University of South Australia

Barbara Hardy Institute

# Peter Pudney

# Research Profile

## Research Area Specialisation

Peter's research is in the area of applied optimisation, with a particular focus on efficient transportation. His initial research was on optimal train control, where he worked with colleagues and industry over many years to develop a system that is now being used by train drivers around the world to keep trains on time with minimum energy use.

On completion of a PhD in optimal energy management for solar racing cars, Peter has helped design, build and race solar and low-mass electric cars. Peter has led projects investigating the impact that electric cars will have in Australia on $CO_2$ emissions and our use of electricity; as well as designing algorithms that will enable the coordinated charging of electric vehicles to control peak electricity demand. Currently Peter is working with the rail industry to develop systems for coordinating the efficient flow of trains through rail networks and is in the process of developing a low-energy vehicle to be used as a taxi service for transporting pregnant women to hospital in rural Zimbabwe.

## Contributing to a better and sustainable environment

Energy is largely invisible.  We fill our cars with petrol and turn on appliances with little appreciation of 'how much energy we are using', 'where it comes from' and the 'impact of its use'. For this reason, Peter's research will now focus on the development of techniques that allow us to meet our energy consumption needs using less energy and developing systems and devices that will allow greater use of renewable energy.

With much of Peter's past research focusing on single users, there will now be a focus on how to  operate more efficiently using a systems approach to providing clean, safe, quiet mobility using a wide variety of vehicle types, each appropriate to its different task and electricity systems that enable cooperative demand management.

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*Great Research into Sustainability*

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## People

- Our researchers are scientists, engineers and social scientists
- We work collaboratively on real-world issues
- Over 100 researchers and 130 research students

## Projects

- Multidisciplinary projects focused on sustainability
- We work in partnership with government, industry and academia
- Extensive testing and evaluation services and consultancy expertise
- Our work is underpinned by community participation and education



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## Research Abstract

Peter is currently working on the following projects:

*Saving Energy on Trains*. After developing the driving advice systems that is now being used by railways around the world, Peter and his team are now developing new methods and tools that will help the users of driver advice systems to analyse the performance of their train networks and to integrate driver advice with central control systems to ensure better flow of trains through rail networks.

*African Solar Taxi*. Peter leads a project that is developing low-energy vehicles that will be used in Zimbabwe to transport pregnant women to hospital to give birth. Lack of transport to health facilities is a key contributor to Zimbabwe's high maternal death rate and to the propagation of AIDS. Traditional fuels are not available, thus he is developing simple electric vehicles that can be recharged from solar-powered charging stations.

*Electricity without fossil fuels*. Peter is working with PhD students on projects that will develop methods for finding the optimal mix of renewable energy generation, demand management and energy storage to enable much greater use of renewable energy.

## Research areas of interest

- Application of optimisation and optimal control to efficient operation of transport and electrical systems
- Low-energy mobility

## Barbara Hardy Institute

The Barbara Hardy Institute is a collection of researchers with a focus on sustainability but with a wide range of interests, expertise and skills. A key advantage of being part of the Institute is the ability to form teams that can add both breadth and depth to a project.

## Keywords to describe Peter's research

- Energy efficiency
- Renewable energy systems
- Transport

*"The development of new electric systems will allow us to reduce our energy consumption and to explode the use of renewable energy."*