RACE for 2030

RELIABLE
AFFORDABLE
CLEAN
ENERGY

# Renewable energy

## A guide for business

August 2022

Australian Government
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Cooperative Research Centres Program

**Final Report**

Capacity Building

**Renewable energy**
A guide for business



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**Disclaimer**



**What is RACE for 2030?**

Reliable, Affordable Clean Energy for 2030 (RACE for 2030) is an innovative collaborative research centre for energy and carbon transition. We were funded with $68.5 million of Commonwealth funds and commitments of $280 million of cash and in-kind contributions from our partners. Our aim is to deliver $3.8 billion of cumulative energy productivity benefits and 20 megatons of cumulative carbon emission savings by 2030.

racefor2030.com.au

**Sustainability Advantage**

Sustainability Advantage is the NSW Government's flagship business support program partnering with large and medium organisations to build confidence and ambition for accelerated action to improve sustainability. It provides practical support, access to curated resources and networks, facilitates strategic collaborations and unlocks other opportunities across four key priority areas: Circular Economy, Net Zero Emissions, Nature Positive and the United Nation Sustainable Development Goals.

To assist its members in the transition to Net Zero, Sustainability Advantage has developed the Net Zero Emissions Leadership Accelerator (Accelerator). The Accelerator has been designed to give participants the foundational theory to develop an organisation's net zero pathway. It also provides access to industry experts and practical support via guided discussions and one-to-one coaching to inspire ambition and assist organisations to achieve net zero commitments and targets.

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# Executive Summary

This guide helps businesses operating in Australia understand possible pathways to reduce scope 2 emissions. It was developed throughout the course of the Sustainability Advantage Net Zero Emissions Leadership Accelerator, a capacity building program for high emitting and committed organisations, providing them with the technical skill and knowledge to develop net zero emissions pathways and strategies for their organisations.

This guide provides ideas for actions that you can take to minimise your organisation's carbon footprint, and fundamental knowledge and definitions for you to make informed business decisions. It contains answers to program participants' most commonly asked questions and aims to share this knowledge with other businesses.

The information contained in this guide was compiled through extensive engagement with various equipment and service providers, industry experts and large energy users. We thank them for their voluntary contributions to the project.

# Contents

# Preface

In 2021, the total greenhouse gas emissions generated in Australia (excluding the offsetting impact of Land Use, Land-Use Change and Forestry) were 527.4 $MtCO_2e$. Out of which, 160.4 $MtCO_2e$ was attributed to the generation of electricity, and 102.6 $MtCO_2e$ to the conversion of other types of stationary energy (e.g. burning gas for heating purposes).[1] As such, roughly half of Australian emissions can be attributed to the generation and conversion of various types of energy. Decarbonising this sector is a major step in bringing Australia to carbon neutrality within the timeframe required to meet Australia's global commitments to reduce greenhouse gas emissions 43% below 2005 levels by 2030 and achieve net zero emissions by 2050.[2]

In the past decade, the world has observed enormous growth in the number of net zero emissions targets set by governments and the private sector. Major companies around the world have published detailed strategies on minimising their impact on the environment and engaged in voluntary public reporting of their greenhouse gas emissions. In Australia, ninety-five of the ASX200 companies are now publicly committed to achieving net zero emissions by 2050 or sooner (Figure 1). Collectively, these companies account for more than two thirds of the ASX200 market capitalisation, which means that over $1.59 trillion is now covered by net zero commitments.[3] Companies who champion the change, lead the industry. Those who choose to stay behind already experience the scrutiny of media, investors, suppliers, clients, and the broader public, which is likely to intensify as the world gets 'cleaner'.

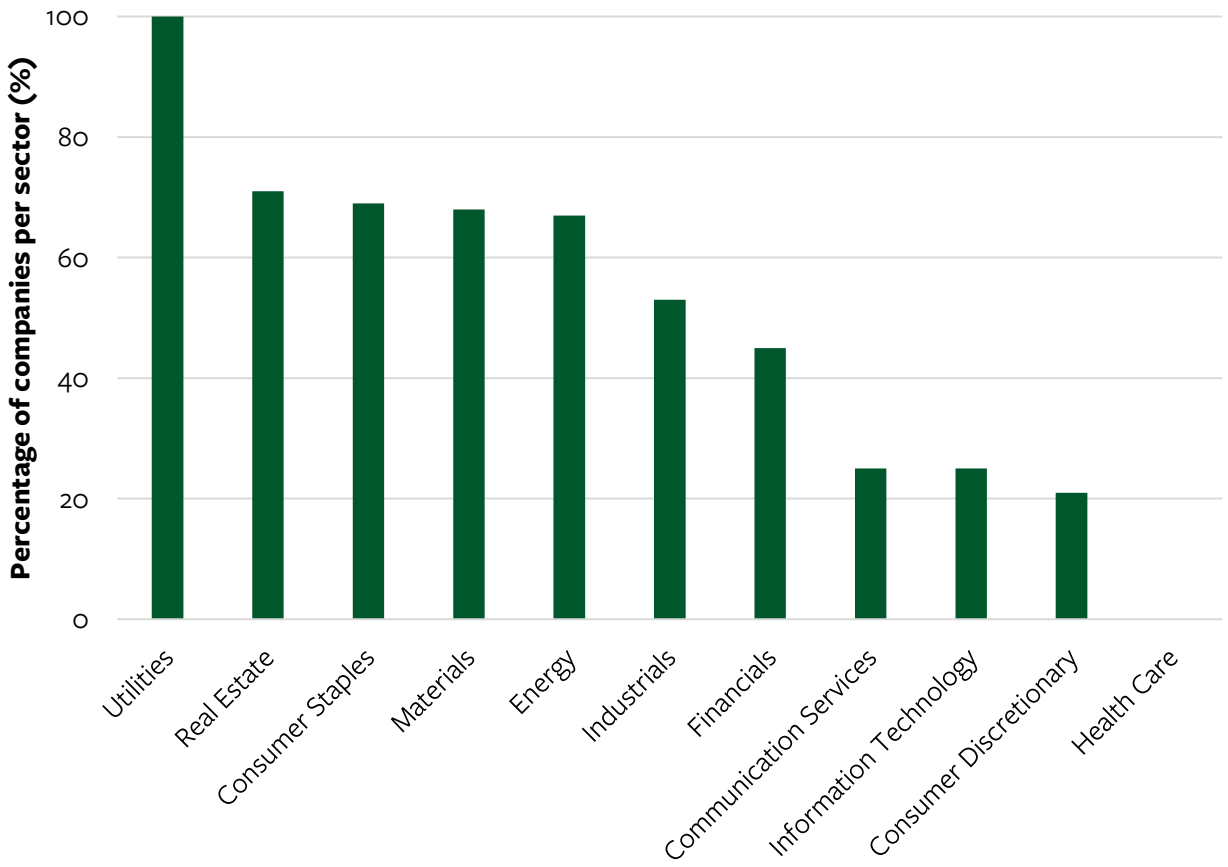
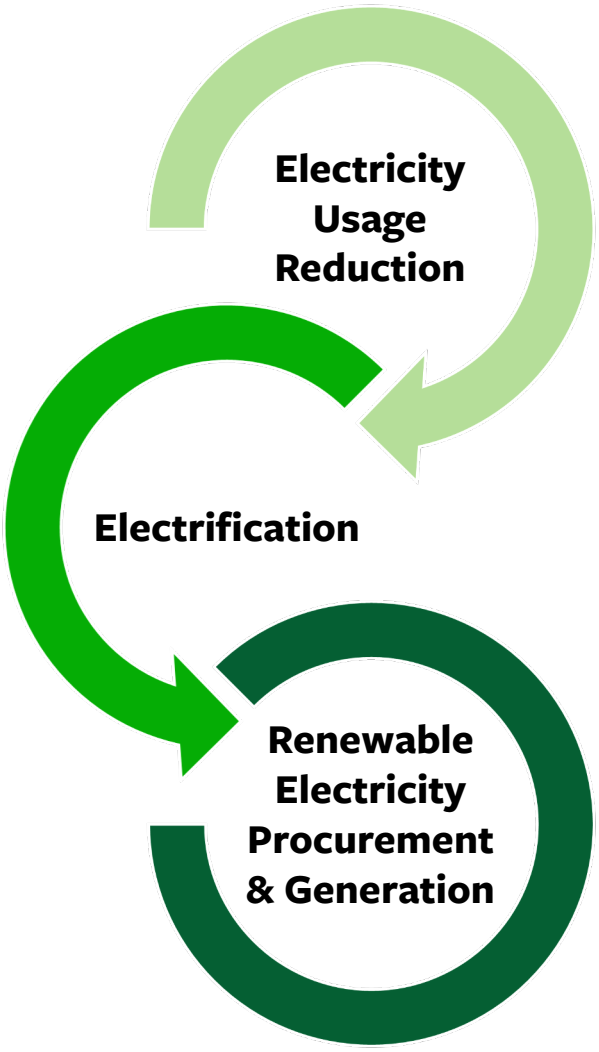



**Figure 1. Percentage of ASX200 companies with net zero targets per sector. Adapted from: ACSI.**[3]

# 1 The journey

You may find that electricity is the major, or one of the major, contributors to the emissions footprint of your business. With increased pressure on electrification caused by the phasing out of fossil fuels (such as petrol and gas), addressing scope 2 emissions will soon become even important.

The journey to eliminating scope 2 emissions is a positive one – all of the technical solutions needed to do so are commercially available and are very often financially incentivised by local, state and federal governments. Solutions described in this guide often bring significant operating cost reductions while decreasing the carbon footprint of businesses. This guide is designed to help you understand the benefits of scope 2 emissions reduction and leaves you with only one question: Why not?




## Scopes of emissions

**Scope 1** emissions are direct emissions from sources that are owned or controlled by the company.
*Examples: combustion of fuels used in owned or controlled boilers, furnaces, vehicles.*

**Scope 2** emissions are indirect emissions from the generation of purchased energy.
*Examples: generation of purchased electricity, steam, heat, or cooling.*

**Scope 3** emissions are all indirect emissions (not included in scope 2) that are a consequence of the activities of the company but occur from sources not owned or controlled by the company.
*Examples: water use, waste generated, staff commute, emissions embodied in purchased products.*

**Definitions sourced from: GHG Protocol.**[4]

# 2 Electricity usage reduction

## 2.1 Why reduction is important

Reduction of electricity usage brings immediate cost savings to businesses and helps build internal support for decarbonisation within the leadership. The payback times for energy efficiency upgrades are usually much lower than for renewable energy procurement and generation. Additionally, electricity is often the main source of emissions of Australian businesses and usage reduction can significantly decrease the overall carbon footprint of businesses.

## 2.2 How to reduce usage

State government grants financially support a broad range of energy efficiency upgrades. The grants have a facility-based focus – even if a business operates in many states (or globally), the grants will help to improve the energy efficiency of a particular facility, operating within a particular state. The Energy Savings Scheme can be used for facilities located in New South Wales,[5] and the Victorian Energy Upgrades program for facilities located in Victoria.[6]

Eligible activities may include:[7]

- Modifying end-user equipment or the way it is used (including installing additional components)
- Replacing end-user equipment with other end-user equipment that consumes less energy
- Installing new end-user equipment that consumes less energy than other comparable end-user equipment
- Selling new end-user equipment that consumes less energy than other comparable end-user equipment
- Removing end-user equipment so that energy consumption is reduced, as long as there is no negative effect on production or service levels.

Regular maintenance of equipment is important for energy efficiency, but it is not covered by the above grants. Equipment should be serviced on regular basis to reduce energy costs.

Practical examples of usage reduction projects include:

- Replacing lightbulbs and fluorescent tubes with light emitting diodes
- Heating, ventilation or air-conditioning system upgrades or optimisation
- Introducing building management controls, such as motion controls for lights or occupant sensors for air-conditioning
- Purchase of equipment that is more energy efficient, such as hot water systems, refrigerators, freezers, motors and variable speed pumps
- Changing windows to double glass.

In general, any upgrade can be considered under the above grants, as long as it brings a measurable energy usage reduction to the business, without compromising on the size of production.

## 2.3 How to make changes within limited budgets

For bigger projects, some equipment suppliers provide an option to install the energy efficient equipment in a client's facilities with no upfront cost – this is called 'Energy as a Service'. In this arrangement, the equipment supplier takes on the full cost of providing, installing, and maintaining the installed equipment. The calculated savings from the upgrade are split between the equipment supplier and client: roughly 50–85% of the savings goes to the equipment supplier to recover the cost of the equipment. These contracts are usually 5–10 years

long (depending on the capital cost and energy savings), after which, the equipment can belong to the client (more common) or supplier, depending on the negotiated contract. Over the contract length, the client must own the building or the next tenant must take over the contract (an agreement of the building's owner is required) or the client must purchase the equipment when moving out (the residual cost decreases every year and should be described in the contract).

## 2.4 Ideas for reducing energy costs

To identify energy efficiency opportunities, you may opt to undertake an external energy audit. There are three standards that describe the minimum requirements for commissioning and conducting different types of energy audits in Australia:

- AS/NZS 3598.1:2014 (commercial buildings)[8]
- AS/NZS 3598.2:2014 (industrial and related activities)[9]
- AS/NZS 3598.3:2014 (transport related activities).[10]

Energy audits are delivered by experienced consultants who perform a site inspection, analyse electricity data and can even install temporary electricity sub-metering devices on specific equipment to identify opportunities for cost savings. An expected cost for such an audit varies according to the size of the facility (indicative prices for small facilities are from $15,000 to $20,000, and up to $50,000 for large facilities), plus the cost of equipment replacement or process changes implementation. The identified opportunities can often cut energy costs by 5–10%. An approximate payback time for energy efficiency improvements with an energy audit service is 2–5 years, depending on the identified changes, which is often shorter than payback times for on-site renewable energy generation.

An energy audit is an excellent investment for older facilities and larger buildings. The energy audit of a single-floor office would most likely not bring sufficient energy savings to recover the cost of the service.

# 3 Electrification

## 3.1 Why electrification is important

Businesses electrify their assets to reduce their scope 1 emissions, as it is often the easiest, or even the only, way to do so. Keeping in mind that this process increases organisations' scope 2 emissions, businesses simultaneously engage in green energy procurement and on-site generation to deliver an overall emissions reduction.

Electrifying assets early allows you to better understand the future demand on renewable electricity that needs to be sourced or generated to reach carbon neutrality. An on-site solar photovoltaic system is sized to a particular demand profile of a business to maximise cost savings. Changes to electricity consumption will change the daily demand profile and affect the size of the system required to meet the demand. Similarly, power purchase agreements are sized to an annual electricity demand of a business. Future electrification (if not accounted for) can pose the risk of insufficient renewable energy sourced from the market to meet publicly pledged targets on renewable energy usage and business decarbonisation.

Electrification initiatives very often have longer payback times than energy efficiency initiatives. Some initiatives may unfortunately increase operational costs and will never make financial sense if the electricity price paid by the business is high and on-site renewable energy generation is insufficient. However, the real value of these projects lies in the environmental benefits, including, but not limited to, enabling decarbonisation, cleaner air and noise reduction.

Significant electrification investments often require high capital expenditure, therefore, are usually implemented when the current equipment is close to the end of its lifespan and replacement the only option. Replacing a relatively new piece of equipment allows for the recovery of some investment costs through the resale price of the old equipment. However, at the same time, emissions generated by the old equipment are simply shifted from the carbon account of one organisation to another one. Hence, the investment does not contribute to the decarbonisation of Australia.

Emissions embodied in the new (electrified) equipment as well as the end-of-life treatment of the old equipment should be considered while electrifying the existing assets, as they will be accounted for in the scope 3 emissions inventory of a business undergoing electrification.

Practical examples of electrification projects include:

- Electrification of gas-powered equipment (cooking and heating)
- Electrification of diesel-powered equipment
- Electrification of fleet
- On-site EV chargers which can be used by clients, staff or fleet.

# 4 Renewable electricity procurement and generation

There are many different strategies to procure renewable electricity. They can, and often should be, mixed and matched to fill the needs of a particular business. Strategies described in this guide include the procurement of GreenPower, on-site solar electricity generation, on-site power purchase agreements and the trading of renewable and carbon certificates.

More site-specific options are available to businesses depending on their activities. You can identify these opportunities through an energy audit, performed by external consultants. Large energy users can also source renewable electricity through off-site power purchase agreements, which are described in detail in Best Practice Corporate Power Purchase Agreement Guide developed by the Business Renewables Centre Australia.[11]

Choosing the right way to source renewable electricity is not an easy task. You should consider a range of parameters when making a strategic decision to reduce or eliminate scope 2 emissions, including the time commitment, investment-related risks, internal expertise, and timeframe needed to implement the strategy. Having a basic knowledge about the business can help you to narrow down the choices (Figure 2).

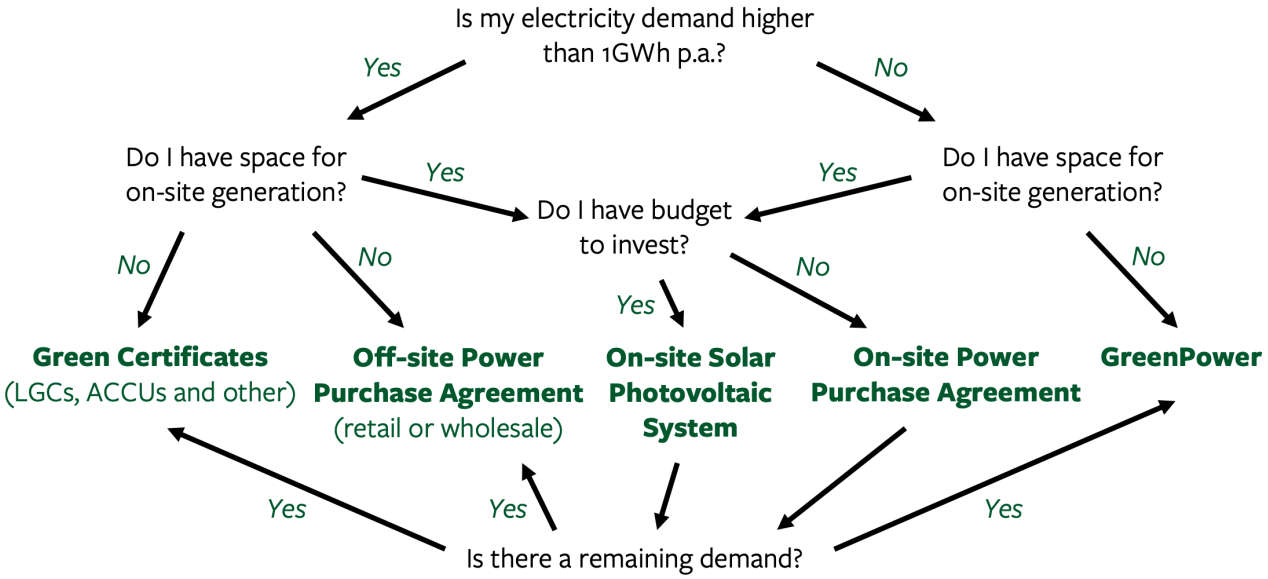



**Figure 2. Renewable electricity procurement and generation - a decision tree.**

## Carbon neutral versus renewable electricity

**Renewable electricity** is sourced from renewable sources, such as wind, solar and hydro. It is deemed zero emissions and carbon neutral.

**Carbon neutral electricity** can be generated through any source, including fossil fuels, as long as emissions generated through this process are zero or are neutralised by surrendering carbon offsets.

Carbon neutral electricity is a broader term that includes renewable electricity.

Table 1 provides a summary of opportunities for renewable energy sourcing and generation, together with basic characteristics of each opportunity.

**Table 1: Characteristics of renewable electricity sourcing options.**

| Opportunity | Annual energy use | Ongoing time commitment | Time needed to set up | Payback | Complexity | CAPEX/OPEX[a] |
|---|---|---|---|---|---|---|
| **Energy efficiency** | All | Low/medium | <1 year | 0–6 years | Low | CAPEX and (lower) OPEX |
| **GreenPower** | <1 GWh | Low | Instant | N/A (added OPEX) | Low | OPEX |
| **On-site solar photovoltaic system** | All | Low | <6 months | 2–5 years (small-scale)<br>4–8 years (large-scale) | Medium | CAPEX |
| **On-site PPA**[b] | All | Low | <6 months | 0 years (reduced OPEX) | Medium | OPEX |
| **Retail PPA**[b] | <40 GWh | Medium | <1 year | N/A (bespoke contracts) | Medium | OPEX |
| **Wholesale PPA**[b] | >40 GWh | High | 1–5 years | N/A (bespoke contracts) | High | OPEX |
| **LGCs**[c] **broker** | >1 GWh | Low | Instant | N/A (added OPEX) | Low | OPEX |
| **LGCs**[c] **DIY** | All | Medium | Instant, or <6 months if registrations are required | N/A (added OPEX) | Medium | OPEX |
| **ACCUs**[d] **broker** | >1 GWh | Low | Instant | N/A (added OPEX) | Low | OPEX |

[a] CAPEX = Capital Expenditure, OPEX = Operating Expenses
[b] PPA = Power Purchase Agreement
[c] LGCs = Large-scale Generation Certificates
[d] ACCUs = Australian Carbon Credit Units

## 4.1 Electricity emissions accounting methodologies

Two methods can be used to account for electricity-related emissions: a location-based approach and market-based approach. The size of scope 2 emissions will differ depending on the method chosen. Under some voluntary emissions reporting standards (such as Climate Active[12]) businesses are required to present results obtained by both methods and, subsequently, provide reasoning why they believe one reflects their real carbon footprint better. Some reporting standards (such as Science Based Targets Initiative[13]) allow businesses to use only one method of their choice, as long as it is used consistently every year. In Australia, the National Greenhouse and Energy Reporting scheme[14] only recognises the location-based method.

The location-based method of accounting for electricity emissions reflects the carbon-intensity of the electrical grid that a business is connected to. In this method, all electricity sourced from the grid during the reporting period (measured by reading the gate meter) is multiplied by an emission factor of the local grid. The emission factors of the electrical grid in each state or territory of Australia are updated annually by the Department of Industry, Science, Energy and Resources.[15]

Under the location-based method, all electricity generated and consumed on-site (behind the meter) is excluded from reporting and the emissions account. As an example, electricity generated by solar panels on your roof, that is consumed by your building, will not be accounted for in this method. This is because the flow of electricity between the solar panels and the building is not registered by the gate meter connecting you with the electrical grid. The location-based method also does not recognise the emissions reduction benefits of purchasing and surrendering Large-scale Generation Certificates by the business, the GreenPower sourced, or power purchase agreements signed by a business.

In contrast, the market-based method of accounting for electricity emissions reflects the emissions intensity of electricity purchased by the business. It recognises the benefits of renewable energy certificates, GreenPower contracts and power purchase agreements signed by a business. This method is preferred by decarbonising companies, as it provides a recognition for emissions reduction efforts of a business. Under this method, all electricity sourced from renewables or offset by Large-scale Generation Certificates is considered carbon neutral. The remaining balance of the electricity usage is multiplied by a residual mix factor of the grid to calculate scope 2 emissions, which is not state-specific, it represents an average value for the Australian national grid. Climate Active published a detailed report on both methods used for electricity emissions accounting.[16]

## 4.2 GreenPower

GreenPower[17] is an Australian government-accredited program which allows electricity providers to purchase renewable electricity certificates on behalf of their client. From a business perspective, it works just like a standard retail contract, but with a higher price for every kWh (adding approximately 4–6 cents on every kWh). GreenPower purchasing allows you to fulfill targets towards renewable electricity consumption and carbon neutrality. The program is recognised by other institutions, such as 100RE[18] and Climate Active[12] as zero emissions electricity. This product is 'hassle-free' and very flexible – there is no minimum or fixed demand required to opt in. Additionally, you can choose a percentage of total electricity usage to come from accredited GreenPower to meet specific targets each year. A full list of GreenPower providers is published on GreenPower' website.[19]

GreenPower is a good choice for:

- Businesses or facilities who are small energy users, who cannot fully cover their electricity demand by installing solar and battery systems, and do not have enough staff to manage trading LGCs on their own

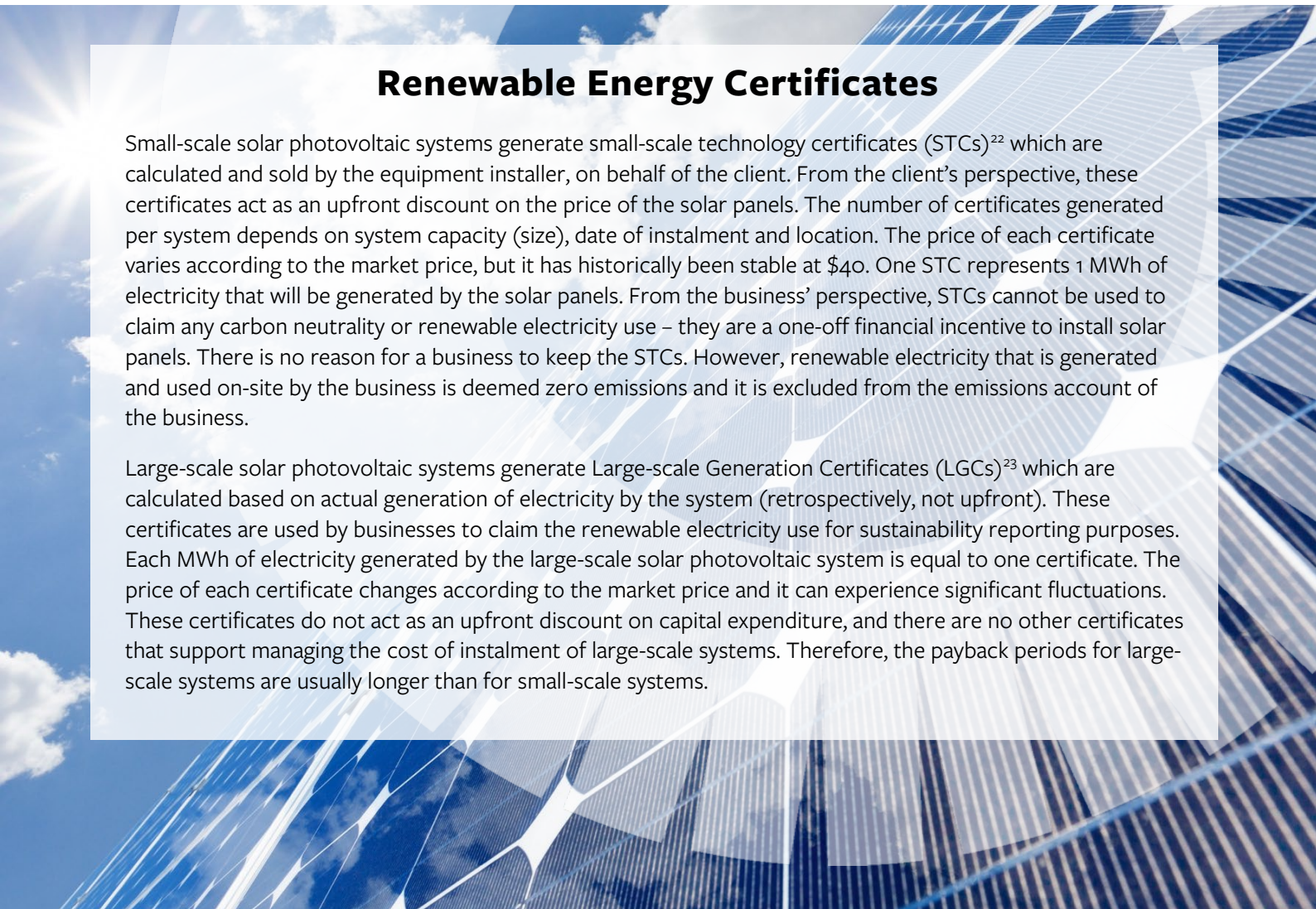
- Businesses whose energy usage is very unpredictable, and they cannot commit to signing a power purchase agreement for a specified demand (e.g. significant project-based usage variations)
- Large energy users who are already covering the majority of their energy usage through on-site renewable electricity generation or a power purchase agreement but need to 'top-up' the remaining usage to meet targets on carbon neutrality.

## 4.3 On-site solar generation

### 4.3.1 Solar photovoltaic system owned by the business

Instalment of an on-site solar photovoltaic system is a common way to reduce the grid electricity usage of a business. The current payback periods of correctly sized solar photovoltaic systems range from 2 to 5 years for small-scale systems (100 kW in capacity or below), and 4 to 8 years for large-scale systems (larger than 100 kW). The payback periods depend on the system size, price of electricity paid by the business, location, roof angle and direction, among many other factors. The relatively short payback periods often make solar photovoltaic systems an attractive investment for residential and commercial energy users. On-site generated solar electricity used by a business is carbon neutral, renewable and deemed zero emissions under all emissions reporting standards. It allows you to reduce consumption of electricity from the grid without introducing any changes to business operations, processes, or equipment. It demonstrates a business' commitment to reducing its carbon footprint and can increase brand trust.

The solar panels sector has seen an enormous growth in Australia over the past decade. One of the contributing factors to this growth is the certificate scheme that was set up by the Australian Government under the Renewable Energy Target.[20] Under the scheme, solar photovoltaic systems are divided into two categories: small-scale and large-scale. Both types of systems 'generate' different certificates, which can be sold according to the market price. These certificates are purchased by energy retailers or a voluntary market. The Clean Energy Council publishes a list of accredited solar installers on its website.[21]



### Renewable Energy Certificates

Small-scale solar photovoltaic systems generate small-scale technology certificates (STCs)[22] which are calculated and sold by the equipment installer, on behalf of the client. From the client's perspective, these certificates act as an upfront discount on the price of the solar panels. The number of certificates generated per system depends on system capacity (size), date of instalment and location. The price of each certificate varies according to the market price, but it has historically been stable at $40. One STC represents 1 MWh of electricity that will be generated by the solar panels. From the business' perspective, STCs cannot be used to claim any carbon neutrality or renewable electricity use – they are a one-off financial incentive to install solar panels. There is no reason for a business to keep the STCs. However, renewable electricity that is generated and used on-site by the business is deemed zero emissions and it is excluded from the emissions account of the business.

Large-scale solar photovoltaic systems generate Large-scale Generation Certificates (LGCs)[23] which are calculated based on actual generation of electricity by the system (retrospectively, not upfront). These certificates are used by businesses to claim the renewable electricity use for sustainability reporting purposes. Each MWh of electricity generated by the large-scale solar photovoltaic system is equal to one certificate. The price of each certificate changes according to the market price and it can experience significant fluctuations. These certificates do not act as an upfront discount on capital expenditure, and there are no other certificates that support managing the cost of instalment of large-scale systems. Therefore, the payback periods for large-scale systems are usually longer than for small-scale systems.

#### 4.3.1.1 System size

You do not need to know the size of a solar photovoltaic system that should be installed on a particular site before you engage with solar installers. Solar installers help you to choose the correct size based on modelling of the predicted electricity generation, electricity usage meter data and grid exports constraints.

The solar installer should match the predicted annual generation profile with the meter data sourced from the retailer, recommend the size of the system, and perform an initial feasibility study. In the majority of cases, all of this is done at no cost to you. A much more detailed feasibility study (and the final project price) should be provided by a chosen equipment installer after a site inspection. It can be modified based on the specific mounting needed to install the system, cable lengths needed and other factors.

#### 4.3.1.2 Maintenance

You should account for maintenance costs in your business case for buying solar panels. Regular cleaning of the panels is important to keep the efficiency high. Any large debris (e.g. leaves and rubbish) should be removed from the panels as soon as possible to avoid shading and loss of generated energy. The top (glass) surface of the panel should be washed every 1-2 years and this service can cost a few hundred dollars, depending on the system size and accessibility. A layer of dirt on the panel can decrease its efficiency by a few percentages. Dusty areas with infrequent rain can require more frequent cleaning. You can estimate the frequency of washing needed by your solar panels based on the frequency of cleaning the exterior windows of your building.

Just like any other electronic device, the solar photovoltaic system should be regularly inspected by a professional electrician. Problems with the system can include damage to cable insulation, electronic components or to the panels. These can be caused by wear out, the weather or animals, and can result in leaking, corrosion, equipment failure or even a fire. There are no official requirements on how often such an inspection should occur, but AS/NZS 5033:2021 standard[24] includes a maintenance schedule with recommended maintenance actions and frequencies. Additional guidelines can be provided by the product manufacturer, installer or could be described in the product warranty. Some companies may have internal policies on inspections of electrical equipment that should be adhered to. Such services cost a few hundred dollars (depending on the system size and complexity) and should be factored into the business case.

#### 4.3.1.3 Constraints

Despite the greatest efforts, you may not be able to install a solar photovoltaic system on your premises, or the system size will be constrained due to following reasons:

- Grid conditions – the energy distributor (in NSW: Endeavour Energy, Essential Energy or Ausgrid) can reject an application to install solar panels or downsize the proposed system if the electrical grid is too congested in the specific location of the facility. The conversation with the distribution network is held by the solar installer and the installer should not proceed with the installation unless the energy distributor has approved the application
- Heritage building or area – special permits must be requested for any works performed on heritage listed buildings or if buildings are located in heritage listed areas. More information should be sourced from the heritage or local council by the building owner. This should be done before engaging solar installers
- Local government restrictions – the local council can prevent a building owner from installing a solar photovoltaic system on the grounds of a building's age or aesthetics (in particular, if the proposed

system is facing the street). More information should be sourced from the local council prior to engaging solar installers
- Roof conditions and warranty – an installer should not install solar panels on the roof unless the roof is in a sufficient condition to support the construction. The installer should perform a site inspection to finalise the project design and inspect the roof prior to signing the job contract. You should check if any roof replacement or maintenance works are planned in the future and, if so, understand how they will be affected by the solar photovoltaic system. You should also check if installing the system affects the warranty of the roof, if there is one
- Roof size and orientation – the space available on the roof that is oriented in the right direction can limit the number of solar panels that can be installed, and thus, the generation capacity of the system
- Electricity demand profile – businesses characterised by the electricity demand profile which does not match the solar generation (i.e. highest demand in the evening, night or early morning) must size the system capacity to the demand in the middle of the day, or back it up with battery storage
- Building lease – a business who does not own the building they occupy must engage in a conversation with the building owner and obtain a written agreement prior to engaging solar installers
- Insurance – a business may be constrained by various insurance policies that prevent it from purchasing any energy generating equipment.

An on-site solar photovoltaic system is a good choice for businesses who:

- Own buildings or have a long lease and good relationship with the landlord
- Have high electricity demand during the day or can tune their demand profile to fit the solar generation profile
- Want to exhibit their commitment to decarbonisation to their clients and staff
- Are not connected to the main grid and source their electricity through diesel generators.

### 4.3.2 On-site (behind the meter) power purchase agreement

You can install solar panels on your site through a behind the meter power purchase agreement (PPA). In this arrangement, a PPA provider installs solar photovoltaic system at your facility at no upfront cost to you and sells you the generated electricity. The PPA provider recovers the cost of equipment over time, through the electricity price (typically called the PPA rate). You enter a new electricity retail contract with the PPA provider, and, simultaneously, continue your existing retail contract:

- The existing retail contract with a retailer – covers the daily supply network connection charges as well as usage charges, when the electricity is not generated by the solar panels, or demand is not fully met. This bill will be lower than before installing the solar photovoltaic system because some usage is covered by the second contract. This bill can also include a credit amount, coming from the feed-in tariff, for all electricity that is generated by the solar panels and sold to the grid
- A new retail contract with the PPA provider – covers usage of electricity generated by the solar panels. It should not have any daily charge.

You are required to purchase the electricity generated by the system at a rate that is negotiated in the contract. The price per kWh can differ between PPA providers, and it depends on the contract length, system size and its generation capacity. The majority of PPA providers will ask about the current price you pay per kWh to the current retailer and offer a lower price. However, this is not always possible, as some large energy users have a really low electricity price with their current retailer. Negotiating a much lower price will result in extending the duration of the contract, which could range from 5 to 20 years.

During the contract, the solar photovoltaic system belongs to the PPA provider. When the contract ends, the system usually belongs to you, but this should be specified in the contract. Additionally, you are usually able to purchase the system at any time before the end of the contract. The buyout price should decrease linearly each year.

Behind the meter PPA allows you to consume renewable electricity without the costs related to the ownership of the generation assets. One of the biggest benefits of this arrangement is that you do not need to worry about system maintenance, as it should be performed by the PPA provider. Benefits of such arrangements also include long-term price security and potential costs savings (if the system is sized correctly and the negotiated price per kWh is favourable).

#### 4.3.2.1 Renewable electricity certificates management

It is important to remember that the PPA provider owns the solar photovoltaic system during the contract. Thus, by default, all renewable electricity certificates generated by the system belong to the PPA provider unless stated otherwise in the contract. This does not create any problems for small-scale solar photovoltaic systems, as the STCs[22] are not used for claiming carbon neutrality; however, for large-scale solar photovoltaic systems, you must ensure that the PPA contract includes a clause on LGCs[23] management. The LGCs must be surrendered either by a business representative or the power purchase agreement provider on behalf of the business to claim the use of renewable electricity by the business for sustainability reporting purposes.

## 4.4 Green certificates

Two types of certificates allow you to reduce or eliminate scope 2 emissions: renewable energy certificates and carbon offsets. In Australia, these are: Large-scale Generation Certificates (LGCs)[23] and Australian Carbon Credit Units (ACCUs).[25]

LGCs are used to claim renewable electricity use and are the preferred certificate type to decarbonise scope 2 emissions. However, you can also use ACCU-like certificates to offset electricity use and become carbon neutral under the Climate Active framework. Using ACCUs does not allow you to make claims on using renewable electricity, but electricity usage that is offset with carbon credits allows you to make claims towards carbon neutrality.

1 Large-scale Generation Certificate (LGC) = 1 megawatt hour of renewable electricity

1 Australian Carbon Credit Unit (ACCU) = 1 tonne of carbon dioxide equivalent

### 4.4.1 Renewable energy certificates

A business who owns a large-scale solar photovoltaic system (above 100 kW in capacity) can create ('register') LGCs. The LGCs can be created by a staff member of the business or by a third-party service provider on behalf of the business. The LGCs can be then transferred ('traded', 'sold') to another business or surrendered ('retired') to meet targets towards renewable electricity use by the business.

The processes of creating, surrendering, and transferring of the ownership of LGCs between businesses takes place in the Renewable Energy Certificate Registry (REC Registry),[26] but this system does not facilitate the accompanying financial transactions, which are performed by businesses separately.

It is important to remember that if a business decides to sell the LGCs, it loses the rights to claim the use of renewable electricity on-site for electricity represented by the sold LGCs. The rights are transferred to the entity who purchased the certificates. The business must surrender LGCs in order to make claims against the use of renewable electricity on-site under the market-based method of electricity accounting.

The majority of businesses outsource LGCs management activities either to the solar installer (if such a service can be provided on an ongoing basis and is negotiated at the request-for-proposals stage) or to an external consulting company. These service providers usually charge a one-off fee for registering the power generation asset to the Clean Energy Regulator and an ongoing service fee for creating, trading, and surrendering the LGCs on behalf of the business.

#### 4.4.1.1 Opening a Registered Person Account

In order to create, trade and surrender LGCs in the REC Registry, you must open a Registered Person Account through the Clean Energy Regulator's website.[27] This process can take a few months and you will need to complete a proof of identity check.

#### 4.4.1.2 Registering a power station

After opening a Registered Person Account, you can apply for accreditation of the power station owned by your business. The application requires you to submit several documents to the Clean Energy Regulator. Many of these documents can be sourced through the installer of the solar photovoltaic system. You can start a new application for accreditation anytime to confirm the most up-to-date list of all documents needed. The application can be cancelled anytime or saved for later use. For more information, see the Clean Energy Regulator's video[28] and webpage.[29]

To register a new generation asset, you are required to develop a data collection method to calculate the number of claimable LGCs. The Clean Energy Regulator provides guidance material[30] on this topic and a general formula[31] to calculate the amount of claimable LGCs. The Clean Energy Regulator has strict requirements on the quality and accuracy of meters used to claim LGCs and some devices may not be eligible. The Regulator can provide you with guidance on the compatibility of the devices installed in an existing solar photovoltaic system or of the devices proposed by a solar photovoltaic system designer.

#### 4.4.1.3 Creating Large-scale Generation Certificates

To create LGCs, you must upload total monthly readings from all meters used in the data collection method as well as raw data from all meters supporting your claims. The total readings are calculated as a sum of individual interval data from the meters for the particular month. The data can be submitted monthly, quarterly or annually, depending on your personal choice but it must be submitted for each month separately. Calculations on the number of claimable LGCs are performed automatically by the REC Registry, based on the generation data submitted to the system and according to the data collection method developed during the registering of the power station. For more information, see the Clean Energy Regulator's video[32] and webpage.[33]

You must upload electricity generation data from a given calendar year to the REC Registry before 14 February of the following year, as this marks a deadline for submitting an Electricity Generation Returns form. However, you do not need to create the LGCs straight away. All LGCs must be created by the end of the calendar year after the electricity was generated. For example, for electricity generated in the 2021 calendar year, you must submit the generation data and the Electricity Generation Returns form by 14 February 2022 and you must create LGCs on or before 31 December 2022.

The Clean Energy Regulator validates the claims before issuing and officially registering the LGCs on the account of your business. This process may take up to 28 days.

#### 4.4.1.4 Buying and selling Large-scale Generation Certificates

Transfer of the ownership of LGCs takes place in REC Registry, but the accompanying financial transactions require bespoke negotiations between a buyer and seller. The Clean Energy Regulator published guidance materials on buying[34] and selling[35] LGCs.

The rights to claim renewable electricity use on-site for the sustainability reporting purposes is transferred with the transfer of the ownership of LGCs. In other words, a business who sold LGCs loses the rights to claim renewable electricity use for the electricity represented by sold LGCs under the marked-based method of electricity emissions accounting.

You may undertake different strategies to find an LGCs supplier. Businesses often buy small volumes of LGCs to 'top up' their annual renewable electricity consumption and reach their renewable electricity targets. Small trades are usually done with the assistance of an LGCs broker who charges a commission fee. Due to increased demand for LGCs, you should expect LGCs price spikes in the lead-up to annual and financial reporting deadlines. You could therefore consider pre-purchasing LGCs during times of low demand. As an alternative, you may ask your electricity retailer to facilitate the purchase and surrender of LGCs. Another option is to check in the public REC Registry[36] which entities have LGCs in their accounts, contact those companies directly and negotiate a favourable price. For large LGCs volumes, you may decide to run a reverse auction and allow LGCs suppliers to bid for the lowest price. All of these options can be negotiated as a one-off, or as an ongoing contract. Prices offered by the suppliers, retailers and brokers per one LGC will differ depending on the volumes traded, and the current market price driven by the demand.

In order to sell LGCs, you may decide to engage a broker or advertise the sell publicly. You could also actively look for clients by reaching out to companies who are publicly committed to decarbonisation – through initiatives such as Climate Active,[12] Science Based Targets,[13] and RE100.[18]

#### 4.4.1.5 Surrendering Large-scale Generation Certificates

To meet your targets on renewable electricity usage, you can surrenderer LGCs generated by a large-scale solar photovoltaic system owned by your business or LGCs purchased from another business in the REC Registry. The Clean Energy Regulator prepared a detailed step-by-step instruction on how to surrender the certificates.[37]

Before proceeding with the surrender, you should check if the emissions reporting standards used by your business require any specific 'reason for surrendering' to be attached to the certificate – for example, 'voluntarily surrendered on behalf of Business ABC to meet its renewable electricity target against Standard DEF in FY 2022–23'. Such attribution increases the transparency of the process and prevents resale or double counting of the certificates. Businesses that decide to engage a third-party service provider to manage the surrender on their behalf should particularly insist on including their business name in the 'reason for surrendering'.

An account holder surrendering LGCs needs to confirm the voluntary surrender using the instructions sent to the email associated with the account. After the confirmation, the Clean Energy Regulator may take up to four weeks before issuing an email with the confirmation of surrender. If you engage a third-party service provider to manage the surrender on your behalf, you should ask the service provider to forward the confirmation email to you for emissions reporting purposes.

#### 4.4.1.6 Submitting the Electricity Generation Returns form

Businesses that have a registered power station (such as a large-scale solar photovoltaic system) must submit an Electricity Generation Returns form to the Clean Energy Regulator. The form should be submitted in the REC Registry by you or by a third-party service provider that manages the account on your behalf. The Clean Energy Regulator prepared a video describing this process.[38]

The form must be submitted for each power station separately, on an annual basis, by 14 February, and must include the total generation that was recorded in the previous calendar year. By default, the Electricity Generation Returns form will be populated with the generation data that was already provided to the Clean Energy Regulator during the processing of the LGCs claims.

### 4.4.2 Carbon offsets

ACCUs and other carbon credits allow you to offset emissions, including emissions generated through the use of electricity. These certificates enable you to make claims towards carbon neutrality, but not towards renewable electricity use. In Australia, a business who uses offsets to cancel out all of its emissions can get certified as carbon neutral with Climate Active. The Clean Energy Regulator published a video on how to participate in Australia's carbon markets to meet corporate climate goals.[39]

ACCUs are generated by emissions abatement projects accredited by the Clean Energy Regulator under the Emissions Reduction Fund.[40] Each certificate represents one tonne of carbon dioxide equivalent net abatement through sequestration or avoidance.

#### 4.4.2.1 Trading and surrendering ACCUs

ACCUs are created, transferred, and surrendered in the Australian National Registry of Emissions Units (ANREU).[41] However, the system does not facilitate financial transactions and buyer–seller matchmaking, which are performed by businesses separately.

As with the REC Registry, if you want to access ANREU, you are required to open an account with the Clean Energy Regulator.[42] ACCUs are classified as financial products, which means that carbon market participants

require an Australian financial services licence to trade and surrender ACCUs. Therefore, businesses usually engage an ACCUs broker to perform all transactions on their behalf.

The Clean Energy Regulator issued guidance on buying ACCUs.[43] Businesses looking to purchase ACCUs may consider contacting the Carbon Market Institute[44] who facilitates ACCUs buyer–seller matchmaking through its marketplace and provides guidance materials for market participants. You can also review the Emissions Reduction Fund project register[45] to identify ACCUs suppliers and contact them directly to negotiate the purchase and surrender of ACCUs on your behalf.

You may decide to source ACCUs as one-off transactions or negotiate a more favourable price through an ongoing, long-term contract with an ACCUs supplier. Long-term contracts can help you to manage risks related to price security and the availability of supply. In this way, you can also reduce the time you spend performing due diligence on ACCUs suppliers and specific projects.

Before proceeding with the surrender, you should check if the emissions reporting standards used by your business require any specific 'reason for surrendering' that should be attached to the confirmation of surrender, issued by the Clean Energy Regulator, and instruct the broker accordingly. An example of such could be: 'Voluntarily surrendered on behalf of Business ABC to meet its carbon neutral target against Standard DEF in FY 2021–22'. This attribution increases the transparency of the process and prevents resale or double counting of the certificates.

#### 4.4.2.2 Choosing the right offsets

Different types of carbon credits are available in the market. Offsets differ by the certifying body, location of the projects, types of projects and price. Other than ACCUs, credits widely accepted in Australia include Certified Emissions Reductions (CERs),[46] Removal Units (RMUs),[47] Verified Emission Reductions (VERs)[48] and Verified Carbon Units (VCUs).[49] However, before you purchase any carbon credits, you should seek advice if the units of your choice meet the requirements of the emissions reporting standard that your business reports against. For example, Climate Active's Carbon Neutral Standard for Organisations includes a list of the types of offsets that are accredited towards the standard together with exclusions.[50]

Carbon credits can be generated through various types of projects, in different locations around the world. In Australia, the Clean Energy Regulator publishes historical data on the types, sizes and location of ACCUs-generating projects.[51] Project examples can include reforestation and afforestation,[52] savanna fire management methods,[53] carbon capture and storage method,[54] energy efficiency methods,[55] landfill and alternative waste treatment methods,[56] agricultural methods,[57] among many others.

Carbon credits brokers can provide you with a description of projects from where the units were generated and they often map their portfolio against United Nations' Sustainable Development Goals.[58] Choosing the right offsetting project is important, as it allows you to align the supported cause to corporate strategy. This will not only help you to get the internal buy-in of the leadership and staff, but also help to communicate decarbonisation initiatives with external audiences. Communicating a story behind the offsetting projects and its impact on local communities, flora and fauna is an important part of stakeholder engagement activities.

# The role of innovation

Traditional approaches for improving energy efficiency by continuous improvement can trim energy use by 10–20%. Once the low hanging fruit is harvested and retained through good monitoring and management systems, then businesses need to look to apply relevant international best practices to optimise core energy processes, take an energy productivity approach to optimise operations and value chains, and reduce emissions from lower carbon energy inputs.

But as businesses seek to decarbonise further, increasingly they need to innovate in the fundamental way that energy is utilised to deliver the end service required by their customers. And, if they fail to do this, there is a risk that other competitors or new entrants to the market who are not constrained by a history of legacy facilities will disrupt their market.

To achieve this change, businesses need to invest in innovation, and this can be leveraged by utilising funding and support from a range of sources.

*Jonathan Jutsen, CEO, RACE for 2030*

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