



# UWA Renewable Energy Vehicle Project

Available Projects: 2<sup>nd</sup> Semester 2005



THE UNIVERSITY OF  
WESTERN AUSTRALIA

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](mailto: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](mailto:leessar@yahoo.com.au)).  
**All project selections must be authorized by the REV Project management.**

## Management

**Manufacturing and Assembly manager** (1 or more students)- Large time commitment

*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) Oversee 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

*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

## Public Relations

**Marketing** (1 or more students)- Medium time commitment

*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

*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 an 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 and Driver

**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.

# Communications and Monitoring

## **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.