The WORLD Solar Challenge - The Background

In **1982,** the world's first solar car, dubbed ***Quiet Achiever***, was driven across Australia, from Perth to Sydney, in 20 days. At the wheel was **Hans Tholstrup,** the Danish-born adventurer who went on to create the **Panasonic World Solar Challenge** (PWSC). ***Quiet Achiever*** was sponsored by BP and this ultimate energy-saving journey was actually 10 days faster than that by the first petrol engine car!

Hans had participated in motor sport for years, especially car rallies, but the oil crisis of the 1970s had caused him to rethink his passion & after the marathon trek with ***Quiet Achiever***, he was inspired to continue to drive on the strength of sunshine. Hans felt that a race was the answer and the World Solar Challenge was born.

The first Challenge in **1987** saw **23 cars** from **seven countries** compete, with General Motors' ***Sunraycer*** winning the race in **44 hours,** with an average speed of **67 km/h.** Fast forward to 2005 and the winning vehicle 'Nuna III' had an average speed of **103 km/h,** with a maximum recorded speed of **147 km/h.** There is perhaps no greater proof of the technological leaps in solar car development than the fact that in many cases, average speeds of vehicles in the PWSC have risen by tens of kilometres over the past 20 years.

WORLD SOLAR CHALLENGE
GROUP OF EVENTS

Aerodynamics and **vehicle weight** are obviously key components of a solar car's speed and much advancement has been made in these areas. Materials used to build solar cars have changed and evolved dramatically since the first Challenge. Composite materials used in the building of aeroplanes are heavily used these days. The vehicles now utilise materials often used in the space industry for construction of spacecraft and satellite systems, which have to be both lightweight and strong. The **shape** and **appearance** of solar cars has altered quite dramatically as aerodynamic technology has come of age. In the early days, different vehicle shapes were experimented with before it was realised the current 'cockroach' shape afforded the best advantage for speed and aerodynamics. ***Quiet Achiever*** had nothing like the sleek, low design of its modern-day counterparts. Its tyres were akin to pushbike tyres; it extended much higher off the ground; and all its solar panelling was on the roof, with no cockpit sitting atop as most cars have these days.

The 1993 Challenge saw the advent of the **wheel motor** which was employed by three of the 52 starters. Tyre manufacturers began to take increased interest, constructing **tyres of low rolling resistance** especially for the PWSC event. **Battery technology** is one area that has moved ahead. In the early days, silver zinc batteries were used, which were expensive and weighty. The energy density of the batteries used today makes them significantly lighter. **Solar cell** technology has progressed dramatically. These days the fastest solar cars have solar cells capable of harvesting much more energy.

The highly successful solar vehicle **Nuna** (which has won the last three Challenges) utilises 'maximum power point trackers' (MPPT) onboard – these MPPTs have been used in satellites for years to optimise the output of solar cells even when they are in the shade. A chip in the MPPT measures continuously the voltage supplied by the solar cells, compares it with the fixed battery voltage, and then determines the best voltage to charge the battery. In this way the energy from the solar cells is kept high and constant and more than 95% efficiency can be attained.

Motor Controllers - the 'black box' able to switch enormous currents at high speed have evolved from being unstable experimental devices to sophisticated electronic gearboxes with no moving parts and an essential component of the emerging hybrid and electric cars demanded by an increasingly environmentally aware public. Sunlight is captured by the cells of the car's solar array, which produces an electrical current. The current can travel to the batteries for storage; go directly to the motor controller, or a combination of both. The energy sent to the controller is used to power the motor that turns the wheel (and makes the car move). If the car is in motion, the converted sunlight is generally delivered directly to the motor controller, but there are times when there is more energy from the array than the motor needs. When this happens, the extra energy gets stored in the batteries for later. When the solar array can't produce enough energy to drive the motor at the desired speed, the array's energy is supplemented with stored energy from the batteries. In the ongoing evolution of solar cars, this year the PWSC has introduced new regulations that see solar cars edging closer towards a sense of everyday practicality and adopting new levels of user-friendliness.

"We've done this to try and increase the level to which people can relate to solar vehicles," said **Chris Selwood, PWSC Event Manager.** For the first time ever, cars entered in the event have features such as more upright seating (no greater than 27 degrees), unaided driver access, lights and reverse gear.

Solar array on vehicles has also been cut by **25 per cent,** from **8 sqm** to **6 sqm.** Mr Selwood was confident there was still a lot more ground that could be broken in solar car technology and didn't rule out that one day we could be driving solar cars for everyday use.

The Twentieth Anniversary Event

Panasonic World Solar Challenge | Government of South Australia | Sensational Adelaide | Panasonic | Northern Territory Government Sponsored Event

This year's race saw Nuna 4, from the Netherlands win in 33 hours at an average speed of 90.87Km/hour.

The Nuna4 team celebrating

Australia's **Aurora 101** finished the race in third place in 35 hours 17 minutes at an average speed of 85 km/hour.