Entrant generators – context, headwinds and options for power purchase agreements

Working paper

COMMERCE COMMISSION NEW ZEALAND
Te Komihana Tauhokohoko

ELECTRICITY AUTHORITY
TE MANA HIKO

About this paper

This paper examines what the Electricity Authority Te Mana Hiko (Authority) could do to improve settings in relation to power purchase agreements (PPAs). This is one of the eight initiatives being considered by the Energy Competition Task Force (Task Force), which was jointly established with the Commerce Commission in August 2024 to investigate ways to strengthen the electricity market in the short to medium term. We plan to release consultation on any proposed actions relating to PPAs in April 2025 to support decisions by June 2025.

To ensure proposals are well informed, we have been gathering information from interested parties as we develop our thinking. We are also publishing this working paper covering context, headwinds, risks, opportunities and high-level options. We are seeking feedback on this paper as we work toward a further consultation on proposals.

PPAs are long-term contracts to support generation. They can provide a route to market for entrant generators and an alternative procurement option for electricity buyers or traders. There are various business models that involve buying or selling PPAs or supplying associated services.

PPAs have the potential to intensify competition – between business models, for the supply of new generation, and for electricity retail services. PPA sellers also compete to stimulate demand growth (eg, through electrification) and some international investors (such as data centre operators) specifically seek out PPAs. PPAs can provide an avenue for broadening the pool of parties investing capital in New Zealand generation expansion.

More intense competition can deliver benefits for electricity consumers. Benefits could include retail innovation (especially for commercial and industrial customers), discovery of better generation options, and increased pressure to add supply earlier leading to lower prices (on average) and better security of supply.

As such, this paper seeks to identify headwinds that dampen PPA activity and options that could help mitigate them. It also discusses, at a high-level, the potential benefits and risks associated with intervening. The paper acknowledges factors that mean the PPA market may develop differently in New Zealand than overseas markets. For example, in New Zealand we have an energy-only market and do not have subsidies for new renewable generation.

The Authority is particularly interested in addressing areas where market settings or structures inefficiently impede PPA activity. As such, the scope of this paper includes services that complement PPAs – including PPA sleeving (retailer services that work alongside a PPA) and PPA firming (pricing for a PPA buyer's residual demand).

Flexible resources to support firming are concentrated among incumbent gentailers, and this market structure may limit PPA activity. Other Task Force initiatives are also examining this issue, because PPA transactions are just one form of activity that could be hampered by difficulty accessing firming.

This paper discusses access to firming and sleeving alongside PPA headwinds. We are seeking input on our analysis to date as we work toward consultation on proposals. We are particularly interested in views on where the greatest impediments to PPAs lie and on the best options for promoting competition, efficient investment, and innovation.

The Task Force understands that PPAs can have a critical role to play in enabling new generation, and that firming and sleeving are parts of this equation – the motivation behind initiating work on this Task Force initiative 1A. The Task Force is willing and ready to act to support new generation development. Your response to this working paper will help us to assess where our efforts should be best directed.

Contents

1. How you can inform our thinking

What this paper is about

1.1. The Electricity Authority Te Mana Hiko (Authority) has joined with the Commerce Commission to form the Energy Competition Task Force (Task Force).[1] In September 2024 the Task Force published two packages of work that it is considering, each with four focus areas.[2]

1.2. This paper provides a snapshot of our emerging thinking on Task Force initiative 1A, which "consider[s] requiring gentailers to offer firming for Power Purchase Agreements."

1.3. We are releasing this working paper to provide insights into our thinking as it evolves. The paper covers:

(a) background and context

(b) analysis of headwinds to power purchase agreements in New Zealand

(c) risks and opportunities

(d) option framing and initial comments.

1.4. We welcome submissions on this paper that will assist as we progress work toward developing and consulting on proposal. We plan to hold an open forum during the consultation period and would welcome direct engagement, including with entrant generators, potential PPA buyers and existing industry participants.

1.5. We are aiming to consult on proposals in April 2025 to support decision-making in June 2025.

How to provide submissions

1.6. The Authority's preference is to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix B. Submissions in electronic form should be emailed to TaskForce@ea.govt.nz with 'PPA working paper' in the subject line.

1.7. If you cannot send your submissions electronically, please contact the Authority on TaskForce@ea.govt.nz or 04 460 8860 to discuss alternative arrangements.

1.8. Please note the Authority intends to publish all submissions it receives. If you consider that the Authority should not publish any part of your submission, please:

(a) indicate which part should not be published and explain why you consider we should not publish that part, and

(b) provide a version of your submission the Authority can publish (if we agree not to publish your full submission).

1.9. If you indicate part of your submission should not be published, the Authority will discuss this with you before deciding whether to not publish that part of your submission.

1.10. However, please note all submissions received by the Authority, including any parts that the Authority does not publish, can be requested under the Official Information Act 1982. This means the Authority would be required to release material not

[1] The Ministry of Business, Innovation and Employment is also involved in the Task Force as an observer.

[2] For more background and context see Energy Competition Task Force | Our projects | Electricity Authority.

published unless good reason existed under the Official Information Act to withhold it. The Authority would normally consult with you before releasing any material that you said should not be published.

When to provide submissions

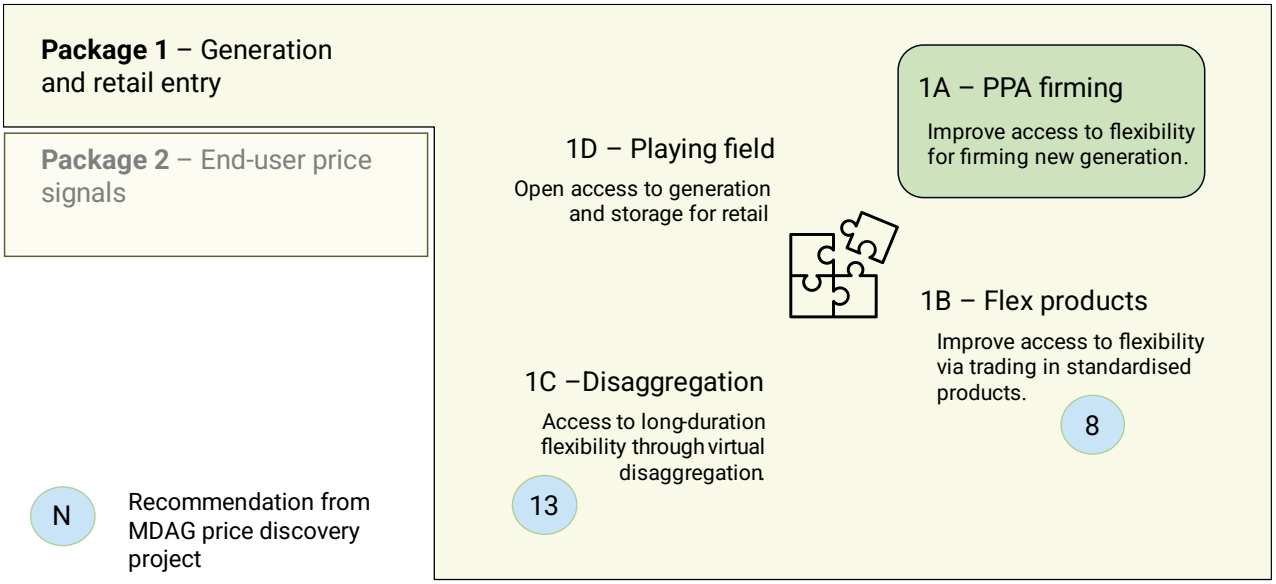
1.11. Please deliver your submission by 5pm, **Friday 28 February 2025.**

1.12. Authority staff will acknowledge receipt of all submissions electronically. Please contact the Authority at TaskForce@ea.govt.nz or on 04 460 8860 if you do not receive electronic acknowledgement of your submission within two business days.

2. Introduction

2.1. The Task Force announced two packages of work in September – Package 1 focuses on retail and generation entry and competition, and Package 2 focuses on price-signals for end users, as illustrated in Figure 2.1.

Figure 2.1 – Task Force work packages



2.2. The goal of Package 1 is to "enable new generators and independent retailers to enter, and better compete in the market. This will encourage more and faster investment in new generation, which puts more energy into the system, strengthens resilience against future shortages and puts downward pressure on prices."

2.3. This paper addresses initiative 1A, which focuses on entrant generation and the role of power purchase agreements (PPAs). As stated in the Task Force's work programme:

> "This option supports the development of new intermittent generation, such as wind and solar. Access to firming (from flexible generation that can run at any time, such as hydro or gas peakers) enables developers to enter into power purchase agreements (PPAs) with large users and retailers that match their supply of electricity to their customers' demand profile, and manage the risks of variable generation volume (eg, when the wind does not blow or the sun does not shine). The Authority will consider requiring gentailers to offer a minimum volume of flexible electricity in the form of long-duration contracts that could be used to firm new generators' PPAs. A deeper and more active market for PPAs will enable more generation investment."

2.4. This is a working paper intended to share work-in-progress thinking as we progress toward potential regulatory proposals. As shown in Figure 2.2, developing and seeking submissions on this paper is a step toward a full consultation paper planned for April 2025.

Figure 2.2 – Timeline for Task Force initiative 1A

Legal framework

2.5. All Task Force members remain actively involved in the shaping and progress of the Task Force initiatives. However, should this process lead to a proposal to amend the Electricity Industry Participation Code 2010 (Code) the Authority is the statutory body responsible for developing and consulting on any proposed Code amendment.

2.6. The Authority's work is guided by its statutory objectives set out in section 15 of the Electricity Industry Act 2010 (Act). The Authority's main objective is: "to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers."[3]

2.7. Should the Authority reach a view that amending the Code is consistent with its statutory objectives, it will consult on the proposed amendments and comply with the other requirements as required by section 39 of the Act (unless an urgent Code amendment is necessary).

2.8. In performing its functions, the Authority must also have regard to statements of government policy concerning the electricity industry issued by the Minister for Energy under section 17 of the Act. The Minister issued a statement of government policy to the Authority in October 2024 and the statement includes elements that are relevant to consideration of entrant generators.[4] Key themes of relevance are:

(a) the expectation that coming decades will see substantial increases in demand, which will require significant investment in new generation and related services

(b) the benefits that participation by a diversity of parties can bring in terms of promoting innovation and competition for the benefit of consumers

(c) the benefits that accurate price signals and decentralised risk management provide in promoting efficient reliability and security of supply

(d) the benefits that effective competition bring in terms of mitigating misuse of market power, supporting clear price signals, spurring innovation, and exerting sustained downward pressure on costs and prices

(e) reinforcing that the Authority should not favour one form of supply over any other.

Related work

2.9. The Market Development Advisory Group's (MDAG) December 2023 paper setting out final recommendations from its *Price discovery in a renewables-based electricity*

[3] As set out in section 15, "The additional objective of the Authority is to protect the interests of domestic consumers and small business consumers in relation to the supply of electricity to those consumers. The additional objective applies only to the Authority's activities in relation to the dealings of industry participants with domestic consumers and small business consumers."

[4] https://www.beehive.govt.nz/sites/default/files/2024-10/Government%20Policy%20Statement%20on%20Electricity%20-%20October%202024.pdf

system project (MDAG report) provides key context for much of the Electricity Authority's work.[5]

2.10. MDAG identified that as our system becomes more renewable, there are limited resources that can cost-effectively provide firming for extended (multi-day or multi-week) periods with low wind and/or solar resource. This contrasts with more regular within-day firming, which is comparatively easy to manage cost-effectively using a range of supply and demand-side resources.

2.11. MDAG's conclusions have informed our work to ensure that flexible resources are being offered/used and valued appropriately. Two of the Task Force initiatives (1B and 1C) are derived from MDAG report recommendations.

2.12. In terms of the Package 1 Task Force initiatives:

(a) initiative 1B aims to facilitate development of standardised flexibility products

(b) initiative 1C prepares virtual disaggregation of the flexible generation base as a backstop measure, should trading not develop sufficiently to mitigate concerns around thinning competition in the supply of medium to long-duration flexibility

(c) initiative 1D aims to further reinforce this package by examining level playing field measures that could further support effective competition.

2.13. Initiative 1A is complementary to other Package 1 initiatives, particularly 1B:

(a) initiative 1B is focused on developing a generic shaped flexibility product, which could be of use to a range of buyers. Trading of such a product, and a broader suite of products in future, could provide transparent price discovery and confidence for PPA buyers that they will be able to access suitable pricing for their residual (non-PPA) demand. Such products could also remove the need for PPA buyers or sellers to approach incumbent gentailers directly to arrange pricing for residual demand. These developments could in turn support more PPA activity leading to increased competition to build new generation, and hence the potential for more competition leading to a more affordable supply of electricity to consumers, more efforts to grow demand, and better security of supply.

(b) initiative 1A was commenced against the risk though that initiative 1B would not adequately meet the needs of PPA sellers and buyers, and therefore would not provide appropriate (efficient) support to new generation entering the market.

2.14. Initiative 1A has also been initiated with the backdrop of the Authority's risk management review, which has raised concerns around the availability and pricing of shaped super-peak hedge contracts.[6]

2.15. Given the context set out above, our work to date, which is captured in this working paper, has focused on:

(a) developing an understanding of PPAs in a New Zealand context

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5 For Market Development Advisory Group recommendations refer https://www.ea.govt.nz/documents/4335/Appendix_A2_-_Final_recommendations_report.pdf

6 The risk management review focuses on the hedging needs of entrant retailers serving a residential consumer base. A retailer supplying firming to a PPA buyer may not have exactly the same needs in terms of the shape of any hedges, but there is the same potential for market power to impact pricing and availability. This in turn could frustrate PPA transactions and stymie generator entry.

(b) identifying headwinds to PPAs in New Zealand

(c) considering risks and opportunities associated with mitigating PPA headwinds

(d) identifying high-level options.

2.16. This work will establish a base from which we can better understand and validate problems, articulate objectives, and evaluate costs and benefits of alternative options.

2.17. To be clear, the Task Force understands that PPAs can have a critical role to play in enabling new generation, and that firming and sleeving are part of this equation. The Task Force is willing and ready to act to support new generation development but is still validating which interventions directed specifically at PPAs are warranted. The motivation behind this initiative remains the view that:

(a) business models built around PPAs could potentially bring significant benefits to consumers by strengthening competition to expand generation, to sell electricity and to grow demand

(b) gentailers could potentially impede such competition, to the detriment of consumers, through their control of access to firming (ie, pricing for residual demand).

2.18. In considering whether to intervene, the Authority needs to consider this potential problem in the context of whether:

(a) the potential for PPAs to deliver meaningful benefits may be inherently limited absent measures that socialise various risks,[7] noting that such measures would conflict with GPS guidance and would carry significant risk of delivering poor outcomes for consumers

(b) some of the factors that impede PPA activity currently will abate over time, including as parties become more familiar with PPAs as a procurement option and as the electricity demand growth outlook solidifies

(c) other initiatives, including within the Task Force work programme, may provide better solutions that assist to strengthen competition from PPAs and other business models.

2.19. Feedback from current and potential PPA buyers and sellers on the material in this working paper will be important for helping us develop our views on these matters and contribute to shaping any PPA-related regulatory intervention in a way that has the best potential to deliver benefits to consumers.

2.20. Finally, we recognise that issues relating to PPAs may be a subset of wider issues that could impede entrant generation. We are focused on PPAs with this work, but we would welcome information on other issues that could inform future work on generator entry.

2.21. The issues canvassed in this paper touch on many related electricity market issues. Readers may find the references listed in Table 2.1 useful for additional context and analysis.

[7] The key risks that could be socialised would be credit risk of PPA buyers, revenue risk for PPA sellers, and firming price risk for PPA buyers. Socialising risks shields parties from costs, which can amount to subsidising the activities of those parties.

Table 2.1 – Useful references

Reference	Comment
Energy Competition Task Force	This paper contributes to the work of the Task Force, which was jointly established by the Authority and the Commerce Commission and currently includes two packages of work.
Price discovery in a renewables-based electricity system	The Authority is implementing a programme of work following MDAG's recommendations on adapting market settings as supply becomes more renewable. Addressing recommendations around access to standardised firming products are included in the Task Force work programme.
Risk management review	The Authority is assessing the impact that pricing and availability of risk management contracts may be having on retailer entry and expansion (issues paper published in November 2024).
Generation investment visibility	The Authority has a programme of work to improve generation investment information – for its own monitoring, for Transpower and for public disclosure.

Useful terms and concepts

2.22. Some of the terms and concepts in this paper are not in common usage in the New Zealand electricity market. **Table 2.2** provides a guide to our usage.

Table 2.2 – Useful terms and concepts

Term	Comment
PPA	Power purchase agreement. A long term contracts to sell the output from a development, whether to an end user or another party. See also paragraph 3.3 for more detail.
PPA firming	Pricing for a PPA buyer's residual volume.
PPA volume	The amount of energy sold through a PPA. Linked to the output from a PPA development.
Residual volume	The difference between an end user's total consumption and their PPA volume.
Sleeving	A retail service that enables an end user to give effect to a PPA by paying different prices for PPA and residual volumes.

Q1. Is there any other related work that you think is relevant to our consideration of PPA issues?

Q2. Do you have any suggested additions or modifications for PPA terms and concepts?

3. PPAs in New Zealand

3.1. This section introduces the role PPAs can play within the New Zealand market. It covers the types of contracts we define as PPAs, examines buyer and seller motivations for PPAs, and considers how PPA-backed generation investment fits within wider system expansion dynamics.

3.2. In developing this paper, we have met with a cross section of gentailers, independent and entrant generators, large electricity users and intermediaries. This engagement has helped us understand the state of PPA activity in New Zealand, perspectives on headwinds, potential benefits of PPAs, and options for improving outcomes.

3.3. We appreciate the engagement we have had to date and look forward to engaging further during the consultation process. We recognise the importance of different business models to deliver an efficient and competitive electricity system in New Zealand.

3.4. Appendix A provides a brief survey of PPAs in Australia, the United States, Europe and the United Kingdom.

What is a PPA?

3.5. For our purposes, we consider a PPA is:

(a) **sold by a generator or developer**—this can be an entrant generator, existing challenger, or an established generator. For sellers, PPAs are a form of offtake or output agreement

(b) **linked to one or more specific developments**—often set up before construction (and typically ahead of final investment decision), but can be against an existing generation facility (including to support end-of-life repowering)

(c) **long-term**—terms of 10 or more years are typical. Re-pricing may occur during the term (tied to forward prices, event-based, or condition-driven), but more commonly PPAs have a fixed price throughout the term. Contracts may include early termination provisions, including force majeure

(d) **generation-following**—energy volume sold through a PPA is directly linked to the output of the generation. This means PPA payments are tied to successful commissioning of the subject generation project and its output, though sometimes these risks may be allocated to the purchaser.

3.6. This definition excludes:

(a) alternative revenue models where a developer adopts some other sales strategy, such as selling all output into the wholesale market (perhaps with hedges to reduce earnings volatility) or to an internal business unit

(b) alternative procurement models where an electricity retailer or end-user procures electricity via a contract that mimics some aspects of PPA pricing.[8]

(c) PPAs can be for on-site or nearby generation connected to a purchaser-owned facility (a ‘private-wire PPA’) or, more commonly, for remotely located generation.

[8] For example, a conventional supply agreement accompanied by renewable energy certificates (RECs) or a supply agreement with a portion of supply notionally linked to a renewable generation portfolio.

3.7. Since all generation must have its output sold through the wholesale market, PPAs in New Zealand are typically structured as a financial derivative contract with a generation-linked volume.[9] The contract may have a fixed strike price or may be structured to modify how price risk is allocated between the parties to the contract.[10] The reference node for the derivative may be located near the generation plant, meaning the purchaser takes basis (or location) risk between that node and their offtake node, but could be at a node near the purchaser or some other reference node.[11]

3.8. PPA agreements may be accompanied by sale and purchase of renewable energy credits of some kind, but this is not an essential feature.

3.9. Because our definition of PPA includes that the volume is generation-following, they make most sense for inflexible renewable generation – solar, wind, run-of-river hydro and geothermal. However, PPAs could make sense for firmed renewables – such as a solar and battery energy storage system combination – with the inclusion of provisions dealing with the routine operation of the firming resource.

Why might parties sign a PPA?

3.10. We consider this question from three perspectives:

(a) sellers – a generator or generation developer, selling a PPA to provide revenue certainty for generation developments

(b) corporate – an end user of electricity, purchasing a PPA to support their own electricity consumption

(c) utility – a party such as an electricity retailer, trader or agent, purchasing a PPA as an input to their business of selling energy services.

3.11. This question is relevant to initiative 1A because the motivation of the parties will help us to understand what might best enable PPAs, and what might prevent potential seller and buyer needs from overlapping.

Seller

3.12. On the sell side, a developer or owner of renewable generation may wish to enter a PPA to:

(a) **remove revenue volatility**– spot prices are volatile, which may present a particular challenge for an entrant generator. Relying on spot revenues may provide similar expected revenue on average, but earnings would vary significantly from month-to-month and year-to-year

(b) **remove revenue uncertainty** –depending on whether and how the PPA re-prices through its term, a PPA can mitigate longer-term price uncertainty relating to system conditions (including hydrology and potential price capture issues for solar or wind)

(c) **reduce revenue complexity** – assessing the risks associated with nodal prices or complex off-take agreements or sales strategies can present a non-

[9] Refer clauses 14.3 to 14.5 of the Code. New Zealand is sometimes described as having a gross pool market, meaning all electricity is traded through the wholesale market regardless of any other contracting arrangements for sale and purchase.

[10] For example, price could be linked to nodal prices below a cap, above a collar, or within a band.

[11] A PPA derivative could be paired with arrangements to supply financial transmission rights (FTRs) to manage locational risk, and the reference node could be at an FTR hub. These are not essential features.

trivial hurdle for developers (and their lenders and investors) trying to assess the viability of a potential investment. A generation-following PPA can significantly simplify the revenue picture

(d) **improve access to financing** – a common and key motivation for developers to sell PPAs is to support their access to finance. From a finance provider's perspective, a PPA can materially de-risk capital-intensive renewable developments. Reduced revenue volatility, uncertainty and complexity, as well as other transfer of risk to purchasers gives lenders and investors confidence. We note that many international investors may, as a default, expect that a PPA will be in place to secure long-term revenue for new generation projects (based on their experience in other jurisdictions). Not having a PPA in place for a planned New Zealand generation investment will therefore immediately impact their perception of the risk involved

(e) **improve project competitiveness** – to the extent that a PPA reduces the revenue risk of a development, this can flow through to reduced financing costs. Because renewable projects have high up-front costs and low running costs, the cost of finance has a material impact on the levelised cost of energy (LCOE) for a development.

3.13. PPAs are also a familiar sales channel in some offshore markets. This familiarity can help reduce the novelty of operating in New Zealand for developers, investors, advisers, and potential purchasers. This may be a non-trivial benefit given the complexity and volatility of our electricity market.[12]

3.14. A PPA can form part of a largely 'set and forget' strategy for market participation, potentially supported by use of an agent to manage ongoing metering, network access, and wholesale market participation obligations. Alternatively, PPAs can form a part of a more actively managed participation strategy where the developer sells PPAs alongside complementary wholesale or retail products and services.

Corporate buyer

3.15. On the buy side, a corporate may wish to enter a PPA to:

(a) **support green credentials of being linked to a renewable project**– buying a PPA is a more tangible way for corporates to support renewable generation than methods such as renewable electricity credits (RECs), and often also includes RECs that contribute to accounting for Scope 2 emissions[13]

(b) **obtain long-term price certainty for a portion of demand** – depending on re-pricing arrangements, a PPA can provide a degree of long-term price certainty for the portion of demand that is met by the PPA

(c) **bypass incumbent suppliers** – PPAs provide an opportunity for buyers to obtain a portion of their supply directly from a developer. This may have the attraction of accessing a wider pool of sellers, plus directly supporting generation expansion (which, at scale, could improve security margins and ease price levels)

12 For example, we have granular nodal pricing and transmission cost allocation arrangements and complex interactions between capacity and energy shortages.

13 https://ghgprotocol.org/scope-2-guidance

(d) **access lower prices** – in some cases, a PPA may provide an opportunity to access a competitive project with costs below the rate reflected in wholesale prices.[14]

Utility buyer

3.16. Utility buyers may include incumbent gentailers, entrant gentailers, independent retailers, and financial intermediaries.

3.17. As such, on the buy side a utility (or trader) may wish to enter a PPA:

(a) to blend a long-term fixed-price contract into their portfolio to alter its overall cost or risk profile

(b) as an alternative (or complement) to developing their own generation or investing directly in a development. For example, a PPA may give a utility access to a technology for which they don't have in-house expertise, have not established their own development pipeline, or do not have competitive developments

(c) for re-packaging and on-selling, either to a single party or divided across a portfolio of buyers.

How might a PPA fit with other contracts?

3.18. PPAs are generation following, so they will not meet all of the demand for a PPA buyer and firming is required. This means PPAs typically work alongside other energy supply contracts, and there are a range of models for those who may wish to purchase PPA firming, and how PPAs may fit into a generation, retail, trading, or gentailing business model.

3.19. Again, we consider this question from the perspective of sellers, corporate buyers and utilities.

Seller

3.20. The simplest structure for a developer is to:

(a) sell one PPA covering all the output from their development, and

(b) engage an agent to provide market services, which may include managing obligations relating to metering, network use, and wholesale market participation.

3.21. Alternatively, a seller may:

(a) sell two or more PPAs that, in aggregate, cover all or most of their output

(b) sell one or more PPAs covering part of their output and adopt some other sales strategy for their residual output. The residual output could be uncontracted, sold through some other form of sales contract, or used to back a portfolio of sales commitments

(c) sell one or more PPAs bundled with a supply agreement or other arrangements that help the buyer manage pricing for their residual demand – in other words, sell a PPA plus firming.

[14] This is not a general outcome of PPAs and depends on the quality of the project backing the PPA, the credit-strength of the PPA buyer, and the outcome of negotiations between buyer and seller as to pricing and risk allocation.

3.22. With any of these arrangements, the generator may manage market services directly as a wholesale participant, or through an agent.

Corporate buyer

3.23. Most electricity users purchase electricity through a retail supply agreement, that commonly:

(a) includes market services, such that the user does not need to manage obligations relating to metering, network use and wholesale market participation

(b) provides a fixed rate, or schedule of rates for different time blocks, with no minimum volume or volume limit. This is commonly referred to as fixed-price variable volume (FPVV)

(c) locks in rates ahead of time for a year or more.[15]

3.24. Larger users may enter more sophisticated retail supply agreements or may instead operate as a wholesale purchaser.

3.25. When a corporate buys a PPA it will cover a portion of their needs, linked to the output of the PPA generation, and leave them with residual volume to manage. In other words, the purchaser will need to "firm" their PPA. Options for PPA firming may include:

(a) firmed retail sleeve – the buyer may enter a retail supply agreement for their residual demand. The sleeve may mimic a normal FPVV supply agreement (or other retail pricing structure) but will have additional provisions dealing with netting off PPA volume and handling PPA cashflow adjustments[16]

(b) vendor firming – the PPA seller may offer firming that covers some or all of the buyer's volume or price risk. In this case the developer is effectively acting as a gentailer, both developing generation and providing retail services to buyers

(c) wholesale firming – the corporate may manage their own firming through some mix of nodal price exposure, physical resource management, and financial hedging.

3.26. Regardless of how a corporate chooses to manage their residual demand, entering a PPA has the effect of decomposing supply into a PPA component and a firming component. Typically, the two components will be contracted over different terms – a long term for the PPA, and a shorter or rolling term for the firming.[17]

Utility buyer

3.27. For a utility buyer, a PPA gives them a contract to manage as part of their portfolio. Examples (at least in theory) could include:

(a) gentailer – a traditional gentailer with its own generation and retail portfolios may buy a PPA as a complement to its own generation. As with building

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15 A contract may offer fixed rates for energy, while passing through changes in network or metering costs.

16 If the PPA is a financial derivative, then the retailer at the buyer's node will need to pay the clearing manager for all energy consumed at the installation. They may then simply pass through nodal prices for the PPA volume (leaving the PPA buyer and seller to manage overs and unders between them) or arrange cashflows that give effect to the PPA strike price.

17 This is because firming costs become more uncertain over a longer timeframe, such that long-term firming contracts may include a substantial risk premium. This effect is heightened when the power system is under transition, because firming costs are affected by changes in technology mix over time.

generation, the PPA will alter the gentailer's risk profile and they may wish to build complementary resources, access firming contracts or modify their retail position

(b) independent retailer – a retailer who does not own generation has to rely on contracts to manage their purchase risk. A PPA could fit into a portfolio of buy-side contracts. Entering a PPA would likely alter the mix of other contracts they need to cover their overall risk position

(c) independent generator – a generator who does not have a retail business could use a PPA to add to their generation portfolio. The PPA would then add supply they can on-sell through their existing sales channels[18]

(d) wholesale trader – a buyer could buy one or more PPAs as part of a portfolio of buy-side contracts underpinning wholesale trade in electricity derivatives

(e) PPA reseller – a buyer could buy one or more PPAs for repackaging and on-sale to energy users, with or without supplying firming. In such a model, PPAs may rely on the reseller's credit strength, or the value of the reseller's retail portfolio. If the reseller wishes to sell firmed PPAs, they need firming resources or access to firming contracts.

3.28. Of the above, the first two are the most common and established business models. The next two are less common and can operate with or without PPAs. The last is a PPA-centred business model.

How do PPAs impact system evolution?

3.29. System expansion is fundamentally driven by actual and expected nodal prices – including expectations around risk and uncertainty and how nodal prices will respond to investments and other events.

3.30. Nodal prices reflect the economic value of production at a given time and place, given all of the factors that feed into demand and supply. Contract prices, including for PPAs, in turn reflect expectations of future nodal prices.

3.31. So, at one level, PPAs should not alter system expansion and evolution at all in a workably competitive market:

(a) PPAs are only economic (and hence commercially viable) when an equivalent non-PPA development is economic

(b) when a development is committed, it will alter nodal price expectations, with a flow-on impact on all other potential developments.

3.32. In other words, feedback loops between nodal prices and investment are at the heart of system expansion and guide the timing and mix of investment toward a least-cost path. To illustrate some of these feedback loops:

(a) as the penetration of a given intermittent generation technology increases, the capture rate for that technology decreases, making it more economic to invest in other technologies.[19] As this dynamic plays out across each technology, it

[18] Independent generators are sometimes referred to as merchant generators, or independent power producers (IPPs).

[19] Capture rate (sometimes referred to as participation rate, or GWAP-TWAP ratio) is the ratio between the generation-weighted average price (GWAP) for a project and the simple time-weighted average price (TWAP). It reflects how well the output from a technology is correlated with the times when production is most valuable.

guides the system toward an optimal technology mix (eg, of wind versus solar) that is not over-saturated with any one technology

(b) the decline in capture rate is influenced by the cost of firming each technology. For example, low-cost battery storage reduces the cost of within-day firming for solar and allows solar to remain economic at higher penetration rates (by supporting higher daytime prices at higher penetrations)

(c) as the cost of thermal resources increases (or availability declines) it becomes more economic to hold hydro lakes higher (with an attendant increase in hydro spill and higher need for other intermittent generation)

(d) if the penetration of a technology in a region increases, local capture rates decline and it becomes comparatively more economic to invest in firming in that region, to expand supply in other regions, and to invest in transmission capacity.[20]

3.33. However, there are various ways PPAs could have a positive impact on system expansion:

(a) having a broader and more diverse set of potential developers could alter competitive dynamics around system expansion, and associated competition to secure sales volumes. This could push the sector toward investing earlier (on average) and pursuing sales more vigorously (including through innovation)

(b) PPAs may provide a route to market for a broader set of potential developments, and a broader set of developers. This could uncover or unlock some economic projects that a smaller set of developers would fail to discover or pursue. This would lower the cost of system expansion, and could alter the optimal technology mix

(c) parties buying PPAs may have different nodal price expectations, or a different disposition toward risk and uncertainty, than other investors. This could lead them to make different decisions on the timing (and other properties) of investments, leading to a different pace and trajectory for system expansion.

3.34. These potential positive benefits motivate our consideration of whether there are interventions we could make to remove barriers to PPA transactions.

3.35. The other way PPAs can alter system evolution is if PPA-backed investments were subsidised in some way. This could:

(a) deter non-PPA generation investment. This would weaken competition, and could lead to later and more costly system expansion on average with higher prices and lower security of supply

(b) skew system expansion toward projects (or developers) that can best access the subsidies. This could disrupt the merit order of system expansion (ie, more expensive projects could be built ahead of less expensive projects)

(c) dampen the role of nodal prices in guiding system expansion toward an optimal mix and timing

(d) reduce incentives on participants to manage risks, and to innovate

[20] Noting that the cost of transmission investments of this kind may be allocated to the beneficiaries of the investment, so transmission investment costs can factor into the relative economics of investing at each location.

(e) transform system expansion from a demand-led dynamic to a subsidy-led dynamic.

Q3. Do you agree with our definition of PPAs?

Q4. Have we correctly identified buyer and seller motivations for PPAs?

Q5. Have we correctly identified how PPAs may fit with other contracts?

Q6. Do you agree with our characterisation of how PPAs may impact system evolution?

4. PPA headwinds

4.1. This section considers the state of the PPA market, and headwinds in the New Zealand context.[21]

Underlying need

4.2. Like any generation investment, the economics of a PPA-backed development rests on underlying demand. Underlying demand for generation can be driven by:

(a) changes in overall electricity usage, or changes in the profile of usage (including changes in the size, timing or location of demand peaks)

(b) changes in other generation, whether due to retirement, fuel or other operating constraints, network constraints, or changes in the role of existing plant. Changes in role are particularly relevant to large hydro lakes, and slow-start thermal[22]

(c) changes in security settings – including factors such as scarcity pricing levels, emergency storage triggers, customer compensation settings, and contingent risk settings

(d) changes in the cost of new supply (or the difficulty of bringing new supply to market). Falling costs can enable new supply to displace existing supply, can alter optimal duty cycles, or make expanded security margins more economic.

4.3. Generation investment involves making a large up-front commitment, with a long lead-time to first production, an uncertain underlying revenue stream and long payback horizon. This is inherently challenging in any system and at any time.

4.4. Some enduring features of the New Zealand market make generation investment challenging, including:

(a) scale – our electricity market is relatively small and is not connected to other markets. This heightens the risk of over-supply, especially for large generation increments and large demand increments (most notably the Tiwai Point aluminium smelter, which accounts for around 12% of total demand)

(b) capital –the depth of New Zealand's capital markets reflect its size. This, combined with current features of the New Zealand electricity sector (eg, no direct Government investment), means New Zealand remains reliant on overseas capital to fund some of its generation investment need. Global competition for this capital is intense, particularly with many other jurisdictions also seeking to materially increase their generation investment in the next period. For New Zealand to be an attractive investment destination, it is important to consider the expectations of international generation investors, including in relation to the availability of PPAs

(c) hydrology – hydro generation accounts for a large portion of total supply and the difference between hydro production in a wet year versus a dry year can

21 We use the term "headwinds" but some of the things discussed could equally be considered to be the absence of tailwinds present in some other markets.

22 To illustrate, the duty cycle of the Rankine units at Huntly Power Station alters over time as the system evolves, and with hydrology. At times, it is economic for them to be kept warm and this means they are able to supply within-day firming. At other times, it is economic to stand them down and only bring them online if there is a prolonged energy shortage. This then increases the need for alternative resources to provide short-duration firming.

approach 15% of total demand. This has a drastic impact on prices and impacts the risk profile for any form of generation

(d) thermal fuels – as with the electricity market, the New Zealand gas market is small and unconnected to international markets. Individual fields account for a large share of total supply, and individual users account for a large share of total demand. These factors, combined with limited transparency, make gas market dynamics a key risk factor for electricity supply and prices.

4.5. As a general rule, investment is less challenging in a high-growth environment, where capacity that is added too early will not take long to be absorbed. In contrast, adding capacity in a flat market can result in prolonged over-supply and failure to recover costs.

4.6. The current context for underlying need in New Zealand includes:

(a) demand risk – between July 2012 and May 2024 there was heightened uncertainty as to the continued operation of the aluminium smelter at Tiwai point.[23] If the smelter had closed, this would have led to a 12% reduction in demand that would have taken up to 40 years to replace at recent growth rates[24]

(b) thermal transition – there has been a net 26% (850 MW) reduction in thermal generation capacity since 2016, offset by a 2,250 MW increase in renewable generation capacity. In addition, there have been a sequence of gas reserve downgrades, production challenges and drilling campaign failures contributing to periods of tight gas supply[25]

(c) low demand growth – demand has grown by only 0.32% per year on average since 2006 and there have been several multi-year phases of declining demand within that timeframe[26]

(d) electrification potential – there is a widespread expectation that coming decades will see large-scale electrification of transport and heating demands as part of decarbonising the New Zealand economy. However, the timing and rate is uncertain and is strongly influenced by government policy settings including emissions trading scheme settings and complementary policy measures.

4.7. The net effect of this context is that the sector is currently transitioning from investment to displace thermal, to investment to support expected but uncertain electrification growth.

4.8. To provide further context, **Figure 4.1** compares a forecast of demand growth (noting this is uncertain) with the energy delivered by projects of various types. This provides an indication of potential PPA contract volume for differing scales and types of development. For example, adding one large (150 MW) utility solar development each year could meet more than half of forecast growth while adding

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23 This uncertainty reduced when a package of long-term supply and demand response agreements were announced in May 2024.

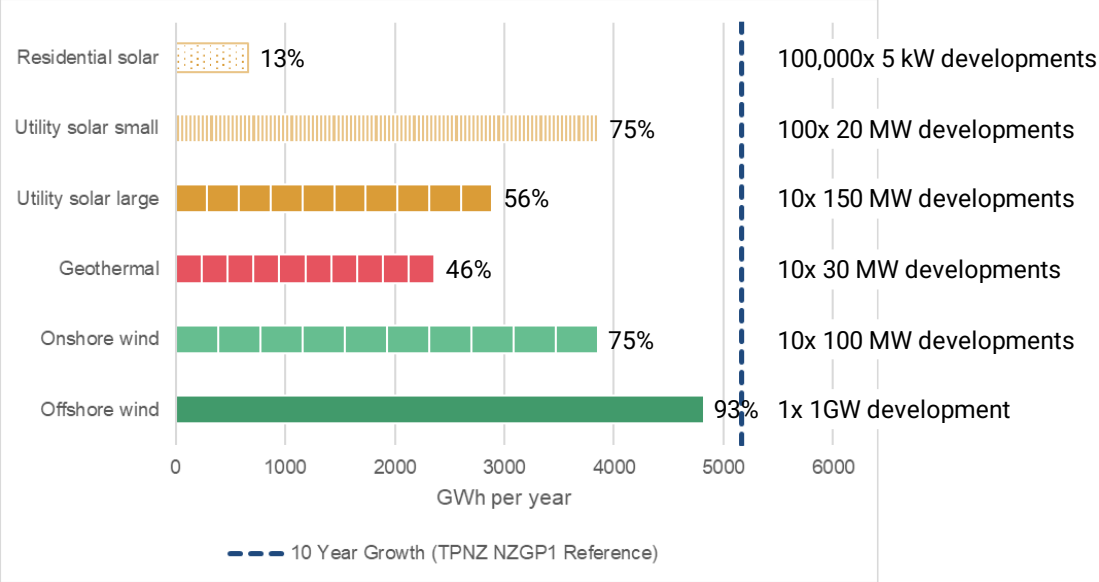
24 Based on the 0.32% constant annual growth rate observed between 2006 and 2024. Future growth is expected to be higher, and Tiwai exit would likely prompt some generation exit, so this comparison is intended to illustrate the materiality of the risk rather than predict how system balance would be restored in practice.

25 See Section 8 from https://eranz.org.nz/assets/documents/2024-10-11-Past-and-future-generation-pipeline-Concept-Consulting-web.pdf

26 See Figures 10 and 11 from https://eranz.org.nz/assets/documents/2024-10-11-Past-and-future-generation-pipeline-Concept-Consulting-web.pdf

10,000 residential rooftop solar developments each year could meet more than 10% of forecast growth.

Figure 4.1 – Number of developments needed depends on project type and size[27]



PPA demand

4.9. Regardless of underlying need for generation, PPAs will not occur without demand from PPA buyers.

4.10. PPAs are a relatively niche procurement option in New Zealand. From a survey of publicly available information, we have identified 13 deals over the past five years that appear to meet our definition of a PPA.[28] Of the identified deals, only nine are corporate PPAs (ie, where the buyer is the end user). Of those deals, seven involve major gentailers as sellers. That leaves two PPAs between end users and entrant or independent generators.[29]

Table 4.1 – Identified PPAs (in chronological order)

Project	Technology	Seller	Buyer	Size (MW)	Date[30]	Term (years)
Waipipi	Wind	Tilt	Genesis	133	May 2019	20
Tauhara	Geothermal	Contact	Genesis	63	Aug 2021	15
Kaiwaikawe	Wind	Tilt	Genesis	75	Aug 2021	20

27 Demand growth taken from Transpower's Net Zero Growth Pathways project. Capacity factor assumptions are 15% (residential rooftop), 22%, 22%, 90%, 44% and 55% (offshore wind).

28 Note that we have excluded contracts with terms of five years of less, and contracts between related parties. We also excluded a deal between Contact and NZ Steel for which the May 2023 announcement refers to 30 MW of renewable energy and a ten-year term but does not link the deal to any specific development. We have relied on public information, which does not reveal pricing terms and may be incomplete in other ways.

29 There are an additional five deals where an entrant or independent generator is a joint venture development partner or is selling to a major gentailer (counting both Tilt Energy deals).

30 Note that this is the date the PPA was publicly announced.

Project	Technology	Seller	Buyer	Size (MW)	Date[30]	Term (years)
Tauhara[31]	Geothermal	Contact	Oji Fibre Solutions	-	Oct 2021	10
Tauhara	Geothermal	Contact	Pan Pac	-	Oct 2021	10
Maungaturoto	Solar	Solar Bay / Mercury	Mercury / Ryman	20	Mar 2023	10
Turitea South	Wind	Mercury	Amazon	15	Apr 2023	15
-	Solar	Lodestone	Warehouse Group	20	Sep 2023	20
-	Solar	Lodestone	Inghams	-	Sep 2024	20
Lauriston	Solar	Genesis	Spark	63	May 2024	10
Kowhai Park	Solar	Contact and Lightsource Joint Venture	Christchurch Airport	-	Aug 2024	15
Waiuku	Solar	Lightyears	Prime Energy	2.4	Sep 2024	7

4.11. PPA deal volumes may increase as the underlying need for new generation strengthens, as familiarity with PPAs as a procurement option grows among electricity buyers and advisers, and if interest rates continue to fall.[32]

4.12. Potential buy-side headwinds to growth in PPA deal volumes include:

(a) **credit strength** – PPAs are more likely where the credit strength of the buyer is sufficient to support the developer's access to capital. In general, stronger credit strength supports lower financing costs, and hence a lower LCOE and sharper PPA pricing. We understand there are relatively few potential purchasers in New Zealand with investment grade credit ratings

(b) **scale** – PPAs are easier to conclude if one purchaser is able to take all the volume from a development. There are relatively few potential purchasers in New Zealand with enough demand to underwrite a large development – in other words, the larger the development the less buy-side depth exists in New Zealand OBJ

(c) **additionality** – a key driver for PPA demand in other jurisdictions is line-of-sight to new renewable generation. This may support corporate sustainability goals, or help the buyer meet regulatory obligations. This motivation is

31 At the time of the deals, the expected output of the Tauhara plant was 152 MW. The Oji and Pan Pac deals were described as being "largely met" by supply from Tauhara, so may cover up to 89 MW between them.

32 Lower interest rates lead to lower financing costs, which lead to lower LCOE and more attractive PPA pricing (noting LCOEs also flow into nodal price expectations for a system at equilibrium).

inherently weaker in the New Zealand context, where electricity supply is highly renewable and the development pipeline is also highly renewable[33]

(d) **sophistication** – PPAs are less straightforward than many other electricity procurement options, which can be a barrier to uptake. Buying a PPA involves developing an understanding of how the PPA allocates risks between the buyer and seller, and how the PPA impacts the buyer's overall price and volume risks. Most PPAs are structured as financial derivatives, which can also present a hurdle. If electricity is not a significant input cost, then these hurdles may be enough to deter buyers[34]

(e) **access to firming** – a PPA buyer is left with residual volume for which they need to manage price risk. In other words, the buyer needs to obtain firming for their PPA. This exposes the buyer to separate PPA and firming prices, which may be difficult to assess in terms of value for money. If a potential PPA buyer is not confident they can access firming at a fair price (both at inception and through the term of the PPA) then they may not wish to enter a PPA

(f) **access to sleeving** – most PPA buyers will continue to buy electricity via a retailer. They need a retailer who is willing and able to handle any adjustments needed to give effect to separate pricing for PPA and residual volumes.

4.13. Generally, these buy-side headwinds are more salient or acute for corporate purchasers than for utility purchasers.

4.14. Large gentailers are particularly well placed to overcome these headwinds, since they have strong credit strength, and are better placed than most buyers to work new PPA-sourced supply into their existing supply and offtake portfolios. However, selling PPAs to incumbent gentailers inherently brings less benefit in terms of intensifying competition.[35]

PPA supply

4.15. The attractiveness of a PPA depends on the quality of the development, which needs to be both credible and competitive:

(a) **credible** – a project is credible if the PPA purchaser is confident the developer will successfully deliver the project and it will perform as expected (including commissioning on time, and reliably producing the expected output). Credibility can hinge on the developer's track record, and the credibility of their suppliers and partners

(b) **competitive** – pricing for a PPA depends on its development cost, production yield and capture rate.[36] If a project is expensive, or its production is weighted toward low-priced times of the day or year, then it will not support attractive

[33] To the extent a new PPA-funded renewable development simply pushes back development of another renewable development, it will not deliver a net improvement in emissions. However, if a major user is considering New Zealand against other countries then they may value being able to establish a clear link to new renewable generation.

[34] This headwind may abate over time as PPAs become more familiar, as advisor experience and capability grows, or as retailers learn how to package and market PPAs effectively.

[35] PPA sales to gentailers may bring benefits in terms of diversifying developments, but not in terms of diversifying decision-making on the timing of those investments, or intensifying competition to sell energy to end users.

[36] Development cost and production yield together contribute to the LCOE of the development.

PPA pricing. Likewise, if a development's production profile makes it expensive for a buyer to firm, it may not be attractive to the buyer.

4.16. These qualities are most important if PPA volume is material relative to the buyer's overall needs. This increases the importance to the buyer of obtaining competitive pricing, and of the project delivering to expectations.

4.17. In many cases a buyer will want to coordinate PPA commencement with planned increases in their own demand (eg, from an electrification project or new facility) or with the termination or amendment of prior supply arrangements. This adds coordination complexity and risk.

4.18. Most PPAs in New Zealand are structured as financial derivatives, which can leave the buyer with an ongoing financial exposure to the generator. This is because the generator receives wholesale market revenues and makes a payment to the PPA purchaser if nodal prices are above the PPA strike price. In some cases, the party seeking to sell a PPA does not intend to retain ownership of the development. This means the need for credibility can extend to multiple sell-side entities.

4.19. For renewable projects, LCOE is sensitive to financing costs. Financing costs can in turn depend on the credit strength of the PPA purchaser, the term of the PPA, and the extent to which the PPA allocates risks to the purchaser. As such, the attractiveness of a PPA can depend indirectly on the purchaser – with better quality purchasers able to secure lower PPA prices.

4.20. The competitiveness of a project can be difficult to assess in its entirety. From a purchaser's perspective, 'competitive' would be assessed:

(a) compared to other similar developments – eg, does the solar project have a low LCOE and basis risk compared to another project.[37] The LCOE will depend on development costs, financing costs and its capacity factor[38]

(b) including consideration of the cost of sleeving and firming their residual demand. This is influenced by how well the generation output profile matches the buyer's demand profile, and by the economic cost of covering that residual profile

(c) with a view to how prices will evolve over the term of the PPA. For example, a PPA is relatively less attractive if:[39]

i. technology costs are declining strongly, such that the PPA risks locking in a price that may be more expensive than future PPA (or nodal) prices

ii. capture rates are at risk of collapse. For example, a wind (or solar) backed PPA is less valuable if there is so much wind (or solar) that production becomes strongly correlated with low nodal prices

iii. overall system balance is expected to shift to surplus, such that shorter-duration contracts (or nodal prices) fall below the marginal cost of system expansion

37 In this context, basis risk refers to the buyer's exposure to differences in nodal pricing at the generation node and their purchase node. This is zero if they are at the same node and can be high if the project is far away or on the other side of a grid constraint.

38 Capacity factor refers to the ratio between average and peak output. It is impacted by the quality of a renewable resource (eg, how sunny or windy) and the capability and design of the plant.

39 Re-pricing arrangements can reduce exposure to these risks, but they also reduce the value of the PPA to the seller as a means of de-risking their investment.

(d) compared to other procurement options (including self-build and traditional supply agreements).

4.21. To date, entrant generator activity has been weighted toward solar developments. This may reflect the relative ease of developing solar, compared to wind and geothermal developments that have more difficult resource acquisition processes, longer lead times, and high up-front costs.

Market structure

4.22. The New Zealand electricity market has four large vertically integrated gentailers who account for around 90% of generation (by volume) and 80% of sales (by ICP) and who control most of the resources that are able to provide multi-day or longer firming.[40] This structure presents potential headwinds for PPAs:

(a) foreclosure – the potential for incumbent gentailers to effectively foreclose PPA-backed generation entry by restricting access to firming

(b) cost – the challenge of achieving a cost of capital that is competitive with incumbent gentailers

(c) pricing – liquidity and price transparency for electricity contracts.

Foreclosure

4.23. PPAs generally will not occur unless the buyer can confidently obtain access, at reasonable prices, to firming for their residual volume (whether independently, through a retailer or from the PPA seller).[41]

4.24. This presents an opportunity for incumbent generators to foreclose generation entry by constraining access to PPA firming, noting this risk:

(a) is less salient for that element of firming that can be supplied using shorter-duration storage, since the barriers to investing in this firming are relatively low

(b) is more acute for that element of firming that relies on medium-to-long duration storage. This is where MDAG identified the risk of thinning competition as the share of flexible generation reduces relative to intermittent generation[42]

(c) is more acute if purchasers of firming must deal directly with an incumbent generator to buy over-the-counter contracts (as opposed to accessing exchange-traded contracts). This increases the opportunity to selectively foreclose entry

(d) is mitigated to the extent incumbent gentailers compete intensely with each other to grow their retail books and expand generation, such that they cannot collectively foreclose generation entry. As such, gentailer access to firming from other gentailers can also have an indirect impact on PPA-based generation entry.

4.25. Incumbent gentailers are also prime buyers for PPAs, given their credit strength, sophistication and capacity to integrate new supply into their portfolios. This

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40 This contrasts with shorter duration within-day firming, which can be provided by batteries and mass-market load control.

41 A buyer may also need sleeving, but there are relatively low barriers to providing this retail service.

42 Refer Appendix D of final recommendations paper. https://www.ea.govt.nz/documents/4335/Appendix_A2_-_Final_recommendations_report.pdf

presents further opportunity for incumbent gentailers to control the timing of generation entry.

Cost of capital

4.26. PPAs will not occur unless the seller can achieve a competitive LCOE for their development. For renewable generation, the cost of finance has a strong impact on LCOE since capital costs are high and running costs are low.

4.27. The PPA-backed model competes with the gentailer model to deliver a competitive cost of capital:

(a) a key function of PPAs is to assist an entrant generator to reduce their credit risk, which can lower their cost of finance and improve the LCOE of their project. The success of the PPA model at delivering low capital costs depends on the credit strength of PPA buyers, and the ability for capital markets to assess project risk.

(b) the vertical integration model involves owning a portfolio of generation and a diversified retail sales book that:

i. reduces exposure to individual end users (or independent retailers)

ii. improves the overall risk profile of the business, due to the natural hedging properties of vertical integration

iii. supports an ability to progressively integrate new supply into a wider portfolio

iv. enables the gentailer to achieve low-cost access to capital, which supports competitive LCOE.[43]

4.28. In other words, PPAs are competing with a business model that is effective at mitigating the financial risks of generation development and supporting competitive capital costs for new developments. The ability for PPA-based business models to compete with the gentailer model is limited by the credit strength of PPA buyers.

Transparency and liquidity

4.29. The gentailer model reduces the volume of trades between parties for electricity supply and hedging (compared to a non-integrated model where contracts are bought and sold between independent generators and retailers).[44] This can make it difficult for:

(a) entrant generators to assess whether their development will be competitive

(b) potential PPA buyers to assess whether quoted PPA and firming prices are reasonable

(c) potential PPA buyers to be confident they will be able to access firming at reasonable prices through the term of their PPA.

[43] Three of the major gentailers are also majority owned by government, which may further enhance their perceived credit strength and reduce their cost of capital.

[44] Noting that a non-integrated model could operate with large, infrequent and non-transparent contracts between parties – resulting in a similar lack of contract transparency and liquidity.

4.30. There is continuous transparent price discovery for quarterly baseload contracts up to four years ahead, which does reveal information about the overall cost of supply and seasonal firming.[45]

4.31. The Authority also discloses information on over-the-counter hedge contracts, and recently decided on Code amendments that will broaden the scope of information published.[46]

4.32. Other Task Force measures aim to further enhance transparency and liquidity by stimulating trading of standardised flexibility contracts.

Summary of headwinds

4.33. We have identified six areas (need, demand, supply, foreclosure, cost of capital, and transparency and liquidity) where headwinds may impact PPA activity levels.

4.34. As initially conceived, Task Force initiative 1A would engage with three of these headwinds – requiring gentailers to make firming available to support PPA transactions could increase demand for PPAs, mitigate foreclosure and could make transparency and liquidity less relevant.

4.35. Examining the full set of headwinds can help us to assess whether:

(a) focusing on firming is likely to be effective

(b) we should focus on other headwinds first, or alongside firming

(c) some headwinds are likely to be enduring (and not amenable to regulatory mitigation)

(d) other interventions, including Task Force initiatives 1B to 1D could address PPA headwinds alongside broader objectives.

Q7. Have we correctly identified and understood PPA headwinds?

[45] That is, the difference in baseload price level between each quarter.

[46] For more information, refer https://www.ea.govt.nz/documents/5051/Decision_paper-_HDO_Improvements.pdf

5. PPA benefits, risks and options

5.1. This section:

(a) summarises the Authority's preliminary view of potential benefits that greater PPA activity could deliver

(b) identifies general risks associated with intervention

(c) provides a high-level view of potential options.

5.2. These provide the building blocks for the next phase of policy development, which will focus on matching problems to more detailed options and assessing cost, benefits and risks.

Potential benefits

5.3. At its best, healthy PPA activity could deliver long-term benefits to electricity consumers by intensifying competition:

(a) to expand supply

(b) to sell energy to end consumers (and retailers)

(c) between rival business models.[47]

5.4. These forms of intensified competition could in turn lead to:

(a) earlier system expansion (on average) leading to lower prices and better security of supply.[48] This could arise from more intense rivalry to supply new demand, especially if PPA buyers are more inclined to err on the side of early expansion (compared to incumbent gentailers)

(b) discovery and development of better (including lower cost) development projects, leading to lower prices.[49] This could arise from more intense rivalry to find the best generation options (including through innovation), from increased diversity of parties (and hence a broader and more diverse pool of projects), and from expanded sources of capital

(c) retail innovation, especially for commercial and industrial segments, leading to service innovation and pressure on retail margins. This could arise from PPA sellers and resellers competing with gentailers to sell electricity volumes

(d) demand growth, including from new activities and electrification of existing activities. This could arise from PPA sellers actively stimulating demand, or from potential demand increments finding supply options that better meet their needs.

5.5. These outcomes would be consistent with the Authority's main statutory objective – specifically PPAs could intensify competition in the electricity industry, delivering efficient generation investment and retail operations, to the long-term benefit of consumers.

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47 Between PPA-backed generation, retail and trading business models versus vertical integration and other established business models.

48 Prices and security margins depend on built resources, operating duties, and operating conditions (demand and fuel). If competitive dynamics promoted earlier system expansion, then there would be fewer instances of tight energy or capacity margins with attendant high prices and demand rationing.

49 At equilibrium (when there are neither too many nor too few built resources), prices settle around the cost of new supply. Discovering lower-cost supply options would reduce the price of electricity at equilibrium.

5.6. These are not guaranteed outcomes of greater PPA activity but are plausible if PPA-centred business models successfully increase competitive pressure. Interventions to mitigate PPA headwinds may, depending on their scope and ambition, aim to:

(a) merely lower the cost of PPA transactions to the direct benefit of PPA buyers and sellers (without hoping to materially intensify competition more generally), or

(b) enable PPA-centred business models to compete sufficiently to bring about the wider benefits that can flow from greater competition.

Potential risks

5.7. In our preliminary view, there are four broad categories of risk:

(a) **failure to deliver benefits** – an intervention targeting any one headwind may have limited impact if other headwinds prevent any meaningful change in the ability for PPA-backed business models to intensify competition. This could result in the costs of intervention outweighing the benefits. Similarly, a poorly designed intervention could fail to meaningfully mitigate the targeted headwind

(b) **disruption to PPA-related activity** – an intervention aimed at assisting PPAs could have the opposite effect if it stalls or disrupts the evolution of PPA-backed business models. This can occur if an option inadvertently locks in a rigid model for the role of PPAs or has an inadvertent chilling effect on PPA-related activities[50]

(c) **disruption to other activity** – an intervention aimed at assisting PPAs could have a detrimental impact overall if it cuts across or undermines other market arrangements or interventions, causing unintentional disbenefits that outweigh the intended benefits

(d) **cost** – interventions that support PPAs could be costly if they distort resource allocation, risk management or investment incentives. This can occur if an intervention socialises risks or overrides price-based risk management incentives.[51]

5.8. The categories above are listed in roughly escalating order of potential harm, but the relevance, magnitude and specifics of each risk depends on the specific intervention.

Potential options

5.9. We have considered options across three broad intervention categories and six headwinds.[52] We consider that the options are consistent with the Authority's main statutory objective, whether through Code amendment or market facilitation. In some cases, there may be other parties (including other government agencies) who could be better placed to pursue the options. In all cases, the Authority would only

50 The prospect of intervention can also have a disruptive effect (as parties hold off) or a positive effect (if it spurs action).

51 Examples of these risks could include worsening security of supply, less optimal (higher cost) system expansion, more costly prudential management (flowing to higher retail margins or higher cost of capital, depending on where the risk lands).

52 Including the three subsets of the market structure headwind.

pursue options likely to deliver a net benefit. The intervention categories and associated options for further consideration are:

(a) information – measures that aim to accelerate development of PPA activity by providing (or supporting development of) information such as:

(b) public domain PPA template(s)

(c) a matching service (such as a bulletin board) that helps PPA sellers find buyers (and vice versa) or helps parties to a PPA transaction find sleeving and firming providers

(d) resources to help electricity purchasers understand and assess procurement options[53]

(e) information that helps potential PPA sellers (or their investors) gauge underlying need for new resources

(f) facilitation – measures that aim to reduce frictions. This could include measures such as:

(g) a pooling service that helps potential PPA buyers or sellers pool their volume and risk

(h) process scrutiny – monitoring incumbent gentailer handling of PPA-related requests, such as for sleeving, firming or over-the-counter hedging

(i) pricing scrutiny (firming) – either collecting information on quoted prices, or obliging incumbent gentailers to provide information on the basis for quoted pricing for firming related to PPAs

(j) pricing scrutiny (PPAs) – as above, but for PPA contracts rather than firming

(k) sleeving – either modification of market arrangements, or provision of new services to facilitate retail sleeving arrangements. Could include information flows, or modifications to prudential security requirements

(l) flexibility trading – when developing Task Force initiatives 1B and 1C, ensure the needs of parties accessing or supplying PPA-related firming are considered

(m) allocation – allocate firming resources by requiring holders of critical firming resources to make volumes available to support PPA transactions.

5.10. In Table 5.1 we provide initial comments on each option. These are necessarily preliminary and we welcome views on the potential risk and benefits of each option, other options, variations on the identified options, and sequencing or staging.

Table 5.1 – Comments on potential options

Option	Comments
PPA template(s)	We have heard mixed views on the potential benefit of a PPA template. It could be that a template would be most useful for small contracts (where transaction costs are material relative to value) but larger

[53] Many PPA proponents suggest that public sector electricity users in particular could make greater use of PPAs given their perceived credit strength may enable them to access competitive pricing.

Option	Comments
	PPAs have more scope to impact system expansion and retail market dynamics. A template would not address any headwinds completely but could have a positive effect on the 'sophistication' and 'sleeving' components of the PPA demand headwind (refer para 4.12). There may be a risk that a template developed or endorsed by a regulator (or government) would stifle innovation (by corralling contracts toward a particular form) or crowd out other parties facilitating PPA templates. Alternatively, it could provide a solid base from which further innovation could develop.
Matching service (bulletin board)	A PPA bulletin board could provide a forum for potential PPA buyers to advertise their needs, PPA sellers to advertise development opportunities, and providers of sleeving and firming to find potential customers. This could have a positive impact on the 'sophistication' and 'sleeving' components of the PPA demand headwind. It is not clear whether there is a need for (or benefit in) regulator involvement in providing such a service given the Authority already provides a public list of certified reconciliation participants[54] and there is at least one existing New Zealand provider of a PPA matching service.[55] We will need to consider the risk that using levy funding to develop a matching service may not provide benefits that outweigh the costs if it crowds out other parties.
Procurement resources	Procurement resources could range from general explanatory guidance, through to commentary or analysis of market conditions and outlook.[56] The Authority currently provides a range of information of this nature,[57] so the question is whether there is any specific gap that the Authority would be well placed to address. If there is a gap, then this could help address the 'sophistication' component of the PPA demand headwind.
Demand information	Demand information helps potential PPA sellers and their finance providers assess the need for new generation. Improving demand

54 To provide sleeving services, a party would need to be a certified reconciliation participant. See: https://www.ea.govt.nz/documents/5592/CRP-register_QE9gKfl.pdf

55 We are aware of EVA Marketplace providing a PPA matching service.

56 It would not be appropriate for the regulator to provide advice to directly to individual parties to support their commercial procurement activities.

57 For example, the Authority maintains the Electricity Market Information (EMI) website, publishes regular *Eye on electricity* articles, and publishes a range of explanatory and analytical papers (including this one).

Option	Comments
	information could help address the PPA supply headwind by attracting developers and helping them secure financing. There are a range of parties who publish demand outlooks – either publicly or commercially. For example, Transpower, MBIE and the Climate Change Commission all publish material on demand and investment drivers, demand projections and investment projections.[58] Over recent years the Authority has also published generation pipeline reports and has now developed ongoing pipeline reporting. As with procurement resources, we would welcome views on whether there is a gap the Authority could be well-placed to address.
Pooling service	A pooling service would go beyond a bulletin board by assisting parties to aggregate their demand (or supply) to better facilitate PPA transactions. This could help address PPA demand and supply headwinds, particularly relating to scale and credit strength. We would need to consider whether it would be appropriate for the market regulator to provide (or contract for) this kind of commercial service. It could be that, if there is benefit from government provision, that it would fit better with an organisation such as the Energy Efficiency and Conservation Authority, which has existing commercial support activities.
Process scrutiny	Process scrutiny could involve setting principles and requirements for dealings between incumbent gentailers and parties seeking access to sleeving and firming. This could assist to address the 'foreclosure' component of the market structure headwind. An existing example of process scrutiny is the network access arrangements for distributed generation found in Part 6 of the Code. These include elements such as timeframes, pricing principles, dispute resolution provisions, prescribed fees and default contract terms.[59] Another relevant development is the voluntary code of conduct for over-the-counter (OTC) participants.[60]

58 For example, see Transpower's Net Zero Grid Pathways (NZGP) project (https://static.transpower.co.nz/public/uncontrolled_docs/Transpower_NZGP_Scenarios%20Update_Dec2021.pdf), MBIE's Electricity Demand and Generation Scenarios (EDGS) and the Climate Change Commission's electricity demand assumptions (https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/preparing-advice-on-emissions-budgets/advice-on-the-fourth-emissions-budget/modelling-and-data-consultation-on-emissions-reduction-target-and-emissions-budgets/, Electricity market modelling datasets for draft EB4 advice).

59 The Authority is currently consulting on extending and adapting network access arrangements to cover large load connections. See https://www.ea.govt.nz/projects/all/network-connections/consultation/network-connections-project-stage-one/ and https://www.ea.govt.nz/projects/all/distribution-connection-pricing-reform/consultation/distribution-connection-pricing-proposed-code-amendment/

60 See: https://www.ea.govt.nz/documents/3932/Voluntary_Code_of_Conduct_OTC_Market.pdf

Option	Comments
	Access arrangements are a form of level playing field measure, which are being considered in more depth as part of Task Force initiative 1D. Accessing PPA-related firming and retail sleeving services is a subset of general access to firming products. For example, a retailer wishing to firm residual demand of an industrial customer has a similar need to an independent retailer wishing to firm their mass-market portfolio. To the extent the acquirer's needs cannot be met through exchange-traded products, they need to negotiate directly with a gentailer to agree price and non-price terms. Access arrangements to enable PPAs could potentially extend to large end users (not just retailers, generators and traders) and to include sleeving (ie, retail billing) services. Process scrutiny could potentially be effective at addressing headwinds relating to market structure (other than the cost of capital advantage of vertical integration). We would also need to consider whether this may best be addressed holistically rather than with a focus only on PPA-related access.
Pricing scrutiny (firming)	Pricing scrutiny for PPA-related firming could build on process scrutiny or operate standalone. It could involve requiring incumbent generators to disclose pricing, or pricing plus rationale. Disclosure could be fully confidential or made public on an aggregated basis. The Authority already operates a hedge disclosure obligation scheme, which it recently amended.[61] The amendment expands the scope of disclosures and will lead in time to more public availability of pricing information – albeit at an aggregated level where needed to protect confidentiality. Disclosure of bids and offers is currently limited to the voluntary OTC code of conduct. As with process scrutiny, pricing scrutiny of PPA-related firming is a subset of broader firming or hedging requirements. There are a range of parties who could seek PPA-related firming (generators, retailers, traders, end-users) and a range of terms, shapes and risk allocation outcomes that access seekers may want to procure – so PPA firming is itself a diverse activity.
Pricing scrutiny (PPAs)	As above, obligations to disclose agreed PPA prices have recently been expanded, though do not include bid and offer price obligations.

61 See https://www.ea.govt.nz/projects/all/otc/

Option	Comments
	PPA prices are an area where the Authority has previously identified a need to balance commercial sensitivity interests against the benefits of transparency.
Sleeving	There may be opportunities to modify reconciliation or other market arrangements to make sleeving services easier to provide. We have not yet investigated this matter. Such modification could, for example, make it easier for independent retailers or small gentailers (including PPA sellers) to offer retail services that involve splitting billing between PPA and residual volumes. If such opportunities do exist, they could mitigate a headwind but may not make a significant difference to PPA transaction volumes.
Flexibility trading	As above, parties accessing firming for PPA-related purposes are a subset of parties seeking firming (or hedges more generally). PPA-related firming can take a variety of forms in terms of the purchasers (eg, end-user, retailer, generator), shape (function of demand and the generation source) and term. It is possible that standardised products available several years into the future could largely address PPA firming needs, particularly if trading provides transparent price discovery and confidence to PPA buyers regarding liquidity (and hence access). This could help address some PPA demand and market structure headwinds. Task Force initiative 1B provides an initial step toward this potential future, while 1C provides a backstop measure that may in turn encourage development.
Allocate firming resources	The Task Force identified a variation of this option for consideration – ie, requiring gentailers to provide firming for PPAs. Firming PPAs is a subset of the uses to which firming resources (whether financial capacity or physical resources) can be directed. We would need to consider whether there is a risk that directing allocation to supporting PPAs specifically could inefficiently remove capacity to apply resources to other uses. If so, this could in turn have a chilling impact on non-PPA investment in generation, could skew the technology mix used in system expansion, or could flow through to less optimal use of (and investment in) the physical resources that support firming.

5.11. While we have not at this stage attempted to assess the merits of these options in detail, we can make the following observations:

(a) allocation is the strongest intervention option. While it has the greatest potential to be effective at stimulating PPA activity it also carries the most significant risk of undermining efficient investment and risk management (leading to higher costs and worse security of supply), hence we are seeking to validate that it is the most useful place to focus at this point

(b) the option to allocate firming resources overlaps with Task Force initiatives 1B and 1C, which build on MDAG recommendations that aim to improve how firming resources are allocated more generally (not just for PPA-related purposes). It will be important to validate that a specific PPA firming product would add material additional value beyond Task Force initiative 1B particularly

(c) options around process and pricing scrutiny could overlap with or complement initiative 1D, which is considering level playing field measures more generally

(d) for all of the 'information' options, there is a risk of the Authority duplicating or crowding out activities that other parties have incentives to pursue. As such, a key consideration would be whether and how the Authority (or other Task Force members) could add value with such activities.

5.12. In addition to the options identified above, we note there are further options that have been suggested to us that would involve socialising some of the risks associated with renewable electricity developments. Under these options, some element of development or firming risk would be transferred to consumers.[62]

5.13. We have set these options out for completeness but do not intend to develop these at this time. In our view they would not align with the recent Government Policy Statement on Electricity, which emphasises buyers and sellers managing their own risks. This is consistent with the view that socialising risks would not promote the Authority's efficiency and competition objectives. However, we acknowledge stakeholders may have feedback on this point.

Table 5.2 – Comments on additional options (not for further development)

Option	Comments
Socialise prudential risk	PPA purchaser credit strength is a key enabler of PPA transactions, so prudential risk is a key limiting factor on PPA transaction volumes. This underlying challenge can be addressed by sellers building a portfolio of buyers, so that the failure of any one party to pay does not materially impact overall cashflows. This is the approach that gentailers adopt and is available to entrant generators too. However, building a broad sales portfolio is more difficult than a business model that links a small number of generation developments to a small number of PPA buyers.

62 Internationally, options that socialise risks do so by transferring costs to electricity consumers or through government assuming risks. For our purposes, we consider transfer to consumers (via electricity participants, who are bound by the Code).

Option	Comments
	Socialising prudential risk could enable sharper PPA pricing and more PPA transactions. However, this could also encourage risky transactions and poor credit risk management, with costs flowing to consumers. It could also disrupt investment in non-PPA developments. Selling risk guarantees commercially could mitigate these risks, but this is not a suitable activity for the market regulator.[63]
Socialise revenue risk	An alternative (or complementary) way to reduce PPA risk and increase transaction volumes would be to socialise revenue risk for PPA sellers – eg, by providing a floor on generator revenues with costs spread to consumers.[64] This would remove a material headwind and could reduce the importance of purchaser credit strength as a barrier to PPA financing. However, risks could include inducing over-build and sub-optimal technology mix (over-saturation), suppressing the price signals that enable unsubsidised generation investment, and driving a wedge between wholesale prices and the prices paid by consumers.
Socialise firming risk	A further alternative (or complementary way) to increase transaction volumes would be to socialise firming risk for PPA buyers – eg, by providing a cap on purchase costs for residual volumes with costs spread to consumers. This would remove a headwind related to buyer appetite for PPAs. However, risks would include muting pricing signals for firming and weakening incentives to invest in flexibility.

Q8. Do you agree with the potential benefits we have identified?

Q9. Do you agree with the potential risks we have identified?

Q10. Do you agree with the potential options we have identified?

Q11. Do you agree with our comments on potential options?

Q12. Do you have a view on the most promising options?

63 For example, in Norway the Export Finance Company sells state-backed PPA guarantees to PPA sellers. See https://www.eksfin.no/en/products/power-guarantee/

64 For example, see the New South Wales LTESA scheme, which spreads PPA revenue guarantee costs to electricity consumers via distributors and retailers. https://www.aer.gov.au/system/files/AER%20-%20NSW%20Electricity%20Infrastructure%20Fund%20-%20Contribution%20Determination%20Guideline%20-%20September%202022.pdf

Appendix A PPAs in other markets

Australia

Market overview

Australia has two main electricity markets – the circa 200 TWh Australian National Electricity Market (NEM) supplying around nine million customers across the eastern states and Tasmania, and Western Australia's circa 20 TWh Wholesale Electricity Market (WEM) supplying around 1.2 million customers.[65]

Like New Zealand, the NEM operates a gross pool, has no capacity market, and forward pricing is managed through exchange-traded derivatives and OTC contracts. Unlike New Zealand, the NEM has only one pricing node per state (ie, it does not have locationally granular pricing).[66]

The bulk of electricity in the WEM is traded bilaterally and there is only one regional reference node. Uncontracted energy can be hedged through a day-ahead market (STEM) and there is also a capacity market (Reserve Capacity Mechanism).

Like New Zealand, the NEM has structural separation between monopoly (network) and competitive (generation and retail) activities. The four largest gentailers in each region (AGL, Origin, EnergyAustralia and Snowy Hydro) account for the majority of generation capacity and supply more than half of retail load.

The NEM has a much steeper decarbonisation challenge than New Zealand – renewable generation accounts for around 32% of grid supply, while coal accounts for around 59%.[67]

Unlike New Zealand, Australian governments have used sector-specific subsidies and interventions to drive renewables uptake. There is a high penetration of rooftop solar, driven by historical feed-in tariffs, resulting in oversupply at times (with low net demand and negative prices). Other schemes include mandatory renewable energy targets for retailers and large users[68] and purchasing or risk allocation programmes such as the Capacity Investment Scheme (CIS)[69] and the New South Wales Long-Term Energy Service Agreements (LTESA).[70]

PPA overview

The drive in renewable energy has seen the cumulative total of PPAs in Australia since 2017 grow to a contracted volume of over 7.4 GW of renewable generation in 2023 (over 165 PPAs).[71] Deal sizes have also been increasing over the years with large industrials entering the PPA market. Sustainability targets appear to drive most transactions.[72]

65 There is a third market serving Northern Territory that is smaller again than the WEM.

66 https://enercloud.io/comparison-of-the-wem-and-the-nem/

67 Annual fuel mix (GWh) over 12 months to 23 November 2024 excluding rooftop solar, as reported on AEMO dashboard. https://aemo.com.au/Energy-systems/Electricity/National-Electricity-Market-NEM/Data-NEM/Data-Dashboard-NEM .

68 https://cer.gov.au/schemes/renewable-energy-target/eligibility-renewable-energy-target

69 https://www.dcceew.gov.au/energy/renewable/capacity-investment-scheme

70 https://www.energyco.nsw.gov.au/industry/long-term-energy-service-agreements

71 https://www.energetics.com.au/corporate-renewable-ppa-deal-tracker

72 https://businessrenewables.org.au/wp-content/uploads/2021/12/SOM-2023v8.pdf

Australia's largest PPA was signed by Rio Tinto in 2024 to buy the majority of the energy from Windlab's 1.4GW Bungaban wind project in Queensland. Follows another agreement to buy all electricity from the 1.1 GW Upper Calliope Solar Farm.[73]

However, the market for firming PPAs is still developing. The 2023 BRC-A annual survey noted that "40 percent of advisers reported firming and battery storage were 'common' or 'sometimes' a part of PPAs, whereas three-quarters of buyers said it was 'never' or 'rarely' a part of their PPA."[74]

In Australia, there is also a growing preference for retail or virtual PPAs (where a retailer sleeves) as there is an emerging role for retailers to act as aggregators to back larger generation projects through sleeved PPAs. This is in large part, driven by creditworthiness challenges arising from a large base of smaller offtakers, and predominantly large-scale renewable projects in Australia. This makes it difficult to secure long-term contracts with buyers to offtake enough volume to support renewable project developments.[75]

United States

Market overview

The United States (US) has multiple synchronous grids, unlike the single grid like in NZ.

Collectively the US grids deliver around 4,178 TWh (2023) of annual electricity generation across the country[76] to 162 million end customers[77] using around 1,300 GW of generation capacity (2024).[78]

The transmission network includes two major AC power grids (Western Interconnection, Eastern Interconnection), and one minor AC power grid (the Electric Reliability Council of Texas, or ERCOT). Multiple balancing authorities in each interconnection ensure operational balance of supply and demand. The Eastern Interconnection includes 36 balancing authorities[79] (31 in the US, 5 in Canada), while the Western Interconnection includes 37 balancing authorities (34 in US, 2 in Canada, 1 in Mexico), ERCOT acts as the single balancing authority, RTO and interconnection provider for the majority of Texas.[80]

ISOs/RTOs[81] operate the energy and ancillary services markets where buyers and sellers can bid for and/or offer generation supply. Like with NZ's Transpower System Operator role, they determine the economic dispatch of generation resources on a marginal cost basis within their region.

73 https://www.riotinto.com/en/news/releases/2024/rio-tinto-signs-australias-biggest-renewable-power-deal-as-it-works-to-repower-its-gladstone-operations

74 https://businessrenewables.org.au/wp-content/uploads/2021/12/SOM-2023v8.pdf

75 https://www.wbcsd.org/wp-content/uploads/2023/10/Pricing-structures-for-corporate-renewable-PPAs.pdf

76 https://www.eia.gov/tools/faqs/faq.php?id=427&t=3

77 https://www.eia.gov/electricity/annual/table.php?t=epa_01_02.html

78 https://www.publicpower.org/system/files/documents/Americas-Electricity-Generation-Capacity-2024.pdf

79 The 'balancing authorities' role is to ensure real-time demand and supply is always in balance. RTOs also function as balancing authorities for the market. ERCOT is particularly unique in that it is the 'balancing authority', interconnection and the RTO in the same physical system.

80 https://www.eia.gov/todayinenergy/detail.php?id=27152

81 Multiple ISOs can act jointly to form Regional Transmission Organisations (RTOs) which perform similar functions to an ISO but across multiple states

Like Australia and Europe, US previously had a zonal pricing model (single pricing node per state), but now, most de-regulated US markets have shifted to nodal pricing like with NZ (eg, ERCOT in 2010) to manage network congestion.

Nearly two-thirds of the US is served in ISO/RTO regions. While most US states have an energy-only market, the PJM, ISO New York and ISO New England's wholesale markets include both energy and capacity markets.[82]

Retail and generation markets are variously regulated, partially un-regulated or fully un-regulated in each state.[83] For example, California is partially de-regulated with its own RTO (ie, balancing authority), the California Independent System Operator (CAISO), and has a competitive wholesale electricity market, but does not offer individual customer choice of electricity retailer.[84]

The US faces a much bigger decarbonisation challenge than NZ. In 2023, about 60% of annual generation was generated from thermal sources: natural gas (around 43%), coal (16%), or diesel (0.4%).[85] Renewables accounted for around 21% of total electricity production: 10% from wind, 6% from hydroelectric sources, 4% from solar, 1% from biomass and 0.4% from geothermal. The remaining 19% of annual electricity generation was generated from nuclear.

PPA overview

The US has world's largest market for PPAs, with 17.3 GW of PPA deals announced in 2023 although this has slowed due to higher electricity prices and increased costs for electricity generation equipment.[86]

In the US, PPAs can be transacted irrespective of whether the state is regulated, partially un-regulated or fully un-regulated. However, the majority are virtual PPAs in de-regulated wholesale markets. For example, over 80% of the virtual PPAs signed between 2021-2023 were in the ERCOT, MISO and PJM service areas.[87]

Unlike NZ, a large driver for PPAs is the financial value of RECs[88] which help provide a financial basis to fund new renewable generation. Under current policy conditions, it is expected that the corporate renewables PPA market could support between 218 and 296 TWh of demand (equating to 55–85 GW of incremental solar and wind capacity additions) in the US through to 2030.[89]

PPA demand in the US is mainly driven by larger corporate firms (given complexity and matching issues). For example, of the 326 corporate purchasers of utility-scale clean energy

82 https://www.nrg.com/insights/energy-education/electricity-markets-what-s-the-difference-between-a-wholesale-en.html

83 https://infocastinc.com/market-insights/solar/regulated-deregulated-energy-markets/

84 Although the state does offer communities the choice to opt out of the local utility and purchase electricity through an aggregator set up by the community, which purchases power from the wholesale market.

85 https://www.eia.gov/tools/faqs/faq.php?id=427&t=3.

86 https://www.edie.net/corporate-clean-energy-buying-reached-a-record-high-in-2023-bloombergnef-confirms/

87 https://www.iea.org/reports/renewable-energy-market-update-june-2023/are-market-forces-overtaking-policy-measures-as-the-driving-force-behind-wind-and-solar-pv

88 https://www.epa.gov/green-power-markets/renewable-energy-certificates-recs

89 https://www.energypolicy.columbia.edu/sites/default/files/pictures/PPA%20report,%20designed%20v4,%17.21.pdf

in the US, technology companies such as Amazon (12.4 GW), Meta (8.7GW), Google (6.2GW), Microsoft (4.5 GW) and Verizon (3 GW) are the top five purchasers of clean power contracts, predominantly virtual PPAs for wind and solar generation capacity.[90] Alternative means of clean energy procurement, such as 'green tariffs' appear less common.

EU/UK

Market overview

Like NZ, Europe's market design is mostly competitive, except for transmission and distribution, which are regulated monopolies. Electricity generators and retailers compete with one another with vertical integration of retail and generation activities permitted.[91] It operates a zonal pricing model across all member states (single pricing node per country, or only a few 'bidding zones' per country).

In 2022, there were over 6,000 generation companies in the EU, producing a total of about 2,701 TWh of net annual electricity generation[92] from a total installed capacity of 1,046 GW (about 36% thermal, 15% hydro, 20% wind, 20% solar, 10% nuclear).[93]

In terms of EU market concentration, around 100 of the roughly 6,000 generation companies cover greater than 5% of the national generation supply. For retail, around 140 of the nearly 4,000 retail companies hold greater than 5% of the total national market share.[94]

A single Transmission System Operator (TSO) is responsible for the transmission network in each EU member state.[95] Nominated Market Operators (NEMOs) are designated by the regulator of each member state to perform the 'coupling' functions between regions.

Through 'coupling', the EU can balance electricity supply and demand between member states via cross-border trading. Through its Single Day-ahead Coupling (SDAC) programme, the EU developed a single pan-European cross-zonal day-ahead (marginal pricing) electricity market, governed by a common set of market rules, to regulate electricity trading between member states.

Through SDAC's common price coupling algorithm (PCR EUPHEMIA), electricity prices across Europe are calculated and implicitly allocates, through auction, cross-border capacity to regions. NZ, on the other hand, has no physical access to electricity resources (eg, additional hydro storage) outside of its domestic supply.

The EU electricity wholesale market is largely an energy-only market, like NZ, with some member states operating capacity mechanisms. Capacity markets (referred to as Capacity Renumeration Mechanisms in the EU) that operate in some member states distort price signals in Europe's other electricity markets. To mitigate this, the EU imposed limitations on when a capacity market can be implemented by its members.

90 https://cleanpower.org/wp-content/uploads/2023/01/2022_CorporateBuyersReport.pdf

91 https://set.kuleuven.be/ei/images/EI_factsheet8_eng.pdf/.

92 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_production,_consumption_and_market_overview.

93 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_and_heat_statistics

94 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_market_indicators

95 Except Germany, which has four TSOs each responsible for a separate 'control area'

Under the Clean Energy Package, EU members are required to identify whether there is an adequacy issue that cannot be solved through Strategic Reserves[96], before being able to implement a capacity market.[97] The capacity markets of the five member states (France, Belgium, Italy, Ireland and Poland)[98] represent about 40% of total EU electricity demand but is expected to continue to grow due to adequacy issues facing some regions.

The EU is undergoing market reform due to high wholesale prices since 2022, sparked by the Russia/Ukraine conflict. This is in conjunction with its decarbonisation objectives, which it aims to achieve 55% of power generation from renewable sources by 2030 under current EU Renewable Energy (RE) targets.

Unlike NZ, only 35% of electricity generation is produced from renewable sources (about 11% is from hydro, 15% from wind, 8% from solar, and 0.2% from geothermal). Nuclear makes up about 21% of the total electricity generation with the remaining 44% met by thermal fuels.[99]

PPA overview

The EU's PPA market is more developed than New Zealand. This is helped by a liquid European hedge market for base and peak load electricity products. For example, several electricity markets in Europe have available long-term base and peak load futures up to six years ahead on the European Energy Exchange (EEX).

Government support has played an important role for the majority of renewable energy projects. Further decrease in technology costs and an increasing demand among corporates for green electricity support the development of a sizeable market for commercial PPAs. In the UK, commercial PPAs are seen as an important tool to de-risk projects and are central to investment decisions.

However, much of the European market may start to see limited commercial PPA activity going forward due to renewable projects being less competitive with current wholesale power prices. In Europe, corporate PPA volumes increased 74% from 2022 to 15.4 GW as supply chain issues eased and gas balances normalised after the region's 2022 energy crisis, causing PPA prices to fall, often faster than power prices, driving increased PPA demand.[100]

Other challenges include limited credible offtake parties available, commodity price volatility, and cannibalisation from increasing renewables in the EU. Sourcing PPAs from abroad could present an opportunity for the EU but carries material risks such as basis risk (or spread),[101] lack of physical interconnection capacity, and challenges in securing long-term capacity from other regions.

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96 'Strategic Reserve' is where a few peak generators are placed in 'reserve' to be activated in case of scarcity, receiving payments for their availability and exclusion from participating in all markets (except under scarcity conditions).

97 https://fsr.eui.eu/capacity-remuneration-mechanisms/

98 Note that Germany, Sweden and Finland determined adequacy issues could be met through Strategic Reserves instead of deploying a capacity market

99 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_production,_consumption_and_market_overview.

100 https://about.bnef.com/blog/corporate-clean-power-buying-grew-12-to-new-record-in-2023-according-to-bloombergnef/

101 Basis risk is when there is a difference between the price of a specific product and the price of the benchmark/or underlying product a counterparty is seeking to hedge against. For example, when a

Some policy efforts have been undertaken to encourage further PPA uptake. This includes minimum disclosure standards, such as a set of PPA 10-year indices specific to Germany and Spain onshore wind and solar being developed.[102] Additionally, Europe has been developing standardised contract structures and terms.[103] For example, a standardised PPA published by the European Federation of Energy Traders (EFET) called the 'EFET standard Corporate Purchase Agreement (CPPA)' aims to support PPA negotiations between counterparties and PPA activity across Europe.[104]

One of the major challenges in Europe has been that PPAs have not been available to small to medium enterprises because of their limited energy consumption. This makes PPAs for SMEs typically complex deals with higher transaction costs and a relatively higher credit risk associated.[105] This has led multi-buyer or aggregated PPA business models to be developed.

The European Commission (EC) has proposed changes to facilitate greater deployment of stable long-term contracts. For example, to address current barriers such as the credit risks of buyers, the proposed reform of the European electricity market design proposed a 'Offtaker Guarantee' (a financial instrument) for PPAs, which de-risks the corporate buyer and provides credit risk protection against corporate buyers' payment default under the PPA.[106]

corporate purchaser signs a PPA for energy supply at the Otahuhu node, but most of their operations are located closer to the Benmore node.

102 Energetics, 'Corporate Renewable PPA Deal Tracker', https://www.energetics.com.au/corporate-renewable-ppa-deal-tracker

103 https://www.montelnews.com/news/1501266/key-mep-proposes-standardised-ppas-in-market-reforms

104 European Federation of Energy Traders (EFET), https://www.efet.org/home/documents?id=26

105 DLA Piper, 'The Role of PPAs in the new Electricity Market Design Proposal', https://www.jus.uio.no/nifs/english/research/events/seminar-series-on-energy-market-design/2023/ppas-in-the-new-electricity-market-design-proposal_23-05-2023_van-verenbergh.pdf

106 European Investment Advisory Hub, https://advisory.eib.org/publications/attachments/developing-potential-financial-instruments-and-advisory-solutions-to-stimulate-more-investment-in-renewable-energy-generation-by-means-of-commercial-power-purchase-agreements.pdf

Appendix B Format for submissions

Submitter	

Questions	Comments
Q1. Is there any other related work that you think is relevant to our consideration of PPA issues?	
Q2. Do you have any suggested additions or modifications for PPA terms and concepts?	
Q3. Do you agree with our definition of PPAs?	
Q4. Have we correctly identified buyer and seller motivations for PPAs?	
Q5. Have we correctly identified how PPAs may fit with other contracts?	
Q6. Do you agree with our characterisation of how PPAs may impact system evolution?	
Q7. Have we correctly identified and understood PPA headwinds?	
Q8. Do you agree with the potential benefits we have identified?	
Q9. Do you agree with the potential risks we have identified?	
Q10. Do you agree with the potential options we have identified?	
Q11. Do you agree with our comments on potential options?	
Q12. Do you have a view on the most promising options?	