Australian Government
Rural Industries Research and Development Corporation

RURAL INDUSTRIES
Research & Development Corporation

Solar guidelines for Australian meat chicken growers

by C. Davies, A Maddocks, and J. Gaschignard of GHD Pty Ltd.

OCTOBER 2014

RIRDC Publication No. 14/105

Australian Government
Rural Industries Research and Development Corporation

Solar guidelines for Australian meat chicken growers

by C. Davies, A Maddocks, and J. Gaschignard of GHD Pty Ltd.

October 2014

RIRDC Publication No 14/105
RIRDC Project No PRJ-009278

ISBN 978-1-74254-722-0
ISSN 1440-6845

Solar guidelines for Australian meat chicken growers
Publication No. 14/105
Project No. PRJ 009278

Researcher Contact Details

Chris Davies

GHD
Level 8, 180 Lonsdale St, Melbourne, VIC, 3000

Phone: 03 8687 8000
Fax: 03 8687 8111
Email: chris.davies@ghd.com

In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

RIRDC Contact Details

Rural Industries Research and Development Corporation
Level 2, 15 National Circuit
BARTON ACT 2600

PO Box 4776
KINGSTON ACT 2604

Phone: 02 6271 4100
Fax: 02 6271 4199
Email: rirdc@rirdc.gov.au.
Web: http://www.rirdc.gov.au

Electronically published by RIRDC in October 2014
Print-on-demand by Union Offset Printing, Canberra at www.rirdc.gov.au
or phone 1300 634 313

Foreword

The Australian Chicken Meat industry has continually reviewed opportunities to improve production efficiency and reduce production costs. Energy consumption comprises a significant percentage of on-farm costs and these costs have increased substantially over the past seven years due to a number for factors, primarily in the electricity sector. As a primary cost of production this has a significant impact on the profitability of farms.

The electricity load profile for chicken meat chicken farms appears to correlate well with electricity generation from solar photovoltaic (PV) systems (i.e. electricity loads during daylight hours are higher than night time loads). Solar PV generation may therefore be suitable for chicken meat chicken farms to reduce electricity consumption from the grid, reduce exposure to increasing electricity tariffs, and improve profitability.

The (RIRDC) Chicken Meat Program engaged GHD to undertake a business case assessment for the installation of rooftop solar PV for two meat chicken farms, and to develop some industry-specific resources to assist farmers assess the feasibility of solar PV energy projects.

These *Solar guidelines for Australian meat chicken growers* (Guide) provide an introduction to rooftop solar photovoltaic (PV) electricity generation as it applies to meat chicken farms.

The Guide provides an initial reference point for chicken growers, including:

- An overview of solar PV and how it relates to chicken growers
- Key issues to consider when investigating solar PV
- An introduction to electricity contracts and tariffs
- Questions to ask suppliers
- Useful reference resources

This Guide is accompanied by the RIRDC Solar PV assessment tool for chicken farmers - https://rirdc.infoservices.com.au/items/14-105: a simple self-assessment tool to assist Australian meat chicken growers make a preliminary assessment of the feasibility of solar PV for their farms.

This project was funded from industry revenue which was matched by funds provided by the Australian Government.

This report is an addition to RIRDC's diverse range of over 2000 research publications and it forms part of our Chicken Meat R&D program, which aims to stimulate and promote R&D that will deliver a profitable, productive and sustainable Australian chicken meat industry.

Most of RIRDC's publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Craig Burns
Managing Director
Rural Industries Research and Development Corporation

Table of contents

Table index

Figure index

1. About this guide

1.1 Purpose of this guide

These Solar Guidelines for the Australian Chicken Meat Industry (Guide) provide an introduction to rooftop solar photovoltaic (PV) electricity generation as it applies to meat chicken farms.

The Guide provides an initial reference point for chicken growers, including:

- An overview of solar PV and how it relates to chicken growers
- Key issues to consider when investigating solar PV
- An introduction to electricity contracts and tariffs
- Questions to ask suppliers
- Useful reference resources

This Guide is accompanied by the RIRDC Solar PV assessment tool for chicken farmers https://rirdc.infoservices.com.au/items/14-105: a simple self-assessment tool to assist Australian meat chicken growers make a preliminary assessment of the feasibility of solar PV for their farms.

1.2 Background

The Australian Chicken Meat industry has continually reviewed opportunities to improve production efficiency and reduce production costs. Energy consumption comprises a significant percentage of on-farm costs and these costs have increased substantially over the past seven years due to a number for factors, primarily in the electricity sector. As a primary cost of production this has a significant impact on the profitability of farms.

A number of studies have investigated on-farm energy consumption, most recently, RIRDC project PRJ-005770 *"Quantifying on-farm energy usage in the Australian meat chicken industry"* (McGahan *et al*., 2013). This report found that the majority of electricity consumption in representative chicken meat farms was consumed by ventilation fans, and that a significant seasonal trend in electricity consumption existed in line with production cycles.

The electricity load profile for meat chicken farms appears to correlate well with electricity generation from solar photovoltaic (PV) systems (i.e. electricity loads during daylight hours are higher than night time loads). Solar PV generation may therefore be suitable for chicken farms to reduce electricity consumption from the grid, reduce exposure to increasing electricity tariffs, and improve profitability.

RIRDC therefore engaged GHD to undertake a business case assessment for the installation of rooftop solar PV for two chicken meat farms (Davies *et al.*, 2014), and to develop some industry-specific resources to assist farmers assess the feasibility of solar PV energy projects.

This Guide follows on from the business case assessment (Davies *et al.*, 2014), a copy of which can be obtained from RIRDC (https://rirdc.infoservices.com.au/items/14-106).

1.3 Who should read this guide

The Guide is designed as a resource for Australian meat chicken growers, particularly those who are considering whether a solar photovoltaic (PV) system would suit their farm.

2. Solar PV overview

Solar photovoltaic (PV) systems convert sunlight directly into electricity. A PV system will generate electricity whenever the sun is shining, with the amount of electricity produced dependent on the intensity of solar radiation at any moment in time.

A typical solar PV system includes the following key elements:

- Photovoltaic (PV) modules (also referred to as panels)
- Inverter(s)
- Mounting system
- Electrical cabling
- Smart meter

In commercial and industrial installations, the solar PV system is typically connected directly into the site's electrical system, either at the main switchboard or a major distribution board.

Electricity generated by the solar PV system is injected directly into the site's internal electrical network, and is consumed on-site if the electrical demand is greater than or equal to the power being generated by the PV system.

If the PV system is producing more power than the site's electrical demand, electricity will flow back through the site's electricity meter onto the electricity distribution network (or grid).

As a cost-saving measure, solar PV currently relies on offsetting electricity consumption rather than exporting electricity to the grid. The economic value placed on this electricity is therefore dependent on the price of electricity being paid by the business at the time of solar generation – which often coincides with peak electricity prices. A smaller, secondary factor contributing to solar electricity's economic value is the potential sale of any excess electricity exported to the network. Chapter 3 discusses pricing in more detail.

Chicken growers face a number of specific issues when considering the viability of solar PV as an effective addition to their business operations. This Guide provides a summary of the findings from two recent solar PV feasibility case studies for chicken growers (https://rirdc.infoservices.com.au/items/14-106), and considers some of the more significant challenges for chicken growers, including:

- Electricity tariff structures and supply contracts
- Matching electricity load profiles with solar generation
- Physical constraints

3. Electricity contracts and bills

The electricity market in Australia is a complex and often confusing system. The sections below are intended to give an overview of some of the most important information for prospective solar customers to understand.

3.1 Electricity market structure

Australia's electricity market is made up of a large number of stakeholders, each playing a different role. Some of the key stakeholders of relevance to small commercial businesses like chicken growers are summarised in Table 1.

Table 1 Key stakeholder groups

Stakeholder type	Role
Network Service Providers	Own and operate the electricity transmission and distribution networks (poles and wires) that transport electricity from Generators to Customers
Generators	Generate electricity
Retailers	Buy electricity from generators and sell electricity to customers.
Customers	Consume electricity

Chicken growers will primarily have a relationship with their electricity retailer and to a lesser extent their local Distribution Network Service Provider (DNSP). The retailer manages all electricity-related payments owed by the customer (including network service charges which are passed through to the DNSP), while the DNSP maintains the physical connection assets up to the electricity meter on-site. Growers will generally only have involvement with their DNSP when there are physical changes to the electrical connection assets (e.g. connecting up the site's electrical supply for the first time), or when a new or modified connection is requested by the customer (e.g. connection of a solar PV generator on-site).

A summary of key DNSP and retailer contacts can be found on the Federal Government's Energy Made Easy website.[1]

3.2 Contractual arrangements

Chicken growers will most likely have two contractual arrangements in place for their business:

1. *Customer connection agreement* with their local DNSP, which dictates the agreed electrical requirements for the site and provides the basis for allocating network charges.
2. *Electricity retail agreement* with their chosen retailer, which is the contract for the supply of electricity and includes agreed tariffs and charges (including DNSP charges), as well as stating any minimum or maximum consumption limits.

The installation of a solar PV system has the potential to affect both of these agreements in the following ways:

[1] http://www.energymadeeasy.gov.au/useful-contacts

— A connection application needs to be made to the relevant DNSP detailing the size and technical parameters of the proposed solar PV generator. The DNSP will then assess the proposed connection and offer a conditional connection agreement for the solar generator (in addition to the existing connection agreement[2]).

— Electricity retailers offer different electricity retail agreements to customers with solar PV systems. Connecting a solar PV system may necessitate moving to a new electricity retail agreement, including possible changes to the tariff structure that applies to your farm.

Under the DNSP's regulatory responsibility for ensuring the quality and reliability of electricity on their network, the DNSP has a right to impose certain requirements or constraints on your new connection. For example the DNSP may require that zero-export protection equipment be installed as part of the solar PV installation. This equipment is designed to either disconnect the site or disable the solar PV system if it was detected that the import demand dropped below a minimum set point level. The requirement for such a system would not only negate any possible revenue from the export of electricity from your farm to the grid, it could also add significantly to the project's capital cost (as zero-export protection is not typically included in the quoted price of a PV system). Both of these factors would have a negative impact on the viability of solar PV for growers.

The connection application process is typically managed by the solar installer on the customer's behalf. It is worth investigating early as it can be a costly and drawn-out process that has a significant impact on the viability of solar PV for growers.

For more information, refer to the reference links in Chapter 8.3.

3.3 Understanding your electricity bill

Every electricity retailer presents their bills in a slightly different way, depending on the type of customer (e.g. residential, small commercial, large commercial), size of customer (based on connection voltage, total energy consumer each year, or peak demand for the site), which state you're in, which DNSP jurisdiction you're in, and the type of contract you've signed up to (which will include a combination of fixed and variable charges).

The typical elements that might make up the total cost on any one of your bills might include:

— Electricity consumption

— Peak demand

— Network charges

— Market charges

— Environmental charges

Some customers may see all of these charges (and more) broken down on their electricity bills, while others may only see one or two different charges.

It is important to note that for larger customers (which would include many chicken growers), you may have the right to negotiate tariffs to suit your particular situation.

For more information, refer to the reference links in Chapter 8.3.

[2] Note – while this results in two separate agreements, it does not require two separate physical connections.

3.4 Relevance for solar PV

The value that solar can offer relates to the costs displaced, and any revenue earned, for every unit of electricity produced.

The displaced costs include all payments the customer would have made if the solar PV system weren't in place. This includes all consumption-based charges (typically charged in units of c/kWh). The revenue earned includes any payments made to the Customer as a result of the solar PV system's operation.

3.4.1 Displaced costs

The most important parts of an electricity bill when assessing the viability of solar PV are those elements that contribute to what we shall refer to as the 'effective peak electricity tariff'. The effective peak electricity tariff is the sum of all consumption-based charges being paid by customers during peak periods. This includes all items charged per unit of peak electricity consumed (typically quoted in c/kWh), and includes peak electricity consumption, peak network usage charges, and a variety of other network and market charges that occur regardless of the time of use.

3.4.2 Revenue

Revenue generated from a solar PV system typically comes from one or both of the following sources:

- Payment of a feed-in-tariff by the retailer (Net or Gross); and
- The sale of renewable energy certificates. These include:
  - Large-scale generation certificates (LGCs); and
  - Small-scale technology certificates (STCs).

For more information, refer to the reference links in Chapter 8.3.

3.5 Sourcing your own 30-minute interval data

For sites that already have a smart-meter installed it may be possible to source 30-minute interval data. These customers have the right to request the meter data from their properties. This is typically provided in the form of 12-months' worth of 30-minute interval data in a Microsoft Excel compatible format.

Customers should request interval data for specific technical parameters from their electricity meter. Speak to your electricity retailer to find out more.[3]

This data can be graphed in Microsoft Excel to show how electricity is consumed over time. Figure 1 (Chapter 4.1), shows a graph of electrical demand (measured in units of kW) plotted against time for the 12-months of data available.

3.6 Case study findings

The Case Studies (https://rirdc.infoservices.com.au/items/14-106) showed that the most significant factor affecting the business case for solar PV was the effective peak electricity tariff[4] being paid by the chicken growers. Growers paying a high effective peak electricity tariff are far more likely to find solar PV a commercially viable option than those growers with a lower tariff.

Electricity prices are dependent on the following factors:

[3] For example, see Origin Energy's information request page - https://www.originenergy.com.au/3244/Interval-meter-data-request

[4] "Effective peak electricity tariff" defined in Chapter 3.4.1

- Location of farm (particularly its state)
- Size of farm, including:
  - type of electrical customer – it is assumed that most chicken farms are being charged as small or medium commercial consumers; and
  - supply voltage – it is assumed most chicken farms will have a dedicated 11 kV electrical supply rather than a standard 415 V domestic supply.
- Specific terms of electricity retail agreement and customer connection agreement for the site.

The electricity tariffs paid by chicken growers will vary significantly across different regions in Australia. While the Case Studies found that both the Queensland and Victorian farms studied did not have electricity prices high enough to support the solar PV business case, it is possible that farms in other regions will be paying high enough prices to warrant further investigation of solar PV.

4. Load Matching

4.1 Matching PV generation with site electrical load

In order to maximise the value of electricity generated from a solar PV system, customers should seek to match the generation of their solar electricity as closely as possible with the electrical load profile of their farm such that most (if not all) of the electricity generated is offsetting peak electricity consumption (and its associated peak tariffs).

Electricity use is measured and billed in half-hourly intervals. Therefore, matching solar generation with a farm's electrical load requires the farm's electrical load to be greater than the solar generation capacity for the majority of these half-hourly intervals over the financial life of the solar PV system (which we will say is nominally 20 years).

Both the site load and the solar generation vary dramatically over every 24-hour period, but also over daily, weekly, and monthly periods. Accordingly, it is necessary to assess these factors in some detail when determining the viability of a solar PV system.

Consideration may need to be given to:

- 30-minute variation in load over typical days
- Daily variation in load across typical years
- Variation of solar radiation over any day (clear sky is most important)
- Variation of solar radiation over typical year
- Size of solar PV system
- Changes in solar PV performance over time.
- Comparative magnitude of solar generation and site load over all these periods.

Considering all these factors, the simplest way to maximise the amount of solar generation consumed on site is to identify the typical minimum daytime electrical load of yourfarm, and size your PV system such that its peak generating capacity is below this typical minimum load.

While a slightly conservative approach, this method allows you to ignore the variability in solar generation, focussing solely on the maximum instantaneous generation possible from the system.

An assessment of PV generation and site electrical load for a sample chicken farm is provided in the following section.

4.2 Load matching

Figure 1 presents an overview of a Victorian chicken farm's electrical demand over a recent 12-month period, showing a distinctly cyclic pattern of electricity use over time. Based on previous research,[5] it is understood that this consumption pattern is driven primarily by the operation of ventilation fans, and their increasing use over the course of each batch of chickens.

[5] Rural Industries Research and Development Corporation, "Quantifying On-Farm Energy Usage in the Australian Meat Chicken Industry – Final Report", April 2013, RIRDC Publication No 12, RIRDC Project No PRJ-005770

This consumption profile was essentially the same for four chicken farms, and is assumed to be broadly representative of the cyclic demand that most chicken farms may experience. Figure 1 shows a number of extended periods where the site's electrical consumption is very low, suggesting that any solar PV installation would be significantly constrained in size if it were to keep it's generation below the site electrical load during these periods of low demand.

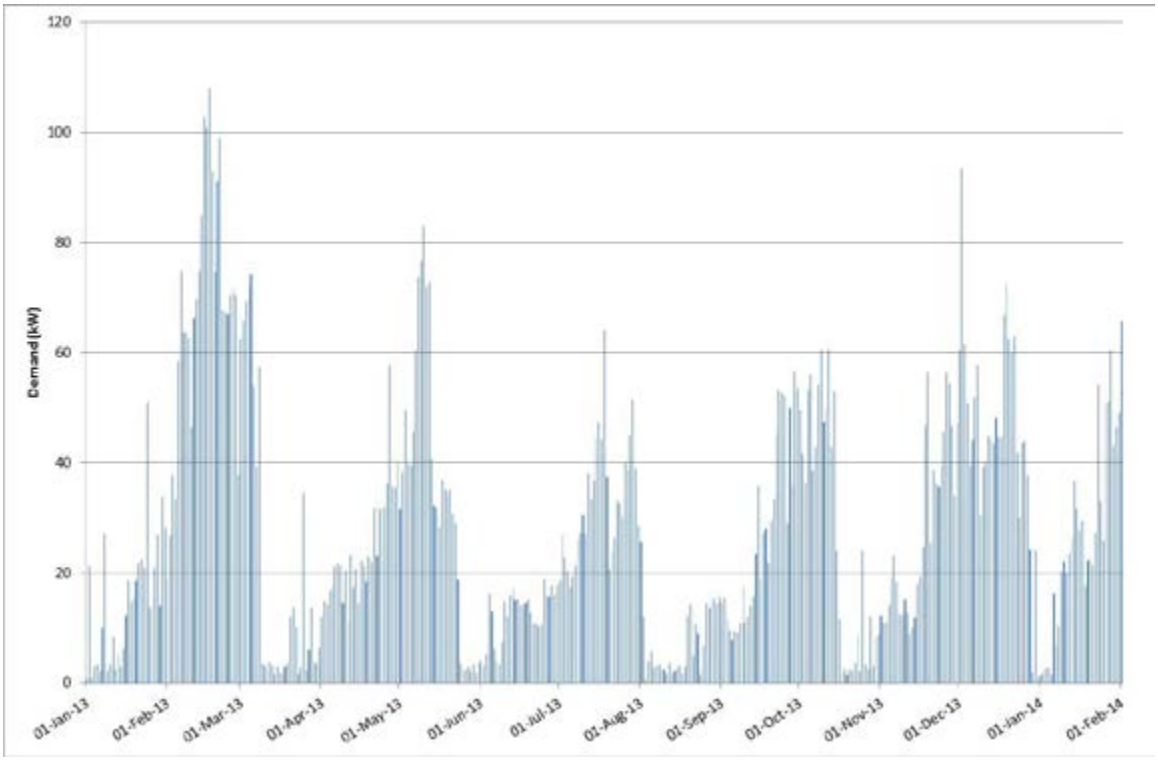


Figure 1 Victorian chicken farm - annual electrical demand profile

Figure 2 presents the simulated generation from a 30 kWp PV system installed at the same location in Victoria. The Figure also provides a visualisation of net demand[6] for this farm, when the generation from a 30 kW PV system is deducted from the demand on site. It is observed that with a 30 kW PV system, there are significant periods of time where demand is negative, meaning that the PV system is generating more electricity than the site can consume, and which will therefore not be offsetting peak electricity prices. In this instance, approximately 25% of the solar electricity generated would not be consumed on-site, resulting in substantial lost revenue.

[6] Net demand = (electrical demand on site) – (electrical generation from PV system). Negative net demand indicates periods of excess generation.

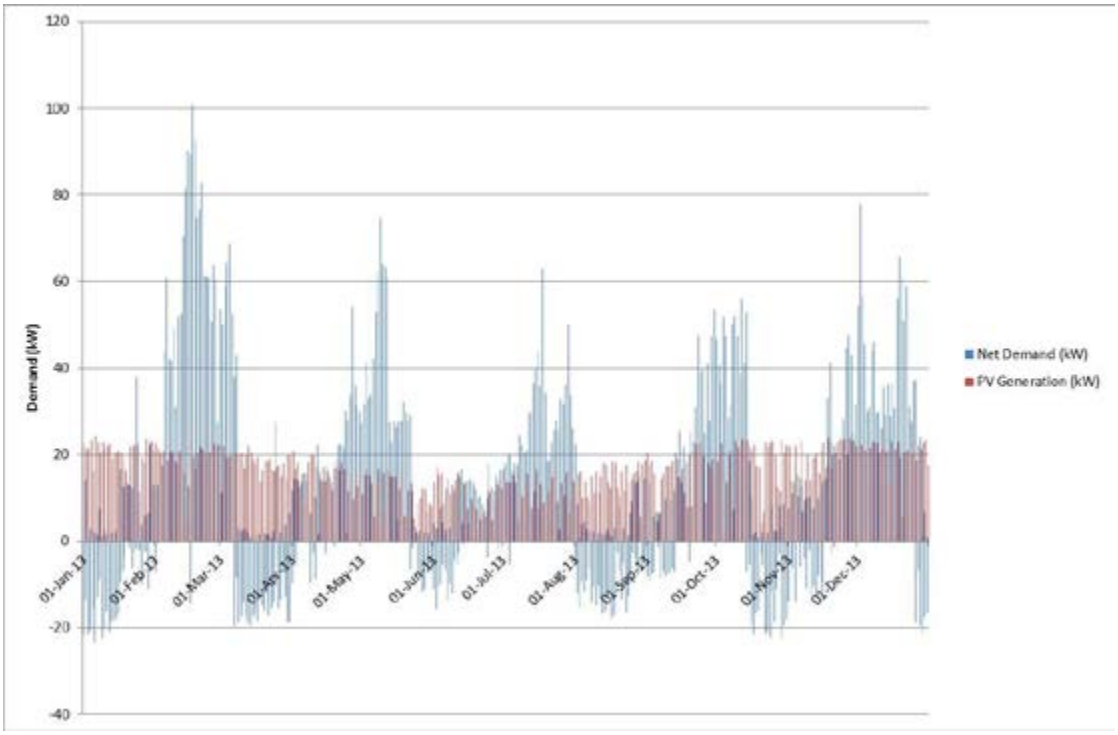


Figure 2 Net demand and PV generation for Victorian chicken farm – (30 kWp PV system)

It is also interesting to consider the variability in demand profile on a 24-hour timescale. Figure 3 shows the maximum, minimum, and average demand profiles during February for the Victorian chicken farm assessed above. For comparison, an indicative peak generation profile for a co-located 30 kW PV system on a cloudless February day is included on the same chart.

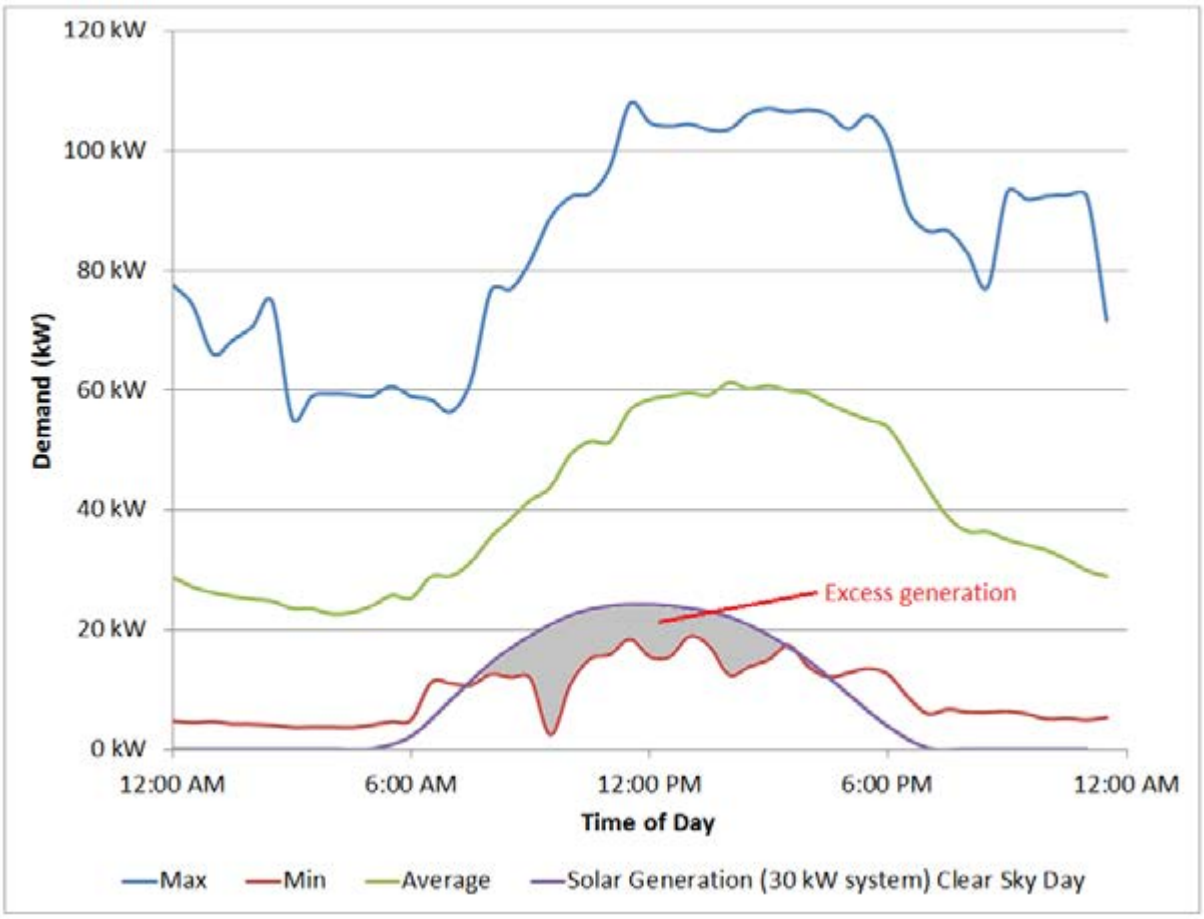


Figure 3 February load profile analysis – Victorian chicken farm

In this instance we can see that if such a peak solar generation day coincided with a day of minimum demand, the solar PV system would be generating excess electricity for a significant proportion of the day. In contrast, if it coincided with an average or peak demand day, the solar generation is well below site demand for the entire 24-hour period. The net demand graph in Figure 2 showed that 25% of all solar generation was in excess of site demand.

5. Physical Considerations

As well as the financial and load-matching considerations addressed above, there are also a number of physical considerations that can impact the viability of solar PV systems for your farm. Table 2 below provides an overview of some of these factors, and an initial assessment of how they are likely to apply to chicken farms.

Table 2 Physical criteria affecting solar PV feasibility

Consideration	Requirement	Comment
Roof area	For roof-mounted solar PV systems, approximately 9m^2 isrequired for every kilowatt of solar panels.	Chicken farms are likely to have far more roof area than necessary for a solar PV system size that matches the site's electrical load profile.
Roof pitch and orientation	To maximise the amount of electricity generated, solar panels should ideally be mounted facing north, and tilted to an angle above horizontal that is roughly equivalent to the latitude of the site.	While ultimately site specific, it is anticipated that most chicken farms will have a roof that would be considered acceptable – if not optimal – for hosting solar panels. Efficiency losses are incurred where solar panels face anywhere from due-west to due-east, and again for tilt angles greater or less than the latitude of the site. However, viable solar PV installations can still be achieved despite such sub-optimal orientations.
Shading	Systems should be installed in locations where no shadows will be cast across the solar panels, except during the early morning and late afternoon. Consider the possible impact of nearby trees, water tanks, grain silos, or any mechanical plant installed on the roof.	Due to the large roof-areas available, all chicken farms will likely have suitable sections of un-shaded roof.

Consideration	Requirement	Comment
Structural capacity	In order to avoid any costly structural upgrades to existing buildings, buildings should have sufficient capacity in their roof structures to accommodate the additional loads from a solar PV system. Buildings should be inspected by a certified structural engineer prior to system procurement.	For chicken growers, this factor will depend on the age and design of their sheds. Newer sheds, particularly those with steel structural elements, are more likely to be suitable. Older sheds, particularly those with timber structural elements are more likely to have limitations.
Electrical infrastructure	Ideally, the site will have a suitable electrical connection point (either a switchboard or distribution board) within close range of the solar system. The electrical connection point would be suitable for the chosen size of solar PV system without the need for any major upgrades (e.g. extension or replacement of a switchboard).	For farms that were built prior to 2007 and do require major upgrades to their existing electrical systems in order to incorporate the solar PV system, you may to upgrade all electrical systems on site to meet the latest Australian electrical wiring standards. Such upgrades could quickly make the solar PV business case non-viable.

6. Choosing an installer

One of the biggest challenges facing consumers in the residential and commercial solar PV market is how to choose an installer from the large number of companies offering solar PV supply and installation services. This Chapter aims to provide some guidance for chicken growers on how to go about this selection process.

Table 3 Installer selection checklist

#	Questions	check
Company Credibility		
1	Does the company have demonstrated capability and experience on similar sized projects?	☐
2	Can the company provide customer testimonials for recent projects?	☐
3	Have you checked the company's financial viability?	☐
4	Have you confirmed that the company is accredited by the Clean Energy Council (CEC) to design and to install solar PV systems?	☐
5	Can the company provide details regarding their Health and Safety Policy and any incident/accident reports?	☐
6	Does the company have sufficient insurances in place for Public Liability, Professional Indemnity, and Workers Compensation?	☐
Company Knowledge		
7	Has the company based their system sizing on a detailed load profile analysis for the site?	☐
8	Has the company reviewed your electricity retail agreement to identify any limitations that might be imposed?	☐
9	Is the company experienced in negotiating grid connection agreements with your local Distribution Network Service Provider?	☐
10	Has the company consulted your retailer regarding the potential impact on electricity prices of implementing solar PV?	☐
11	Has the company clearly explained the basis of their assumptions for current and future electricity prices in any business case they present to you?	☐
12	Has the company undertaken a detailed site inspection, including electrical infrastructure and structural assessment, to ensure their quotations are comprehensive?	☐

Product Quality		
13	Are the proposed products listed under the Clean Energy Council's list of approved products?[7]	☐
14	Are the proposed products from reputable suppliers who have proven quality assurance systems in place?	☐
Company and Product Longevity		
15	What sort of after-sales support is included within the quoted price? (e.g.12 months maintenance and defects liability service)	☐
16	Is the company likely to be in operation for a long period of time in order to support future concerns or issues? (consider the company's history, credit rating, and diversification of business services)	☐
17	Has the supplier clearly explained the product and performance warranties that are included in their offer?	☐
18	Are the proposed product suppliers likely to be able to honour their after-sales service and warranty claims? (e.g. product suppliers that operate across diversified sectors are more likely to exist in 25 years than those operating just in solar PV module or inverter production)	☐
Value for money		
19	Have you sought multiple quotations in order to get a range of offers?	☐
20	Has the company offered an all-inclusive quotation that guarantees there will be no hidden costs?	☐
21	What sorts of performance guarantees have been offered?	☐
22	Is there a clear process proposed for monitoring system performance to ensure any issues are identified in a timely manner?	☐
23	Have you sought independent financial advice regarding the risks associated with such an investment, and to understand what your minimum target investment return is?	☐

[7] https://www.solaraccreditation.com.au/solar-products.html

7. Next Steps

In the context of chicken farms, solar PV is only likely to be considered if there is an attractive commercial proposition for doing so.

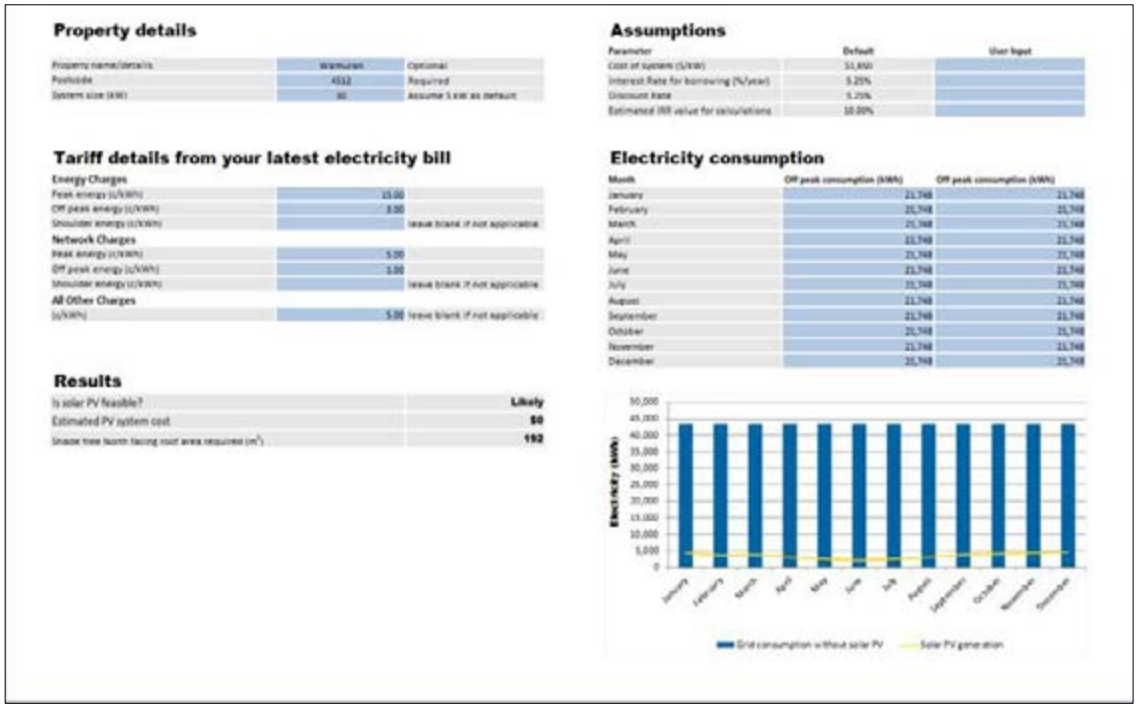
As noted in Chapter 3.6, the Case Studies (https://rirdc.infoservices.com.au/items/14-106) showed that the most significant factor affecting the viability of solar PV was the effective peak electricity tariff[8] being paid by the chicken growers. The geographic location of the farm is also important, as the amount of solar energy generation varies significantly across Australia (meaning a solar PV system installed in Queensland will produce significantly more energy than an identical system installed in Tasmania). Finally, there are a number of financial assumptions that will vary with each site, including system cost, the interest rate for any loans, discount rate, and acceptable rate of return.

In order to simplify the solar PV assessment process for growers, a simple interactive tool has been developed to accompany this Guide, allowing users to input this basic information about their property to get an indication of whether the commercial proposition is likely to be attractive for them.

This self-assessment tool is available on the RIRDC website (https://rirdc.infoservices.com.au/items/14-105).

Figure 4 provides a screenshot from the self-assessment tool.

Figure 4 Screenshot of self-assessment tool



Depending on the outcome from the preliminary assessment using this tool, growers can then decide whether they wish to investigate solar PV in more detail, using the resources within this Guide as a starting point.

Ultimately, the investment decision should be based on consultation with a qualified financial advisor.

[8] "Effective peak electricity tariff" defined in Chapter 3.4.1

8. Reference resources

8.1 Chapter 1 - About this guide

Davies, C., Maddocks, A., and Gaschignard, G. 2014. *"Two case studies of commercial viability for solar photovoltaic systems on meat chicken farms"* RIRDC Final Report on Project No PRJ 009278 (https://rirdc.infoservices.com.au/items/14-106)

McGahan, E., Davis, R. and Poad, G. 2013. *"Quantifying On-Farm Energy Usage in the Australian Meat Chicken Industry"* RIRDC Final Report on Project No PRJ-005770

8.2 Chapter 2 - Solar PV overview

Reference Resource	Description	Link
Guide to installing solar PV for business and industry	Comprehensive resource, including a detailed procurement checklist.	Downloadable from https://www.cleanenergycouncil.org.au/technologies/solar-pv.html
Information for Consumers	Useful starting point for anyone considering solar PV. Provides references to finding Accredited Installers, Solar PV Retailer Code of Conduct, and Grid Connection Guides for different states.	https://www.solaraccreditation.com.au/consumers.html
How solar PV works	Simple introductory information on how PV systems work.	https://www.solaraccreditation.com.au/consumers/purchasing-your-solar-pv-system/how-solar-pv-works.html
Solar PV costs and savings	Useful resource – includes factors that affect project costs.	https://www.solaraccreditation.com.au/consumers/purchasing-your-solar-pv-system/solar-pv-costs-and-savings.html

8.3 Chapter 3 - Electricity contracts and bills

Reference Resource	Description	Link
Key energy industry organisations	A summary of key DNSP and retailer contacts can be found on the Federal Government's Energy Made Easy website	http://www.energymadeeasy.gov.au/useful-contacts
What is an energy contract	A useful starting point for anyone interested in understanding their energy contract.	http://www.energymadeeasy.gov.au/understand-your-bill-and-contract/what-is-an-energy-contract

Reference Resource	Description	Link
What is a solar contract	Information regarding the different contracts that might be imposed on customers who install solar PV.	http://www.energymadeeasy.gov.au/understand-your-bill-and-contract/solar-contracts
Electricity tariffs and fees	A useful resource for anyone seeking to understand how their electricity bill is structured.	http://www.energymadeeasy.gov.au/understand-your-bill-and-contract/tariffs-and-fees-explained
Renewable Energy Target information	Information about the Federal Government's Renewable Energy Target, and the associated Large-scale and Small-scale renewable energy certificates available.	http://ret.cleanenergyregulator.gov.au/
Solar Feed-in Tariffs	An overview the feed-in tariffs offered around Australia at present for any excess electricity exported to the grid.	http://www.solarchoice.net.au/solar-rebates/solar-feed-in-rewards
30-minute interval data request	Example of one retailer's process for requesting 30-minute interval data for your property.	https://www.originenergy.com.au/3244/Interval-meter-data-request

8.4 Chapter 6 - Choosing an installer

Reference Resource	Description	Link
Guide to installing solar PV for business and industry	For more information, including a further checklist for use when choosing an installer, the Clean Energy Council has produced the "Guide to installing solar PV for business and industry", which can be downloaded from this site.	https://www.cleanenergycouncil.org.au/technologies/solar-pv.html

9. Glossary

Table 4 Glossary

Abbreviation	Definition
Effective peak electricity tariff	Sum of all consumption-based charges being paid by customers during peak periods
Feed-in-tariff	Special rate for electricity generated back into the grid from a specific technology (solar PV here).
kWp	The units kWp (kW-peak), refer to the rated DC size of the PV system. For example, a 30 kWp system, has 30 kW worth of PV modules (e.g. 100 x 300 W modules).
PV	Photovoltaic(s)
RIRDC	Rural Industries Research and Development Corporation

Solar guidelines for Australian meat chicken growers

by C. Davies, A Maddocks, and J. Gaschignard of GHD Pty Ltd.

Pub. No. 14/105

RURAL INDUSTRIES
Research & Development Corporation

Phone: 02 6271 4100
Fax: 02 6271 4199
Bookshop: 1300 634 313
Email: rirdc@rirdc.gov.au
Postal Address: PO Box 4776,
Kingston ACT 2604
Street Address: Level 2, 15 National Circuit,
Barton ACT 2600

www.rirdc.gov.au