Example 1MW Solar System for Fosters Yatala

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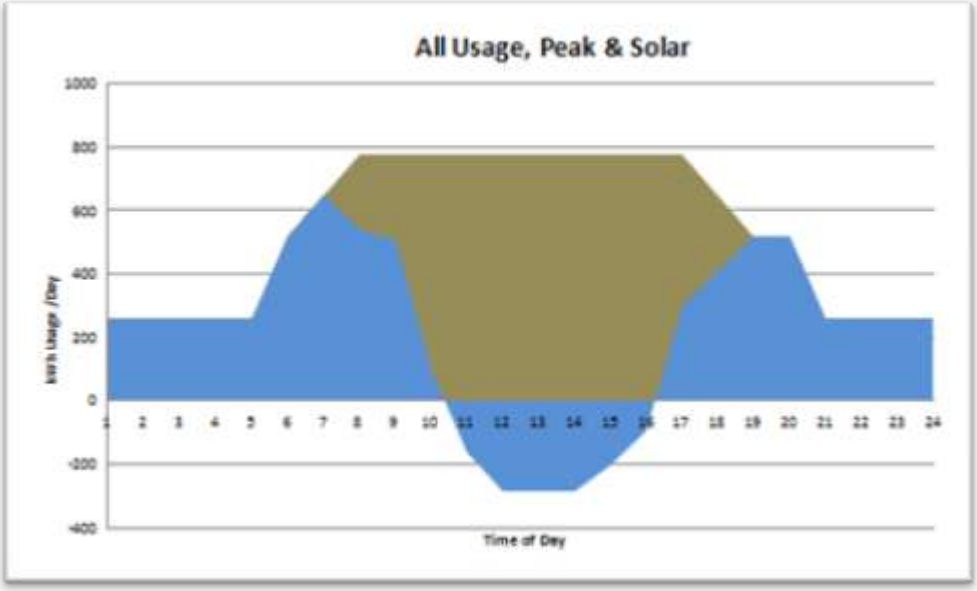
Key Points for a Solar PV System 1MW at Fosters Yatala Qld

Highlights

- **Control and stability of electricity prices over the next 25 years.**
- **Reduction in peak demand load from the grid**
- **Replacement of up to 40% of power usage in example shown (typical usage profile)**
- **Payback under 5 years (with grant)**
- **Estimated Internal rate of return in excess of 27.2% (with grant)**
- **Multiple self funding finance options**
- **Eligibility to secure grants under the Federal Government's Clean Technology program (up to 33%)**
- **Estimated Co2 Savings of 1324 tonnes PA**
- **Sustainable future power supply**
- **Technologically mature and sustainable green generation method**
- **The PV System is expandable for future site growth**
- **Assumptions used are very conservative**
- **Rapid deployment under 3 months for complete installation (roof array)**
- **Annual maintenance and technical support included in the assumptions**

Figure 1 Brown Section denotes replaced power from solar



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Case Study Example for a Solar PV System 1MW at Fosters Yatala Qld - Brewery Application

Problem

Electricity is a significant component part of input costs for Fosters in producing and storing of beer at Yatala QLD. Power is used for lighting, fans for cooling, refrigeration for beer tanks, as well as pumps, etc. The annual site usage was approximately 3750 MWh costing approximately $636,938 average per annum @ 16.985 cents per kWh. It must be noted that the cost of power is expected to rise significantly over the next few years.

The brewery roofs, and cool room roofs are an ideal location to mount solar panels, and do not require a Development Approval from the council. Alternatively, a solar farm can be established adjacent to the brewery which takes up approximately 1- 2 hectares. By installing a solar system, it allows the manufacturer to control its power costs over the next 25 years.

Future Site Analysis (Solar only)

A power usage log, with a 30 minute increment for a typical year (baseline), would be required for analysis to determine the optimum size of installation for this site - taking into consideration.

A. Winter, summer usage profile
B. Time of day usage profile
C. Is any power going to be used elsewhere on the property
D. Power usage split between, office, manufacturing plant, refrigeration etc.
E. Roof area survey
F. Roof loading limits etc
G. If ground array - change of use & building approval may be required together with a land survey

(It was assumed in this instance that the electricity production from the solar panels would be consumed at the site. This installation would be a "behind the meter installation", with no feed in tariff or power purchase agreement (PPA) negotiations required or permissions from the electricity company).

Figure 2 Yatala Warehouse

25 degree's off due north

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Brief Desktop Analysis

The north facing roof of the warehouse on the north of the site measures approximately 142 meters wide and 82 meters high, providing a roof area of 11,614 m3. Conservatively 4000 panels would fit on this roof assuming the roof was able to accept the required load.

Available Grants

Yatala would be eligible to apply for a grant under the Clean Technology Program (CTP) food & foundries program, as a manufacturing business is classified under ANZSIC code 1212, covered by the program. The grant applied for can be for up to 1/3 approximately of the cost of the installation. *(This grant is also available for other energy saving devices like LED lights, variable speed device's (VSD's) for pumps, augurs etc.. It is recommended that a complete energy audit be conducted for all other items as well, as a % the capital cost is eligible under the grant.)* We modelled the installation with and without a grant.

Solution Example

In this example the optimum size was determined to be a one megawatt (1MW) installation, based on the usage assumptions. It is projected that Yatala would save circa 1,487,746.97 kWh PA and produce a saving approximately $272,087.00 in the first year, replacing 39.5% of current power usage. The payback period is approximately 4.9 years (with grant) and 6.6 years (without). It is also assumed that all the panels would fit on the roofs of the brewery complex. (Subject to survey)

Finance Options

Loan Type	Conditions	CTP Grant	Financier
Traditional corporate loan	Corporate Guarantee	Yes	Major Bank
Operating lease	Corporate Guarantee	Yes	Major Bank
3rd party finance / operator (Off balance sheet)	15 – 20 year Power Purchase Agreement at preset power prices.	TBA	Specialist provider

Assumptions

It is assumed for the purposes of this exercise that there are no planning issues and the roofs are able to sustain the required load. The installation has been costed using industry standard components at a price of $2.25 per watt or a total of $2,250,000 + GST. The grant, debt and equity used are shown in the table below.

Example Capital Structure	Amounts
Equity	$0
Grant	$675,000
Debt	$1,575,248
Totals	$2,250,248

For the purpose of this exercise we have shown the payback and cost of generation with and without the grant. (The grants are competitive)

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1. Before Solar Install

Assumptions	Values
Usage profile throughout the Week	Typical Usage Profile (See Item 6)
Current Usage PA	3760 MWh PA
Current Demand Peak	778.85 kW
Nominal Average Electricity Price	0.16985 Cents per kWh
Annual Electricity Bill (RAW)	$636,938
Usage Assumption (behind the meter)	All power consumed by site (No feed in tariff required)

a. Current Usage Profile - Peak / Off Peak Periods

Current Usage Profile	Start	End	Annual kWh	%
Peak Energy	0700 hrs	2100 hrs	2,174,278.85	57.81%
Shoulder Energy	0	0		0.00%
Off Peak energy	2100 hrs	0700 hrs	1,586,538.46	42.19%
**Weekends all off peak		Totals	3,760,817.31	100.0%

2. After Solar Installation of 1MW System

Assumptions	Values
Average Sun hours per day Yatala SA (Bureau of Meteorology)	5.44 per day
Usage profile throughout the Week	Usage Profile
Revised Usage From Grid PA	2273 MWh PA
Revised Current Demand Peak kWh	649.04 kW
Nominal Average Electricity Price	0.16985 Cents per kWh
Revised Annual Electricity Bill (RAW)	$0.16985

a. Revised Annual Usage Peak / Off Peak Periods

Annual Usage	Start	End	Annual kWh	%
Peak Energy	0700 hrs	2300 hrs	1,111,602.44	48.90%
Shoulder Energy	0	0	0.00	
Off Peak energy	2300 hrs	0700 hrs	1,161,467.90	51.10%
**Weekends all off peak		Totals	2,273,070.34	100.0%

3. Power Production Profile from a 1MW Solar System

kWh Generated From Solar	Annual kWh	%
Peak Energy	1,062,676	71.4%
Off Peak Energy	425,071	28.6%
Total	1,487,747	100.0%

a. Replacement Revenue from Solar

Revenue from Solar	Yearly kWh	Cost per kWh	Annual production in $
Total Generated from Solar	1,487,747	0.1655	$272,087
LGC (Large-scale Generation Certificates)	1487	@$38 each	$56,834
		Total deemed Revenue or Savings	$328,921

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b. Power Usage Split Grid & Solar

Total Power MWh %	Solar Production	Net Grid Purchase	Total Power Used
MWh	1487	2273	3760
% Usage	39.6%	59.4%	100%

4. Capital Cost Example for 1MW Solar System

A. Example cost Installed @2.25 per watt
B. Project Life 25 Years
C. With 30% Grant under the Current Government Clean Technology Program

Capital Structure	Amounts	Payback Inc Grant	Payback Ex Grant (All Debt)
Equity	$0	6.10	9.41
Grant	$675,000	4.89	6.60
Debt	$1,575,248	IRR	IRR
Totals	$2,250,428	27.21%	18.21%
Loan Years	5	ROI	ROI
Loan Interest Rate	7.00%	402%	372%

1. Price stability per KWh is assured with generating your own power, with or without the grant.

a. Raw Cost of power production with the grant, less LGC (Large-scale Generation Certificates)

Year	Year 1	Year 3	Year 5	Year 7	Year 10	Year 15	Year 20
Grid + 2.88% PA	$0.170	$0.180	$0.190	$0.202	$0.219	$0.253	$0.292
Solar Cost Power	$0.252	$0.252	$0.251				
Aggregate Cost Per kWh	$0.188	$0.194	$0.200	$0.107	$0.117	$0.136	$0.158

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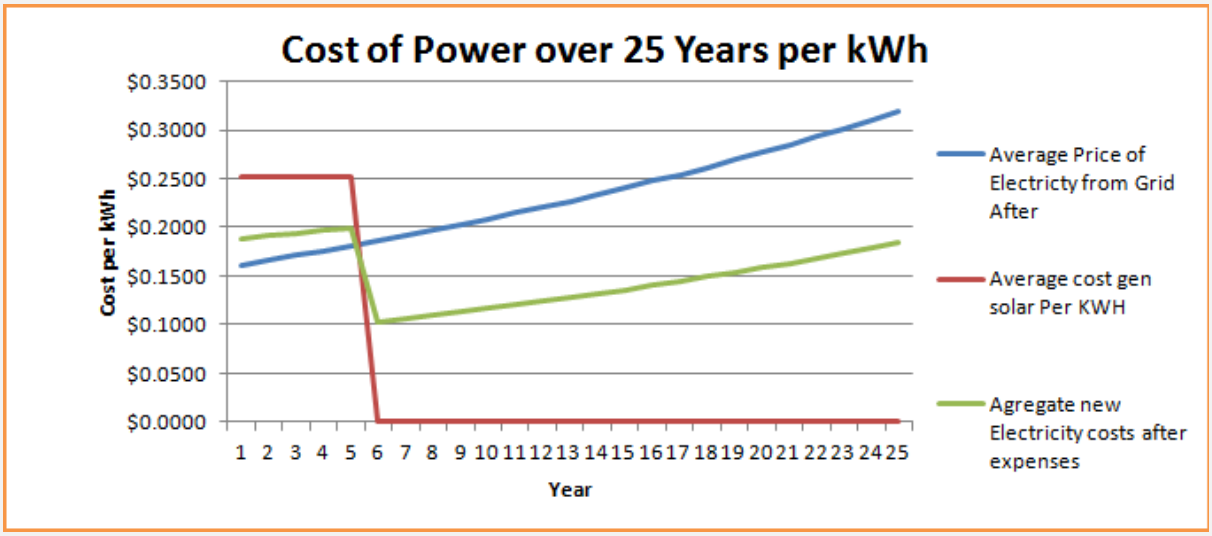
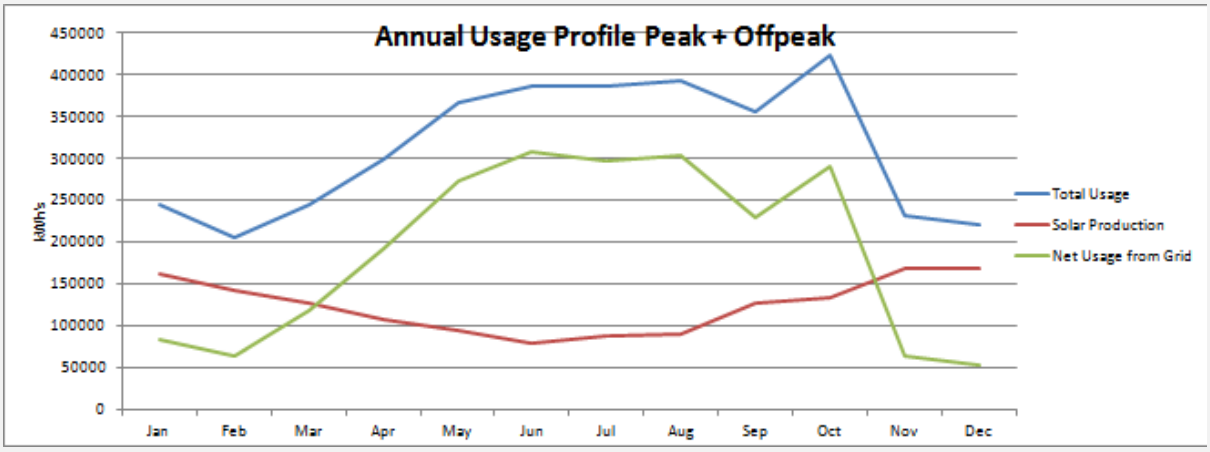
The real story is that Yatala has pegged the rise in the price of electricity to 1.5% in year 1 and 1.63% in year 10, based on the grid price rising by 2.88% PA. Then having a large reduction in Year 10, slowly increasing over time - as well as reducing the peak demand from 778KW to 649KW.

Figure 3 with Grant



2. Typical Usage and Load Profile total & After installation



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3. Solar System Specification for a 1MW System

a. 3922 x Monocrystalline 255 Watt panels
b. 60 x SMA Inverters 17 KW or 50 x 20KW SMA Inverters
c. Standard or Custom made roof mounting arrangement (BCA2006, AS4100 and AS1170) compliant **or**
d. Ground mounting arrays to be erected on a field (1 -2 hectares)
e. Installation compliant to current Australian Standards.

4. Warranty

1. Solar Panels Warranty 25 years
    a. 10 year limited warranty of materials and workmanship
    b. 10 year limited warranty of 90% of power output
    c. 25 year limited warranty of 80% of power output
    d. Warranty backed by China Export & Credit Insurance Corporation (SINOSURE) is a state-funded policy-oriented insurance company.
2. Inverters Variable
    a. Warranty – 5 – 25 years (optional – Cost dependent)
    b. Usually excess inverters are purchased to swap out defective units as well as a warranty.
3. Racking Warranty 25 years

5. Maintenance Contract for a 1MW System

a. A long term maintenance contract would be established to clean and maintain the solar panels in a roof array, and replace and repair any panels that became defective as well as maintain the electrical installation and inverters. (this is allowed for in the economic analysis)
b. If a ground array, then maintenance would be quoted separately as mowing and other services are required in addition to standard maintenance services.

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Appendix A

Return on Investment calculator

RETURN ON INVESTMENT CALCULATOR

Version 2

STEP 1 - Enter applicant's ABN (no spaces)

STEP 2 - Enter first financial year of project: 2012

STEP 3 - Breakdown project expenses for each year in the cells below.

	2012	2013	2014	2015
Eligible	$2,250,248			
Ineligible				

STEP 4 - Enter the expected grant ratio (1:1, 2:1 or 3:1): 1 (1)

OR enter in the total grant amount requeste: $675,000

STEP 5 - Enter the average effective life of the conservation mea: 25 Years

STEP 6 - How many years until savings are fully realised? Years

STEP 7 - Enter the name of Fuel

				Enter in the applicant's current fue			Enter in the applicant's fuel price increases per year		
Peak Electricity	Savings	1,062,676	kWh	Peak Electricity	$0.210	kWh	Peak Electricity	2.9%	kWh
Off-Peak Electricity	Savings	425,071	kWh	Off-Peak Electricity	$0.115	kWh	Off-Peak Electricity	2.9%	kWh
Shoulder Electricity	Savings		kWh	Shoulder Electricity		kWh	Shoulder Electricity	2.9%	kWh
Demand Charge	Savings		kWh	Demand Charge		kWh	Demand Charge	2.9%	kWh
Fuel 5	Savings		Unit	Fuel 5		Unit	Fuel 5		Unit

RESULTS

Discount rate for NPV analysis	7.0%
Net Present Value (without grant)	$2,595,048
Internal Rate of Return (without gr	18.2%
Return On Investment (without gr	372%
Payback period (of total project co	6.6
Net Present Value (with grant)	$3,270,048
Internal Rate of Return (with grant	27.2%
Return On Investment (with grant)	402%
Payback period (of applicant's co	4.9

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
	Totals	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Peak Electricity	26,566,910	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676	1,062,676
Off-Peak Electricity	10,626,764	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071	425,071
Shoulder Electricity														
Demand Charge														
Fuel 5														

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Peak Electricity	$0.210	$0.216	$0.222	$0.229	$0.235	$0.242	$0.249	$0.256	$0.264	$0.271	$0.279	$0.287	$0.295
Off-Peak Electricity	$0.115	$0.118	$0.122	$0.125	$0.129	$0.133	$0.136	$0.140	$0.144	$0.149	$0.153	$0.157	$0.162
Shoulder Electricity													
Demand Charge													
Fuel 5													

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Other net return ($) STC's	1,413,360	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534	$56,534
Other costs ($)	557,905	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316	$22,316

STEP 11 (Optional) - Enter any comments on assumptions and approach

LGC Rate per kWh: $0.038 0.036 LGC Rate

Maintainence Rate per kWh: $0.015

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