SOLAR OUR SCHOOLS FAQ

Why do we need solar panels for every school, child care and kindergarten in Australia?

Solar panels generate clean energy from the sun, which is used directly by the school or early childhood centre for their electricity needs, instead of them buying coal- or gas-generated power from the electricity grid. Any excess solar power they generate and don't use (for example, in school holidays) is fed directly back into the grid for others to use. The school is often paid for this power generated (this is called the feed-in tariff). Schools can also be part of a "Virtual Power Plant" (VPP) which gives them further income (see below).

This cuts power bills for the school and it reduces greenhouse gas emissions, because it means less coal- or gas-generated power is needed.

The Solar our Schools (SOS) campaign is calling on the federal government to fund solar and batteries for every school and early childhood centre in Australia. At a time when Australia needs to create more jobs and stimulate our economy, this project would create thousands of regional jobs. Solar installers are local businesses in the regions where the schools and early childhood centres are, so local economies would benefit. The money saved by the schools would allow them to employ thousands of new teachers and support staff, adding to the job creation.

Research recently released as part of the Beyond Zero Emissions Million Jobs Plan [1] estimates that installing solar panels and batteries on all Australian schools and early childhood centres that do not currently have solar and allowing them to operate as VPPs would:

- Save $114,000 in annual energy bills per large school or centre and $12,700 per small school or centre
- Create at least 6,870 jobs in the renewable energy industry

[1] Beyond Zero Emissions 'Million Jobs Plan' 2020. This plan, developed in conjunction with Tesla, provides for large schools to utilise 250kW of solar plus a medium battery and small schools to use 25kW of solar panels plus a small battery.

- Save at least 1.35 million tonnes of greenhouse emissions per year

These figures assume that the cost of the solar and batteries is footed by the government through a grant process. If the school were to pay for the solar and batteries the returns would be lower, though still very strong.

The exact number of schools without solar is not known, but estimates indicate it's at least 4000 (42.5% of all government and non-government schools)[2]. In addition, a large proportion of the more than 11,000[3] Australian childcare centres, kindergartens and preschools also do not have solar.

In addition, many schools and centres already have solar but it is not enough to cover their power needs. Additional solar panels would rectify this.

If every school, child care centre and kinder that does not yet have solar were to get solar and batteries, it's estimated that at least 6,870 renewable energy jobs would be created in all regions of Australia[4] -- it's the perfect way to stimulate our economy!

Why do we need batteries on schools?

Batteries coupled with solar means that a school or early childhood centre can store the unused solar energy it generates each day. Battery-stored power can be used through the night when the sun is not shining to run fridges, lighting or any other night time power needs, or used during the morning peak the next day, before the sun is out. Moreover, weekend-generated power can be stored for use on Monday morning.

There is now technology that allows for electricity retailers to draw stored power out of batteries on high demand days when the shared grid needs more power, such as a very hot day when everyone turns on their air conditioners. This means during the summer holidays or on hot weekends the school battery can provide power to meet demand in the community, and the school gets paid for this. The school then forms part of a Virtual Power Plant (VPP), generating power for the community.

---

[2] Beyond Zero Emissions 'Million Jobs Plan' 2020
[3] Australian Bureau of Statistics
[4] Beyond Zero Emissions 'Million Jobs Plan' 2020

There is still no clear agreement between the State Governments as to how state schools can participate in a virtual power plant - it is easier in some states than others, and the financial income will vary according to the state education department's rules about this. However, non-government schools and early childhood centres are free to participate in VPPs.

If schools are connected to the network as part of a VPP, there are additional financial benefits, on top of those delivered from solar panels and batteries because they are able to sell their excess energy to others. Operating as a VPP, a large school could save up to $37,000 extra per year, on top of the $77,000 annual savings generated by its panels and battery[5].

As mentioned, this annual saving can only be achieved if the school or centre has no upfront capital cost to purchase the solar and battery (for example, if this is covered by a government grant). The school would also have to join a larger VPP aggregator that aggregates the capacity of batteries to make up at least 5MW capacity to buy into the ancillary services market[6].

What is a "Virtual Power Plant" and how does a school join one?

A Virtual Power Plant (VPP) is a network of solar photovoltaic (PV) and battery systems on schools (or homes or businesses) working together to generate and store solar energy, and feed their excess energy into the grid.

Schools can store electricity during times when the sun shines and dispatch electricity during times without sun. This takes advantage of both high prices during peak demand times (morning and evening peaks) and low prices during low demand times. This means that electricity can be bought and sold cheaper in the VPP which saves schools money on their electricity and also gives them income for selling their power.

It also means that less fossil fuel electricity from the grid is needed for consumption in the community, who can buy the schools' solar energy.

[5] Beyond Zero Emissions 'Million Jobs Plan' 2020
[6] Ancillary services markets are operated by the Australian Energy Market Operator (AEMO) to ensure grid stability and functionality
https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services

Selling electricity provides the schools with a payment for their excess energy, while reducing their energy costs beyond the electricity saved during the day from their solar generation

Another significant benefit is that, on very hot days when there is peak demand for energy due to so many people switching on their air conditioners, schools can send their excess energy into the grid to be used by homes and businesses. Peak demand times often occur during summer holidays and on summer evenings - times when the schools are closed and not using the power their panels are generating. Having this energy available to support high demand in the grid means that additional gas-fueled power plants do not need to be built or maintained - hence why it is called a virtual power plant.

Moreover, the distribution grid is built to serve peak demand periods. If these peaks can be reduced, there is less need to increase the size of the grid, which will help reduce customers' electricity bills in the long-run. This is, because the cost to build the grid are shared across all customers in the grid.

The batteries are equipped with technology that helps the healthy functioning of the grid. Increased penetration of solar PV puts strain on the network, which can be reduced with the help of batteries. Keeping the network in good working condition also reduces network cost and hence electricity bills in the long-term. Schools need to have a battery to participate in a VPP, hence we are calling for the government to fund batteries for all schools in addition to solar panels.

To join a VPP, schools need to be with an energy retailer which supports the trading of energy in a community VPP and work with the retailer to set up their VPP network. Trading can be done with anyone who is in the same electricity network region (large areas across each state).

Do schools need approval from the state government to join a VPP? And can they keep the savings from that too? Does it change from state to state to territory?

Excess electricity is always either curtailed or sent back into the grid. In some cases, the school would already receive a Feed-in-Tariff (FiT) for this electricity.

Australian Parents
for Climate Action

Sending electricity into the grid and providing clean energy to the community, as part of a VPP, does not require any approval from the state government. However, in order to participate in a VPP, both parties, generator and load, have to be with the same retailer. Some government schools or centres are not allowed to change retailer and would be precluded from participating in VPPs. There should be no barriers to a non-government school or centre from participating as VPP.

At this point in time, there is no consensus across states and territories in relation to savings from reduced electricity consumption from the grid and from VPP participation. The treatment of these savings is also dependent on any State/Territory policy that encourages the installment of rooftop solar PV on schools.

In addition, it is worth noting that the state and territory governments have mostly not explicitly considered the possibility of participation in a VPP. AP4CA is approaching the state governments to ask them to come to an agreed position on this in order to allow state schools to participate in VPPs.

Don't the state and territory governments already pay for solar on schools?

Current state and territory grant programs do not provide for all state schools, just a proportion of them. The most widespread programs are in Queensland, where two grant programs are installing panels on most state primary and high schools[7] and in the ACT where all schools now have solar, and some school batteries are now being rolled out. However, many of these installed systems are not large enough to cover the full daytime energy demand of the school.

There have also been substantial state government programs in NSW, Victoria, WA, SA and the NT. However many state schools still do not have solar - or their systems are too small - and few have batteries.

State government programs also do not, on the whole, fund non-government schools, child care centres or preschools, many of whom struggle to afford solar.

As an organisation of Australian parents, our experience is that many schools struggle with the administrative burden of applying for grants and fundraising enough funds for solar. Through the *Solar Our Schools* campaign, we're calling

[7]Two grant programs: Cooler, Cleaner Schools & Advancing Clean Energy Schools Program

on the federal government to remove application burdens, and streamline grants programs for solar and batteries.

What will the Solar Our Schools program cost?

Research done by Beyond Zero Emissions and Tesla has estimated the cost per school for solar and batteries to meet their full daytime power needs is:

- Large school or centre: Solar system = $375,000 Battery system = $278,400
- Small school or centre: Solar system = $29,750 Battery system = $53,600

The total cost of the program will depend on how many schools and early childhood centres are included in the scheme. Further research is required to ascertain how many schools and centres do not currently have solar and how many have very small systems that need to be expanded.

The program may also offer means-tested loans to private schools and centres, which would reduce the cost.

What about all those solar panels and batteries when they reach the end of their life - will they create waste?

Solar systems have a lifespan of around 20-25 years but can last up to 40 years, with reduced capacity, if they are good quality[8].

Concerns about the longevity and the end-of-life governance of solar panels is a valid concern. Cheap panels installed by dubious installers have resulted in underperforming panels that have gone to landfill prematurely. AP4CA *Solar Our Schools* strongly encourages a solar installers program that ensures high quality (Tier 1) panels and uses accredited Clean Energy Council (CEC) installers.

Nevertheless, it is estimated that 900,000 tonnes of solar panels reaching end of

8 https://www.ecogeneration.com.au/as-pv-systems-age-its-time-to-plan-for-panels-retirement-by-keeping-them-out-of-landfill/

their life will need to be handled by 2050[9]. It's important for these panels to be recycled to avoid landfill waste and to improve the total embodied carbon footprint of renewable energy.

In Victoria solar panels and inverters are considered e-waste and are banned from landfill, and can be recycled at all e-waste collection points. There are varying approaches in other states and territories[10].

Australia already has two PV recycling companies. Reclaim PV in South Australia says that they recycle 90 per cent of materials in a panel and that Australia is ahead of the rest of the world on PV recycling[11]. PV Industries also recycles solar panels.

What about batteries - can they be recycled?

The most common type of battery used with a solar system is lead-acid and lithium-ion batteries, which last between five and 15 years. Australia has a well-established market for used lead acid batteries and Australia's only lithium battery recycler, Envirostream, is in Victoria[12].

The Battery Stewardship Council has been appointed to design and implement a consistent management approach for batteries in Australia.

In the future, a more sustainable approach will be to shift from lead-acid and lithium-ion to more sustainable chemistry, such as Vanadium redox flow. This type of battery lasts for 25 years and more, it can be 100% recycled and the vanadium can be re-used at the end of life. There is no degradation.

At this point in time, vanadium batteries need to be of a larger capacity, but they are trialing a smaller version in Germany as we speak.

We strongly encourage a government solar program to provide product

---

9 https://www.ecogeneration.com.au/as-pv-systems-age-its-time-to-plan-for-panels-retirement-by-keeping-them-out-of-landfill/

10 https://www.sustainability.vic.gov.au/About-us/Research/Solar-energy-system-lifecycles

11 https://www.thefifthestate.com.au/waste/how-australias-looming-solar-panel-waste-crisis-could-actually-be-a-big-opportunity/

12 https://www.sustainability.vic.gov.au/About-us/Research/Solar-energy-system-lifecycles

stewardship mechanisms with up-front costs to ensure that end-of-life solar panels, inverters and batteries can be recycled and diverted from landfill.

What is the embodied energy of making a solar panel and is that more energy than the panels actually generate?

Research done by non-profit group, Renew, found that the energy payback period of making a solar panel depended on the type of solar panel and what location in Australia it was installed - it ranged from 0.7 years for polycrystalline panels in Alice Springs to 1.1 years for monocrystalline panels in Melbourne[13].

If you also added a lithium battery with a rated storage capacity of 10 kWh to the solar system, the energy payback period ranged from 0.9 years to 1.3 years.

Solar panels have an expected lifespan of around 25 years so you can see that there are many years of clean energy generated once the energy from making the solar panels and batteries is recouped.

Do solar panels and batteries emit dangerous levels of electromagnetic radiation that could harm children?

No, solar panels, inverters and batteries do not emit high levels of electro-magnetic radiation (EMR). The radiation given off by solar panels and inverters is non-ionizing (like a mobile phone), which does not have enough energy to damage atoms and molecules by breaking them or stripping away their electrons[14].

All electrical appliances, such as computers, TVs and mobile phones, emit some level of EMR. These expose us to higher levels of radiation than solar panels and batteries do since we spend so much time close to them. Solar panels, inverters and batteries are located away from where we are living or working inside buildings and so present a lower risk than indoor appliances. However, all these appliances have to comply with government standards for EMR levels to ensure they are at safe levels.

In fact, solar panels collect and transmit electricity via a DC current, which has a zero hertz static field, so until your inverter converts it to AC current, it actually emits no radiation. Inverters and batteries do emit low level EMR but these are within safe

[13] https://renew.org.au/renew-magazine/solar-batteries/energy-flows-how-green-is-my-solar/
[14] https://www.solarquotes.com.au/blog/electromagnetic-radiation/

levels and are also generally not located close to human contact.

The World Health Organisation concludes that low level EMR has biological effects, such as heating of the body, but no health hazard has been proven by the extensive studies into the issue[15].

[15] https://www.who.int/peh-emf/about/WhatisEMF/en/index1.html