Overview Of Energy on Burgorah

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St George, Qld
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This Activity received funding from the Department of Industry and Science.

Where it all began

- New Property - no power
- Investigated solar for House and shed
  - too expensive
- Ergon offered 8km of powerline with guarantee to use power on 2 pumps
- Originally competitive with diesel

The Incentive

- Queensland Government offers 44c FIT
- To maximise output from a 30kW limit looked into tracking system
- Single axis determined to be most cost effective
- Installed 30kW in Nov 2010 at pump site 2

Deadlines are met

- The Newman Government says systems need to be in by June 2013
- House and shed, and 2 two axis trackers installed by due date

Prices keep falling

- Panels get cheaper and grid power just gets dearer
- Threat of withdrawal of rebate
- Decide to install 63kW fixed to cover power requirements of 60kw electric motor during the day

Tariffs 15c off peak

43c Peak

Design

Project name:	**63 kW Array Burgorah**	**Location: Australia / Brisbane**
Project number:		
Project file:	63 kW Array Burgorah.sdp2	Grid voltage: 3~230 V

System overview

126 x Phono Solar PS250M-20/U (EU) (PV array 1)

Azimuth angle: 180°, Inclination: 15°, Mounting type: Free installation, PV peak power: 31.50 kWp

1 x STP 10000TL-10

1 x STP 17000TL-10

Technical data

Total number of PV modules:	126	Performance ratio (approx.)*:	86.5 %
PV peak power:	31.50 kWp	Spec. energy yield (approx.)*:	1573 kWh/kWp
Number of inverters:	2	Line losses (in % of PV energy):	---
Nominal AC power:	27.00 kW	Unbalanced load:	0.00 VA
Annual energy yield (approx.)*:	49537.30 kWh	Self-consumption:	---
Energy usability factor:	99.7 %	Self-consumption quota:	---

Sunny Design 2.30.0.R

Burgorah Single Axis Tracker costings 30kW Installed Oct 2010							
Actuals							
			GST				
Panels		80363	8036				
Inverters		25941	2594				
Tracker		25000	2500				
Marking out	1 day	200					
Bore Holes	4hrs	400					
Set up	2days	400					
pour and strip	2 days	400					
Concrete	12.4m	2980	298				
Hangers		400					
Electrician		11007	1101				
Mounting panels	2 days	400					
Security System		5000	500				
TOTAL COST		152491					
Rebate		30673					
NETT COST		121818					
	$/watt	4.0606					

Burgorah 63kW solar array Costings Fixed Feb 2015				
	Gross	GST	Nett	
panels	49896	4990	44906	
Inverters	10844	1084	9759	
Electrical	17029	1703	15326	
Ground Mount	22000	2200	19800	
	99769	9977	89792	
RECs Rebate	1451@37.9		54993	
Total			34799	
Total/watt			0.552	

LCOE Calculation

Yearly Income/Cost				
		3.25	cents per kWhr LCOE	
-$34,798		$3,250	first year income	
$3,250		degradation	1	%
$3,218		Power generated		
$3,185		per Year	100000	kWhr
$3,153				
$3,122				
$3,091				
$3,060				
$3,029		Cost Of System		
$2,999		panels	44906	
$2,969		racking	19800	
$2,939		electrical	15326	
$2,910		inverter	9759	
$2,881				
$2,852		rebate	-54993	
$2,823		Nett Cost	34798	
$2,795				
$2,767				
$2,740		NPV	$4.59	
$2,712		(need to get		
$2,685		this close to		
$2,658		zero)		
$2,632				
$2,605				
$2,579				
$2,553				
0.0700	IRR			
RESULTS	with rebate 3.25c / kwhr			
	without rebate 8.4c / kwhr			
	to give 7% return on capital			

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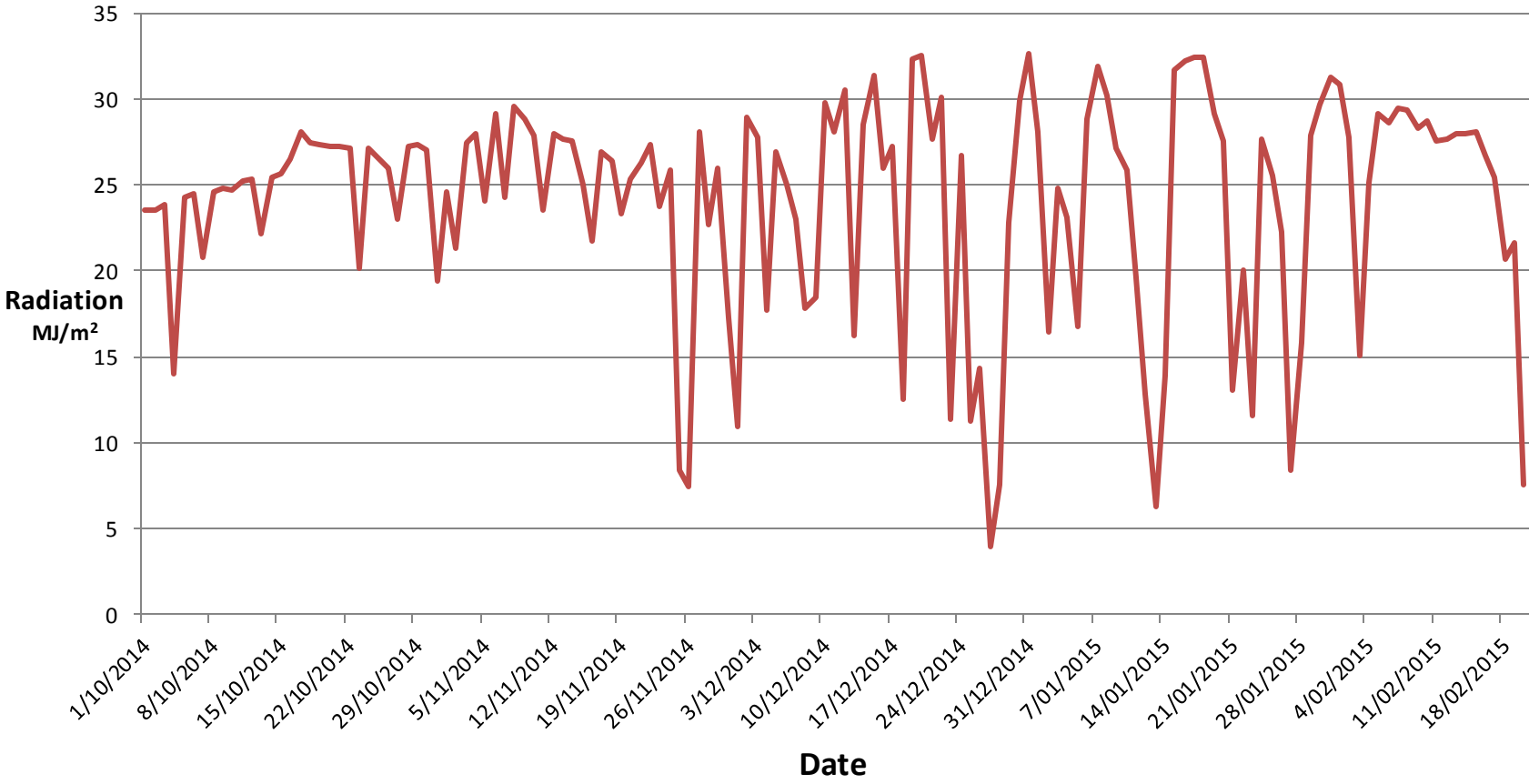
Daily Solar Radiation



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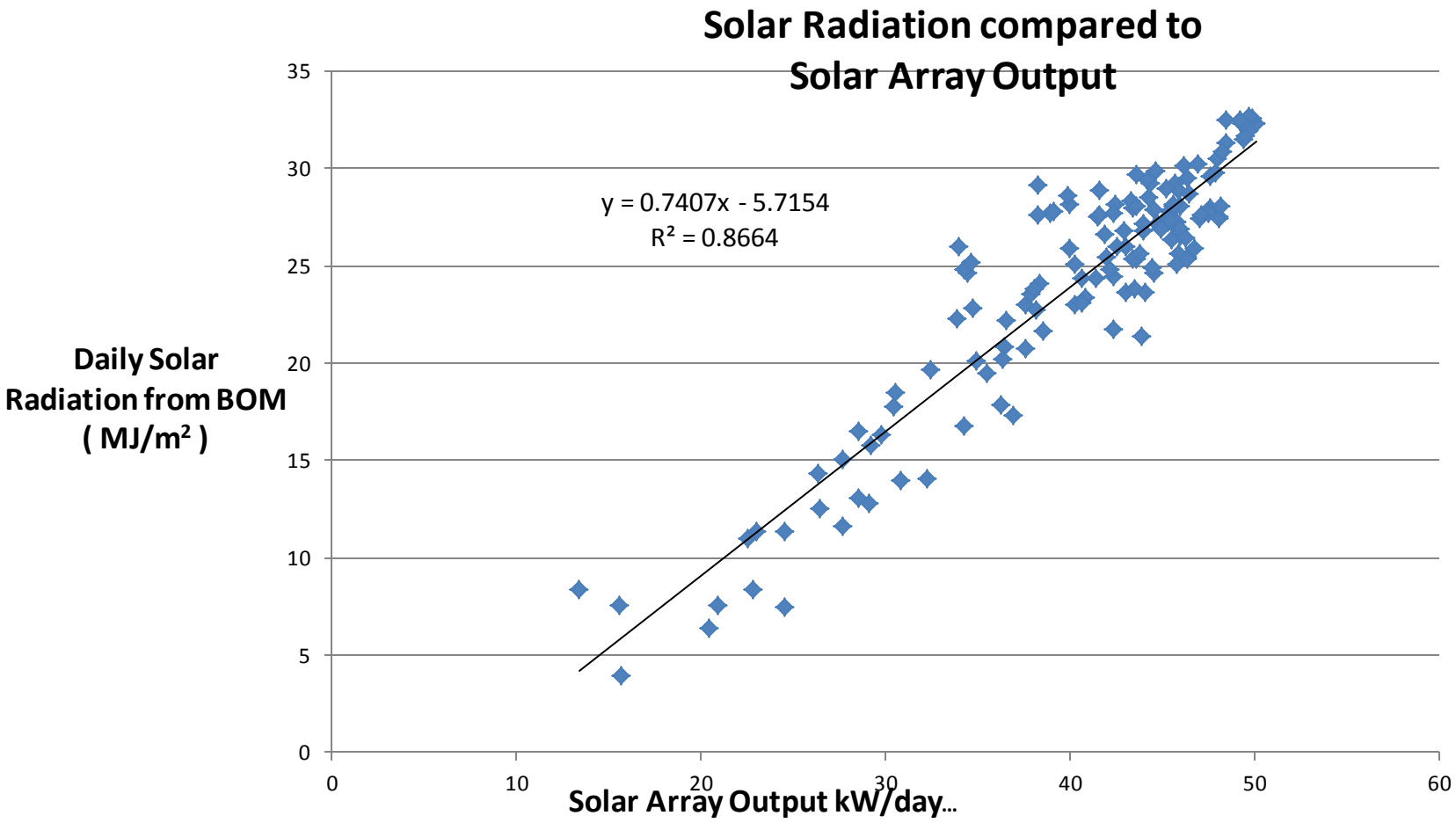

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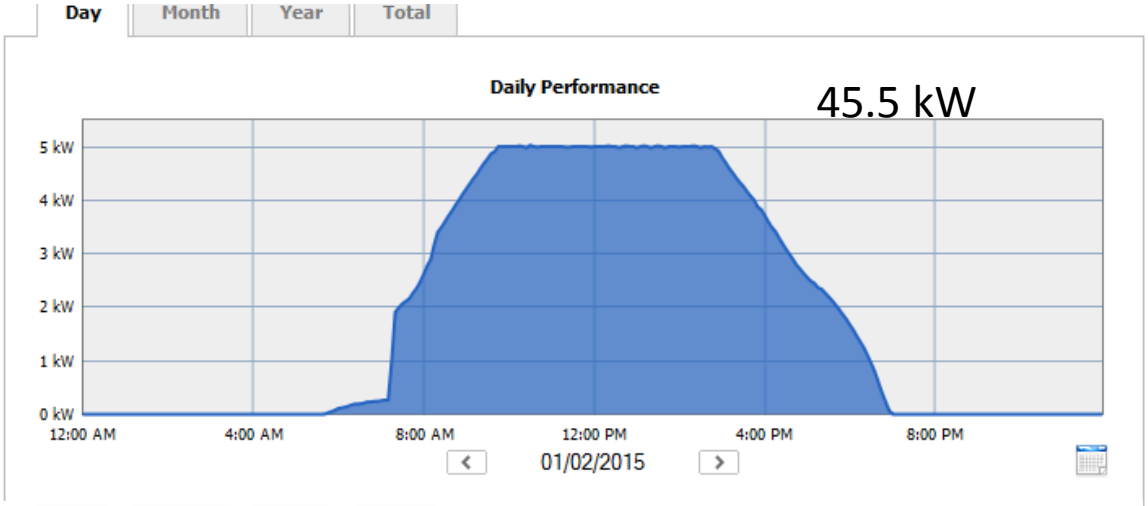
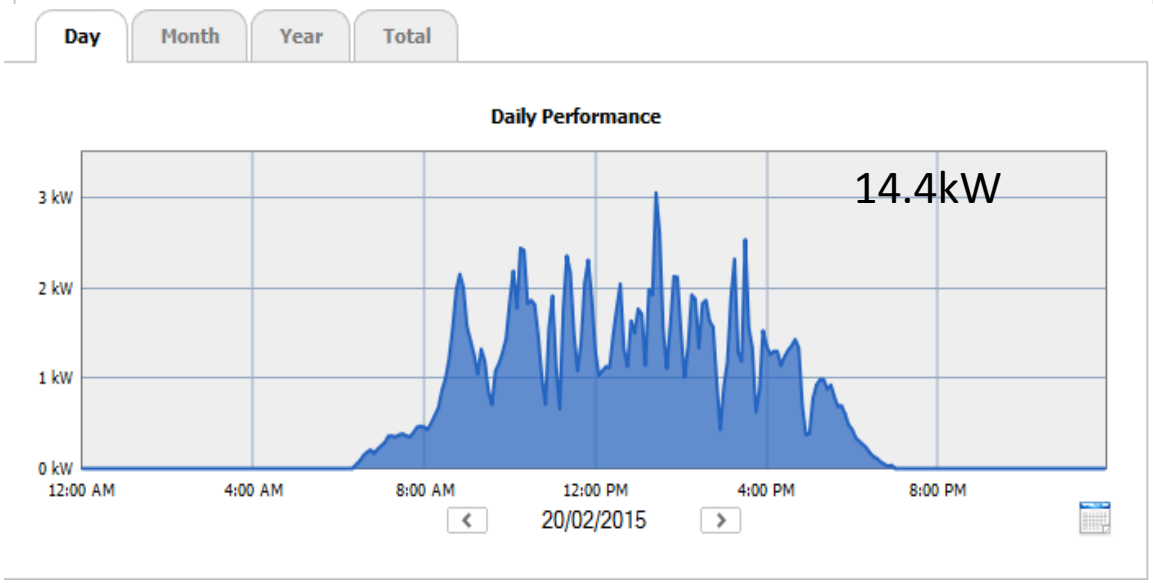
Comparison Of Solar Radiation (MJ/m²) for Different Cotton Areas

Data From BOM						
	Emerald	St George	Moree	Griffith		
December	785	710	758	881		
January	730	724	749	774		
February to 18th	440	484	477	459		
TOTALS	1955	1918	1984	2114		
% change from St George	1.9%	0.0%	3.4%	10.2%		

House 8kW 5kW inverter





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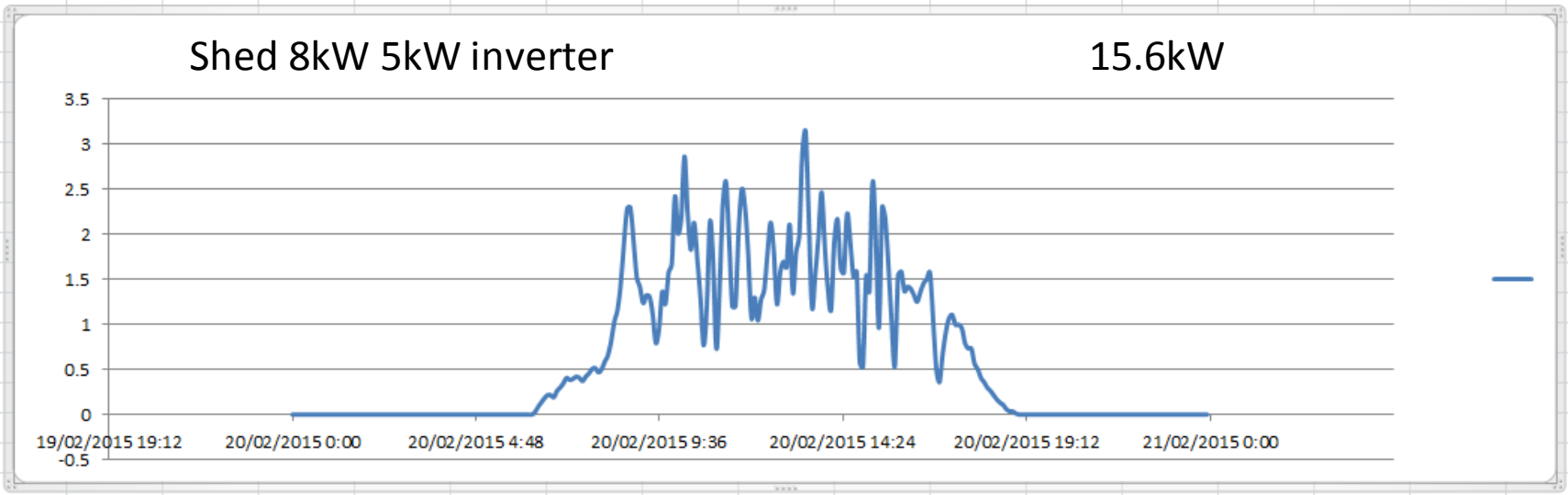

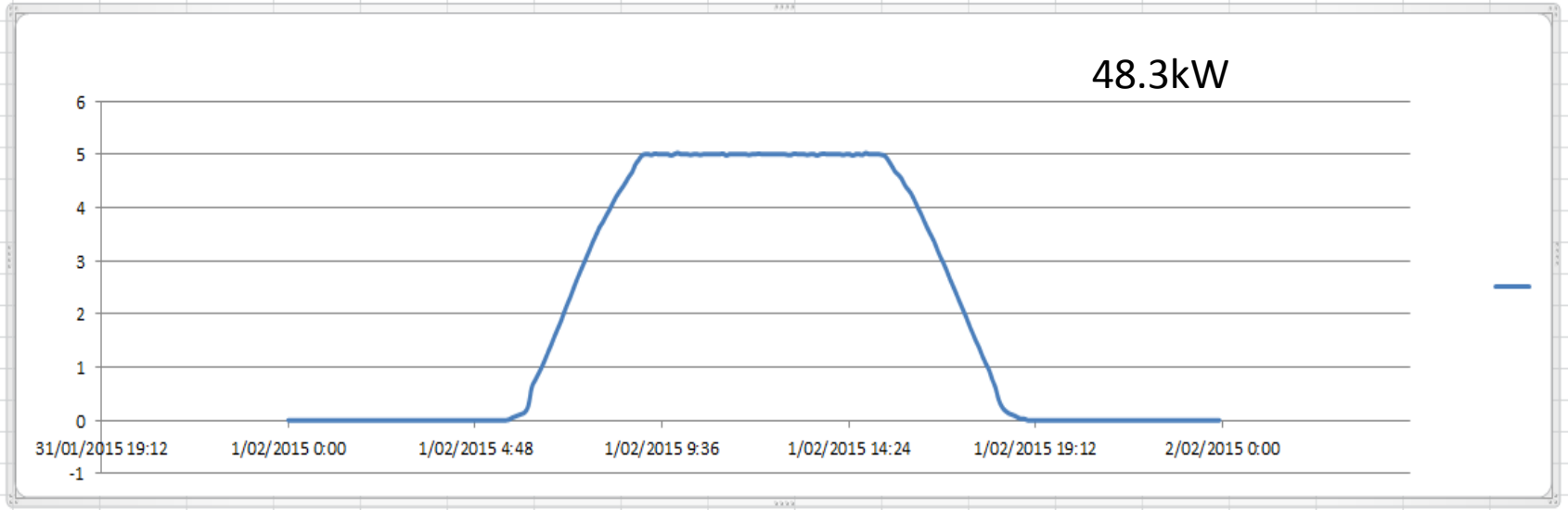

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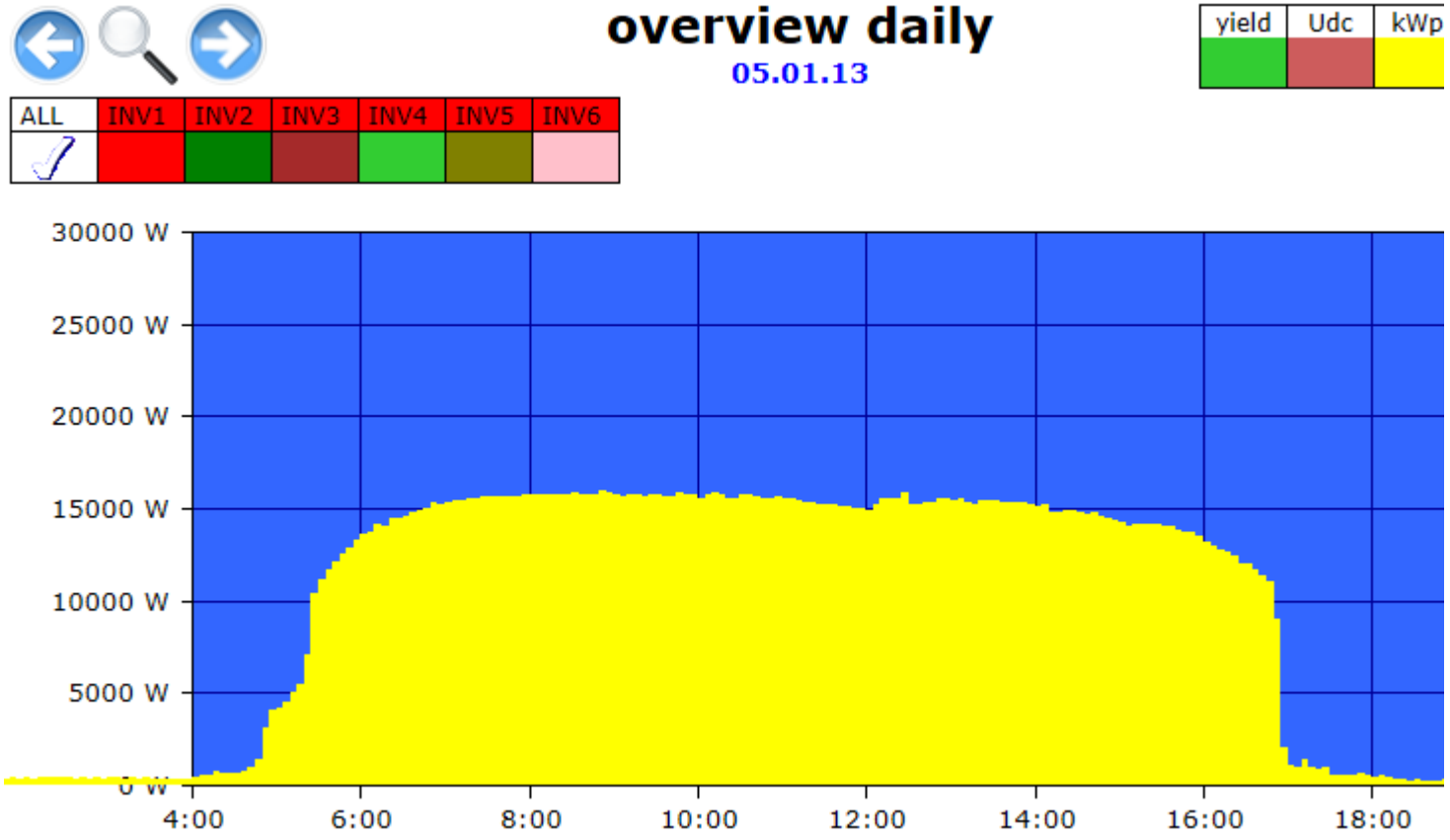
Single axis typical data



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Modelling Results

- Using Retscreen model
- Fixed 63 kW @ 15% 117 Mw / year
- 1 Axis 63 kW 147 Mw / year 25% ↑
- 2 axis 63 kW 157 Mw / year 34% ↑
- 1 axis extra cost $43000
- 2 axis extra cost $62000
- Fixed 85kW extra cost $12000 157Mw /year

Tariff Comparison

Irrigation Site 2 Burgorah St George								
	Monthly usage							
Month	day kW	night kW	max kW demand	Tariff 62	Tariff 22	Tariff 44	Tariff 45	Tariff 41
July	200		30	109	103	1727	5569	1175
Aug	200		30	109	103	1727	5569	1175
Sep	200		180	109	103	6672	7850	5610
Oct	10000	15000	180	6657	5984	9515	10693	8440
Nov	10000	15000	180	6657	5984	9515	10693	8440
Dec	10000	15000	180	6657	5984	9515	10693	8440
Jan	4000	6000	180	2676	2421	7796	8973	6728
Feb	4000	6000	180	2676	2421	7796	8973	6728
Mar	1800	2000	180	1109	969	7085	8263	6021
Apr	200		30	109	103	1727	5569	1175
May	200		30	109	103	1727	5569	1175
June	200		30	109	103	1727	5569	1175
TOTALS	41000	59000		$27,082	$24,379	$66,531	$93,985	$56,282

Solar option to reduce pumping Costs

Weekday peak Cost	40%of12266kWh@43.352c/kW.h		$2,127.02	/month
Weekday Solar Cost	60%of12266 kWh@3.5c/kWh		$257.59	/month
Off Peak Rate Cost	84%of17173 kWh @ 15.33c/kWhr		$2,211.40	/month
Weekend solar Cost	16%of17173 kWh @ 3.5c/kWhr		$96.17	/month
Annual Weekday Cost	3 months @ $2384.61/ month		$7,153.83	/annum
Annual Off Peak Cost	3 months @ 2307.57/ month		$6,922.71	/annum
Annual Service Fee	365 days @ 73.115 c/day		$266.87	/annum
Total Annual Electricity Charge			$14,343.41	/annum
Water Volume Pumped			3000	ML/annum
Cost / ML			$4.78	/ML
Cost to install enough solar				
200kW solar @.55c/watt	$110,000.00			
If a FIT of > 3.5c/kWh was available the capital would be self funding at an interest rate of < 7%				

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Comparison of Diesel and Electric Costs

Electric Motor Pump	60	ML/day	$6.55/ML	electricity @ av .273c/kWhr
Diesel Motor Pump	51	ML/day	$6.05/ML	Diesel @ 72c on farm
	23	ML/day	$3.60/ML	Diesel @ 72c on farm
Electric Motor Pump with solar	60	ML/day	3.72/ML	electricity @ av .154c/kWhr

Output of Solar Installations to Date

- 30kW Single Axis Oct 2010 250MW
- 5kW Shed July 2013 21MW
- 5kW House July 2013 20MW
- 30kW dual axis July 2013NotTracking 56MW

Useful Resources

- PVWatts
- Retscreen
- Homerenergy
- SMAsunnydesign
- Reneweconomy
- Climatespectator
- BOM
- Desertknowledge
- Sunwiz
- Supply partners
- Renewable energy traders
- CBE
- JSH Products

Tariff 44 Demand Small	GST inclusive from 1 July 2014 (carbon price removed)	GST inclusive from 1 July 2014 (Includes carbon price)	GST inclusive from 1 July 2013 (Includes carbon price)
Demand charge - dollars per kW of chargeable demand per month	$42.365	$42.365	$38.805
All consumption - cents per kWh	11.463	14.568	12.834
Service fee (daily supply charge) - cents per day	5,681.892	5,681.892	954.605

Tariff 45 Demand Medium	GST inclusive from 1 July 2014 (carbon price removed)	GST inclusive from 1 July 2014 (Includes carbon price)	GST inclusive from 1 July 2013 (Includes carbon price)
Demand charge - dollars per kW of chargeable demand per month	$38.012	$38.012	$33.666
All consumption - cents per kWh	11.463	14.568	12.834
Service fee (daily supply charge) -	18,488.067	18,488.067	2,978.979

Tariff 62 Farm Time of Use (Transitional) pricing structure	GST inclusive from 1 July 2014 (carbon price removed)	GST inclusive from 1 July 2014 (Includes carbon price)	GST inclusive from 1 July 2013 (Includes carbon price)
Weekdays peak (7am-9pm) first 10,000kWh per month - cents per kWh	43.352	45.322	39.411
Weekdays peak (7am-9pm) remaining kWh per month - cents per kWh	36.661	38.327	33.328
Other times - cents per kWh	15.330	16.026	13.936
Service fee (daily supply charge) - cents per day	73.115	76.438	66.468

Tariff 41 Low voltage (demand)	GST inclusive from 1 July 2014 (carbon price removed)	GST inclusive from 1 July 2014 (Includes carbon price)	GST inclusive from 1 July 2013 (Includes carbon price)
Demand charge - dollars per kW of chargeable demand per month	$29.566	$29.566	$25.583
All consumption - cents per kWh	11.326	14.226	12.383
Service fee (daily supply charge) - cents per day	885.327	885.327	883.823

Tariff 22 General supply time of use	GST inclusive from 1 July 2014 (carbon price removed)	GST inclusive from 1 July 2014 (Includes carbon price)	GST inclusive from 1 July 2013 (Includes carbon price)
Peak (weekdays 7am-9pm) - cents per kWh	28.158	31.060	28.046
Off-peak (other times) - cents per kWh	20.810	23.711	20.535
Service fee (daily supply charge) - cents per day	154.481	154.481	143.177