type, pref. Mechanical, Mechatronic or Electrical)}
   1) Arrange work space, storage and equipment for Mechanical and Electrical workshops
   2) Perform safety assessments of workshop environment and work taking place
   3) Arrange safety inductions for team members
   4) Instruct team members on usage of workshop space, maintenance and cleaning
   5) Inspect equipment at regular intervals and arrange repairs

Marketing (1 or more students)- Medium time commitment
   \textit{To Suit: Business, Commerce, any other degree}
   1) Evaluate REV Project marketable characteristics and formulate a marketing program
   2) Target particular groups with individual approach methods
   3) Produce targeted marketing materials and distribute
   4) Educate team on marketing strategies
   5) Contact potential sponsors, media, educational institutions etc to promote the project

Education (1 or more students)- Medium time commitment
   \textit{To Suit: Any degree}
   1) Contact possible schools and educational institutions who may be interested in having the REV Project to attend and inform them
   2) Create press releases to be set to schools informing them of our educational offers, and for public exhibitions
   3) Prepare material to be used at these presentations (prepare different degrees of difficulty, depending on level of education)
   4) Prepare educational packages including information on the project for purchase by schools or the public (including posters)
Tour Planning (1 or more people) - Medium time commitment

To suit: Business, Commerce, any other degree

Organize all aspects of the “road trip” around Australia proposed for February 2006:
1) Organize transport needs, spare parts, support vehicles, mobile workshop and pickup locations around country to perform repairs and collect supplies
2) Organize personnel, including vehicle support crew
3) Prepare accommodation plans, food, supplies and transportation for people
4) Organize itinerary, including stopovers and promotional stops along the way
5) Prepare backup plans if technical difficulties are encountered

Support Vehicle Design (2 or more people) - Medium/Large time commitment

To suit: Engineer (preferably Mechanical or Mechatronic)

Design the structure of the support vehicles:
1) Determine the requirements of the support vehicles
2) Select the most appropriate form of vehicles for each task
3) Design a removable storage facility (e.g. sea container, custom-made trayback) which can be constructed before being placed on a truck for the REV Tour
4) Integrate the mobile hydrogen separation unit and solar panels into the removable unit
5) Determine the required maintenance tools and supplies to be taken
6) Outfit other support vehicles with necessary equipment, e.g. radios, sat nav, medical equipment etc.

Hydrogen Separation Unit (2 or more people) - Medium time commitment

To suit: Engineer (Mechanical, Electrical, Mechatronic, Chemical), Chemistry, Physics

Continue research started by thesis students into design of a hydrogen separation unit
1) Review research and designs proposed by past thesis students on $\text{H}_2$ separation unit
2) Produce design for unit to electrolyse water, purify, then compress hydrogen for storage
3) Construct unit (or modular units) and test
4) Arrange units by mid-semester to produce a store of hydrogen over a extended time, to be taken on the support vehicle for the REV Tour
5) Work with Support Vehicle Design to integrate electrolysis unit into support vehicle

Crash Testing (1 or more people) - Medium time commitment

To suit: Engineer (Mechanical)

The REV will be licensed for road use: crash worthiness must be demonstrated in some way
1) Review the design of the chassis and crash structures
2) Investigate crash testing techniques used
3) Produce a replica chassis and crash structures (if time allows), or sections of the structure
4) Devise means to test the crash worthiness of the structure
5) Test the chassis under a variety of conditions
6) Make recommendations for change to chassis or safety structures if required
Suspension (1 student)- Medium time commitment

To suit: Engineer (Mechanical, Mechatronic)

Work with current thesis student to design, manufacture and test suspension systems
1) Revise suspension research completed by recently finished and current thesis students
2) Determine desired ride characteristics, wheel travel, camber angles etc.
3) Design rear suspension to accommodate uprights, hub motors and disk brakes
4) Model suspension using software to determine spring and damper rates
5) Construct suspension and attach to rolling chassis to perform tests
6) Conduct dynamic testing of vehicle at operating speeds and adjust ride to suit

Wheels and Tyres (1 student)- Medium time commitment

To suit: Engineering (Mechanical)

Design/select rims, centres and locking bolts/nut for attachment to axle and wheels, and select low wear, low rolling resistance tyres
1) Research previous wheels and tyres on renewable energy and efficient vehicles
2) Determine weight, stability and performance requirements of vehicle
3) Investigate ideal tyre characteristics, e.g. diameter, thickness, profile and compound etc
4) Choose tyres for a good balance of low rolling resistance, grip/handling (inc. wet weather), weight and low wear
5) Collaborate with suspension, braking, uprights and motors to ensure components will fit within given wheels and tyres
6) Select or manufacture wheels and determine best method of attachment
7) Test wheels and hubs on rolling chassis to ensure suitable performance

Body Construction and Integration (2 or more students)- Medium/Large time commitment

To suit: Engineer (Mechanical, Materials)

Determine the best methods for manufacturing, attaching, joining and sealing the outer body
1) Inspect and revise the body shape and break into panel sections
2) Determine methods for manufacture
3) Manufacture components and finish to appropriate level
4) Determine mounting and attaching techniques for body to chassis (inc. removal systems)
5) Investigate panel joining and sealing techniques to achieve a flush outer body surface
6) Test and refine fit and finish, as well as replacement of panels, to ensure rigidity

Lighting (2 or more students)- Medium time commitment

To suit: Engineer (Mechanical, Mechatronic)

Design the external (and possibly some internal) lighting systems for the vehicle
1) Determine necessary lighting for car and investigate ADR requirements
2) Research types of lights (low power draw)
3) Plan necessary controls and circuitry, with reliable power supply
4) Design lighting clusters and housings to integrate with bodywork and install
5) Adjust lights and test spread and intensity to comply with ADRs

Miscellaneous Mechanical Items (1 or more students)- Medium time commitment

To suit: Engineering (mechanical, Mechatronic)

Design a handful of mechanical devices required for other systems and licensing
1) Select/design a low-power, lightweight horn to mount under the front bodywork
2) Investigate various front window wiper mechanisms
3) Design/integrate a front window wiper, ensuring it does not interrupt the air flow when deactivated
4) Work with the Mirrors project to determine the placement of rear-view cameras on body
5) Design necessary mounts or housings for cameras and mount to body
6) Any other systems which arise
**12V Bus voltage** (1 student) - Medium time commitment
*To suit: Engineering (Electrical, Mechatronic)*
TO BE CONFIRMED…….. contact the Project Manager for more details.
1) A
2) B
3) C
4) D
5) E
6) F

**Overall System Layout, wiring and wiring harnesses** (1 student) - Medium time commitment
*To suit: Engineering (Electrical, Mechatronic)*
Determine the overall layout of the electrical components in the REV, and the wiring layout and wiring harness design to connect the components
1) Document all electrical components and their requirements, e.g. cooling, shielding etc
2) Determine the best location for components within the allocated chassis space
3) Create a wiring diagram and design harnesses to securely connect components
4) Connect components and avoid interference of components and cables for easy maintenance
5) Test system for reliability under various conditions, e.g. high temp, moisture, vibration etc

**Drive-by-wire research** (1 student) - Medium time commitment
*To suit: Engineering (Mechatronic, Electrical)*
Investigate the use of lightweight, low power drive-by-wire systems for future modifications to the first REV or for future vehicles
1) Investigate current “drive-by-wire” technologies and control methods
2) Determine appropriate system for REV and systems to control
3) Measure weight and power draw of such a system
4) Design system for integration into first REV for testing purposes
5) Install and test system under safe, controlled circumstances
6) Investigate integration of other systems, such as ABS, steering assistance etc.

**Driver Awareness Detection** (1 student) - Medium time commitment
*To suit: Engineering (Mechatronic, Electrical)*
Design and test a system to determine the “awareness” of the driver by independent means
1) Obtain/conduct research on driver responses after prolonged driving periods and/or driver responses as a function of age;
2) Specify the device(s) that will be used for detection (e.g. infra-red sensitive cameras/lighting, visible light cameras/lighting, pressure sensors, etc...)
3) Devise a driver-independent strategy to classify the driver into "Awake" and "Asleep" (or "SafeMode" and "Hazardous") according to the data in #1 above;
4) Determine the method(s) of warning (e.g. audible alarm; vibration; bring the vehicle to stop; steer vehicle to shoulders and stop; etc...)
5) Implement and test.