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Creating value in transition

ECONOMIC REGULATION AUTHORITY OF WESTERN AUSTRALIA

WESTERN POWER AA5 EXPENDITURE PROPOSAL REVIEW

EXECUTIVE SUMMARY

SEPTEMBER 2022

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About Us

Future-focused and progress orientated, Engevity works with organisations to expertly navigate the complexities of change. We create value through transition by offering innovative thinking, expert guidance, pragmatic advice and smart solutions – leading us to a more sustainable future. Engevity's model is agile, solutions-focused and centred around our people & our client's needs.

We are an Australian owned, professional services organisation committed to supporting our clients to sustainably evolve their organisations with our passion, integrity and the power of our exceptional people. Our experienced team of trusted leading experts brings diverse real-world experience, tackling challenging projects and creating enduring value for clients.

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ACRONYMS AND GLOSSARY

Term	Definition
AA4	Fourth access arrangement period, spanning 1 July 2017 to 30 June 2022
AA5	Fifth access arrangement period, spanning 1 July 2022 to 30 June 2027
AEMO	Australian Energy Market Operator
AMI	Advanced Metering Infrastructure
CAPEX	Capital Expenditure
DER	Distributed Energy Resources
DSO	Distribution System Operator
DSO	Distribution System Operator
Dx	Distribution
ERA	Economic Regulation Authority
EV	Electric Vehicles
ICT	Information And Communications Technology
m	Million
NFIT	New Facilities Investment Test
OPEX	Operating Expenditure
PV	Photovoltaic
RAB	Regulated Asset Base
SCADA	Supervisory Control and Data Acquisition
SPS	Stand-Alone Power System
SWIS	South West Interconnected System
Tx	Transmission
VPP	Virtual Power Plant
WACC	Weighted Average Cost of Capital

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EXECUTIVE SUMMARY

Western Power submitted its proposed revised access arrangement for the fifth access arrangement period (AA5), spanning 1 July 2022 to 30 June 2027, to the Economic Regulation Authority (ERA) on 1 February 2022.

ERA engaged, Engevity Advisory, Qubist and Oakley Greenwood (Engevity) to provide technical advice to assist the ERA with its assessment of Western Power's actual capital expenditure for AA4, and proposed capital and operating expenditure for AA5. Engevity, along with our delivery partners Qubist and Oakley Greenwood, provide market leading experience in achieving regulatory outcomes for both the economic regulators and the regulated businesses across Australia and the South Pacific.

Using the Regulatory Model provided with Western Power's submission, in 'nominal'[1] terms the total revenue requirement is $7.93 billion over AA5 – comprising $5.84 billion for distribution services and $2.09 billion for transmission services – which is comparable to the total reported historical AA4 revenue of $7.99 billion.

However, this outcome must be interpreted against the changes in Cost of Capital and level of capital expenditure. The proposal includes a substantial 'real dollar'[2] increase in planned Total CAPEX of 40 per cent ($1.48 billion) to $5.18 billion compared to the AA4 total CAPEX of $3.71 billion for both distribution and transmission. Proposed operating expenditure, or 'OPEX', of $2.18 billion is relatively stable from the previous period's $2.19 billion.

Engevity considers Western Power's AA4 CAPEX was largely prudent and efficient expenditure. Of the $1.58 billion we assessed for AA4, we recommend a $24.9 million negative adjustment. Although there were significant variances for individual CAPEX programs we assessed, Western Power underspent its AA4 allowance overall.

However, we recommend significant adjustments to Western Power's AA5 access arrangement proposal. We consider ERA should not accept Western Power's CAPEX forecast. Our alternative estimate of efficient CAPEX is $2.51 billion (direct costs) – which is $665.9 million (21 per cent) lower than Western Power's proposal. We consider the network transformation program proposed by Western Power should be delivered over a longer time frame to prudently and efficiently manage its implementation. We also recommend a lower estimate of efficient OPEX of $2.02 billion.

Engevity has reviewed Western Power's Access Arrangement proposal material submitted to ERA, met with Western Power staff and in some instances sought additional information.

This executive summary document outlines our high-level findings and should be read in conjunction with our supporting detailed attachments, which makes recommendations for ERA's consideration in making its draft decision.

Summary of Findings

Engevity recognises the need for Western Power's business transformation program, in response to the transition challenges and its broader operating environment. We are broadly supportive of the strategic direction and drivers for change outlined by Western Power. Also, we found that Western Power benchmarks well against its peers in the NEM and despite some implementation concerns Western Power Governance Frameworks appear to align with good industry practice.

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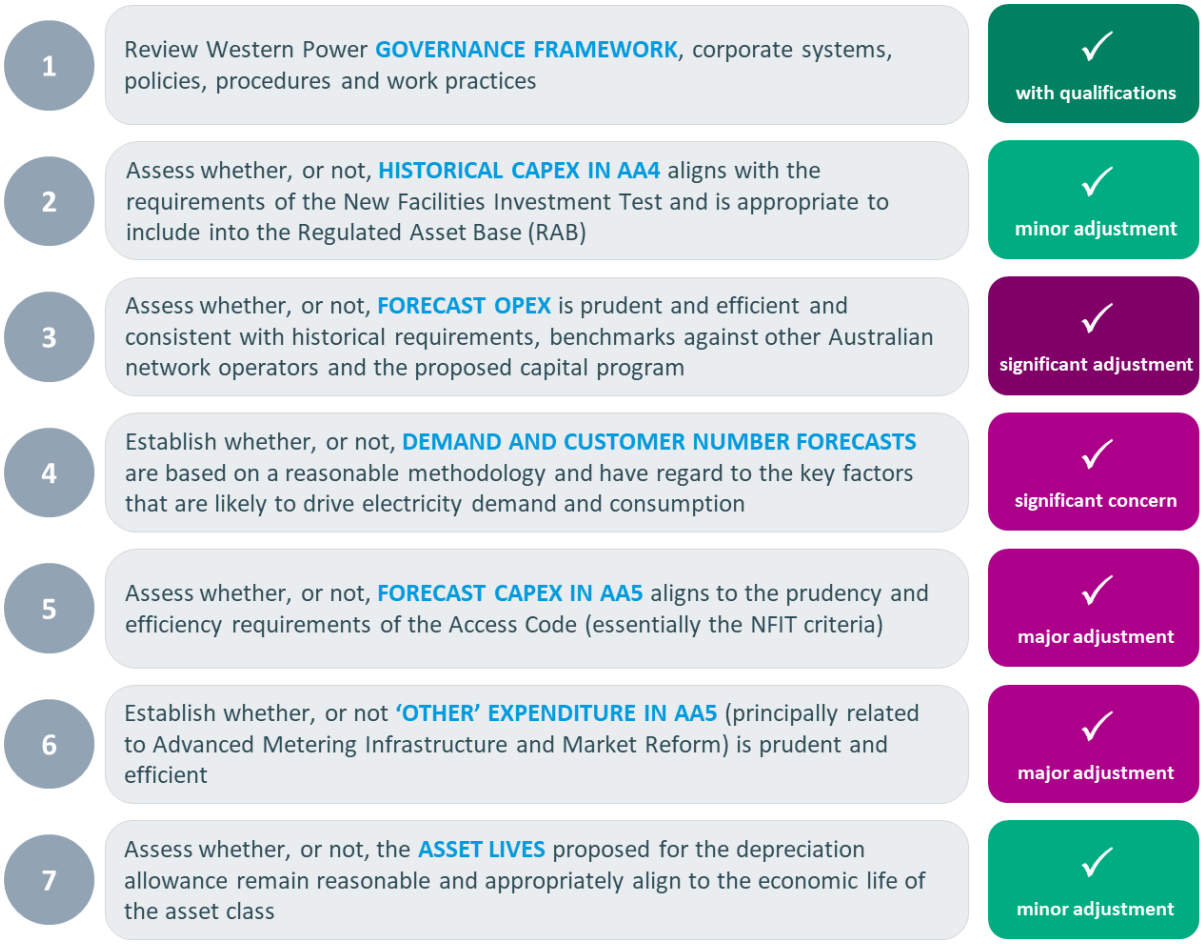
1 'Dollars-of-the-day' with no adjustment for the time value of money to account for historical or forecast inflation trends

2 Expressed on a constant $real June 2022 basis

A summary of our scope of review and findings is illustrated below.

Figure 1: Summary of scope and findings



Our concerns with Western Power's AA5 proposal are summarised below:

- We found that much of the investment in the multi decade network transition strategy is included in the AA5 period. **Delivery over a longer timeframe mitigates AA5 delivery and market maturity risks**, and better captures technology cost and learning curve efficiencies to minimise overall cost of the transition.
- The significant scale up in proposed expenditure and ambition introduces substantial **efficiency risk.** Further, the planned investment over the AA5 period raises significant **deliverability risk** based on Western Power's AA4 performance, current market skills shortages and our comparison with other networks.
- **Justification and validation** through robust business cases or costed options analysis of the benefits and costs were not typically provided, and we identified inconsistent underlying assumptions – especially for demand and energy forecasts, which did not capture structural changes in peak and minimum demand.
- We note that Western Power has complex risk evaluation tools, simple 'risk matrix' and qualitative risk screening across various governance frameworks that are applied in a 'patchwork' fashion across different areas of the business and between different projects. Engevity has found that **systemic errors and forecasting/estimating inconsistencies compound across programs** (and over time) to include an implied risk contingency.

Opportunities exist to reduce the uncertainty embedded in AA capex forecasts to manage risk and optimise expenditure levels within the AA5 period more actively.

We consider there **are opportunities for Western Power to take advantage of a less ambitious scale-up in expenditure during AA5** to:

- **Maximise the technology cost curve benefits and efficiency improvements** that are likely to materialise as solar and battery prices continue to reduce aggressively over time – particularly as the shift to electric vehicles delivers large economies of scale and research funding to battery supply chains.
- **Establish a foundation built on the learning curve benefits that will arise** from Western Power and the Western Australian contractor market adopting new solutions, increasing the scale of delivery, optimising customer recruitment activities for stand-alone power systems and allowing for the option to adapt delivery models over time.
- **Further consider the option value of staging expenditure using risk-based assessments of condition and/or benefits** to defer new investment or implement life extension strategies to manage asset risk with modest investment until a longer-term solution becomes economically viable. This is particularly relevant to asset replacement activities where there is an intent to deliver a change in overall technology for electricity supply (e.g. overhead line retirement enabled by SPS, wood pole retirement enabled by undergrounding).
- **Improve resource levelling and deliverability issues across the AA5 period and beyond** to minimise the cost of the broad scale transition investments, whilst maximising the value of existing assets to consumers.

Additional factors that should be taken into account when considering our recommendations relate to the future pricing impact on customers include:

- **Recent geopolitical events, inflation figures and interest rate announcements** since the preparation of Western Power's proposal are likely to have influenced the outlook for financing costs. A sustained increase would place strong upward pressure on prices as a key component of the Return on Assets building block. This would be reinforced by the significant RAB growth arising from Western Power's proposed AA5 CAPEX.
- **The continuing downward trend in electricity consumption**, with total consumption from Western Power's network forecast to fall back to around 2008 levels by 2027 (this is largely a result of the uptake of rooftop solar meeting customer load behind the meter).
- **The exclusion of electric vehicle demand and consumption from Western Power's AA5 forecasts** representing both an opportunity (through additional consumption/revenue) and a risk (through increased investment requirements – or duplicated investment within a short timeframe from a failure to provide for additional capacity in undergrounding programs etc.).
- The risks associated with the largely unproven implementation and customer acceptance of SPS rollouts of the scale proposed.

Recommended adjustments to Western Power's planned CAPEX program

Our recommendation is that ERA does not accept Western Power's forecast CAPEX (direct costs) of $3.18 billion (real $m 30 June 2022) reviewed in this report. We are not satisfied that all regulatory categories have demonstrated that they reasonably reflect the NFIT requirements. Instead, we consider our alternative estimate of $2.51 billion for the regulatory criteria assessed meets the criteria. **This is $665.9 million (21 per cent) lower than Western Power's proposal.**

Table 1: Western Power AA5 capex forecast and Engevity recommended adjustments ($m)

Project/Program	AA5 Forecast Total Cost	AA5 Forecast Direct Costs	AA5 Direct Costs Adjustment	%Δ	AA5 Recom-mended
Undergrounding Programs	685.2	376.6	**-66.8**	**-18%**	309.8
Wood Pole Management	423.1	362.7	-	-	362.7
SPS & Microgrids	330.8	283.3	**-102.6**	**-36%**	180.8
Depot Program	145.8	125.3	**-27.6**	**-22%**	97.7
Replacement Program	912.0	781.6	**-147.7**	**-19%**	634.0
Distribution Augex	874.3	245.4	-	-	245.4
SCADA/Comms IT & Cyber	872.2	745.9	**-223.8**	**-30%**	522.2
AMI	311.3	257.5	**-97.5**	**-38%**	160.0
Total Expenditure Assessed	4,554.7	3,178.4	**-665.9**	**-21%**	**2,512.5**

Our alternative estimate of efficient costs allows Western Power to deliver its transformation program over time, while maintaining a safe and reliable service for customers. We propose significant reductions to the following CAPEX categories:

- We have recommended a 17.7 per cent lower forecast of $309.8 million for the proposed **undergrounding program.**
  - Our alternative estimate of efficient costs provides for significant grid transformation to occur, while allowing Western Power to implement improved contractor management and scoping estimates of costs so these projects are delivered on time and to budget, unlike the AA4 period.
- We have recommended a 36.2 per cent lower forecast of $180.8 million for the proposed **SPSs and microgrids program.**
  - We consider Western Power does not have the capability or systems in place to efficiently scale-up delivery of this program to the extent proposed, and the benefits to customers are not adequately justified by Western Power.
- We have recommended an 18.9 per cent lower forecast of $634.0 million for the proposed **transmission and distribution replacement programs.**
  - Western Power's risk-based approach to determine when assets require replacement does not seem to account for varying failure rates for different asset categories, which leads to overly conservative decisions – and, as a result, means Western Power overestimates forecast efficient replacement CAPEX.
- We have recommended a 30.0 per cent lower forecast of $522.2 million for the proposed **SCADA and communications program**.
  - Although we broadly support Western Power's ICT strategy and a gradual increase in the volume of works delivered by Western Power to date in AA4, we consider the scope of the AA5 ICT program is not justified as a clearly defined scope that is aligned to the identified need has not been provided. In addition, the accelerated timing and increased

expenditure of the current ICT program is not aligned with a prudent and cost-efficient approach.

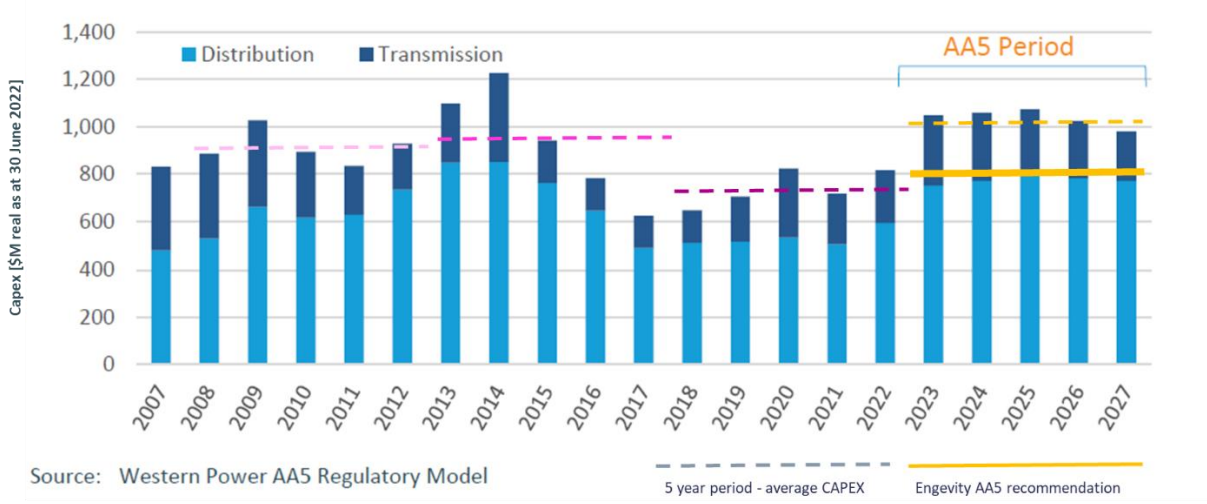
- We have recommended a 37.9 per cent lower forecast of $160.0 million for the proposed **AMI program**.
  - We consider Western Power does not have the ability to efficiently deliver the AMI program in AA5, nor realise sufficient benefits to justify the increased costs to consumers – given the scale of expenditure and substantial increase in delivery volumes being proposed.

We consider the adjustments to forecast CAPEX reflects our findings and the inherent uncertainty in delivering large scale network transformation implementation. Despite the substantial recommended reductions, we note that our findings are in aggregate an increase on the actual expenditure in AA4 – which likely enables Western Power to progressively demonstrate over AA5 a compelling business case for continued investment (or a more efficient alternative strategy) throughout AA6 where costs, technology capability and delivery challenges are better known.

1.0 SUMMARY OF RECOMMENDED ADJUSTMENTS

We have reviewed the CAPEX and technical aspects of Western Power's proposal and made several recommendations, to be consistent with the NFIT criteria. Western Power proposes a 40 per cent increase in total CAPEX for AA5 compared to AA4 of $3.71 billion,[3] as shown in the figure below.

Figure 1–1: Capital expenditure



1.1 AA4 CAPEX was considered largely prudent and efficient

In reviewing Western Power's CAPEX performance over the AA4 period, Engevity has conducted a structured assessment of a sample of material issues, projects and programs for each of the major CAPEX programs to establish whether or not the investment proposed by Western Power satisfies the requirements of the NFIT (see **Attachment 7**). These projects and the variances between costs approved by ERA for and spent in AA4 are shown in Table 1–1.

Except for the customer change management system, Engevity considers Western Power's expenditure for each of the above projects complied with the NFIT requirements, or otherwise represent prudent and efficient expenditure that minimises costs to customers. As a result, we recommend ERA does not to make any adjustments to these expenditure categories.

Although the Reactive Voltage Rectification project was not contemplated in Western Power's AA4 access arrangement proposal, we consider this CAPEX complies with the NFIT requirements. The risk of voltage non-compliance and system blackout due to 'System Low' events – that were not foreseen by Western Power at the time – was in our view appropriately managed through this program as a longer-term network reinforcement solution. Regardless of any argument that Western Power should have foreseen the issue, the technical solution would likely have been the same – albeit commencing at an earlier point in AA4. As a result, the actual timing of the reactive reinforcement program notionally provides a one-year deferral benefit for customers over the optimal timing of a pre-planned solution.

We reviewed the information provided by Western Power on the Customer Management System in AA4. We have found that the expenditure did not comply with the NFIT requirements or represent efficient expenditure. In its AA4 Access Arrangement final decision, ERA did not accept Western Power's proposal to undertake this project – finding the project costs were overstated and Western

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[3] Total Capex from Western Power AA5 Regulatory Model, Output Summary Rows 80-82

Power could fund this project through its OPEX allowance, which will be offset by the efficiencies.[4] Western Power's business case documentation highlights a range of benefits to justify the expenditure, largely expected in the notional 5-year regulatory depreciation life of the system.

Table 1–1: Western Power AA4 capex and Engevity recommended adjustments ($m)

Project/Program	AA4 Actual Cost $m	Variance to AA4[5] $m	Recommended Adjustments
Kalbarri Microgrid	15.77	+4.37	Nil
Hay MIL Switchboard	12.3	-17.7	Nil
Grid Transformation Engine	14.5	+14.5[6]	Nil
Reactive Voltage Rectification	25.1	+25.1[7]	Nil
SPS	51.2	+51.2[8]	Nil
Wood Pole Management	679.3	-8.4	Nil
IT, SCADA & Communications	506.6	+185. 3	Nil
AMI	158.77[9]	+55.5	Nil
Customer Management System	24.9	-	-24.9
Forrestdale Depot	79.5	-26.4	Nil
Total Expenditure Assessed	**1,567.94**	**+283.47**	**-24.9**

Engevity was not provided with sufficient information to confirm that the benefits for the Customer Management System project were reflected in the base year OPEX or the net step change component of Western Power's OPEX forecast. Therefore, to ensure that customers are not paying for CAPEX that has already been recovered by Western Power through OPEX benefits and incentive arrangements, we recommend that the value of this project be excluded from the opening RAB for the AA5 period.

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4 ERA, Western Power AA4 – Final Decision, para. 805.

5 Negative variances indicate a material underspend of the AA4 Further Final Decision (FFD) forecast for the project. Positive variances indicate a material overspend of the FFD forecast. Figures from NFIT compliance summaries. Note that the overall CAPEX allowance is set at a total level, Western Power can reprioritise expenditure throughout the AA period within the overall capital expenditure allowance. This provides the flexibility to adapt the capital expenditure portfolio to meet changing or unforeseen needs.

6 Attachment 5.6 AA4 – NFIT Compliance Summary – Grid Transformation Engine, Table 2.2, p.4. Variance to AA4 FFD stated as -$14.5M. Regulatory approval (AA4 FFD) is listed as 'n/a'.

7 Attachment 5.7 AA4 – NFIT Compliance Summary – Reactive voltage rectification, Table 2.2, p.4. Variance to AA4 FFD stated as -$25.1M. Noted that regulatory approval (AA4 FFD) listed as 'Nil'.

8 Attachment 5.8 AA4 – NFIT Compliance Summary – Stand-alone Power Systems, Table 2.2, p.4. Variance to AA4 FFD stated as 'n/a' and regulatory approval (AA4 FFD) as 'n/a'. Western Power notes "SPS projects were not identified as part of the AA4 submission, rather separate business cases were raised for SPS units as the opportunity was identified" on p. 9.

9 Western Power Attachment 5.2 - AA4 CAPEX Variance Report, sheet 'Actual Exp by Fin Year AA4', line 34, total actual AA4 expenditure for Metering Capex.

1.2 Proposed AA5 CAPEX program considered overly ambitious

Our recommendation is that ERA does not accept Western Power's forecast CAPEX (direct costs) of $3.18 billion (real $m 30 June 2022) (see Table 8-1, **Attachment 8**). These direct costs are derived from Western Power's forecast CAPEX (total costs) of $4.56 billion. We are not satisfied that all regulatory categories have demonstrated that they reasonably reflect the NFIT requirements. Instead, we consider our alternative estimate of $2.51 billion (direct cost) for the regulatory criteria assessed meets the criteria. **This is $665.9 million (21 per cent) lower than Western Power's proposal.**

The proposed network investment requirements are driven by the needs identification, scoping and option assessment, cost estimating process, delivery model and consideration of OPEX solutions or other non-network alternatives for investment.

We have reviewed these business cases for the major CAPEX programs proposed by Western Power for AA5 to establish whether or not the investment proposed by Western Power satisfies the requirements of the NFIT (

Table 1–2).

Our assessment has been limited by the level of information provided by Western Power in its access arrangement proposal, and its relatively high-level responses to our enquiries on several material issues. Also, the expenditure reviewed in the deep dives was only $3.2 billion in direct costs, which is a subset of the total proposed expenditure of $3.71 billion[10].

Table 1–2: Western Power AA5 capex forecast and Engevity recommended adjustments ($m)

Project/Program	AA5 Forecast Total Cost	AA5 Forecast Direct Costs	AA5 Direct Costs Adjustment	%Δ	AA5 Recom-mended
Undergrounding Programs	685.2	376.6	**-66.8**	**-18%**	309.8
Wood Pole Management	423.1	362.7	-	-	362.7
SPS & Microgrids	330.8	283.3	**-102.6**	**-36%**	180.8
Depot Program	145.8	125.3	**-27.6**	**-22%**	97.7
Replacement Program	912.0	781.6	**-147.7**	**-19%**	634.0
Distribution Augex	874.3	245.4	-	-	245.4
SCADA/Comms IT & Cyber	872.2	745.9	**-223.8**	**-30%**	522.2
AMI	311.3	257.5	**-97.5**	**-38%**	160.0
Total Expenditure Assessed	4,554.7	3,178.4	**-665.9**	**-21%**	**2,512.5**

The reasons for recommending significant adjustments to several Western Power CAPEX programs are outlined below. We recognise ERA's draft decision may take into account additional information not made available to us.

[10] Western Power Capex Model, Total Direct Network Capex (excl. Corporate Capex, escalation, adjusted for Capcons)

Undergrounding

Western Power's undergrounding program, such as the Network Renewal Undergrounding Program (NRUP), involves the targeted conversion of overhead powerlines to underground power. Western Power says it seeks to underground the network through financial partnerships with local communities (via the relevant local governments).[11]

We have recommended a reduced forecast of $309.8 million (direct costs) for the proposed undergrounding program – which is 18 per cent less than Western Power's proposal of $376.6 million (see **Attachment 8.1**). In summary:

- Western Power's proposed undergrounding CAPEX program is a 370 per cent increase compared to the AA4 period.
- Western Power states that a significant part of the metropolitan overhead network is reaching the end of its service life and will soon need to be replaced – the timing of the undergrounding projects is intended to address much of the overhead assets that require replacement.
- It is not clear that the scope of the proposed expenditure on undergrounding is commensurate with the need in the AA5 period – and the costs and benefits of alternatively replacing the overhead network were not explored in any detail by Western Power, essentially excluding the like-for-like replacement option.
- Ideally the capex for the AA5 period would be re-estimated using a detailed risk-based prioritisation of overhead asset replacement, and demonstrate clear cost efficiencies, a realistic likelihood of councils' participation and acknowledgement of delivery constraints for undergrounding over like-for-like options, on a project-by-project basis.
- Western Power experienced significant cost and delivery time over-runs during the AA4 period due to inaccurate scoping estimates of costs, local council challenges to deliver multiple projects, local government approval processes, and contractor pricing and availability issues.
- Our alternative estimate of efficient costs for Western Power's undergrounding program provides for significant undergrounding investment to occur during AA5, while allowing Western Power to implement lessons learnt from the AA4 period program – especially improved contractor management, scoping estimates of costs (considering local conditions), and management of local government stakeholders to better ensure these projects are delivered on time and to budget. Thereby enabling a more compelling business case to be developed for AA6 and beyond.

Standalone power systems and microgrids program

Stand-alone power systems (SPSs) are off-grid power systems that operate independently from the main electricity networks. Each SPS consists of a renewable energy supply (such as solar panels), battery storage, an inverter and, where necessary, a backup generator. Each SPS typically supplies electricity to a single property.[12] The Western Power SPS program is a key element of Western Power modular grid strategy.

We have recommended a reduced forecast of $180.8 million (direct costs) for the proposed SPSs and microgrids program – which is 36 per cent less than Western Power's proposal of $283.3 million (see **Attachment 8.3**). In summary:

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[11] Western Power access arrangement proposal, February 2022, p. 202.

[12] Western Power access arrangement proposal, February 2022, p. 35.

- Although SPSs represent a potentially low-cost option to supplying customers in Western Power's rural network area, we have significant concerns around the deliverability and efficiency of the proposed investment.
- Western Power will have delivered 187 SPSs over the entire AA4 period and is still collecting data, developing internal processes and otherwise in learning stages to deliver SPSs at scale.
- We consider Western Power does not currently have the capability nor systems in place to efficiently scale up to delivering between 290 to 355 SPSs each year of AA5 (totalling 1,583 SPS units over AA5), and the benefits to customers of such a large-scale role out are not adequately justified by Western Power.
- We are also concerned the SPS program is not cost efficient due to high unit costs and limited evidence that SPSs currently offer a more cost-effective solution for supply to customers than a like-for-like replacement of overhead distribution network assets.
- Conceptually we support the end state of Western Power's SPS program but consider that risks and customer benefits would be better managed by pursuing a less ambitious program in AA5 to ramp up delivery scale, consolidate learnings and get all the necessary processes and systems in place to efficiently roll out SPSs over the longer term.
- As a result of these adjustments, we recommend the costs related to Western Power's SPS program should also be removed on a pro-rata basis – these are the related ICT CAPEX as well as some OPEX items such as the SPS related OPEX and $61.0 million[13] non-recurring OPEX for line decommissioning should both be adjusted down on a pro-rata basis for any reductions on SPS CAPEX roll out which the ERA may adopt.

Replacement program

Western Power's transmission and distribution replacement CAPEX program covers all expenditure deemed to be required by Western Power to replace network assets that are at end-of-life and therefore pose an unacceptably high risk to Western Power's ability to maintain reliable supply.

For replacement program capex that is not allocated to the NRUP, SPS, metering or wood pole management asset replacement programs, we have recommended a lower forecast of $426.1 million (direct costs) for the proposed distribution replacement program and $207.9 million (direct costs) for the proposed transmission replacement program – which are 12.8 per cent and 29.1 per cent less than Western Power's proposal of $488.4 million and $293.2 million for distribution and transmission, respectively (see **Attachment 8.5**). We have assessed the NRUP, SPS, metering and wood pole management programs in detail separately and have therefore made recommendations on the capex related to those programs separately as well.

In summary:

- Western Power uses a risk-based approach to determine when assets require replacement, balancing criticality and condition and basing decisions on risk reduction and whole of lifecycle costs.
- We are concerned about Western Power's approach to risk management and the identification of assets to be replaced. From the information provided, we found Western Power's risk and failure volume forecasting algorithms consistently output increasing asset risk and failure volumes on almost every transmission and distribution asset category. This is not consistent with the experience of other networks in which each asset class follows different failure curves that range between a propensity for early failure, increasing end of life failures and relatively constant failures over an asset's life. Whist we were not provided with the models or details of

[13] Western Power, Attachment 7.8 – Operating Expenditure model, Non-Recurrent sheet

the algorithms, the outputs of the modelling suggest that asset aging significantly out weights condition information in the calculation.

- We recommend an overall adjustment to the total proposed replacement expenditure for transmission and distribution to align it with actual expenditure incurred in AA4. Western Power's AA4 expenditure has been demonstrably sufficient to meet network performance requirements and maintain safety and reliability.
- The reprioritisation of the replacement program to accommodate over $180m in additional unplanned SCADA investment beyond the level approved by ERA in AA4 – without major increases in failure rates over AA4 demonstrates the flexibility that exists within Western Power's replacement capex forecasting processes.

Overall, the replacement program is a very significant component of any network capex forecast. A systemic bias to over forecasting the risk and volume of failures across many asset categories can create a significant overstatement of asset requirements – even if the underlying assumptions are consistent with expert opinion and the logic of the forecasting process appears sound.

This is highlighted in the AER's 2010 review of ETSA Utilities (now SA Power Networks) that included a 49 per cent reduction to the replacement forecast due to systemic failure modelling imprecision – noting a $417 million and $6 billion estimate from two reputable consultancies of the value of the 'backlog' of over-age assets. [14]

Ultimately, we consider that recent trends in replacement expenditure and volumes represent a more accurate measure of the business's actual replacement decisions to meet their network safety and performance obligations than a forecast relying on a poorly calibrated tool that produces algorithms for failure forecasts that do not align with historical experience.

IT, SCADA and communications network

Engevity has defined the distribution and transmission SCADA, Comms and Corporate IT programs into a broad category referred to Information and Communication Technology or ICT Program. Specifically, this includes Western Power's:

- Information Technology capex which includes Corporate IT assets and systems to run the business;
- the Network IT (often called Operational Technology) assets and systems used to operate the electricity network itself;
- SCADA systems are important for capturing information from field devices, passing it to the control room and the system operator.

Collectively the Corporate IT, SCADA and communications (or 'ICT Program') provides information, systems, cyber security and infrastructure that allows Western Power to proactively manage the network to maintain safety and reliability.

We have recommended a lower forecast of $522.2 million (direct costs) for the proposed SCADA and communications network program – which is 30 per cent less than Western Power's proposal of $745.9 million (see **Attachment 8.7**). In summary:

- Western Power is forecasting a significant increase of 73 per cent in ICT program actual expenditure from AA4 or 171 per cent increase on the approved expenditure in the same period. These figures are based on Engevity analysis using the Western Power regulatory model.

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[14] Parsons Brinckerhoff, *Review of ETSA Utilities regulatory proposal for the period July 2010 to June 2015,* p 52

- We recognise and support the intent of Western Power's ICT strategy as well the moderate increase in the volume of works delivered by Western Power to date in AA4. However, we consider the scale of the AA5 ICT program is excessive and not adequately justified. Most notably, there is an absence of a clearly defined scope for the program that is aligned to identified network needs beyond the assertion that systems need to be modernised or need replacement once they are no longer supported by the vendor. There is also a clear issue that the accelerated timing of the current ICT program and increased expenditure is not aligned with a prudent and cost-efficient approach to electricity network ICT delivery and it is not clear how this acceleration minimises costs to customers. For example:
  - Our review found that assets are forecast to be replaced on a conservative asset age basis, rather than an actual asset condition or risk basis. Western Power has not demonstrated that ICT cost forecasts have been estimated with reference to efficient industry benchmarks or comparable implementations of major ICT systems in other networks. Such market assessment measures would have shown that the scale of the program is very high for an Australian network..
  - We also found that the acceleration of SPS and AMI deployment was not supported and is reasonably expected to face deliverability issues over AA5. The associated adjustment to these programs reduces the need and timing for some of Western Power's ICT capex program.
  - The Project Symphony trials are still at an early stage and Western Power should not pre-empt this project's findings by including substantial expenditure for large scale implementation. Should further expansion of Project Symphony be required, the system would likely provide benefits that are partially, or completely funded out of OPEX and capex efficiencies. Noting Western Power's demonstrated ability to reprioritise its AA4 network replacement program to accommodate over $180 million of SCADA additional investment beyond the level approved by ERA for AA4, we consider that there is sufficient flexibility in the overall capex portfolio to manage both network risk and prioritise emergent ICT capex needs.
- Western Power has not demonstrated the capability and resources to deliver its proposed ICT program for the AA5 period in a cost-efficient manner – especially given the scale of approved expenditure overruns experienced in AA4. Whilst we recognise the need for investment in ICT systems to support the network transformation strategy, it is critical that they are delivered in an efficient manner to ensure that the substantial investment in ICT systems delivers the expected benefits for customers whilst managing costs within the business case forecast that was justified by those benefits. To credibly mount a case for the scale of ICT and SCADA investment proposed by Western Power, it would need to demonstrate:
  - detailed business cases outlining the need, options considered, timing, delivery model and supported by detailed costs forecasts;
  - mature ICT program management systems;
  - replacing ICT infrastructure based on obsolescence, rather than on an asset condition basis is both prudent and efficient.
  - identification of strong vendor management and value-focused procurement of contracted ICT delivery partners;
  - demonstrably consistent ICT scope management and cost management outcomes;
  - robust ICT benefits estimation, delivery and verification processes;
  - consistent program/system implementation outcomes.

In the absence of this evidence, which appears to be a similar finding in AA3, Engevity considers the proposed ICT expenditure not to be prudent and efficient.

Advanced metering

Advanced metering infrastructure (AMI) refers to digital meters with a communication device installed to measure and report electricity use to network/market systems in near real time. Advanced meters can automatically and remotely read electricity flows and provide early detection of connection faults and supply issues. They provide a clearer picture of the power quality, including the voltage and current levels, and how much renewable energy is being fed back into the network.[15] AMI meters and the associated ICT systems are a key enabler of more flexible network and retail tariffs, which can drive more favourable consumer consumption behaviour.

We have recommended a lower forecast of $160.0 million (direct costs) for the proposed AMI program – which is 38 per cent less than Western Power's proposal of $257.5 million for the metering category (see **Attachment 8.8**). In summary:

- Western Power commenced its AMI rollout in 2019, with the intention of supplying all customers with AMI hardware by 2037. An estimated half-a-million advanced meters will have been installed by June 2022.
- The need for the program is supported by the WA Government and Energy Policy WA to address voltage control problems during high solar exports, enable time-of-use tariffs, and address system stability issues.
- Additional AMI meter replacements were added to the roll out during AA4 under the WA Government Service Connection Condition Monitoring (SCCM) program. The AMI meter provides ongoing monitoring of the continuity of the neutral conductor to the customer premises, which avoids the risk of shocks and tingles from metallic objects such as plumbing fixtures due to degradation of the overhead wire or underground cable between the customer premises and the network infrastructure on the street.
- Western Power is proposing to accelerate and effectively complete the AMI rollout in AA5, with a further 795,130 installations planned in the period.
- The main benefit claimed by Western Power is the acceleration by five years of neutral integrity monitoring for approximately 20 per cent of the customer. For example, Western Power asserts a 70 per cent reduced risk of electric shock to approximately 240,000 of customers over a five-year deferral period when compared to the original 2037 program.
  - the Government's Service Connection Condition Monitoring program sought to reduce shocks and tingles resulting from degradation of the neutral service wires/cables which connect houses to the street electricity infrastructure in AA4 and Western Power has cited the acceleration of service connection condition monitoring as the justification for the additional expenditure in AA5.
- The urgency of establishing the condition monitoring capability for these customers is already well mitigated by Western Power's previous safety activities and historical safety performance – taking account of factors such as:
  - the relatively young service wire population following the widespread Western Power 'Twisties' service wire replacement program in the early 2010's covering around three quarters of the overhead service wire population

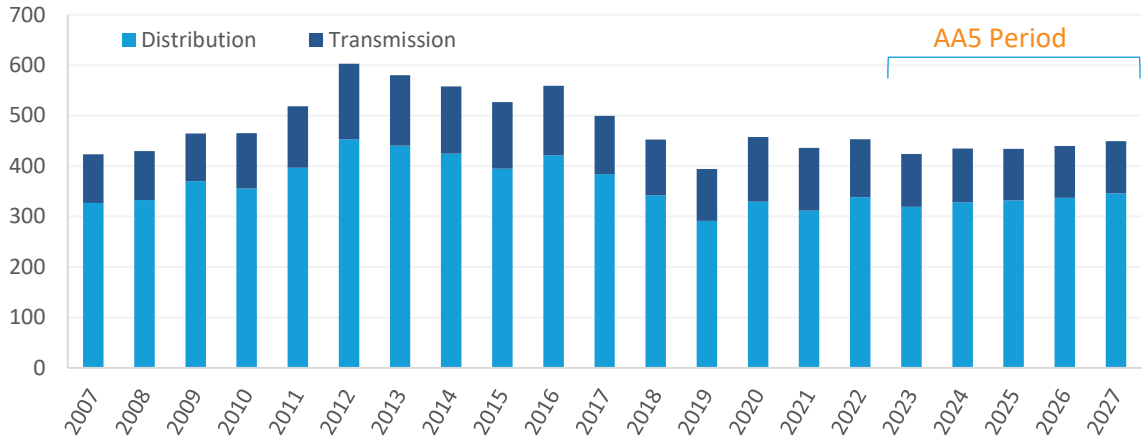
[15] Western Power access arrangement proposal, February 2022, p. 202.

  - the approximately 500,000 AMI customers expected to have condition monitoring by the end of AA4, approaching half of Western Power's meter population
  - the reduction in the number of overhead customers (where the greatest neutral integrity risk occurs) through substantial investment in SPS and undergrounding proposed in AA5 – even following our recommended adjustments to those programs.
- Overall, we consider Western Power does not have the ability to efficiently deliver the AMI program in AA5 and it is unlikely that the WA electrical services contractors have the resources to double the scale of the AMI rollout without incurring additional labour and accommodation expenses to attract meter technicians from interstate. Even if the proposed program were undertaken in AA5 it would not realise sufficient benefits to justify the increased costs it would impose on consumers.
- We also note Western Power's financial analysis explicitly includes a 'contingency allowance' of 10 per cent on AMI and ICT costs – effectively making allowance in the program budget for customers to fund the first 10 per cent of cost overruns. We consider this proposal would inefficiently transfer delivery risk to customers and, therefore, does not promote the Access Code objective or NFIT. We have recommended that this 'Contingency' or 'Risk Allowance' is removed from the AA5 capex allowance.

1.3 OPEX is relatively stable, despite transformation project

Western Power proposed OPEX of $2.18 billion is relatively stable from the previous period, as shown in the figure below.

Figure 1–2: Operating expenditure



Our recommendation is that the ERA does not accept Western Power's forecast OPEX of $2.18 billion ($real 30 June 2022). Instead, we recommend an alternative estimate of efficient OPEX of $2.02 billion. We consider our OPEX forecast promotes prudent and efficient expenditure, while allowing service performance, safety and network risk to be maintained within the range of AA4 outcomes (see **Attachment 5**).

The main reasons why we have recommended a lower forecast OPEX are that we applied:

- **Lower network growth escalation** of $33.0 million (down from $52.9 million) to account for:
  - the removal of the line-growth element in calculating the distribution network growth escalator – which we consider should be based on an estimate of finished AA5 line-length that is consistent with Western Power's plans to convert parts of the shared network to stand-alone power systems;
  - reverting the transmission network growth estimation back to factor in transmission connection points rather than overall customer numbers, as proposed by Western Power – which we consider would lead to a one-off step up in growth that is inconsistent with the approach for distribution and therefore not considered to be reasonable.
- **Higher productivity factor** of negative $110 million (compared to negative $14.3 million) to account for the greater efficiencies Western Power should expect to achieve from the investments to be made in SPS and AMI – even with our recommendation to scale these programs back for AA5.
  - Engevity considers, on balance, Western Power should be able to target an efficiency improvement across the AA5 period of 2 per cent per annum. This outcome is more consistent with Western Power's stated approach to estimating the productivity growth factor – using the most recent Australian Energy Regulatory (AER) benchmarking data available and distinguishing between movements in the efficiency frontier versus 'catch up'.
- **Removal of proposed step change** relating to the Silicone Treatment Program of $5.3 million per annum, which is not required under the relevant Energy Safety Order. Industry guidelines recommend alternative approaches.

- **Lower estimate of expensed indirect costs** (from $183.4 million to $161.8 million) by removing the network growth escalation item, which we consider does not significantly impact indirect costs because these overhead costs do not have a causal relationship to network size – unlike items such as labour costs and productivity changes.
- **Lower labour cost escalation** of $39.6 million (from $42.7 million) to, in our view, better reflect the expected economic circumstances of Western Australia in the AA5 period.

We did not have access to Western Power's OPEX governance documentation for our review.

Challenges in assessing OPEX proposal for AA5

Given the proposed transformation of Western Power to adapt its network to the rapidly changing energy landscape, the standard Base–Step–Trend methodology may no longer be an appropriate basis for forecasting recurrent OPEX – at least between AA4 and AA5. The proposed network transformation project, including the transition to deployment of SPSs, increased undergrounding and AMI, may represent a 'break' in the time series. In other words, OPEX items that have been largely recurrent in the past may no longer be part of Western Power's business-as-usual activities.

We were unable to test this assumption in Western Power's proposal. Despite our requests, Western Power would not or could not provide the cost detail underlying its planned OPEX – especially OPEX relating to Western Power's strategy to deploy SPSs, increased undergrounding and AMI. Although Western Power may claim its OPEX model accounts for these impacts, we did not have visibility of the OPEX line reductions netting off, for example, lower overhead system inspection and maintenance costs from increased undergrounding.

We were therefore limited in our ability to consider how these programs interact with Western Power's base OPEX. For example, Western Power's plans to accelerate its SPS deployment in rural areas will result in the removal of redundant network poles and wires, which would significantly increase OPEX as it transitions to a new cost structure. Detail on these anticipated transitional costs is not provided in Western Power's proposal or subsequent information request responses.

Despite the reductions to the OPEX forecast recommended above (engaging in the detail of Western Power's proposal), we consider Western Power will be under significant pressure to deliver its OPEX program within the allowance as it undertakes its business transformation project. There is a risk that Western Power's OPEX allowance is not adequate to manage several new initiatives, the interaction of those initiatives with normal operations, and the overall level of change. Western Power will need to exercise a level of governance and operational discipline that improves on its AA4 performance. Our recommendations to reduce delivery pressure across several of the network transformation programs should mitigate some of these risks by significantly reducing the overall scale of activity that Western Power is required to manage over AA5. But a holistic assessment beyond the detail of Western Power's OPEX proposal may be required to balance its overall revenue allowance.

In the same context, it is noted that there is a risk Western Power's proposed non-recurrent OPEX to decommission distribution overhead lines ($61.0 million) and remove the 66 kV transmission line ($7.4 million) will not be able to be fully completed in AA5. These are ambitious targets. Western Power is not bound by a regulatory obligation to meet these commitments and has discretion to defer these programs to AA6 (as distinct from making efficiency gains). If so, forecast efficient expenditure for AA5 will be overstated. Customers are not in a position to manage this risk, so ERA may consider mechanisms to commit Western Power to deliver these outcomes or better share risk.

2.0 REVIEW SUMMARY

2.1 The changing operating environment

As ERA recognises in its March 2022 Issues paper, advances in renewable generation technologies, the continuing take-up of rooftop Photovoltaic (PV) systems and likely similar trend for behind-the-meter batteries, the introduction of grid-side energy storage, and changing consumer choices and preferences, are significantly reshaping the dynamics of the power system and the demands on the electricity network.[16] The Western Australian Government recently announced closure of all state-owned coal power stations by 2030 as the growing focus on renewable energy through rooftop solar has forced a change to the energy system.[17] Government climate change policies to achieve net zero may require Western Power to more proactively make investments to promote the uptake of clean energy sources and new services. Moreover, extreme weather events such as storms, heat waves and bushfires have been having a significant negative impact on the network.[18]

Western Power is expecting to see a continuing uptake of rooftop solar, and a continuing decline in daytime minimum load on the network.[19] This presents significant challenges for Western Power. For example, in a September 2021 report, the Australian Energy Market Operator (AEMO) outlined the risks of declining levels of demand in the South West Interconnected System (SWIS) – including heightened threats to power system security – and recommended to:[20]

> *"As soon as practically possible, enable the capability to manage newly installed and upgraded DPV* [distributed photovoltaic] *(i.e., for output reduction and/or curtailment) on instruction from AEMO to a third party to assist in managing power system security and reliability in all emergency operational conditions, including during extreme low system load conditions and black start, as a measure of last resort (i.e., backstop capability)."* [21]

Government policies and initiatives are also driving change. The State Government launched an Energy Transformation Strategy in March 2019 to respond to the changing operating environment with the aim of delivering cleaner, affordable and more reliable energy to Western Australian households and businesses. The strategy includes:[22]

- **development of a 'DER Roadmap'** to identify ways to maximise the benefits provided by distributed energy resources (DER) in the power system of the future;
- **modernisation of the network connection and market arrangements** to allow more low-emission energy technologies to connect to the network;
- **the roll out of stand-alone power** systems in areas where they offer a more reliable and cost-effective supply option;
- **enablement of advanced metering** to deliver the smart energy solutions of the future (among other things).

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16 ERA Issues paper, March 2022, p. 1.

17 See: Media statements - State-owned coal power stations to be retired by 2030

18 As noted in Western Power's AA5 proposal, this includes: severe storms in May 2020 stretching from Quinns Rock in the north through to Albany in the south; the Wooroloo, Wundowie and Red Gully bushfires in January, February and March 2021; storm related flooding in Northam and surrounding areas in March 2021; Tropical Cyclone Seroja in April 2021; and heatwave conditions in December 2021 with four consecutive days above 40 degrees Celsius (p. viii).

19 ERA Issues paper, March 2022, p. 12.

20 AEMO, Renewable Energy Integration – SWIS Update, September 2021, p. 7.

21 This recommendation is made by AEMO as an alternative to disconnecting a distribution feeder or substation, which would interrupt power supply to all customers in suburbs connected to that part of the network (both with and without rooftop solar).

22 See: Energy Transformation Strategy 2019-2021 (www.wa.gov.au)

An innovative pilot, Project Symphony, is being undertaken in Western Australia where eligible DER, like rooftop solar, batteries and selected household appliances, will be coordinated as part of a Virtual Power Plant (VPP). The Project Symphony VPP organises and aggregates the connected DER to generate and store electricity at a local level – combining the energy sources of the DER and orchestrates them to smooth out the supply and demand for electricity.[23]

Looking ahead, the State Government's DER Roadmap identifies a potential new role for Western Power as a distribution system operator (DSO). A DSO would require high visibility of the distribution network and, for example, could be responsible for:

- enabling connection and operation of active DER on the network, while ensuring the network operates within its technical limits;
- identifying and managing network technical issues as they arise, and engaging DER providers to mitigate these issues where it is the most efficient solution.

Another significant change is amendments to the Networks Access Code in July 2021 to support the introduction of constrained network access. This a key reform under the WA Government's Energy Transformation Strategy.[24] A new market design based on security constrained economic dispatch will be introduced in October 2023 – replacing the current market design that assumes all generators have 'firm' access rights to the network. Under the new market design, the algorithm used to decide which generators will be dispatched will take into account both the price offered by the generator and any constraints in the network. Western Power has based its proposed standard access contract, applications and queuing policy and contributions policy on the revised documents included in the Access Code.[25]

Western Power reports customers expect it to integrate more renewables into the grid and to prepare the grid for the future.[26] This notwithstanding, independent research as part of Western Power's Community and Customer Engagement Program found customers are open to increased investment in community batteries, stand-alone power systems and microgrids, but remain cautious as to how much additional cost they are willing to absorb.[27] Western Power also notes that 'the feedback from customers is that they are happy with their level of reliability and do not value additional investment to improve reliability'.[28]

Western Power is expected to deliver the above government policy objectives, meet customer needs and preferences, and continue to adapt its network to the changing environment – while maintaining acceptable standards of service quality and reliability for customers.

2.2 Western Power's network transformation

The complex and significant work required to upgrade grid infrastructure to minimise adverse grid impacts and maximise the benefits of distributed energy resources such as rooftop PV and behind-the-meter storage requires considerable time and resources. Electricity networks were not designed to accommodate high levels of export from DER, and networks across Australia and around the world are responding to these challenges differently.

ERA acknowledges that Western Power's network will need to be reconfigured and modernised, as well as operated differently to support and enable the transformation of the State's electricity

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23 See: Project Symphony is paving the way for our brighter energy future (www.wa.gov.au)

24 See: Electricity Networks Access Code – Tranche 2 amendments (www.wa.gov.au)

25 ERA Issues paper, March 2022, p. 26.

26 Western Power access arrangement proposal, February 2022, p. x.

27 Western Power Community and Customer Engagement Program Report, attachment 4.1, February 2022, p. 5.

28 Western Power access arrangement proposal, February 2022, p. 71.

sector.[29] At the same time, Western Power seeks to reduce the risks and adverse community effects associated with its overhead network, which has received significant scrutiny in recent years, and to re-structure its underlying operating cost structure.

Western Power states the rise in technologies such as solar PV, energy storage and electric vehicles (EVs), and the emergence of new business models such as virtual power plants (VPP), microgrids and stand-alone power systems (SPS), has accelerated its need to respond to this constantly and quickly changing environment.[30]

Western Power says to meet customers' needs in the future requires it to transform the network into a 'modular grid' – moving from a traditional network towards one which incorporates a mix of new energy solutions that can potentially plug into or out of the grid as needed. Western Power states new solutions forming the modular grid include:[31]

- SPS which combines solar, storage and potentially a generator, allowing a customer to be disconnected from the main grid;
- **microgrids which are small scale power grids** providing power to an entire community, which may be used in preference to or as backup connections to the main supply system during outages;
- **battery energy storage systems**, which can be used for local communities to store excess solar power, or to be used as a temporary backup if the main grid goes down.

Western Power states the modular grid will consist of three zones:[32]

- a **tightly meshed urban network** of increasingly underground assets that will service the majority of customers;
- a **hybrid network of mostly overhead assets** but new technologies such as SPS and connected microgrids where possible;
- an autonomous stand-alone network of remote power systems such as SPS and disconnected microgrids.

Box 1 below highlights the proposed expenditure associated to some of the above initiatives. These are major investment decisions – particularly given Western Power is focussed on CAPEX programs with assets like AMI, information and communications technology (ICT) and SPS that have shorter asset lives than traditional network infrastructure. This will result in higher depreciation costs and more frequent re-investment, both of which would ultimately be paid for by Western Australian customers. As a result, it is imperative that these investments are prudent and efficient to achieve good outcomes whilst minimising costs to consumers.

Although the above CAPEX and OPEX programs may be considered necessary steps to transform Western Power's network to take advantage of the opportunities of new technology and market developments, and achieve net zero emissions, the efficiency of costs and timing of implementation requires careful consideration.

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29 ERA Issues paper, March 2022, p. 15.

30 Western Power access arrangement proposal, February 2022, p. 14.

31 Western Power access arrangement proposal, February 2022, p. 14.

32 Western Power access arrangement proposal, February 2022, p. 19.

Box 1: Western Power network transformation projects

The following programs proposed by Western Power for the AA5 period highlight its plans to undertake significant investment to develop its network into a modular grid:

Western Power has developed a new program to **target conversion of overhead areas to underground power, proposing $681.8m CAPEX** to underground 875 kilometres of overhead distribution lines.

Western Power intends to **transition 4,000 existing connection points to either SPSs or remove the supply** with the agreement of the customer by 2031 – **proposing $330.8m CAPEX and significant line decommissioning OPEX to install 1,861 SPS units** and remove the associated 19,000 poles and conductors.

Western Power **proposes $22m of OPEX to develop DSO capabilities**, as well as $6m of CAPEX to support Project **Symphony** (an innovative industry trial) and $4.1m OPEX to implement stage 1 of the Energy Transformation Strategy.

To increase visibility (and potentially control) of the distribution network, Western Power **proposes $311.3m of CAPEX to roll out advanced meters across most of the network – which is partially offset by operating expenditure savings of $13.8m**. This, Western Power says, will enable the effective integration of DER solutions for mitigating the risk of low load, enabling flexible tariffs and allowing end-use electricity customers to actively participate in the energy market.

Western Power **proposes to modernise its Supervisory Control and Data Acquisition (SCADA) and telecommunications systems during the next two regulatory periods** to support a digital network and enable the integration of distributed energy resources. The **AA5 proposal includes $483.4m of CAPEX and $19.5m of OPEX for these systems.** Western Power considers this investment will enable a secure transformation to the modular grid by improving cyber security controls and enabling the introduction of new and emerging technologies.

2.3 The scale up has not been justified

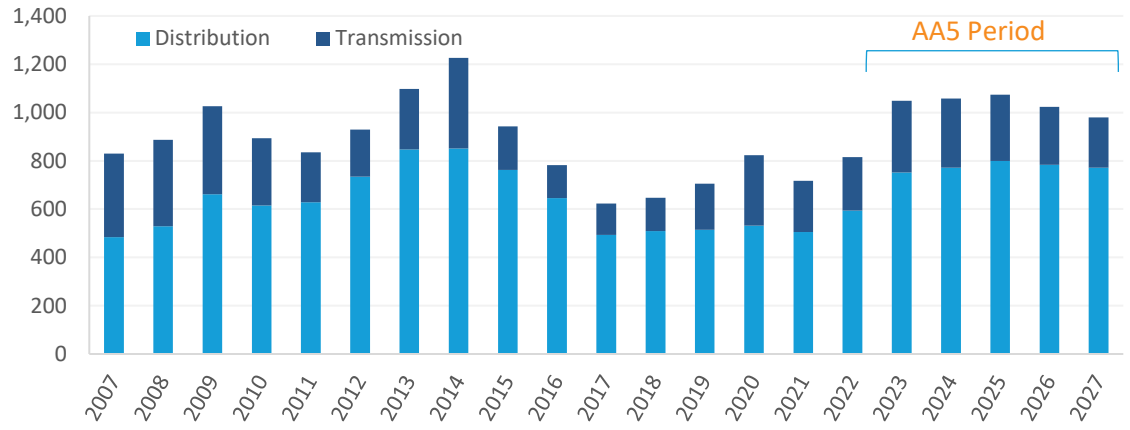
Many of the proposed CAPEX and OPEX programs promote innovative ways of utilising the network platform to support multiple services that future energy system users may demand – including energy production, storage and trading, in addition to energy consumption.

However, Western Power's proposal – especially its CAPEX program of $5.376 billion:

- has not demonstrated the sheer scale of planned investment is achievable over the AA5 period;
- is not supported by robust business cases or optional analysis of the benefits and costs to customers;
- seeks to replace assets that may still provide valuable services to customers at low cost; and
- is based on often inconsistent and unvalidated underlying assumptions.

In our view, Western Power's proposal to increase its investment program by 40 per cent from AA4 to AA5 (as shown in the figure below) is too ambitious to the extent of being unachievable. **We consider Western Power should aim to develop its capacity to deliver the network transformation program over both the AA5 and AA6 periods**. In other words, Western Power could spread these programs over both the AA5 and AA6 periods to ensure they are efficient, improve their quality, and lower their cost.

Figure 2–1: Historical and forecast CAPEX



Western Power AA5 Regulatory Model

Western Power has responded to the recent challenges from minimum demand with sensible investment in voltage management approaches to alleviate the immediate voltage control issues and continue to address the impact for new solar connections via emerging requirements for control of inverters on new solar installations. With approximately 500,000 advanced meters expected to be installed by the start of AA5 in July 2022, and lower cost non-AMI reliant inverter control capability offered via Synergy's online control portal.

It is Engevity's view that much of the infrastructure that Western Power sees as necessary for the transition is already in place to respond to the network challenges that will emerge in AA5. Western Power's proposal seeks to accelerate the installation of much greater quantities of assets such as an order of magnitude increase in SPS deployment and an aggressive acceleration of AMI Meters. It is difficult to endorse this approach without evidence that Western Power has, is able to, or is planning to aggressively leverage the benefits from the existing 500,000 AMI meters on the network.

This is particularly material given the disconnect between Western Powers proposal and the benefits claimed in the supporting analysis (faster AMI uptake will drive a strong customer uptake and sustained response to variable tariffs – driving substantial deferred network investment benefit, improving response time and rectification time for outages - creating reliability benefits, controlling rooftop solar inverters for grid stability, service cable condition monitoring).

- These **investment deferral benefits become challenged in the environment of a flat demand forecast** with no impact of EV charging or from flexible tariffs, as there is notionally very little investment in new network capacity in the forecast that can be avoided through:

  a) customers having an AMI meter

  b) customer consumption patterns responding to flexible tariffs

  c) controlling solar inverters when there is a lower cost online portal solution that doesn't rely on AMI meter functionality or Western Power's AMI mesh communications network.

- **the available reliability benefits are limited** other than on long rural feeders. This is because Western Power is largely meeting its reliability obligations with customer feedback indicating that there is limited willingness to pay for reliability improvements outside outer rural areas of the network – which is targeted through SPS deployment and likely to be supported by a review of operational practices in AA5 that may enable faster re-energisation under certain higher risk-customer consequence conditions.

- **the safety benefits are limited by Western Powers strong existing safety performance** for the Service Conductor Condition Monitoring capability. Targeting of problem areas in AA4 and recent ~$100m+ replacement of almost all customer overhead service cables within the past 10-15 years means that risks are already well mitigated.

    This major overhead service cable safety program (known as the 'Twisties' program) means that Western Power is not exposed to the same service cable deterioration issues as other networks that typically have services cables that have been exposed to wind, rain, salt and UV for 30-40 years.

Overall, we consider that the proposed solutions are appropriate and innovative, however, they need to be justified against the value of benefits that they provide to customers, and not simply against Western Power's risk appetite or strategic planning. This involves trade-offs to optimise the scale, staging and timing of program to demonstrate that the expenditure efficiently minimises costs in accordance with the Access Code requirements.

2.4 Capacity and capability to deliver concerns

The accelerated timing of Western Power's proposed CAPEX and OPEX programs do not reflect the current labour market challenges (skills shortage) being experienced in the Australian economy, and its capability limitations to deliver similar programs in AA4 – especially its SPS, undergrounding, ICT and AMI programs. We have formed this view based on the information provided by Western Power in response to our requests during our review. We have developed our recommended alternative estimates of efficient program levels and their associated costs based on our expertise and experience, and our assessment of Western Power's delivery performance in AA4.

For example, Western Power will have installed 187 SPS units over the entire AA4 period. We expect Western Power has increased its capability and systems to scale up SPS deployment by continuing to collect data and develop its internal processes (among other learnings). However, Western Power is proposing to increase volumes to 317 SPS units per year on average in the AA5 period – with a proposed total of 1,583 SPS units installed over AA5.

This planned scale up, in our view, is likely unachievable and Western Power has not given us a basis (or justification) to consider otherwise. Conceptually we support the end state of Western Power's ambitious SPS program however consider that its delivery should ramp up over AA5 from current levels to enable full-scale delivery in AA6. This will ease delivery pressure on contractors while Western Power 'develops the market' for Western Australian SPS service providers, maximise the learning curve benefits from the AA5 program, and leverage the reductions that are forecast to occur in the cost of rooftop PV systems and behind-the-meter batteries.

For its undergrounding program, we note that Western Power is already experiencing deliverability constraints in AA4 due to local government and contractor constraints. Nevertheless, Western Power has proposed an accelerated program with related CAPEX increasing 370 per cent in AA5. Our alternative estimate of efficient costs allows Western Power to implement lessons learnt from the AA4 period program so its undergrounding projects are delivered on time and to budget, and to continue to build its capability through to AA6.

As noted through Western Power's consultation, customers generally 'do not value additional investment to improve reliability'.[33] Noting our acknowledgement of the modular grid approach, we support additional investment in SPS and microgrids – however, a tenfold increase on Western Power's AA4 program is likely unachievable.

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[33] Access Arrangement Information, 1 February 2022, Western Power, p. 71

2.5 Demonstrated customers benefits unclear

If the access arrangement proposal is approved in its current form, we consider there is a significant risk that Western Power's accelerated program will lead to over-investment and cost inefficiencies. The Code objective requires Western Power to make timely investment decisions to promote the long-term interests of consumers. The onus is on Western Power to demonstrate the value for money of its CAPEX programs for customers.

Western Power's access arrangement proposal lacked the level of detail required (such as the underlying models and assessment methodologies used) for us to undertake a comprehensive assessment of key CAPEX projects. Moreover, despite our information requests, Western Power generally provided limited and delayed responses – hampering our ability to conclusively review its plans.

As a result, our alternative estimates of efficient costs rely on comparative analysis against other networks and our experience and expertise of prudent industry practice. For context, our team has consulted to all Australian networks on regulatory and investment matters, been involved in over 30 regulatory determination processes across Australia and New Zealand for either the businesses or the regulators, worked within several network businesses across regulation, pricing, asset strategy, operations, program delivery, strategy and innovation. Some of our team have also held executive positions in Australia's largest distribution businesses.

We recognise ERA's draft decision may take into account additional information not available to us, or the ERA may choose to exercise its regulatory discretion to take an alternative position on matters.

An example of Western Power overstating the benefits of its proposed CAPEX program is for the AMI rollout. Western Power did not quantify the safety benefits from the AMI acceleration, despite asserting that the primary benefit of the proposal was justified on the basis of reduced safety risk from earlier neutral integrity monitoring. Even at the highest end of our estimates of the potential safety benefits, we could not reconcile Western Power's business case.

Also of concern is the inclusion of contingencies in some projects. For example, the proposed AMI program includes an explicit 'contingency allowance' of 10 per cent on meters and ICT costs. This is similarly reflected in Western Power's CAPEX spend for AA4, suggesting Western Power systematically over-states costs in the regulatory forecasts.

2.6 Conservative risk profiling of replacement assets

There are several examples of Western Power making conservative estimates of asset lives compared to standard industry practice, which are then used to justify the need for new investment. Given the significant proposed investment in shorter life assets such as the SPS, AMI, IT, SCADA and communications categories over AA5, it is important that these assets are depreciated over their full life to minimise costs to customers.

For example:

- For its SCADA and communications program, we consider assets are being prematurely replaced on a conservative asset age risk basis, rather than actual asset condition basis or prioritisation on higher risk assets. Western Power has also not demonstrated that ICT cost forecasts have been estimated using efficient industry benchmarks. Western Power's AA5 forecast $483.4m for AA5 for Dx and Tx SCADA is significantly higher than expenditure levels of all other Australian transmission and distribution businesses – in most cases double and even triple.
- We are concerned about Western Power's approach to risk management and the identification of assets to be replaced. From the information provided, we found Western Power's risk and failure forecast algorithms consistently output increasing asset risk and failures over almost

every transmission and distribution asset category. This is not consistent with the experience of other networks in which each asset class follows a different failure curve.

2.7 Business cases lack validated assumptions

Many key assumptions underlying Western Power's proposal are highly questionable. In some cases, Western Power has ignored critical trends that should influence its investment strategy but are not accounted for in the business cases.

For example, Western Power's demand and energy forecasts – which underlie many of its CAPEX and OPEX business cases – did not capture 'structural changes' in peak demand and minimum demand, including the adoption of new technologies like EVs and battery storage. Instead, Western Power relied on historical trends that do not necessarily reflect the major changes in its operating environment that will almost certainly occur over AA5. Increasing uptake of behind-the-meter batteries and EVs (which is potentially a very significant new load) is likely to offset some of the impact of the higher solar PV penetration that is driving lower midday minimum demand periods. Western Power proposes new investment to overcome minimum demand issues without accounting for these trends. In practice, there is reasonable possibility that daytime EV charging may mitigate minimum demand instabilities within a 5–10 year timeframe (noting that both solar PV and EV uptake are likely to accelerate due to the impact of current high global energy prices).

Also, although Western Power assumes a rapid uptake of customers responding to time-of-use tariffs in its financial analysis for the AMI program benefits (35 per cent of AMI customers by 2023, and 55 per cent by 2027), Western Power does not reflect the impact of customers shifting their load profile in response to price signals in its demand forecasts. So, on the one hand Western Power assumes significantly higher adoption and response of time-of-use tariffs than any network in the NEM has achieved, yet does not account for any resulting smoothing of peak or minimum demand periods within the business cases of its proposed flagship CAPEX programs.

Western Power considers accelerating the roll out of AMI to all customers would enable increased control of inverters to prevent system black events. While this mechanism would likely increase Western Power's ability to manage the purported $b+ scale risk. Western Power assumes there would be no changes to regulation or power system operation, and that no other technical option is available to meet the stated needs in AA5. Ultimately, this materially overstates the risk on several fronts. In practice, there would certainly be a regulatory and operational response as the timing and likelihood of the event becomes more imminent. There are also several technical solutions with lower cost and faster implementation times that have proven successful in the South Australian network and elsewhere to improve system resilience considering high renewables, high rooftop solar, interconnector constraints and islanded operation over recent years.

2.8 Demand forecasts do not consider critical trends

We consider there are several areas of Western Power's approach to forecasting energy and demand that are fundamentally not fit-for-purpose. These forecasts require adjustments to more accurately inform the proposed CAPEX and OPEX forecasts, as well as the strategic direction of the transformational modular grid strategy (see **Attachment 3**).

Western Power's energy forecasts are driven by historical relationships – for example between energy consumption and economic activity, electricity prices, and substitution factors. However, this forecasting approach is not consistent with Western Power's proposal to undertake a network transformation program to respond to the major changes in its operating environment.

Western Power has not adequately considered the 'structural changes' in demand, including the adoption of new technologies like EVs and battery storage, that are not reflected in the historical data. Other factors such as:

- the **expected size of newly installed solar PV systems**, which has increased significantly over time, with 6-10kW systems typical and 13kW+ not uncommon. Five years ago, 3-7kW systems were typical. 10 years ago, 1.5kW systems were the norm.
- the **level of saturation of rooftop PV and other forms of DER within different areas of the network**, for example, it is not plausible that penetration exceeds the number of residential buildings in the area.
- the consumption behaviour of new customers, as compared to existing.
- customers' response to new tariff structures being proposed by Western Power.

also mean assuming historical relationships will largely continue through the AA5 and AA6 periods is clearly a flawed approach.

For example, increasing uptake of behind-the-meter batteries and EVs is likely to offset some of the impact of the higher solar PV penetration that is driving lower minimum demand periods. This impact will be more significant if cost reflective pricing structures are implemented to smooth demand for consumption and export services as much as possible. Western Power proposes a very low, 'super off-peak' energy price for consumption to encourage more use of the network during periods when solar panels are exporting renewable energy to the grid.[34] By design, this will encourage customers to shift load to and charge their EVs during the middle of the day where they are able.

Western Power proposes new investment to overcome minimum demand issues but does not account for the above factors, nor does it include sensitivity analysis. This is a significant error. The benefits of Western Power's proposed CAPEX will be overstated – all other things being equal.

Further, Western Power's approach and input assumptions do not appear to:

- **align with AEMO's latest forecasts** (2021 ESOO) of DER uptake (e.g., PV);
- account for potential changes in the size of future PV systems (as compared to historical);
- contemplate how the spatial take up of PV may change over time (relative to history).

We have sought to account for these factors in assessing Western Power's AA5 proposal, but the impacts on planned CAPEX and OPEX programs require more detailed consideration due to the interrelationships between several programs.

2.9 Western Power benchmarks well

We have benchmarked Western Power against the other Australian electricity networks to provide a high-level check on the performance of Western Power and potentially highlight areas of concern. We acknowledge that benchmarking cannot always account for the differences between any two network service providers – particularly given the unique circumstances of Western Power, including its combination of transmission and distribution services (see **attachment 2**). However, we consider benchmarking at least provides useful context for our efficiency assessments.

Based on the partial performance indicators from the AER's 2021 distribution benchmarking report Western Power appears to be a relatively efficient network service provider. This is a similar conclusion to the previous benchmarking work that GHD completed for the AA4 review – which is to be expected because the AER's process uses five-year averages to smooth year on year volatility. For the avoidance of any doubt, we have not attempted to define or apply any Operating Environment Factors to capture any cost drivers that are unique to Western Australia, as the AER applies as an adjustment to OPEX benchmarking results.

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[34] Western Power access arrangement proposal, Tariff Structure Statement Overview, Appendix F.1, p. 3.

Our results indicate Western Power performs well on:

- distribution total OPEX per customer, per kilometre of circuit length and per MW of maximum demand;
- distribution total cost per customer, per kilometre of circuit length and per MW of maximum demand.

However, Western Power's service performance compares poorly to the other networks in statistics that measure unserved energy. These performance measures are expressed in terms of the System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) to reflect the 'average' consumer's annual interruption duration and frequency. These are often reported by feeder type (CBD, urban, short rural, long rural) and used to set reliability targets.

This performance benchmarking highlights concerns with the following service measures:

- rural long and urban type feeder SAIDI;
- rural long and urban type feeder SAIFI;
- transmission average outage duration.

2.10 Governance and asset management aligns with good industry practice

Our review of Western Power's governance systems, processes and policies forms an important part of the expenditure assessment (see **Attachment 1**). The business' investment governance framework (IGF) should be aligned with good industry practice and applied appropriately. If so, this would give us greater confidence Western Power can deliver prudent and efficient outcomes for its customers.

We consider Western Power's IGF is consistent with good industry practice and has appropriate check points and approvals for investment, which promote prudent and efficient investment decisions. Internal audit reporting found that the IGF design was adequate and fit for purpose and was operating effectively. Although the internal audit indicates no major issues with the application of the IGF, it is silent on the effectiveness of the framework in meeting cost, schedule and benefits realisation tolerances at key decision milestones.

The asset management framework and systems used by Western Power have been reviewed against ISO 55000 and ERA asset management system requirements. We consider they are compliant. For example, the risk-based approach to asset management used by Western Power is consistent with good industry practice – it has applied data driven methods and expert judgement to quantify the likelihood of failure events.

Strong governance is a key to success for all organisations. In a regulated environment, where decisions and performance are reviewed by government agencies, governance is vital to ensure that valid decisions are made, and operations are run efficiently and in accordance with the code and regulation. This should ensure that customers benefit from a well-managed and efficient businesses, delivering network services at the lowest long-term cost.

Western Power's governance framework consists of its policies, processes and procedures that are used in the planning process to prioritise and allocate CAPEX and OPEX.

For its CAPEX program, Western Power is expected to:

- prioritise investment in areas where returned value is maximised;
- follow robust and reproducible processes to assess alternative investment options and justify the option selected;
- ensure investment decisions align with Western Power's overarching regulatory mandate and customer needs, including approval at the appropriate executive level;

- consistently measure progress and performance, follow a structured approach to analyse and report on learnings and integrate learnings into future decision processes.

For OPEX, Western Power's governance systems should result in:

- accurate, clear and sufficiently granular operational budgets;
- a robust and reproducible performance assessment framework to identify areas of underspend or overspend and provide a framework to develop a solution;
- proactive identification of efficient alternatives or innovations to reduce costs or improve the value created.

Engevity's review of governance and management systems within Western Power are key to assessing the validity and credibility of Western Power's expenditure proposal. Forecasts based on mature, well-designed systems allow greater confidence in their outcomes, especially where also supported by consistently applied business processes and work procedures.

The nature of electricity networks and information asymmetries mean that there will always be a significant degree of uncertainty in future requirements – including customer, electricity market and broader economic factors. Western Power's governance systems should enable it to efficiently and effectively account for uncertainty and adjust its approach as needed. These factors have been considered in the context of the SWIS and the scale and timing of approaches adopted by other Australian network businesses.

We expect that certain challenges facing Western Power over the AA5 period will particularly test the efficacy of Western Power's governance processes. These challenges include stand-alone power supplies, EV charging, solar penetration, demand side management (DSM) and network control – which will require specific focus and analysis that may depart from previous approaches.

All expenditure decisions made by Western Power should occur within the corporate systems for governance, investment decision making, planning standards and strategic asset management direction. We recognise that certain projects or initiatives may be approved to be delivered under alternative arrangements (such as strategic projects, joint ventures/alliances, new technologies/systems that don't fit existing frameworks). The alternative framework should still provide comparable transparency, control and oversight in order to demonstrate its efficiency in delivering favourable customer outcomes.

3.0 BACKGROUND

3.1 Our task

Western Power submitted to the ERA its proposed revisions to its Access Arrangement for the fifth access period on 1 February 2022. The Electricity Networks Access Code requires Western Power to detail its proposed terms and conditions for access to its network and consequential activities for each regulatory activity.

ERA is responsible for assessing each proposal as to whether it promotes efficient investment in, and efficient operation and use of, services of networks in Western Australia for the long-term interests of consumers.

Engevity was engaged by ERA to undertake a technical review of the prudency and efficiency of Western Power's proposed expenditure for the AA5 period and provide recommendations on an alternative level of expenditure where required. Our review encompasses an examination of Western Power's proposed CAPEX and OPEX, including an assessment of their historical performance, benchmarks, governance and asset management processes, regulatory depreciation via the consideration of standard lives, and interactions with regulatory incentives and adjustments.

This report details our findings and recommendations of this review.

3.2 Regulatory framework

The Western Australia Electricity Networks Access Code 2004 sets out the requirements on Western Power to submit an Access Arrangement proposal to the ERA for review and approval for each access period. Western Power's AA5 proposal covers the upcoming AA5 regulatory period, which extends from July 2022 to June 2027.

The purpose of this process is to set an efficient revenue allowance – one that enables Western Power to undertake efficient investment in and operation of its network – and to provide incentives for the network to outperform the allowance during the period – consistent with the Code objective outlined above.

The Western Australian regulatory framework follows a similar, but not identical, approach to those adopted in other Australian and international jurisdictions.

The Western Australian framework provides a stronger mechanism for ex-post (after the fact) review of actual expenditure against the New Facilities Investment Test (NFIT) to ensure any historical inefficiencies within the preceding AA period can be excluded from the value of the future asset base. As outlined in more detail in section 1.2.1 below, this test requires that any capital expenditure to be included in the regulatory asset base (RAB) must be:

- Efficient, on the basis that the investment solution selected has the least cost or greatest net benefit over the long-term compared to any viable alternative solution;
- Necessary to maintain the reliability and security of the network or otherwise results in net benefits to users or additional revenue that would outweigh the cost of the investment.

As such, this review assesses the efficiency of both Western Power's proposed expenditure for the AA5 period as well as its actual expenditure over the previous AA4 period covering 2017–2022. ERA can adjust both the proposed AA5 expenditure and the actual AA4 expenditure recovered by Western Power where it is found that the proposed or actual expenditure is not efficient. As part of this review, Engevity has made recommendations for expenditure adjustments where we have found it to be warranted, based on the information we have been given and comparison with industry experience and practice elsewhere in the NEM.

3.2.1 New Facilities Investment Test

The capital expenditure has been assessed against the NFIT as outlined in the Access Code (box 2).

Box 1: New facilities investment test

"New facilities investment test

6.52 New facilities investment satisfies the new facilities investment test if:

the new facilities investment does not exceed the amount that would be invested by a service provider efficiently minimising costs, having regard, without limitation, to:

whether the new facility exhibits economies of scale or scope and the increments in which capacity can be added; and

whether the lowest sustainable cost of providing the covered services forecast to be sold over a reasonable period may require the installation of a new facility with capacity sufficient to meet the forecast sales; and

if it is not a priority project, alternative options to the new facility (including the capital costs and non-capital costs that would be incurred in respect of that alternative option); and

one or more of the following conditions is satisfied:

i. either:

the anticipated incremental revenue for the new facility is expected to at least recover the new facilities investment; or

if a modified test has been approved under section 6.53 and the new facilities investment is below the test application threshold – the modified test is satisfied; or

ii. the new facility provides a net benefit in the covered network over a reasonable period of time that justifies the approval of higher reference tariffs; or

iii. the new facility is necessary to maintain the safety or reliability of the covered network or its ability to provide contracted covered services; or

iv. the new facility is in respect of a priority project."

The purpose of our review is to reach a conclusion on the following:

Is the proposed expenditure efficient, with the objective of minimising costs?

Have available and **realisable economies of scale and scope** been efficiently captured?

Is the proposed investment **consistent with reasonable expectations** of the level of future network services required by customers?

Have a **reasonable range of alternative options been considered** for the proposed investment, with the most appropriate solution chosen?

Does the proposed expenditure meet one or more of the following conditions?

Is the **cost of the new facilities investment reasonably expected to be recovered** by the incremental revenue?

Does the proposed/actual investment deliver an expected net benefit over a reasonable period of time that justifies higher tariffs?

Is the proposed investment necessary to maintain the safety and reliability of the network or its ability to provide contracted network services?

Is the proposed investment required to deliver a priority project?

We note that there are no priority projects currently identified for the AA5 period.

3.3 The building block model

ERA uses a tool known as the 'building block model' to help set the annual revenue allowance of Western Power. It allows ERA to spread the capital expenditure of the business over time in such a way that Western Power receives a reasonable assurance that it will be able to pay back its lenders, with interest, and provide its investors with a reasonable return on their investment—given the relative risk of the business compared to other investments.

The building block model comprises:

- **Return *on* Assets** | Western Power's approved CAPEX contributes to a RAB on which Western Power is allowed a fixed return based on an agreed weighted cost of capital (WACC). Revenue is calculated as RAB x WACC.
- **Return *of* Assets** | Western Power is provided a revenue stream to account for regulatory depreciation of its assets.
- **Opex** | Western Power forecasts its operating expenditure for each regulatory period to be approved for recovery by ERA.
- **Regulatory Tax Allowance** | Western Power also receives and allowance to recover an efficient benchmark of tax expenditure or tax equivalent payments to State Treasury where appropriate.
- **Regulatory Incentives and Adjustments** | There are several performance incentives and adjustment schemes that can provide additional revenue or fees to Western Power based on the performance of their network against key performance targets. These financial incentives encourage Western Power to seek efficiencies and improve its service beyond the minimum requirements set out in regulation.

All regulated network revenue is recovered from network customers through the network component of their electricity supply bills.

3.4 Report Structure

Our detailed assessment and review are included in the supporting attachments document. The structure of this document is as follows:

- Attachment 1: Governance Framework, Policies and Procedures
- Attachment 2: Benchmarking
- Attachment 3: Demand Forecast
- Attachment 5: OPEX
- Attachment 6: Asset Lives
- Attachment 7: Historical AA4 CAPEX
- Attachment 8: Forecast AA5 CAPEX