

AUSTRALIAN ENERGY MARKET COMMISSION

# OPENING UP RENEWABLE ENERGY FOR EVERYONE

A guide to how distributed energy resources like solar PV, batteries and new energy tech can benefit your household and the whole community



# About the AEMC

The Australian Energy Market Commission is an independent statutory body with two key roles: making and amending rules for the National Electricity Market, elements of the national gas market and related retail markets; and providing strategic and operational advice to the Energy Ministers' Meeting.

The National Electricity, Gas and Retail Rules made by the AEMC have the force of law.

Under the National Energy Laws, all of the AEMC's work is guided by the three legislated national energy objectives:



Each objective requires an explicit focus on the long-term interests of energy consumers in our rule making decisions and advice.

None of our decisions are taken lightly. The security, reliability and cost of energy underpins our quality of life.

[www.aemc.gov.au](http://www.aemc.gov.au)



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### Talking about renewable energy



# Introduction

**A quiet transformation is taking place across Australia as homes and businesses invest in Distributed Energy Resources (DER) such as rooftop solar PV, batteries, electric vehicles and smart energy management systems.**

These technological innovations are placing electrical power into the hands of consumers at an unprecedented rate. Between 2.6 and three million Australian households have already installed solar panels on their rooftops. A further three million households will follow during the next decade. These investments are playing a significant role in the decarbonisation of our energy supply.

It is essential that Australia's energy network has its own transformation to keep pace with this evolving technology to meet changing consumer needs.

This rate of change is world-leading and, aside from the environmental benefits, its impact is being felt at two other levels. For individual households this will help keep power bills down, but collectively this is creating a new energy system. By 2050, rooftop solar systems and other types of distributed energy will contribute more than 45% of Australia's electricity. Australia is working its way towards a smarter, enhanced energy system that can better manage supply and demand pressures, handle peaks and troughs smoothly and efficiently and get the most value from existing poles and wires infrastructure without the need for expensive re-investment.

This must be an energy system that works for everyone, both consumers with solar, batteries and smart management systems and those without these things. This will allow all Australians to harness the sun and reap the benefits of a new technological age.

## ABOUT THIS GUIDE

Whether you already have solar PV, are planning to invest in it in the future, are thinking about a home battery or are not in a position to consider any of this new technology, there are implications from this quiet revolution for everyone.

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What happens to the energy produced but not used at home?

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When is the right time to buy a battery?

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What can consumers earn from energy exports, and why isn't that as much as it used to be?

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What happens if everyone else gets solar and you don't?

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Why are we being charged for clean energy when the sun is free?

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Is there a limit to how much solar we can generate?

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Do we need more poles and wires to spread the energy around?

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Can we share the energy we generate with our neighbours?

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While this guide can answer some of these questions, we can't advise you of what system to get (if any). There is plenty of information at [www.cleanenergycouncil.org.au/consumers](http://www.cleanenergycouncil.org.au/consumers). You can compare the costs of various options at [www.energymadeeasy.gov.au](http://www.energymadeeasy.gov.au), and there is more independent government advice available at [www.energy.gov.au/households/solar-pv-and-batteries](http://www.energy.gov.au/households/solar-pv-and-batteries).

This guide is designed to help inform energy consumers across Australia about how the rapid growth of rooftop solar is impacting how our energy system works, and what that means for us all in the future.



## ABOUT THE DISTRIBUTED ENERGY INTEGRATION PROGRAM (DEIP)

Because there is more to solar energy than harvesting sunshine, stakeholders and market bodies in Australia's energy system are working together so consumers can continue to access safe, secure, reliable and affordable energy from these new energy sources. As more and more households invest in solar, the task becomes bigger.

The Distributed Energy Integration Program (DEIP) is a collaboration of consumer associations, energy peak bodies, energy market authorities and industry, which have been working together for some time to maximise the value of customers' distributed energy resources (DER) for all energy users.

This joint initiative is led by ARENA – the Australian Renewable Energy Agency – and includes the Australian Energy Market Operator (AEMO), Australian Energy Market Commission (AEMC), Australian Energy Regulator, Clean Energy Regulator, Energy Consumers Australia, Clean Energy Council, Australian Energy Council, Energy Networks Australia, CSIRO, and the Clean Energy Finance Corporation. It supports information exchange and collaboration on distributed energy issues, identifying knowledge gaps and priorities, and accelerating reforms in the interest of customers.

The group is tackling the big renewable energy issues, holding regular events with leaders from across the energy industry to share information about virtual power plant (VPP) integration,

addressing the regulatory frameworks for network businesses, and developing reforms to address network access and pricing arrangements for energy systems that sit 'behind-the-meter'. Behind-the-meter refers to household or business-level systems that use the poles and wires managed by the electricity distribution networks, rather than large generators and storage providers that use big transmission infrastructure.

Established in 2018, DEIP's 'New Energy Compact' provides a set of principles to ensure reforms are fair and equitable, energy is secure and reliable, environmental impacts are minimised, and that customers are provided with choices and protections.

Its work to date includes addressing the technical challenge of making new home energy resources like solar, batteries and electric vehicles "talk" to the market and trade services securely. It is also looking at standards and data considerations for new energy systems as well as safety and reliability issues.

This work has led to the package of reforms to the rules being developed by the Australian Energy Market Commission (see page 11). Much has already been achieved and there is more to do. However, it's important for energy consumers to know that there is an organised, industry-wide collaborative approach to the change underway. Plans are in place to make sure distributed energy is integrated into the power system in a functional, responsible, effective way.

It's important for energy consumers to know that there is an organised, industry-wide collaborative approach to the change underway.



# The basics

## WHAT ARE DISTRIBUTED ENERGY RESOURCES?

A distributed energy resource (DER) is a small-scale unit of power generation or storage that operates from homes and businesses and is connected to a larger power grid at the distribution level.

The devices that enable distributed energy resources are frequently investments made by customers and are referred to as being 'behind-the-meter' because they are on the customers' side of the energy meter rather than being part of the power equipment owned and operated by an energy company.

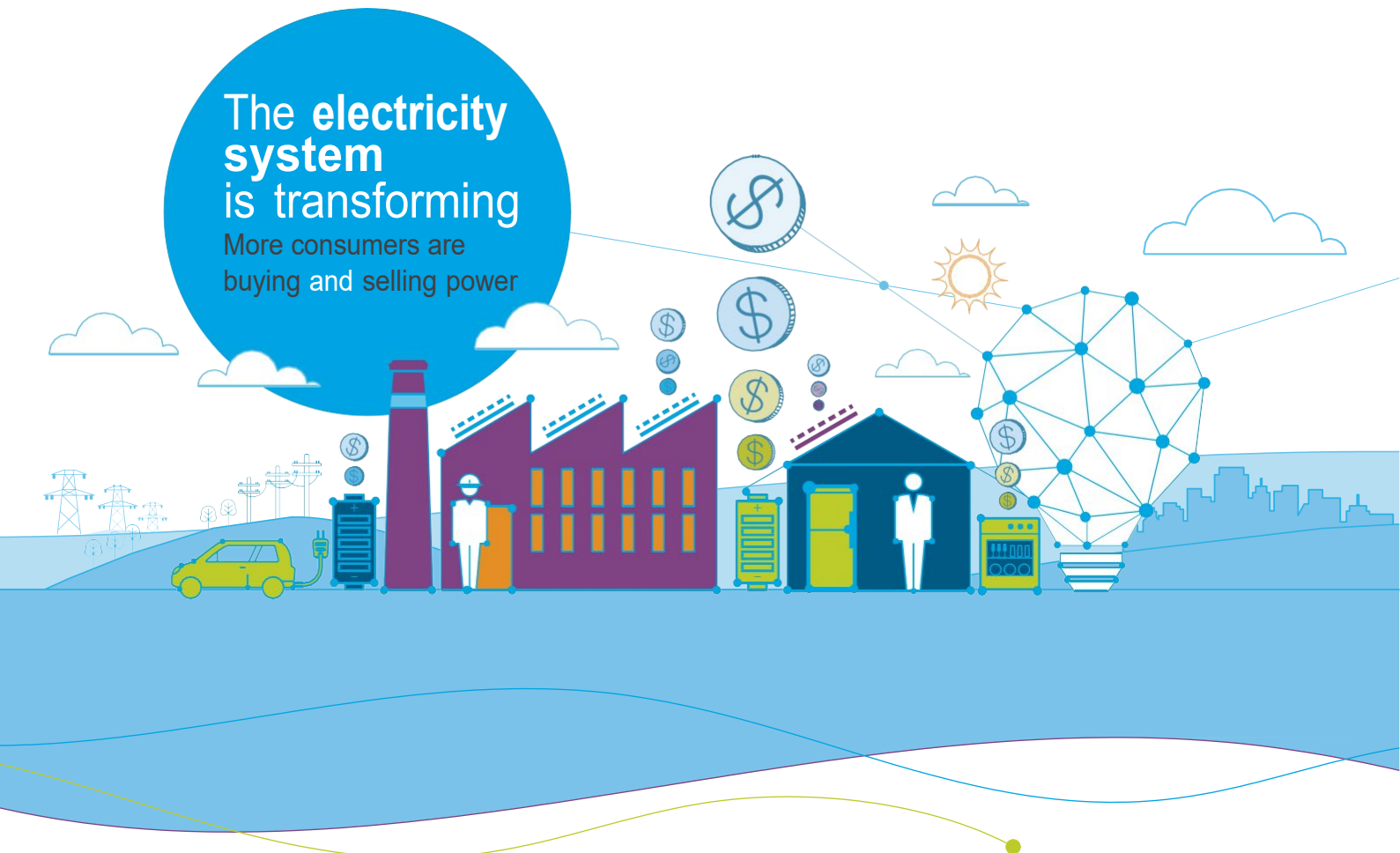
These devices, such as rooftop solar systems, are often found at homes or business premises.

The name is also given to increasingly common technological devices that help monitor and manage power consumption or generation either for a home or a business.

These devices are rapidly increasing in number across the nation as technologies such as battery storage and solar PV mature and become more affordable, available and efficient.

A distributed energy resource system might include any combination of 'behind-the-meter' technologies, from solar and home batteries to smart appliances like refrigerators, air conditioning systems, hot water heaters, pool pumps and energy management systems you might operate through your home WiFi system. Electric cars, when plugged in at home, can also be part of a distributed energy resource system because they can act as 'batteries on wheels', using energy from the grid when they're charging and sending energy back to the grid when it's needed.

The electricity system is transforming  
More consumers are buying and selling power





### DISTRIBUTED ENERGY RESOURCES IN AUSTRALIA

This small-scale method of power generation is rapidly becoming a major source of Australia’s energy. The Australian Renewable Energy Agency (ARENA) says that “over 40 per cent of energy customers will use distributed energy resources by 2027. By 2050, that figure will grow to more than 60 per cent”.

With 21% of homes already with rooftop solar PV in Australia, we have the highest uptake of solar per capita globally. Today there are more than 2.86 million rooftop solar power systems installed across the National Electricity Market (NEM) supplying approximately 14.7GW of installed capacity. That is the equivalent of a large coal-fired generator dispersed through the country.

In 2019, South Australia operated for a period where 64% of its regional demand was met by domestic PV generation. This hit 70% in October 2020 and by 2025 it could reach as high as 85%. Other mainland NEM regions could be regularly operating close to or above 50% instantaneous penetration.

Battery storage installations are also increasing, adding sophistication and options to generation and storage in households. This trend will accelerate as states and territories develop incentive schemes. More jurisdictions are offering incentives like interest free loans to install solar battery systems. Digital technologies are opening new opportunities for customers to manage their load and their distributed energy resources.

### HOW DISTRIBUTED ENERGY RESOURCES CAN SAVE YOU MONEY

#### 1. Reduced energy bills

One of the most important ways that distributed energy resources can save consumers money is by reducing power bills. Both individual consumers and businesses can install solar panels, wind turbines or other forms of renewable energy on their properties. This helps them power their home or business using alternative power, reducing the amount of electricity they draw from the network.

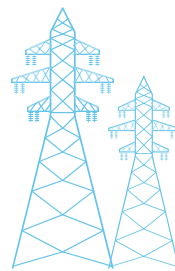
When choosing renewable resources, it’s important to consider how much energy will be generated and when. This allows you to better manage your energy needs and also your costs. Installing solar panels, for example, may reduce your power costs by as much as 50%, largely depending on the time of day you use the most energy.

What are the different components that make up your energy bill?

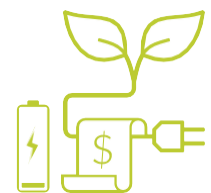
Electricity bills for energy consumers have four cost components: the wholesale cost of electricity (around 30-45%), network costs (around 40-50%), the cost of jurisdictional schemes, for example green programs that subsidise the purchase of renewable technology such as solar panels (around 6-10%) and retailer costs and margins (around 10%). These cost components will differ, depending on which state or territory you live in. Networks set their prices for the services they provide, such as maintaining poles and wires and managing their systems safely. They charge these prices to electricity retailers who then decide how to pass them on to consumers via their electricity bill.



WHOLESALE



NETWORKS



ENVIRONMENTAL POLICY



## 2. Enhanced energy efficiency

When people or businesses install renewable energy resources, they usually also apply a strategy that reduces energy consumption. Pairing renewables and energy efficiency in this way can help households and businesses rely less on electricity drawn from the grid and save even more money on energy bills.

## 3. Selling excess energy to the grid

If an individual or business installs an energy generation system that produces more energy than it uses, they can often (but not always) sell that energy back to the grid.

This means that renewable energy can be more than just a money saver. It can also be an additional source of revenue. Selling energy back to the grid can help offset the costs of installing solar panels or another form of distributed energy resource such as a battery.

Selling energy back to the system has been very lucrative for some early solar pioneers who received government subsidies, often 3-4 times the going price for electricity, to boost the income they received. In those cases, the electricity metering arrangement allowed most of those households to export all of the energy they produced back to the grid at a premium rate (that is, they could sell it for more than they paid to buy it).

Those subsidies have been eliminated or substantially wound back over the past decade. These days, solar feed-in tariffs are only around 6-8c/kWh in most places, and many retailers offer plans that pay no feed-in tariff but offer lower overall prices instead to attract customers with solar panels.

This means it now makes more financial sense for households to use the energy they generate first before exporting any 'left-overs' to the grid. It also means that by incentivising solar owners to consume their solar-sourced energy before drawing power from the grid, this can push down demand for coal-generated energy and reduce carbon emissions.

## Who determines existing feed-in tariffs paid to solar owners for exporting solar to the grid?

States and territories set minimum benchmarks for solar feed-in tariffs and electricity retailers operating in those jurisdictions decide whether to offer feed-in tariffs and whether to pay above this rate. Retail tariff offers and the way they are structured can differ considerably. In some jurisdictions, different tariffs may now apply depending on the time of day. Check with your electricity retailer about what they offer and compare other offers through reputable comparison sites like the Australian Government's Energy Made Easy website.

## Why are feed-in tariffs paid to solar owners for exporting electricity usually lower than what is paid for consuming electricity?

The benchmark minimum rates for feed-in tariffs represent the wholesale electricity price – or the same price retailers would pay if they bought electricity from a large generator. Wholesale prices go up and down; at some times of day they may be lower than a retailer feed-in tariff and at other times they may be higher. When wholesale prices go up or down over the longer term, jurisdictions' minimum benchmarks for feed-in tariffs will reflect the change in price. The price for consuming electricity is higher because it is a retail price. The retail price is made up of several components: network costs, the cost of jurisdictional schemes, and retailer costs and margins.

## 4. Increased reliability

As much as energy operators try to avoid them, power outages are part of being connected to the energy network. Any outages can be costly both for individual consumers and businesses, not to mention lost opportunity.

If you own your own generation resources as well as being connected to the grid, you can decrease your chances of experiencing an outage by having a system that can operate as an 'island' from the network. This is most common in micro-grids, which have the technology to maintain the necessary frequencies and voltages to keep the electricity supply stable without risking the safety of workers repairing the larger grid. Adding a battery also decreases your vulnerability. Battery capacity, cost and efficacy are improving rapidly.





# The benefits and costs of distributed energy resources

The decision about whether to invest in solar or another distributed energy resource is an individual one. The prices for solar, batteries, and other devices, are falling rapidly and the pay-back period (the amount of time it takes for the savings to exceed the cost of the initial benefit) changes often because of prices, government subsidies, energy demand, other generation, and so on.

The best way to decide whether the costs outweigh the benefits is to understand how and when you use power and talk to local suppliers and a range of energy retailers to see what offers are available for you. [www.energymadeeasy.gov.au](http://www.energymadeeasy.gov.au) is a good place to start.

Aside from the individual benefits and costs, there are also benefits and costs of distributed energy resources for the broader community.

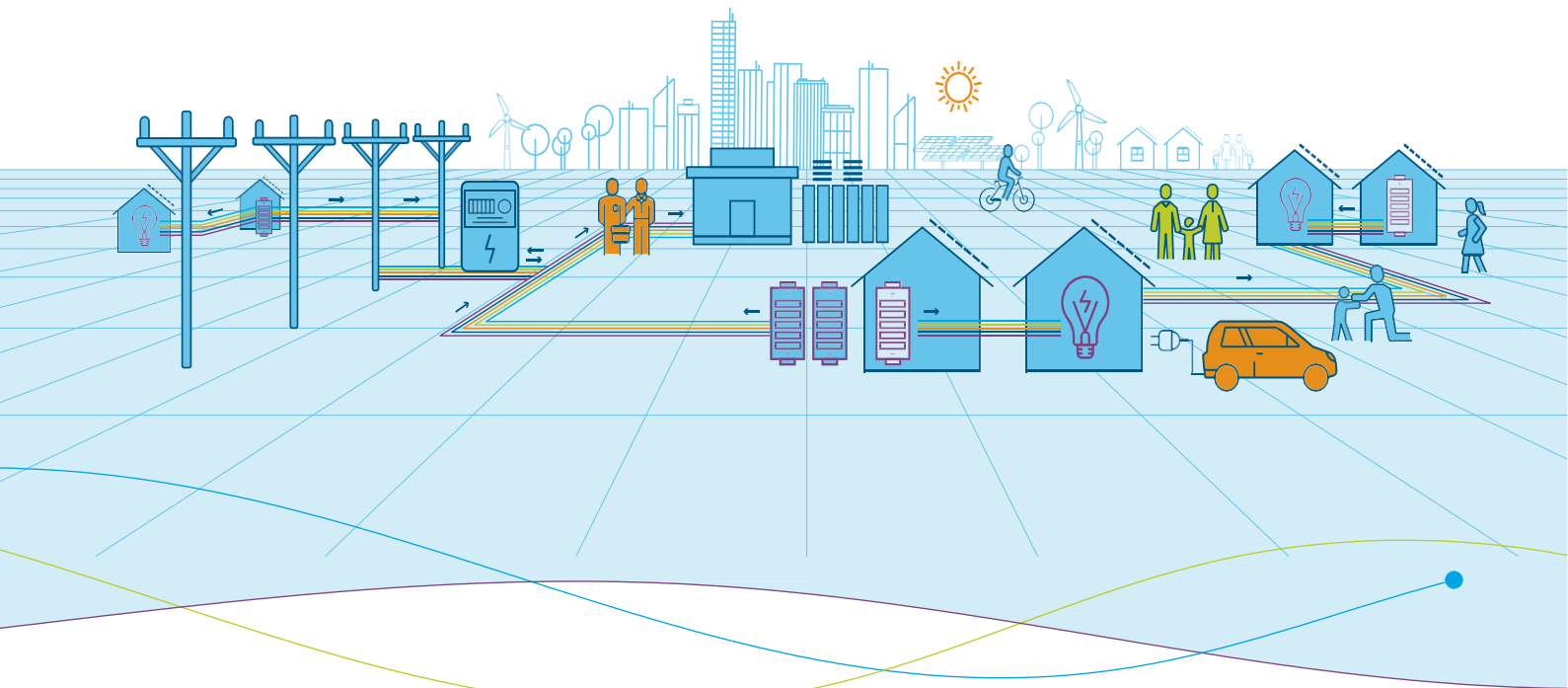
The two clear benefits are reduced emissions and new, clean, and cheaper ways to generate electricity, while the costs are about increased network traffic affordability, reliability and security of our energy supply.

As more and more consumers install technology that enables them to access this cheap and clean energy, managing the electricity grid is becoming more complex. This complexity will involve extra costs. We must determine how those costs are spread across those who use the system. This is one part of the smart energy reforms developed by the Australian Energy Market Commission (see page 11).

## WHAT MORE DISTRIBUTED ENERGY RESOURCES MEANS FOR ELECTRICITY BILLS

There is good news and bad news. For while the sun and wind are free, there are costs in getting that power to where and when its needed, and in ensuring our electricity supply is not disrupted when the energy produced varies with the weather. Disruptions can happen when the sun isn't shining and the wind doesn't blow and even a lot of sun and wind can create challenges too.

On the plus side, those who are able to invest in distributed energy resources can save money on their bills by using the energy they generate and/or store, and programming smart appliances to turn on when energy is cheapest. There is a substantial up-front cost but the savings over time will likely more than cover the initial investment.





On the negative side, more distributed energy resources in the community could put additional costs on the system, such as:

- Investment in new poles and wires and other network infrastructure upgrades to allow energy to flow both to and from your house or business (instead of traditionally flowing just one way). This allows consumers with distributed energy resources (including battery storage capacity) to send excess energy back to the grid for use elsewhere. It is important to note the costs of new network infrastructure, which represents an average of 50% of your bill, is paid for by all energy consumers, whether or not you have a distributed energy resource such as solar PV.
- The cost associated with the market operator's ability to balance more variable supply in real time.
- Deploying advanced, often costly, network-ready software to manage energy flows and technical considerations around how distributed energy systems dovetail with the system.

Yes, such changes cost millions. But these are changes that need to happen if we are to maintain uninterrupted supply across the grid and maximise the value of our electricity supply.

The smart solar reforms developed by the AEMC will help keep these costs as low as possible and reduce solar waste by better aligning solar supply with electricity demand.

### WHAT MORE DISTRIBUTED ENERGY RESOURCES MEANS FOR THE SUPPLY OF RELIABLE AND SECURE ELECTRICITY

The increase of intermittent generation such as distributed energy resources has a big impact on both the reliability and the security of our electricity supply because the times of peak demand and peak supply don't match.

Solar photovoltaic generation (PV) and wind power both produce intermittent generation that is cheaper to produce and reduces carbon emissions but can be unpredictable in certain conditions. That's why you will hear the term 'variable renewable energy'.

Because this variable renewable energy is cheaper to supply at certain times of the day – generally between 11am and 3pm during the milder months of the year – the demand for electricity that would historically have been drawn from the grid is no longer needed at different times.

When that happens, the supply of electricity exceeds the demand and the prices generators can earn can fall to zero or less. Known as 'minimum demand', this situation means it is uneconomic for thermal plants to continue operating.

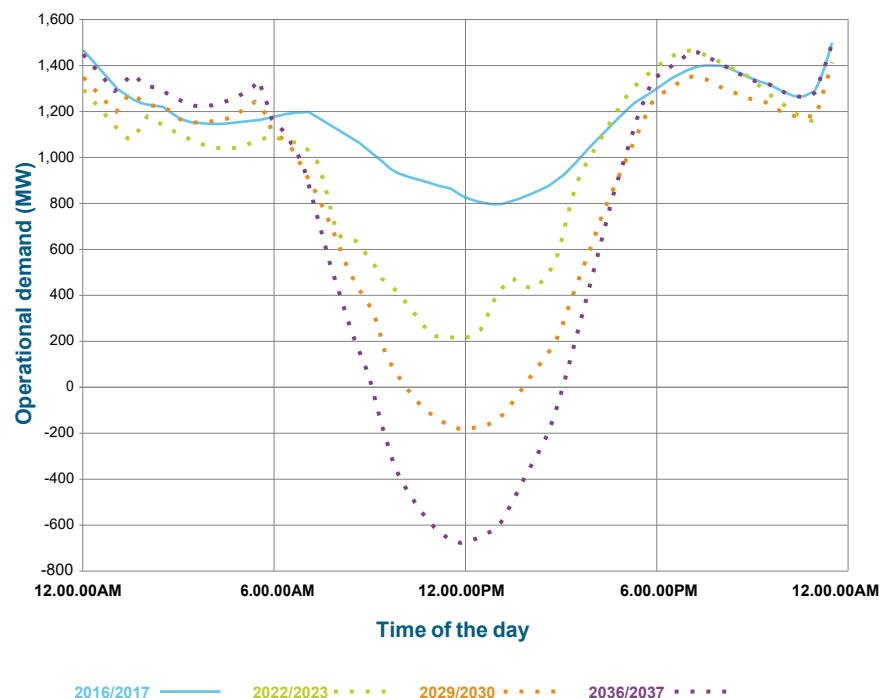
This 'minimum demand' is already happening in some parts of Australia,

and it is expected to be a problem across all regions by 2025. But we still need the technical stability thermal plants provide to the system to keep things operating smoothly.

Our system can't cope with different types of energy at different times of day without creating stability issues for voltage and frequency on the grid – unless we have back-up sources of energy that can swing into action at short notice to keep things on an even keel. Without any form of energy storage during times of high solar generation, other forms of generation must rapidly increase their output around sunset to compensate for the loss of solar generation. This is what's known as a high 'ramp rate' and it produces what the industry calls the duck curve. Coined in California in 2012, this duck curve refers to the imbalance in timing between peak demand for energy and when renewable energy is actually produced.

### The solar duck curve:

#### Projected changes in operational demand in South Australia



Source: AEMO



# Preparing the grid of the future

## WHY WE NEED TO USE THE SYSTEM SMARTER

It's a new world. Change is coming fast to the power system and this will affect every single Australian during the next few years. We are now moving toward a network-wide future of cheaper energy and action that also lowers carbon emissions. At the same time, we need to keep power affordable, sustainable and secure as we bed down a new way of operating the power system to deal with energy flowing both to – and from – consumers.

The system needs to evolve to allow power to flow both ways. As more consumers want to buy and sell more solar and other renewable power to and from the grid, we have imposed tough new obligations on power companies so they will make their networks smarter and more efficient. This will limit solar waste and benefit both the grid and consumers. It will also make room for more solar from Australia's growing PV base and precipitate smarter investment. These essential reforms will also help decarbonise the economy, pave the way for increased battery uptake and investment, maintain the value of solar investments and lay the foundations for a renewable energy future.

Increasingly, more households are unable to export their solar energy because of daytime 'traffic jams' on the network. This has meant some people who had energy they wanted to sell to the grid couldn't get access because too many other people wanted to do the same thing at the same time.

To prevent these traffic jams and avoid the system reaching its technical limits, we are requiring networks to change the way the grid operates so that it is genuinely a two-way system in which customer solar and/or battery exports are just as important as power sent to your house from old-world large-scale generators.

This is just one of many innovations currently underway including:

- **Better, more affordable battery storage** – The use of utility-scale energy storage, in addition to consumer-owned batteries, to act as a 'solar soak' to use excess distributed PV generation. *Being developed by a number of parties in the energy sector.*
- **Technical standards** – Improving performance standards so all distributed energy resources installed can keep operating through disturbances. *Changes to the rules now being implemented.*
- **Load shifting** – making the existing grid work harder and smarter by spreading the grid demand for exports through incentives to avoid peak times. Under the recent smart solar reforms, distributed energy owners will be able to earn more when demand is high and supply is lower but earn less or pay an export charge when the grid is most congested. This will depend on the circumstances of their individual network and won't be compulsory. *Smart solar reforms to change the energy rules developed by the AEMC*

Aside from costing more both individually and collectively and slowing down decarbonisation of the energy sector, failing to invest in such changes would threaten the security of our electricity, making outages more frequent and impacting business and consumers. This is a result not just of network connections, but also the types of energy being generated and sent out through the towers, poles and wires to our homes and businesses.

## THE AEMC SMART SOLAR REFORMS

The rules governing the National Electricity Market (NEM) were changed in August 2021 as a result of the final determination of the [Australian Energy Market Commission](#) to get more small scale solar into the grid and support the growth of batteries and electric vehicles.

These reforms provide a long-term, sustainable pathway for the future of our electricity grid. They place new obligations on power network companies to make their networks 'smarter'. This means they will become accountable for getting their systems solar- and battery-friendly so everyone can benefit from this leap forward in technology.

At the same time, reforms will pave the way for solar owners to be rewarded for managing their energy in ways that minimise solar wastage, put downward pressure on prices and substantially help to decarbonise our economy. This is a long-term sustainable plan to help us navigate a new energy future.

If we change the incentives in the system, over time, more new customers with distributed energy will be able to connect to the grid and existing customers can access the grid to export if they choose. All this will be done so that all energy users benefit from distributed energy resources – whether they have them or not.



## The call for reform

The AEMC first identified the need for reform in 2019. We flagged that the rules must keep pace with the amount of distributed energy coming into the system and could better support integrating these new technologies so that all electricity users can benefit from them. Since then, we have been collaborating extensively as part of the Distributed Energy Integration Program (see page 5) about the issues facing the system and how we could adapt. Community groups have recognised the need for change and formally asked us to change the energy rules.

The final reforms adopted were in response to rule change requests initiated by groups including the [Total Environment Centre](#), [St Vincent de Paul Society of Victoria](#), [Australian Council of Social Services](#) and [SA Power Networks](#).





### SMART SOLAR: THE REFORMS AT A GLANCE

- **New obligations on power network businesses** to support energy flowing both ways. Includes a performance framework, mandatory reporting on how they are delivering on expectations to deliver more solar and removing blanket export bans.  
  
Power network companies will be able to offer a range of options – including a basic free service – to encourage solar owners to limit solar waste, save money and benefit the grid. Those choosing paid plans could earn more for solar export at some times and less at others but they'll have more opportunities to earn and save.
- **Australian Energy Regulator has oversight.** All new network plans will be scrutinised and signed off as being in consumers' interest. Networks would have to consult widely and test and trial the options they put forward.

- **No new pricing plans for existing customers before July 2025** giving customers more certainty.

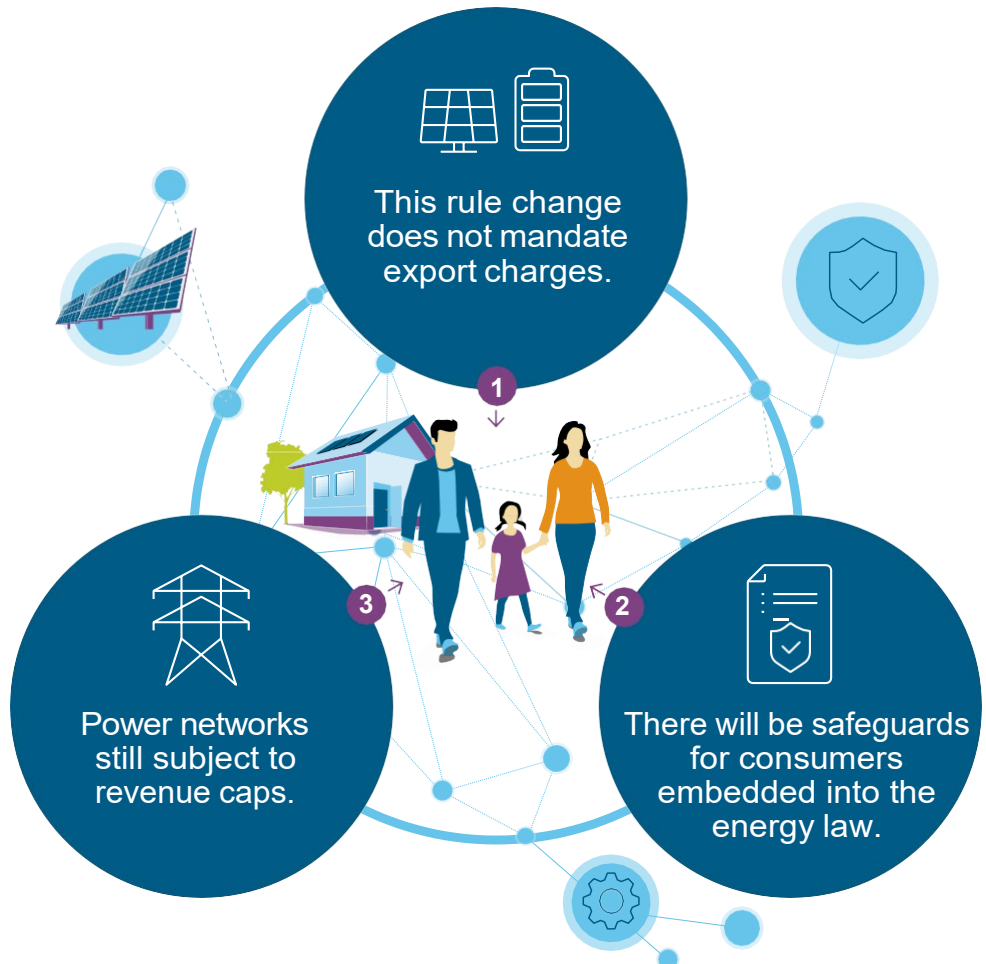
These changes to the energy rules will embed distributed energy into the power system to benefit all energy consumers – from existing and new renewables customers to customers who are yet to make that investment and customers who are not able to access distributed energy resources.

By changing the incentives in the system, over time more new customers with distributed energy will be able to connect to the grid and existing customers can access the grid to export if they choose. All this will be done so that all energy users benefit from distributed energy resources – whether they have them or not.

### WHY WE NEED TO ACT NOW

It will take time to implement the smart solar reforms, so planning ahead means we can prepare in an orderly way and give everyone time to have their input into the plans to be developed by networks, adjust to any change and make sure transition plans are in place. We want to avoid everyone paying more for crisis solutions further down the track.

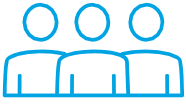
### CONSUMER PROTECTIONS





# Making more sun for everyone

## WHAT REFORM MEANS FOR YOU

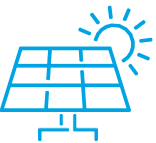


### All consumers

Getting more distributed energy into the system benefits everyone. Having more, low-cost energy in the system when it is needed can drive down wholesale energy costs and help us decarbonise the energy sector faster.

These essential reforms provide a framework for network businesses to efficiently support distributed energy resource integration by avoiding expensive additional poles and wire investment in their networks. Network costs represent about 50% of the average electricity bill and while new technology is expensive, it's considerably cheaper than building and maintaining more infrastructure which is ultimately paid for by everyone, regardless of whether you have solar or not. The difference between smart solutions and "building out" the problem is the difference between spending tens of millions compared to hundreds of millions.

Most households don't yet have solar. Under these reforms, the four out of every five customers who do not have solar will likely see their household bills drop because they will no longer pay for solar export services they are not using.



### Solar panel owners

The solar pioneers who have led the way with Australia's transition to renewable energy will have a choice of how they want to maximise their solar investment once these reforms take effect from July 2025.

Networks will decide whether to develop their own export pricing plans. These will have to include a basic free option for customers who don't want to pay. It might limit what they export back to the grid. Beyond that, paid plans could see people earning more for export at times energy is needed and less for export at times it is not. But they could minimise any lower earnings if they changed the pattern of their energy consumption to use more of what they generate themselves. For example by using timers on their washing machine or air conditioner. Smart energy systems can help them do this.

Others might decide to store excess energy in a battery (or perhaps even their electric car, which can be used as a battery on wheels). They could use it later themselves or send it to the grid when demand is high so they can earn more.

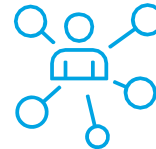
Some may decide to simply not export at all, and opt for a smaller system which best matches their own energy profile at home and still offers considerable energy bill savings.

Solar owners will likely have different types of solar export services to choose from. There won't be a one-size fits all solution because each network will design its own pricing structures for approval by the Energy Regulator. That's because there are different levels of solar uptake across networks, different customer profiles and different levels of solar capacity in each network.

AEMC modelling shows even under a worst-case cost scenario, solar owners choosing paid plans would still earn at least 90% of what they do now – and that's before taking any action to change their energy behaviours. This compares favourably with lost income from being blocked from exporting energy.

A paid plan also doesn't mean that a customer would receive a bill for what they export. Any package would be built into whatever retail deal someone chooses.

Under these reforms, solar owners will be more likely to be able to export their energy to the grid because networks will no longer be able to put blanket bans on people sending solar back to the grid.



### Future panel owners

A system that serves customers on a first-come, first-served basis is inequitable and ultimately would cost everyone more. However, the smart solar reforms ensure that by using the grid in a smarter way we can keep costs down and protect the value of household solar investments.

Making these changes means future solar panel owners won't be locked out of the system. This is how we will make room for more solar on the grid.

Solar energy is and will continue to be a good investment, both for those who have it and for those now considering it in the future. The key benefit of investing in solar panels, as recently identified by the New South Wales Independent Pricing and Regulatory Tribunal (IPART), is that regardless of feed-in tariffs "customers will continue to make savings on their bills by using the electricity that they generate."

IPART has found that if a typical customer consumes 50% of their solar generated electricity, instead of the usual 30%, they would reduce their bills by a further \$300 beyond the savings they already get. Overall, this customer would reduce their annual bill by around \$1,000 per year compared to if they did not have solar panels. This reduces the payback period for their solar panels to just over four years.



## Batteries – now and into the future

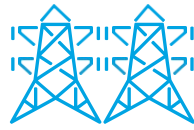
Whether you currently have solar or not, the smart solar reforms supply even further incentives to invest in storage such as batteries. There are now more than 100,000 solar storage systems in homes across the country. Around a third of these batteries came online in 2020 as more and more Australians eagerly adopted this innovative technology.

Those with both solar and storage could gain the most from these reforms by supplying energy to the grid when demand and feed-in tariffs are highest during the evening peak (peak demand period) and avoiding exports in the middle of the day (peak supply period) when the grid is most congested. The cost of batteries has declined 88% during the past decade. Like rooftop solar systems, it is likely that the cost of batteries will come down even further in the future.

## AEMC obligation to consumers

The AEMC is bound by law to make decisions that serve the long-term interests of consumers in terms of price, quality, safety, reliability and security of electricity supply as well as the reliability, safety and security of the national electricity system.

We also must take consumer protections into account. In seeking stakeholder views on these proposals, we will weigh up the evidence provided to us with those legal obligations in mind.

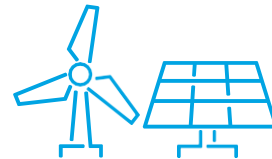


## Distribution networks

Australia's strong solar uptake has created issues for the grid, with solar at times generating so much surplus energy that demand falls near zero, destabilising the power system. At the same time, distribution networks had no financial penalties for poor network export services and no rewards for good service. These reforms oblige networks to invest in services that help send power back to the grid where there is customer demand for it.

Networks won't be able to make more money from these reforms but will instead be able to offer different prices for solar exports at separate times so supply and demand on the grid can be smoothed out during the course of the day. It helps address substantial amounts of solar being exported in the middle of the day when it benefits the system least.

Without changes to how the networks operate, ongoing growth in solar means networks would increasingly need to restrict power exports or even block solar connections to prevent voltage spikes and even local blackouts.



## Other generators

Congestion on the grid and the need for new investment is not just an issue for households with solar PV. It is also an issue for large-scale commercial renewable generators now trying to access the grid.

Wind and solar is being built so fast, in so many places, that networks are overloaded, slowing down the grid and stopping new energy technologies reaching consumers.

Looking at how these new large-scale generators can export to the grid while avoiding the need for consumers to pay for augmentation of the grid is a key part of the work happening more broadly on renewable energy zone arrangements and long-term access reforms.

**This is not an instant change. If adopted, implementation would require power networks to consult with their customers about what they want, and the Australian Energy Regulator would consult further to assess any network proposals and sign off on plans. New safeguards will ensure consumers and jurisdictions have a strong say in how distributed energy should be integrated into the energy system and priced.**



# Top 10: Key questions answered on proposed reforms



## 1. Does this mean existing solar owners face a mandatory charge every time they export solar to the grid?

No. Networks will be allowed to offer paid export plans – but they'll also need to offer a free basic export service and must stop putting blanket bans on customers sending solar back to the grid.

These smart solar changes give networks the ability to develop new pricing structures that could reward solar owners for using energy in ways that limit solar going to waste. You might earn more to export when there is high demand for your energy and less if you decide to send it when the grid is already full. But you could offset any lower earnings by changing how you use your energy, like using a timer on your washing machine or airconditioner to use more of your own solar -- the power would be in your hands.

A paid plan also doesn't mean that a customer would receive a bill for what they export.

Any package would be built into whatever retail deal you choose.

It is important to remember that before any new pricing plans could be introduced, it will be up to the networks to justify their proposals to the Australian Energy Regulator after consulting with their customers about what would work best for them.

These pricing plans could be very different depending on where you live, the capacity of the network now, how much solar demand there is in that area, and what the preferences of different state or territory governments are. But the common theme will be consumer choice – you can choose the option that works for you.



## 2. How can you be sure that power companies won't just increase their prices to make more money?

Extra safeguards are now included in the energy rules to ensure existing and new solar customers – and non-solar customers – are protected around price and given options that work for them. If a network business wanted to introduce export pricing plans, they would need to consult extensively with customers and have a transition plan in plain English detailing exactly what they are proposing approved by the Australian Energy Regulator. The Regulator will make the final decision on whether these pricing structures are in the interests of consumers.





### 3. If my network did decide to offer paid export plans, what impact would that have on my solar benefits?

Solar remains a good investment regardless of these reforms and any changes that may occur from 2025 when they come into effect.

Our modelling shows that even if networks got approval to charge in the upper range, solar owners who export to the grid would still earn 90% of what they do now even before saving any money by changing how much energy they self-consume. But they could offset that cost if they change their pattern of consumption to enable them to use more of their own energy – for example, programming washing machines to start in the middle of the day.

For most solar owners, the impact would be far less than this, and it will depend on the offers networks develop after consulting with their customers and what works best for individual solar owners.

But the reality is, if we don't make these smart solar reforms, solar owners are likely to benefit less in the future unless we upgrade the grid in a smart way to enable more exports.

If everyone on the network is blocked from exporting 10% of the time, that will also increase payback periods by about 6 months. If they're blocked for 25% of the time that increases to about 15 months and if they're blocked half of the time, you're looking at three years longer to pay back your panels.



### 4. How will changing the way network services are priced create more rewards for exporting energy at peak demand times?

Networks could offer to pay more when there is high demand for electricity – such as at 6pm in the evening. This would be easier to do if solar energy generated throughout the day could be stored in a home battery or an electric vehicle. But the other main benefit would come from changing your energy usage patterns and using more of the energy you generate when the grid doesn't need it, such as programming a dishwasher to run in the middle of the day. This means you pay less for consuming energy from the grid at peak times and don't send energy to grid when it isn't needed. Smart solar reforms allow networks to devise a series of options for consumers and each network will be free to come up with its own plan – though there are safeguards. The networks will have to involve consumers in developing their plans and the energy regulator will need to approve any plan before prices can change.



### 5. Will networks earn more money if they are allowed to charge for export services?

No. The existing caps on what power networks can earn still apply. The Australian Energy Regulator sets the amount of money networks can earn overall and networks apply to the regulator to re-assess the amount of revenue they require. Under the smart solar reforms, networks will still need to put forward their revenue proposal – as well as how costs are allocated to consumers – to the Australian Energy Regulator. This gives the network businesses incentives to move some of that money they already earn for investing in poles and wires to investing in new ways to accommodate more solar PV. Exactly what the networks spend their money on depends on their own circumstances, and what you as a customer want. Our reforms require the networks to work with customers to develop their investment plan so that you have a clearer idea of what the money would go towards.



## 6. What will networks actually do to improve solar services to customers?

Networks can use smart software to dynamically manage the network to allow the most solar possible at any given point in time. This will mean they can let people know when its most advantageous to take from the system in charging their electric vehicles and batteries and when they should give back to the system by exporting their stored power.

This technology already exists – our reform package makes networks accountable for considering how to make smart solutions part of the way they do business.

This investment will be cheaper than just building more poles and wires to handle more solar.

They can also use technology to better manage and control voltage levels remotely.

And they can do other things like encouraging community batteries and educating customers about smart energy use.



## 7. Do large generators pay to use the distribution network (poles and wires)?

Yes. Large generators like coal and gas plants or large-scale solar have to pay to use the grid too – they just pay differently. The big generators use the transmission and the distribution lines. Comparing these to home solar is like comparing apples and oranges. If a large generator wants to connect to the grid, they have to pay for the infrastructure needed to connect them. And when congestion occurs, they are constrained off the grid so they can't export their power. They also have to pay if their generator causes an issue on the network.

Any larger generators that use the distribution lines (poles and wires to your house) – like big factories for example – will all be subject to the same rules as homes and smaller businesses under this draft package of reforms.



## 8. How will retailers be involved with these reforms and how will they reflect changes to network pricing? Will I have to change retailers if I don't want a paid plan?

We are expecting network businesses and retailers to work together because your energy retailer will need to consider how to incorporate these new pricing structures into the retail bills they offer – including the basic free service option. This does not necessarily mean you will need to change retailers. The best response for consumers is to keep monitoring their retail energy deal, via comparison websites like the Australian Government's Energy Made Easy website and shop around for a better deal if you find yourself unhappy with the options your retailer is offering you. Remember that distribution network businesses will have to come up with their pricing structure in consultation with their customers under this new system. Then, the Australian Energy Regulator will have to approve it.



### 9. How will my energy bill look different as a result of all this?

It's not possible to say as this will depend on many factors. But it is certainly going to be possible for solar customers to save money on their bill depending on the rewards and incentives on offer. And it would mean that non-solar customers would see the network portion of their energy bills drop as well.

There will be opportunities to earn and save. But this won't mean monitoring your energy 24/7. There are smart devices and set-and-forget systems out there already that can help you navigate a more dynamic energy system.



### 10. If, as a result of this change, more solar owners buy batteries and use all their own energy rather than export it, will that cause problems for the grid?

If customers choose to buy batteries, they would likely be financially better off if their network decides to reward them for exporting energy when it is of most value to the power system. Consuming the energy you generate rather than exporting it is also going to be an option for consumers to be rewarded better in how they use the system. Both of these things are good for the grid – they will help us all be smarter about using the poles and wires we have already have and hopefully minimise expensive network upgrades.

This will be more important as more electric vehicles come into the system. By the mid-2030s electric vehicles are forecast to become the primary driver of increased energy consumption in Australia. We are going to need a system where supply and demand is smoothed out across the day rather than high peaks and low troughs of minimum demand.



# Talking about renewable energy

There remains a concern in some sections of the population that renewable energy is neither reliable enough nor sufficient to provide our energy needs. It is certainly true that renewable energy cannot supply all of Australia's energy needs at this time. But this situation is rapidly changing and solutions are in sight.

Here are some commonly discussed issues around renewable energy and some facts that may help.

## How renewable energy will make a difference to climate change

Renewable energy will have a significant impact on Australia's carbon emissions because the energy sector represents more than 50% of Australia's total emissions (around 33% from electricity and 20% from the direct combustion of fuels for manufacturing, mining, residential and commercial use). Sectors such as transport and agriculture also impact on emissions, making up around 17% and 14% of emissions respectively. Decarbonising the energy sector will help Australia meet its commitments under the Paris Agreement, which aims to reduce carbon emissions across the world by 2050. The purpose of the Paris Agreement is to hold the average increase in world temperature to "well below 2°C above pre-industrial levels." An Australian National University report released in November 2020, states that emissions from electricity generation, gas use and transport in the 12 months ending in July 2020 fell by almost 14 million metric tonnes of carbon dioxide equivalents, scientifically recognised as a contributor to global warming. This is a drop of 4.6% on the previous 12 months. And this, the report concluded, is mostly due to wind and solar generation.

## Can renewable energy really meet our energy needs?

Yes, but it will take time to get there – that is why we talk about 'the energy transition'. Many countries are already focusing on increasing their reliance on renewable energy. Take Costa Rica for example. This South American nation regularly meets 90% of its energy needs through renewable resources. It's estimated that the US will generate 80% of its energy needs from renewables by 2050. Renewable energy, when used in combination with other emerging technologies such as hydropower (HYDRO 2.0 will be fully online and commissioned in 2025), biofuels, storage and effective demand-response strategies, can provide all our energy needs into the future. A 2019 report from the International Energy Agency (IEA) suggests that by 2024 the world's solar capacity will grow to 600 gigawatts – that is twice the installed capacity of Japan. That will jump to 1200 gigawatts during the next five years, the entire current capacity of the United States.

## How renewable energy compares on cost

It may have been a while since you last looked at the costs of renewable energy, but solar panels have come down in price. There was a time when they were more expensive than conventional energy sources, but not anymore. Solar generated power is by far the cheapest energy of all. That is why the new rules seek to maximise the use of this cheap, plentiful resource and limit solar wastage. Remember that just a few decades ago, computers were incredibly expensive and beyond the reach of most people. Now everyone has access to them. The economics of renewables means that while it is true that for many people the upfront costs mean solar remains out of reach, improving technology, efficiencies, increasing demand and new retail options available to customers all combine to push prices down. Batteries are still too expensive for many people, but they are coming down in price too.

## How much energy goes into producing big renewable generators like wind turbines?

A two-megawatt turbine might require 260 tonnes of steel produced using 170 tonnes of coking coal as well as 300 tonnes of iron ore. That's a lot of energy, however if sited correctly that same turbine will recover the energy expended within three years of operation and then save that energy many times over during its lifetime.

## The future for renewable energy

Trends come and go, but the facts are that renewable energy is here to stay and is already becoming a permanent part of our energy network. Here's an example of how the world's biggest corporations view renewables – Google recently purchased THREE gigawatts of renewable energy capacity. That's equal to the annual energy needs for all its offices worldwide. Renewable generation in Australia has grown by 72% during the past decade and the revolution has barely begun.

