# Darryl Robert Smith, B.E. (Electrical), VK2TDS

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## Profile

* Consultant Electrical Engineer with practical experience and theoretical knowledge
* Areas of expertise include Wireless Networks, Radio Systems, Energy Conservation and Management, Software, Linux, Hardware, Firmware, Project Management, Systems Engineering, Critical Thinking, Cost Engineering, Engineering Information Management.

## Academic Qualifications

Bachelor of Engineering (Electrical). University of Technology, Sydney. 1990-1995.

## Trade and General Qualifications

Amateur Operators Limited Certificate of Proficiency 1993

Certificate III in Telecommunications Cabling. Milcom. 2002.

ACMA Master Communications Cabling License. 2002

OH&S General Construction Induction. Workcover NSW. 2012

Private Pilots License (Airplane) Theory. 2012

Safe Work at Heights. Pinnacle Height Safety. 2013

Mobile Elevated Work Platform Operations. Coates Training. 2014

High Voltage Safety Rules – Authority to perform and supervise High Voltage Power Station works. Bayswater Power Station. Pacific Power. 2005

## Areas of Interest

* Internet of Things & Wireless TCP/IP
* Telecommunications Systems and Policy
* Sustainability
* Energy Efficiency and Energy Policy
* Wireless Systems
* Low Bandwidth Networks
* GPS Technology and Applications
* Radio based GPS tracking systems
* Open Source Software and Hardware
* Distributed Systems
* Home Automation
* Linux Operating System
* Electronics R&D

## Employment History

### Redshift Wireless. Owner. 2013-

The idea behind Redshift Wireless is to assist mostly businesses and other organizations manage their electricity consumption, by giving them the tools to manage their distributed Split System Air Conditioners. This has involved doing much of the work developing not only the technology, but associated company, along with outsourcing some of the work.

### Radioactive Networks. Owner. 2000-

Radioactive Networks was started to provide a structure for consulting services, generally in the area of radio, computer networks, electronics, energy and cabling. Jobs have included work as varied as a GPS Tracking demonstration for Intel in Hollywood in 2001, work on IronMan Hawaii in 2002 doing GPS Tracking, work assisting to implement a glider collision avoidance system, assisting with the implementation of a laptop based technician tracking and management system for Telstra and maintaining AM/FM rebroadcast systems in underground road tunnels.

### Radio Station 2NBC. Acting Chief Engineer. 2014-

The work at Radio Station 2NBC involves being available to assist with the technical aspects of running a community Radio Station. This has involved significant works redesigning the distribution network, post studio, and currently involves planning the move of the studio to new premises with significant equipment upgrades.

### GreenBox Group Ltd. Chief Engineer. 2009-2012

GreenBox Group Ltd aimed to be the first Smart Energy electricity retailer, based on the concept that the company could make the most money by helping their customers move and manage their energy consumption. My job was to conceive the high level design of the systems needed to do this, and procure hardware for customer premises to achieve this. It also involved managing R&D activities to determine the mix of technology to be installed.

### Pacific Power (Electricity Commission of NSW). Cadet Engineer & Graduate Engineer. 1990-2002

The work at Pacific Power was initially as a University Student, and then as a Graduate Engineer. As a student doing a ‘Sandwich Course’, I completed a number of industrial placements, including eight months of electrical trades training in an apprentice training school, approx. a year in Power Station Controls and Instrumentation, eight months in the telephony side of the Grid business, three months in substation design and three months in the environmental section of a coal fired power station.

As a graduate I spent nine months as a plant owner at a large coal fired power station working on DC Systems, Switchboards, Battery Rooms and more. During this time, I received authorization from the organization to work on High Voltage and supervise others doing this. I then spent several years working on Drawing and Information Management, transitioning to new technology, and architecting new systems.

## Board Positions

Board Member, Tucson Amateur Packet Radio Corp. Richardson, Texas. 2002-present

## Other Relevant Volunteer Positions

HACKAGONG 2015. Ambassador for ‘Build’ and ‘Sustainability’ within the weekend long HACKAGONG event at the University of Wollongong. This also involved assisting with the planning of not only the HACKAGONG 2015 event but also the HACKAGONG 3D 2015 event, and associated workshops and networking events. The HACKAGONG events are being organized by the Wollongong IT Society (WITS), a student club associated with the University of Wollongong Centre for Student Engagement.

## Publications[[1]](#footnote-1)

Smith DR, Smith RB. 2015 International Conference on Alternative Energy in Developing Countries and Emerging Economies (2015 AEDCEE). Bangkok, Thailand. Innovative Solutions for Energy Conservation through Commercial and Domestic Demand Side Management. 2015. [Awaiting Publication in Energy Procedia | Elsevier]

Smith RB, Nuchkoom N, Smith DR[[2]](#footnote-2). Feed-In Tariffs and its implication in Thailand: Legal Measures, Implementation, Challenges and Solutions. Legal issues of Renewable Energy in the Asia Region: Recent Development in a Post-Fukushima and Post-Kyoto Era. Anton Ming-Zhi Gao & Chien Te Fan (Editors). Kluwer Law International. 2015: pp127-146

Smith RB, Nuchkoom N, Smith DR. Recent Development of an Emission Trading Scheme in Thailand. Economic Instruments to Combat Climate Change in Asian Countries. Ken’ichi Matsumoto & Anton Ming-Zhi Gao (Editors). Kluwer Law International. 2014: pp153-172

Smith RB, Nuchkoom N, Smith DR. Law, Bureaucracy, and Electric Power from Renewable Energy in Thailand. Southeast Asian Journal of Contemporary Business, Economics and Law. Vol 5, Issue 4. December 2014: pp1-5

Smith DR. Report looking at data collection and modelling deficiencies of the Green Loans Program submitted to the Environment and Communications References Committee’s Investigation into the Green Loans Program, and referenced in final report. Australian Senate - Commonwealth of Australia. 2010:25-26 & Submission #49

Smith DR. Google Earth – Applications for Ham Radio. Proceedings of the 24th ARRL/TAPR Digital Communications Conference – Santa Ana, California. ARRL/TAPR. 2005: pp105-108

Smith DR. Spread Spectrum Power Control. Proceedings of the 23rd ARRL/TAPR Digital Communications Conference – Des Moines, Iowa. ARRL/TAPR. 2004: pp139-150

Smith DR. Bazaar Ham Publicity – Applying the Bazaar approach to Ham Radio. Proceedings of the 22nd ARRL/TAPR Digital Communications Conference – Hartford, Connecticut. ARRL/TAPR. 2003: pp228-233

Smith DR. APRS IP Mobile in a non-dynamic Wireless Environment. Proceedings of the 22nd ARRL/TAPR Digital Communications Conference – Hartford, Connecticut. ARRL/TAPR. 2003: pp222-227

Smith DR. 802.11 and Ham Radio. Proceedings of the 21st ARRL/TAPR Digital Communications Conference – Denver, Colorado. ARRL/TAPR. 2002: pp71-75

Smith DR, Kovacs B, Brock P. APRS in Hollywood – Integrating Real Time 3D Graphics and Wireless GPS Systems. Proceedings of the 20th ARRL/TAPR Digital Communications Conference – Cincinnati, Ohio. ARRL/TAPR. 2001: pp39-43

Smith DR. Intelligent Filtering of the APRS Internet Gateway Data Streams. Proceedings of the 19th ARRL/TAPR Digital Communications Conference – Orlando, Florida. ARRL/TAPR. 2000: pp126-131

Smith DR. Half Duplex Spread Spectrum Networks. Proceedings of the 17th ARRL/TAPR Digital Communications Conference – Chicago, Illinois. ARRL/TAPR. 1998: pp102-106

Smith DR. Terminal Node Controllers - Towards the Next Generation. Proceedings of the 16th ARRL/TAPR Digital Communications Conference – Baltimore, Maryland. ARRL/TAPR. 1997: pp156-163

Smith DR. A Spread Spectrum Packet Radio Network – Report submitted in Partial Fulfillment of the requirements of the Degree of Bachelor of Engineering (UTS) in Electrical Engineering. University of Technology, Sydney, 1995.

## Mass Media Publications

Smith DR. Radio Communications in the Sydney Olympics. Radio and Communications Magazine. 2001.

Smith DR. APRS in the 1998 City to Surf. Amateur Radio. 1999.

## Other Conference Presentations

Smith DR. NZART Annual Conference. Christchurch, New Zealand. Radio in the Olympics and Hollywood. 2003.

Smith DR. NZART Annual Conference. Christchurch, New Zealand. Publicity for Digital Communication. 2003.

Smith DR. GPS/GIS In the 1996 Atlanta Olympics. ACT Technical Symposium. Wireless Institute of Australia – ACT Division. 1998.

## Projects and Consulting projects of Note[[3]](#footnote-3)

Implementation of wireless communications infrastructure for Palerang Council. Radioactive Networks / Palerang Council. 2014.

Upgrade of studio and transmission equipment. Radioactive Networks / 2NBC. 2014

Maintenance of AM/FM Radio Rebroadcasts infrastructure in the Sydney m5east and Eastern Distributor tunnels. PlusComms. 2013

Freezing Yoghurt for marketing campaign using high altitude helium balloons. Radioactive Networks / Cloud 9 Frozen Yoghurt. 2012

Implementation of an Energy Saving Home Automation System. Radioactive Networks / GreenBox Group. 2010.

Review of the Australian Government ‘Green Loans’ program for the Senate Enquiry. 2010

Bluetooth Based Indoor Tracking System using proximity sensing. Radioactive Networks. Sydney, Australia. 2008.

Member of the review team for the TAPR Open Hardware License, one of the world’s first dedicated Open Hardware Licenses. TAPR. Richardson, Texas. 2006-7

Managing programmers developing a Laptop based SatNav system. C1 Communications / Telstra. Sydney, Australia. 2006

Radio Systems Consultant and Installer for Airport Ground to Air and Ground to Ground Communications. Radioactive Networks / Paris Radio Electronics. 2006-

Development and production of a GPRS based GPS Tracking Unit. Radioactive Networks / Mailcall Couriers. 2005.

Implementation of embedded software for a Glider Collision Warning System. RF Developments. Queensland, Australia. 2005.

Implementation of a radio based GPS tracking system, with an interface to a live 3D rendered virtual environment. REZn8 / Intel. Hollywood, California. 2001.

Installation of a Television Studio for the Sydney Medical Simulation Centre. Lateral Linking. Sydney, Australia. 2000.

Development of a GPS locked radio transmitter beacon for use during the production of movies. Lateral Linking. 2004.

Implementation of a radio based GPS tracking system for broadcast TV assets (Helicopters, motorcycles) and wireless weather station for the 2002 IronMan World Championships. Lateral Linking / IronMan. Hawaii, USA. 2002

Implementation of a radio based GPS tracking system for broadcast TV assets (Helicopters, motorcycles, vehicles) for the 2000 Sydney Paralympics. Sydney Paralympic Broadcasting Organization / WE Media / Lateral Linking. Sydney, Australia. 2000

Implementation of a radio based GPS tracking system for broadcast TV assets (Helicopters, motorcycles, vehicles) for the 2000 Sydney Olympics. Sydney Olympic Broadcasting Organization / Winemiller Communications. Sydney, Australia. 2000.

Developing PC software for the Australian made LED signs produced by Textron. This involved working with their firmware engineer to implement control software to get the most out of the signs. Textron, Sydney. 1997-2000.

## Links

* LinkedIn – <https://au.linkedin.com/in/vk2tds>
* Papers - <http://www.radio-active.net.au/web3/Resume>

## Optional Attachments

* University Transcript
* Certificate III documentation
* Copies of listed publications

## Awards

* Best Paper Award (Law) in Kuala Lumpur International Business, Economics and Law Conference 5 for the paper “Law, Bureaucracy, and Electric Power from Renewable Energy in Thailand” – 2014.
* Certificate and Commemorative Silver Medallion in recognition of and appreciation for the contribution to the success of the games of the XXVII Olympiad from the International Olympic Committee and the Sydney Organizing Committee for the Olympic Games. 2000.
* Queen’s Scout Award – 1989.
* Reuben F. Scarf Award for Commitment – 1989.

## Hobbies and Pastimes

* Amateur Radio – including Digital Communications, Satellite Communications and Software Defined Radios
* Electronics and Computing – including the Maker movement
* Light Aircraft (< 2000 lbs.) construction and maintenance
* Karate and Running

## Professional Referees

### Dr Russell Darroch

Senior IT Manager

Former IT Director – Palerang Council

Former ???

(m) 0403 243 111

(e) rkd993@gmail.com

### Mr Richard Talbot

(m) 0421 475 933

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### Mr Andrew Curtis

### Dr Maryanne Large

Associate Professor – Sydney University

## Possible Papers / Areas of Research

The following list is a collection of topics that I find interesting, and would contribute to the state of the art. Each provides an assumption to be tested, and has the potential for real world impact. Some are within my area of expertise, and others would require collaboration with subject matter experts.

### Decision Support Systems and Modelling

Should I Replace That Fridge – modelling the economic justification for replacing domestic refrigerators based on reduced electricity consumption with improvements in appliance efficiencies.

Modelling Home Air Conditioning Costs – Given the efficiency and size of of Reverse Cycle Air Conditioner, along with a 24-hour meteoroidal forecast, given a small number of parameters about a building, it should be possible to model the impact of different thermostat settings on energy consumption and therefore cost.

Exploring the Fallacies in Home Energy Usage – examining the energy saved by turning off storage hot water heaters, that Fluorescent lights should be kept on since they use so much energy to turn them on, cold showers are almost free, and more.

An Economic Analysis of the Tesla Home Battery Pack – Tesla has recently made headlines with plans for a battery pack permitting people to disconnect from the grid. Is this economically feasible, given the cost per charge of the battery infrastructure.

Improving Household Electricity Usage Projections Using Circuit Based Monitoring – examines if circuit based usage monitoring can be used to improve the reliability of electricity usage projections, leading to more accurate forecasting and better wholesale bidding.

### Energy & Greenhouse Gas Policy and Programs

An Analysis of the Green Loans Program – A look at the structural problems with the Labour Green Loans program, with recommendations for what to do with future programs. This would also look at why the collected data is essentially worthless, and should not be used.

A Model for Energy Reduction and Environmental Programs – On the assumption that a federal government made available at least $1 billion annually, this would describe some of the programs that could be implemented to provide real environmental outcomes, such as roof insulation for rental properties, scrap metal collection in country areas, small retail premises refrigeration improvements etc.

Household Solar Versus Business Solar – Is implementing household solar a poor investment compared to a properly designed larger system in a business site.

Distributed and Centralized Energy Infrastructure – the case for large coal fired power stations but using natural gas for transportation, heating and cooking in order to save cleaner fuels for distributed use where environmental issues are harder to manage.

More Than Light Globes – An analysis of areas for energy saving within the home, and areas where efforts for energy saving would essentially be wasted effort.

Carbon Trading Artifacts – The impact of BassLink on the Victorian and Tasmanian Carbon Dioxide emissions per kWh of energy consumed. This looks into why Tasmanian emissions rose from about 70g CO2-e/kWh to 250g CO2-e/kWh following commissioning the HVDC link.

The Cost of Renewable Technologies – Lifecycle costs per MW-h of energy, rather than per MW of peak supply – A response to a paper at the 2015 International Conference on Alternative Energy in Developing Countries and Emerging Economies (Thailand).

Electricity and the National Greenhouse Account Factors – Hidden secrets of Australia’s Greenhouse Accounts.

Issues with the MEPS (Minimum Efficiency Performance Standards) Scheme in Australia – looking at the issues with MEPS including loopholes and lack of ability for consumers to report non-consuming products.

### Demand Response and Energy Reduction

Would Someone Turn the Lights Off – Implementing a smart lighting architecture for use in sporting grounds, permitting lights to be turned on only when needed, and not when training has been cancelled due to rain.

Energy Reduction Opportunities with the Internet of Things – Now that the Internet is becoming ubiquitous, there are various opportunities available for resource usage reduction. This paper presents some of these opportunities, with practical solutions.

Cost Reduction Strategies in Hot Water Heating in areas with TOU Electricity – looking at possible ways to reduce electricity costs, and to a lesser extent usage in premises with TOU electricity and no timer.

Customer Driven Demand Management – Using a Carrot rather than a Stick. Looking at business plans where increasing electricity prices are an advantage rather than a disadvantage.

Gamification and Reducing Electricity Consumption – Can Gamification concepts be used to drive a reduction in electricity consumption, in the short, medium and long term.

The Problem with DRED – The issues with the Demand Response interface to HVAC systems, and why DRED is not the answer.

Driving Electricity Usage Reduction with Household Flat Rate Electricity Tariffs – Current pricing of electricity and other resources (water and gas) make implementing some private energy reduction schemes economically viable.

### Analyzing the Household

An Analysis of a Household – Approximately six years of practical data has been collected through instrumentation on a single person household in a three-bedroom brick veneer house. This data collection includes: Lights and light switch use, cold and hot water consumption, off peak electricity availability, household weather station, roof temperature sensors, circuit based energy usage, HVAC usage, room occupancy and more. The logging has been in long enough that generally the occupier is no longer changing their behavior because they are being monitored.

Instrumenting the Australian Home – An architecture for monitoring an actual Australian home as a way to generate insights into the way we live and the energy we consume. This would involve developing an architecture for monitoring energy (at least on a circuit level), room presence, internal and external climate, major appliance use, gas and water usage, water heating etc.

Retrofitting The Home – An analysis of where electricity is used within the average home, and therefore where the major savings are possible, given technology, even if that technology does not exist year.

Learnings from Living In a R&D Experiment – A self-evaluation of living in an instrumented house for multiple years, to the point where the technology becomes invisible most of the time.

### Grid and Communications Infrastructure

Potential Negative Impacts on Grid System Stability from Distributed Micro Inverters – looking at the potential for issues to the reliability and stability of the electricity grid as the number of solar photovoltaic installations increases.

Distributed Electrical Infrastructure Vulnerabilities – Certain models of Solar Inverters are susceptible to temporary outages when the incoming supply contains spurious waveforms. This paper looks at the potential for major distributed infrastructure disruption due to either intentional or inadvertent actions, and possible protections.

Ubiquitous Communications and Energy Efficiency – The implications of ubiquitous connectivity for improving the energy efficiency.

Challenges in Building a Home Area Network – What was my WiFi password again? Looking at some of the problems in building a HAN, and what some of the solutions may be.

Failure Modes with the Internet of Things – What happens to smart devices when ubiquitous connectivity is missing.

### Privacy

Privacy Implications for Home Automation – How much information is too much, and what can we learn from trawling through home automation data?

### Education

Solutions to Electricity Bill Shock – Technology to allow households to monitor and reduce their consumption, reducing the feedback time from the three-month billing cycle to under a day.

Demand Response Education – informing the community what Demand Response is and how it can help them.

Does That Appliance Click – The myth of Vampire Power in many modern appliances, and how appliances that make a little click when you turn them off use almost no power when they are switched off.

### Domestic Integrated Household Systems

Integration of Household Systems – The impact on the household of integration of Alarms, Solar Inverters, HVAC and Energy Monitoring systems. This describes how systems can be interconnected to provide feedback to householders giving them the tools to monitor their energy consumption.

An Inexpensive Electricity Usage Monitoring Infrastructure – With companies such as Teridian producing energy monitoring devices, it is now time that they were combined with WiFi for placement in fuse boxes, providing centralized monitoring of energy consumption.

Linking Split System HVAC systems, Meter Box Monitoring and Solar PV Systems – pre-heating and pre-cooling residences when excess electricity is available from PV systems.

Taking Building Information Systems to the Household – translating the learnings from commercial buildings into the residential sector, with old and new housing stocks split between Multiple Dwelling Units and freestanding cottages.

Retrofitting Adaptive Air Conditioning Control Based On External Meteorological Condition’s, With Specific Reference to Domestic Split System Air Conditioners.

## Statement on Personal Research

Since about 2009 I have been living in a Smart House that I personally developed and implemented as an R&D test bed. This house contains numerous controls and sensors, including: - Room occupancy, light switch and luminaire monitoring, hot and cold water usage, solar system output, circuit based energy monitoring, roof space temperatures, local climate through a weather station, land line calls received, HVAC and off peak power availability. Various connections have been implemented between systems in order to ensure the house operates in an effective manner, providing timely information to the occupant.

All this data has been collected and time-stamped, giving a unique insight into one Australian bungalow. Various discoveries have been made as a result of this research, with some of it going into various business enterprises, with other information starting to be disseminated through conferences and journals.

This R&D process is to the point where the discoveries have been made, and some of the papers listed above would involve documenting insights and analyzing data.

## Interests in Further Research

Facilities like the Sustainable Energy Research Centre are interesting permitting ideas to be tested in a new building. Whilst there is new construction, along with knock down/rebuild happening in Australia, this translates to only a small proportion of the housing stock being replaced each year. Even the number of major renovations of buildings where new environmental design elements can be included are not very significant.

Therefore, as a community, we are left with a large proportion of the population living in dwellings that are wasteful of energy. Investigating technologies to either measure the scale of the problem of wasted energy, or to develop solutions is of particular interest.

The question becomes one of what can be done to reduce the energy consumption of existing stock. In researching this for Redshift Wireless, I came up with a number of areas where simple technologies have great potential for savings: -

* Retrofitting centralized control to IR controlled Split System HVAC systems in residential, commercial and educational facilities
* Intelligent pool filter control in residential properties
* Intelligent Stored Electric Hot Water control in Multiple Dwelling Units with compulsory Time of Use (TOU) electricity and no timer
* Intelligent control of lights in sporting fields, so that lights can be turned on and off remotely, without keys, permitting lights to be switched off when training is complete, or training is cancelled.

As an example, in households with a swimming pool, the pool consumes on average about 10% of their energy. Anecdotal evidence suggests that many to most pool owners do not bother adjusting their pool timer settings during winter, where research suggests pump times can be reduced by 50%. Implementing this scheme by itself would reduce the pool energy usage by 25%, or the household energy consumption by about 2.5%. In addition, even in summer, pools generally only need to have their water cleaned once during days with low UV output, leading to further reductions in energy use.

Another major area is the prevalence and use of Reverse Cycle Air Conditioners in schools. I have noticed recently constructed classrooms using HVAC systems at 11am on a lovely autumn Sydney day, where the best solution would be to open the windows. Likewise, there is a school in Hervey Bay in Queensland that has over 100 Split System Air Conditioners. Just managing the remote controls for their Air Conditioners is a major management issue.

An intelligent Stored Electric Hot Water unit would give the householder the ability to choose the maximum rate for heating water, be it Off Peak, Shoulder or in special circumstances, Peak rates. If the capacity of the heater was consumed, the householder would have the ability to heat their water regardless of the cost. However, they would generally not need to use this feature, saving money.

The real power from this comes by installing an electricity meter for the hot water that would give daily feedback on the cost and amount of electricity used to heat their hot water, giving contemporaneous feedback, providing the householder with the tools to change their behavior.

It should be remembered that even without the behavioral changes, there can be a net environmental improvement driven solely by shifting load due to the tendency for more fuel efficient technologies to be used when electricity demand is lowest.

Ultimately, the solution to environmental issues both domestically and internationally will involve not only improvements in new construction, but improvements in existing stock, until that stock ultimately reaches the end of its usable life and is significantly upgraded or replaced. These are improvements that could make sense on a economic basis due to reduced energy bills, in addition to the improved environmental outcome.

My interest is very much in the development of the tools to meet the environmental challenges facing us all. I am not suggesting that any of the items that I have listed here would be topics for me to look at as part of a higher degree – they are more listed to provide insight into my thought processes.

1. Underlining indicates that Darryl Smith also presented this paper at the relevant conference. [↑](#footnote-ref-1)
2. With the exception of the three papers co-authored with RB Smith and N Nuchkoom, I was the primary author and researcher. The three co-authored papers noted included significant input from me, although I was not the primary author. [↑](#footnote-ref-2)
3. This is only a sample of the projects I have worked on. Projects have not been included for many reasons, including that of confidentiality. [↑](#footnote-ref-3)