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## INTRODUCTION

Solar panels have been installed on the roofs of houses and other buildings in Australia since the 1970s. The momentum has grown exponentially since the Australian Government introduced incentives for the purchase of small solar units to reduce reliance on supply from the electricity grid.

In 2007 the government committed to ensuring that 20 percent of Australia's electricity supply would come from renewable energy sources by 2020 by establishing the expanded national Renewable Energy Target (RET) scheme. Since November 2007, over 880,000 rooftop solar photovoltaic (PV) systems and over 560,000 solar and heat pump water heaters have received support under the RET scheme. This period of unprecedented growth has been driven by the upfront support under the scheme, rapidly declining system costs, a high Australian dollar, State and Territory feed-in tariffs and rising network prices.

Houses with solar systems use solar power first before sourcing electricity from the grid. State based schemes such as feed-in tariffs, where excess household energy from a solar electricity system is fed into the grid, have provided further incentive to install solar. Photovoltaic panels have no moving parts, require little maintenance and can be expected to last more than 20 years, but must be installed correctly to perform to their maximum efficiency. Grid-connected (GC) solar PV systems need an inverter to transform the DC electricity created by the photovoltaic panels into AC electricity suitable for ordinary household needs. When the panels are not producing electricity at night, electricity is supplied to the home from the electricity grid. For systems with an optional battery backup, the inverter regulates the charging of batteries. The electricity stored in the batteries can then be used at night or during blackouts.

## COLLECTION SYSTEMS

### *Solar Electricity*

Many factors impact on the type of solar collection system chosen. It is important that a holistic approach is adopted by designers, builders and homeowners when considering the most appropriate system for any site. Factors that may influence the design include:

- The orientation of the roof and the unshaded roof area available;
- The total hours of sunlight received in the area;

- The type and size of PV panels to be used;
- The generating capacity of the system to be installed (the bigger the system the more PV panels and the greater the roof area required);
- The type and size of any structure needed to support the panels;
- The type of roof cladding (steel, tiles, other) and the angle of the roof;
- Whether the system is connected to the grid or stand-alone;
- The visual aesthetics of the installations.

Solar PV panels are different to solar hot water systems, which are also mounted on household roof-tops but use the heat from the sun to provide hot water for household uses.



### *Solar Hot Water*

In early 2010, the Australian Government announced its Renewable Energy Bonus Scheme to assist households to reduce their carbon emissions. Under the Small-scale Renewable Energy Scheme, eligible solar water heaters and heat pumps are entitled to a number of Small-scale Technology Certificates (STCs). This is based on the estimated amount of electricity in megawatt hours (MWh) the system displaces over the course of its lifetime. The number of STCs a particular solar water heating model is entitled to create will depend on its installation date and geographic location identified through its postcode. As part of its National Strategy for Energy Efficiency the government also announced a phase out of greenhouse intensive electric hot water systems in new buildings from 2011.

**However on February 1st 2013, the Queensland Plumbing and Wastewater Code requirements mandating the installation of solar, heat pump or gas hot water systems in new houses (or when replacing a hot water system in existing houses) were repealed. Home owners can now install hot water systems that best suit their circumstances.**

A solar water heater uses energy from the sun to heat water. Water is heated by the sun as it passes through collectors located on the roof of a house. The main solar collector types are flat plate and evacuated tube. Evacuated tube systems are more efficient than flat plate systems in most situations but are also more expensive. They offer the benefit of being able to be individually replaced if a tube should fail, and their tubular shape and vacuum insulated characteristics mean they are directly exposed to the sun for longer than flat plate collectors. The heating of water in these systems is often supplemented by either electricity or gas. Storage tanks for solar hot water systems can be installed on-roof, in-roof or on the ground depending on the strength of the roof structure and the type of system selected. Solar hot water systems may also be used to supplement existing hot water systems such as off-peak systems and instantaneous systems.



## QUOTES AND CONTRACTS

In Queensland, the *Queensland Building and Construction Commission Act 1991* and the *Domestic Building Contracts Act 2000* determine the legislative requirements in relation to contracts for 'building work'. Essentially it is the nature of the building work to be performed (domestic or commercial), and for whom the contractor will be performing the work (i.e. dealing directly with the homeowner or sub-contracting to a principal contractor or commercial building owner), that determines the applicable legislation and the format of contract required. It is very important that contractors understand their contractual obligations and use appropriate contract documentation, as failure to do so may result in costly disputes, leave the contractor exposed to the risk of prosecution, or give rise to contract termination and loss of revenue.

## DOMESTIC BUILDING CONTRACTS ACT 2000

Domestic building work that is carried out directly for the homeowner and exceeds \$3,300 in value (inclusive of labour, materials and GST) is governed by the *Domestic Building Contracts Act 2000* (the DBC Act). The DBC Act requires that contracts meet a number of stringent mandatory conditions. Some of the key provisions of this legislation are listed below, however for further and more comprehensive details of this Act, Contractors should refer to the QBCC booklet titled 'Domestic Building Contracts Act 2000– What Contractors Need To Know', on the QBCC's website. Homeowners should refer to the QBCC's website [www.qbcc.qld.gov.au](http://www.qbcc.qld.gov.au)

Some key provisions are:

- Contracts must be in writing and signed by both parties.
- Deposits must not exceed a mandated maximum amount - namely 10% for work valued at less than \$20,000 and 5% for work valued in excess of \$20,000.
- Progress payment stages must be clearly defined and payment for any work shall not be made unless the work has been carried out.
- The contractor must provide the homeowner with a QBCC approved Information Statement and a signed copy of the contract within 5 business days of entering into the contract.
- The contract is subject to a 5 business day cooling off period to protect homeowners from high pressure salesmanship.
- Generally, variations must be recorded in writing and signed by the homeowner prior to the work being carried out.

***Cost plus contracts are unlawful in most situations.***

## QUEENSLAND BUILDING AND CONSTRUCTION COMMISSION ACT 1991

If a contractor has no direct contractual arrangement with the homeowner (e.g. either because the work is commercial or because the contract is a sub-contract with a principal contractor), the requirements of the *Domestic Building Contracts Act 2000* do not apply. Instead the provisions of Part 4A of the *Queensland Building and Construction Commission Act 1991* ("QBCC Act") have effect. These contractual provisions are less

onerous than those applying to 'domestic building work' and apply to building work valued at \$3,300 or more. Some key provisions of the QBCC Act include:

- A written contract is required for work valued at \$3,300 or more - or for work of any value if the work is undertaken by a contractor holding a QBCC licence in Plumbing and Drainage or Drainage.
- The obligation to have a contract in writing rests with both the principal contractor and the sub-contractor.
- The contract must include the scope of services to be provided, the contractor's name and licence number, the value - or the method by which the value of the contract will be calculated, the payment arrangements, any retentions or securities, the completion date, the address of the site of works and the need to record any directions given under the contract in writing.

Further information in relation to commercial contracts or sub-contracts can be obtained from the QBCC publication 'Contractual Obligations, Demerit Points and Bans' available on the QBCC's website at [www.qbcc.qld.gov.au](http://www.qbcc.qld.gov.au).



## CONTRACTS

Although it is possible to personally draft (with legal assistance) contracts compliant with the legislation, the easiest way to satisfy the legislative requirements is to use an appropriate contract that has already been developed and where appropriate, has an Information Statement already approved by the QBCC. The QBCC produces contracts for domestic building work and building work valued at less than \$3,300 and has these available at no charge for downloading from its website. Major industry associations also produce and offer for sale both commercial and domestic building contracts. The QBCC also produces subcontracts that are available for downloading free of charge at [www.qbcc.qld.gov.au](http://www.qbcc.qld.gov.au).

## QUEENSLAND HOME WARRANTY SCHEME

The installation of a solar hot water system or solar PV power system:

- only becomes work requiring payment of a Queensland Home Warranty Scheme premium when such work is included with other works (e.g. construction of a new home) and then is only covered for non-completion; and
- work performed in isolation (e.g. retro-fitting solar hot water systems or solar PV power systems to an existing building) does not require payment of a premium.

More information for contractors in relation to the Queensland Home Warranty Scheme can be obtained from the QBCC booklet 'Facts for Licensees' and for homeowners from the booklet 'Smart Building & Renovating.' This information is also available from the QBCC website at [www.qbcc.qld.gov.au](http://www.qbcc.qld.gov.au).



## QBCC LICENSING REQUIREMENTS

### *Solar hot water systems and photovoltaic solar panels*

This information does not replace anything contained in the *Queensland Building and Construction Commission Act 1991* or the *Queensland Building and Construction Commission Regulation 2003*.

Under that legislation, the installation of solar hot water systems and photovoltaic solar panels constitutes 'building work'. This means the person undertaking installation of these items is required to hold an appropriate QBCC licence as listed below. If you are required to be licensed and are not, you may not be entitled to payment and may be prosecuted by the QBCC.

### *Installation of solar hot water systems*

(Solar hot water systems include any part of a water heating system designed to heat water using light or heat from the sun)

For the installation of a solar hot water system, a QBCC contractor licence in one of the following classes is required:

- Builder Open;
- Builder Medium Rise;
- Builder Low Rise;
- Plumbing and Drainage

The holder of an unrestricted Queensland electrical contractor's licence may install solar hot water systems without a QBCC licence where:

- the electrical contractor carries out only the part of the work that is electrical work; and
- the part of the work that is not electrical work is carried out by a person who holds a QBCC contractor's licence of the appropriate class for the non-electrical work, and is engaged by the electrical contractor to carry out that non-electrical work.

**Note:**

**Only a QBCC licensed plumber with the appropriate Plumbing Industry Council occupational licence and endorsement can install, replace, test, repair and maintain the non-electrical components of solar and heat pump hot water systems. Only an appropriately licensed electrical contractor can carry out the electrical work.**

**Installation of photovoltaic solar panels – on roofs or attached to a building.**

A QBCC licence is required to install photovoltaic solar panels situated on roofs or attached to a building, where the value of the work exceeds \$3,300. *Value of building work means an amount representing the reasonable cost to a consumer of having the work carried out by a licensed contractor on the basis that all building materials are to be supplied by the contractor (whether or not the work is in fact carried out by a licensed contractor on that basis).*

A licence in any of the following is appropriate:

- Builder Open;
- Builder Medium Rise;
- Builder Low Rise;
- Carpentry;
- Roof and Wall Cladding;
- Roof Tiling;

- Plumbing and Drainage;
- Structural Metal Fabrication and Erection.

The holder of an unrestricted Queensland electrical contractor's licence may install photovoltaic solar panels without a QBCC licence.

The installation of freestanding photovoltaic solar panels which are not attached to a building is not considered to be building work and a QBCC licence is not required.

**Note:**

**The contracting entity must hold either a QBCC licence or an unrestricted electrical contractor's licence. If your company engaged licensed electrical contractors to perform the work, your company must still hold a QBCC or unrestricted electrical contractor's licence.**



**CLEAN ENERGY COUNCIL ACCREDITATION**

**As well as a QBCC and/or occupational licence, contractors will need to be accredited by the Clean Energy Council of Australia before they can install solar PV systems.**

**Benefits of accreditation**

Several government initiatives exist to encourage consumers to adopt renewable energy technologies, including solar photovoltaic power systems.

For example:

**Renewable Energy Certificates (RECs)**

Renewable Energy Certificates created in the REC Registry for solar Small Generation Units must contain a CEC accredited designer and installer number. This means that the unit must have been designed and installed by a person accredited for stand-alone and/or grid-connected photovoltaic power systems under the Clean Energy Council Accreditation Scheme.

In June 2010, the Federal Government announced amendments to the RET scheme. As part of these changes, the scheme was split into two parts:

1. the Small-scale Renewable Energy Scheme (SRES) which covers small-scale technologies such as solar panels and solar hot water systems;
2. the Large-scale Renewable Energy Target (LRET) which covers large-scale renewable energy projects like wind farms, commercial solar and geothermal.

Following these changes, RECs created under the Small-scale Renewable Energy Scheme are now called Small-scale Technology Certificates (STCs), while RECs created under the Large-scale Renewable Energy Target continue to be called RECs.

## Solar Credits

The Solar Credits scheme for solar PV systems is based on the REC scheme, but multiplied the number of RECs able to be created for a solar PV system for up to 1.5kW of system capacity, by a pre-determined multiplier. This multiplier has been removed by the Australian Government from the first of January 2013. Solar Credits will be phased out entirely by July 2014.

Solar Credits created in the REC Registry for solar Small Generation Units must contain a CEC Accredited Designer & Installer Number.

### NOTE:

**Accreditation is a qualification that is available to individual solar photovoltaic power system designers and installers only. In this regard, it differs from Clean Energy Council membership, which is only available to business entities.**

## Approved products

The Clean Energy Council has a list of solar panel and inverter models that meet Australian standards. In order to receive STC's installers must use products from the CEC approved products lists.

## Standards

In addition to the Building Code of Australia, the relevant standards for design and installation of solar PV systems are:

### **AS 4509 Stand-alone power systems**

Part 1 Safety requirements

Part 2 Design guidelines

Part 3 Installation and maintenance

### **AS 4086 Secondary batteries for SPS**

Part 2 Installation and maintenance

## **AS/NZS 5033 Installation of photovoltaic (PV) arrays**

A copy of the standards can be purchased from SAI Global at <http://infostore.saiglobal.com/store/> or by calling 131 242.

If you're a CEC accredited installer you MUST have and use a copy of these standards.

Other relevant standards include:

- **AS/NZS 3000 Electrical Wiring Rules**
- **AS 1768 Lightning Protection**
- **AS/NZS 1170.2 Wind Loads; and**
- **AS4777 Grid Connections of Energy Systems via Inverters**

## **BUILDING APPROVAL AND CERTIFICATION OF SOLAR PV SYSTEM INSTALLATION.**

At present, there is some confusion within the building industry around whether a building approval is needed for installation of photovoltaic panels. The current and prevailing interpretation by Building Codes Queensland (BCQ) is that these installations are generally self-assessable. That is, they can be assessed for compliance with the Building Code and relevant standards by the person undertaking the work.

In order to remove any confusion BCQ has released and is consulting on draft legislation that is more explicit. It is proposed that the installation of all solar panels will be self-assessable unless they do not comply with the applicable regulation. In order to comply with the new regulations, installations will need to be:

- Parallel to the roof surface
- Elevated not more than 300mm above the roof surface (no pitched frames)
- Less than two times the elevated height from the roof edges

If an installation does not comply with these requirements it will become assessable development requiring building development approval.

Because some panels are fixed so high that they can be unsightly and have an adverse effect on the amenity of neighbouring properties, consideration is also being given to amending the Sustainable Planning Regulation (SPR) to allow local governments to apply amenity and aesthetic provisions through a planning scheme. If a planning scheme refers to this issue, it will be able to address the potential amenity and aesthetic impacts of solar panels on a particular locality.

Solar hot water system installations are similarly generally self-assessable and will also require plumbing

approval, however are 'notifiable plumbing work'. Notifiable work can be undertaken by a licensed plumber without prior approval however the plumber must notify the Plumbing Industry Council of the work within 10 business days of completing it through lodgement of a Form 4 and payment of applicable fees.

**Note: Care must be exercised to ensure that the installation of PV and solar hot water panels and tanks do not adversely affect any existing constructions such as the roof frame to the extent that they are incapable of withstanding the effects of any additional implied loads.**

## CONSTRUCTION

### Generally

When installing photovoltaic power generation systems or solar hot water systems a number of design and construction issues need to be considered including;

- The structural performance of the systems to ensure that they will not damage the supporting structure or become dislodged in a high wind situation, thereby also becoming flying missiles and posing a risk to life safety.
- The compatibility of components with other building elements, to ensure that incompatibility (e.g. corrosion due to dissimilar metals) will not lead to rapid deterioration of panels or other parts of the structure.
- Installation techniques that do not compromise the ability of the roofing system to remain weather-tight in accordance with the amenity requirements of the Building Code of Australia; and
- The ability to resist hail and other impact as might occur in certain parts of Australia. These issues are not unique to PV and solar water heating systems and apply equally to many other building components, particularly those that are retrofitted or installed subsequent to completion of the home or building. Accordingly, various sections of the BCA act to define the regulatory requirements to ensure that such installations do not compromise the structural integrity, durability or amenity of the structure.

### Structural performance

The primary loads applied to PV and solar systems in Australia are wind loads generally in an upward direction. This places great importance on not only

the PV or solar structure itself but also on the fasteners and other components crucial to ensure that the system remains attached to the structure below.



*Evaluation of this system should include panels, supporting structure and connection to roof.*

In order to more accurately determine the potential loads that these systems and their fixings are likely to experience, the Cyclone Testing Station of James Cook University undertook a series of wind tunnel tests to develop net pressure coefficients for solar systems including their supporting structure. These net pressure coefficients have been incorporated into AS1170.2 to provide guidance for designers and engineers designing such systems. Whilst this information will assist by providing guidance to designers there is still a need to develop evaluation methods that demonstrate systems comply. The Cyclone Testing Station recently completed a draft proposal for an evaluation method for the structural performance of solar systems when subjected to wind loading. This was submitted for consideration as an Appendix to AS 5033:2012 "Installation and safety requirements of photovoltaic (PV) arrays".



*Fixings at close spacing to resist wind loads*

It is currently on circulation to the relevant Standards committee for comment. The incorporation of the proposed Appendix in AS5033 should help to ensure that solar systems can be safely installed anywhere on a roofing system within Australia. It is worth noting, however, that any such evaluation is normally limited to the performance of the solar system and its immediate fixings to the structure below.

## Material compatibility

Compatibility of metals in contact or in close proximity to each other is detailed in various sections of the BCA but most relevantly in the Roof Cladding section of Volume 2, table 3.5.1.2 and in AS 1562 - Design and Installation of Sheet Roof and Wall Cladding - Metal. Materials used in the solar systems or their fixings must be checked for their compatibility with materials and fasteners on the supporting roof structure or where water may, for example, run over the PV system before discharging onto metal surfaces below. In some circumstances separation strips preventing close contact between differing metal materials may be necessary.



All fixings securely tightened (note black strip to separate different metals)

## Weather-tight installations

Suitable weather-tight flashings and cappings to penetrations for fasteners and service pipes will vary depending upon the type of roof covering on the existing structure. The system used however must, in addition to being weather-tight, be durable, able to resist expansion and contraction of adjoining materials and should not rely solely on sealants.

## Ability to resist hail and other impact.

Test methods to ensure that panels are able to offer a reasonable level of resistance to hail and other impacts are currently under consideration.

## Summary and recommendations

- Both builders and consumers should seek advice from system manufacturers to ensure that any manufactured system for installation in Queensland provides installation details for the wind region applicable to the site that clearly details the type, number and location of fixings and connections for

the panels and supporting brackets and rails including connection to the structure below.

- Unless the suitability of existing supporting constructions can be adequately assessed by the builder or designer, engineering advice should be sought regarding the potential affect the installation of the solar system and any associated water tank will have on the existing structure.
- The composition of materials used in the manufacture of the systems and associated connectors and fasteners should be obtained from the manufacturer and assessed for compatibility with existing adjacent or downstream materials used on the existing structure.
- The ability of the existing structure to remain weather-tight around any fasteners and fixings should be maintained through good construction practice based on recommendations for flashings, cappings and sealants specified by the relevant existing roof cladding manufacturer or as detailed in the BCA.
- Until adequate testing methods are developed regarding resistance to hail and other impacts this advice should be sought from the manufacturer and should include the basis or test method used to determine the advice.

## QUEENSLAND SOLAR BONUS SCHEME FOR CONSUMERS

The Queensland Solar Bonus Scheme rewards eligible households and other small electricity customers that install solar power (photovoltaic) renewable energy systems by paying them for the excess electricity they generate and return to the grid.

The Queensland Solar Bonus Scheme is a **net tariff scheme** which means that at any point in time when your household consumes less electricity than your PV system is generating, you are paid for the surplus electricity that is fed back into the grid. The Scheme is scheduled to end on 1 July 2014.

## Key eligibility

To be eligible for the Queensland Solar Bonus Scheme feed-in tariff, you must:

- consume less than 100 megawatt hours (MWh) of electricity a year;

- purchase and install a new solar power system or operate an existing system that is connected to the Queensland electricity grid;
- generate surplus electricity that is fed into the Queensland electricity grid;
- have an agreement in place with your electricity distributor (Ergon Energy, ENERGEX or Country Energy) and have appropriate metering installed;
- have a solar PV system with a capacity that does not exceed 5 kilowatts (kW);
- hold an electricity account with an electricity retailer; and
- submit only one application per eligible premises.

Homeowners, landlords, renters and small businesses are eligible to apply. Renters should check with their landlord before installing solar power systems. A number of other conditions apply. Check your eligibility on the Queensland Government Office of Clean Energy website.

## MONETARY REBATES

### Feed-in tariff

The Queensland government offers a feed-in tariff for excess electricity returned to the grid by homeowners. This tariff is currently 8 cents per kWh (July 12 2013) and is calculated as a net input. It is calculated by deducting the amount of electricity used from the amount input. The homeowner receives a rebate of 8 cents for each kilowatt hour of electricity returned to the grid in excess of usage.

Your electricity bill will be credited at a rate of 8 cents per kilowatt hour (kWh) for the surplus energy you feed into the grid. When your meter is read, the amount of surplus electricity exported to the grid and the amount imported from the grid will be passed onto your electricity retailer. Any surplus will be credited to the electricity account for the property where the system is installed.

### Renewable Energy Certificates (RECs)

*(known as STCs since the advent of SRES in June 2010)*

STCs are an electronic form of currency created by the *Renewable Energy (Electricity) Act 2000* (also known as the RET scheme). One REC is equivalent to one megawatt hour of electricity generated by solar PV Small Generation Units. The price of RECs changes

according to market conditions. Owners of solar PV power systems can register, sell, trade or surrender RECs for Small Generation Units up to 100kW.

You could also be eligible for financial assistance to help with the cost of installing a small-scale solar system under the Australian Government's Small-scale Renewable Energy Scheme.

### Next steps

The full implications of any proposed installation must be considered before proceeding. Further information can be obtained from the Department of Energy and Water Supply on 13 43 87.

Feed-in credits or payments may have implications if any Centrelink or other benefit payments are received. They may also be considered as assessable income by the Australian Taxation Office.