Gabrielle Kuiper, DER Specialist, IEEFA Guest Contributor
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Institute for Energy Economics and Financial Analysis
IEEFA.org

Cheaper, Faster Decarbonisation

What State Governments Can Do To Support Distributed Energy Resources

Executive Summary

Private investments in distributed energy infrastructure – in supply, demand response, and storage – can be leveraged to support the cheaper, faster, and necessary decarbonisation of the electricity system to urgently address climate change targets.

Rooftop solar, electric vehicles, battery storage and remotely controlled air conditioning are examples of distributed energy resources (DER) – the hardware and software investments made by consumers.

To date, Australian households have spent an estimated A$25 billion on DER. That number is likely to increase at least six-fold over the next decade.

Distributed energy resources are the nexus between buildings, planning, transport and technology. Responsibility for DER integration into the electricity grid crosses national and state responsibilities.

This report focuses on what state governments can do to support and accelerate DER integration, including through Energy Ministers' meetings and the planning and transport portfolios. Collaboration will be required for success.

More efficient housing is the best investment state governments can make to tackle energy poverty.

Bringing several portfolios into the room is also an opportunity to improve outcomes for low-income households through smart policy and planning.

More efficient housing is the best investment state governments can make to tackle energy poverty.

This report makes ten recommendations for State Governments to consider:

1. **Invest in more energy efficient housing** to tackle energy poverty, including:
    - Minimum energy performance standards
    - Mandatory disclosure at sale or lease
    - Ensuring that both minimum standards and mandatory disclosure have adequate enforcement and compliance

- Developing a program to upgrade all social housing over time.

2. **Electrify homes**, rolled out in tandem with more energy efficient housing, including:
    - Changing planning regulations to exclude the use of on-site gas from new developments to avoid locking in households to higher energy costs
    - Developing a program to supply lower cost electric heating and cooling, hot water and cooking for low-income and vulnerable households.
3. **Remove gas connections from all buildings**. Gas is no longer a wise investment due to its high level of methane emissions, and its role as a transition fuel has finished. If removed from low-income housing, those homes will be both cheaper to run and safer for people's health.
4. **Legislate a demand response capability requirement for priority household appliances** under the *Commonwealth GEMS Act 2012* to ensure larger household appliances can finally be used as a resource.
5. **Expand the demand response mechanism (DRM) to include aggregated household DER** via a rule change to allow aggregated household demand to participate in the wholesale DRM.
6. **Upgrade energy efficiency schemes** to reward "emiciency" (emissions savings by time of day) and "pay for performance" programs based on actual verified savings (for households and businesses that cannot participate in the DRM), thereby overhauling the current old-fashioned certificate-based energy savings schemes in Victoria, New South Wales and South Australia, which require retailers to make "deemed" savings through activities such as upgrading lighting equipment.
7. **Support managed electric vehicle charging** including the development of national technical standards and planning requirements.
8. **Investigate how distribution network service provider (DNSP) revenue regulation can be updated to be fit-for-purpose**, given how much the business and operations of DNSPs have changed with widespread DER.
9. **Determine the commercial viability of supplying Standalone Power Systems (SAPs) and microgrids** to remote, regional and climate vulnerable consumers within their jurisdictions, now and into the future.
10. **Ensure the compliance and enforcement of DER devices, software and installations** is undertaken by the Australian Energy Regulator (AER).

If governments undertake to deliver on these recommendations, it will assist the smart uptake of DER in Australia, which in turn will lower the overall cost of the energy transition.

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Leveraging Consumer Capital for a Cheaper, Faster Energy Transition

"Distributed, decarbonised, democratic" is an oft-quoted cliche about the future energy system. But where are we, in terms of progress towards this future, and what is the role of governments in supporting this triple-D energy transition?

Australian households have spent more than $15 billion on rooftop solar alone, in excess of $1 billion on 110,000 batteries, and expenditure on electric vehicles (EVs) is growing rapidly. Commercial and industrial facilities are also investing in solar, batteries and in some cases, smart control equipment to manage energy use. If only half of Australia's 14 million cars are replaced with EVs during the next decade, it will provide a $140 billion investment in distributed energy resources (DER).

DER will play a major role in the future electricity supply.

DER comprises hardware and software located behind-the-meter or on the distribution system that generate or store electricity or manage demand. These include rooftop solar, batteries, EVs, vehicle-to-home (V2H), vehicle-to-load (V2L) and vehicle-to-grid services, smart (controllable) hot water systems, smart appliances (e.g., air conditioning, pool pumps) and energy management systems.

Consumers have shown they are prepared to pay for DER resources, which can be leveraged to provide energy, grid services (Frequency Control and Ancillary Services, or FCAS) and in some cases, distribution network services. DER can also be aggregated into Virtual Power Plants (VPPs).[1]

Consumers have shown they are prepared to pay for DER resources.

All forecasts point to DER playing a major role in the future electricity supply, demand response (balancing electricity supply with consumer demand, thereby reducing the need to run high-cost generators) and grid services.

The central scenario in the Australian Energy Market Operator's (AEMO) draft 2022 Integrated System Plan (ISP) indicates a five-fold increase from the current 15 gigawatts (GW) to about 75GW of rooftop solar by 2050 (providing a quarter of all consumption) with three-quarters of all dispatchable ("on demand") electricity capacity being distributed by 2050.[2] This means that EVs and batteries, and flexible demand in homes, businesses and factories will have the largest capacity available to draw upon to balance demand and the supply from variable renewables. As the sun sets or wind speeds decrease, the millions of distributed assets will be critical to

[1] Gabrielle Kuiper. IEEFA. What Is the State of Virtual Power Plants in Australia? From Thin Margins to a Future of VPP-tailers. March 2022.
[2] Australian Energy Market Operator (AEMO). Draft 2022 Integrated System Plan. December 2021.

balancing the electricity system, alongside large-scale batteries and pumped hydro.

AEMO's scenario suggests that we need to plan carefully to make the most of a DER-focused future.

State governments can accelerate the integration of DER.

The orchestration of consumer DER behind-the-meter (BTM) can play a big future role in the integration of renewables, enabling an even greater hosting capacity of renewables on the grid as we move towards a net-zero carbon future.

While numerous players have important roles in supporting the technical, regulatory and market integration of DER, governments can take significant action in their role of setting an overarching vision and energy transition targets for jurisdictions including regulating housing standards and supporting EVs; licensing distribution networks; managing, maintaining, and supporting social housing; and providing incentives consistent with the vision. State governments can also have a significant advocacy role within the national Energy Ministers' meetings and in setting direction for energy market institutions.

Consumer DER behind-the-meter can play a big future role in the integration of renewables.

However, state governments should be cautious about taking on responsibilities best managed nationally by energy market institutions or getting involved in the operational matters of distribution network service providers (DNSPs). Instead, governments should focus on areas where there is a clear role for them to provide big-picture leadership and direction to these organisations.

State governments should also avoid buying into technical scaremongering rhetoric about DER damaging or overwhelming the distribution grid as very little evidence has ever emerged of this occurring. The best example of a distribution network's ability to handle very high penetrations of DER is SA Power Networks' recent modelling of dynamic operating envelopes (DOEs) for supporting real time dispatch of generation and storage. The electricity distributor in South Australia, SA Power Networks is looking to offer 10kW dynamic limits, up from the current 5kW static limit, from mid-2022, with modelling indicating that households will be able to export the new 10kW limit 98% of the year.[3] The dynamic operating envelope will bind below this new doubled limit at only 2% of the time or approximately 50 daylight hours per year. This means solar households will be able to double their exports nearly all the time. This remarkable figure will need to be assessed in practice but it suggests that grid congestion or distribution network management

[3] SA Power Networks. Flexible Exports FAQs. March 2022.

issues are not, in fact, significant on a grid where more than 1 in 3 houses has a rooftop solar system.

So-called excess generation from solar is an opportunity, not a threat.

State governments can help support load shifting to the middle of the day to take advantage of abundant solar generation. Several options for this are outlined below in the sections on demand response and energy efficiency.

Minimum System Load (MSL) – the balance of supply and demand at high solar generation, very low demand times – is being managed by AEMO through a new MSL mechanism, akin to the Reliability and Emergency Reserve Trader (RERT) designed to provide the market operator with resources and flexibility when needed. State government policies and programs to support load flexibility will also be valuable for MSL.

Many Threads Are Needed for Comprehensive DER Integration

Upgrading Housing, Especially Social Housing

About a third of Australia's electricity use is in homes, yet Australian homes continue to have very poor thermal comfort in comparison with comparable jurisdictions such as California (which has the equivalent of 8-star NatHERS rating). The best way to reduce household electricity bills while improving health outcomes and creating jobs is mandating high thermal comfort via energy efficient housing, and large household appliances with high levels of energy efficiency and demand response capability (especially if this mandate applies to existing homes).

The NSW Government has been installing solar on 5,000 social and Indigenous housing properties without changes to the thermal performance.[4] NSW also has the lowest average star rating of all the states and territories for new housing, averaging 5.9 stars from 2016-2022, compared to 6.2 stars on average across Australia during the same period, and 6.8 stars in the ACT.[5]

Added to existing homes, rooftop solar systems bring down the cost of electricity but they do not solve the fundamental issue of poor quality housing stock which has major consequences for human health. Both extreme heat and cold can contribute to short-term and chronic illness and death.

A 2015 study published in the Lancet of 13 countries including the United Kingdom and Australia estimated that 7.3% of deaths between 1985-2012 were due to cold, and 0.4% due to heat.[6] This is particularly an issue in rental housing where tenants have no control over the building fabric, or often, the heating and cooling and,

[4] Melinda Hayter. NSW Government solar panel project for social housing providing financial freedom to regional pensioners. ABC. 5 October 2020.
[5] CSIRO. Australian Housing Data Portal. States and Territories. 12 April 2022.
[6] Adrian Barnett. The Conversation. Cold weather is a bigger killer than extreme heat – here's why. 22 May 2015.

generally, these homes are of lower standard. In NSW, one third of the population rents and half of these are families with children. Energy poverty is literally poverty, with low-income households spending 6% of their disposable income on energy bills compared to an average of 2%.[7]

Through the Healthy Homes for Renters campaign[8], 100 organisations have called for minimum standards for rental properties, with only Victoria and the ACT currently taking action to establish minimum standards.

There is some progress with the "7-star" NatHERS thermal comfort standard being included in the National Construction Code planned to take effect from September 2022.[9] However, the median or most common score for an existing house in Australia is just 1 star, with an average of 2.2. stars (this data is not broken down by state).[10] This is of concern for energy bills and human health as low thermal efficiency ratings means homes are fundamentally unsafe in heatwave conditions, which Australia will see more of as climate change accelerates.

Housing upgrades do not need to be funded by government. Private finance can be used, preferably with a subsidy via a lender such as the Clean Energy Finance Corporation (CEFC). The CEFC has already completed several deals to finance energy efficient and sustainable housing.[11] For example in 2016, CEFC announced a $250 million Community Housing Program to help finance the construction of up to 1,000 new energy efficient dwellings by Community Housing Providers (typically not-for-profit groups that provide community housing to those most in need in a particular region, reinvesting their surpluses).

However, this program pales against that provided by KfW, the German government development bank, which has financed six million new and retrofitted KfW Efficient Houses since 2006. Borrowers receive generous repayment and investment grants where the higher the energy efficiency of the housing unit, the higher the subsidy: up to €37,500 for a new home or up to €67,500 for an existing home.[12] After 10 years (in 2017), KfW's "Energy-efficient Construction and Refurbishment" had triggered more than €260 billion in building activity and underpinned an average of 320,000 jobs per year in building and associated trades.

Australia needs to significantly scale-up subsidised investment in housing retrofits. This is outlined in a Reliable Affordable Clean Energy for 2030 Cooperative Research Centre (RACE for 2030 CRC) report, which models that one million home retrofits over five years represents a $55 billion private finance investment opportunity, and highlights that low-income households will be wholly reliant on government funding for home retrofits.[13] In addition, capacity building will be

[7] Australian Council of Social Service. Brotherhood of St Laurence. Energy Stressed in Australia. October 2018.
[8] Healthy Homes for Renters website. 2021
[9] Australian Government. NatHERS website. 2022
[10] CSIRO. Australian Housing Data Portal. States and Territories. 12 April 2022.
[11] Where we invest> Housing. CEFC. 2022.
[12] Your promotion for new houses and condominiums. And Existing Properties. KfW. 2022.
[13] Pathways to scale: Retrofitting One Million+ homes. Race for 2030. December 2021.

needed to mobilise industry, especially to increase training and accreditation, and regulation for compliance and enforcement will be essential.

The non-profit Climate-KIC is working with industry stakeholders to establish "Retrofit Australia" as a public-private partnership to deliver (an initial target of) one million home retrofits over five years.[14] The initiative also intends to expand and support the ecosystem required to enable mandatory disclosure but clearly more bodies to deliver more retrofits are needed.

Not strictly DER, the energy performance of housing matters when making the most of any rooftop solar installations, as it's central to the energy efficiency of any heating or cooling appliance and is also important for improving climate resilience.

Modelling in a joint report by the University of NSW and the Australian Photovoltaic Institute (APVI) showed that adding solar panels to the nation's 440,000 social housing dwellings for an initial investment of $360 million a year for five years[15] would save low-income households at least $750 a year on power bills, delivering annual savings of $328m for 20 years.

The energy performance of housing matters when making the most of any rooftop solar installations.

State governments should consider the following:

- Regulating minimum energy performance standards for existing houses and apartments, including rentals – to be implemented and ratcheted up over time, with incentives for the upgrade of existing housing (potentially through the Energy Savings Scheme). Note that the Victorian Energy Upgrades (VEU) program has targets to achieve $1.3 billion in investment in energy efficiency and energy management from 2022 to 2025. This includes support for ceiling insulation and energy management systems.[16]

- Regulating for mandatory disclosure of actual housing energy performance at point of sale and lease – as has existed in the ACT since 1999. This puts an energy efficiency signal into a market that is currently dominated by other considerations. In the ACT, the system is largely managed by real estate agents who notify intending landlords or sellers of the need for them to obtain and then disclose (in all advertising) the star rating of the dwelling. A study undertaken by the Australian Bureau of Statistics (ABS) showed that, in 2005 and 2006, each half-star added $3,500 to the sale price of a house.[17]

[14] Climate-KIC. Retrofit Australia.
[15] M Roberts, Z Abdullah-Vetter, P Heywood, A Bruce, R Egan. Solar Potential of Australian Social Housing Stock. (2021) APVI
[16] Victoria Government. Victoria Energy Upgrades Program.
[17] National Framework on Energy Efficiency, Energy Efficiency Rating and House Price in the ACT, prepared by the Australian Bureau of Statistics and published by the Australian Government Department of the Environment, Water, Heritage and the Arts, 2008.

With house prices rising dramatically since then, this value is likely to be very much higher, and many times the cost of a rating (which is about $300).

- Ensuring that both minimum standards and mandatory disclosure have adequate enforcement and compliance.
- Developing a program to upgrade all social housing over time. The Victorian Government has made a commitment to upgrade 35,000 social (public and community) housing properties through insulation and draught-proofing and replacing inefficient appliances. Such a program could also include the installation of solar (and batteries, when cost effective) where rooftops are suitable.

Electrifying Homes

A significant proportion of Australian homes depend on fossil fuel methane gas for heating, hot water and/or cooking. In NSW, 1.3 million homes derive 35% of their household energy from gas. The arguments for reducing Australia's dependence on polluting gas continue to grow with increasing evidence about the high emissions from gas production and distribution.[18]

Fossil fuel supply to any new or non-residential development is incompatible with sustainable development. Instead, it is locking in expense and emissions for current and future property owners.

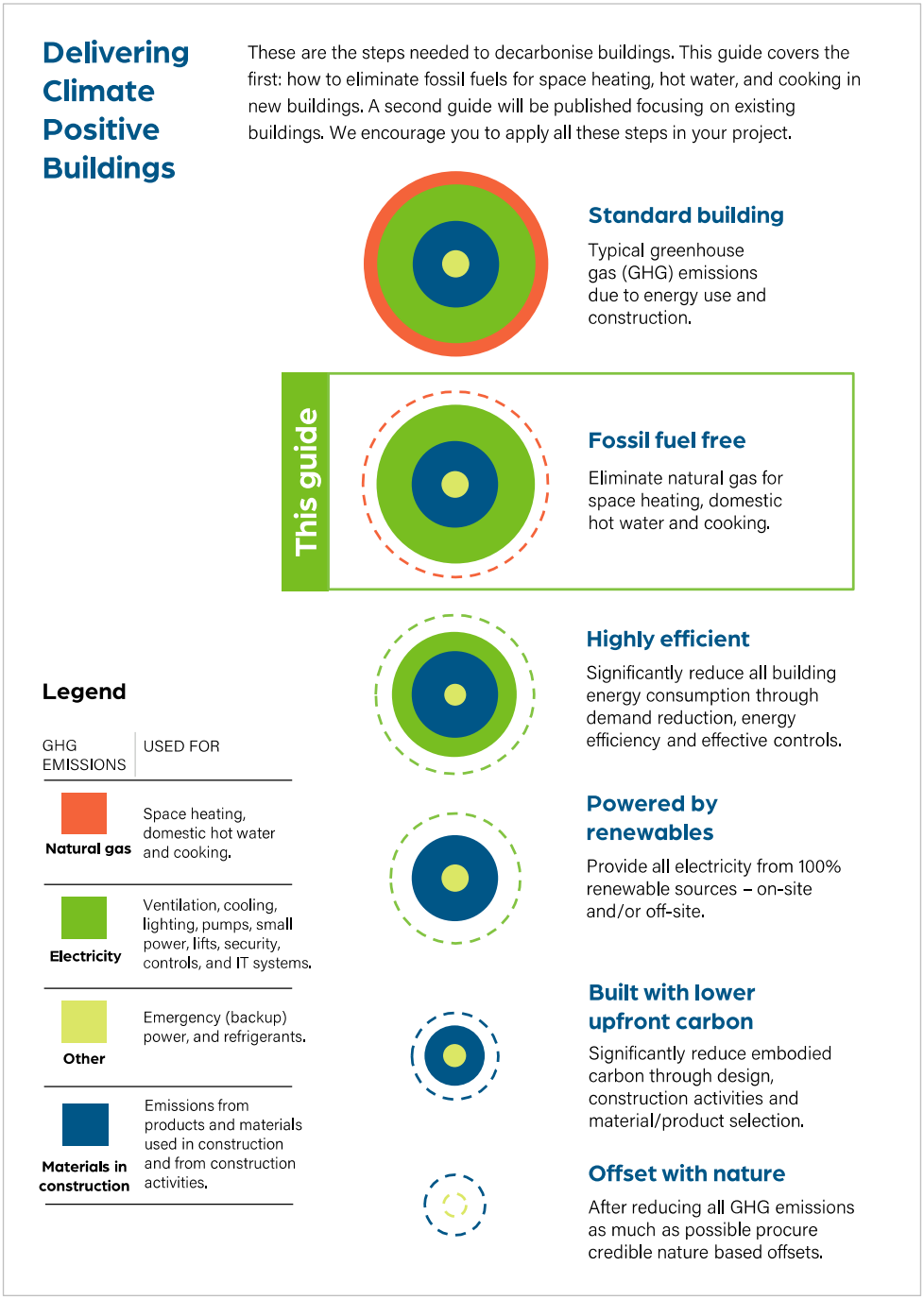
Fossil fuel supply to any new or non-residential development is incompatible with sustainable development.

This has been true at least since 2018, according to research from non-profit Renew.[19] The International Energy Agency (IEA) said last year there should be no new gas, oil or coal developments.

Low-income households connected to gas pay the greatest price, having to service both electricity and gas supply and usage charges. The ACT removed the requirement for a gas connection for new suburbs in January 2020 but planning requirements must go further to ensure all new developments are electric-only.[20] Electric buildings are far better investments and the Green Building Council of Australia (GBCA) has recently released a practical guide to electrification for new buildings.[21] As GBCA's guide highlights, going fossil fuel-free is the first step to being climate positive (Figure 1).

[18] Bruce Robertson. IEEFA. Is the Gas Industry Facing Its Volkswagen Moment? Gas Is More Emissions Intensive Than the Gas Industry's Marketing Arm Suggests. March 2020.
[19] Renew. Gas versus electricity: Your hip pocket guide. 17 April 2018.
[20] ACT Government. Now we're cooking with … electricity! Gas no longer a requirement in Canberra suburbs. 17 January 2020.
[21] Green Building Council of Australia. A practical guide to electrification For new buildings. 2022.

Figure 1: Green Building Council of Australia's Steps to Decarbonise Buildings



Source: Green Building Council of Australia.

State governments should consider the following:

- Changing planning regulations to exclude the use of on-site gas from new developments.

- Developing a program to supply lower cost electric heating and cooling, hot water and cooking for low-income and vulnerable households. A Victorian Government program is providing $335.5 million in support to replace old, inefficient, high-cost and high-emissions heaters with high-efficiency reverse-cycle air conditioners (does not include hot water). The Victorian program estimates energy bill savings of between $300 and $900 per year as a result of these upgrades. Including hot water and cooking conversions in this program would enable households to disconnect from the gas network, eliminating connection and usage costs. It's also important to ensure that the hot water system is controllable so that it can contribute to load shifting, especially to match peak solar generation (as discussed below).

Household Appliance Demand Response Standards

Energy Ministers agreed in 2019 that priority household appliances should have demand response capability. IEEFA disagrees with the proposed use of the AS4755 series of standards for this purpose and previously recommended that consideration be given to legislating "a demand response capability" requirement for priority household appliances under the Commonwealth Greenhouse and Energy Minimum Standards (GEMS) Act 2012.[22] This requirement would enable manufacturers, and the market, to offer a range of solutions, rather than locking Australia into AS4755, an out-of-date standard.

In legislating a demand response capability, Energy Ministers should ensure solutions allow consumers to retain control (override), are certified to be interoperable, and support verification and validation over secure two-way communications. This would be preferable to state-by-state action on implementing demand response for household appliances.

Legislating this requirement would effectively bring down the enablement costs of other DER such as air conditioning, water heating, pool pumps and the like. This means participation of those appliances as DER assets would reach across socio-economic backgrounds, enabling many more consumers to be able to monetise their DER assets for financial reward.

State governments should consider the following:

- In 2022, prioritising a decision by Energy Ministers to legislate "a demand response capability" requirement for priority household appliances under the Commonwealth GEMS Act 2012. Any jurisdiction could undertake the legal review and drafting of the relevant changes to the GEMS Act to present these for agreement at an Energy Ministers' meeting.

- Once legislated, state governments should include upgrades for demand response capability of these appliances within their jurisdictional energy efficiency schemes, such as the Energy Savings Scheme in NSW, until such

[22] IEEFA. Mandating AS4755 Ignores Households and Widely Supported International Solutions. August 2021.

time as aggregated household demand response is included in the wholesale DRM.

Enabling Households to Participate In the Demand Response Mechanism (DRM)

Participation in the wholesale DRM is currently limited to large customers (>100 MWh or, in Victoria >40 MWh) and requires the application of a baseline for load consumption at site. A rule change could allow aggregated DER to participate, which would unlock greater value for residential and commercial DER. In California, aggregated household demand response is now a major contributor to its wholesale market, creating substantial load flexibility, especially to assist in managing extreme weather events such as heatwaves.

Load flexibility is also increasingly important to help manage variable renewable generation in the NEM. For example, on 4 October 2021, Queensland's daily minimum operational demand was 4,228MW at 1030 hrs and maximum operational demand was 7,833MW at 1900 hrs – an operational demand swing of 3,605MW within one day.[23] At the same time, there are increasing amounts of DER under aggregator management able to assist with these swings. IEEFA's report on Virtual Power Plants suggests that there is 300MW of household DER participating in VPPs, and Origin has committed to expand its VPP to 2,000MW by 2026.[24] Having household aggregated demand able to participate in the wholesale DRM would support the scaling-up of VPPs and reduce consumers' bills.

The wholesale DRM has been operational only since October 2021. It generally takes the Australian Energy Market Commission two years to examine rule change proposals so there is no reason one can't be lodged now.

State governments should consider the following:

- Seeking agreement of Energy Ministers to a rule change proposal to expand the DRM to include aggregated household DER – or lodging a rule change proposal themselves.

Comparable Energy Efficiency and Support for Commercial and Industrial Properties

Many of the principles applying to the importance of building and appliance/equipment energy efficiency and demand response also apply to commercial and industrial (C&I) sites.

Victoria, South Australia and NSW all have requirements for energy efficiency on retailers, which pay for estimated "deemed" savings and don't consider the time of

[23] AEMO. Quarterly Energy Dynamics Q4 2021. January 2022.
[24] IEEFA. What Is the State of Virtual Power Plants in Australia? From Thin Margins to a Future of VPP-tailers. March 2022.

day when the efficiency occurred. Therefore, these schemes don't consider emission reductions resulting from the activity.

For example, the NSW Energy Savings Scheme (ESS) in place since 2009 has an energy savings target that will increase by 0.5% each year from 2022, topping out at 13% in 2030. The target will remain at 13% until the end of the scheme in 2050. The ESS allows C&I businesses to receive funding for a wide range of energy efficiency upgrades from refrigeration to heating, ventilation and air conditioning (HVAC), to motors, fans and pumps.[25] The ESS was revised in September 2021 to cover a wider range of fuel switching activities. This includes the installation of heat pump and solar water heaters in households and small business, and heat pump water heaters in commercial and industrial premises.

All of these activities are important but savings are not based on actual performance. Instead, certificates are awarded for "activities" such as replacing equipment. The ESS was developed before smart measurement and interoperability between controllers and devices became affordable and common, and before the NEM started to decarbonise.

More modern efficiency programs focus on "emiciency" (proportionate emissions reduction at the time) and verified savings (through monitoring and verification) known as "pay for performance". The danger is that current schemes are paying for savings that don't eventuate, or for energy efficiency in the middle of the day when there is abundant solar generation.

State governments need to move away from outdated "deemed" energy savings.

Emiciency considers the emissions being created by electricity generation at the time the efficiency measure is activated. For example, there is very little emission reduction savings for energy efficiency measures in the middle of the day when solar generation is at its peak in Australia. We also now need to focus on shifting demand into the solar peak, something not in scope for the ESS. It is also very important that state governments move away from outdated "deemed" energy savings and actually look at rewarding verified energy savings – something that is now possible at much lower cost than a decade ago.[26]

State governments should consider the following:

- Reviewing their energy efficiency schemes to focus on two major changes – rewarding "emiciency" and transforming into "pay for performance" programs for households and businesses that cannot participate in the DRM.

[25] NSW Government. Energy Saver.
[26] Green Tech Media. From Programs to Markets: How to Make Efficiency a Valuable Real-Time Resource. 21 May 2015.

EVs, as Fast as Possible, With Managed Charging

Electric vehicles (EVs) are the ideal partner to rooftop solar. They provide six to 10 times the capacity of stationary batteries, far more for larger vehicles such as trucks or buses. One of the fastest, cheapest way to decarbonise Australia is to match the three million households, plus numerous commercial and industrial buildings that have rooftop solar, with two-way managed EV charging. A further step is to support the transition to V2G (vehicle-to-grid) charging, whereby vehicle batteries will provide (subject to regulation) supply, frequency control and ancillary services, demand response and, where appropriate, network services.

State governments should consider the following:

- Working jointly across states and territories to develop national standards for managed EV charging, including for V2G in all types of buildings and facilities (not just apartments). These will be both technical standards and planning requirements.
- Working with Distribution Network Service Providers (DNSPs) to ensure connection requirements for EV chargers are reasonable and consistent and provide data that assists DNSPs to manage any additional load from EV charging without compromising EV owner privacy.
- Ensuring there are no barriers in the current strata law to managed EV charging, regardless of how it is operated.
- Revise planning policies to:
    - Reduce car parking requirements below current allowances for new developments within 800m of a railway station and within 400m of a bus stop. This is vital to allow for innovation. For example, the inclusion of car and electric bike sharing schemes in new residential developments.
    - Require bike and e-bike parking in new developments.
    - Ensure all parking space requirements are EV-ready (that is, they have access to suitable electrical cabling) for all classes of new buildings, as all new vehicles will most likely be electric by 2040.
    - Ensure a minimum of visitor parking spaces in new developments are installed with EV charging (future proofing through upfront installation).

EV Fleets With V2G as Fast as Possible

Given the potential of Vehicle-to-Grid (V2G) in reducing the cost of decarbonisation, it is worth looking at how to support the uptake of V2G by fleets as quickly as possible. The NSW Government has taken a leadership role through its EV Strategy,

including committing to convert the entire state bus fleet to electric by 2050 and providing funding for EV fleets for business.[27]

State governments should consider the following:

- Providing funding for V2G in future EV fleet funding.

Changing How Distribution Networks Do Business

The nature of distribution networks has fundamentally changed. The former focus was on building more infrastructure as demand grew but, since about 2007, demand has declined and multi-way flows in the network have increased. Recently, because of the "access and pricing" rule change, DNSPs were given responsibility for DER integration. For all these reasons and more, distribution network revenue regulation needs to change to match the changed roles and responsibilities of DNSPs. The financial incentives need to be consistent with consumer expectations and the transition to net-zero emissions.

State governments should consider the following:

- Commissioning a detailed investigation into how to update DNSP revenue regulation to be fit-for-purpose for the energy transition. This investigation should look to performance-based regulation and changing the timing of revenue resets:[28]
    - Performance-based regulation needs to enable innovation and risk and reward sharing between distribution businesses and consumers (or taxpayers). Australia is a long way from the static networks in which the current form of CPI-X revenue regulation was developed. Creating revenue regulation suited to the challenges of decarbonisation would mean moving not only to capital expenditure + operational expenditure) (totex), but to whole system analysis; a major reconsideration of what kind of incentives are needed for decarbonisation across electricity, transport, and gas (in particular) at reasonable cost.
    - Qualitative assessments may be a valuable tool for cultural change in utilities, in addition to benchmarking and ex-post reviews. And regulators must be given sufficient flexibility to vary regulations to meet changing technological and commercial circumstances.[29]
- Vision and direction for the energy transition must be provided by government and embedded in legislation and regulation, especially revenue

[27] NSW Government. NSW Electric Vehicle Strategy.
[28] As detailed in the author's Churchill Fellowship report: Kuiper, Gabrielle. The future of electricity distribution networks. Report for Churchill Fellowship. 2019.
[29] Kuiper, Gabrielle. The future of electricity distribution networks. Report for Churchill Fellowship. 2019.

regulation for regulated monopolies.[30]

Changing How We Provide Electricity Services in Remote and Regional Communities

The potential to supply many remote and regional electricity consumers more cheaply and more resiliently through SAPS and microgrids arises from the falling costs of solar+storage.

To provide electricity consumers with cheaper, more reliable, and more resilient electricity supply, state governments should take the lead and consider how, and how far, to make the transition to off-grid and microgrid systems for areas of low customer density.

State governments should consider the following:

- An independent investigation to determine the commercial and technical viability now and into the future of supplying remote, regional and climate vulnerable consumers with SAPs and microgrids. This should be a comprehensive investigation looking across the states and modelling a range of scenarios, including associated write-downs of existing assets, and it should take both a future-oriented and climate-risk focused approach. It should seek to overcome status-quo bias and look imaginatively at future energy needs by developing a roadmap to transition to increased supply of SAPs and microgrids for remote, regional and climate vulnerable consumers.

- The investigation should feed into the review of revenue regulation detailed above.

Technical Issues Relevant to DER Programs

DER Technical Standards for BTM Interoperability

The interoperability standard IEEE2030.5 CSIP-AUS has been developed to control the communication from any site to a DER aggregator or distribution network service providers' (DNSP) platforms. Standards Australia is currently considering how this useful standard will be adopted in a Guideline.

Currently there are no standards allowing access to individual devices behind-the-meter. That means device manufacturers can lock off management of their devices through proprietary protocols. The alternatives to proprietary standards are voluntary or mandated open device standards, i.e., fully featured control of individual DER via local standards-based communications to enable interoperability.

There's a need for state governments to consider the costs and benefits of behind-

[30] Kuiper, Gabrielle. IEEFA. What the NEM could learn from an economics professor and a moon landing. 9 February 2022.

the-meter open device standards, especially in their own programs.

State governments should consider the following:

- Mandating local DER BTM interoperability in any government-sponsored rollouts or rebate programs.

Real-Time On-Site Access to Smart Meters

Consumers or third parties acting on a consumer's behalf cannot currently obtain real-time access to the consumer's smart meter data. This seriously limits the ability of a consumer's decision making about DER investments and is a major barrier to consumers being able to benefit from their DER participating in markets via Virtual Power Plants.

State governments should consider the following:

- Supporting changes to the National Electricity Rules (NER) and Smart Meter technical standards to enable consumers and/or appointed agents access to real-time power data information from the connection point revenue smart meter.

These changes to rebate programs and smart meter local data access, along with a wider focus on standards-based BTM interoperability of DER, will potentially save consumers millions of dollars over the coming decades, avoiding consumer DER "lock in", and so accelerating the transition to a carbon net-zero future.

Compliance of DER Installations

The issue of the lack of compliance of DER hardware and installations is important for DER integration and one that is best addressed at a national level by the Australian Energy Regulator (AER), which is responsible for almost all other compliance matters in the NEM.

State governments should consider the following:

- Working with Energy Ministers to direct the AER to take responsibility for ensuring the compliance and enforcement of DER devices, software, and installations. Immediate priorities are to ensure:
    - The DER hardware installed in Australian homes and businesses meets the required Australian Standards (e.g. the new AS 4777.2 for inverters)
    - The DER hardware is installed with the required Australian settings (not settings for other jurisdictions).

About IEEFA

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About the Author

Gabrielle Kuiper

DER Specialist and Guest Contributor, Dr Gabrielle Kuiper is an energy, sustainability and climate change professional with over twenty years' experience in the corporate world, government and non-government organisations and academia. She has spent the last two years as the DER Strategy Specialist with Australia's Energy Security Board. Prior to that Dr Kuiper held senior executive or senior advisory energy-related positions in the Office of the Australian Prime Minister, at the Public Interest Advocacy Centre (PIAC) and in the NSW Government.

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