



**Gascoyne
Murchison
Strategy** ~ a new lease on life.

FINAL REPORT

ELECTRICAL & SOLAR TRAINING FOR PASTORALISTS

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In the aftermath of Cyclone Vance in March 1999, much of the water infrastructures across the Pilbara, Gascoyne and Murchison districts were totally devastated. As part of its emergency relief support, the government subsidized the replacement of infrastructure on all affected stations. Although several producers moved into solar, a significant number chose to reinvest in wind mills, based on their better understanding of this traditional technology. Had more people been better informed about photovoltaic (solar or PV) systems, a greater shift towards this more reliable and safer source of powered water delivery may have resulted. Consequently, the Gascoyne Murchison Strategy (GMS) commissioned the Department of Electrical Engineering at Curtin University of Technology to custom build an electrical and solar power training program for rangeland producers (Appendix 1).

The program was delivered by Curtin Associate Professor Dr Bill Lawrance through a series two hour "hands-on" workshops. At the end of the workshop, participants received a set of four VHS tapes, valued at \$82, as take-home reference material, free of charge. The topics covered on each tape are presented in Table 1.

Table 1. Subject matter of take-home video reference material.

TAPE/MODULE TITLE	DESCRIPTION
<i>Module 1</i> AVOIDING ELECTROCUTION	A discussion of common electrical hazards on a station and practical methods to ensure safety.
<i>Module 2</i> MULTIMETERS	A detailed presentation of the various types of multimeters currently available, how they work and what the information they provide actually means.
<i>Module 3</i> SOLAR POWER	A highly informative introduction to solar technology that explains the various components and their functionality in easy to understand layman terms.
<i>Module 4</i> SOLAR PUMP TROUBLE SHOOTING	A demonstration of the most popular types of water pumps and covering how they work, what can go wrong and what can be done to fix them on the station.

The first workshops were held in the Goldfields in mid July 2003. These were delivered at Gwalia, Kalgoorlie and Rawlinna on 14, 15 and 16 July, respectively. Dr Lawrance was assisted by Jim Addison and Samantha Van Wyngaarden, both with CMAE. The second series of workshops were held in the

Pilbara in early November 2003 in conjunction with Roebourne/Port Hedland, East Pilbara and Ashburton Land Conservation District Committee meetings. These were delivered at Boodarie Station, Ethel Creek Station and Wyloo Station on 3, 4 and 7 November, respectively. Dr Lawrance was assisted by Peter Smith (DAWA) and Hayley Turner (CMAE).

The format for all workshops included a talk covering multi-meters, PV technology and pumps, followed by a demonstration of PV and the use of the multi-meter. Finally, there was a discussion where participants told of their experiences (and problems) with PV systems.

The total number of 55 stations that attended workshops reportedly found them a unique opportunity to engage with a reputable expert who actively contributed to discussions and provided objective answers to their questions. A listing of recurring discussions is presented in Table 2.

Table 2. Frequently asked questions and issues raised during training workshops

Question/Issue Raised	Dr Lawrance's Response
<p>Cost. High initial investment costs deter producers from investing in PV systems</p>	<p>Pastoralists need to consider costs over the lifetime of the system. PV modules are guaranteed for 25 years and will continue to function at reduced efficiency after this. PVs need less maintenance than windmills and there currently is a substantial government subsidy for PV systems</p>
<p>Quality of the installations Suppliers and installers charge top prices for PV systems but after-sale service is poor or non-existent</p>	<p>Initial planning using best practice guideline is imperative. Many small hybrid solar home systems are incorrectly sized and improperly installed. Not surprisingly, such systems are prone to frequent failures. It is essential systems be correctly designed for a given application. System design should be as modular as possible to facilitate fault location and replacement of faulty components. A design software package is being developed. A good multi-meter is indispensable for tracking down faults but there needs to be some guidance for the non-technical user.</p>
<p>Mechanical tracking systems Mixed experiences from users</p>	<p>I agree with the users who contend it is more reliable to use a fixed array and add modules to increase output to the required level. Some users are happy to use a rigid frame, adjustable for summer (10°) and winter (50°) conditions. This increases the PV output but it would be less than what could be gained by a mechanical tracker (approx 40%).</p>
<p>Compatibility of different sized PV modules</p>	<p>It is best to use modules of the same size (same power rating). It is still possible to use modules of different sizes in an array however performance (for series connections) will be reduced. Try to avoid having series strings which contain one smaller module, as this will limit the output of the other modules in the string</p>
<p>Module security Since the modules are expensive items and often located in remote locations they are susceptible to theft</p>	<p>The obvious but costly solution would be the erection of a physical barrier. An alternative solution may be to incorporate an electronic ID tag to identify stolen property but these will require some R&D</p>
<p>Availability of multi-meters with a current clamp</p>	<p>The instrument demonstrated was a Digitech QM1562 with ranges of 0-200A (ac and dc) and 0-600V (ac and dc). A convenient feature is that current can be measured directly via the current clamp (hence it is not necessary to break the circuit) and frequency can also be measured with this meter. The meter is available from retailers such as JAYCAR and costs around \$150.</p>

It is interesting to note that no workshops have yet to be conducted in the GMS region proper despite the project's targeted promotional activities. The training initiative featured on *ABC News* Geraldton on 05 July 2003 and an article was published in the *Countryman* (10 July 2003, p4). Earlier in June 2003, each of the Gascoyne Murchison LCDC secretaries were provided with a copy of the course videos and invited to indicate their interest in hosting a workshop. The only response to this invitation came from the Shark Bay LCDC who indicated their preference a workshop some time in mid 2004.

In reaction to this apparent lack of interest in attending workshops, articles were published in the November 2003 and May 2004 issues of the SR Pastoral Memo inviting practicing pastoralists interested in receiving their complimentary set of reference videos to complete and fax back a short EOI form. A total of 50 stations have since taken advantage of this offer.

The distribution of videos to date by industry segment is presented in Table 3. A complete list of provided with a set of videos is provided in Appendix 2.

Table 3. Total distribution numbers according to industry segment and dispatch type as at 08 June 2004.

ADMINISTRATION (Government)		PRIVATE ENTERPRISE (PASTORAL, MINING, RETAIL)		
PROMOTIONAL	WORKSHOP	PROMOTIONAL	WORKSHOP	FAXED ORDER
13	6	24	55	60
19		139		
158				

A total of 500 sets of videos were originally produced. The Carnarvon and Meekatharra offices were each sent 150 sets of videos. These supplies remain virtually intact. The remaining balance of 200 was dispatched to Kalgoorlie where only 42 set remain (as at 22 June 2004).

The project was able to deliver its outputs within its allocated budget of \$28,000 (Appendix 1). The training initiative has reached over one third of the pastoral businesses in the Southern Rangelands, suggesting it was relatively successful. Any further workshops will need to be funded from subsequent allocations.

The GMS has also commissioned Dr Lawrance to develop water infrastructure design software for rangeland applications. This is scheduled for release in October 2004. The current training program should be considered as a pre-requisite for the better utilisation of the water infrastructure design software.

Dr Lawrance has found the videos to be an effective tool for his undergraduate students. He has indicated he would be able to use any surplus copies once they where no longer needed by DAWA.

R Rouda
22 June 2004

Appendix 1.

CMAE PROJECT PROPOSAL FORM

PROGRAM CODE: Stock Water Management	PROJECT NO. 6 3.2
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Project Title:

Solar & Electrical Training Modules
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Project Objectives

- | |
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| <ol style="list-style-type: none">1. To improve pastoral managers understanding of basic electrical and PV based equipment2. To develop a series of interactive electrical & solar PV training modules in a format that would appeal to producers in remote areas, such as workshops and videos |
|--|

Project Manager

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Activity Leader(s)

Name Dr William Lawrance	Title: Assoc. Professor,		
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Project Description

Following Cyclone Vance, solar pumping vendors held a field day to show their products and to demonstrate their serviceability. Some months afterward, Mono Pumps ran a training school in the Gascoyne district, which was well attended. However, the majority of pastoralists say that they would like more training in solar pumping maintenance.

Generally, pastoralists are not familiar with electrical equipment beyond basic automotive electrical skills. A training course needs to cover fundamental concepts dealing with electrical safety, solar modules and solar pumping systems. Manufacturer-specific training in specific pumping equipment will complement this training.

Training has to be delivered in a useful form to the pastoralist and at a pace they can absorb. They do not need a formal qualification (unless required by law for higher-powered installations). Five half day training workshops will be delivered through the existing Farmbiz network across the Gascoyne, Meekatharra and Kalgoorlie advisory districts. At the end of these sessions, participants will be later provided with a set of topic-specific reference VHS videos or DVDs that document the material covered in the workshops as take-home reference material. Ideally every attempt will be made to combine these workshops as part of other pre-planned industry functions to improve the rate of attendance. Four workshop modules will be developed.

Module topics include:

1. General electrical/solar occupational health & safety.
2. Using the digital multimeter.
3. Solar module characteristics, panel alignment and power maximisers
4. Pump motors, servicing and trouble-shooting techniques.

Itemised Project Budget

Item	Funders Includes In-kind	Status*	Year 1
Salaries & Wages (incl on-costs)			
Dr R Rouda (5 days)	DAWA (SHH)	C	1,000
Dr W Lawrance (20 Days)	Curtin	C	10,000
Technical officer support (10 days)	DAWA (SKL)	C	5,000
Operating Costs			
Development of course materials/ consumables	DAWA (SKL)	C	5,000
Travel associated with delivery of 5 sessions	DAWA (SKL)	C	4,200
Promotional material	DAWA (SKL)	C	1,000
CMAE Overhead (15%)	DAWA (SKL)	C	1,800
TOTALS			28,000

Operational Staff and Location

Dr Robert R Rouda CMAE/DAWA, Project Manager, Kalgoorlie
 Technical Officer Support (DAWA Kalgoorlie-Currently vacant & Carnarvon-Currently vacant)
 Associate Professor Dr W Lawrance, Course developer & workshop presenter, Curtin University Bentley
 Mr Roy Mercer, Video production & workshop presenter, Curtin University Bentley
 Five host stations (Yet to be determined)

Opportunities for Collaboration and Integrated Service Delivery

This project was developed to increase producers fluency with basic electrical and solar technology. As such, it has linkages with other technologies being developed within the Vibrant Grazing Industries Program (Remote Information Management System for rural and rangeland applications). It will also enhance the application of pre-existing technologies (such as water medication dispensers) for supplementing extensively grazed animals and as such, contribute to the achievement of desirable outcomes identified within DAWA's Livestock Production Management and Industry Business Development projects

Anticipated IP Outcomes

This project will provide pastoralists with training in the regular maintenance and general repair of electrical and solar equipment. This information will be accompanied by a series of high quality reference VHS videos/DVDs designed specifically for a pastoral audience. However, this reference material may be used to train electrical engineering students and other interested parties so long as the prior permission is granted by the CMAE and its ownership of the material is acknowledged in all future reproductions.

IP Ownership & Management Statement

In accordance with Clauses 14 and 16 of the DAWA - Curtin University CMAE agreement, all IP generated during the conduct of this project shall be equally and jointly owned by both DAWA and Curtin University as tenants in common. Background IP provided to projects by participating parties will be managed in accordance to Clause 15.

Commercialisation Strategy

Copies of the reference videos/DVDs will be provided to all WA pastoralists free of charge. Members of the general public including pump vendors may wish to purchase and distribute copies of this material to include as part of their product marketing package will be able to purchase copies (priced on a cost recovery basis) through the CMAE. The revenue generated from sales will be held in trust by the CMAE to fund future video production if and when the need arises (additional copies of the current video series and/or additional modules covering new topics).

Milestones *(Provide details of key outputs over the duration of the project)*

No.	Activity Description	Completion date
1	Filming of module reference material covering the four identified topics	20 February 2003
2	Review of module reference material and development of workshop/distribution plan	21 March 2003
3	Production of master copy of each module in both VHS and DVD format ready for reproduction	31 March 2003
4	Develop training workshops and support video	31 March 2003
5	Finalise workshop delivery schedule	04 April 2003
6	Workshop delivery	20 November 2003

Appendix 2

VIDEO DISTRIBUTION LIST as at 08 June 2004

ADM: Administrative Dispatch Government Bodies
WS: Workshop Distribution
FO: Faxed Request
UPD: Unsolicited Promotional Dispatch

BUSINESS	RECIPIENT	LCDC PROMO	SET S	DISPATCH DATE	PURPOSE
ABC Landline Brisbane	Peter Lewis		1	25 Jun 2003	ADM
Albion Downs Station	Greg Payne		1	17 Jun 2004	FO
Anaconda Pastoral Company	Mark Harper		1	14 Jul 2003	WS
Annean Station	Manager		1	03 Nov 2003	FO
Arubiddy Station	Peter Brown		1	16 Jul 2003	WS
Atley Station	Trevor Hodshon		1	17 Jun 2004	FO
Badja Station	Roger Pitman		1	31 May 2004	FO
Bidgemia Station	Lochi McTaggart,		1	28 Oct 2003	UPD
Boodarie Station	Andrew Laycock		1	04 Nov 2003	WS
Boolathanna Station	Bob Bettini,		1	28 Oct 2003	UPD
Boologooroo Station	Bob Symonds,		1	28 Oct 2003	UPD
Boolygoo Springs Station	Bob Reed		1	16 Jun 2003	FO
Bulga Downs Station	David McQuie		1	04 Dec 2003	FO
Bullara Station	Edwina Shallcross	Lyndon	1	24 Jun 2003	UPD
Byro Station	Danial Murray		1	04 June 2004	FO
Callagiddy Station	Peter Johnson,		1	28 Oct 2003	UPD
CALM	Mick Coulter		1	15 Jul 2003	WS
Carey Downs Station	Ron Rogers		1	03 Dec 2003	FO
Carnegie Station	Faye Smith		1	12 Nov 2003	FO
Cheela Plains Station	Evan Pencini		1	07 Nov 2003	WS
City of Kalgoorlie Boulder	Kylie Del Fante		1	15 Jul 2003	WS
Clover Downs Station	Jeff Carter		1	14 Jul 2003	WS
CMAE	Bill Mason		1	03 Jul 2003	ADM
CMAE	Molgolian Delegation		1	17 Sep 2003	ADM
Coolawanyah Station	Kim Parsons	Roeboune Pt.Hedland	1	04 Nov 2003	WS
Cooralya Station	Manager		1	09 Dec 2003	FO
Cowarna Station	Malcom Sims		1	15 Jul 2003	WS
CUT	Roy Mercer		2	09 Jun 2003	ADM
CUT	Bill Lawrance		1	09 Jun 2003	ADM
Dairy Creek Station	M Steadman		1	07 Nov 2003	FO
Dalgety Downs Station	Helen Williams	Upper Gascoyne	1	24 Jun 2003	UPD
DAWA	Sam van Wyndergaarten		1	09 Jun 2003	ADM
DAWA	Kevin Shackleton		1	09 Jun 2003	ADM
DAWA (Farmbiz)	Kay Bodman		1	07 Jul 2003	ADM
DAWA Derby	Shireen Jung		1	25 Jul 2003	ADM
Depot Station	Ian Fox		1	16 Jul 2003	WS
Depot Springs Station	Matthew Cavallaro		1	17 Jun 2004	FO
Edah Station	Manager		1	03 Nov 2003	FO
Edjudina Station	Brett Crook		1	15 Jul 2003	WS
Ella Valla Station	Ken Baston		1	28 Oct 2003	UPD
Energy Safety Directorate	Bob Lawrance		1	25 Jul 2003	ADM
Ethel Creek Station	Barry Gratte		1	05 Nov 2003	WS
GEDC	Annaleise Walster		1	14 Jul 2003	WS
Gifford Creek & Wanna Stns	William Radford		1	28 Oct 2003	UPD

Gindalbie Station	Steve Tonkin		1	15 Jul 2003	WS
Glenorn Station	Trent Stillman		1	14 Jul 2003	WS
GoGo Station	Graham Cruikshank		1	02 Feb 2004	FO
Gunnadorah Station	Brett Day		1	16 Jul 2003	WS
Hamersley Station	Matt Herbert		1	07 Nov 2003	WS
Hamersley Station	Luke Herbert		1	07 Nov 2003	WS
Hill Springs Station	JA Hopkinson,		1	30 Oct 2003	FO
Hillview Station	Geoff Lacy		1	28 Oct 2003	UPD
Kanandah Station	Mark Forrester		1	16 Jul 2003	WS
Karratha Station	Gavin Clark		1	04 Nov 2003	WS
Kooline Station	Wayne Stammers,		1	28 Oct 2003	UPD
Kooline Station	Clinton Burnhart		2	07 Nov 2003	WS
Kybo Station	Rod Campbell		1	16 Jul 2003	WS
Lakeside Station	Manager		1	17 Nov 2003	FO
LCDC	Martin King	Cue	1	24 Jun 2003	UPD
LCDC	Jorgen Jensen	Mt Magnet	1	24 Jun 2003	UPD
LCDC	Kathy Mitchell	Yalgoo	1	24 Jun 2003	UPD
LCDC	Ken Walker	East Pilbara	1	14 Oct 2003	FO
Leonora Shire	Patrick Kelly		1	12 Dec 2003	FO
Liveringa Station	John McInnes		1	20 Oct 2003	FO
Lyndon Station	Shaun D'arcy,		1	28 Oct 2003	UPD
Mallee Station	GA Groove		1	04 Nov 2003	FO
Manberry Station	John Gooch		1	10 Nov 2003	FO
Mandora Station	Cob DePledge		1	04 Nov 2003	WS
Mardarthuna Station	Burt Maslen	GascoyneWooramel	1	24 Jun 2003	UPD
Marrilla Station	Kim Forrester		1	28 Oct 2003	UPD
Meeberrie Station	Manager		1	21 Nov 2003	FO
Melita Station	PC Dallas		1	01 Dec 2003	FO
Mellenbye Station	Manager		1	17 Nov 2003	FO
Middalya Station	Dough Hearmen		1	28 Oct 2003	UPD
Mileura Station	Tim Walsh		1	28 Oct 2003	UPD
Milgun Station	Brian O'Dwyer	Gascoyne Ashburton Headwaters	1	24 Jun 2003	UPD
Millrose Station	Rex E Ward		1	11 Dec 2003	FO
Minderoo Station	Mike McKeown		1	07 Nov 2003	WS
Minesite Rehabilitation	John Law		1	15 Jul 2003	WS
Minilya Station	Manager		1	17 Nov 2003	FO
Mininer Station	Wendy Harvey		1	07 Nov 2003	WS
Mooloo Downs Station	Manager		1	03 Nov 2003	FO
Mouroubra Station	Arthur Hele		1	14 Jan 2004	FO
Mt Florence Station	Jamie Richardson		1	04 Nov 2003	WS
Mt Gould Station	Manager		1	03 Nov 2003	FO
Mt Jackson Station	Manager		1	12 Jan 2004	FO
Mt Narryer Station	Sandy McTaggart		1	28 Oct 2003	UPD
Mundabullangana Station	Dave Barton		1	04 Nov 2003	WS
Muralgarra Station	JA Morrissey		1	30 Oct 2003	FO
Murchison Downs Station	Manager		1	31 Oct 2003	FO
Murchison House Station	Manager		1	13 Nov 2003	FO
Murgoo Station	Manager		1	17 Nov 2003	FO
Nallan Station	MJ Clinch,		1	31 Oct 2003	FO
Nerren Nerren & Meadow Stn	Harold Crawford		1	02 Jun 2004	FO
Newmont & Bronzewing	Dave Brinsden		1	14 Jul 2003	WS
Newmont & Bronzewing	Melanie Hayhow		1	14 Jul 2003	WS
Orient Well	Jack Reed		1	14 Jul 2003	WS
Oudabunna Station	Manager		1	12 Jan 2004	FO
Outback Energy Supplies	Jim Thompson		1	15 Jul 2003	WS
Packsaddle Farm	Simon Thomas	Wiluna	1	24 Jun 2003	UPD
PGA	Edgar Richardson		1	04 Jul 2003	ADM
Pingandy Station	Manager		1	03 Nov 2003	FO
Pinnacles Station	Jason Homewood		1	18 Jun 2004	FO
Private	Peter Prugnoli		1	14 Jul 2003	WS
Private	John McCarthy		1	14 Jul 2003	WS

Private	Bob Haulin		1	14 Jul 2003	WS
Private	Terry Paull		1	14 Jul 2003	WS
Private	Graeme Keeler		1	14 Jul 2003	WS
Private	Lyn Duncan		1	14 Jul 2003	WS
Private	Annette Haulin		1	14 Jul 2003	WS
Pundamurra College TAFE	Neil Waters		2	04 Nov 2003	WS
Rawlinna Station	Ross Wood		1	16 Jul 2003	WS
Rawlinna Station	Mark Role		1	16 Jul 2003	WS
Rawlinna Station	Murray Bloggs		1	16 Jul 2003	WS
Red Hill Station	Digby Cocker	Ashburton	1	07 Nov 2003	WS
Rocklea Station	Robert Morgan		1	07 Nov 2003	WS
Roy Hill Station	Murray Kennedy	East Pilbara	1	05 Nov 2003	WS
Seamore Downs Station	Neil Hogg		1	16 Jul 2003	WS
Sherwood Station	Harvey Nichols	Meekatharra	1	24 Jun 2003	UPD
Shire of Coolgardie	Sandra Trenowden		1	15 Jul 2003	WS
Sturt Meadows Station	Paul Axford		1	18 Jun 2004	FO
Talisker Station	DM Bennett		1	17 Nov 2003	FO
Tamala Station	Kerry King	Shark Bay	1	24 Jun 2003	UPD
Tangadee Station	Manager		1	20 Nov 2003	FO
Tardie Station	R Faulkes Taylor		1	06 Nov 2003	FO
Three Rivers Station	Ben Forsyth		1	03 Dec 2003	FO
Turee Creek Station	Manager		1	12 Nov 2003	FO
Urala Station	Jim Cullen		1	07 Nov 2003	WS
URS Asia Pacific	Andrew Thomson		1	31 May 2004	ADM
UWA Library	Angus Hopkins		1	05 Jul 2003	ADM
Wagga Wagga Station	Manager		1	17 Nov 2003	FO
Wallal Downs Station	BJ Wade		1	27 Jan 2004	FO
Warambie Station	Wade Sambell		2	04 Nov 2003	WS
Warrawagine Station	Robill Mills	De Grey	1	07 Nov 2003	WS
WD Moore & Co	Geoff Moore		1	11 Aug 2003	ADM
Weebo Station	Nathan Blake			17 Jun 2004	FO
Weelarrana Station	John Anick		1	05 Nov 2003	WS
Winderie Station	Elaine Kempton		1	17 Nov 2003	FO
Windimurra Station	Dale Zadow		1	16 Dec 2003	FO
Windsor Station	TG Carvell		1	17 Nov 2003	FO
Woodleigh Station	Manager		1	05 Jan 2004	FO
Wooleen Station	Brett Pollard		1	05 Nov 2003	FO
Woolgorong Station	Meg Officer	Murchison	1	24 Jun 2003	UPD
Woolgorong Station	Tim Officer		1	17 Nov 2003	FO
Woolibar Station	Tony Crook		1	15 Jul 2003	WS
Wondinong Station	CF Scott		1	11 Nov 2003	FO
Wydgee Station	WE Moses		1	10 Dec 2003	FO
Wyloo Station	Dunken Johns		1	07 Nov 2003	WS
Yakabindie Station	Doug Browlie		1	17 Jun 2004	FO
Yarrabubba Station	Adam Howden		1	31 May 2004	FO
Yeelirrie Station	Tim Mahony		1	17 Jun 2004	FO
Yerilla Station	Iain McGregor		1	18 Jun 2004	FO