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14 February 2025

NEM Review Panel

Lodged by email: NEMreview@dcceew.gov.au

Dear Review Panel,

RE: NEM Review – Initial Consultation

The Centre for Independent Studies (CIS) appreciates the opportunity to provide input into the Initial Consultation of the NEM Review.

The CIS is a leading independent public policy think tank in Australia. It has been a strong advocate for free markets and limited government for more than 40 years. The CIS is independent and non-partisan in both its funding and research, does no commissioned research nor takes any government money to support its public policy work.

We are concerned that the Review Panel, per the Terms of Reference (ToR) release package, may be locked into a viewpoint that overlooks the significant economic and practical challenges posed by the energy transition. Specifically, there is a presumption in the ToR release package that the transition to renewables will result in a lower-cost energy system driven by market competition. However, we argue that this assumption fails to acknowledge the rising total system costs associated with firming, storage, and grid integration.

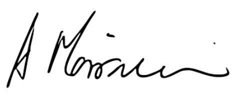
CIS also raises concerns over the rejection of advice and recommendations by the former Energy Security Board (ESB) in recent years. These include critical reforms aimed at internalising the costs of renewable intermittency and incentivising firming capacity. This rejection has led to missed opportunities for market-based mechanisms to properly price system costs, forcing policymakers to rely on a patchwork of interventions that distort market signals and undermine long-term investment certainty.

In addition, we are concerned with the current narrative surrounding Consumer Energy Resources (CER), particularly the presumption that widespread adoption of rooftop solar and home batteries will lower system costs. This belief is unsupported by rigorous modelling or empirical data, and risks oversimplifying the challenges of CER integration. The Review Panel must critically assess whether CER genuinely reduces system-wide expenses or simply shifts the financial burden to non-solar consumers, especially given the increased strain on grid stability and the associated infrastructure costs.

Lastly, CIS emphasises the need for a clear and honest articulation of the role of government intervention in shaping the future energy system. While market-based reforms are essential, they must be designed with a full understanding of the transition's inherent costs and limitations. Whether through taxes, subsidies, or capacity mechanisms, any intervention must be carefully justified, ensuring that it does not distort market signals or drive investments based on ideological assumptions rather than economic reality.

We urge the Review Panel to confront these crucial issues and ensure the long-term interests of consumers and the sustainability of the NEM are prioritised.

Yours sincerely,



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1 NEM reforms must be guided by total system cost

The Centre for Independent Studies (CIS) welcomes the opportunity to contribute to the Initial Consultation of the National Electricity Market (NEM) Review. The Review comes at a pivotal moment in Australia's energy transition. As challenges mount, market reform must be guided by economic and technological realism, rather than policy assumptions that may be politically motivated.

The renewables-dominant energy transition is moving beyond its honeymoon phase. The easy gains of a 40% renewables grid are already behind us. The initial phase of integrating renewables was relatively uncomplicated, but as penetration increases, the challenge of firming and integrating intermittent generation grows exponentially.

AER Chair Clare Savage has already warned of the impending "wall of capex" facing consumers as more renewables are integrated to the grid[1]— directly contradicting the narrative of a seamless, inevitable glide path to cheaper renewable energy. It is imperative that the increasing costs and structural challenges of the energy transition be acknowledged, rather than presuming that a predetermined shift to renewables will remain cost-effective or provide cheaper power as penetration levels rise.

The Terms of Reference (ToR) release package recognises two significant attributes of Australia's electricity market: its essential role in the nation's economic prosperity and its contribution to emissions. While seeking to achieve both affordable, reliable electricity and decarbonisation, the Review must acknowledge the inherent trade-offs between these objectives. Policies designed to accelerate the transition may impose significant costs on consumers, reduce investment certainty, and compromise system reliability if market signals are distorted by excessive intervention.

Transparency about the true costs and trade-offs involved in rapidly decarbonising the grid is often missing in public discourse about the energy transition. The public has often been led by policymakers and energy technocrats to believe that a renewables-dominant system is inherently the cheapest alternative.

The most recent example of this was Matt Kean, in his capacity as Chair of the Climate Change Authority, testifying before Senate Estimates on 4 November 2024. Kean made the stunning statement that "the ISP [Integrated System Plan] is a look at the counterfactuals as to other sources of generation to provide the cheapest replacement cost of an existing system."[2] However, the ISP does not in fact compare alternatives on a level playing field—it strictly adheres to the government's 82% renewables target and excludes competing pathways from serious consideration.[3]

The CIS contends that many NEM participants, along with the broader public, are being misinformed regarding the true costs of the energy transition. The ToR release package claims an "ongoing shift towards zero emission renewable generation, driven by falling renewable energy and storage costs", yet this shift is not a natural outcome of competitive market forces, but rather a product of sustained political and regulatory intervention. The energy transition is, as the Review Panel implicitly concedes, being mandated, not market-driven, with governments and regulators engineering artificial conditions to "promote investment in firmed, renewable generation and storage" while obscuring the reality of rising system costs.

This lack of transparency is not sustainable. The expectation that the transition will imminently lower power bills largely hangs on non-rigorous assumptions rather than strong evidence, and when those assumptions fail to materialise, public trust in the energy transition will erode.

1.1. A market reform that is not market driven?

Reading the ToR release package raises a fundamental question: does the Review Panel view the NEM as a genuine market, or a centrally planned procurement system?

At the heart of this Review lies an unresolved contradiction: policymakers claim to be designing market mechanisms to facilitate investment in preferred generation source, yet the investments themselves are not market driven. The Review Panel explicitly asks how the NEM can encourage long-term investment signals for firmed renewable generation and storage, but if these investments are genuinely cost-competitive, intervention would not be required.

Successive interventions—including the Capacity Investment Scheme, Renewable Energy Target, and state-based underwriting mechanisms—have been introduced to override market signals that do not align with the government's policy objectives.

If firmed renewables were naturally the cheapest and most efficient option, the private sector would already be deploying it at scale without government backing. The very need for revenue guarantees, mandates, and subsidies demonstrates that policymakers are not operating within a genuine market framework but rather orchestrating a managed transition while attempting to preserve the illusion of market competition.

Instead of questioning why the market has not naturally delivered the transition policymakers desire, the Review appears to be layering additional regulatory and financial interventions to facilitate a predetermined outcome: a NEM centred on firmed renewable generation and storage. If the Review Panel is introducing new interventions to address the failures or unintended consequences of previous ones, then it should be explicit about this reality, rather than maintaining the rhetoric of a competitive market.

If the NEM is to function as a genuine market, the role of government intervention must be clearly defined and explicitly justified based on genuine market failures—not used to force a politically preferred outcome at any cost.

1.2. Current energy transition masterplan is deeply flawed

The CIS has extensively documented severe economic and engineering flaws in Australia's energy transition, revealing a pattern of omission, optimistic modelling, and speculative assumptions that distort the true costs and feasibility of the transition.[4] [5] Key policy documents — AEMO's Integrated System Plan (ISP) and CSIRO's GenCost report — systematically underestimate total system costs, rely on unproven technologies, and misrepresent the economics of renewables.

Critical integration costs—including transmission expansion, system security services, and firming requirements—are excluded or understated, making the transition appear cheaper than it really is. The ISP prioritises massive interconnectors rather than assessing whether localised renewable energy zones (REZs) with adjacent storage would provide a more cost-effective solution. Meanwhile, rooftop solar and home batteries are assumed to contribute significantly to supply, but their costs are offloaded onto private consumers and cross-subsidised by non-solar customers (see Section 3.3 below), distorting the economic picture. Wind turbine, solar panel, and battery recycling costs are ignored, giving the false impression of low lifetime costs, while Scope 1 emissions accounting shifts emissions offshore rather than reducing them globally.

The transition's modelling is overfitted to best-case scenarios — assuming perfect weather foresight, seamless coal retirements, and just-in-time deployment of flexible gas generation when needed. In reality, the grid must prepare for all weather conditions every year, requiring far greater investment in firm capacity than currently projected.

Additionally, transmission projects are justified through double-counted benefits, with projects assessed in isolation rather than as part of an integrated system. This allows uneconomic investments to pass regulatory hurdles and shift costs onto consumers. Government-committed projects are also treated as locked in without reassessing their economic merit, making subsequent transmission investments appear more valuable than they actually are.

Finally, speculative technologies like hydrogen electrolysers are assumed to absorb excess solar generation, despite no commercial viability at scale.

Rather than providing a realistic pathway to a reliable and cost-effective energy future, the current energy transition plan obscures the full cost and complexity of integrating renewables at scale. Given that the Review is expected to undertake modelling and analysis to compare different policy options and to consider previous work by market bodies, the CIS urges the Review Panel to confront these modelling flaws, to ensure total system costs, genuine counterfactual scenarios, and economic pragmatism dictate Australia's energy future.

1.3. Ropes, not skis: We need a realistic understanding of cost trajectory

A clear-eyed understanding of total system cost is essential before embarking on significant market reforms. Without it, policymakers risk investing in the wrong tools and making path-dependent decisions that entrench inefficiencies. If the final destination of system cost is not properly understood, then the energy transition will be driven by wishful thinking rather than economic and engineering realism.

To illustrate this, consider a boulderer and a skier. Both navigate slopes, but in opposite directions and with entirely different equipment and techniques. A skier moves downhill, relying on gravity to accelerate with minimal effort. A boulderer, in contrast, climbs upward, requiring careful planning, continuous exertion, and specialised gear to progress.

This analogy is instructive for the energy transition. If we mistakenly assume that we are skiing downhill—that costs will naturally decline as renewables scale—we will prioritise the wrong market reforms, embed path-dependent investments in the wrong technologies, and leave consumers exposed to spiralling costs. If, instead, we acknowledge that we are climbing up a steep economic slope, where each step demands higher capital investment and system integration costs, then the tools we use to guide the transition must be fundamentally different.

The CIS is concerned that the Review Panel appears to accept, rather than critically examine, the assumption that Australia's transition to firmed renewables will continue to deliver increasing economies of scale. The very notion that the market can naturally deliver the transition implies the belief that cost-minimising competition will drive the required decarbonisation via firmed renewables — as if we are accelerating downhill with gravitational ease.

However, the fact that policymakers are now contemplating increasingly complex interventions — including reforms in wholesale and derivative markets, capacity mechanisms, and certificate schemes (a euphemism for subsidies) — suggests that we are not in fact gliding effortlessly downhill, but rather scaling a slope that is getting steeper.

Put another way, the honeymoon period for renewables is over. The easy gains of integrating early-stage renewables — when they could simply displace existing capacity without major system adjustments — have already been realised. The remainder of the journey along this course will require policymakers to force investment in firmed renewable generation and storage, regardless of market signals. This is a far cry from a market-driven transition; it is a centrally managed and intervention-heavy process, sustained only by continuous financial engineering and regulatory mandates.

It is unfortunate there is no clear acknowledgment of the true trajectory of our renewables commitment. The prevailing lexicon of the energy debate implies it is inevitable that Australia will be a renewable superpower — that economic forces will propel us toward it with minimal intervention. A December 2024 press release from the Energy Minister Chris Bowen reinforced this narrative when he lauded the expansion of the Capacity Investment Scheme, stating:

> *Successful projects were chosen from 84 bids proposing to deliver about four and a half times more capacity than what was tendered for, demonstrating that the pipeline of investors wanting to construct and operate cheap, clean, reliable renewable projects in Australia is currently strong.*[6]

Mr Bowen perpetuates the belief that investment appetite is high and that the transition is merely waiting to be unlocked. But the very existence of the revenue guarantee scheme reveals the opposite: investment is not occurring at the required scale on market terms. If firmed renewables were truly the cheapest and most efficient option, they would attract investment organically, without the need for continuous underwriting, subsidies, and policy mandates.

The prevailing narrative suggests that the energy system is merely in a temporary bind—that once short-term obstacles are cleared, the transition will proceed smoothly down a well-defined glide path. Yet the very need for this NEM Review indicates that progress has been far more difficult than anticipated. It is crucial to consider an alternative reality: rather than standing at the edge of a relatively effortless descent, we are facing a steep and demanding climb. The current suite of incentives and policy mandates in the NEM cannot and will not deliver the envisioned investments—because, in truth, the energy system is transitioning toward structurally higher costs.

One of the best outcomes of this Review would be a clear articulation that Australia is moving toward a higher-cost energy system. Being directionally correct about the gradient is of paramount importance when designing market reforms — because if policymakers misdiagnose the slope, they will continue to embed market distortions, misallocate capital, and saddle consumers with ever-increasing costs.

2 The sidelined proposals of the Energy Security Board (ESB)

The ToR release package acknowledges the importance of "consider[ing] previous and current work of governments and the market bodies". In this regard, CIS urges the Review Panel to consider comprehensively the work of the Energy Security Board (ESB), whose policy proposals were crucial in shaping the conversation around integrating renewables into the NEM.

2.1 Revisiting the ESB

Established in 2017 following the Finkel Review's recommendation, the ESB was tasked with ensuring grid reliability and protecting consumer interests amid the shift to renewables. The ESB, comprising an independent chair, deputy, and the heads of various market bodies, sought to address the systemic challenges associated with integrating renewable energy through market-based mechanisms.

However, the ESB's work was unfortunately dismissed and curtailed in 2023 after being subjected to intense lobbying from the renewable energy industry.[7] Industry pressures, alongside political lobbying, led to the ESB's proposals being dismissed. This marked the success of the renewable energy lobby, which opposed market mechanisms that would have slowed the transition to renewables. As discussed below, the industry claimed that such measures—particularly Locational Marginal Pricing (LMP) and the Capacity Mechanism—would slow the roll-out of renewables and preserve the position of coal-fired generation.[8] Despite their technical merit, the ESB's proposed reforms faced substantial opposition because they were perceived to be obstacles in the pursuit of a renewables-dominant grid as promoted by vested industry and lobby groups.[9]

While the proposed reforms were abandoned, they remain highly relevant to the NEM Review today. The CIS believes the ESB's proposals, especially LMP and the capacity mechanism, were grounded in a necessary understanding of the economic and engineering challenges that come with integrating variable renewables into the grid. These proposals sought to internalise the costs of renewable intermittency and mitigate grid congestion. They recognised that renewable generation, while cheap, comes with systemic costs, including transmission bottlenecks, grid services costs, and reliability risks. By asking renewable generators to share in these system costs, the ESB sought to establish a fairer and more sustainable system.

2.2 Locational marginal pricing and capacity mechanism

The ESB's proposed reforms aimed to mitigate the economic and engineering challenges of integrating variable renewables into the grid. The ESB recognised that while renewable generation was cheap, it imposed systemic burdens on the grid: their intermittent fuel and geographic distribution exacerbate transmission bottlenecks, inflate grid services costs, and threaten reliability.

The ESB's solutions sought to fairly expose renewable generators to these system costs while incentivising firming capacity. In particular, the locational marginal pricing (LMP) involved a market design that incentivises generator to bid more closely with their true costs of generation based on their location to reflect real-time grid constraints,[10] discouraging oversaturation of renewable projects in congested zones. Similarly, the capacity mechanism sought to incentivise sufficient dispatchable generation to back up renewables during periods of low output, ensuring that the grid would remain reliable even when renewable sources could not meet demand.[11]

These reforms were grounded in engineering and economic principles, acknowledging that a renewables-dominated grid requires market signals to manage spatial and temporal mismatches.

2.3 Regulatory capture

Despite the technical merit of the ESB's proposals, the renewables industry, lobby groups, and state Labor governments mounted a fierce opposition to them. The industry denounced the ESB as a relic of the fossil fuel era, accusing it of ideological bias and obstructing the downhill path to clean, affordable and reliable energy. This narrative gained traction among ministers, who rejected the ESB's advice at critical junctures.

As self-reported in the industry publication *RenewEconomy* several times, the ESB was dismantled by the renewables industry. At the December 2022 and May 2023 Energy Ministers' meetings, the ESB was reportedly humiliated.[12] Its capacity mechanism was derided as "CoalKeeper" for allegedly propping up legacy fossil fuel assets, while LMP was labelled a "Solar Stopper" that would deter investment in renewables.[13] These caricatures ignored the ESB's independent function and scope, and by extension, its nuance: the capacity mechanism was technology-neutral, and LMP aimed to optimise transmission use, not stifle renewables. Ms Savage, then-ESB member, warned that "If we don't get it right, the costs could be higher, and the benefits of renewables and storage not realised. Worst case, we rebuild the grid twice."[14]

The final blow to ESB came in May 2023, when ministers abolished the Board and replaced it with the Energy Advisory Panel (EAP). Unlike the ESB, the EAP operates under complete opacity. There are no public Terms of Reference, and there are no minutes or records kept – the only detail we know is that the EAP reports directly to ministers without public accountability. Its mandate — to "coordinate advice" on security and affordability — effectively reduced market bodies to ministerial subordinates. Statements of Expectations issued in August 2022 formalised this subordination, requiring AEMO, AEMC, and the AER to align their work with government priorities, eroding their statutory independence.

As noted above, Matt Kean appeared before Senate Estimates on 4 November 2024 and exposed his fundamental misunderstanding of what the ISP demonstrated regarding the cost of renewables relative to other generation sources. This is of great concern, as Kean may have held this misconception while serving as NSW Energy Minister and overseeing the development of the Capacity Investment Scheme.

During the Senate Estimates hearing, Kean said:

> *As the former energy minister in New South Wales, we looked at what the cost of replacing the existing system in a New South Wales context was against other counterfactuals, and that's what we relied on AEMO for.*[15]

The ISP, as discussed above, is constrained by government policy, including carbon budgets, the exclusion of nuclear, and the absence of any allowance for coal refurbishment or new coal generation. Given these constraints, the ISP does not provide an objective counterfactual and cannot credibly support Matt Kean's assertion that it demonstrates the least-cost replacement of the existing system. In reality, the ISP only evaluates renewable-dominated pathways—all of which assume significant transmission expansion.

Consequently, if the Capacity Investment Scheme—which was fashioned on the NSW LTESA system as pioneered by Matt Kean[16]—was built on the mistaken assumption that we are transitioning to a lower-cost system, then serious concerns arise about its viability and effectiveness. The total cost to taxpayers from the scheme could be far higher than anticipated, with long-term implications for energy affordability, reliability, and investment certainty.

The CIS strongly urges the Review Panel to take into account the ESB's work — even though it was dismantled under industry pressure — when evaluating the NEM Review. The ESB's proposals for LMP and the capacity mechanism were especially vital for addressing the challenges of integrating renewable energy while ensuring that the costs were fairly distributed across the system.

3 Consumer energy resources (CER)

The Review Panel claims in the ToR release package that CER can lower unit costs by improving grid and generation infrastructure utilisation. It perpetuates the narrative of a 'solar paradise', where rooftop solar, EVs, and home batteries, if integrated well, deliver lower costs and system-wide benefits.

However, this belief is unfounded and is not backed by any modelling or empirical research from Australia's energy market bodies:

- AEMO has modelled the benefits of coordinating home batteries ($4.1 billion in savings) but has not tested whether incentivising rooftop solar and home battery uptake reduces total system costs.[17] Its ISP assumes a four-fold increase in rooftop solar and a 34-fold increase in home batteries but does not quantify whether this path is cost-optimal.[18]
- The AER has echoed AEMO's claims,[19] but goes even further, citing an unverified $11 billion in avoided network augmentation costs from integrated CER in the ISP[20]—yet this figure is nowhere to be found in the ISP.
- The AEMC, similarly, assumes that CER "offers substantial benefits for consumers",[21] citing AEMO and other modelling exercises that show more CER coordination reduces costs compared to less or no coordination.[22] The AEMC then makes the leap of faith that increased CER uptake itself will lower power bills.

None of the energy market bodies have attempted to demonstrate that increased CER uptake actually lowers total system costs. Instead, they have uncritically endorsed consumer investments in rooftop solar and home batteries as cost-saving measures without testing whether these technologies reduce system-wide expenses or merely shift costs onto non-solar consumers.

In reality, CER is likely to increase total system costs and worsen consumer bills over time. As discussed below, rooftop solar does not reduce generator capital expenditure because it fails to reliably lower forecast critical peak demand, meaning full backup capacity remains essential. Instead, it increases distribution capital expenditure, necessitating costly network upgrades to handle excess solar exports and voltage fluctuations. Home batteries, despite subsidies, remain financially unviable and unreliable for peak demand reduction, as distribution network service providers (DNSPs cannot depend on consumers to discharge them at critical peak times. While export tariffs are being introduced, they are unlikely to offset the cost burden on non-solar customers, who continue to face higher network charges as solar penetration grows.

CIS urges the Review Panel to rigorously scrutinise the assumptions underpinning the 'solar paradise' narrative rather than accept it at face value. Before committing further to CER as a policy direction, the Panel must ensure that any proposed strategies are demonstrably in the long-term interests of consumers—supported by robust empirical research and modelling, not optimistic projections or wishful thinking.

3.1 Rooftop solar does not reduce generation or distribution network capital costs

Renewables advocates often claim rooftop solar reduces overall grid demand and peak demand, thereby lowering capital costs for generation and networks.[23] However, these claims typically focus on shifting daily peak demand or reducing the *average* demand, rather than reducing *critical peak demand*, which is key driver of network and generation investments.

Critical peak demand refers to the highest, most extreme demand events that occur under stress conditions—such as heatwaves or winter cold snaps—when energy consumption spikes to its maximum. It is the projected critical peak demand that dictates system planning, as networks and generation infrastructure must be built to readily handle the highest load at any given time to avoid blackouts or system failures.

Due to the unpredictability of future weather, rooftop solar cannot reliably lower forecast critical peak demand by a substantial amount across the relevant timescales for each subsection of the grid. As a result, it does not reduce network or generation capital expenditure, as full backup capacity remains necessary.

3.1.1 Flawed studies overstate rooftop solar's system benefits

Studies that claim that rooftop solar reduces critical peak demand often rely on aggregated data across broad areas, which does not reflect the localised nature of network constraint. For example, in 2023, Energex estimated that rooftop solar reduced Queensland's peak demand by 292 MW (5.3%),[24] while Ergon Energy reported a 23 MW (0.9%) reduction.[25] These studies, however, are network-wide estimates that do not account for the localised constraints driving network upgrade costs. Peak demand reductions observed at a broad scale do not necessarily translate into meaningful reductions at the local feeder or substation level, where infrastructure upgrades are planned based on forecasted critical peak demand in specific areas.

Some studies overstate rooftop solar's impact by averaging reductions over time rather than measuring actual critical peak demand events. For instance, a 2016 study of Queensland households found rooftop solar reduced peak demand by 4.4% in summer and 0% in winter, but this was based on half-hourly data rather than the absolute second-by-second peak that drives system costs. [26] Also, the study assessed demand reduction over 'critical event days'—the 12 hottest and coldest working days—rather than the single highest demand event. Given that network and generation planning is based on the absolute peak load, not seasonal averages, such studies do not demonstrate meaningful reductions in forecasted critical peak demand or infrastructure needs.

3.1.2 Real-world data show rooftop solar fails to reduce critical peak demand

The NEM must maintain sufficient generation and grid capacity to accommodate sudden spikes in demand when rooftop solar output drops due to passing clouds. AEMO data shows solar farms can lose up to 80% of their output within five minutes under such conditions,[27] and the same applies to distribution networks with high rooftop solar penetration. To prevent instability, DNSPs must build in a buffer beyond recent peak demand levels to account for rare but extreme weather events. [28] Additionally, critical peaks vary across different areas as consumers switch on appliances at different times, making localised grid resilience essential. [29]

Recent state-wide maximum demand records illustrate rooftop solar's inability to reliably reduce critical peak demand. On 22 January 2024, Queensland's market demand peaked at 11,036 MW, nearly 9% higher than the record set just three days earlier. [30] Underlying demand exceeded 12,000 MW, yet rooftop solar contributed at most 500 MW (4%) of demand.[31] This peak surpassed AEMO's 1-in-10-year summer projection for 2024, underscoring the inability of rooftop solar to provide dependable relief during extreme demand events.[32]

Western Australia also broke records on 20 January 2025, with maximum demand reaching 4,486 MW, exceeding the previous record by 6%.[33] Despite WA's large-scale solar capacity being theoretically sufficient to meet 80% of demand on a sunny day, [34] it contributed just 0.2% at the time of peak,[35] because the demand spike occurred at 6:30 pm on a cloudy day, when solar output was minimal.[36]

In short, DNSPs and other NEM participants cannot predict the exact timing of critical peak demand or the level of rooftop solar generation available at that moment. To ensure system reliability, the NEM must build sufficient utility-scale generation capacity and distribution network capacity to meet peak demand in every subsection of the grid, without depending on rooftop solar. Given its inability to reliably reduce critical peak demand, rooftop solar does not lower network or generation capital costs.

3.2 CER increases grid instability and distribution augmentation costs

Rooftop solar and home batteries introduce additional costs and complexity to the distribution network by increasing grid stress and instability. Unlike the traditional one-way electricity flow from large-scale generators to consumers, rooftop solar necessitates a two-way flow between exporting households and the grid.[37] At high penetration levels, this can exacerbate network congestion, voltage fluctuations, and reverse power flows, requiring costly infrastructure upgrades.[38]

3.2.1 Rooftop solar disrupts grid stability and increases operational costs

As rooftop solar penetration increases, minimum demand levels decline,[39] forcing synchronous generators (coal, gas, hydro) to withdraw supply. This reduces essential grid stability services such as voltage management, frequency control, and inertia, compromising the grid's ability to be operated safely.[40] DNSPs must respond by investing in voltage regulation technology and infrastructure upgrades.

For example, SA Power Networks has resorted to curtailing rooftop solar through brute force overvoltage disconnections,[41] while AEMO has introduced the Victorian Emergency Backstop Mechanism to allow DNSPs to remotely switch off rooftop solar during periods of minimum demand.[42] AEMO has signalled its intent to expand such measures across the NEM, underscoring the challenges posed by high rooftop solar penetration.[43]

3.2.2 Rooftop solar integration costs escalate sharply beyond hosting capacity

The cost of integrating rooftop solar remains minimal until the grid reaches its hosting capacity — the point at which the network can no longer absorb additional rooftop solar generation without significant upgrades.[44] Once this threshold is exceeded, costs rise incrementally before reaching a critical point where large, system-wide upgrades become necessary.

Due to the uncertainty surrounding when and where these cost inflection points will occur, estimates for total distribution network upgrade costs vary widely. A study of Victoria's grid found that enabling 60% of customers to install rooftop solar — without resorting to large-scale battery adoption or curtailment — could result in annual per-customer costs ranging from $47 to $886 in rural areas and $82 to $2,525 in urban areas.[45]

If costs at the higher end of this range materialise as solar penetration increases, it would impose a significant financial burden on many consumers. Such costs may prove politically untenable without additional government subsidies, further shifting the financial risk of rooftop solar expansion onto taxpayers.

3.2.3 Batteries are an unlikely solution

Home batteries are often touted as the solution to rooftop solar's grid challenges, but they remain prohibitively expensive — even with subsidies — and their ability to reduce distribution costs is highly uncertain.

Despite years of government incentives, battery adoption has remained low. Programs in South Australia,[46] Queensland,[47] Victoria,[48] and Tasmania[49] have had minimal impact, with battery installations trailing far behind rooftop solar uptake. Many of these subsidy schemes have already been discontinued due to poor consumer uptake, as home batteries remain financially unattractive for most households even after rebates.[50]

Even if widespread adoption was somehow achieved, home batteries would still be unreliable for reducing critical peak demand. DNSPs cannot count on consumers to charge and discharge their batteries in a way that meaningfully lowers peak demand. To reduce network costs, batteries must (1) be fully charged before peak events and (2) sustain discharge long enough to cover the full peak duration. However, if a critical peak day is cloudy, many batteries may be depleted, rendering them ineffective for peak shaving. Furthermore, tariff structures may encourage battery owners to discharge at similar times (i.e. during peak periods), potentially depleting their batteries too early and merely shifting rather than reducing peak demand.

One way of providing more certainty around battery charging and discharging — and therefore peak demand reduction — is through CER coordination via Virtual Power Plants (VPPs). Indeed, AEMO's ISP assumes that 85% of consumer batteries will be coordinated through VPPs to support the grid.[51]

However, consumer participation in VPPs is far from guaranteed. Battery owners want to be adequately compensated for grid services but also value maintaining backup power — especially during peak demand or blackouts. This conflicts with how VPPs operate, as they prioritise selling stored power back to the grid when prices are highest, typically during peak demand events or system stress.

These conflicting incentives make widespread VPP participation challenging and costly. Financial incentives are necessary to persuade consumers to relinquish control of their batteries. The coordinated CER trial, Project EDGE, found nearly half of consumers showed little to no interest in joining a VPP.[52] The report further noted that consumers prioritised reliable power supply, cost savings, and quality service over the potential emissions reductions from widespread CER and VPP adoption.

Ultimately, home batteries are neither a cost-effective nor a reliable solution to the grid challenges posed by rooftop solar. Their high upfront costs and highly uncertain system benefits make them an impractical means of achieving generation and network savings.

3.3 Solar customers are overcompensated, resulting in cross-subsidies

The Review Panel takes for granted that CER benefits all consumers, but in fact it creates a cost shift that disadvantages non-solar households. Rooftop solar owners reduce their reliance on grid-supplied electricity, lowering their contribution to network cost recovery while still depending on grid services for backup and stability. As a result, network costs must be spread across a smaller consumption base, raising per-unit electricity costs for non-solar consumers.

3.3.1 How much rooftop solar saves the grid

The only genuine system-wide cost savings from rooftop solar come from marginal reductions in coal and gas generation’s fuel and variable operating costs — rather than any avoided capital expenditure. In a forthcoming paper, CIS estimates that rooftop solar reduces system costs by at most 4c/kWh in averted fossil fuel generation costs.

As detailed in Table 1, CIS calculated these savings by multiplying fuel costs and variable operating expenses ($/GWh) for each generation type by the notional generation (GWh) displaced by rooftop solar. The resulting total estimated fuel and operating cost savings across the NEM amount to $971 million annually, or 4c/kWh.

This estimate, however, does not account for the additional distribution network upgrade costs required as solar penetration increases and is hence a conservative figure.

Table 1. Notional gas and coal generation displaced by rooftop solar (GWh) and associated fuel and opex savings ($) in the NEM.

Generation Type	Fuel Costs ($/GWh)	Variable Opex ($/GWh)	Annual Generation (GWh)	Notional Displaced Generation (GWh)	Fuel and Opex Savings ($)
Brown coal	$9,769	$4,785	32,610	5,998	$87,298,594
Black coal	$29,320	$5,063	89,473	16,457	$565,857,954
Gas-powered steam turbine	$177,009	$2,779	1,069	197	$35,360,872

Combined cycle gas turbine	$103,706	$8,794	6,211	1,142	$128,522,186
Open cycles gas turbine	$217,464	$12,588	3,139	577	$132,839,046
Reciprocating engine gas	$133,593	$13,341	299	55	$8,076,661
Waste coal mine gas	$133,593	$13,341	498	92	$13,450,921
Total			**19,043**	**24,519**	**$971,406,234**

3.3.2 Rooftop solar owners are earning outsized bill savings

The savings rooftop solar customers receive on their energy bills arise from self-consumption (averted usage costs) and feed-in tariffs (payments for exported excess energy), less any applicable solar meter fees. However, CIS analysis finds that these bill savings are around 2 to 4.5 times larger than the 4c/kWh that rooftop solar can plausibly save the system.

Figure 1. presents CIS' analysis on solar customer bill savings in the forthcoming paper. The median bill savings are calculated in c/kWh of solar generation for typical rooftop solar customers in the NEM with 3, 6, and 9 kW systems and no home batteries. Customers on single-rate tariffs saved between 9 and 18 c/kWh, while those on time-of-use tariffs saved between 8 and 16 c/kWh. This represents substantial savings from self-consumption and exports that are far higher than warranted, given rooftop solar generation provides at most 4c/kWh of value to the grid.

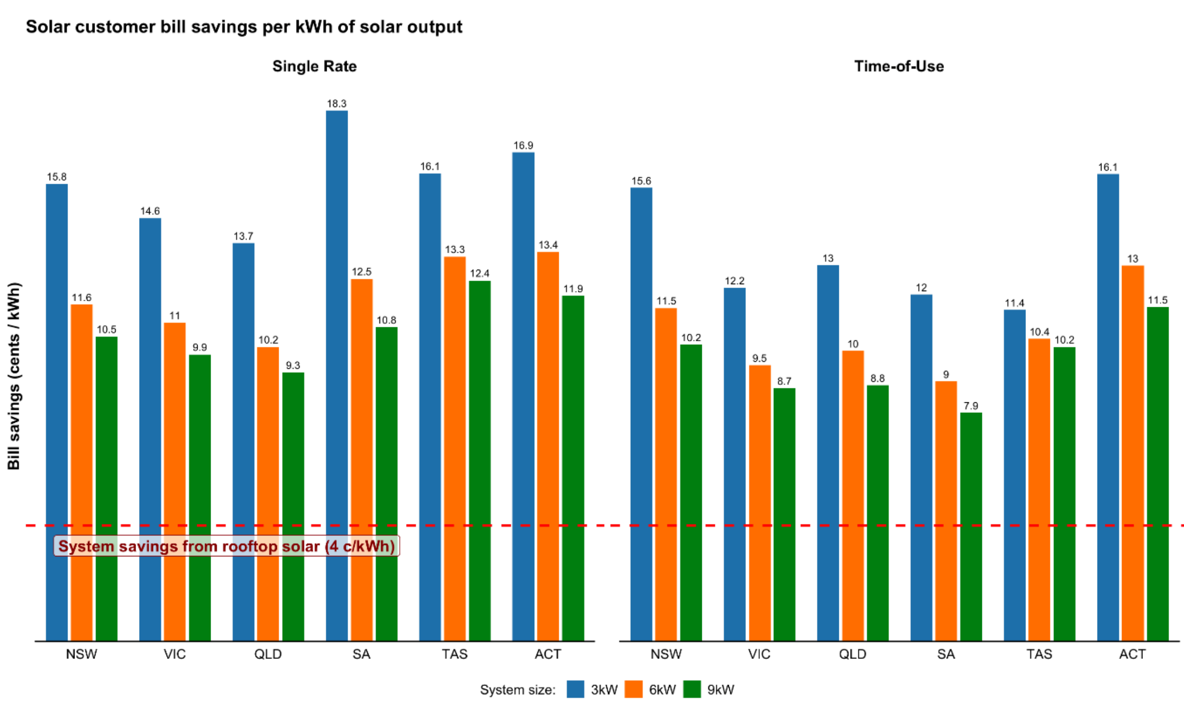

Figure 1. Bill savings for rooftop solar customers on both single rate and time-of-use tariffs exceed electricity system savings from rooftop solar generation (4c/kWh) in all NEM states and for all modelled rooftop solar system sizes.

The large gap between household savings and actual system savings underscores how rooftop solar is overcompensated at the expense of non-solar customers. Since retailers must recover all network costs from their customers, excessive rooftop solar bill savings result in higher electricity costs for non-solar consumers. Prior research has also found that rooftop solar households avoid a disproportionately large share of network charges, incentivising inefficient levels of rooftop solar investment.[53]

3.3.3 Current tariff structures enable cross-subsidies at the expense of non-solar customers

Cross-subsidies between solar and non-solar consumers are reinforced by the structure of network tariffs, which were originally designed before rooftop solar reached mass adoption. Historically, these tariff structures — though not fully cost-reflective — were sufficient to distribute network costs fairly. However, with high levels of rooftop solar penetration, they now introduce substantial cross-subsidies.

Current network tariffs are structured in such a way that 60-75% of network costs are recovered through variable usage charges rather than fixed charges,[54] and these costs are passed through to consumers in the form of variable retail tariffs and fixed daily charges, with network charges making up around half of retail bills.[55] Prior to mass rooftop solar uptake, this model worked because electricity usage was strongly correlated with peak demand, making it a reasonable proxy for allocating network costs.[56]

However, under today's tariff structures — including single-rate and time-of-use pricing — rooftop solar owners can significantly reduce their total energy consumption while still requiring and benefiting from full network availability. This results in solar customers paying disproportionately less for network infrastructure, even though they still depend on the grid for backup power and stability. This means the lower usage charges paid by solar customers — who do not help lower system costs — are causing non-solar consumers to pay higher per-unit prices to recover fixed network costs.

3.4 NEM Review should correct its approach to CER

For the Review to develop credible and beneficial recommendations, it must address the real economic and equity challenges of CER integration rather than assume that increased participation will inherently lower system costs. The Panel should:

1. Move away from simplistic assumptions about CER participation and cost reduction. Rather than assuming that higher CER penetration is always beneficial, the Panel should evaluate the conditions under which CER actually delivers net system benefits, and the policy levers needed to correct market distortions.
2. Explicitly model CER integration costs, including cross-subsidies and network infrastructure upgrades. The Panel seems to assume that CER reduces costs without accounting for the hidden cost burdens shifted onto non-solar consumers. Transparent modelling of these cost shifts is essential.
3. Look at reforming tariff structures to ensure fair cost allocation. Current volumetric pricing mechanisms allow CER owners to avoid paying their share of network costs, leading to inequitable price increases for non-solar consumers. The Panel should explore fixed network charges or capacity-based tariffs to more equitably distribute costs.
4. Acknowledge the failure of battery subsidy programs and re-evaluate assumptions about home storage uptake. If battery adoption is necessary for the transition to a high-renewables grid, the Review should question whether continued reliance on direct subsidies is an efficient policy mechanism.

4 Principles for government intervention in the NEM

The Panel can consider four main categories of intervention into the market to achieve a particular outcome:

1. Taxes (e.g., a carbon tax)
2. Subsidies or mandates (such as the CIS, RET or the Value on Emissions Reductions)
3. Additional markets (e.g., for capacity, auxiliary services)
4. Direct investment (such as Snowy 2.0)

The CIS firmly supports the use of the free market wherever possible, and laments that in achieving a transition towards a higher-cost energy system extremely significant interventions are likely to be required. Any deviation from market-principles should be carefully explained and justified in terms of clear and compelling market failures.

The NEM’s energy transition has been marked by a series of government interventions in the market, that lack both a clear justification and an admission that they comprise a transition towards a higher-cost system. Rather than picking winners, policymakers have consistently picked losers — hydrogen turbines, offshore wind, and rooftop solar — while directing supposedly independent authorities to declare these choices "optimal," "reliable," and "least-cost." Where deemed necessary, exceptions to market-based principles must be carefully justified.

The following is a summary of potential and pitfalls of the overall categories of mechanisms available.

Carbon Tax

By far the most transparent and efficient means of inducing a transition to a higher-cost system would be to fundamentally shift the gradient of incentives through a carbon tax. Only this type of mechanism can effectively shift the gradient of incentives that the market experiences. This would provide a technology-neutral means of achieving a reduction in emissions, allowing all options to achieve reductions to be explored by the market. Unfortunately this has proven to be politically difficult. This is unlikely to be overcome, since the transparency that leads to the mechanism's efficiency also makes it clear to the population what the direction of travel is.

Subsidies or Mandates

These categories of investments are likely be far less efficient, less transparent, and potentially also prone to corruption.

The revenue underwriting mechanisms such as the Capacity Investment Scheme and Long-Term Energy Service Agreements (LTESA) in NSW provide significant risk to taxpayers, particularly if there is not a clear acknowledgement of the overall direction of travel of the costs for the systems. As more correlated generation is added, the capture price for energy from these sources declines, and will continue to do so, exposing taxpayers to far larger costs that haven't been quantified publicly in advance of the mechanism being announced.

These subsidies were also adopted instead of other market-based mechanisms such as those proposed by the ESB which would have more efficiently guided investment, by incentivising the most efficient types of investment. The CIS will allow a cost to be borne by the taxpayer to meet a target for a given capacity. Given that final approval rests with the Minister for each contract under the CIS, and the inclusion of many other merit criteria along with cost (social license, indigenous engagement etc), there is little guarantee that the proposals required to meet the target are all low cost or least-cost. The high discretion offered to the minister to include/exclude individual projects also introduces an obvious opportunity and incentive for corruption.

Mandates such as the Renewable Energy Target force a transfer to occur from consumers to generators. Such a mechanism is likely more transparent and less prone to corruption, since individual projects don't get included or excluded, i.e. everyone can participate.

The inclusion of a Value of Emissions Reduction in the regulatory system for regulated investments also comprises a forced transfer from consumers to the operators and owners of regulated assets. This mechanism is extremely opaque in its current form, since the documents which show the operation of this value in the regulatory system are complex and generally inaccessible. It is also likely to be very inefficient, since the transfer is mandated for any project which can be modelled to have "net benefits" including the benefit of providing emissions reductions. The possibility that there could be lower cost ways of achieving emissions reductions does not preclude the award of these transfers to a transmission or distribution business that is capable of modelling a scenario where their investment induces others to take actions (such as additional generation construction, dispatch, or changed consumer behaviours) that reduce emissions.

As discussed earlier, the use of Feed-in-Tariffs to incentivise rooftop solar and distortive tariff regimes to allow solar users to under-pay their share of system fixed costs has led to very inefficient outcomes. This is another example of market interventions being justified on the false premise that at some point soon, economic gravity will take over, and the interventions will not be required and have delivered net benefits by accelerating the transition to a lower-cost overall state.

Additional Markets

Creating secondary markets for valuable services (such as reliable availability, inertia, fast frequency response, etc) can be efficient. However, if there aren't other matching market interventions to exclude the generators that can provide these services (such as thermal generators) they cannot alone be expected to force investments uphill. Again, the presence of a market can give on the false impression that the direction of economic travel is downhill, when in fact additional mandates, bans, or other interventions are required for force policy-preferred participants into the market.

Direct Investment

There is a further obvious (and blunt) means by which government can achieve a drive towards a higher-cost system: directly investing in the chosen technology, using public funds to overcome the higher cost.

Again, such an investment faces high transparency risks, and could easily be extremely inefficient if the government has not been judicious in their attempt to pick a winner. The case of Snowy 2.0 also exemplifies the case of such an investment being made on the premise of assisting the transition to a lower-cost overall system, when in fact the business case was opaque, and no evidence of the economic justification seems to withstand examination in hindsight.

Snowy 2.0 also exemplifies another pitfall of direct investment, in that the boundaries of the special project were poorly defined, and have consequently greatly distorted other elements of investment which were left to the regulatory system, and further impacted the market. This is most certainly the case for the required transmission to connect Snowy 2.0. Given the project's location in high mountains, far from population centres and other likely renewable energy generation, the cost of transmission to connect Snowy 2.0 (Western Renewables Link, VNI West, HumeLink and Sydney Ring South) is likely to significantly exceed the cost of Snowy 2.0 itself. As can be seen in the case of HumeLink, on which the Centre for Independent Studies has made a significant submission to the Energy Planning and Regulation in Australia Senate Committee, these projects do not pass normal tests for consumer benefits, and the regulatory process is being manipulated in order get the projects to pass investment tests.

As a general principle, if the government wants to intervene directly in a market by funding a proposal that the market would not, it must properly delineate the full scope of the intervention, and internalise any costs or undesirable distortions that the investment has on other parts of the market. Snowy 2.0 provides a case study in how this has not been done to date.

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