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Evolution of the Pilbara Networks Rules

Consultation Paper

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Abbreviations

Term	Definition
AEMO	Australian Energy Market Operator
ACCC	Australian Crime and Corruption Commission
CFCT	Critical Fault Clearing Times
CPC	Connection Point Compliance
EPNR	Evolution of the Pilbara Networks Rules (Project)
ERA	Economic Regulation Authority
ESS	Essential System Services
FCESS	Frequency Control Essential System Services
GenSOO	Generation Statement of Opportunity
HTR	Harmonised Technical Rules
ISO	Independent System Operator
MAC	Market Advisory Committee
NEM	National Electricity Market
NSP	Network Service Provider
PAC	Pilbara Advisory Committee
PETA	Pilbara Electricity Transformation Assessment
PET	Pilbara Energy Transition (Plan)
POE	Probability of Exceedance
PNAC	Pilbara Networks Access Code
PNR	Pilbara Networks Rules
PSP	Pilbara System Plan
PSSR	Power System Security and Reliability
RoCoF	Rate of Change of Frequency
RME	Requirement for Monitoring of Equipment
SCADA	Supervisory Control and Data Acquisition
SRESS	Spinning Reserve Essential System Services
SWIS	South West Interconnected System
UFLS	Under Frequency Load Shedding
UVRT	Under Voltage Ride Through
WEM	Wholesale Electricity Market

Executive Summary

The Evolution of the Pilbara Networks Rules

The Pilbara Networks Rules (PNR) form part of the regulatory framework applying to the North West Interconnected System (NWIS). The Harmonised Technical Rules (HTR) are part of the PNR and specify technical standards for equipment connected to the NWIS. Energy Policy WA has published a Design Summary of the PNR, which aims to provide a summary of the content and application of the PNR.

The PNR were designed around a power system that relies predominantly on dispatchable thermal generation fleet comprised of gas turbines.

Following Australia's commitment to achieving net zero by year 2050, decarbonisation efforts are expected to see a radical change in the types of technologies supplying electricity in the Pilbara, and the services needed to operate a secure and reliable power system. The capacity mix is anticipated to rapidly transition towards more variable renewable generation, energy storage resources, and increasingly flexible demand. The current arrangements will not support the changes to the capacity mix resulting from this rapid transition.

The Evolution of the PNR (EPNR) project was initiated in close consultation with stakeholders – including the Pilbara Advisory Committee (PAC) – to identify and implement changes necessary to evolve the PNR to ensure it enables and supports efficient decarbonisation of Pilbara electricity systems.

This paper sets out proposed changes to many aspects of the PNR, including:

- an enhanced planning framework to ensure capacity adequacy, with backstop procurement powers for the Pilbara Independent System Operator (ISO);
- a new balancing mechanism, providing connected parties and the ISO with new tools to manage increasingly variable supply and demand;
- amendments to essential system services (ESS) arrangements to increase flexibility for system operations, and improve incentives for connected parties to manage the need for these services;
- a centralised outage planning process, to increase transparency and consistency;
- new governance arrangements for the ISO, enhancing its independence and transparency;
- consistent treatment of storage and demand side technologies, to allow these new technologies to contribute more effectively to maintain Power System Security and Reliability (PSSR) in the Pilbara; and
- a range of changes to the HTR to fill existing gaps and address known issues.

These changes are required to support the Pilbara transition to intermittent renewable energy resources.

Call for Submissions

Stakeholder feedback is invited on the Evolution of the PNR proposals that are outlined in this paper. Submissions can be emailed to energymarkets@demirs.wa.gov.au. Any submissions not marked as confidential will be published on www.energy.wa.gov.au. The consultation period closes at **5:00pm AWST on Tuesday, 15 April 2025**. Late submissions may not be considered.

A separate consultation paper, *Evolution of the Pilbara Networks Access Code*, outlines proposed changes to the PNAC. Stakeholders are encouraged to review and respond to both papers.

Summary of Design Proposals and Rationale

Table 1 lists the proposals arising from Stage 3 of the Evolution of the PNR project, along with a summary of the rationale for each proposal.

Table 1: Proposals to evolve PNR

Proposal	Rationale
Power System Security and Reliability	
Proposal 1: Long term planning 1.1 The ISO will have effective information- gathering powers for all networks in the Pilbara, whether connected to the NWIS or not. Requested information will relate to plans to connect to the NWIS during the planning horizon. 1.2 Every two years, the ISO will prepare an integrated plan for the NWIS (the Pilbara System Plan (PSP)), including potential interconnections and new supply and demand sources. 1.3 The ISO will consult on the assumptions and methodologies to be used in preparing the PSP. 1.4 Input and output data for the PSP will be published for transparency, with commercial sensitivity respected. 1.5 In years where an updated PSP is not published, the ISO will prepare a generation statement of opportunities including updated demand and capacity forecasts, taking into account network constraints.	The size and location of transmission, generation, and loads are critical factors in maintaining system reliability as the system decarbonises. Evolving long-term planning arrangements will assist stakeholders, including potential investors, to efficiently scope their developments. Enabling the ISO to gather information outside the NWIS means the planning process can better account for potential new connections of both existing infrastructure and new developments.
Proposal 2: Network reliability standard 2.1 The default network planning and operation standard for the NWIS will be n-1. 2.2 Parts of the network can be planned and operated to a higher or a lower standard, with the agreement of affected parties. 2.3 NSPs can use alternative, non-network solutions to achieve an n-1 standard.	In a power system dominated by renewables, connected parties become more dependent on each other’s operations. Having a consistent planning and operation standard means that all parties know what to expect. Traditional network investments will not be the most efficient way to achieve the standard in all circumstances.
Proposal 3: Capacity forecasting 3.1 The ISO will forecast capacity requirements for the NWIS, based on avoiding unserved energy in the event of expected one-in-ten-year peak demand and low renewable output, including a reserve margin to account for expected supply outages.	Having the ISO carry out system-wide forecasting ensures that there is clear responsibility for monitoring system conditions and potential capacity shortfalls. Providing transparency of forecasts and forecast methodologies increases confidence to current and prospective connected parties.
Proposal 4: Individual capacity requirements	Having a formal, structured approach to capacity assessment ensures that all parties are clear on their

Proposal	Rationale
4.1 The ISO will set the method for participants to calculate their required contribution to the capacity requirement. 4.2 Participants can nominate part of their demand as non-firm, to be excluded from the firm capacity requirement. 4.3 Participants do not have to account for consumption served by co-located generation. 4.4 Participants will be required to have sufficient capacity to meet their capacity requirement. 4.5 The final NWIS capacity target will be the sum of individual participant requirements.	needs, and those needs are determined in a consistent way. The rise of flexible demand (where consumption follows available generation, rather than the other way around) has the potential to significantly offset the volatility of wind and solar output. If it were not accounted for, capacity targets would be overestimated.
Proposal 5: Capacity certification 5.1 A participant can self-certify the capacity contribution of its own facilities if: • energy from the facility will be used to serve its own consumption; and • this supply will not be affected by network constraints. 5.2 If a participant does not include consumption served by co-located generation in its capacity target, the co-located facilities cannot have a certified capacity contribution. 5.3 The ISO will certify all other capacity: • Firm generation will be certified according to maximum output under peak demand conditions, supported by test results. • Variable generation will be certified by a probabilistic method that accounts for the variability and the correlation with other variable generation. • Storage will be certified by linear deration.	Central certification provides a reliable and transparent approach for parties who rely on others to supply capacity and energy. There will be large volumes of self-supplied load in the Pilbara. Generation and consumption that does not use the network does not need to be accounted for in capacity planning. Capacity certification methods for firm generation and storage are standard around the world. Using a probabilistic method for variable generation will allow the correlation of renewable facilities to be accounted for, as well as the weather dependent correlation between renewable output and load.
Proposal 6: Backup capacity procurement 6.1 If participants do not present evidence of sufficient capacity to meet their individual requirements for a particular year (including a reserve margin), the ISO will seek to procure additional capacity to meet the shortfall in that year. 6.2 Submissions will specify a $/MW capacity price and a maximum $/MWh balancing energy price. 6.3 The ISO will select submissions based on the lowest overall cost considering capacity payments and expected energy payments	Having a backstop mechanism to procure capacity provides confidence to current and prospective participants that the NWIS will continue to provide reliable supply in all reasonably expected circumstances. A simple approach to capacity procurement, with costs allocated only to those who have a capacity shortfall, provides clear incentives for all parties.

Proposal	Rationale
and will pay all selected providers at the highest capacity price (pay as cleared) that fills the shortfall. 6.4 The costs of capacity procured by the ISO will be allocated to the participants with individual shortfalls. 6.5 Selected providers must offer energy in the balancing mechanism, with the energy price limited to the maximum price in the capacity submission.	
Proposal 7: ESS framework 7.1 The two existing essential system services (ESS) will be retained. 7.2 The existing “FCESS” service will be renamed “Regulation” 7.3 The existing “SRESS” service will be renamed “Contingency Reserve Raise”. 7.4 When energy storage penetration increases, a new Contingency Reserve Lower service will be introduced to manage unplanned loss of load. 7.5 Power system security will be managed by defined ESS requirements rather than by a minimum synchronous generation requirement. 7.6 Power system studies will be conducted to assess Rate of Change of Frequency (RoCoF) ride-through capability of generators and other connected equipment, to determine the need for additional services such as inertia. 7.7 The ISO will move to dynamic ESS requirements, with the ability to set different requirements at different times of day, different times of year, and for different system conditions. 7.8 The ISO may set locational ESS requirements for pre- and post-contingency management of the power system, with payment mechanisms aligned with system-wide arrangements. 7.9 The ISO will establish an ESS accreditation framework, and monitor compliance with standards for ESS provision. 7.10 ESS will continue to be procured and provided under contracts, i.e., not through a dynamic mechanism.	These changes to ESS are consistent with the approaches used around the world to support the energy transition. A new load rejection reserve service (Contingency Reserve Lower) will support the connection of large storage facilities. The need for an inertia service depends on the ride-through capability of existing generation and load equipment, which is not clear at this time. Moving to more dynamic ESS requirements in the future would allow the ISO to target services to when and where they are needed, which will be more cost effective than a static requirement for all times and locations. Effective delivery of ESS requires a party to assess facility capabilities, monitor compliance, and act when performance does not match the requirement. The limited number of facilities capable of providing ESS in the current Pilbara fleet is not sufficient to support procurement through a dynamic mechanism or closer to real time so, at this stage, it is efficient to continue to procure ESS via competitively procured, direct contracts until the depth of this capability increases.
Proposal 8: ESS cost recovery	The proposed methods allocate ESS costs to those who cause the need for the service. Causer pays cost

Proposal	Rationale
8.1 ESS costs will be recovered from causers where practical, on a trading interval basis. 8.2 Regulation costs will be allocated to participants who vary their generation or load from their balancing positions. 8.3 Contingency reserve raise costs will be allocated to supply facilities based on their output in each interval, according to the runway method. 8.4 Contingency reserve lower costs will be allocated to a load based on their demand in each interval, according to the runway method. 8.5 Facilities will be exempt from Contingency Reserve Raise costs if they provide evidence that a facility trip would be automatically offset by load curtailment by the same participant.	allocation provides incentive to reduce the quantity of ESS required, providing downward pressure on total system costs. Allowing participants to avoid contributing to ESS costs if they do not cause a service requirement ensures that connected parties have the option to manage their own operations if they consider this to be more efficient.
Proposal 9: System strength 9.1 The HTR will provide guidance on the setting of the minimum and maximum fault levels on the NWIS. 9.2 The ISO will approve system strength requirements for different parts of the network. 9.3 NSPs will support the ISO to determine the system strength requirements for locations on their networks.	System strength requirements differ across locations, but impact the power system as a whole, so it is reasonable for the ISO to work with NSPs to determine the appropriate levels for different parts of each NSP network. If there are conflicts between settings in different locations, the ISO is the obvious party to resolve the inconsistency.
Proposal 10: Outage planning 10.1 The ISO will manage a centralised outage planning process. 10.2 All registered facilities on an outage planning list will be required to participate. 10.3 The outage planning list will be published from time to time by the ISO and will contain the facilities of which outages have the potential to materially impact PSSR. 10.4 Network and supply facilities will submit outage plans to the ISO. 10.5 Outages of unregistered facilities or those not on the outage planning list must be notified to the ISO, but do not require approval. 10.6 Outage requestors must consult with affected parties before submitting outage requests to the ISO. 10.7 If a network outage would affect power system reliability the network operator must	A common outage planning, and publication process is key to transparency, and to manage an increasingly interdependent power system in which parties rely on each other to maintain security and reliability. Maintaining self-scheduling for outages that do not affect other parties maximises flexibility for vertically integrated portfolios. ISO consulted on this topic during its review of subchapters 7.3 and 7.4 of the PNR from July to October 2024[1].

[1] https://pilbaraisoco.com.au/current-consultations/review-of-subchapter-7-3-and-subchapter-7-4-of-the-pilbara-networks-rules/

Proposal	Rationale
include a plan to mitigate the reliability impact. 10.8 The ISO must develop an outage assessment procedure containing a risk-based outage assessment framework, in consultation with connected parties. 10.9 The ISO must assess outages according to the assessment framework and must approve outages unless doing so would have a material impact on PSSR.	
Proposal 11: Outage plan timing 11.1 Outage plans must be submitted as soon as practicable, and no later than a year in advance. 11.2 The ISO must assess and approve or reject an outage plan within two weeks of its receipt. 11.3 Outage plans may be updated after submission, as long as the outage window is maintained. To extend the outage window, a new submission must be made. 11.4 The ISO can only withdraw approval for a previously approved outage plan if there is a risk to power system security or reliability and must inform the requestor as soon as practicable. 11.5 If the ISO withdraws approval within a week of the scheduled start time or recalls an outage, the requestor can request compensation for costs incurred in relation to the cancellation or recall.	Clear timeframes for outage information provision and approval are necessary for effective operation of the outage management process. Sometimes, short notice changes will be unavoidable. If these occur to maintain system security for everyone, it is reasonable to compensate affected parties for the costs of the change. ISO consulted on this topic during its review of subchapters 7.3 and 7.4 of the PNR from July to October 2024. Cancellation compensation is included in the proposal in response to submissions on that consultation.
Scheduling and dispatch	
Proposal 12: Balancing mechanism 12.1 The ISO will operate day-ahead trading mechanism in which participants can trade energy around their bilateral positions in half hour increments. 12.2 Participants must nominate: • planned consumption by portfolio loads; • planned supply by portfolio generation and storage, including contracted supply from other parties; and • expected dispatch order for facilities in their portfolio nominations must balance. 12.3 Participants may choose to offer to deviate from their initial position, by making $/MWh bids (to sell energy) and offers (to buy energy). 12.4 The ISO will clear the day-ahead trading mechanism.	Centrally coordinated trading and balancing arrangements provide tools for participants and the ISO to manage increasing generation volatility, reducing the need for each participant to build flexible capacity to smooth the volatility of its renewable generation portfolio. It will simplify complex multi-party nominations and allow more responsive and cost-efficient dispatch closer to real-time. Separate trading and balancing arrangements are proposed because feedback from stakeholders indicates that current operational practices require significant lead time for most parties, meaning a day ahead trading mechanism is preferred initially. A separate but related balancing mechanism is included because there can still be significant changes to load and variable generation and using only ESS to keep

Proposal	Rationale
12.5 Trading positions and prices will be determined a day ahead of real time. 12.6 Traded energy will be settled at the marginal clearing price at the point supply offers and demand bids intersect. 12.6 Participants can nominate specific facilities to provide balancing energy. 12.7 Participants from whom the ISO has procured backup capacity must provide balancing offers for the contracted facilities. 12.8 During the trading day, the ISO will designate and dispatch balancing facilities according to their bids and offers. 12.9 The ISO will determine a balancing price for compensating the balancing facilities based on the marginal price of the last facility dispatched. 12.10 Balancing energy will be settled at: • for additional energy dispatched from balancing facilities, the balancing price; and • for uninstructed imbalances (from trading outcomes) outside a small tolerance range, the balancing price multiplied by a penalty factor. Penalty factors will be different for positive and negative imbalances.	the system within limits would require significantly higher volumes and costs. Operating on a portfolio basis allows participants to continue to manage their own generation, and requiring a portfolio merit order allows the ISO to account for network congestion in its dispatch process. Including penalty factors provides another incentive for participants to stick to their balanced positions.
Proposal 13: Metering 13.1 Content and timing requirements for meter data submissions will be moved from the Energy Balancing and Settlement Procedure to the PNR. 13.2 Meter data format specifications will remain in the Energy Balancing and Settlement procedure.	Meter data submission is part of the settlement process. It is appropriate for definitions, timeframes and high-level process steps to be included in the rules, rather than in a delegated instrument. This provides for clarity and certainty for participants and data providers.
Proposal 14: Manual load shedding plan 14.1 Participants must use best endeavours to manage their portfolios to balance their consumption and supply according to the trading and balancing mechanism provisions. 14.2 The ISO must seek to maintain the power system in a secure operating state at all times, including using powers of direction to avoid involuntary load shedding. 14.3 If the ISO forecasts a real-time supply shortfall, it must notify participants of the forecast time of the shortfall, and the quantity of expected unserved load. 14.4 The ISO must develop a manual load shedding priority list, identifying the order in	A pre-existing plan means participants have a shared understanding of what will happen in the event of a supply shortfall.

Proposal	Rationale
which network elements and load will be disconnected in the case of a forecast energy shortfall. 14.5 In preparing the priority list, the ISO must: • If possible, ensure that consumption relating to contracted energy volumes and contracted capacity volumes is disconnected later than consumption not associated with contracted capacity. • Ensure that consumption by foundation users of transmission network elements is prioritised ahead of others when network congestion is the cause of the shortfall. • Take account of network equipment serving both load and generation. • Attempt to achieve an equitable distribution and rotation of load disconnection across participants in proportion to their consumption. • Consult with NSPs and other connected parties to ensure the priority list is practical. 14.6 If load shedding is required, the ISO must endeavour to follow the load shedding priority list.	
Governance of ISO	
Proposal 15: ISO functions 15.1 Over time, the remit of the ISO will expand to cover additional functions. 15.2 The ISO will take control room functions in house by January 2027.	Independent performance of a wider range of functions is critical to support third party access and investment. Current arrangements restrict the ability of the control desk to access information about power system operations. Moving the control desk inside the ISO will reduce some of the competition concerns and allow the ISO to perform its core function.

Proposal	Rationale
Proposal 16: ISO board 16.1 The ISO board will continue to have five members, including a Chairperson and the Pilbara ISO Chief Executive Officer (CEO, Managing Director). 16.2 ISO directors must be independent of participants. 16.3 Directors (except for the CEO, who is appointed by the board) will be appointed by the Minister for Energy. 16.4 To be appointed, any new Director must meet selection criteria, including any requisite skill requirements. 16.5 Directors will be appointed for staggered three-year terms, with eligibility for reappointment twice. 16.6 ISO cost recovery should be amended at the same time as board composition changes.	An independent ISO is critical to support third party access and investment. Current arrangements require exemption from the ACCC to comply with competition law. Current ISO fee allocation is consistent with NSP board representation and control, but the proposed fee allocations (see proposal 18) are not.
Proposal 17: ISO budget 17.1 The ISO board must consult on a draft budget. 17.2 The ISO board will set the ISO budget annually. 17.3 The ISO budget will be subject to review and approval by the ERA.	To safeguard efficiency of, and fair allocation to, ISO operations, the ISO budget needs to be subject to review and approval by a third party.
Proposal 18: ISO fees 18.1 ISO costs will be recovered from participants based on gross injection and withdrawal figures into and from the NWIS. 18.2 The fee (in $/MWh) will be determined annually. 18.3 Fees will be recovered in each settlement period. 18.4 The approach to ISO cost recovery will be changed at the same time as the board composition is changed.	ISO costs should be borne by all parties who use the power system. As new parties connect, current cost allocation methods will become increasingly unfair. This proposal brings the recovery of fees in the NWIS in line with other networks.
Proposal 19: Confidential Information 19.1 Information will be public unless there is a compelling reason for it to remain confidential. 19.2 Public information will include outage schedules, demand forecasts, generation schedules, capacity figures (both supply and demand) and balancing quantities. 19.3 The PNR will designate certain information as confidential (for example terms, conditions, and prices in bilateral contracts). 19.4 Disclosers can request that information provided to the ISO be treated as confidential and provide supporting reasoning. The ISO must determine whether the information meets the PNR specified	Transparent access to information is key to efficient operations. If participants have access to data on the power system, they can better plan their operational strategies. Transparency measures should apply to all parties equally to provide a level playing field. Requiring NSPs to share operational data with the ISO enables the ISO to effectively operate the power system and maintain PSSR. Transparency improves the perception of independence of the ISO. Confidential information should be protected in appropriate circumstances.

Proposal	Rationale
criteria for being confidential, in accordance with an ISO procedure. 19.5 Disputes about classification of information will be resolved by the Coordinator of Energy.	
Proposal 20: Compliance monitoring 20.1 The ISO will monitor participant compliance with the PNR, including the HTR. 20.2 Initial focus areas for ISO monitoring will be portfolio balancing, dispatch compliance, and ESS performance. 20.3 The ISO will publish quarterly compliance reports on the activities it monitors. 20.4 The ERA will continue to monitor behaviour, with additional focus required from the start of the balancing mechanism.	As the Pilbara networks move towards more integrated arrangements, connected parties need to be able to rely on each other's compliance with the PNR, including the HTR. The PNR must include a framework for monitoring and reporting on compliance of connected parties.
Proposal 21: Compliance enforcement 21.1 The ISO will be able to issue formal warnings and requests for non-compliant parties to return to compliant operation. 21.2 The ISO will be able to refer non-compliance to the ERA for investigation. 21.3 The ERA will be able to levy monetary penalties (civil penalties) for non-compliance with civil penalty provisions, to be prescribed by the relevant Regulations. 21.4 The ERA will have power to restrict participation in the trading mechanism for participants who persistently fail to meet their traded energy quantities. Participant energy will still be settled in balancing. 21.5 Disconnection will remain as a sanction of last resort.	The proposed suite of remedies for non-compliance will allow more effective enforcement of compliance with the PNRs, in line with other networks, which will assist the maintenance of security and reliability for all parties connected to the system.
New Connections	
Proposal 22: NSP to NSP connection arrangements 22.1 The PNR will include a process for the interconnection of additional networks to the NWIS. 22.2 The ISO will manage the connection process for new networks connecting to the NWIS, and for new interconnections between existing networks. 22.3 Connecting networks must show compliance with Chapter 2 of the HTR, unless they are self-contained (established for the purpose of the participant serving only its own facilities).	The unusual nature of the Pilbara electricity sector means that new connections can be more complex than in most other electricity systems. Providing transparent rules for how to handle the interconnection of existing infrastructure will smooth the process for sharing infrastructure. Having the ISO manage the interconnection process for new networks provides a level playing field for parties that may compete with existing NSPs.

Proposal	Rationale
22.4 Generation, storage, and load facilities on the connecting network must demonstrate compliance with Chapter 3 of the HTR. 22.5 Self-contained network infrastructure may opt to demonstrate compliance at the interconnection point to the NWIS.	
Proposal 23: Preferential supply for transmission foundation customers 23.1 Foundation customers of transmission infrastructure will be entitled to firm supply for their loads when using the network components they have funded. 23.2 Foundation customers of transmission infrastructure will be allocated energy from other sources if their generation is constrained in balancing. 23.3 Foundation customers of transmission infrastructure will be settled without imbalance penalties if their dedicated generation is constrained after trading positions are finalised.	Transmission investment and generation investment go hand in hand. Giving foundation customers of transmission infrastructure priority for the use of that infrastructure will reduce their uncertainty about the ability to continue to benefit from this investment. If the Pilbara had locational pricing, this could be done by allocating a financial transmission right for the funded asset, but with a single zonal price, that is not possible, and physical preferential access will be more cost effective than providing constrained payments. Similarly, preferential dispatch for foundation generation could be more easily implemented in a security constrained economic dispatch environment, which is not proposed for the Pilbara at this stage.
Proposal 24: Self-contained networks 24.1 The PNR will distinguish between a network operator which provides services to third parties, and the operator of network infrastructure that is used to serve load and generation of that network operator. 24.2 Network operators who use their network equipment solely to service their own generation and load, can choose to be treated as a network user (demonstrating compliance at the connection point with the NWIS), or a network (compliance of all critical equipment within the network). 24.3 New connections must provide standing data and real-time data for individual pieces of critical equipment to the ISO, including if their facilities are subject to connection point compliance. 24.4 An Excluded Network can have a maximum of 10 MW of injection or consumption. If injection or consumption exceeds 10 MW for more than a set percentage of time over a rolling horizon, the Excluded Network status will be revoked. 24.5 A network owner which wants to be treated as a user but is not an Excluded Network is	Allowing connected parties to manage their own processes is an important part of the approach to Pilbara operations, as long as it can be done without affecting other connected parties. It is not necessary to require self-contained networks to comply with technical rules that support third party access. Providing visibility of connected equipment to the ISO supports power system security.

Proposal	Rationale
not required to show non-compliance with the HTR to be able to opt for Connection Point Compliance.	
Proposal 25: Storage participation 25.1 Controllers of storage works above 5 MW must register their facilities. 25.2 A new defined term 'Energy Producing System' will be added to encompass generation and storage facilities. 25.3 Where appropriate, Rules that refer to generation only will be broadened to refer to Energy Producing Systems. 25.4 Technical requirements for storage works will be added to Chapter 3 of the HTR.	Storage is an important enabler for the connection of increased renewable energy. Allowing storage to participate fully under the PNR will increase the revenue streams available to it, and the overall efficiency of the system operations.
Proposal 26: Demand side participation 26.1 Load participation in the PNR will be focused on ESS provision and mechanisms for flexible load to take advantage of available variable renewable energy. 26.2 Flexible load can be designated as non-firm in the capacity adequacy process, so that it is not required to be matched by supply capacity. 26.3 Owners of flexible loads can bid in the proposed trading mechanism to purchase additional energy, and then manage their load to match their position. 26.4 Owners of flexible loads will be allowed to contract with the ISO to provide contingency reserve raise as interruptible load.	Historically, the electricity sector has seen generation as a flexible resource to meet inelastic demand. In a power system with large volumes of variable renewable resources, flexible demand will have greater opportunity to access inexpensive energy much of the time and will see greater incentive to respond at short notice. The proposed arrangements for capacity adequacy and balancing include the ability for participants to leverage load flexibility at portfolio level. This proposal lays groundwork for real-time demand response when it arrives.
Development of the Harmonised Technical Rules	
Proposal 27: HTR standards 27.1 The HTR will set a default standard for "automatic qualification". 27.2 NSPs will not have technical standards for connections in addition to the HTR. 27.3 In the medium term, the HTR will set a minimum standard for connection. 27.4 Connection will not be allowed for equipment that falls short of the minimum standard.	The HTR are intended to function as a single, end-to-end technical power system standard for all networks and equipment connected to the NWIS. Allowing automatic rights of connection to parties meeting the standard is a key principle of open transmission access, to enable the evolution of the Pilbara.
Proposal 28: HTR negotiation framework 28.1 NSPs must negotiate with access seekers and consult with the ISO on requested departures from the default standard, and the ISO will have final power of approval (as it does for all connections). 28.2 The ISO may provide guidance for acceptable bounds of negotiation, evidence, and mitigation measures.	If a connecting party does not meet the default standard specified in the HTR, it can affect other connected parties. The ISO has responsibility for the security of the whole power system, so the ISO must be the final approver of deviations from standards. At the same time, providing visibility to the ISO behind the connection point will enhance the ISO's ability to operate the power system securely.

Proposal	Rationale
28.3 NSPs must publish estimated and actual timeframes for connection assessment activities in their control. 28.4 NSPs and access seekers can escalate disputes to the ISO, and where the ISO is a party to the dispute, to an appropriate dispute resolution mechanism. 28.5 NSPs and the ISO must publish agreed deviations from the default standard (whether above or below the standard).	Requiring publication of agreed deviations from the standard aligns with the transparency objectives.

1. Introduction

1.1 Background

With its large natural resources and mining operations the Pilbara region, located in the north of Western Australia (WA), is a significant driver of Australia's economy. Being the top supplier of iron ore in the world, the Pilbara accounts for 14.3 per cent of WA's and 2.3 per cent of the entire country's GDP [2].

The unique context of the Pilbara, and the commercial drivers of the resource sector, has led to separate or weakly interconnected transmission systems to maintain a secure and reliable electricity supply for large mining corporations. The North-West Interconnected System (NWIS) consists of several independent interconnected networks owned by different private companies and a public utility. Although interconnected, each network operator has their own network requirements and restrictions.

The NWIS is governed by the Pilbara Networks Rules (PNR), which were designed around a power system that is based predominantly on dispatchable thermal generation comprised of gas turbines. The Harmonised Technical Rules (HTR) are part of the PNR and specify technical standards for network operators and equipment connected to the NWIS.

Following Australia's commitment to achieving net zero by year 2050, decarbonisation efforts are expected to see a radical change in the types of technologies that are available to supply electricity, and the services needed to operate a secure and reliable power system. More specifically, the electricity system is anticipated to transition towards more variable renewable generation, energy storage resources, and increasingly flexible demand.

1.2 The Evolution of the Pilbara Networks Rules Project

In late 2023, the WA Government endorsed the Pilbara Energy Transition (PET) Plan based on the consensus of the Pilbara Industry Roundtable discussions. The objectives of the PET Plan include encouraging common use electricity infrastructure to increase the networks' efficiency and to support the anticipated increase in levels of renewable energy and decarbonisation in the Pilbara.

The Evolution of the Pilbara Networks Rules (EPNR) project was undertaken in close consultation with stakeholders – including the Pilbara Advisory Committee (PAC) – to identify and implement any changes necessary to evolve the PNR to ensure it enables and supports efficient decarbonisation of the Pilbara electricity system.

The PAC has established the EPNR working group to support this project, with two workstreams:

- Workstream 1 supports the evolution of the PNR; and
- Workstream 2 supports changes to technical standards in the HTR.

The working group is chaired by Energy Policy WA. It first convened on 28 March 2024 followed by a further 12 meetings to 21 November 2024. The working group discussed and progressed the project, including development of proposals for this paper. The PAC has been informed and regularly discussed the working group's progress at its meetings.

[2] https://app.remplan.com.au/pilbararegion/economy/industries/output

The EPNR project is being carried out in four stages.

Stage 1 established the governance mechanism that would support the analysis and development necessary to complete the scope of the project. A scope of works and the working group were created to complete this stage.

Stage 2 developed and modelled scenarios to examine trajectories that meet the Pilbara decarbonisation goals. This involved modelling generation and storage development scenarios.

Stage 3 is the assessment of the effectiveness and efficiency of existing PNR against the decarbonisation goals of the region, leveraging the insights and results from Stage 2. The working group considered a list of development issues drawn from the modelling, the Pilbara round table, and other stakeholder feedback. The draft proposals developed from discussions with the PAC, the PAC Working Group, and Energy Policy WA are compiled in this consultation paper and published for public feedback.

Stage 4 will establish an implementation plan to ensure that the PNR evolution needs emerging from Stages 2 and 3 are captured. The Implementation Plan will provide a detailed explanation of the PNR evolution stages, and an outline of actions required to implement the staged evolution including timing, governance, resourcing, and milestones.

1.3 The Future of the Pilbara Electricity System and the Purpose of this Paper

If the Pilbara is to successfully decarbonise, the electricity sector has to change. Today, electricity in the Pilbara is supplied by dispatchable generators fuelled by gas. Over the next two decades, as all parts of the sector work to decarbonise, electricity supply will progressively come primarily from variable renewable energy.

As the use of variable renewables increases, maintaining secure and reliable power supply means that:

- either every company is investing in sufficient generation, energy services and network equipment to meet all of its demand; or
- energy producing resources and essential system services are shared across interconnected networks, to reduce the overall capital and operational costs of meeting Pilbara's electricity demand.

The Stage 2 modelling, described in Section 2 of this paper, quantified the significant whole of system cost savings from more integrated arrangements in the Pilbara energy system. These cost savings are expected to outweigh the overall cost of the reform proposals outlined in this paper.

This paper sets out a range of proposals to enable the Pilbara system to decarbonise cost effectively. These proposals:

- provide mechanisms for connected parties, should they wish to do so, to trade energy, share system reserves and energy services, and manage increased energy supply volatility;
- maintain the ability for connected parties to control their own operations, as they do today, as long as doing so does not impact on other participants;
- describe an end state - their commencement will be staged progressively to meet the needs of the increasingly decarbonised system, and an implementation plan will define their target commencement dates; and
- provide a high-level direction for the reform of PNR, not a detailed design or cost/benefit analysis of each individual proposal.

They are also intended to resolve issues regarding transparency that currently require exemptions from competition law requirements and to maintain the ability of connected parties to meet their obligations under State Agreements. Specific examination of, and alignment with, State Agreements will need to occur during the detailed design of the reform initiatives.

After consultation, Energy Policy WA will prepare an implementation plan, identifying the key triggers which will drive the need for individual reforms, a program of work to progress towards the end state, and projected timeframes, dependencies, and high-level cost estimates. Energy Policy WA considers that detailed design work will be required to inform meaningful cost estimates. These estimates are to ensure that, prior to the implementation of the individual reforms, there is confirmation that the reforms costs are lower than the expected whole of system benefit.

1.4 Structure of this Paper

This paper sets out:

- findings from the techno-economic modelling conducted in Stage 2;
- proposals for the evolution of the PNR arising from Stage 3;
- proposed amendments to the HTR arising from Stage 3; and
- a request for feedback on the proposals.

This paper is structured as follows:

- Chapter 2 describes the modelling assessment undertaken to identify and inform potential changes to the Pilbara electricity sector in a variety of possible futures;
- Chapters 3 through 5 set out proposals for development of PNR, including the current arrangements, options considered, and a high-level design for future arrangements; and
- Chapter 7 sets out proposals for the development of the HTR.

2. EPNR Modelling

2.1 Modelling purpose and approach

In 2023, Energy Policy WA modelled the Pilbara electricity system with a focus on transmission expansion. The Pilbara Electricity Transformation Assessment (PETA) modelling used a least cost expansion model to consider a range of matters, including insights into future electricity infrastructure requirements.

During Stage 2 of the EPNR project, Energy Policy WA worked with stakeholders and its consultants to develop a dispatch model of the Pilbara electricity system. It used the model to consider existing PNR arrangements, to explore the commercial aspects of the sector (energy supply costs, energy exchange, provision of services, and settlement) and to assess the size of the system-wide benefit under different scenarios.

The purpose of the modelling was to assess the suitability of the mechanisms provided for in the current PNR in a variety of possible futures. This helped to identify opportunities for the rules to evolve to accommodate changes in the generation mix, demand profiles and participants. Cost forecasts generated by the modelling allowed comparison of the relative costs between different scenarios.

The modelling exercise was not intended to:

- predict a specific future;
- provide concrete price projections;
- assess the merits of specific transmission or energy supply projects; or
- develop a generation, storage and transmission plan for the potential development of the NWIS.

Where possible, assumptions used in the prior transmission modelling were carried over to the generation modelling, and outputs of the transmission modelling were used as inputs to the generation model. The EPNR modelling was then able to explore:

- potential threats to secure and reliable electricity supply in a decarbonising power system;
- whether existing PNR arrangements are fit-for-purpose in the decarbonised power system; and
- potential cost and security/reliability benefits from greater integration or enhanced operational arrangements.

Stage 2 modelling was finalised and presented to the PAC in August 2024[3]. Separate to this modelling exercise, Energy Policy WA is continuing to refresh the PETA modelling that was completed in 2023 as part of the Western Australia Government's Sectoral Emissions Reduction Strategies and Pilbara Industry Roundtable work programs.

[3] https://www.wa.gov.au/system/files/2024-08/pacmeeting-29august2024-meetingpapers.pdf

3. Power System Security and Reliability

The energy transition is challenging historical approaches to maintaining PSSR. The current PNR arrangements are based on a predominantly thermal generation fleet that can provide firm energy if dispatched at any time. Integrating large volumes of variable generation into the Pilbara system requires evolution of the PSSR standards and practices.

3.1 Long Term planning

3.1.1 Current Arrangements

Every two years, the ISO is required by the PNR to prepare and publish two Network Coordination and Planning reports the:

- Transmission Development Plan; and
- Pilbara Generation Statement of Opportunity (GenSOO).

The Transmission Development Plan describes scenarios for NWIS Covered Transmission Elements, including the locations and quantity of supply and demand in the Networks, and a summary of the most recently published proposed augmentations.

The Pilbara GenSOO sets out potential investment opportunities for renewables and storage in the NWIS, the ISO's projection of generation fuel availability, fuel sources, and renewable energy developments, a report on essential system services (ESS) procured, assessment of the adequacy of the system capacity, and other information set out in the Planning and Reporting Procedure.

Both reports are focused on the covered networks in the NWIS, but may also include information on existing, or potential new, extended or expanded non-covered networks that are not part of the NWIS. However, the ISO has limited power in seeking information from parties that are not connected to the NWIS.

3.1.2 Issues and Options

The size and location of transmission, storage, generation, and load are critical factors in maintaining system reliability as the system decarbonises. Given the expected growth in demand and geographical range of the Pilbara networks, including the NWIS, there is a heightened need for timely information to identify efficient, system-wide investment requirements.

Options to improve planning signals include:

- devolve responsibility to Network Service Providers (NSPs) to carry out planning and publish plans for their own networks;
- shift the long-term planning function to Energy Policy WA; or
- retain responsibility for centralised planning in the ISO, with a broader scope and effective information gathering powers.

Devolving responsibility for long-term planning to NSPs is unlikely to provide a 'coordinated' view of future demand and infrastructure requirements in the Pilbara region and is therefore not expected to provide effective and efficient investment signals.

A stakeholder suggested that Energy Policy WA would be in a better position to undertake the long-term planning function for the Pilbara. Energy Policy WA is currently completing annual modelling on the Pilbara region, which has been utilised to develop and deliver the Western Australian Governments PET Plan. This work program includes identification of transformative, priority projects for the Pilbara. As such, Energy Policy WA may be considered as an alternative to the ISO to deliver the PSP.

The ISO currently has responsibility for long-term planning, albeit with a potentially narrow focus on the existing covered NWIS. To ensure the plan is as useful as possible, it would need to consider electricity use outside the covered NWIS. This could then address potential interconnections or connections, expected large loads, or new networks – particularly those built to deliver renewable electricity to load locations.

Overall, Energy Policy WA considers that the ISO is better placed to sustainably deliver the long-term planning function.

The presence of a project in the plan would not require that existing connected parties to invest. The mechanism for the delivery of transmission investment is being considered in Energy Policy WA's work on the PET Plan[4].

Given the expected pace of change in the Pilbara, a PSP would need to be updated every two or three years. In years without a PSP, the ISO would need to continue to carry out demand and capacity forecasting.

3.1.3 Proposal

Proposal 1: Long term planning and consultation question

Proposal

1.1 The ISO will have effective information-gathering powers for all networks in the Pilbara, whether connected to the NWIS or not. Requested information will relate to plans to connect to the NWIS during the planning horizon.

1.2 Every two years, the ISO will prepare an integrated plan for the NWIS (the Pilbara System Plan (PSP)), including potential interconnections and new supply and demand sources.

1.3 The ISO will consult on the assumptions and methodologies to be used in preparing the PSP.

1.4 Input and output data for the PSP will be published for transparency, with commercial sensitivity respected.

1.5 In years where an updated PSP is not published, the ISO will prepare a generation statement of opportunities including updated demand and capacity forecasts and taking into account network constraints.

Consultation question

(1)(a) Do stakeholders support the proposed approach to long term planning?

(1)(b) Do stakeholders agree that the ISO is best placed to deliver the PSP?

This proposal was circulated for review ahead of the 24 October 2024 working group meeting and discussed at the 21 November 2024 working group and 5 December PAC meetings.

4 https://www.wa.gov.au/organisation/energy-policy-wa/pilbara-energy-transition-plan

3.2 Reliability standard and supply adequacy

3.2.1 Current Arrangements

In the current PNR, each NSP decides the standard to which its network is planned and operated. This has the potential to lead to different levels of reliability across the NWIS.

With regard to supply adequacy, exit users nominate a demand cap, and procure generation adequacy certificates to match their nominated cap. They surrender the certificates to the ISO which, if necessary, restricts their consumption to that quantity of offtake.

This approach avoids centralised procurement of capacity, and the consequential allocation of costs based on contribution to system peak (or another reliability metric).

Participants are responsible for finding enough supply to meet their projected demand. This also allows participants to procure surplus capacity to ensure their supply reliability is maintained.

Specifically:

- the ISO must publish the peak demand or the method for determining peak demand;
- exit users must forecast their own peak demand and nominate a demand cap;
- generators must self-certify the capacity they provide;
- exit users must provide generation adequacy certificates; and
- exit users must be restricted to withdrawing up to their demand cap.

These requirements are currently suspended, and no methodologies have yet been published. A reliability standard must be included to evolve the current system and enable the integration of increasing volumes of variable generation.

The PNR needs to evolve to include a supply adequacy standard that:

- determines an overall capacity requirement;
- includes variable renewables, storage, and demand side response;
- accounts for correlation (or lack thereof) in the output of variable renewable generation, for example where different wind farms tend to have low output at the same time;
- allows for different standards in different parts of the network; and
- allows participants to opt out for behind the meter arrangements in which loss of generation is tied to load reduction.

3.2.2 Issues and Options

Reliability standard for network operation

To maintain consistent reliability in each part of the network, a certain level of resilience to outages is required. The PNR needs to specify a planning standard to apply to the whole network. The standard will inform network planning, outage assessment, and pre- and post-contingency measures. It is acknowledged that, in some parts of the network, connected users may wish to have a greater level of redundancy.

Energy Policy WA proposes that all parts of the NWIS should be planned and operated to at least n-1 standard, so that the network is resilient to the loss of any single piece of critical equipment. In some cases, this may be best achieved by non-network solutions, such as flexibility agreements with generators or consumers in particular locations. This will provide parties with the ability to develop n-0 transmission when connected parties agree to reduce demand, or increase supply, in response to relevant network outages.

Self-contained networks, which do not provide services to the rest of the system, do not need to maintain n-1 reliability, but any new part of the power system that will be relied on by other parties should be designed to the n-1 standard. Some existing networks may need a reasonable period to transition to the n-1 standard.

Capacity forecasting

The PNR provide for the ISO to define what "peak demand" means, and for individual users to calculate their own contribution to that peak demand. The ISO also has a role in long term planning and forecasting.

In the future, as new consumers and suppliers (including renewable generators) connect to the NWIS, this approach will become unmanageable. Having a central body responsible for forecasting the overall capacity requirements for the NWIS will ensure a consistent approach and coordinated to forecasting, and a more accurate assessment of potential capacity shortfalls.

Given its role, the ISO should be responsible for forecasting the capacity requirement for the system as a whole. This should include the NWIS, as well as other relevant parts of the Pilbara (e.g. potential connections or interconnections). Connected participants can choose to provide their own forecast data to ISO for consideration and inclusion.

Most jurisdictions focus on a single measure of supply adequacy based on a one-in-ten-year peak demand event. With increasing penetration of variable renewable generation, there is also the potential issue of a lack of energy. Modelling (see footnote three) has identified that the installed capacity required to reliably meet demand may be five or six times the peak load.

Energy Policy WA proposes that the ISO forecasts, for each of the next ten years:

Peak demand in:

- a one-in-ten-year event (10% probability of exceedance (POE));
- a one-in-two-year event (50% POE); and
- a nine-in-ten-year event (90% POE).

Weekly available generation output (based on the existing and committed generation fleet) in:

- a one-in-ten-year low renewable output week (90% POE);
- a one-in-two-year low renewable output week (50% POE); and
- a nine-in-ten-year low renewable output week (10% POE).

Expected unserved energy in a week with one-in-ten-year combination of high demand and low renewable output[5].

The ISO can then determine and publish the quantity of firm capacity (expected capacity requirement):

- required to meet peak demand in a one-in-ten-year peak demand event;
- required to avoid unserved energy in a one-in-ten-year low renewable output week; and
- assuming new renewable generation has the same capacity contribution (per MW installed) as the existing and committed renewable fleet.

[5] This does not mean simply assuming that the 10% POE peak demand occurs in the week with the 90% POE renewable output, but rather assessing the worst combination of peak demand and renewable output that could occur once in ten years.

The expected capacity requirement also needs to include a reserve margin to account for the largest contingency. Assuming that no planned outages would be permitted in times of extreme system stress, the reserve margin should be set to the expected average forced outage rate of the supply fleet.

Supply adequacy and individual capacity targets

Once a capacity target has been determined, the next step is to identify whether there is a shortfall, and if so, assess individual demand contribution to the need for additional capacity.

In the future there are likely to be some loads which do not require firm supply (i.e. flexible loads). For example, a commonly presumed business model for green hydrogen is that production would adjust up and down depending on the availability of cheap renewable energy. It does not make sense to include this demand in the capacity target. The future PNR must treat this type of load accordingly by allowing participants to denote part of their consumption as opportunistic or non-firm for it to be excluded from their capacity requirement.

Similarly, if consumption is directly offset by generation, as managed by a user, there is no need to include it in the overall capacity target. This may be where a user has generation and load at the same location, does not use the generation to serve any other load, and a generation trip automatically triggers the curtailment of the load. In this situation, the user does not rely on supply from other capacity, and no other parties rely on that user's generation for their continued supply.

For all other loads, the ISO will need to publish a method to determine their contribution to the capacity requirement. The final NWIS capacity target for a year will be the sum of all individual targets.

Each consumer must then provide evidence to the ISO of how much capacity it has in place to meet its individual requirement. Some participants may have more or less capacity available than their targets.

Capacity certification

The PNR require generators to self-certify the quantity of capacity they provide. This is relatively straightforward for traditional technologies but is more difficult for variable technologies which cannot guarantee how much energy they will be able to provide at any time. If network users rely on other parties for their supply (either through contracts or through balancing mechanisms), they must be able to have confidence in the approach used.

Energy Policy WA proposes that each participant can self-certify its own generation if:

- the energy is to be used *within its portfolio,* and
- this supply will be unaffected by network constraints.

If these criteria are not met, facility capacity contribution must be assessed by the ISO. While there is more work to be done on the specific methods to be used, at high level, Energy Policy WA proposes that:

- firm generation is assessed based on its maximum output under expected peak demand conditions, supported by testing results;
- variable generation is assessed using a probabilistic method based on effective load carrying capability; and
- storage is assessed using linear derating, which assumes the total stored energy is discharged evenly over a required performance duration.

These methods are consistent with those used to assess capacity in other jurisdictions, including in the Wholesale Electricity Market (WEM) in WA, though more work is required to detail the specific approach for the Pilbara.

Capacity procurement

There are two options to deal with a projected capacity shortfall. Either:

- participants are fully responsible for ensuring they have built or contracted sufficient capacity to serve their demand. If some participants have not done so, then in conditions of system stress, a shortfall will occur; or
- a designated party steps in to procure capacity to meet the shortfall.

Energy Policy WA considers that the nature of the Pilbara is such that it is not appropriate to allow energy shortfalls to occur when they are projected well in advance. Building new capacity takes time, so a backstop method needs to be initiated in time to allow new capacity to come online. At the same time, it is important to allow participants to manage their own needs.

Energy Policy WA proposes that ISO procures additional capacity to cover a forecast shortfall 24 months in advance via a competitive tender process. Submissions will be required to specify:

- a $/MW capacity price; and
- a $/MWh maximum energy balancing price.

The ISO will select successful applicants based on the lowest overall cost, considering capacity payments and expected energy payments. The ISO will pay all selected capacity at the highest winning capacity price (pay as cleared, not pay as bid).

Successful participants must offer this capacity in both the day-ahead trading mechanism and the balancing mechanism, with the energy price limited to the maximum price in the capacity submission.

The ISO will recover capacity costs from individual participants that have not procured sufficient capacity to cover their individual requirements. Participants who have procured sufficient capacity will not share in the costs.

3.2.3 Proposal

Proposal 2: Network reliability standard and consultation questions

Proposal

2.1 The default network planning and operation standard for the NWIS will be n-1.

2.2 Parts of the network can be planned and operated to a higher or a lower standard, with the agreement of affected parties.

2.3 NSPs can use alternative, non-network solutions to achieve an n-1 standard.

Consultation Questions

(2)(a) Do stakeholders support the proposed network reliability standard?

(2)(b) Are there important exceptions to the reliability standard that should be included in the PNR?

Proposal 3: Capacity forecasting and consultation question

Proposal

3.1 The ISO will forecast capacity requirements for the NWIS, based on avoiding unserved energy in the event of expected one-in-ten-year peak demand and low renewable output, including a reserve margin to account for expected supply outages.

Consultation Question

(3)(a) Do stakeholders support the proposed method to determine the NWIS capacity requirement?

Proposal 4: Individual capacity requirements and consultation questions

Proposal

4.1 The ISO will set the method for participants to calculate their required contribution to the capacity requirement.

4.2 Participants can nominate part of their demand as non-firm, to be excluded from the firm capacity requirement.

4.3 Participants do not have to account for consumption served by co-located generation.

4.4 Participants will be required to have sufficient capacity to meet their capacity requirement.

4.5 The final NWIS capacity target will be the sum of individual participant requirements.

Consultation Questions

(4)(a) Do stakeholders support the proposed exclusions from individual capacity targets?

(4)(b) Do stakeholders have any other comments on determining individual capacity targets?

Proposal 5: Capacity certification and consultation questions

Proposal

5.1 A participant can self-certify the capacity contribution of its own facilities if:
- energy from the facility will be used to serve its own consumption; and
- this supply will not be affected by network constraints.

5.2 If a participant does not include consumption served by co-located generation in its capacity target, the co-located facilities cannot have a certified capacity contribution.

5.3 The ISO will certify all other capacity:
- Firm generation will be certified according to maximum output under peak demand conditions, supported by test results.
- Variable generation will be certified by a probabilistic method that accounts for the variability and the correlation with other variable generation.
- Storage will be certified by linear deration.

Consultation Questions

(5)(a) Do stakeholders support the proposed conditions for self-certification?

(5)(b) Do stakeholders support the proposed methods for assessing capacity contribution of different types of facility?

Proposal 6: Backup capacity procurement and consultation questions

Proposal

6.1 If participants do not present evidence of sufficient capacity to meet their individual requirements for a particular year (including a reserve margin), the ISO will seek to procure additional capacity to meet the shortfall in that year.

6.2 Submissions will specify a $/MW capacity price and a maximum $/MWh balancing energy price.

6.3 The ISO will select submissions based on the lowest overall cost considering capacity payments and expected energy payments and will pay all selected providers at the highest capacity price (pay as cleared) that fills the shortfall.

6.4 The costs of capacity procured by the ISO will be allocated to the participants with individual shortfalls.

6.5 Selected providers must offer energy in the balancing mechanism, with the energy price limited to the maximum price in the capacity submission.

Consultation Questions

(6)(a) Do stakeholders support central capacity procurement as a backstop in case of shortfall?

(6)(b) Do stakeholders support the proposed approach to capacity procurement?

These topics were initially discussed at the 22 August 2024 working group and the 29 August 2024 PAC meeting. Proposals were discussed at the 24 October 2024 working group and the 5 December 2024 PAC meetings.

3.3 Essential System Service Definition and Procurement

ESS are services other than energy supply provided by generators and other equipment connected to the power system. They support the delivery of energy and help to maintain PSSR.

3.3.1 Current Arrangements

Subchapter 8.1 of the PNR deals with the specification, procurement and enablement of the two existing ESS in the Pilbara regime:

- FCESS (frequency control ESS) – regulation service used to manage frequency fluctuations in the power system; and
- SRESS (spinning reserve ESS) – contingency reserve that ensures adequate headroom (i.e., for a generator, the droop response capacity to help arrest a fall in frequency after a contingency) in the power system.

The FCESS have regulation raise and regulation lower components defined separately in the rule 201(b). However, they are procured as a single product with a single primary provider designated for the entire power system. In the event the primary provider is not able to maintain the frequency, the ISO will identify all potential secondary providers available and utilise the lowest-cost option. Secondary FCESS is compensated differently, and has an administered price cap.

SRESS is used to cover larger contingency events resulting in a loss of supply. It is also procured via contracts with one or more SRESS providers. There is currently no load rejection reserve service to manage a significant drop in load.

3.3.2 Issues and Options

The definition, requirements and procurement of the ESS in the PNR need to evolve to suit a future with high renewable penetration, including utilising storage and curtailed renewables and allowing more dynamic procurement to reduce costs. This is also an opportunity to standardise terminology with other Australian power systems.

Services

ISO System Coordination bulletins for the year to June 2024 show 20 events during which frequency dropped below 50Hz, and 12 events in which frequency rose above 50Hz. The maximum generation lost was 100 MW, when a major generator tripped, and the maximum load lost was 33 MW due to an emergency shutdown valve operated at a gas delivery station.

Energy Policy WA considers that the existing ESS are still relevant and should be retained. However, their naming does not align with the naming for equivalent services in other parts of Australia. For consistency, Energy Policy WA considers they should be renamed “regulation raise”, “regulation lower” and “contingency reserve raise”.

In the future, the modelling demonstrates that the largest contingency in the NWIS is expected to be a sudden change in variable generation output. At the same time, having more variable generation built means significant curtailment will occur most of the time, which will be able to support both regulation and contingency response.

Power systems in other jurisdictions have implemented new ESS to support the energy transition. These include:

- load rejection reserve (such as the four contingency lower frequency control ancillary service markets in the National Electricity Market (NEM) and the Contingency Lower Reserve in the WEM);
- inertia requirements (such as Rate of Change of Frequency (RoCoF) Control Service in the WEM);
- fast frequency response (sub-second contingency reserve);
- operating reserves (30-minute response to replace used up reserves after a contingency); and
- minimum synchronous generation (firm generation is constrained on, often at minimum load).

In the future, as the quantity of connected storage increases, a service to deal with frequency increases following load rejection contingencies will become relevant. Implementing a minimum synchronous generation requirement assumes reliance on the pre-transition paradigm, and thus is not a solution for the long-term. An inertia service or faster contingency response may also be useful, and Energy Policy WA considers that this would require studies to understand the likely RoCoF rates and ride-through capabilities.

Setting ESS requirements

The nature of electricity demand in the Pilbara has limited variation arising from the weather or the time of the day. This means that ESS requirements have historically been relatively static.

ESS requirements are currently set at least once annually, with the same quantity requirement applying in every hour of every day. A single value is used for the whole system, and if parts of the system are islanded, the ISO has mechanisms to require local generators to provide ESS even if not contracted.

The ISO has recently begun procuring supplementary ESS to allow different quantities of ESS to be provided at different times depending on the need. The need for different quantities of ESS is expected to increase in future, as solar and wind penetration increases the variability in the generation fleet being used to meet demand.

Other jurisdictions set ESS requirements dynamically. For example, Contingency Reserve Raise requirements can be defined based on the maximum supply loss possible at that time (be it a generating unit or a network element).

Similarly, other jurisdictions provide for specifying locational ESS requirements for different parts of the network. If this approach were used in the Pilbara, it could remove the need for separate management of islanded ESS provision.

ESS procurement

While ESS is currently procured on a contract basis, it could be procured via a balancing mechanism in the future. This would mean scheduling it at the same time as balancing energy, with participants submitting available ESS quantities along with their balancing submissions.

The number of facilities capable of providing ESS in the current Pilbara fleet is not sufficient to support procurement through a balancing mechanism anywhere close to real time, so Energy Policy WA proposes that ESS continue to be procured under contracts until the depth of this capability increases. If paid via contracts, no additional ESS payments would need to be made (except for energy settled at the balancing price).

Compliance and data

Effective delivery of ESS requires a party to assess facility capabilities, monitor compliance, and act when performance does not match the requirement. To effectively operate an integrated power system, the ISO needs information about facilities capabilities. This means:

- Supervisory Control and Data Acquisition (SCADA) points for facility output;
- high-speed recorder data for key facility variables;
- meter data for all connection points; and
- access to test reports and ability to mandate tests of connected equipment.

The ISO needs to be able to review facilities' ESS accreditation, based on performance.

3.3.3 Proposal

Proposal 7: ESS Framework and consultation questions

Proposal

7.1 The two existing essential system services (ESS) will be retained.

7.2 The existing "FCESS" service will be renamed "Regulation"

7.3 The existing "SRESS" service will be renamed "Contingency Reserve Raise".

7.4 When energy storage penetration increases, a new Contingency Reserve Lower service will be introduced to manage unplanned loss of load.

7.5 Power system security will be managed by defined ESS requirements rather than by a minimum synchronous generation requirement.

7.6 Power system studies will be conducted to assess Rate of Change of Frequency (RoCoF) ride-through capability of generators and other connected equipment, to determine the need for additional services such as inertia.

7.7 The ISO will move to dynamic ESS requirements, with the ability to set different requirements at different times of day, different times of year, and for different system conditions.

7.8 The ISO may set locational ESS requirements for pre- and post-contingency management of the power system, with payment mechanisms aligned with system-wide arrangements.

7.9 The ISO will establish an ESS accreditation framework, and monitor compliance with standards for ESS provision.

7.10 ESS will continue to be procured and provided under contracts, i.e., not through a dynamic mechanism.

Consultation Questions

(7)(a) Do stakeholders support the proposed approach to essential system services?

(7)(b) Do stakeholders support the proposed approach to ESS procurement?

This proposal was discussed at the 24 October 2024 working group and the 5 December 2024 PAC meetings.

3.4 Essential System Service Cost Allocation

3.4.1 Current Arrangements

The responsibility of paying FCESS (regulation) costs currently falls upon the party responsible for nominating energy volumes. By default, this is the network user. The allocation is calculated based on the size of the difference between maximum load and minimum load for the entire three-year reference period.

SRESS (contingency reserve raise) costs are recovered from connected parties based on the size of their largest generation unit, regardless of how many units the participant has or if the largest unit actually operated in any particular time period.

These arrangements are reasonable in the current context of the Pilbara regime as participants have similarly sized generation portfolios and large units are run at high-capacity factors. In the near future, as renewables and storage enter the system these arrangements are not appropriate and will become barriers to entry for renewables and storage.

3.4.2 Issues and Options

Causer pays

ESS cost allocation arrangements need to evolve to reflect a ‘causer-pays’ approach.

Participants are causers of the need for system-wide ESS if the operation of their facilities (whether consumption or generation) can impact on the rest of the system.

- Causers of the need for regulation are those whose net generation or consumption varies from the scheduled quantity within a dispatch interval.
- Causers of the need for contingency reserve raise are those whose net energy injection or flexible demand can drop significantly, almost instantaneously.

If costs are allocated to those who cause the need for the service, all parties have incentive to reduce their need for the service, meaning less of the service needs to be procured and the overall cost to the system would reduce over time.

The current cost recovery approaches are not causer pays:

- Regulation is allocated to those with a large difference between their maximum consumption and minimum consumption, even if that consumption varies predictably and the consumer closely aligns its withdrawal of energy with its forecast.
- Contingency reserve raise is allocated based on the capacity of the largest unit in the portfolio, regardless of how often that facility runs. This is closer to causer pays than the regulation allocation, but it is not suitable for a future with variable ESS requirements. Further, it favours providers with large portfolios of generation versus those operating individual facilities or smaller portfolios.

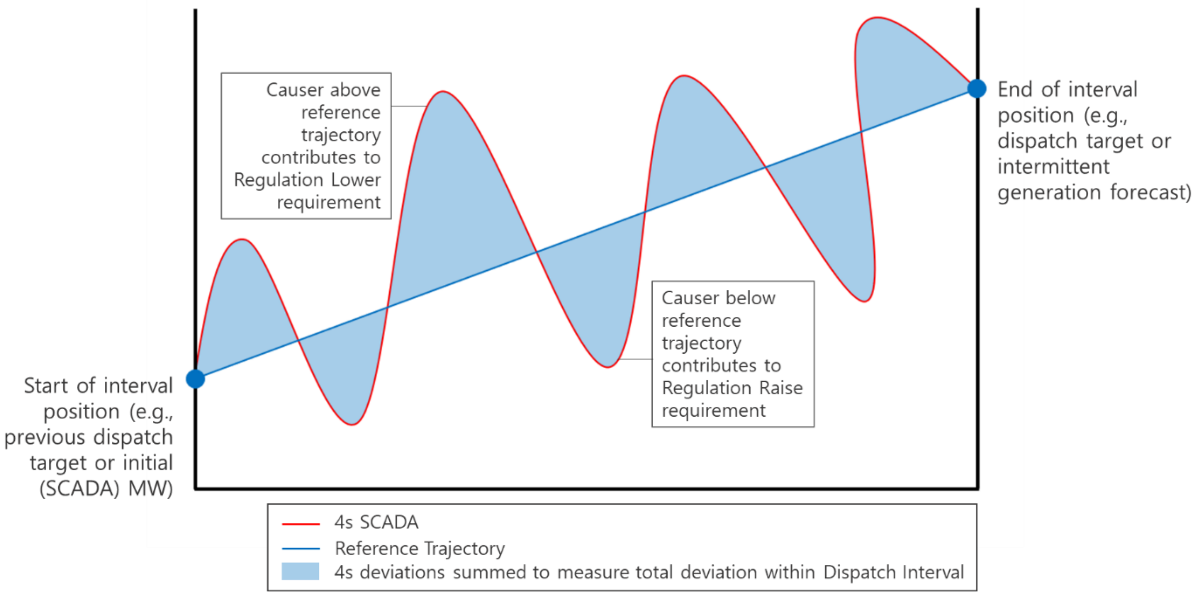
Under the current approaches, participants cannot readily reduce their exposure to cost allocation and, even if they did, this would not necessarily lead to a reduced requirement for the services.

Regulation cost allocation

Many jurisdictions use postage stamp allocation for regulation costs, where costs are allocated to all participants on a per MWh basis. This is simple to calculate but is not a causer pays method. It can be a reasonable approximation if all facilities (including loads) have similar intra-interval volatility.

The NEM and the proposed method for the WEM use real-time causer calculations. They use SCADA data to compare the output of each generator to a theoretical perfect output trace, as shown in Figure 2.

Figure 2: Real-time frequency deviation causer



Regulation costs are assigned to facilities in proportion to their departure from the theoretical trajectory.

Alternatively, regulation costs could be allocated on a portfolio variation basis, where either SCADA measurements or metered values for all of a participant's facilities and load is summed for each dispatch interval, and costs allocated based on how well participants align their operation to their balancing forecasts. Energy Policy WA considers that this approach would better fit the Pilbara's portfolio-based nature.

Contingency reserve cost allocation

The obvious approach to contingency reserve raise cost allocation is to develop the existing runway-like method into an improved runway method. The runway allocation method allocates Contingency Reserve costs based on facility contributions to the size of the largest contingency in any given trading interval. Figure 3 shows an example for two generators. This is the approach used in the South West Interconnected System (SWIS). Figure 4 shows a modified runway method, which also considers generator failure rates.

Figure 3: WEM Runway method

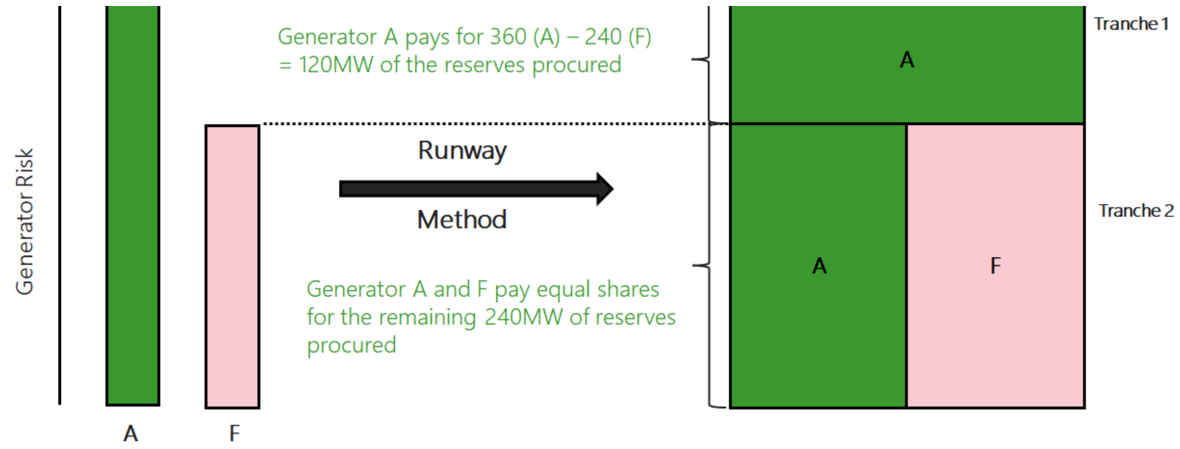
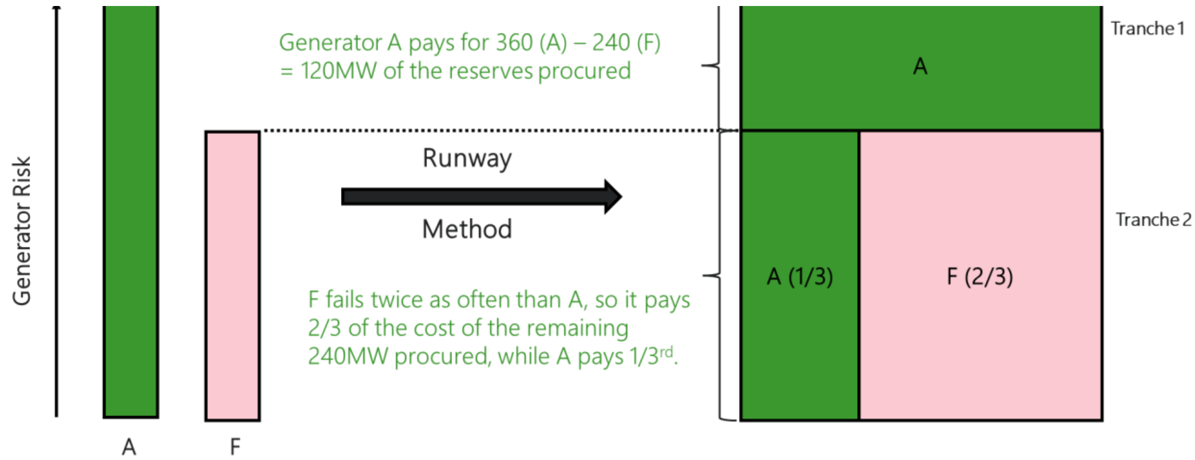


Figure 4: Modified runway method (as used in Singapore)



Energy Policy WA considers the regular runway method is sufficient to provide the right incentives.

Exemption from funding ESS

If a participant provides its own reserve, it need not contribute to system-wide ESS costs.

To exclude a facility from the runway allocation, the ISO would need to be satisfied it does not need to secure reserve for that facility. Meaning the participant must have an automated mechanism in place to automatically curtail load if the facility trips.

A participant cannot be exempted from contributing to regulation costs but could theoretically reduce its exposure to zero by predictable operation.

3.4.3 Proposal

Proposal 8: ESS cost recovery and consultation question
Proposal
8.1 ESS costs will be recovered from causers where practical, on a trading interval basis.
8.2 Regulation costs will be allocated to participants who vary their generation or load from their balancing positions.

8.3 Contingency reserve raise costs will be allocated to supply facilities based on their output in each interval, according to the runway method.

8.4 Contingency reserve lower costs will be allocated to a load based on their demand in each interval, according to the runway method.

8.5 Facilities will be exempt from Contingency Reserve Raise costs if they provide evidence that a facility trip would be automatically offset by load curtailment by the same participant.

Consultation Questions

(8)(a) Do stakeholders support the proposed cost recovery methods?

This proposal was discussed at the 24 October 2024 working group meeting and the 5 December 2024 PAC meeting.

3.5 System Strength framework

3.5.1 Current Arrangements

The NWIS consists of various interconnected networks with different operators and owners. System strength requirements can differ for individual networks, but events on one network can impact operations on interconnected networks.

There are no minimum or maximum standards set in the HTR, and no information and negotiation provisions for situations where fault levels on one network impact other networks.

3.5.2 Issues and Options

System strength issues can affect the power system as a whole, but must be considered at a very local level.

In some places (such as the NEM), network operators are required to provide equipment and/or services for Australian Energy Market Operator (AEMO) to use to manage system strength. In other places (such as PJM), system strength is managed by the network owner/operator.

Energy Policy WA considers that in the Pilbara, network owners are best placed to manage system strength issues. While the HTR can provide guidance on some aspects, and the ISO has an interest in system strength management, it will always need to be a consideration for individual network owners, who are best placed to manage and mitigate issues.

Fault levels can be an indicator of system strength in power systems based on synchronous generation, but inverter-based resources can affect both in a non-linear manner, and grid-forming and grid-following inverters have different impacts. Low or high fault levels can affect operations on nearby networks, so Energy Policy WA considers it is reasonable for the HTR to provide limits on fault levels, and for NSPs to work with each other when their operations impact one another.

Arrangements in the Pilbara can also draw on work in the SWIS under the auspices of the PSSR Standards Review.

3.5.3 Proposal

Proposal 9: System strength and consultation question	
Proposal	
9.1	The HTR will provide guidance on the setting of the minimum and maximum fault levels on the NWIS.
9.2	The ISO will approve system strength requirements for different parts of the network.
9.3	NSPs will support the ISO to determine the system strength requirements for locations on their networks.
Consultation Question	
(9)(a)	*Do stakeholders support the proposed approach to system strength and fault level settings?*

This issue was discussed at the 28 August 2024 and 10 October 2024 working group and the 5 December 2024 PAC meetings.

3.6 Outage planning

3.6.1 Current Arrangements

Outages are currently managed relatively informally.

Subchapter 7.4 of the PNR requires NSPs planning outages to verbally notify their planned outages to other NSPs during the fortnightly system coordination meeting, and to provide copies of internal outage planning reports to the ISO. Forced outages only need to be notified if they may affect system security or the provision of ESS.

There are no timelines specified for notification, and no central register recording the timing, extent and impact of outages.

If two outages conflict – that is, if both were to occur at the same time and may cause the power system to be outside the technical envelope – and NSPs cannot resolve the conflict between themselves, the ISO can direct a resolution.

The current arrangement for outage planning is not sustainable in a more integrated Pilbara system in the future. A more integrated system will see increased potential for outages to impact operations and, thus, more scheduling conflicts. Moreover, with the expected high volumes of variable renewable energy, having a clear process for outage scheduling, assessment, and approval is necessary for long-term efficiency and maintaining PSSR. The NWIS needs a more structured approach to generation and network outages with:

- an independent outage assessment done by a centralised decision-making authority; and
- a transparent outage information system in which the same data is available to all parties.

This will reduce the possibility of scheduling conflicts and avoid having to resort to directions to maintain PSSR.

3.6.2 Issues and Options

Centralised outage process

While all parties with registered facilities would have to participate and submit their outage plans to ISO, a centralised outage process does not mean that all outages need be approved by the ISO.

The ISO would maintain an outage scheduling list with all facilities that can impact on PSSR. If a facility or piece of network equipment is not on the list, then outages can be self-scheduled by the relevant participant. Such outages would still need to be notified to the ISO, but because PSSR can be maintained during the planned outage, there is no need to seek approval.

For outages on the outage scheduling list, if other parties will be affected by an outage (for example, if it would mean their generation would be curtailed or load could not be served), the outage applicant would need to consult with all affected parties before submitting the outage to the ISO for approval.

If a network outage would affect power system reliability (e.g., by reducing to n-0), the participant would have to include a plan to mitigate the reliability impact. This could involve standby generation, runback arrangements with generators, load curtailment agreements, SRESS procured by the ISO, or expedited emergency recall in case of concurrent unplanned outage of another piece of equipment.

The ISO would collate, review, and approve outages. Outage assessments would need to use a risk assessment framework published by the ISO and prepared in consultation with stakeholders. If outages cannot be approved simultaneously, they would be prioritised in accordance with the risk framework, including order of submission.

The ISO would publish an outage schedule showing the timing and extent of approved and notified outages, so that all connected parties have the same information.

Timeframes

Most planned outages can be planned well in advance. In normal circumstances, parties should be able to request outage windows at least 12 months prior to the date of outage. Parties could also request “opportunistic” outages with shorter notice if system conditions allow, but these can only be accommodated if there is sufficient time to assess the outage properly and if the outage would not present risk to maintaining PSSR.

Forced outages would need to be notified as soon as practicable, even if they do not affect PSSR.

The ISO should approve or reject outage requests within two weeks of receiving the application. An ISO rejection relates to the particular requested time window or the risk mitigation plan, not a blanket refusal for the outage of that equipment. Approved outages could still be recalled or withdrawn if required to maintain security of supply. If an outage is recalled or withdrawn due to system conditions, it is reasonable for the affected party to request compensation for unavoidable expenditure.

3.6.3 Proposal

Proposal 10: Outage planning and consultation questions	
Proposal	
10.1	The ISO will manage a centralised outage planning process.
10.2	All registered facilities on an outage planning list will be required to participate.

10.3 The outage planning list will be published from time to time by the ISO and will contain the facilities of which outages have the potential to materially impact PSSR.

10.4 Network and supply facilities will submit outage plans to the ISO.

10.5 Outages of unregistered facilities or those not on the outage planning list must be notified to the ISO, but do not require approval.

10.6 Outage requestors must consult with affected parties before submitting outage requests to the ISO.

10.7 If a network outage would affect power system reliability the network operator must include a plan to mitigate the reliability impact.

10.8 The ISO must develop an outage assessment procedure containing a risk-based outage assessment framework, in consultation with connected parties.

10.9 The ISO must assess outages according to the assessment framework and must approve outages unless doing so would have a material impact on PSSR.

Consultation Questions

(10)(a) Do stakeholders support the proposed outage process?

(10)(b) Are there other circumstances in which self-scheduling outages could be allowed?

Proposal 11: Outage plan timing and consultation questions

Proposal

11.1 Outage plans must be submitted as soon as practicable, and no later than a year in advance.

11.2 The ISO must assess and approve or reject an outage plan within two weeks of its receipt.

11.3 Outage plans may be updated after submission, as long as the outage window is maintained. To extend the outage window, a new submission must be made.

11.4 The ISO can only withdraw approval for a previously approved outage plan if there is a risk to power system security or reliability and must inform the requestor as soon as practicable.

11.5 If the ISO withdraws approval within a week of the scheduled start time or recalls an outage, the requestor can request compensation for costs incurred in relation to the cancellation or recall.

Consultation Questions

(11)(a) Do stakeholders support the proposed outage timeframes?

(11)(b) Are there other aspects of outage costs that the PNR should cover?

These proposals were discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

4. Scheduling and dispatch

Historically, the Pilbara electricity systems have developed as separate and dedicated power systems, typically developed to support mining operations. This has led to a weakly interconnected NWIS, supported by a firm thermal generation fleet.

Interconnections between networks will increase over time as the Pilbara energy transition progresses. Modelling results show that a regulatory framework that allows resources to be shared across supply/demand portfolios has the potential to unlock significant efficiencies in the future NWIS. With the interconnection of more networks in the future, scheduling, dispatch, and settlement provisions in the PNR must be changed to facilitate the expected changes in generation technology.

4.1 Centralised Balancing Service

A central finding in the modelling is that more centrally coordinated balancing arrangements that facilitate improved utilisation of generation, storage and network infrastructure will provide significant cost reductions compared to the status quo, largely load following, arrangements. A centralised balancing service will also:

- simplify complex multi-party nominations;
- facilitate responsive energy dispatch closer to real-time; and
- provide an additional tool for the ISO to manage higher levels of renewable energy volatility.

4.1.1 Current Arrangements

Individual NSPs are required to balance their own generation and load. Colloquially, participants have a responsibility to 'follow their own load'. Rule 169(1) of the PNR states that a balancing nominee must ensure that its imbalance for each trading interval, as well as in real-time, is as close to zero as reasonably practicable.

Participants can purchase energy from others, and this can either occur through direct contracting or through the nominations process during the settlement process. Typically, nominations must be in place before the start of the relevant settlement period, unless the ISO agrees to accept an ex-post nomination.

Any mismatch between real-time supply and demand is met by ESS providers or by ISO direction, if ESS is insufficient to meet the imbalance. This may result in payment shortfalls or surpluses.

4.1.2 Issues and Options

Form of balancing mechanism

A balancing mechanism uses centralised energy dispatch to balance supply and demand on the power system. It operates on a timeframe of 5 to 60 minutes, while ESS operate on shorter timeframes.

For example, in the UK electricity system, participants nominate their generation ahead of time. They have the option to make bids and offers to depart from their pre-planned schedules. The system operator assesses the supply-demand mismatch, and dispatches sufficient balancing energy to meet it.

Balancing activity should occur as close to real time as feasible, so that forecasts of load and variable generation as well as any network constraints are as accurate as possible.

Even when there is no mismatch between supply and demand, a balancing mechanism can still result in an altered dispatch, for example increasing output from a generator with a lower offer price while reducing output from a generator with a higher offer price.

A balancing mechanism could be:

- An open platform, in which anyone can submit bids and offers to depart from their planned position. This would need to allow participants to change their offer prices day to day, as bids and offers represent changes from self-scheduled positions.
- A closed platform, in which the ISO contracts specific facilities to provide balancing services, and only those facilities are adjusted up or down.

Stakeholders have indicated a preference for the balancing mechanism to operate a full day ahead of real-time. Most of the current Pilbara fleet is relatively inflexible, so changes to operating schedules may need a lot of notice. This dynamic reflects relatively stable demand, as generation is largely serving industrial loads. As variable renewable energy penetration increases, flexible generation will need to be able to respond to generation variability much closer to real time.

For this reason, Energy Policy WA proposes a hybrid balancing approach, with:

- An open, day-ahead energy “trading” mechanism in which all participants must submit their balanced contract positions, and may submit bids and offers to purchase or supply additional energy around their contracted position, on a portfolio basis. This will allow all participants to buy and sell energy, resulting in more efficient dispatch.
- A closed “balancing” mechanism, in which the ISO can dispatch specified facilities close to real-time based on their bids or offers in the day-ahead energy trading mechanism. This will reduce the complexity of dispatch arrangements, particularly in the early stages in which demand for short-term balancing services is likely to be small.

Scheduling and dispatch processes

Day ahead trading mechanism

The trading mechanism would operate as follows:

- Participants nominate their planned portfolio position for the relevant period (likely 24 to 36 hours). For each half hour, they would nominate:
  - planned consumption;
  - planned generation[6]; and
  - bilateral contract quantities to and from other parties.

  Any energy transfer to or from the NWIS must be included. If both generation and consumption exist at a single connection point, only the net quantity needs to be nominated.
- Nominated positions must balance, so Generation + Contracts – Consumption = 0.
- Participants can choose to bid or offer to buy or sell energy around their contract positions. A participant can provide $/MWh price-quantity pairs for each half hour to:
  - Offer to produce more (or consume less) energy.
  - Bid to consume more (or produce less) energy.

[6] Input submissions could be required to include a separate declaration of variable generation component, to allow ISO to assess potential volatility.

- The ISO would clear the trading mechanism, matching supply bids and demand offers, and advise participants of the quantity of energy bought or sold in the day ahead trading mechanism. This quantity becomes an additional contract quantity adjustment to each portfolio position. All sales and purchases would be transacted at the marginal clearing price.

Participants would not be obliged to buy and sell energy in this trading mechanism. A participant who just wanted to manage its own output would nominate total planned consumption, generation, and contracted quantities, make no bids or offers, and then manage its operations to maintain its balanced position.

The ISO would provide adjusted contract positions forecasts in the day ahead. As variable renewable penetration increases, finalisation of trading outcomes will need to move closer to real time, so that participants have a better idea how much generation they have available.

Balancing mechanism

If the trading mechanism closure is a long way ahead of real time, the ISO still needs a mechanism to adjust generation to match changes in the supply/demand balance close to real time. It could use the Regulation ESS to do so, but that service is only intended for small changes based on frequency fluctuations, and multiple facilities are likely to be required.

The balancing mechanism would operate as an extension to the day ahead trading mechanism, but with only certain facilities included. It would operate as follows:

- In the day ahead trading mechanism participants can nominate specific facilities to provide balancing energy. These facilities must be able to adjust output at short notice (within 5 minutes) and to be dispatched directly by the ISO.
- Facilities from whom the ISO has procured backup capacity (as discussed in section 3.2) will be included in the balancing mechanism, with prices that do not exceed the $/MWh prices included in their capacity agreements.
- The ISO determines the actual supply/demand balance and dispatches these balancing facilities according to the bids and offers.
- The ISO would determine a separate price for compensating facilities in the balancing mechanism, again based on the marginal price of all balancing facilities dispatched.

Once the trading mechanism closure is moved close enough to real-time this additional mechanism would no longer be required and could be retired.

Settlement

After real-time, the ISO would calculate imbalances using meter data. Participants pay or are paid based on their imbalance at prices determined by the trading and balancing mechanisms:

- Energy relating to participant net contract positions nominated into the trading mechanism will be settled at zero price.
- Energy transacted in the trading mechanism will be settled at the trading price.
- Additional energy dispatched from balancing facilities will be settled at the balancing price.
- Uninstructed imbalances at portfolio level (compared to day-ahead trading market outcomes) will be settled at the balancing price multiplied by a penalty factor, outside a small balancing tolerance.

4.1.3 Proposal

Proposal 12: Balancing mechanism and consultation questions

Proposal

12.1 The ISO will operate day-ahead trading mechanism in which participants can trade energy around their bilateral positions in half hour increments.

12.2 Participants must nominate:

- planned consumption by portfolio loads;
- planned supply by portfolio generation and storage, including contracted supply from other parties; and
- expected dispatch order for facilities in their portfolio nominations must balance.

12.3 Participants may choose to offer to deviate from their initial position, by making $/MWh bids (to sell energy) and offers (to buy energy).

12.4 The ISO will clear the day-ahead trading mechanism.

12.5 Trading positions and prices will be determined a day ahead of real time.

12.6 Traded energy will be settled at the marginal clearing price at the point supply offers and demand bids intersect.

12.6 Participants can nominate specific facilities to provide balancing energy.

12.7 Participants from whom the ISO has procured backup capacity must provide balancing offers for the contracted facilities.

12.8 During the trading day, the ISO will designate and dispatch balancing facilities according to their bids and offers.

12.9 The ISO will determine a balancing price for compensating the balancing facilities based on the marginal price of the last facility dispatched.

12.10 Balancing energy will be settled at:

- for additional energy dispatched from balancing facilities, the balancing price; and
- for uninstructed imbalances (from trading outcomes) outside a small tolerance range, the balancing price multiplied by a penalty factor.

Penalty factors will be different for positive and negative imbalances.

Consultation Questions

(12)(a) How close to real-time could trading market outcomes be finalised and still allow participants to manage their portfolios?

(12)(b) Do stakeholders have any other comments on the proposed trading and balancing mechanisms and arrangements?

This topic was initially discussed at the 22 August 2024 working group and 29 August 2024 PAC meetings. The proposal was discussed again at the 24 October 2024 working group and the 5 December 2024 PAC meetings.

4.2 Metering obligations

4.2.1 Current Arrangements

Rule 135 of the PNR assigns responsibility to provide metering services to the covered NSP. This includes maintaining a Metering Database in accordance with the Electricity Industry (Metering) Code 2012 and requirements to record information on how metered quantities are to be allocated at metering points with more than one network user.

The Energy Balancing and Settlement Procedure sets out the timing and content required for meter data submissions.

4.2.2 Issues and Options

Meter data submissions are part of the settlement process. With a centralised balancing mechanism, it is appropriate for definitions, timeframes and high-level process steps to be included in the rules, rather than in a delegated instrument. This provides clarity and certainty to participants and meter data providers.

4.2.3 Proposal

Proposal 13: Metering and consultation question

Proposal

13.1 Content and timing requirements for meter data submissions will be moved from the Energy Balancing and Settlement Procedure to the PNR.

13.2 Meter data format specifications will remain in the Energy Balancing and Settlement procedure.

Consultation Question

(13)(a) Do stakeholders have any comments on the proposed changes to metering data management?

This proposal was discussed at the 5 December 2024 PAC meeting.

4.3 Manual load shedding plans

4.3.1 Current Arrangements

Load shedding is defined by the HTR as reducing or disconnecting load from the power system. Although the PNR specifies that load shedding can only be used as last resort to maintain frequency within limits, NSPs are mandated by the HTR to maintain automatic under-frequency load shedding (UFLS) systems on transmission and distribution systems in case of a contingency event.

In cases where energy shortfall is forecast in advance, waiting for the frequency to fall enough to trigger the UFLS would be inappropriate.

The Loss of Generation Protocol includes measures for responding to a contingency event, but otherwise no specifications on what load to shed first, the allocation of load shedding to participants or networks, nor the timeframes for forecasts or notifications currently exist.

4.3.2 Issues and Options

The primary goal of the ISO is to maintain and improve power system security. This includes situations when the power system is reaching the limit of available energy supply. In these situations, sometimes involuntary load shedding may be unavoidable. A pre-existing plan for load shedding would provide a shared understanding of what will happen in the event of a supply shortfall.

Options include individual plans which are developed and published by each NSP, or a coordinated plan that is set out in the PNR or a procedure. Energy Policy WA considers that a coordinated plan developed by the ISO according to principles specified in the PNR will deliver the best overall outcome.

Critical loads such as hospitals, life support systems and fire emergency equipment should be afforded the highest priority, and detailed design work must consider the rights and supply obligations under State Agreements.

4.3.3 Proposal

Proposal 14: Manual load shedding plan and consultation question

Proposal

14.1 Participants must use best endeavours to manage their portfolios to balance their consumption and supply according to the trading and balancing mechanism provisions.

14.2 The ISO must seek to maintain the power system in a secure operating state at all times, including using powers of direction to avoid involuntary load shedding.

14.3 If the ISO forecasts a real-time supply shortfall, it must notify participants of the forecast time of the shortfall, and the quantity of expected unserved load.

14.4 The ISO must develop a manual load shedding priority list, identifying the order in which network elements and load will be disconnected in the case of a forecast energy shortfall.

14.5 In preparing the priority list, the ISO must:

- If possible, ensure that consumption relating to contracted energy volumes and contracted capacity volumes is disconnected later than consumption not associated with contracted capacity.
- Ensure that consumption by foundation users of transmission network elements is prioritised ahead of others when network congestion is the cause of the shortfall.
- Take account of network equipment serving both load and generation.
- Attempt to achieve an equitable distribution and rotation of load disconnection across participants in proportion to their consumption.
- Consult with NSPs and other connected parties to ensure the priority list is practical.

14.6 If load shedding is required, the ISO must endeavour to follow the load shedding priority list.

Consultation Question

(14)(a) Do stakeholders agree with the proposed arrangements for planning for manual load shedding?

This proposal was discussed at the 5 December 2024 PAC meeting.

5. ISO Governance

Pilbara ISOCo Limited has been appointed as the Pilbara ISO, pursuant to Regulation 14 of the *Electricity Industry (Pilbara Networks) Regulations 2021*. Pilbara ISOCo Limited is a registered not-for-profit company limited by guarantee under the *Corporations Act 2001* (Cth). Its current members are the three registered NSPs in the Pilbara: Rio Tinto, APA Group and Horizon Power.

The current governance mechanisms are made up of the following arrangements:

- a five-member board, with incumbent industry representatives comprising a majority of the board;
- key system operation functions delegated to participant NSPs (including control desk functions delegated to Horizon Power);
- a collaborative and informal approach to PNR functions (for example fortnightly system coordination meetings, including regarding outage scheduling);
- administered funding and resourcing, approved by the ISO board;
- reliance on internal company controls rather than regulatory instruments; and
- minimal options for enforcement of rule compliance.

The EPNR Project has identified three key drivers for ISO governance reform:

- to address competition law concerns raised during the assessment of the Pilbara ISOCo's authorisation application by the Australian Competition and Consumer Commission (ACCC);
- to support an expanded ISO role, required by a larger NWIS and evolving power system security concerns; and
- to provide confidence required to enable third-party investment and participation in an expanded NWIS.

5.1 The role of the ISO

5.1.1 Current Arrangements

The ISO currently operates under a resource-light model, relying on the input and expertise of NSP members in decision-making processes.

Some processes, such as outage management, are informal by design, replicating the pre-ISO practices of individual NSPs managing their own operations. This requires active discussion between the ISO and registered NSPs and the NSPs input at coordination meetings. The ISO does not have internal resources to pro-actively monitor or assess the impact of outages across the power system.

The ISO may delegate functions to an NSP or another entity. A core ISO responsibility is to manage real-time operations of the power system, maintain and improve power system security, and respond to contingency events.

The ISO's real-time functions may be, and currently are, delegated to Horizon Power. Horizon Power is subject to ring fencing arrangements, a confidentiality regime and supporting internal policies adopted by the ISO and Horizon Power to manage potential conflicts. Despite this, participants are alert that Horizon Power also operates and maintains its own network, and in some respects competes with other NSPs. This dynamic creates hesitation and may discourage NSPs sharing relevant information in communications with the ISO control desk, currently managed by Horizon Power.

5.1.2 Issues and Options

As more renewables connect to the NWIS, real-time system operations will need to deal with more generators, more loads, and more complex decisions about the operation of storage, curtailment of variable renewables and other matters.

To support the transition, the ISO will need to carry out new tasks:

- more structured forecasting and planning (sections 3.1 and 3.2);
- more dynamic balancing and ESS arrangements (sections 3.3 and 4.1);
- outage planning (section 0);
- compliance and enforcement (sections 0 and 5.7); and
- interconnection of NSPs (section 6.2).

It is clear the ISO model will need to evolve over time from the existing administrative model to effectively address the three key drivers for governance reform, identified above.

Many of these functions build on existing ISO activities. The ISO is already responsible for long-term planning, connection approvals, ESS procurement, contingency response, compliance monitoring, and applicable market settlement. Some proposals represent significant change, in particular a larger and more direct role in the balancing mechanism, generation dispatch, and settlement. These are necessary to enable and support the efficient and effective energy transition of the Pilbara system.

To deliver the expanded functions, the ISO control desk will need increased visibility and data on facilities capability and operations. If the ISO control desk remains with Horizon Power, this would exacerbate existing concerns.

A key enabler to building internal capability and addressing competition law concerns is for the ISO to develop an in-house control desk and withdraw its current delegation of real-time functions to Horizon Power. This will not be a quick process, and will need to consider:

- physical assets (control room location and fit out);
- information and technology assets (such as SCADA and Energy Management Systems);
- personnel (a 24x7 operation needs a qualified team with structured rostering practices); and
- training framework and continuing development (for new and existing controllers).

This proposed change will increase the cost-of-service delivery relative to the current delegation arrangements, but will enable an expanded role for the ISO, required to deliver the material benefits of increased integration identified in the modelling discussed in Chapter 2.

Based on the recent movement of system operations from Western Power to AEMO in the WEM, this process may take up to 18 months to complete. To enable some of the new and revised ISO functions to be in place, in advance of the ACCC authorisation expiry, it is proposed that the ISO in-house control desk is effectively in place by January 2027.

5.1.3 Proposal

Proposal 15: ISO functions and consultation questions
Proposal 15.1 Over time, the remit of the ISO will expand to cover additional functions. 15.2 The ISO will take control room functions in house by January 2027.

Consultation Questions

(15)(a) Do stakeholders support the move away from an administrative ISO?

(15)(b) Do stakeholders support the ISO taking the control desk function in-house?

(15)(c) Do stakeholders agree with the proposed time frame for shifting control desk functions?

This proposal was discussed at the 24 October 2024 and 21 November 2024 working group and the 5 December 2024 PAC meetings.

5.2 The ISO Board

5.2.1 Current Arrangements

The current ISO board is captured by incumbent industry representatives. It consists of five members:

- an Independent Chair appointed by voting NSP members;
- a director appointed by the Western Australian Government; and
- three member appointed directors– an APA appointed director, a Horizon Power appointed director, and a Rio Tinto appointed director.

The Chair and the Government appointed director are expected to hold office from the date of appointment to the end of the fourth annual general meeting. Both positions have a term limit of no more than 12 years. On the other hand, the NSP Member directors can hold office until they cease to be a director under the conditions set on clause 12.7 of Pilbara ISOCo's company constitution.

The Board has appointed a Chief Executive Officer to manage the company's day-to-day operations. Information sharing between the ISO and NSP board members is a potential conflict of interest, and decision-making protocols are in place to address this. This weakens the collective ability of the board to provide oversight, input and strategic insight into the operations of the ISO.

5.2.2 Issues and Options

As the role of the ISO expands, the neutrality and governance of the ISO will be improved by an independent board. The journey to system operator independence is a well-worn path around the world - system operations have moved from vertically integrated, to industry self-governance, to independent facilitation. For example:

- New Zealand began retail competition in 1993 with a self-regulating industry body overseeing competition and moved to independent oversight in 2004.
- The Philippines began wholesale market operations in 2006 with a market operator governed by participant nominees and moved to a fully independent board in 2018.
- In the WEM, system operations was part of Western Power until 2016, when it moved into the independent market operator.
- In the UK, the monopoly transmission network operator National Grid is the system operator and owns (without any control or financial interest) the market operator Elexon. System operation functions are being spun out into a separate ISO, and ownership of Elexon is expected to be transferred to industry, although governance arrangements will still require independent directors and finances.

The three drivers for governance reform identified in this paper sharpen the focus and of the need for strengthening the independence of the ISO board. However, it is critical that an independent board does not come at the expense of directors with suitable knowledge and experience to navigate the energy transition in the economically significant and remote Pilbara region.

This could be achieved by:

- having a minority of directors appointed by connected parties (including NSPs) collectively; or
- requiring directors to have electricity sector experience and, in particular, knowledge of the Pilbara power sector and/or other similar power systems.

Energy Policy WA considers that there is sufficient depth in the potential independent director pool to obviate the need for participant-appointed directors, as long as appointment guidelines and suitable criteria are specified and met.

At present, costs of the ISO are split equally between the three NSPs who appoint directors. As the board composition changes to support greater variety in connected parties and participants, this approach to ISO cost recovery will also need to change. This issue is discussed in section 5.4.

5.2.3 Proposal

Proposal 16: ISO board and consultation questions

Proposal

16.1 The ISO board will continue to have five members, including a Chairperson and the Pilbara ISO Chief Executive Officer (CEO, Managing Director).

16.2 ISO directors must be independent of participants.

16.3 Directors (except for the CEO, who is appointed by the board) will be appointed by the Minister for Energy.

16.4 To be appointed, any new Director must meet selection criteria, including any requisite skill requirements.

16.5 Directors will be appointed for staggered three-year terms, with eligibility for reappointment twice.

16.6 ISO cost recovery should be amended at the same time as board composition changes.

Consultation Questions

(16)(a) Do stakeholders support the ISO board being independent of participants?

(16)(b) Do stakeholders support the proposed board arrangements?

(16)(c) Do stakeholders agree that board composition and ISO cost recovery should be amended at the same time?

This topic was initially discussed at the 27 June 2024 and 22 August 2024 working group, and the 29 August 2024 PAC meetings. The proposal was discussed at the 24 October 2024 working group meeting and the 5 December 2024 PAC meeting.

5.3 ISO budget

5.3.1 Current Arrangements

Currently, the ISO budget is set by the ISO board. The ISO publicly consults on its draft budgets, which are considered and approved by the ISO board. Through this process, the funders (the three NSPs) each have opportunity to provide input on the budget publicly, and ultimately to vote on whether to approve the budget itself.

5.3.2 Issues and Options

Significant expansion of the ISO's functions will bring increased costs. With an independent board, participants will no longer have the same level of influence over the ISO budget. The budget setting process must be supported by mechanisms for effective challenge and oversight to ensure the ISO budget is prudent and efficient. The two main options are:

- The (new) ISO board develops and consults on the draft budget, then members vote to approve or reject it, with a majority needed for approval. This may not provide stakeholders with confidence that adequate oversight and transparency are applied to the ISO budget setting.
- Independent budget review and approval typical for a monopoly infrastructure provider. The ISO board will develop and consult on a draft budget, which will be required to be submitted to a regulator for review and approval.

Energy Policy WA considers that the Economic Regulation Authority (ERA) is best placed to review and approve the ISO budget to ensure budget efficiency and the fair allocation required to deliver ISO functions. This approach follows a model commonly used in other places, including the WEM.

5.3.3 Proposal

Proposal 17: ISO budget and consultation questions

Proposal

17.1 The ISO board must consult on a draft budget.

17.2 The ISO board will set the ISO budget annually.

17.3 The ISO budget will be subject to review and approval by the ERA.

Consultation Questions

(17)(a) Do stakeholders support the proposed budget arrangements?

This proposal was discussed at the 24 October 2024 working group and the 5 December 2024 PAC meetings.

5.4 Fee allocation

5.4.1 Current Arrangements

The ISO, ERA, and Coordinator of Energy incur costs to administer, and operate in accordance with, the PNR. These costs are currently divided equally between the three registered NSPs regardless of their size, energy supply or use, settlement volumes, or other participation metrics. No costs are allocated directly to generators or their customers.

With the expected increase in the types and sizes of parties connecting to NWIS, and proposed reform to the ISO board composition, the current fee allocation mechanism will no longer be fair or efficient.

5.4.2 Issues and Options

In considering potential options for equitable cost allocation, causer pays cost allocation is preferred where possible, as this allows participants to manage their exposure, and reduce the need for and the cost of services. The ISO functions, however, cannot be readily linked to particular metrics. The level of trading and balancing mechanisms, system operations, and compliance monitoring activities scales with the complexity of the power system, and there are economies of scale as the power system grows. If causer pays allocation is not possible, a beneficiary pays approach is the next best option.

Various metrics could be used as a proxy to approximate 'beneficiary pays' ISO fee allocation. These include:

- On the basis of proportional benefit from ISO activities. In future, when there will be a mix of small and large participants, this is unlikely to be a practical approach.
- Gross volume based (sum of absolute values of individual generation and consumption). A volume-based approach is the most common way of recovering ISO costs across other markets. This would place more costs on those with larger portfolios.
- Net energy volume based (absolute value of sums of portfolio generation and load). This would place costs on those who are long or short generation in their portfolios, with no allocation to participants with balanced portfolios, even though they do benefit from ISO activities.
- Traded volume based (volumes net of contract quantities – i.e. only volumes traded through ISO settlement). This would place costs only on those transacting energy through central settlement, when all benefit from ISO operations and oversight.
- Value based – a percentage markup on all amounts calculated by the ISO. This would also allocate some costs to ESS providers and payers but would be more likely to result in over- or under-recovery as transaction values are likely to be more volatile than energy quantities.
- Network element based - for example the length of transmission lines, equipment-size-weighted element count. This would require novel and complex calculations.

Energy Policy WA considers:

- a gross volume-based approach (as used in many other systems) is the most appropriate;
- allocation should be restricted to participants total injection and withdrawal of electricity to and from any network that forms part of the NWIS, whether covered, non-covered, excluded, or integrated mining[7]; and
- fees should be determined on an annual basis, as a $/MWh fee rate.

The fee rate could be calculated by:

1. taking the ISO budget for the following year;
2. subtracting any over recovery in the current year, or adding any under recovery;
3. finding the injection or withdrawal MWh quantity for each generation, storage and load facility in the NWIS in each trading interval of the previous year, including notional meters;
4. finding the absolute values of each data point from step 3;
5. summing all the data points from step 4; and
6. dividing the amount from step 2 by the total from step 4 to get a $/MWh rate.

In each settlement process, steps 3 and 4 would be repeated for each trading interval in the settlement period, and the resulting participant totals would be multiplied by the $/MWh fee from step 6 to get the fee payment for that participant for that settlement period.

[7] This will likely require additional balancing points than those used today.

5.4.3 Proposal

Proposal 18: ISO fees and consultation questions	
Proposal	
18.1	ISO costs will be recovered from participants based on gross injection and withdrawal figures into and from the NWIS.
18.2	The fee (in $/MWh) will be determined annually.
18.3	Fees will be recovered in each settlement period.
18.4	The approach to ISO cost recovery will be changed at the same time as the board composition is changed
Consultation Questions	
(18)(a)	*Do stakeholders support the proposed approach to ISO cost recovery?*
(18)(b)	*Do stakeholders support the proposed timing for changes to ISO cost recovery?*

This proposal was discussed at the 24 October 2024 working group and the 5 December 2024 PAC meetings. A comparison of this fee calculation method with fees in other places was provided at the 21 November 2024 working group meeting.

5.5 Confidential information

Appropriate treatment of confidential information is critical for protecting legitimate commercial interests, while reducing the perception and potential for anti-competitive behaviour. Uniform transparency of information to current and prospective participants, and other key stakeholders is essential for the promotion of competition and efficient outcomes.

5.5.1 Current Arrangements

Chapter 8 of the Pilbara Network Access Code (PNAC) requires NSPs to adopt and implement ringfencing rules with the main objective of ensuring that the vertical integration of NSP with any other associated business does not decrease competition. Ringfencing policies must address confidentiality, cost allocation, and prevention of discriminatory treatment favouring other associated businesses of the NSP.

The PNR also has confidentiality and cyber-security clauses that set out limitations on how to use, store, analyse, and disseminate confidential information, including those obtained during meetings and discussions. As discussed above, this is particularly relevant for the control desk functions delegated to Horizon Power. The ISO has controls in place to prevent confidential information being shared with member directors.

One challenge with current confidentiality rules is that information is often confidential by default, with no checks and balances for confidentiality claims.

5.5.2 Issues and Options

Energy Policy WA's PET Plan work program[8] is examining the Pilbara ringfencing arrangements to ensure that they are fit-for-purpose, are capturing all relevant parties, and that restrictions specified in the PNAC capture all intended conduct.

The EPNR project is focused on the treatment of confidential information, seeking to increase transparency:

[8] https://www.wa.gov.au/organisation/energy-policy-wa/pilbara-energy-transition-plan

- between NSPs, the participants and the ISO; and
- between the ISO and the public.

All information should be public, unless there is a clear reason why it should be confidential. For example, bilateral contracts between commercial parties are commercially sensitive, and will remain confidential. Further, applying the same transparency measures to all parties provides a level playing field.

This can be achieved by refining the confidential information definition in Rule 295 to allow a discloser to *request* confidentiality and provide a reason why information should be confidential, i.e. that, for example, it:

- is specified as confidential in a contract to which the discloser is party;
- could pose a risk to power system security or reliability if disclosed;
- contains personal information about an individual; or
- is likely to cause commercial detriment to the discloser or another party, if disclosed.

The ISO would use criteria specified in the PNR (and a process in an ISO procedure) to assess the request and determine the appropriate treatment for the class of information, to avoid differential treatment of different disclosers. Disagreements can be referred to the Coordinator of Energy.

Even if information is confidential, the ISO (once its functions are expanded) will need access to operational information from all rule participants. As discussed in section 0, in-housing the control desk functions would remove a barrier to achieving this.

5.5.3 Proposal

Proposal 19: Confidential Information and consultation questions

Proposal

19.1 Information will be public unless there is a compelling reason for it to remain confidential.

19.2 Public information will include outage schedules, demand forecasts, generation schedules, capacity figures (both supply and demand) and balancing quantities.

19.3 The PNR will designate certain information as confidential (for example terms, conditions, and prices in bilateral contracts).

19.4 Disclosers can request that information provided to the ISO be treated as confidential and provide supporting reasoning. The ISO must determine whether the information meets the PNR specified criteria for being confidential, in accordance with an ISO procedure.

19.5 Disputes about classification of information will be resolved by the Coordinator of Energy.

Consultation Questions

(19)(a) Do stakeholders support the principle of transparency of information?

(19)(b) Do stakeholders agree with the proposed criteria for designating confidential information?

(19)(c) Do stakeholders support the provision of real-time operational data with the ISO?

Initial material on this topic was circulated in advance of the 24 October 2024 working group meeting. The proposal was discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

5.6 Compliance monitoring

As the Pilbara electricity system moves towards more integrated arrangements, connected parties need to be able to rely on each other's compliance with the PNR and HTR. The PNR must include a framework for monitoring and reporting on compliance of Rules Participants, and robust enforcement mechanisms.

5.6.1 Current Arrangements

The ISO is responsible for monitoring participants' compliance with the PNR, as well as their own compliance. The Interim Compliance Procedure provides for the ISO's compliance monitoring activities to be performed with as little formality and as much expedition as reasonably practicable, with minimal resource and regulatory burden on ISO and Participants. The activities are focusing on high-risk issues and expeditiously dealing with low level non-compliances. Neither the PNR nor the procedure require the ISO to make known the matters on which it focuses its monitoring efforts.

There is no explicit requirement for any party to monitor behaviour, including the exercise of market power.

5.6.2 Issues and Options

The current approach is sufficiently robust if participants largely operate within their own portfolios, but it would not be sufficient when connected parties are reliant on each other's compliance for their own operations' continuity and security.

Core components of a compliance regime are:

- Specific guidance on which activities the ISO should focus its monitoring activities on. Energy Policy WA considers that, initially, portfolio balancing, dispatch compliance, and ESS performance are the core activities that the ISO should monitor.
- Regular publication of compliance monitoring outputs (for example, "naming and shaming" repeat offenders).
- Transparent data provision, so parties can monitor each other's performance.
- Behavioural rules and a surveillance role for the ERA to assess the presence and exercise of market power. This is not an immediate concern but should align with the start of the trading and balancing mechanisms.
- A compliance audit regime for the ISO and participants. The ISO already has an audit requirement, and participants are audited in respect of their electricity licenses.

Some electricity systems have pre-emptive market power mitigation mechanisms, in which participants are required to offer certain quantities or prices. These should be considered at a later date, when the competitive participant pool has increased to a point where participants are no longer capable of serving all their own load.

5.6.3 Proposal

Proposal 20: Compliance monitoring and consultation questions

Proposal

20.1 The ISO will monitor participant compliance with the PNR, including the HTR.

20.2 Initial focus areas for ISO monitoring will be portfolio balancing, dispatch compliance, and ESS performance.

20.3 The ISO will publish quarterly compliance reports on the activities it monitors.'

20.4 The ERA will continue to monitor behaviour, with additional focus required from the start of the balancing mechanism.

Consultation Questions

(20)(a) Do stakeholders support the ISO having a more explicit compliance monitoring function?

(20)(b) Do stakeholders agree with the proposed activities for the ISO's initial monitoring?

(20)(c) Do stakeholders see any issues with the proposed monitoring arrangements, and if so, what?

This topic was discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

5.7 Enforcement

5.7.1 Current Arrangements

The current PNR has three main mechanisms to deal with rule breaches:

- an administered penalty price for out-of-balance energy is calculated for participants who fail to balance their demand/supply portfolio beyond tolerance margins;
- publication of the non-compliance, and
- a last resort disconnection.

Given that disconnection is not a practical remedy in most situations, many non-compliant participants will not face consequences for their actions, reducing the incentive to abide by the rules.

5.7.2 Issues and Options

For the enforcement mechanism to be effective, the PNR must include graduated options to respond to non-compliance. Practices in other jurisdictions include:

- automatic monetary penalties (for example imbalance penalty factors, or event fees for contingency events);
- formal warnings, where a letter is issued to the board of the non-compliant entity;
- orders to bring an activity back in compliance;
- increased compliance attention, where non-compliant entities are subject to more frequent audits or other monitoring activity;
- financial penalties (civil penalties) for contravening specific rules, where the penalties relate to the severity of the impact, and do not apply to all rules;
- judicial or quasi-judicial processes to seek non-monetary sanctions; and
- suspension from some or all aspects of trading mechanism participation, such as the ability to purchase energy from outside the participant portfolio, or the ability to provide ESS.

Energy Policy WA considers that a suitable range of enforcement options (but not all of those listed) are necessary for the Pilbara regime.

5.7.3 Proposal

Proposal 21: Compliance enforcement and consultation questions	
Proposal	
21.1	The ISO will be able to issue formal warnings and requests for non-compliant parties to return to compliant operation.
21.2	The ISO will be able to refer non-compliance to the ERA for investigation.
21.3	The ERA will be able to levy monetary penalties (civil penalties) for non-compliance with civil penalty provisions, to be prescribed by the relevant Regulations.
21.4	The ERA will have power to restrict participation in the trading mechanism for participants who persistently fail to meet their traded energy quantities. Participant energy will still be settled in balancing.
21.5	Disconnection will remain as a sanction of last resort.

Consultation Questions

(21)(a) *Do stakeholders support the proposed enforcement measures?*

(21)(b) *Are there any other enforcement options stakeholders consider would be useful in the PNR?*

This proposal was circulated for review ahead of the 24 October 2024 working group meeting and discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

6. New connections

The connection process for generation facilities, storage and networks needs to be closely examined to ensure it is fit for purpose in the future, when new connections are likely to increase, reflecting:

- an increase in renewable generation and storage facilities in the Pilbara region, which will also require significant new transmission build;
- an expanded NWIS strengthening existing interconnections and integrating new or existing networks and operations in the NWIS; and
- an increased prevalence of common use transmission infrastructure, as a result of the PET Plan.

6.1 New transmission build

The approach to building new transmission in the Pilbara is an important aspect of the energy transition. This topic was highlighted by working group members early in the EPNR project but is more appropriately dealt with outside the EPNR project.

Energy Policy WA's PET Plan workstream is considering an approach to new transmission build, ownership models, ring fencing arrangements, transmission access pricing, and access contracting.

6.2 NSP to NSP connection arrangements

Processes for connecting new facilities are a core function of the PNR, necessary to enable third party access and ongoing growth and development of electricity production and consumption in the region. The nature of the Pilbara electricity sector is such that future connections are likely to include connection of new network infrastructure as well as generation, load, and storage.

6.2.1 Current Arrangements

The PNR and the HTR both include connection requirements for new facilities. These include minimum performance standards, operating requirements, and requirements for commissioning tests. These requirements are focused on new generating units connecting to the NWIS, and not on connection of existing or new networks.

The HTR include technical standards for network operation, as well as high level rules for an incumbent NSP connecting new network equipment:

- chapter 2 of the HTR sets out performance and planning criteria for networks and the power system;
- chapter 3 sets out technical requirements for connected generation and storage facilities; and
- chapter 4 sets out processes for connecting generation, storage and consumer load facilities to a network, including provisions for testing compliance with Chapter 3.

Connection requirements are not designed to deal with the case in which a separate network is seeking to connect to the NWIS, or where two networks that are already part of the NWIS are seeking to strengthen or create a new interconnection.

New connections are managed by the host NSP to which the connection will be made, and the ISO has final approval.

6.2.2 Issues and Options

There are existing networks in the Pilbara which are geographically close to the NWIS but are not interconnected. In the future, it is probable that some of these networks will interconnect to access new energy sources. Similarly, new network connections are expected to be required to allow renewable electricity generators to inject energy into the NWIS, leading to an increase in registered NSPs in the Pilbara regime.

What process should network interconnections follow

Connecting a new network to the NWIS requires different considerations to the process for connecting a new generator or load. Potential impacts on the grid may be larger, and additional studies and coordination may be required. In addition, if the network has been planned to different standards than the NWIS, each connected generator and load on that network is likely to need to be assessed for compliance with the HTR.

Ideally, the different nature of network connections warrants its own process framework in the PNR, rather than being seen as similar in nature to the existing connection processes. The network connection process will need to make use of the generation and load connection processes in relation to the facilities on the connecting network.

In summary, when a new network serving third-party generation and load connects to the NWIS:

- it must show historical compliance with Chapter 2 or demonstrate work completed to enable future compliance;
- it may negotiate to meet a lower standard (see discussion in section 0);
- the ISO must conduct system studies to assess its impact on the NWIS and engage with NSPs and other affected parties on the findings; and
- individual assets on the connecting network must demonstrate compliance with Chapter 3, with that process managed by the connecting network NSP, liaising with the ISO.

Alternatively, a network owner that only uses network equipment to serve its own generation and load may choose to connect as a user, rather than an NSP. See section 0 for further discussion.

Who should manage the process

Most established grids around the world do not have the same potential for interconnection of new NSP networks. As a result, processes in other places do not deal with the connection of whole networks, but rather the incremental addition of new network equipment (such as merchant transmission in the USA or new state-to-state interconnectors in the NEM) or embedded distribution networks and microgrids. Processes there deal primarily with regulatory and legal issues, rather than technical aspects.

The PNR and HTR need to set out the rules for proving compliance with technical standards, while land access, environmental approvals and transmission charging are dealt with through other instruments.

The ISO’s role in planning and operating the power system means its role in any new interconnection will need to be greater than other types of connection.

Given that NSPs can potentially be in competition with each other (particularly if one or both are vertically integrated), it is sensible for an independent party, like the ISO, to have overall responsibility for managing the connection process for new network equipment.

This means that when a new connection to the NWIS involves:

- Generation, storage, or load, or a combination thereof, the connecting NSP will continue to manage the connection process.
- Generation, storage, load, network equipment that will only be used to serve the connecting party (a "self-contained network" – see section 6.3), the connecting NSP will manage the connection process.
- Transmission equipment owned and/or operated by an existing NSP and connecting only to that NSPs network, the NSP will manage the connection process.
- Transmission equipment to be owned and operated by a new NSP (including where there is a combination of transmission equipment and generation, storage or load), the ISO will manage the connection process.
- Transmission equipment owned and/or operated by an existing NSP and connecting to another NSP's network, the ISO will manage the connection process.

Constrained access

The business model for new transmission will likely see foundation customers contributing to the funding of new transmission infrastructure. These new networks will enable new generation to serve the NWIS and change the way electricity flows in the existing system.

Network constraints may result in some generation being curtailed while other generation is dispatched. All things being equal, more expensive generation should be curtailed ahead of cheaper generation.

If energy is made available for sale and purchase in the trading mechanism, economic curtailment will be automatically compensated – a participant with a balanced portfolio can buy cheaper energy in the trading mechanism and have an overall more efficient outcome than if it had run its own generation. However, if congestion happens after the trading mechanism has closed, a participant could find itself out of balance and unable to supply its load. For a foundation customer who has contributed to the funding of the network element which is congested, this would seem an unfair outcome which could discourage customers from funding network investment in the first place.

There are several ways this could be dealt with:

1. The PNR could operate on the principle of least cost constrained access, meaning that all generators and loads are treated equally in efficient dispatch, and foundation customers are treated the same as other consumers.
2. Some facilities could be entitled to preferential dispatch, which may be out of merit. This would require separate consideration in dispatch calculations, which could be automated through security constrained economic dispatch (SCED, which is not currently proposed for the Pilbara).
3. Some participants could be compensated for generation curtailment due to transmission congestion. In a system with locational pricing, this could be managed through financial transmission rights. In a single-price system like the Pilbara, it would require constrained off payments.
4. Some participants could be guaranteed that their consumption will be unaffected in the event of network congestion on certain lines, and the ISO will source alternative energy for their use.

Energy Policy WA considers that a guarantee of supply without balancing penalties will provide certainty of benefit from transmission investment, without complicating the scheduling and dispatch processes. Additionally, the effects of transmission constraints on dispatch outcomes will need to be considered in transmission planning, and new connection processes will need to include network congestion studies to identify the likely impact on dispatch.

6.2.3 Proposal

Proposal 22: NSP to NSP connection arrangements and consultation question

Proposal

22.1 The PNR will include a process for the interconnection of additional networks to the NWIS.

22.2 The ISO will manage the connection process for new networks connecting to the NWIS, and for new interconnections between existing networks.

22.3 Connecting networks must show compliance with Chapter 2 of the HTR, unless they are self-contained (established for the purpose of the participant serving only its own facilities).

22.4 Generation, storage, and load facilities on the connecting network must demonstrate compliance with Chapter 3 of the HTR.

22.5 Self-contained network infrastructure may opt to demonstrate compliance at the interconnection point to the NWIS.

Consultation Question

(22)(a) Do stakeholders agree with the proposed approach to network interconnections?

Proposal 23: Preferential supply for transmission foundation customers and consultation questions

Proposal

23.1 Foundation customers of transmission infrastructure will be entitled to firm supply for their loads when using the network components they have funded.

23.2 Foundation customers of transmission infrastructure will be allocated energy from other sources if their generation is constrained in balancing.

23.3 Foundation customers of transmission infrastructure will be settled without imbalance penalties if their dedicated generation is constrained after trading positions are finalised.

Consultation Questions

(23)(a) Do stakeholders agree that foundation customers should be treated differently from customers who have not funded transmission expansion?

(23)(b) Do stakeholders agree with the proposed approach to providing certainty of access to foundation customers?

These proposals were discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

6.3 Self-contained networks

The Pilbara contains different types of networks. Some are large, others small. Some provide services to connected third parties, while others are used only to transfer energy between generation and load owned and operated by or on behalf of one party. The PNR needs to have appropriate arrangements for each type of network.

6.3.1 Current Arrangements

The primary registration category in the PNR is the network service provider or NSP. NSP status depends on the status of the networks they operate. A network may be covered or non-covered. NSPs of covered networks are required to register as NSPs under the PNR and are subject to all of the PNR obligations. NSPs for some non-covered networks are also required to register, but those for excluded networks are not. Some networks were excluded as part of the introduction of the PNR, but a new network connecting to the NWIS can also qualify as an excluded network if:

- it includes a consumer facility;
- it does not include any generation facilities larger than 10 MW; and
- its configuration and operation could not credibly jeopardise PSSR or the Pilbara electricity objective.

Excluded networks are treated as single facilities under the PNR and are not required to meet the obligations placed on networks that provide network services to third parties.

The PNR and HTR include the concept of connection point compliance (CPC). A connecting party that has non-compliant equipment can apply for CPC status so its compliance is assessed at the point of connection to the NWIS rather than for each piece of equipment behind that connection point. This approach is targeted to connections with embedded generation, load and network equipment.

These arrangements provide the means for parties to avoid falling under the parts of the PNR which regulate network services, when they have network equipment which is only used to serve their own load.

6.3.2 Issues and Options

The current arrangements effectively define all network owners as a NSPs, then decide whether to treat them as such or to exempt them from the service provision aspects of the PNR.

Allowing connected parties to manage their own processes is an important part of the approach to the Pilbara regime, as long as it can be done without affecting other connected parties.

It is not necessary for PSSR to require self-contained networks to comply with technical rules that support third party access. The current rules somewhat restrict this. In particular:

- some self-contained networks may contain generation larger than 10 MW; and
- some network owners may prefer to benefit from the connection point compliance regime, even though all equipment behind the connection point would comply with the HTR in its own right.

Energy Policy WA considers that the PNR should allow for these sorts of connections to manage their own operations, as long as this does not affect PSSR. Large generation obviously can affect the NWIS PSSR, and so should be required to provide visibility to the ISO.

At present, CPC can only be applied if there is non-compliance behind the connection point. Energy Policy WA considers that monitoring and assessing compliance at the connection point is likely to be increasingly necessary as the generation fleet changes, and more complex facility configurations comprising different technologies behind the connection point seek to connect to the NWIS. Energy Policy WA therefore proposes to make connection point compliance an option even if all equipment would be compliant individually, as long as all equipment behind the connection point is the responsibility of a single party.

The ISO would still need information and data about the characteristics and operation of individual pieces of equipment behind the connection point to ensure power system security.

Connected networks that rely on ESS provided by the NWIS need to contribute to the cost of ESS, and similarly networks that rely on the NWIS for injection or withdrawal of energy need to contribute to the cost of the ISO.

6.3.3 Proposal

Proposal 24: Self-contained networks and consultation questions

Proposal

24.1 The PNR will distinguish between a network operator which provides services to third parties, and the operator of network infrastructure that is used to serve load and generation of that network operator.

24.2 Network operators who use their network equipment solely to service their own generation and load, can choose to be treated as a network user (demonstrating compliance at the connection point with the NWIS), or a network (compliance of all critical equipment within the network).

24.3 New connections must provide standing data and real-time data for individual pieces of critical equipment to the ISO, including if their facilities are subject to connection point compliance.

24.4 An Excluded Network can have a maximum of 10 MW of injection or consumption. If injection or consumption exceeds 10 MW for more than a set percentage of time over a rolling horizon, the Excluded Network status will be revoked.

24.5 A network owner which wants to be treated as a user but is not an Excluded Network is not required to show non-compliance with the HTR to be able to opt for Connection Point Compliance.

Consultation Questions

(24)(a) Do stakeholders agree with the proposed approach to self-contained networks?

(24)(b) Are there other aspects of the existing PNR that provide barriers to connection of self-contained networks?

This topic was discussed at the 21 November 2024 working group meeting, in the context of the intermittent load concept used in the WEM. It was also discussed at the 5 December 2024 PAC meeting.

6.4 Storage facilities

The EPNR modelling suggests that over the next decade or so, storage facilities are likely to displace gas fired generators as the primary provider of firming energy in the Pilbara. The PNR must be able to manage their introduction and operation, so they can contribute to the power system on a level playing field with other technologies.

6.4.1 Current Arrangements

Storage works is defined in the PNR as any wires, apparatus, equipment, plant, or buildings used, or to be used, for, or in connection with, or to control, a storage activity. However, storage works are exempt from registration by default, and there are many parts of the PNR that deal with generation facilities but not storage works, including:

- storage works cannot provide ESS;
- storage works cannot contribute to generation adequacy;
- the HTR treat storage as a combination of a generation unit and consumer equipment;
- the definition of the technical envelope considers generation facilities, but not storage works; and
- the ISO can require information about generation facilities outside the NWIS for the purposes of long-term planning, but not about storage works.

6.4.2 Issues and Options

As more variable generation and storage facilities are expected to enter the NWIS in the future, the PNR must evolve to include concepts relevant for storage as it does for generation. In most cases this can be dealt with simply by expanding generation obligations to also cover storage works by defining a new construct (such as an 'energy producing system') which comprises both generating units and storage works.

One area that will be different for generation and storage is the de minimis level for registration. Storage is currently exempt from registration altogether under rule 92, while only generation less than 10 MW is exempt. Because modern battery storage facilities can switch from charging at maximum capacity to discharging at maximum capacity in a matter of seconds, a 5 MW storage facility can have the same impact on PSSR as a generation facility of twice the capacity. Such storage is large enough to contribute to the ESS requirements, as discussed in section 3.4.

In the short term, the existing approach of applying a combination of generation and consumption requirements to storage can continue. In the long term, chapter 3 of the HTR should include specific requirements for storage. Most of the requirements currently in chapter 3 already differentiate between synchronous and inverter-based generation, so additional requirements largely need to deal with storage behaviour while transitioning from producing to consuming energy, and clarifying different requirements for grid-forming and grid-following inverters.

6.4.3 Proposal

Proposal 25: Storage participation and consultation questions

Proposal

25.1 Controllers of storage works above 5 MW must register their facilities.

25.2 A new defined term 'Energy Producing System' will be added to encompass generation and storage facilities.

25.3 Where appropriate, Rules that refer to generation only will be broadened to refer to Energy Producing Systems.

25.4 Technical requirements for storage works may need to be added to Chapter 3 of the HTR at a future point.

Consultation Questions

(25)(a) Do stakeholders agree with the proposed changes to accommodate storage facilities?

(25)(b) Are there other matters that Energy Policy WA should consider in relation to the treatment of storage facilities in the PNR?

This proposal was discussed at the 21 November 2024 working group and the 5 December 2024 PAC meetings.

6.5 Demand Side Participation

One potentially significant component of demand growth in the Pilbara is load which can flexibly ramp its withdrawal up and down to match the availability of variable generation. Examples cited include hydrogen, ammonia, and green steel production.

The modelling further demonstrated that there will be significant quantities of renewable generation that will be curtailed unless flexible demand is able to use it. To use this generation efficiently, load will need to be scheduled close to real time.

6.5.1 Current Arrangements

There are currently no provisions regarding demand side participation in the PNR. Participants are free to use any flexible load in maintaining a balance between their generation and consumption, but there are no formal mechanisms through which flexible load can respond to variable generation operated by other participants.

6.5.2 Issues and Options

Historically, the electricity sector has seen generation as a flexible resource to meet inelastic demand. In a power system with large volumes of variable renewable resources, flexible demand will have greater opportunity to access inexpensive energy much of the time and will see greater incentive to respond at short notice.

This kind of load is not yet present at scale, and while other systems have allowed dispatchable load participation for many years (such as the NEM's scheduled load facility class, or New Zealand's dispatchable demand program), participation has been low. Many systems have seen significant participation by loads providing ESS, including interruptible load providing contingency reserve raise in the WEM and elsewhere.

The proposed arrangements for capacity adequacy (section 3.2) and balancing (section 4.1) include the ability for participants to leverage load flexibility at portfolio level. Energy Policy WA considers that this ability lays the groundwork for real-time demand response when it becomes more prevalent and that, in the meantime, provision for demand participation should focus on ESS, where it has been used effectively in other systems.

6.5.3 Proposal

Proposal 26: Demand side participation and consultation questions

Proposal

26.1 Load participation in the PNR will be focused on ESS provision and on mechanisms for flexible load to take advantage of available variable renewable energy.

26.2 Flexible load can be designated as non-firm in the capacity adequacy process, so that it is not required to be matched by supply capacity.

26.3 Owners of flexible loads can bid in the proposed trading mechanism to purchase additional energy, and then manage their load to match their position.

26.4 Owners of flexible loads will be allowed to contract with the ISO to provide contingency reserve raise as interruptible load.

Consultation Questions

(26)(a) Do stakeholders agree with the proposed approach to demand side participation in the Pilbara?

(26)(b) Are there other services that demand participation could provide in the NWIS?

7. Development of the Harmonised Technical Rules

7.1 Standards in the Harmonised Technical Rules

The HTR are the part of the PNR that set out technical standards for connected equipment.

7.1.1 Current Arrangements

Historically, separately developed and owned networks in the Pilbara have adopted different technical standards. Each network operator set the technical requirements for connecting to and operating on its network.

The PNR introduced a common framework for the interconnected networks making up the NWIS, including the HTR contained in Appendix 5 of the PNR.

The HTR do not currently cover all aspects of technical operations, and some NSPs still maintain separate technical standards.

7.1.2 Issues and Options

The HTR are intended to function as a single, end-to-end technical power system standard for all networks and equipment connected to the NWIS. They are intended to supersede technical rules for different networks, and provide a single, uniform standard across all parts of the interconnected system. The PNR project's HTR workstream has identified gaps and solutions for many issues in the current HTR, as discussed in section 0. Any further gaps identified in the HTR should be the subject of a Rule Change Proposal, rather than requiring alternative technical rules to be applied as part of an access contract. Connecting parties need to know what the rules are for connecting to the NWIS. One primary role of the HTR is to provide that standard. Where a prospective connection meets the standards provided in the HTR, they should be able to have confidence that they will face no additional technical hurdles for connection. This approach requires NSPs to apply the same standards to all comparable connections.

In some cases, the parties involved may wish to negotiate a different standard (see section 0 for more discussion). The NSP may wish the connection to meet a higher standard, or the connector may wish a certain part of the standard to be relaxed. This may be possible, but doing so has the potential to impact other network users. There is some minimum level of performance below which connection cannot be contemplated, and the HTR has a role to provide guidance on what that is.

In addition to the default (or "automatic") standard, the HTR could also set a minimum standard:

- below which connection and operation is not permitted; and
- above which (if also below the default standard) the prospective connection applicant can seek departure from the default standard from the network operator and the ISO.

At this time, it is not practical to develop and implement a minimum standard. However, Energy Policy WA considers that such a standard needs to be developed in the near future and this should be included as a specific milestone in the PNR evolution implementation plan.

7.1.3 Proposal

Proposal 27: HTR standards and consultation questions

Proposal

27.1 The HTR will set a default standard for "automatic qualification".
27.2 NSPs will not have technical standards for connections in addition to the HTR.
27.3 In the medium term, the HTR will set a minimum standard for connection.
27.4 Connection will not be allowed for equipment that falls short of the minimum standard.

Consultation Questions

(27)(a) Do stakeholders agree that the HTR should be the only technical standards for the NWIS?
(27)(b) Do stakeholders agree that the HTR should include both default and minimum standards?

This proposal was discussed at the 11 July, 28 August and 21 November 2024 working group meetings.

7.2 Departures from the HTR

While compliance with the HTR is sufficient for connections to be allowed, sometimes a prospective connection or a network may wish to depart from the standard. For example, a new connection may wish to not comply with some portion of the HTR, or a network operator may prefer compliance with a higher standard than required in the HTR. In either case, the relevant parties would need to negotiate and agree on such a departure.

The PNR must include a mechanism for negotiation, formalisation, and ongoing monitoring of departures from the HTR, including dispute resolution process.

7.2.1 Current Arrangements

Currently, NSPs require access seekers to meet technical requirements that they specify in addition to those set out in the HTR. NSPs have discretion to negotiate different standards for each connection. The ISO must give its approval before any new equipment can be connected to the NWIS.

If a connection is subject to different technical standards than others, that information is not available to other connected parties.

7.2.2 Issues and Options

If a prospective connection meets the default standard, no negotiation is required, and no additional conditions can be required by the network operator. This is the main mechanism for avoiding disputes. The access seeker must demonstrate that it meets the standard. The access seeker can choose whether it does this for each piece of equipment, or at the connection point.

With or without a minimum standard, the PNR needs to include a mechanism for negotiation, transparency, and ongoing monitoring of departures from the HTR, including supporting dispute resolution process. Ideally, the PNR will be structured to avoid disputes, and to resolve them early if they do arise.

A network operator can request that an applicant meet a higher standard than specified in the HTR, but if the applicant rejects the request, no further negotiation is necessary, as an applicant that meets the automatic standard has the right to connect.

If a connection applicant wishes to meet a standard lower than the default standard, it must request this through the connection process. The ISO will have to be satisfied that the departure does not negatively impact system security or reliability for any connected party or, if it does, the connection plan includes appropriate technical or financial mitigation.

When a minimum standard is defined, the PNR can designate aspects of the standards which the NSP can negotiate without involving the ISO until the end of the process. The PNR can also provide guidance on what evidence a prospective connection applicant must provide and what mitigation measures are acceptable.

The time required to assess connection applications depends on the complexity and size of the connection. Energy Policy WA considers that it is not reasonable to set firm one-size-fits-all timeframe requirements for the processing of connection applications, but that NSPs should be required to publish estimated time requirements for different types of connection and publish information on actual time taken for the NSP portion of the process.

All parties should be acting in good faith. If parties are unable to reach agreement, including on whether a prospective connection meets the default standard or has provided sufficient evidence, it may be necessary to seek resolution from another body. Energy Policy WA proposes that the ISO fill this role for connection applications other than NSP to NSP connections. For applications where the ISO is a party to the dispute, this could be an arrangement like the one expected to be established in the WEM, following completion of the PSSR Standards Review.

Any deviations from the “automatic” standard agreed in the negotiation process should be made transparent to the rest of the sector and be published by the NSP or the ISO.

7.2.3 Proposal

Proposal 27: HTR negotiation framework and consultation question

Proposal

28.1 NSPs must negotiate with access seekers and consult with the ISO on requested departures from the default standard, and the ISO will have final power of approval (as it does for all connections).

28.2 The ISO may provide guidance for acceptable bounds of negotiation, evidence, and mitigation measures.

28.3 NSPs must publish estimated and actual timeframes for connection assessment activities in their control.

28.4 NSPs and access seekers can escalate disputes to the ISO, and where the ISO is a party to the dispute, to an appropriate dispute resolution mechanism.

28.5 NSPs and the ISO must publish agreed deviations from the default standard (whether above or below the standard).

Consultation Question

(28)(a) Do stakeholders support the proposed negotiation framework?

This proposal was discussed at the 28 August and 21 November 2024 working group meetings.

7.3 Recommended changes to the HTR

As part of the PNR, the HTR must be adapted to accommodate new technology (i.e. renewables and storage) and an increasing number of complex facility configurations seeking to connect to the NWIS.

The EPNR Working Group members developed a list of existing issues and gaps in the HTR, which were compiled and provided to the PAC on 18 April 2024. These issues were categorised as either governance or technical issues. Governance issues (including responsibility for managing system strength, clarification of compliance point connection facility definition and compliance and enforcement of standards), were transferred to the PNR workstream, to enable the HTR workstream to focus on technical issues and standards, of which a significant number relate to the automatic standards.

For each issue, the working group identified a lead, who facilitated small groups to discuss and analyse the issue and recommend HTR changes to the wider working group. These issues, description and recommendations are outlined in Table 2 below. All of the recommendations are proposed for implementation.

More information on the detail of each issue, options considered, and supporting discussion is available in meeting materials published on Energy Policy WA's website.

Table 2: HTR-specific issues and proposals

Topic	Description	Proposal
Definition of Contingency Events	The PNR and HTR have different definitions of credible contingency events. Different definitions with multiple components can result in different interpretations.	Align the PNR and HTR to have a common definition of credible and non-credible contingency events, adopting the definition in line with AEMC.
Voltage and Frequency Regulations	The recent *Electricity Industry Amendments Act 2024* will remove the voltage and frequency requirements from *Electricity Act 1945*. New voltage setting will align with AS IEC 60038:2022.	Update the HTR to reflect the new voltage setting to a nominal voltage of 230V with upper limit of 254V and lower limit of 207V. There may be some non-distribution network areas where this may not apply.
Power System Performance	There are a range of power system performance technical issues which the HTR should provide guidance on, but insufficient data exists on the current performance and capability of the power system. These include: • power system ride through requirements, and performance and restoration for major disturbances; • frequency variations; • continuous uninterrupted operation requirements; • identified rate of response; and • RoCoF and settings for under frequency load shedding and/or under frequency islanding.	Investigations and power system studies to be done with the following scope: • review critical fault clearing times; • review generator ride through requirements; • review system islanding scheme and settings; • rate of response; and review of frequency operating standards. • Allocating responsibility and identifying funding will be necessary to deliver this modelling scope.
NWIS Power System Strength	There is currently no specific requirement for, or guidance on, NSP's determining minimum strength requirements which may compromise system stability and protection scheme performance.	Develop a framework for the management of system strength within the NWIS, leveraging the work undertaken by the SWIS PSSR Standards Working Group.
Holistic review of treatment of BESS	There are several rooms for improvement with the storage works provisions in the HTR, including:	In the medium term, amend HTR Clause 3.3 to address specific areas where the applicable technical

Topic	Description	Proposal
and inverter based generation (IBR)	• frequency control requirements for dispatchable non-synchronous generating systems; and • frequency control response rates for inverter-based storage	standard not defined for dispatchable, non-synchronous generation. • HTR 3.7(b) allows NSP and ISO to define technical performance standards for BESS, with respect to injects, by leveraging clause 3.3; and • fixing gaps in clause 3.3 will allow 3.7 to continue to operate appropriately. In the long term, rewrite section 3.7 to include comprehensive requirements for inverter-based storage facilities. Provide definitions in the HTR for "grid forming", "grid-following" and for the unique characteristics of grid-forming technology such as "synthetic inertia".
Inverter Dynamic Performance – Oscillation Damping	The HTR damping clause wording is synchronous generator centric. Moreover, inverter connected generation does not have concept of rotor angle stability. Inverter connected generation can be a source of power system oscillations, thus a risk for power system security.	Realign the rules to the increasing penetration of inverter-based generation in NWIS.
Inverter Dynamic Performance – reactive current injection/absorption during fault & recovery period	There are two HTR clauses that needs to be addressed: • Clause 3.3.3.3(f) requires non-synchronous generation to terminate pre-fault absorption within 200msec and are permitted to resume 60s after post fault voltage stabilises. This does not fully utilise inverter connected generation capability to support voltage recovery during and post fault recovery period. • Clause 3.3.3.3(g) requires generation to be able to deliver reactive power post fault to ensure connection point voltage is within the range for uninterrupted operation. However, the clause does not quantify performance requirement for reactive injection/absorption.	Review HTR clause 3.3.3.3(g) and consider including quantifiable measures of reactive current injection/absorption during fault or post fault.
Use of "energisation" and "commercial operations" in PNR and HTR	The terms "energisation" and "commercial operations" are used in the Interim Access and Connection Procedure but is not used in the PNR.	Add a new definition to PNR and HTR for "commercial operation". Move the HTR definition of "energisation" to the PNR, amend definition in the HTR to point to PNR definition.

Topic	Description	Proposal
		Substitute the current PNR references to “energisation” with “commercial operation”. Add a new PNR rule dealing with process to obtain authorisation for energisation for the purposes of testing and commissioning.
Inclusion of data to be submitted with connection applications	Deals with the question of whether the information requirements for connection applications should be provided in the HTR.	Include high-level requirements for submission of technical information in HTR attachment.
Inclusion of testing requirements for new generation connections	Deals with the question whether the required tests for new generation connections should be provided in the HTR, and differentiation in tests for dispatchable and non-dispatchable facilities.	Generator testing requirements should be included in an HTR attachment. The requirements should cover minimum standards as well as special tests required by the NSP. The requirements do not need to cover microgrids. Tests for battery storage, IBR and non-dispatchable generation should draw on rules from other jurisdictions.
Under Voltage Ride Through (UVRT)	UVRT requirements in the HTR reflect Horizon Power’s existing Technical Rules requirements which is largely inherited from Western Power’s.	Conduct a pre-requisite engineering and power system analysis on fault clearance times and choose the preferred option of the analysis outcome. Options are to retain status quo, or to redefine UVRT magnitude, duration, and envelope shape.
Frequency Control Dead Band	The current requirement on frequency dead band is vaguely written as it does not specify how the 0.05Hz deadband is applied.	Redefine the dead band of a generating unit to be less than or equal to ±0.025 Hz around 50 Hz, unless an adjustable dead band is agreed to in the access contract.
Disturbance Monitoring and Synchrophasors	Synchrophasors provide operational visibility of dynamic and small signal stability of the power system, measuring things like frequency, rate of change of frequency, voltage signals, and additional benefits with power quality monitoring. Additional protection and control layers can be added to this system.	• Update HTR Section 3.3.4.1 (d)(3)(a) to include synchrophasor as an acceptable measured value as determined by the relevant NSP. • Make remote monitoring compulsory. • Develop a procedure to define data formats, data exchange protocols, and allow ISO access to synchrophasor data. • Check proposed wording for WEM/SWIS to ensure alignment where possible.

Topic	Description	Proposal
Reactive Power Capability Figure 3.3	Figure 3.3 in the HTR shows reactive capability of inverter coupled generating units, but only shows positive active power. The diagram needs to cater fully for battery connected units.	Update the clause 3.3.3.1(c)(4) and Figure 3.3 of the HTR to cater for battery energy storage units. This should align with the outcomes of holistic review of treatment of BESS and inverter-based generation.
Treatment of Ambient Temperature	Temperature dependence is a critical factor in the Pilbara, and it is not adequately addressed in the HTR. Some issues are: • Clarify how ambient temperatures are determined. • Clarify distinction of using 'name plate; vs a derated payment in generator compliance rules.	Clause 3.3.3.1 (reactive power) must be updated to provide clarity on ambient temperature.
Monitoring and Control Requirements	Clause 3.3.4 outlines the general methodology approach to requirements for monitoring and control of equipment (RME/RCE). There are no mandatory set of requirements, and it relies on consultations between NSP, controllers, and customers.	• Update clause 3.5 to require mandatory monitoring and control capability of distributed energy resources. • Undertake a general review of clauses 3.3.4 and 3.4.9 of the HTR to consider RME/RCE requirements.
Pole Slip Protection	Clause 3.4.10.2 requires pole slip protection for small generating units (up to 10MW) that connect to the distribution network. This is relevant for minimising network instability in response to a failure within the generating unit governing and excitation system.	Update the HTR to provide the minimum and recommended protection elements for majority of generating units.
Review of Fault Level Management	Based on fault level management review on the system, there should be a minimum fault rating requirement for Transmission plant at significant network nodes, and fault management level; as well as requirements for limitations on maximum fault levels on the system, and guidance on calculation of fault levels.	• Develop table of minimum fault withstand ratings for new plant (based on review of available plant, and possibly Horizon Power Technical Rules Tables A13.1, A13.2, A13.3) and include in the HTR. • Establish a procedure or update an existing procedure to introduce the requirement for NSPs to assess fault levels as part of new connections and system changes. • Include in the HTR a note which requires maximum fault levels at any point will not exceed the minimum fault withstand ratings.
Adequacy of requirements for	HTR section 2 lists the network performance criteria that NSPs must comply with. This issue deals with the	Add a drafter's note to the PNR giving system restart as an example where it may be impractical to maintain the

Topic	Description	Proposal
System Restart arrangements	question whether the frequency and voltage operating standards of the HTR should be relaxed during system restart scenarios	system inside the Technical Envelope, with the following considerations: • System restart plans in the Pilbara rely on fracturing the power system at points of interconnection. • Adequate synchronisation points between registered networks are essential • Explore a requirement in the PNR or HTR mandating at least one network synchronisation point.
Connection Point Compliance (CPC)	Setting the CPC parameters and definition, as well as considering if there are updates required to facilitate or improve the treatment of CPC measures.	Amend PNR requirement which requires non-compliance to qualify for CPC status. (also see section 0).
Determination of Power Transfer Limits	In the HTR, the NSP must determine all credible system load and generation matters to be assumed. It does not provide any guidance on how to determine power transfer limits	NSPs will continue to be responsible for determining power transfer limit as they are best placed to determine this since they are responsible for networks and could understand overall network constraints the best.
Update Critical Fault Clearing Times (CFCT) at HP-RTIO interconnectors	An independent study suggested a need for CFCRs of 365ms or faster on the 33kv RTIO-HP interconnectors. The updated fault clearance times for the RTIO-HP interconnectors were not captured when the HTR was developed. The maximum fault clearance times (MFCT) is outdated and is considered impractical for distribution systems. CFCTs on some radial distribution lines may also be higher than 300ms, and thus a mechanism is needed to allow alternative times.	Amend HTR Table 2.10 to modernise and simply MFCTs • Remove row for 33 kV HP-Rio tie lines. • All 33 kV systems will be subject to MFCT of 300ms. • If ‘slower’ clearing times can be justified by the host NSP, based on CFCT studies, the HTR should allow this to be accommodated. • If faster clearing times are needed for interconnectors, this can be implemented under HTR clause 2.6.5 “critical fault clearing lines”.
Special protection schemes in managing network congestion/ instability	Requirements on NSPs to enact special protection schemes to manage network congestion/instability as required to enhance system security, as one option to manage security issues.	Introduce requirements into HTR around select non-credible events (like ‘protected events’ in the NEM). High consequence non-credible events should be brought in line with other NSP practices in Australia.
UFLS integrity and transparency	UFLS settings appear to take a set and forget approach at present. It is not clear that NSPs have full confidence that the scheme will operate as intended.	Require periodic tests, annual publication of test results, and reporting on performance following contingency events.

Topic	Description	Proposal
Overall review of referenced standards	Several of the standards referenced in the HTR are outdated. Some have undergone multiple revision, and a review is necessary to reflect advancement and changes in the field.	HTR explicitly states that the most recent version of all standards should be referenced to ensure compliance and accuracy. Remove any specific references to the applicable year, such that the most recent version always applies.
Definition of Distribution feeder, interconnector, tie, and ESS	Clarity required for definitions of distribution feeder / interconnector / tie	• Add the definition of "interconnector" to clause 1.5 of the HTR which refers to the PNR definition. • Replace all instances of "tie line" with interconnector. • Update HTR Table 2.10 to make appropriate use of definition for "interconnector" and "distribution feeders" as applicable.
Definition of "ancillary services" and "essential services"	The definition of "ancillary services" and "essential services" should be aligned in the PNR and HTR.	Replace the term of "ancillary services" with "essential services".
Accumulated Synchronous Time Error	The term accumulated synchronous time error is used in clause 2 of the HTR dealing with transmission and distribution system performance and planning criteria. The issue is whether this clause is still relevant and necessary in the HTR, as this is removed from the NER.	No changes to the PNR or HTR since providers of FCESS in the NWIS often rely on the standard for accumulated synchronous time error to determine effectiveness of the service.
Back-up Protection Systems Definition	The present rules do not reflect the critical nature of interconnectors operating at distribution voltages. Having two fully independent schemes of differing principle is more robust, appropriate, and suitable for maintenance purposes.	Establish a subclause in clause 2.6.2 of the HTR which specifically deals with requirements of interconnectors, referring to the nature and the role of tie lines in the broader system, availability requirements of the tie line, and technical requirements for system stability. The focus should be away from forming a separate island.
Model and Interaction of Modelling Guidelines	The ISO released the interim Power System Modelling Procedure that appears adequate to cover the requirements of the combined NWIS whole of system model.	Item closed with no change necessary.

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