AEMC

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

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Introduction

A quiet transformation is taking place across Australia as homes and businesses invest in Distributed Energy Resources (DER) such as roof top 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.

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.

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

When is the right time to buy a battery?

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

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

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

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

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

Can we share the energy we generate with our neighbours?

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. You can compare the costs of various options at www.energymadeeasy.gov.au, and there is more independent government advice available at 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 (VVP) 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?

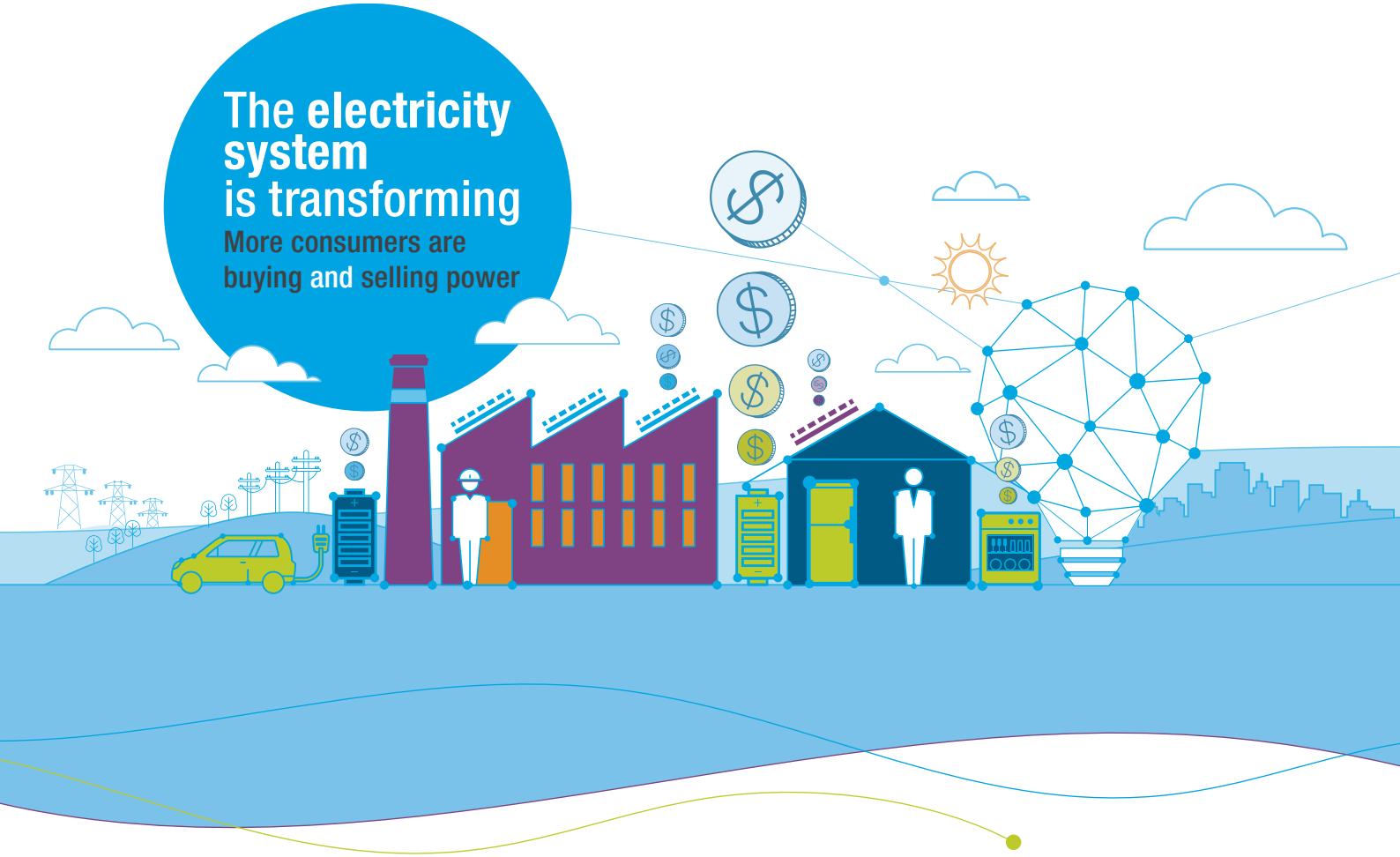
A distributed energy resource (DER) is a small-scale unit of power generation or storage that operates from homes and businesses and is connected to a larger power grid at the distribution level.

The devices that enable distributed energy resources are often investments made by customers 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, can often be 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 and pool pumps. 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.



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 2.66 million rooftop solar power systems installed across the National Electricity Market (NEM) supplying approximately 14GW 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

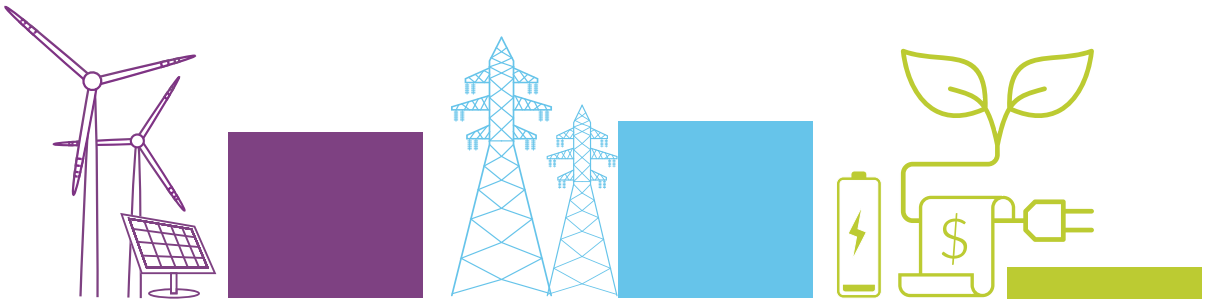
1. Reduced energy bills

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 had to pay 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.

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 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.

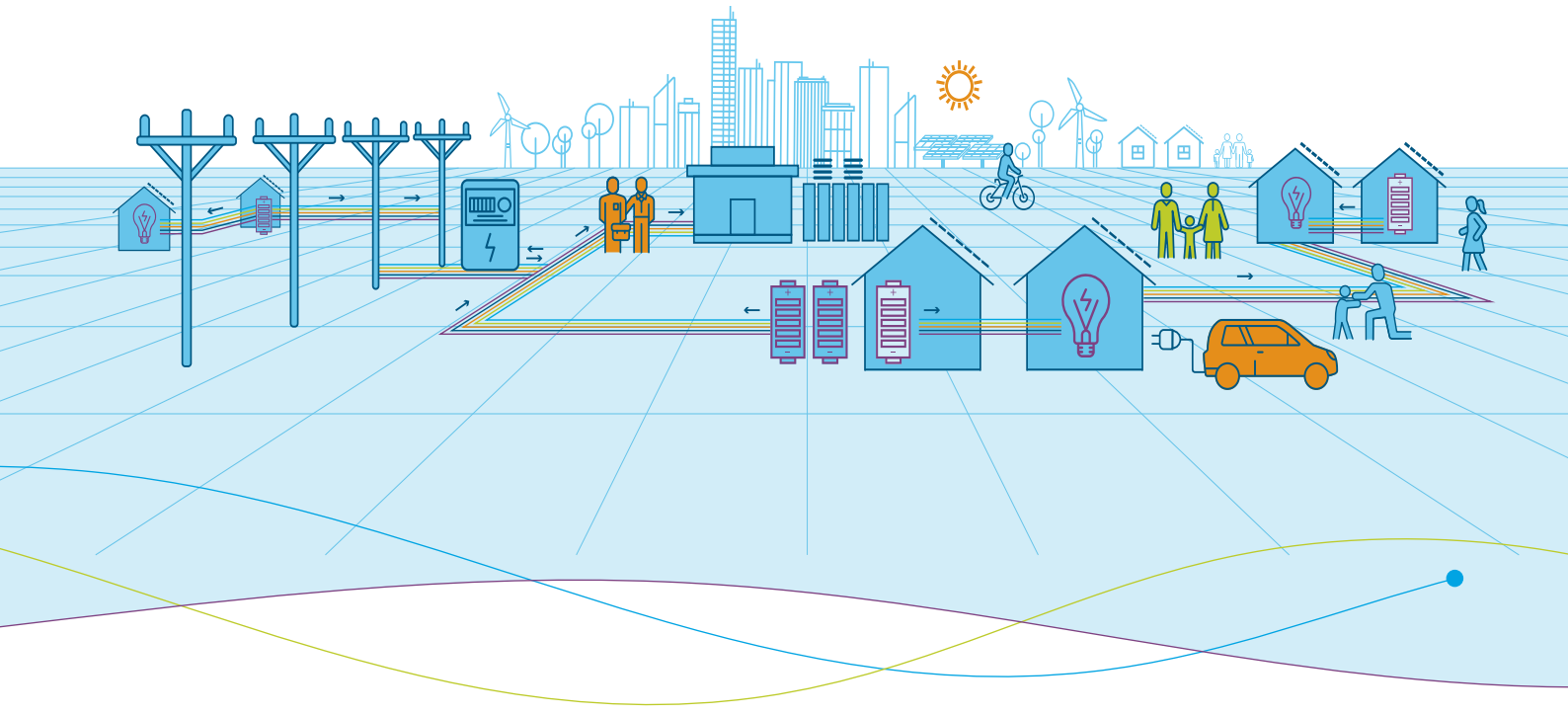
The two clear benefits are reduced emissions and new, clean, and cheaper ways to generate electricity, while the costs are about affordability, reliability and security of our energy supply.

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 a package of reforms to the energy rules being 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 organisations that oversee Australia's energy markets are looking at how those costs can be kept as low as possible.

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'.

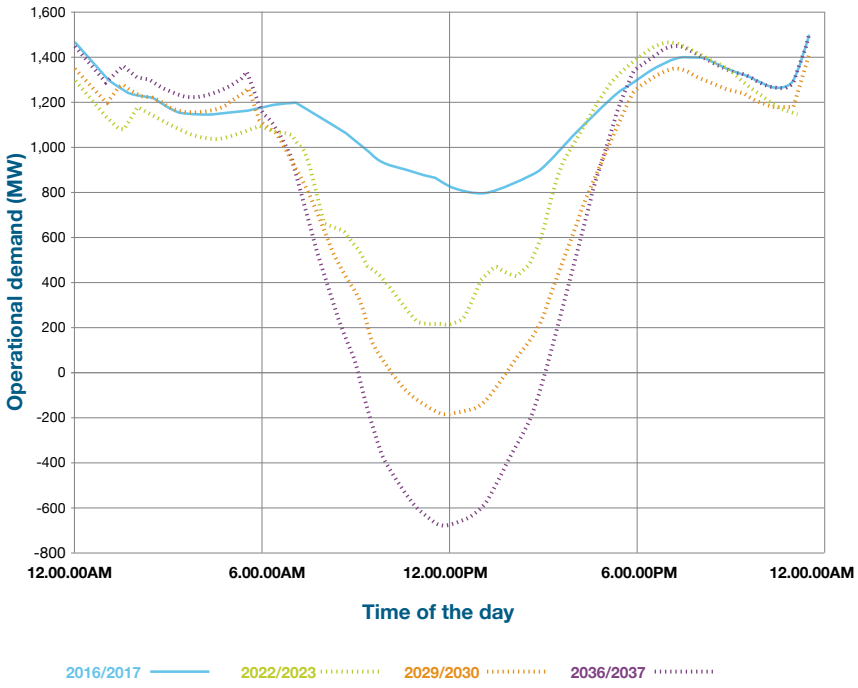
Because this variable renewable energy is cheaper to supply at certain times of the day – generally between 11am and 3pm during the milder months of the year – the demand for electricity that would historically have been drawn from the grid is no longer needed at different times.

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 have an opportunity to move toward a network-wide future of cheaper energy and action that also lowers carbon emissions. But we need to act 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 wasn't designed for power flowing both ways. But now, more consumers are buying and selling power. Despite this, power networks have no incentives to help customers get their solar back to the grid. We need to change that.

Not everyone with solar panels can export their solar energy because of daytime 'traffic jams' on the network. This means some people who have energy they want to sell to the grid can't get access because too many other people want to do the same thing.

This problem hasn't affected all solar owners yet, but it's getting worse. If we don't act, the system will reach its technical limits. Then, power networks will have to limit power exports, meaning current and future owners of solar and other distributed energy will be financially worse off because they won't be able to earn as much from sending their energy back. Alternatively, we will have to build costly new poles and wires to cope with the new solar on its way. The sun is free, but poles and wires are not, so planning ahead will avoid costly over investment.

The reliability and safety of our electricity supply may also be compromised if the transmission and distribution networks are not capable of providing backup for intermittent renewable energy.

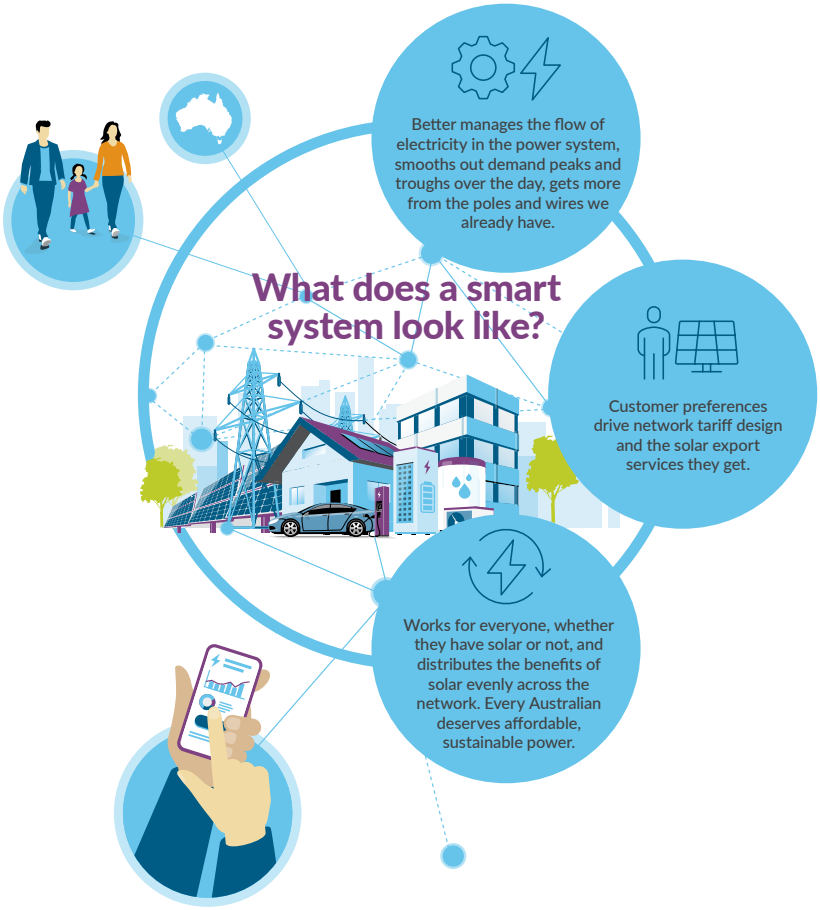
Many organisations are looking at the most cost-effective and reliable ways to address these challenges. The innovative solutions under development, already in place or underway include:

- **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 the private 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. Distributed energy owners could earn more when demand is high and supply is lower but earn less or pay an export charge when the grid is most congested. *Draft rule change under consideration 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 REFORMS ON THE TABLE

Right now, the Australian Energy Market Commission is considering some key proposals initiated by groups including the Total Environment Centre, St Vincent de Paul Society of Victoria, Australian Council of Social Services and SA Power Networks. These proposed changes to the energy rules will smooth how we 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.



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 AEMC proposes:

- Giving networks a stronger reason to help customers export their power and set their poles and wires up to better manage two-way flows. Making clear in the rules that it is the power networks' role to support both consumption *and* export of electricity
- Giving consumers more influence over what export services networks deliver and how efficiently they deliver them
- Letting networks offer two-way pricing to foster better system management. This will give them options they currently don't have to motivate solar and battery owners to send power to the grid when its needed or charging a tariff for exporting when the system is overburdened. This strategy will also encourage battery uptake and the consumption of self-produced power, in turn reducing strain on the grid
- Strengthening the existing consultation framework. When designing their tariff options, network proposals will need to reflect what their customers want, what technical capability they have, and what government policies apply to them.

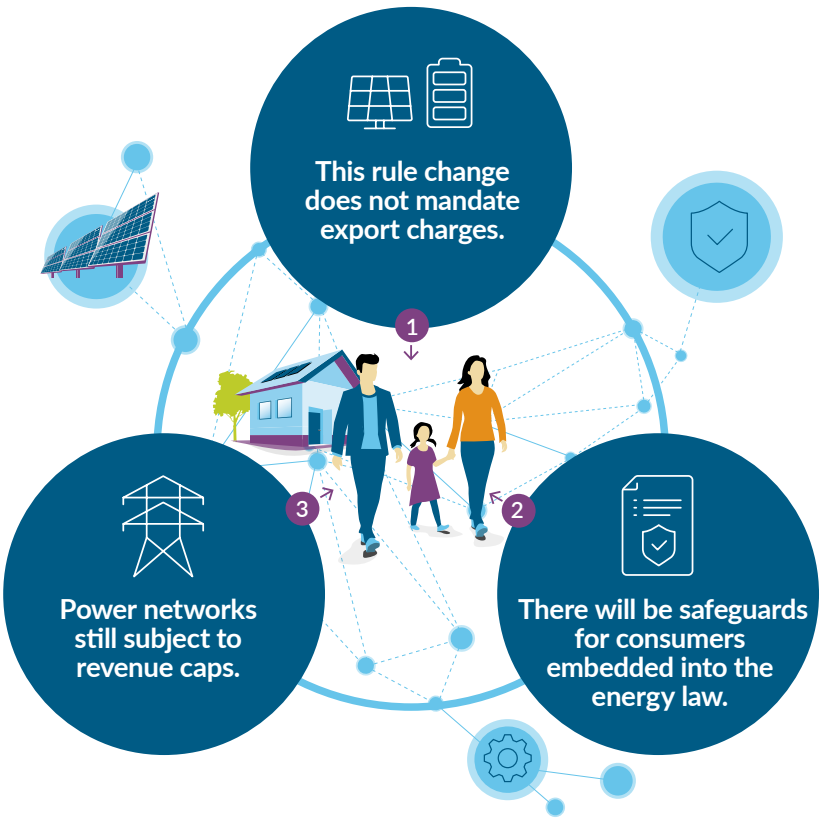
At the same time, the proposals have inbuilt consumer protections:

- The rule changes don't mandate export charges. Instead, we envisage consumers would be given a menu of options from which to choose
- Networks will need to set out a transition strategy if they intend to introduce export charges, and this needs to be approved by the regulator
- Further safeguards in energy laws will protect consumers, including being consulted on any proposed changes
- Power networks will not be able to use charges to boost their revenue – existing caps on network earnings will remain. It is important to note that these reforms are just the start of the journey. Much more work needs to be done before new tariff structures are developed and approved. It will be critical to involve consumers along the way.

WHY WE NEED TO ACT NOW

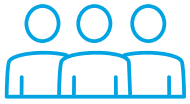
It will take time to design a solution so planning ahead means we can prepare in an orderly way and give everyone time to have their input, adjust to any change and make sure transition plans are in place. We want to avoid everyone paying more for crisis solutions further down the track.

Consumer protections



Making more sun for everyone

WHAT IT MEANS FOR YOU IF THESE CHANGES GO AHEAD

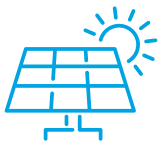


All consumers

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.

It provides a framework to assess how network businesses can most efficiently support distributed energy resource integration by avoiding expensive additional investment in their networks. Network costs represent about 50% of the average electricity bill. Preventing this overinvestment means renters and others who can't invest in solar aren't paying more for services they're not able to access.

Most households don't yet have solar. Under these proposals, four out of every five customers who do not have solar would also see their household bills drop because they would 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.

After using the solar energy they generate at home, they can store it in a battery for later use, send it to the grid where they can be paid for what they export, or simply not access it at all. They can also change the pattern of their energy consumption to use more energy when their solar is producing the most to further reduce their bills. Smart energy systems can help them do this.

It is likely that if these changes are adopted, solar owners will 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. Retailers may offer their customers different options like a free service – where they don't pay but might not be able to always export their energy – to a premium service where they might pay an amount in return for unlimited energy exports. Some networks might offer grandfathering options for existing solar owners.

If they did opt to pay for exports, households with a solar PV system of around 2-4kW might earn around $30 on average less from their exports each year. Those with systems of 4-6kW could earn $70 less and those with large solar PV systems (above 6–8 kW) who are currently earning over $1,200 per annum on average – including reductions in the cost of energy from the grid as they supply their own load – could earn around $100 a year less if they did not change their patterns of usage or invest in a battery, which could earn them money.

While export charges could lead to a marginal drop in earnings for some (not all) solar owners, solar homes will face that same drop if they are constrained from exporting energy just 10% of the time. Being constrained 50% of the time would reduce their solar earnings on a 4-6kW system by more than $300 per year. The likelihood of being constrained from exporting is increasing due to the traffic jams on the grid.

If these reforms are adopted, solar owners will be more likely to be able to export their energy to the grid.

Future panel owners

A system that only serves those on a 'first come, best dressed' basis is inequitable and will ultimately cost everyone more. New and future solar owners are more heavily affected by limits being placed on energy exports. Currently, while networks in Victoria and South Australia are connecting new solar customers, some of them are preventing those customers from exporting any energy at all because they don't have enough capacity in their network to manage the two-way flow of energy.

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.

Batteries – now and into the future

Whether you currently have solar or not, the proposed changes 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. Like rooftop solar systems, it is likely that the cost of batteries will come down.

AEMC obligation to consumers

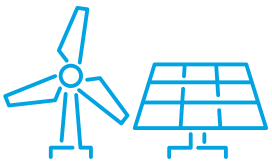
The AEMC is bound by law to make decisions that serve the long-term interests of consumers in terms of price, quality, safety, reliability and security of electricity supply as well as the reliability, safety and security of the national electricity system. We also must take consumer protections into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

The 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. But also, distribution networks have no financial penalties for poor network export services and no rewards for good service. Changing the incentives for networks encourages them 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 proposals 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 over 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. The proposal does not mandate default charges for exporting power. However, it gives networks the ability to develop new pricing structures. These could be very different depending on the capacity of each different network now, how much solar demand there is in that area, and what the preferences of different state or territory governments are.

2. How will consumers get a say on these pricing plans and be sure they are appropriate?

There will be extra safeguards 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 charging, 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 charge for exports, what impact would that have on what I can earn from my solar?

It's important to remember that some people are already facing lost earnings because they are blocked from exporting to the grid. These opportunity costs will increase and affect more people as grid congestion grows. We have done detailed modelling that shows for the 20% of electricity customers with solar, there could be a range of export charge impacts, depending on system size. There could be a marginal reduction in the amount of solar earnings. But being blocked from exporting to the grid will have a more detrimental effect on solar earnings. Both solar and non-solar owners will be better off as a result of these changes – which will also help the electricity sector decarbonise faster as more solar will be able to connect.

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. Our package of reforms allows 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 proposed changes, 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 proposal requires 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 do you mean when you say networks should deliver high-quality export services on distributed energy? What does a high-quality export service look like?

A high-quality export service is essentially one that supports people to export their power and that can take advantage of technology to do that. An example might be the power network equivalent of a smart home energy management system like a Google Nest – that gives networks the information they need to see what's happening with the power flow and manage the system so that more solar energy can come in, and so they can let people know when its most advantageous to take from the system in charging their electric vehicles and other batteries and when they should give back to the system by exporting their stored power. This technology already exists – our reform package gives networks incentives to make it part of the way they do business.

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 that use the transmission lines have to pay significant up-front costs and fees to make sure that they don't do anything to impede the reliability and security of the system. 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 proposals and how will they reflect changes to network pricing? Will I have to change retailers if I want to avoid export charges?

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. 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.

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 over 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

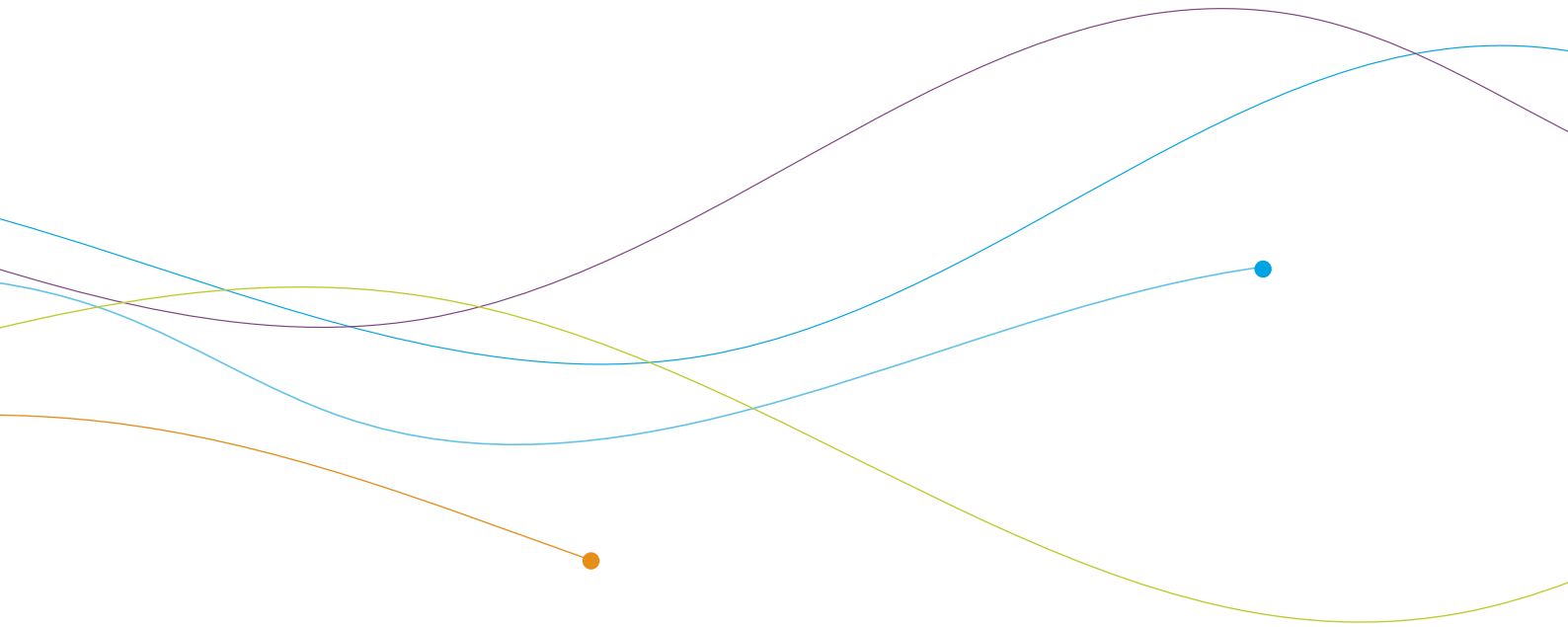
It may have been a while since you last looked at the costs of renewable energy, but solar panels have come down in price. There was a time when they were more expensive than conventional energy sources, but not anymore. Solar generated power is by far the cheapest energy of all. Remember that just a 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.



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