



Department of **Energy, Mines,
Industry Regulation and Safety**
Energy Policy WA

Goldfields Region Electricity Forum

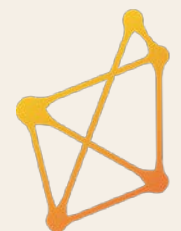
1 November 2024



PoweringWA

Acknowledgement of Country

The Government of Western Australia acknowledges the traditional custodians throughout Western Australia and their continuing connection to the land, waters and community. We pay our respects to all members of the Aboriginal communities and their cultures; and to Elders both past and present.



Agenda

Time	Item
9:30am	Acknowledgement of Country
9:40am	Opening Remarks
9:45am	Ministerial Address
10:00am	Kalgoorlie Supply Arrangements
10:20am	Morning Tea
10:50am	Supporting Our Future Energy Requirements
11:20am	Goldfields Regional Network: Modelling and Next Steps
11:50am	Powering the Goldfields: For Today and Tomorrow
12:30pm	Closing Remarks
12:40pm	Lunch
1:30pm	Event Close



Ministerial Address

Hon. Reece Whitby MLA



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Kalgoorlie Supply Arrangements

Gair Landsborough, Executive Manager Asset Management

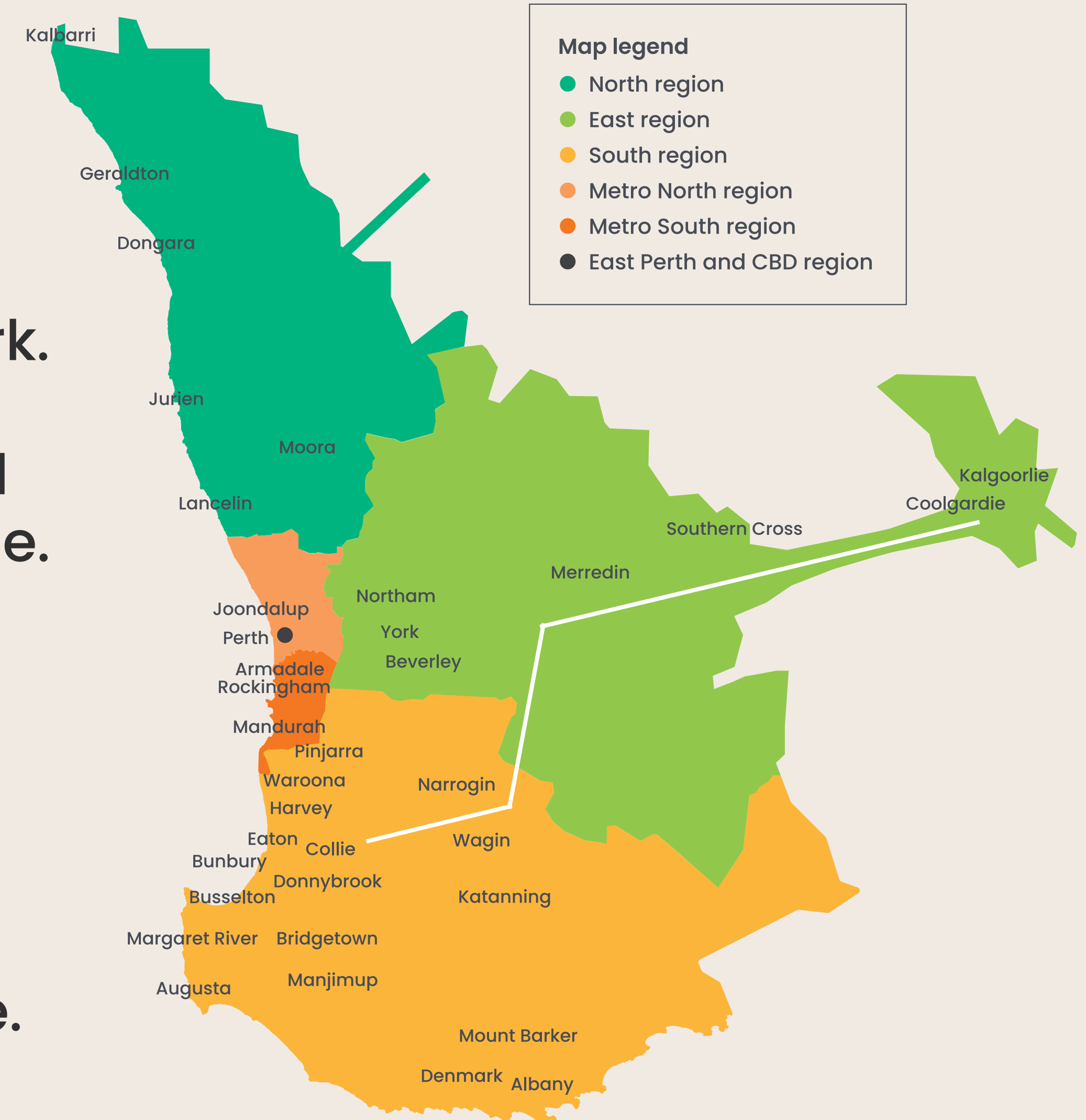


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South-West Interconnected System – East Region



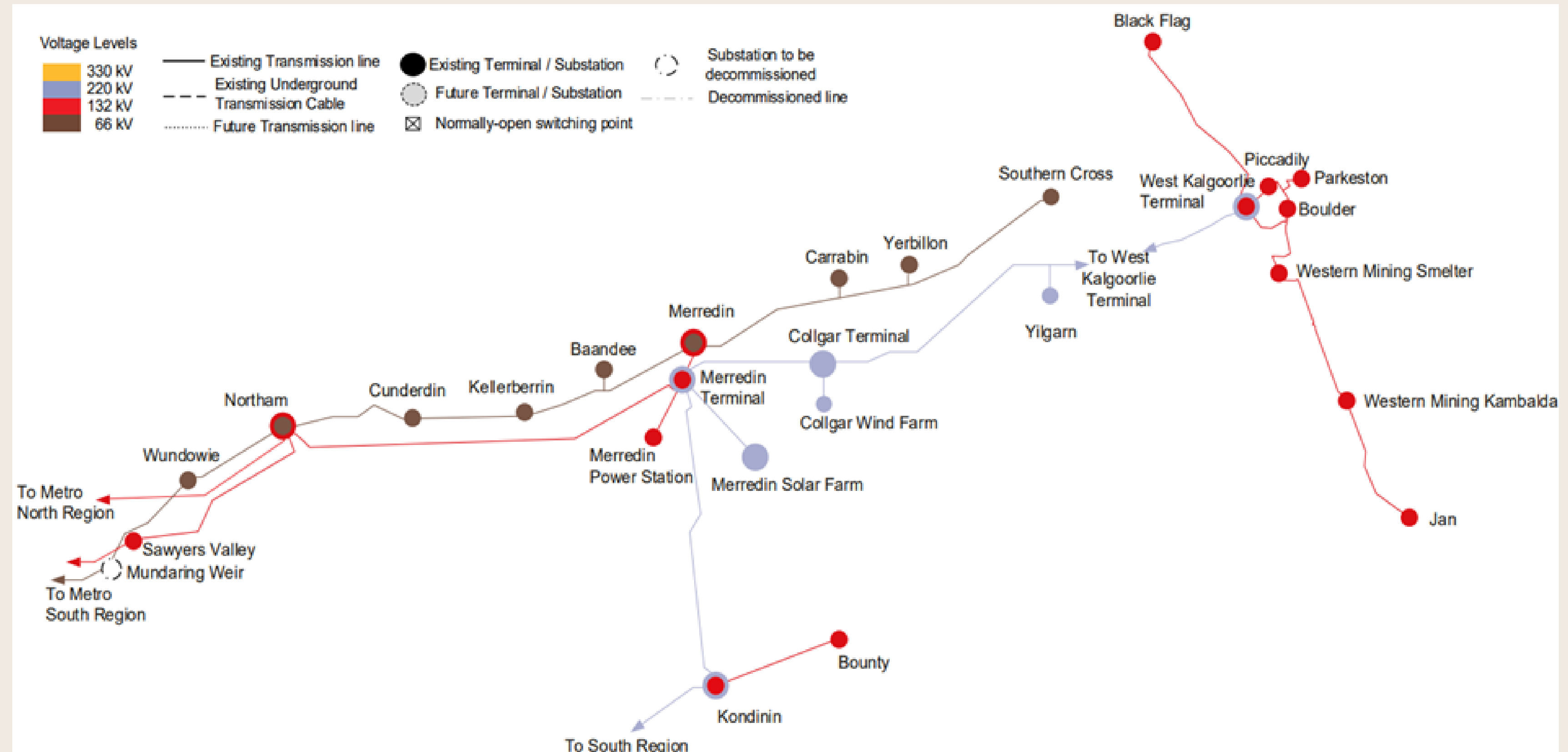
- The East Region has a mixture of low density residential & agricultural loads, with a significant proportion of high-density mining and industrial customers located within the Eastern Goldfields (EGF) sub-network.
- The Kalgoorlie region is a 150MW load supplied via a single 220kV over 650KM transmission line. The load is supplied via a combination of local generation and supply from the Collie region.
- *Electricity Industry (Network Quality and Reliability of Supply) Code*, Western Power contracts Synergy to provide 45MW of generation services for the Kalgoorlie town site.



Goldfields network



- The Muja to Kalgoorlie 220kV transmission line is single 650km line which, due to its length has a higher risk of transmission related outages, exposing it to external factors such as weather, fires, debris and third-party impact.



Improving power reliability – since 2021



\$33M

to replace West Kalgoorlie Static Var Compensator (SVC) with new STATCOMS, reactor and control scheme to improve stability – completed in late 2021.

\$40M

to install new STATCOMS and 250MVA transformer to increase supply to the Super pit and improve stability – completed in early 2022.

\$8M

to install new reactors at West Kalgoorlie to improve stability in the region which is currently in progress.

\$25M

to install a new 33MVA transformer at West Kalgoorlie terminal substation – in delivery pipeline

\$25M

to install a new 33MVA transformer at Black Flag substation – in delivery pipeline



Increased staffing levels at the Kalgoorlie depot.

Increasing capacity

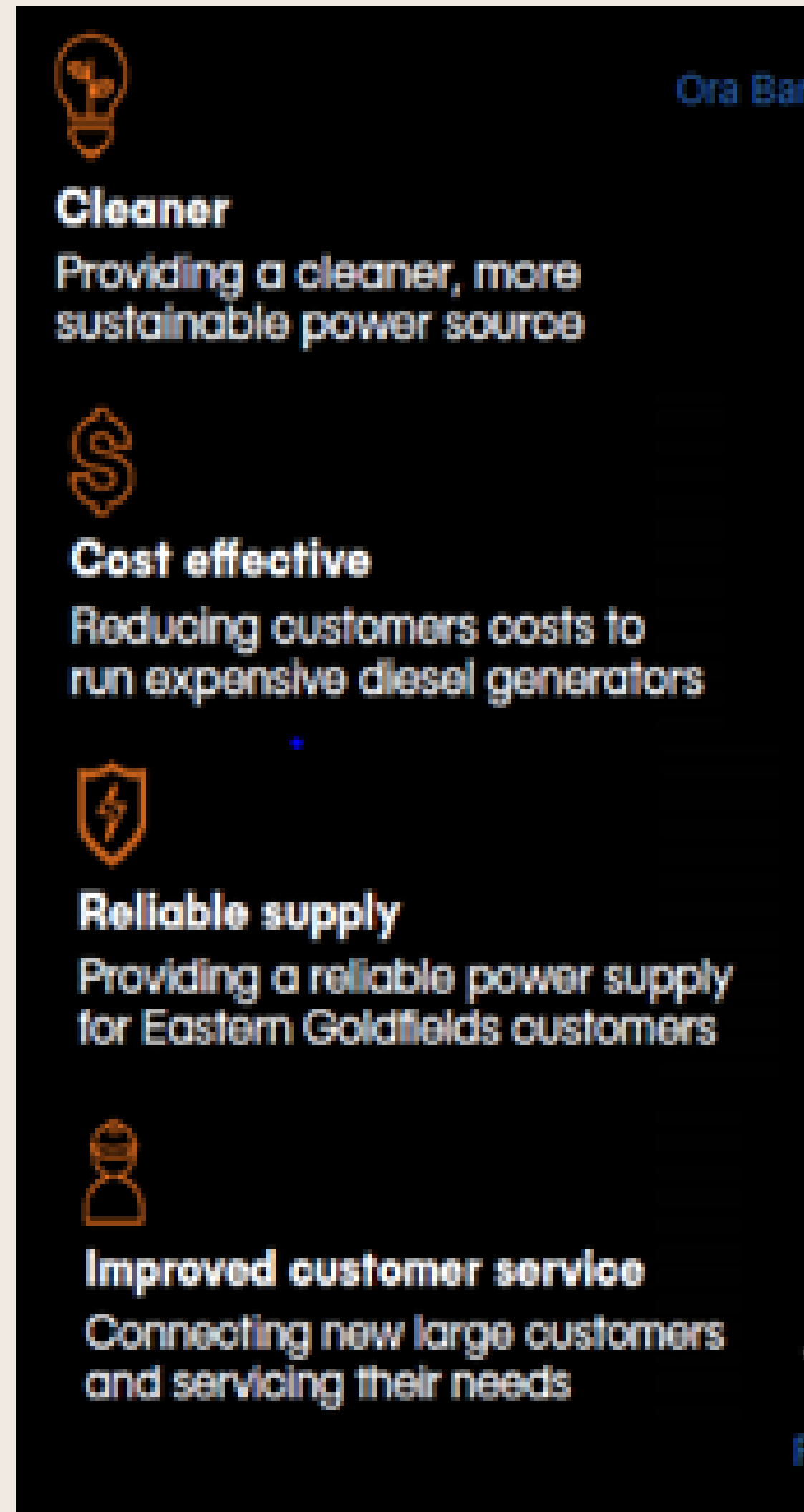


- Currently investigating Dynamic Line Ratings, using innovative technology to allow for an increase in future generation and load connections.
- Next iteration in the development of this is about to be launched to derive benefits for the East Region Energy program.
- Future trials will see further development and full integration into our operational systems before being used to fully use the capacity of all the Tx lines across the SWIS.

Eastern Goldfields Load Permissive Scheme



- 7 customers connected.
- 17MW of new load connected.
- 43MW of capacity remaining
- Level of constraint – 0% (attributable to capacity constraint, the customers may be constrained for other reasons)



Cleaner
Providing a cleaner, more sustainable power source

Cost effective
Reducing customers costs to run expensive diesel generators

Reliable supply
Providing a reliable power supply for Eastern Goldfields customers

Improved customer service
Connecting new large customers and servicing their needs

Ora Bank

P



Goldfields network



- Synergy's Kalgoorlie Power Station is contracted until 2028 by Western Power to provide backup generation during transmission line outages.
- The backup involves Western Power creating an 'islanded' network (a section of network that is disconnected from the SWIS) with backup generation supplying the island.
- This solution has enabled power supply to the Kalgoorlie townsite during planned and unplanned transmission outages.
- We developed and funded a project last year to install black start capability, which was completed earlier this year.
- Delivered improvements to the West Kalgoorlie Power Station's control system, the installation of additional black start capability and a Starlink satellite communication system.

EGF NCESS – service requirements



- Following Western Power's submission and subsequent determination by the Coordinator of Energy, a Non-Co-optimised Essential System Services (NCESS) procurement process was triggered for:
 - up to 150MW of Reliability Services
 - up to 1,500 MVA of System Strength Services.
- The anticipated contract term for the proposed services is estimated to start 1 October 2026, noting that we will consider services to be provided no later than 1 Oct 27. Services will be for:
 - an initial five-year duration, and
 - the possibility of a five-year extension.

Submissions have closed and we're currently assessing



Interim solution

- To supplement our current arrangement with Synergy while we evaluate submissions, we worked with EPWA and industry to investigate an interim solution.
- To maintain the integrity of the long-term NCESS procurement process, we approached all respondents to both the Expression of Interest and Call for Submissions to understand current immediate capability and capacity and sought external probity oversight.
- Only one vendor, TransAlta, could provide services immediately.



TransAlta arrangement



The arrangement with TransAlta will see delivery of:

- immediate back-up generation from Oct 2024-25.

This will in effect provide a 'top-up' to the generation from Synergy's power station at West Kalgoorlie Terminal.



Improving power reliability – back-up generation



1 Heavily invested in upgrading the power station near West Kalgoorlie Terminal including significant upgrades to the West Kalgoorlie Power Station's control system, the installation of black start capability and a Starlink satellite communication system.

2 Completed aerial 220kV line inspection for defects or issues.

3 Investigating alternative and complementary solutions.

Target:
To have island running and town energised 2hrs after an unplanned fault.

Morning Tea

10:20am – 10:50am



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Goldfields Regional Network: Supporting our Future Energy Requirements

Jai Thomas – Coordinator of Energy, Energy Policy WA

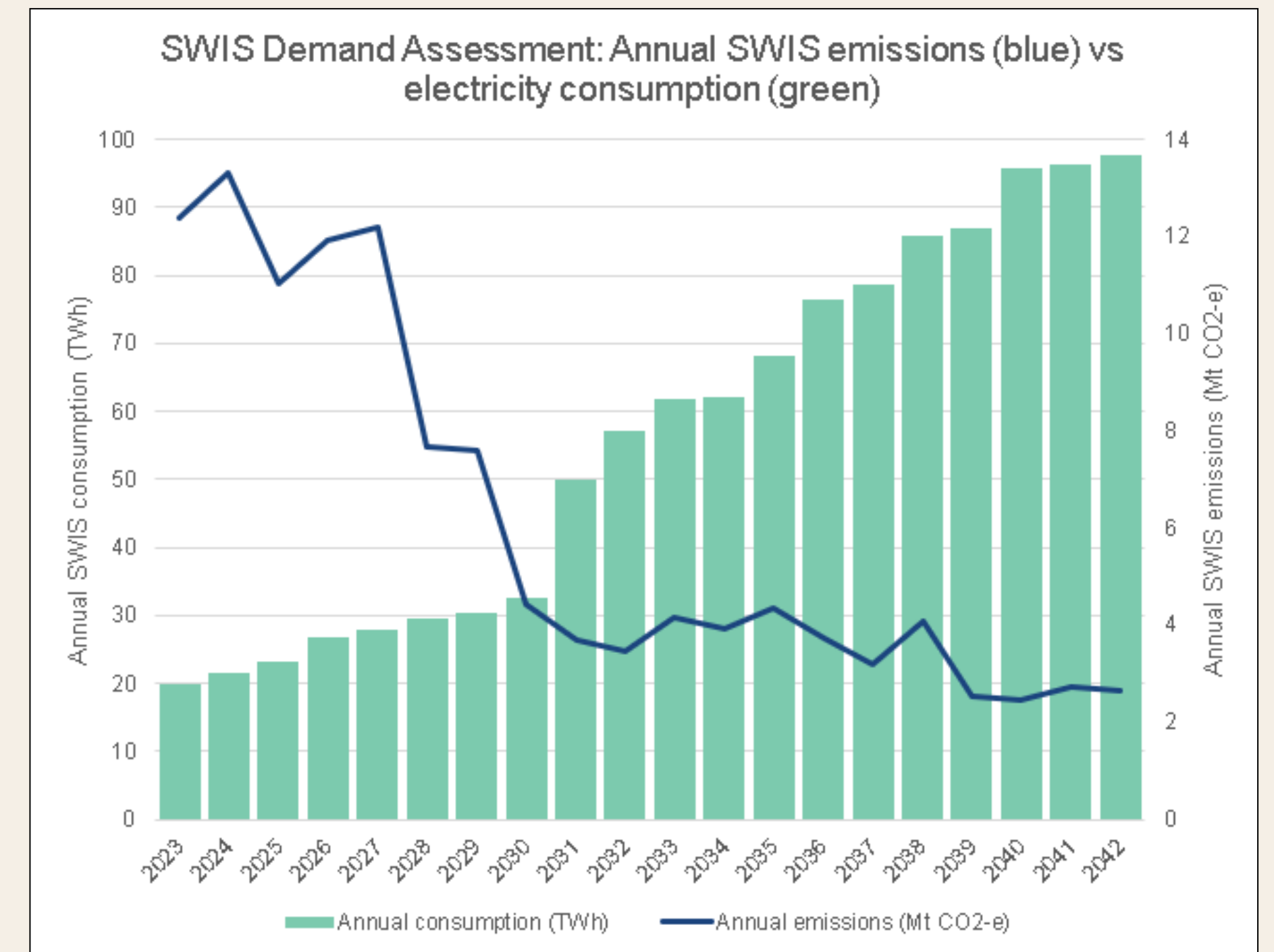


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Decarbonising WA

Reliable, low emissions electricity supply is critical to decarbonising heavy industry and mining

- The electricity sector is expected to play a significant role in WA's low carbon future and meeting the State Government's commitment to achieve net zero by 2050
- A significant reduction of heavy industry and mining emissions can be achieved through electrification, underpinned by timely investment in renewable energy generation and transmission infrastructure
- There is increasing demand for renewable energy from gold and critical minerals suppliers in the Goldfields region



The Goldfields

The Goldfields plays a significant role in WA's economy

- The Goldfields region is one of the most significant mining regions in Australia, producing commodities including gold, nickel, copper, lithium, iron ore, rare earths and critical minerals
- The Goldfields-Esperance region contributes significantly to WA's export income and generates more than 37,500 jobs*
- It is also home to important and meaningful cultural and natural resources and Aboriginal people continue to practice culture and care for Country
- Power outages in January and August this year highlighted persisting energy reliability issues in Kalgoorlie and its surrounds
- There is an opportunity to harness the abundant renewable energy resources in the region to progress the State Government's decarbonisation objectives and deliver affordable, more reliable energy to industry and communities

**Goldfields-Esperance Development Commission (GEDC) 2023*



Solutions for a more reliable energy future

Energy reliability issues in the region and the need to decarbonise have prompted the development of short- and long-term solutions.



Collapsed Transmission tower on the Kondinin to Merredin line
Source: Western Power

Solutions under Development

1. An NCESS procurement process for reliability and system strength services in the EGF region was triggered in March 2024
2. Western Power is progressing an interim solution to utilise existing facilities to provide backup services until the NCESS commences



Aerial view of Western Power's sub-station in West Kalgoorlie
Source: Western Power

3. PoweringWA is investigating the potential for a common-use network in the Goldfields to ensure reliability in the long-term

Long-Term Solution

PoweringWA is investigating potential development of a privately owned common-use electricity network – the Goldfields Regional Network (GRN) – from Kalgoorlie to Leinster via Leonora

- Modelling suggests that a GRN is the optimal transmission outcome for the Goldfields region
- The GRN would provide:
 - Access to more reliable low-emissions energy to support industry decarbonisation using high-quality and diverse wind resources
 - An opportunity for a private sector-led solution
- Three planning stages:
 - Stage 1: concept study (draft results to be discussed today)
 - Stage 2: identify commercially viable options
 - Stage 3: identify regulatory and market arrangements
- PoweringWA will engage meaningfully with Aboriginal people in the region throughout all planning stages



Key Drivers

The Energy Trilemma provides a framework to consider the key drivers and potential benefits for the potential GRN. A successful GRN would deliver improvements to key stakeholders in each of these categories.

Energy Affordability

- A large-scale network comprised of renewable generation and storage, supported by gas, could deliver a lower cost of energy to operators.
- Gas and diesel generation is currently sized for the load of mining operations, including back-up requirements.
- Renewable energy solutions are currently limited by integration with gas and diesel generation and the operating life of mines.

Energy Security

- The Goldfields region represents over 600 MW of load (demand) that is predominantly supported by standalone generation at each location.
- Disbursed variable generation feeding into one network would allow for firm renewable power.
- The GRN would offer an additional point of supply to the City of Kalgoorlie-Boulder.

Energy Sustainability

- The GRN would reduce the region's reliance on diesel and gas generation.
- Multiple locations across the Goldfields provide abundant natural resources (solar and wind) for the development of large-scale renewables, subject to Government approvals.
- A network with significant renewable generation may fast track emissions reductions for facilities under the Commonwealth Safeguard Mechanism.



Aboriginal Engagement

The Government is committed to working with Aboriginal people and their representatives in pursuit of shared goals

Through the GRN project:

- We want to help Aboriginal communities participate in the renewable energy transition.
- Ensure that project proponents meaningfully engage with Aboriginal groups impacted by the project.
- Minimise disturbance to Country, through careful project design and collaboration.



The Goldfields Regional Network Forum

This Forum has been established to ensure PoweringWA can engage closely with stakeholders throughout the GRN Project

The success of the Project will be supported by the Forum and will allow PoweringWA to:

- Gain a first-hand appreciation of issues and challenges in the Goldfields region
- Ensure that industry and Aboriginal people in the region are central to the development of the GRN.

Chair	<ul style="list-style-type: none"> • Jai Thomas (Coordinator of Energy, Energy Policy WA)
Member organisations	<ul style="list-style-type: none"> • Local, State and Commonwealth Government agencies and representatives • Aboriginal people and their representatives • Current and future network customers
Working groups	<ul style="list-style-type: none"> • Industry and Commercial • Aboriginal Engagement • Regulatory and Markets

PoweringWA will facilitate the potential development of the GRN, but the solution will ultimately be led by private industry and through meaningful engagement with Aboriginal people in the region



Goldfields Regional Network: Modelling and Next Steps

Stephen Eliot – Principal Advisor, Energy Policy WA



Concept Study for the Goldfields Regional Network (GRN)

PoweringWA has engaged EY and ResourcesWA to deliver a Concept Study for the GRN – an economic assessment of the viability of the GRN Project

Preliminary outcomes from the Concept Study will be presented today

- Two main network scenarios were tested:
 - Standalone (the benchmark case with self-supply and no GRN)
 - A GRN that is connected to the SWIS
- Stocktake of current and future load (demand)
- Consideration of existing and future supply capacity and requirements
- Transmission infrastructure requirements and costs
- Levelised costs of electricity
- Impacts on reliability of supply and emissions



Concept Study: Methodology and Assumptions



Modelling Approach



Inputs and assumptions



Three demand scenarios:
Committed, Steady, Electrification



Existing and probable supply capacity
(including retirement assumptions)



New build options (wind, solar, gas, battery)



Five potential nodes



Capacity expansion modelling

EY's capacity expansion model

Used in past capacity mix modelling such as the WOSP, SERS and SWISDA.

Identifies the capacity mix to meet demand at the lowest total cost, subject to a set of defined constraints.



Initial results, analysis and insights

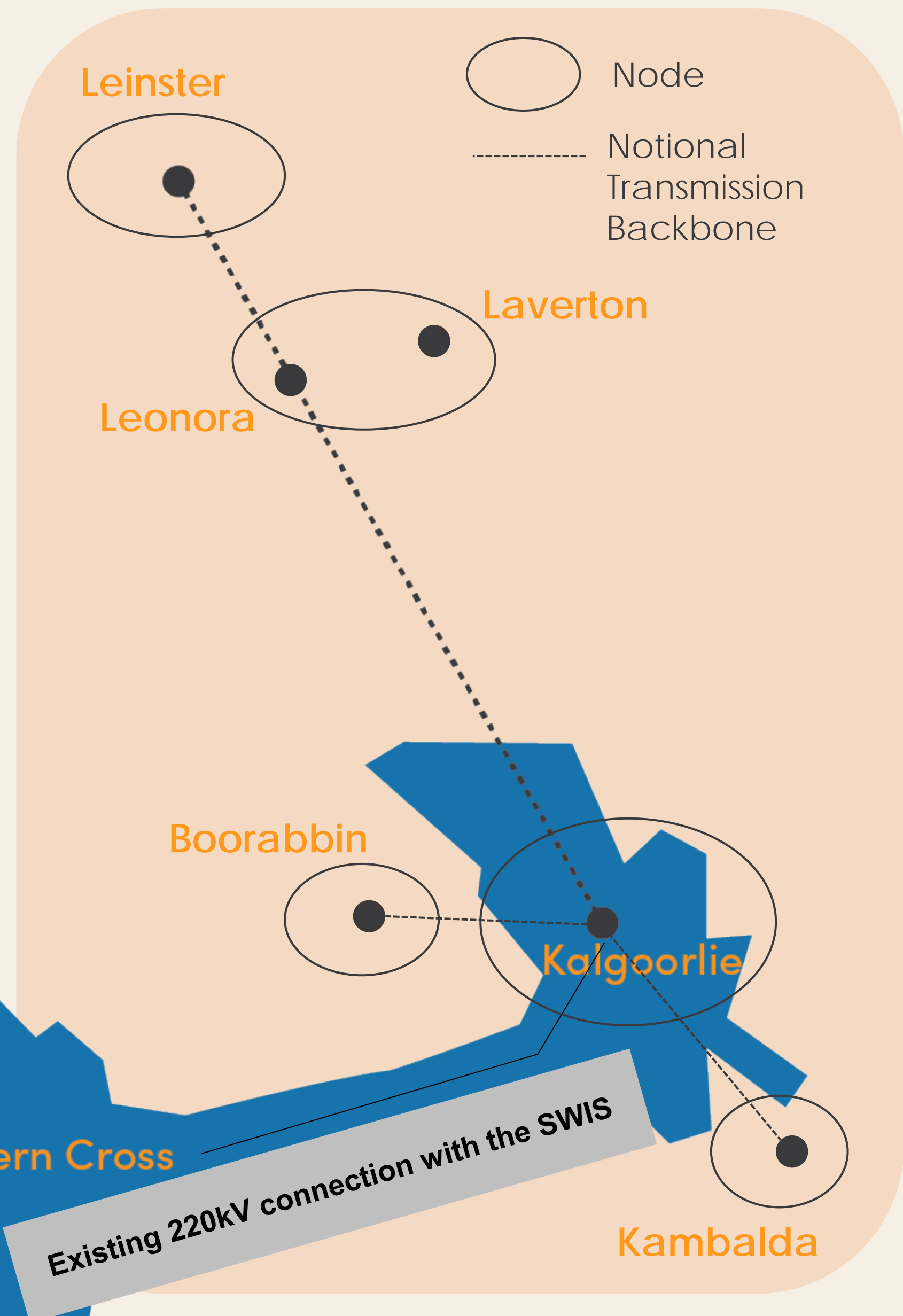
- Generation and storage capacity (MW) needed to meet existing and new loads in the Goldfields
- The scale of the network
- The cost to supply the loads (\$ billions, \$/MWh)

*The study **does not** include an in-depth assessment of power system security and reliability.*

Inputs and assumptions developed collaboratively between PoweringWA, EY, ResourcesWA, and stakeholders.

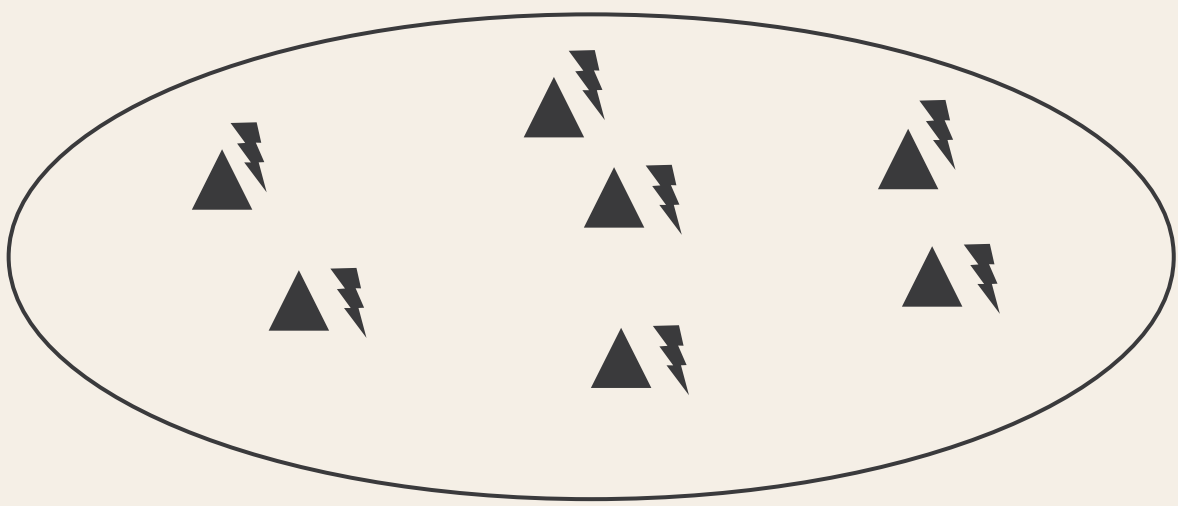


Goldfields Regional Network Nodes



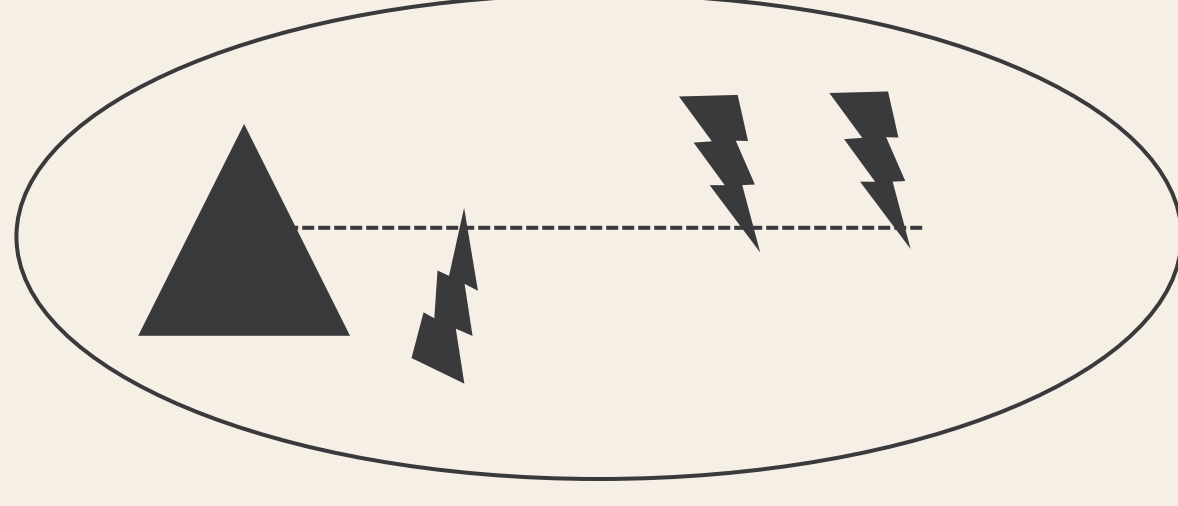
- Five nodes were modelled
- Loads, generation and storage facilities aggregated by node and by technology type
- Aggregation preserves confidentiality and simplifies data preparation
- Transmission network backbone modelled between nodes
- Intra-nodal connection between specific sites not explicitly modelled

In reality, standalone supply means multiple, individual loads with adjacent, on-site supply



No intra-nodal reticulation between sites

Modelling of nodes assumed aggregated loads and aggregated supply (by technology)

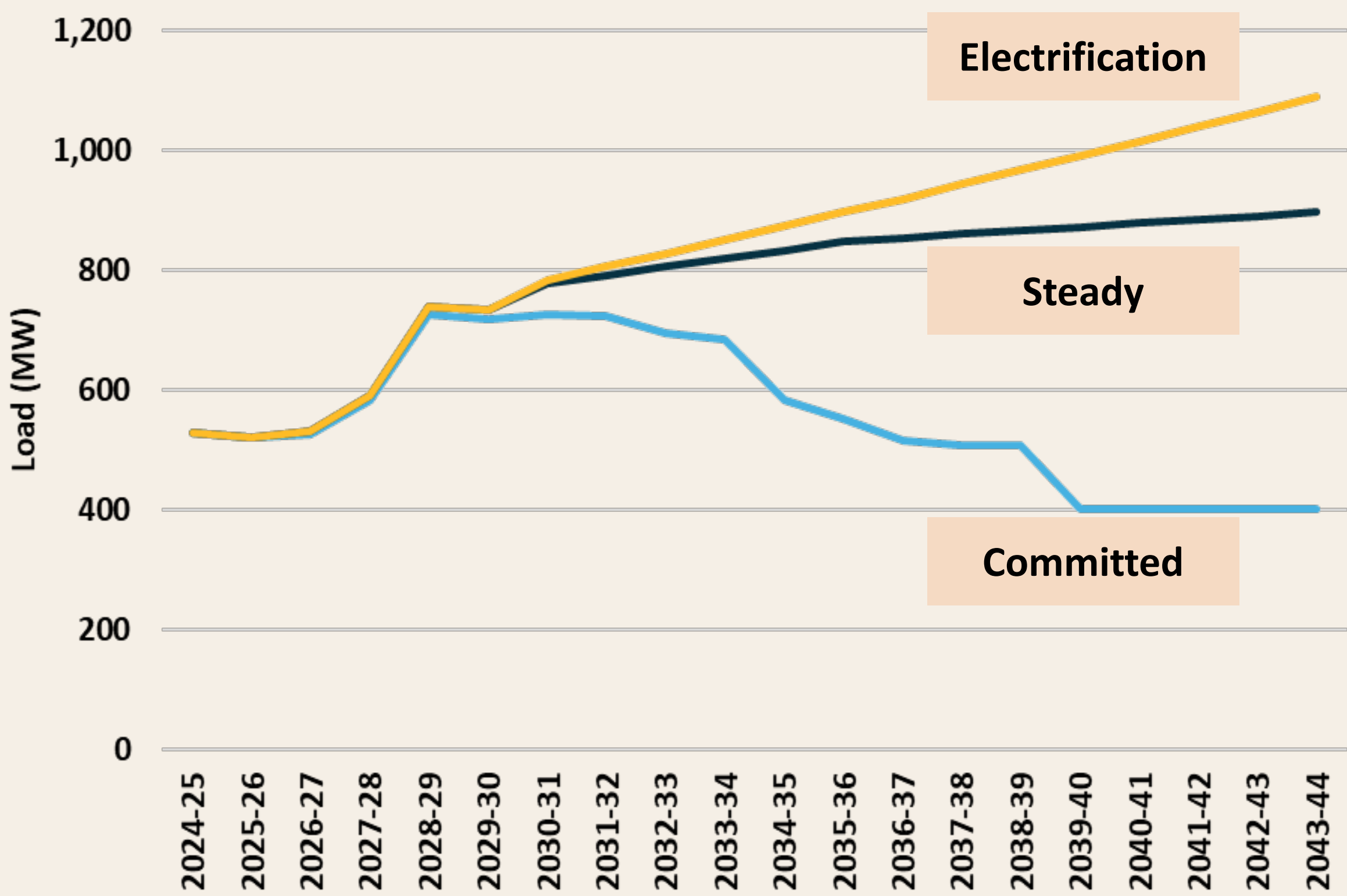


Assumed intra-nodal reticulation between sites

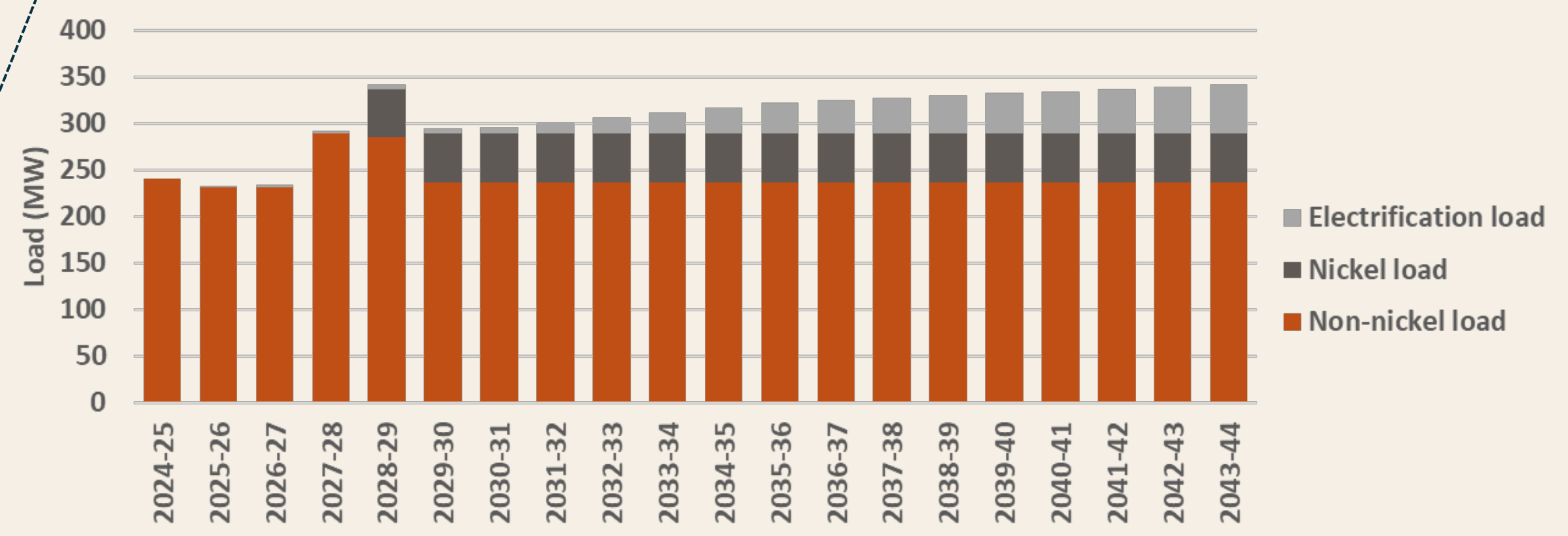


Demand Scenarios

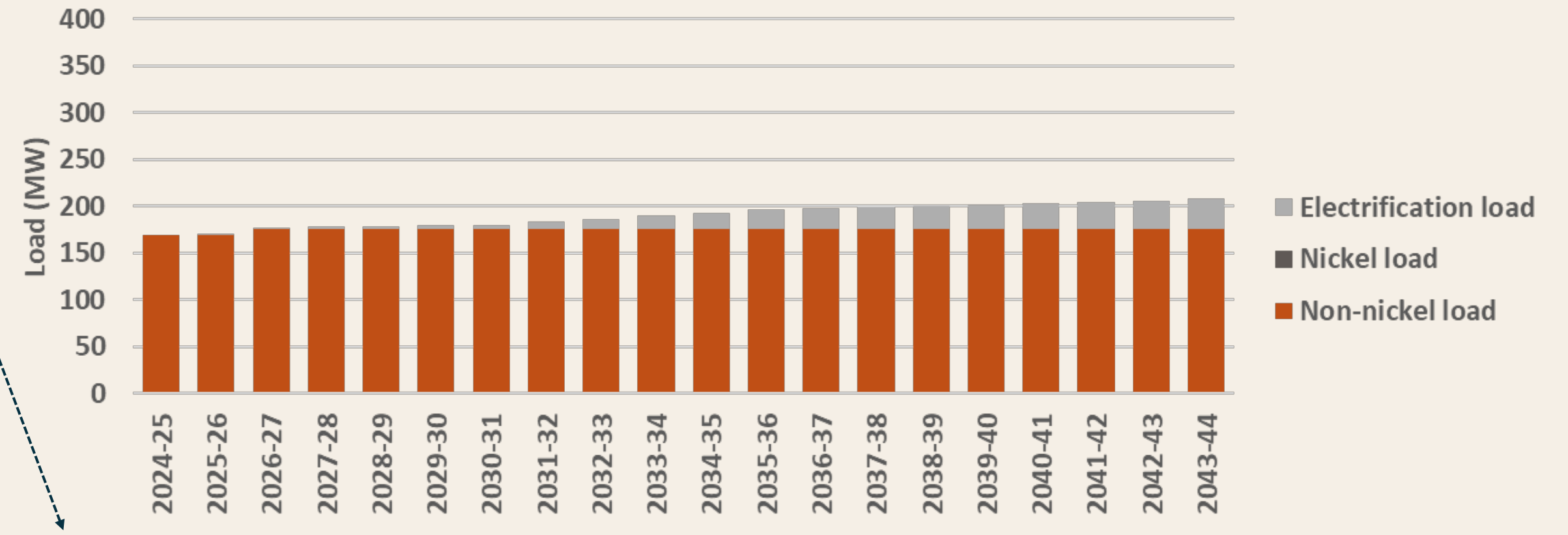
Combined industrial demand (MW) per scenario



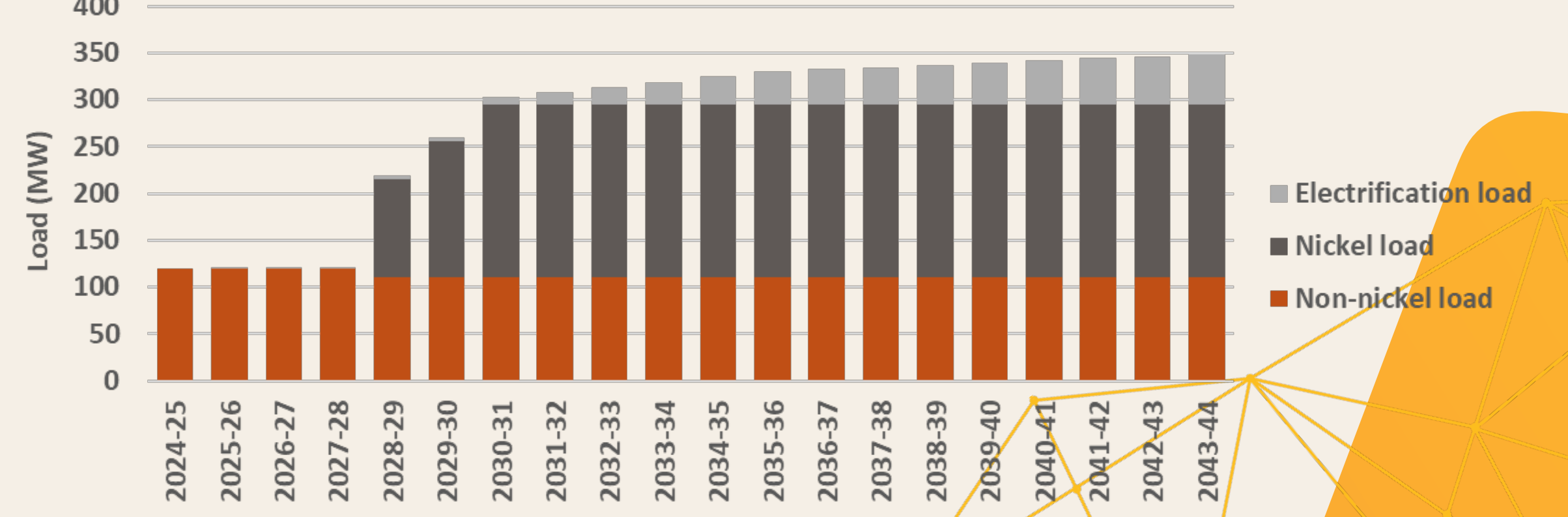
STEADY scenario, demand (MW) per load type, Kalgoorlie node



STEADY scenario, demand (MW) per load type, Leonora/Laverton node

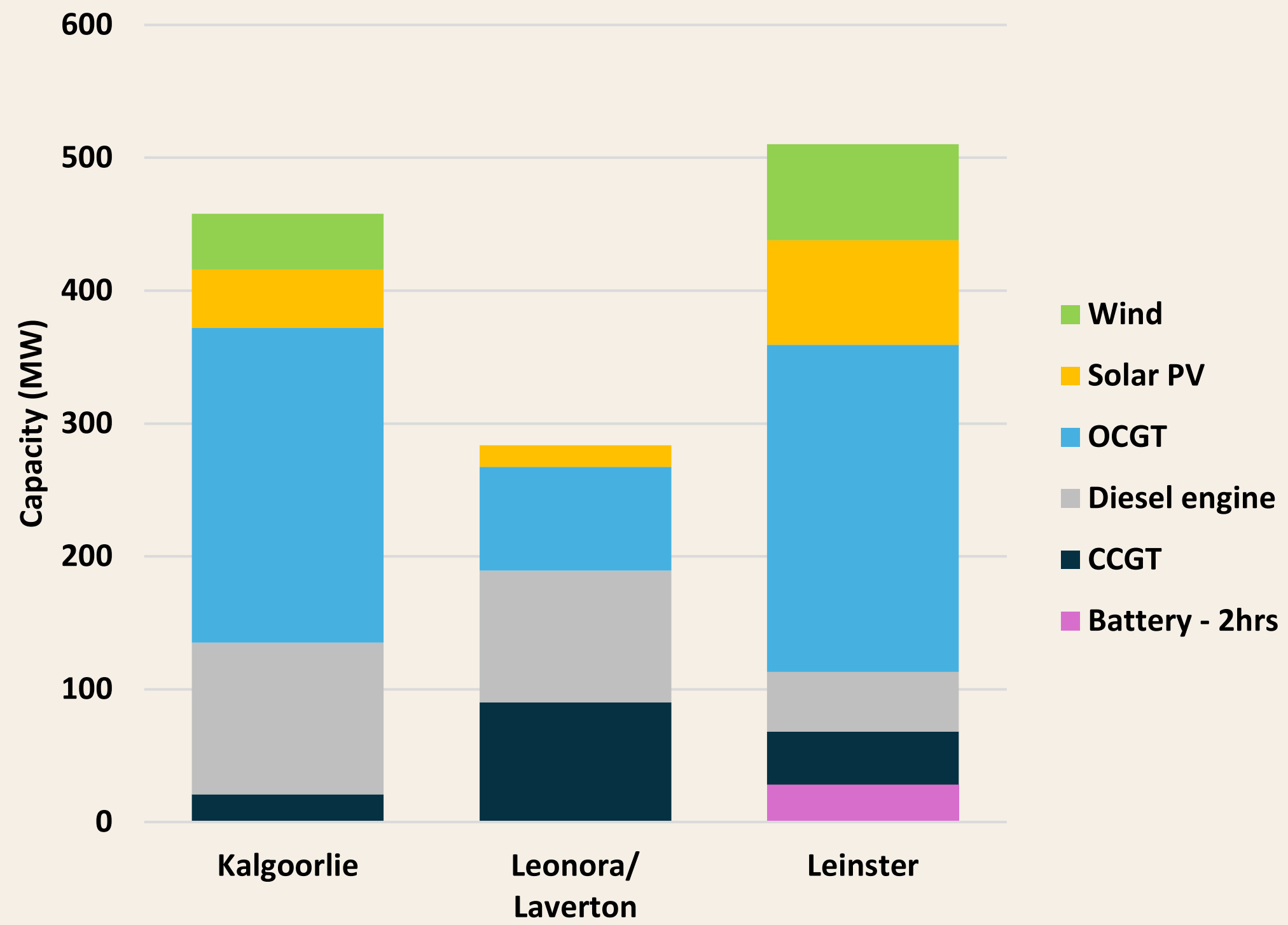


STEADY scenario, demand (MW) per load type, Leinster node

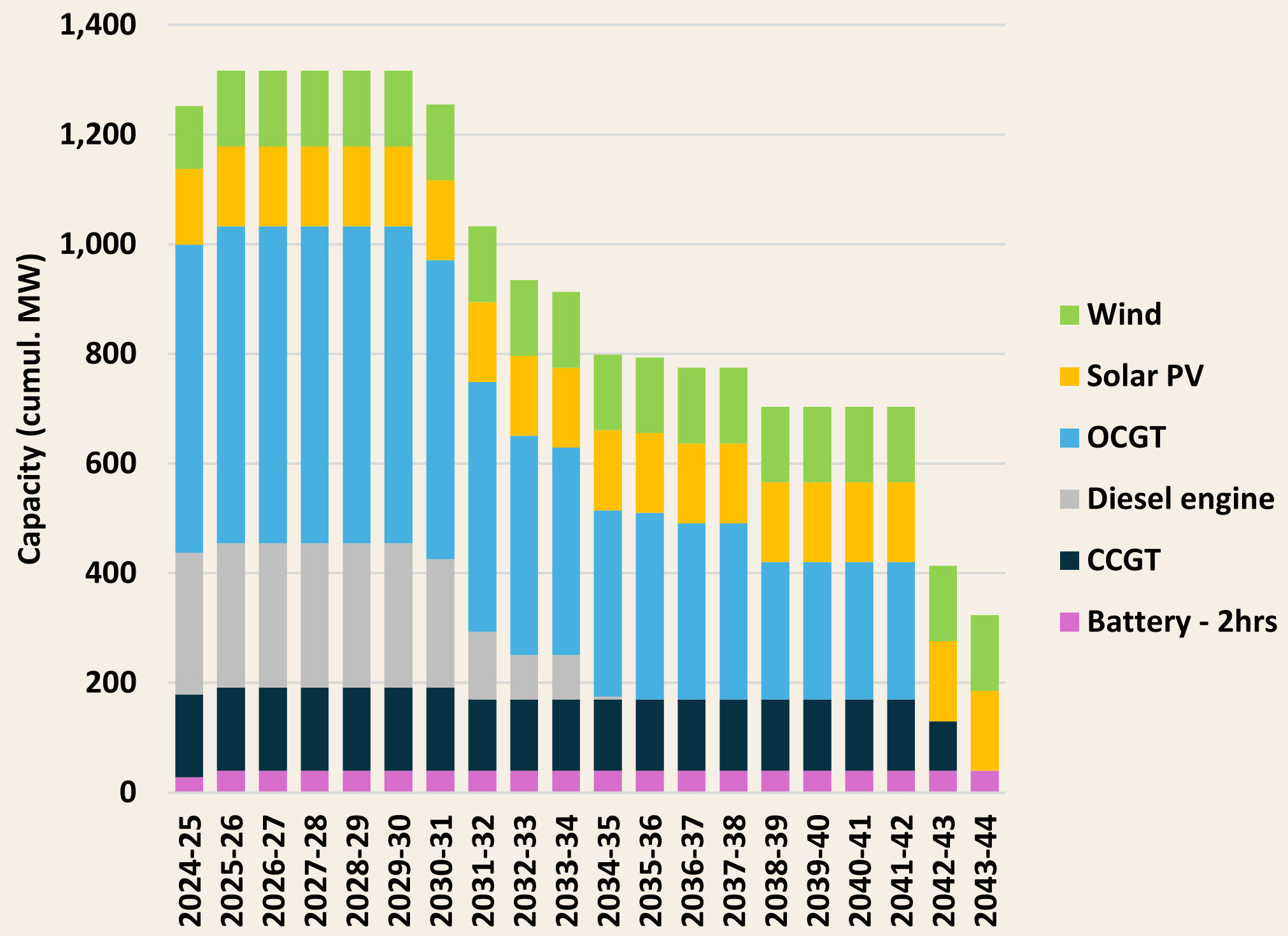


Existing Generation and Storage

Existing and committed supply capacity (MW)



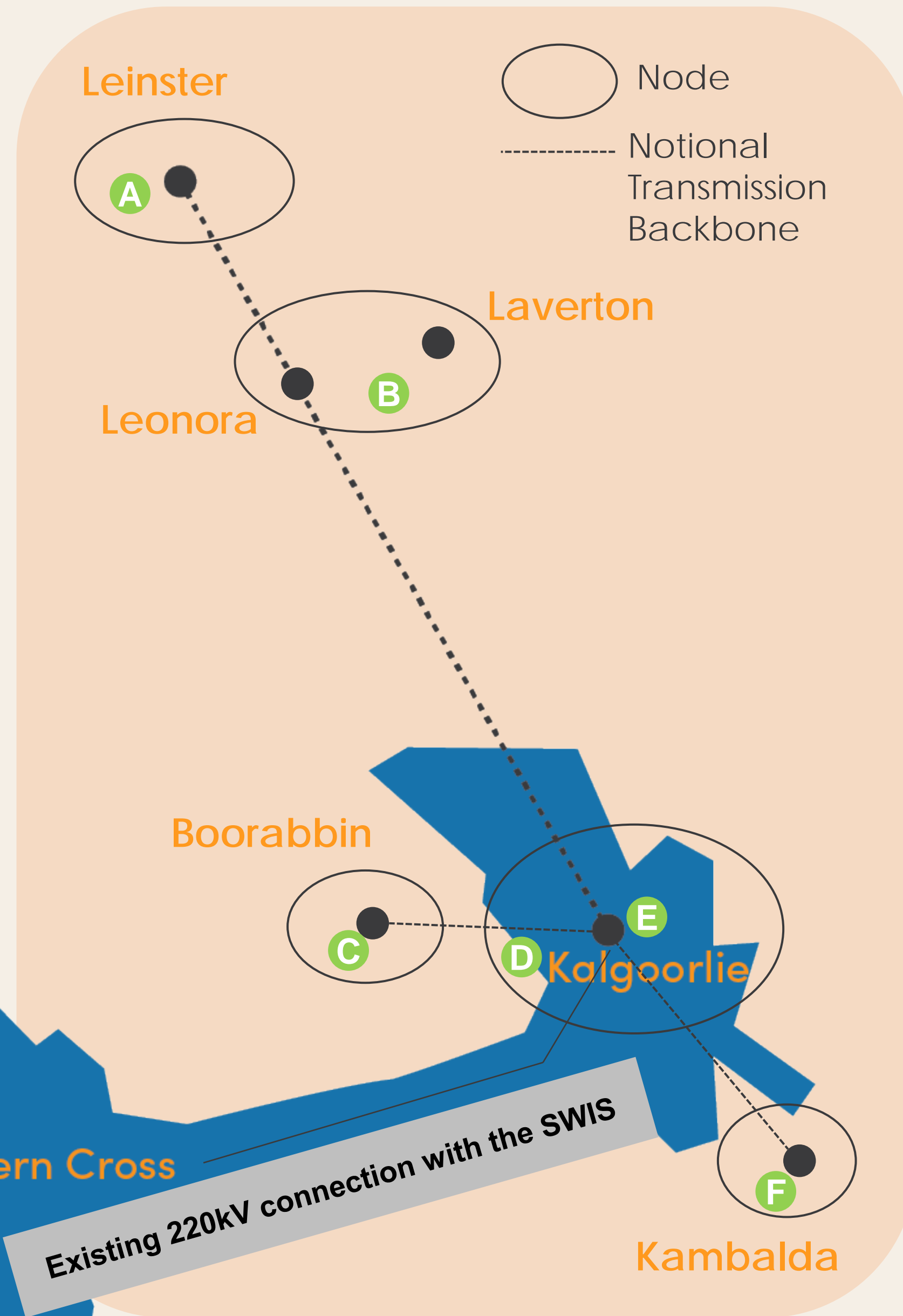
Assumed retirement schedule of existing facilities (MW)



In 2024-25, it is estimated that just **15-20% of generation is from renewable sources.**

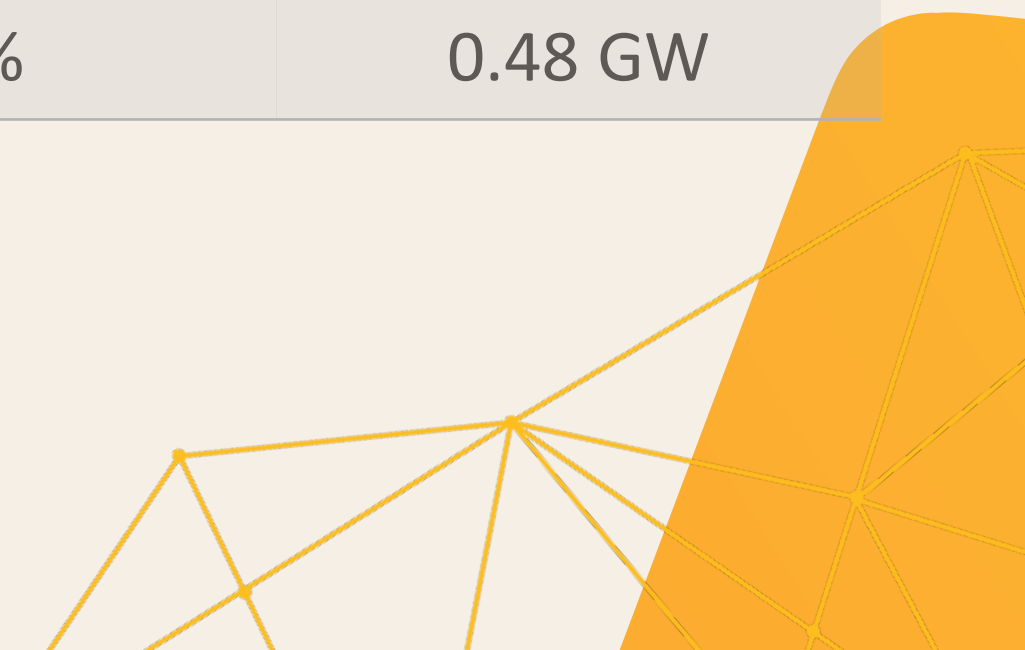
Construction of the **GRN** by around 2033-34 would **reduce the reliance on thermal generation** and signal opportunities for the **development of renewables.**

Assumptions on Potential Supply



Wind locations	Indicative capacity factors	Build limits
(A) Leinster	46%	2.40 GW
(B) Kookynie	40% and 43%	4.86 GW
(C) Wallaroo/Boorabbin	48%	10.33 GW
(D) Coolgardie/Mount Burges	31%	0.11 GW
(E) Kalgoorlie	37%	0.35 GW
(F) Kambalda West/Widgiemooltha	43%	1.09 GW

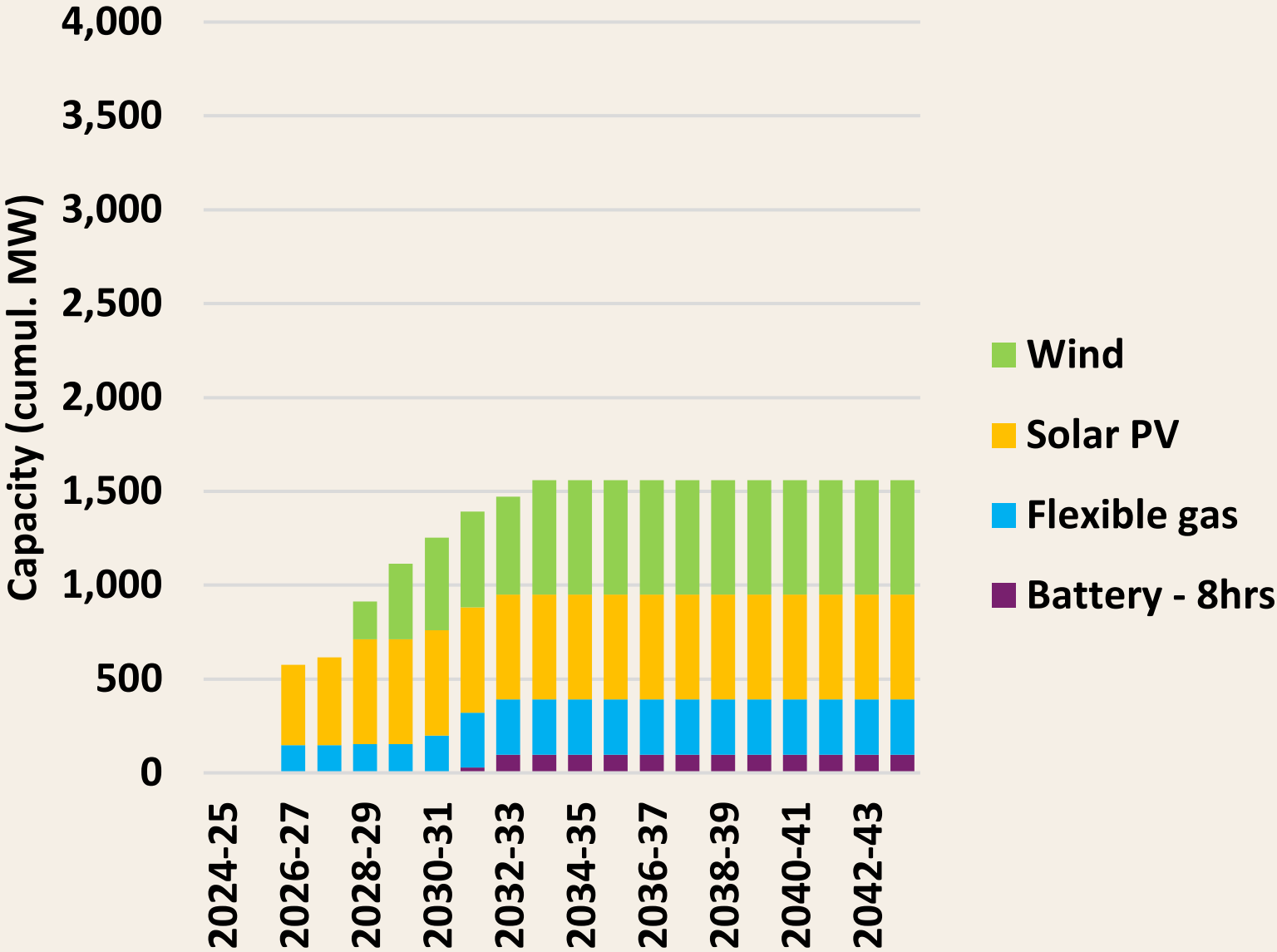
Solar locations	Indicative capacity factors	Build limits
(A) Leinster	30%	6.74 GW
(B) Kookynie	30%	3.00 GW
(C) Wallaroo/Boorabbin	30%	0.27 GW
(D), (E) Kalgoorlie/Coolgardie/Mount Burges	30%	0.47 GW
(F) Kambalda West/Widgiemooltha	30%	0.48 GW



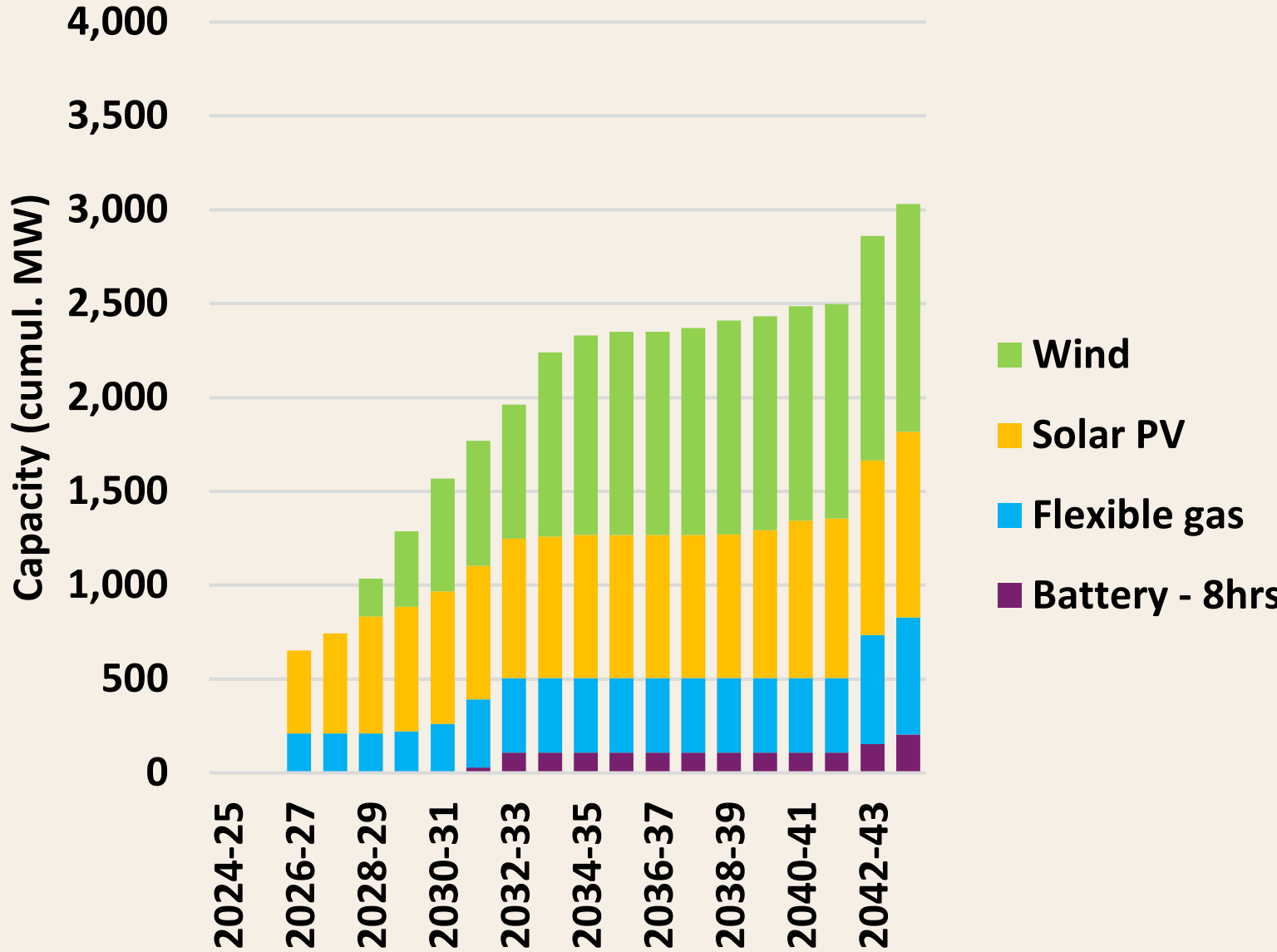
Concept Study: Outcomes

New Generation and Storage Requirements

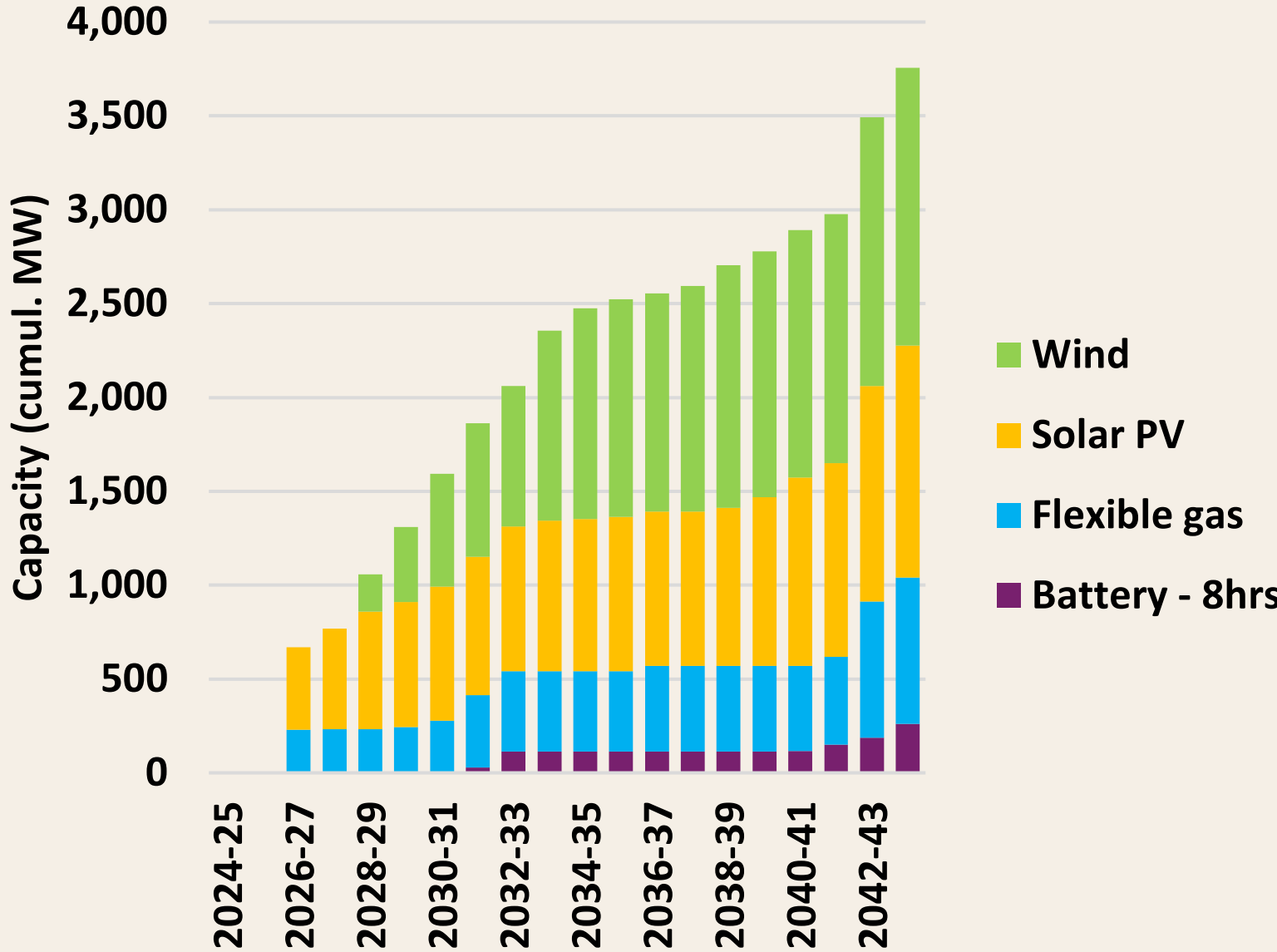
COMMITTED demand scenario (MW)



STEADY demand scenario (MW)



ELECTRIFICATION demand scenario (MW)

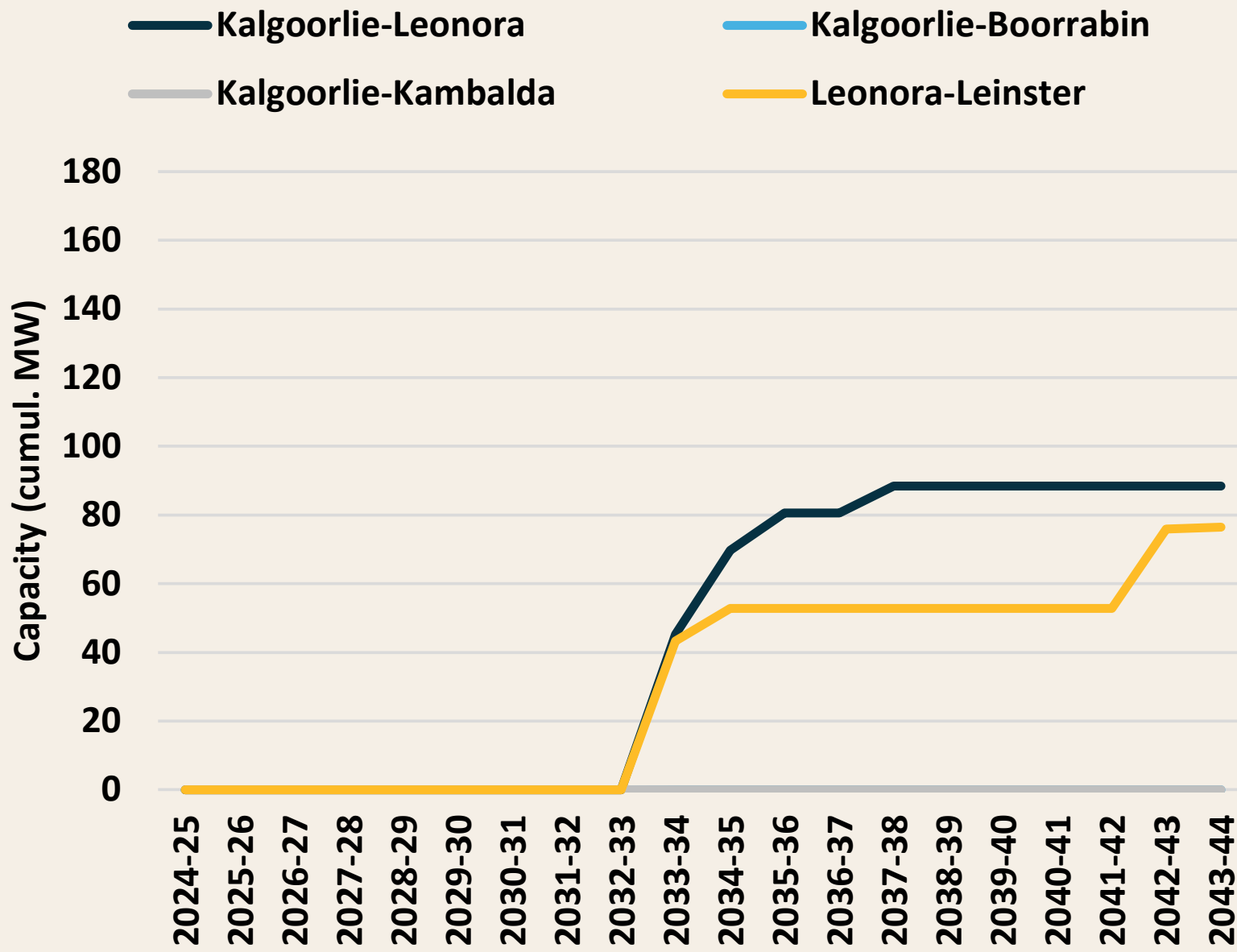


The GRN would require significant **additional renewable generation**, supported by storage and firming gas.

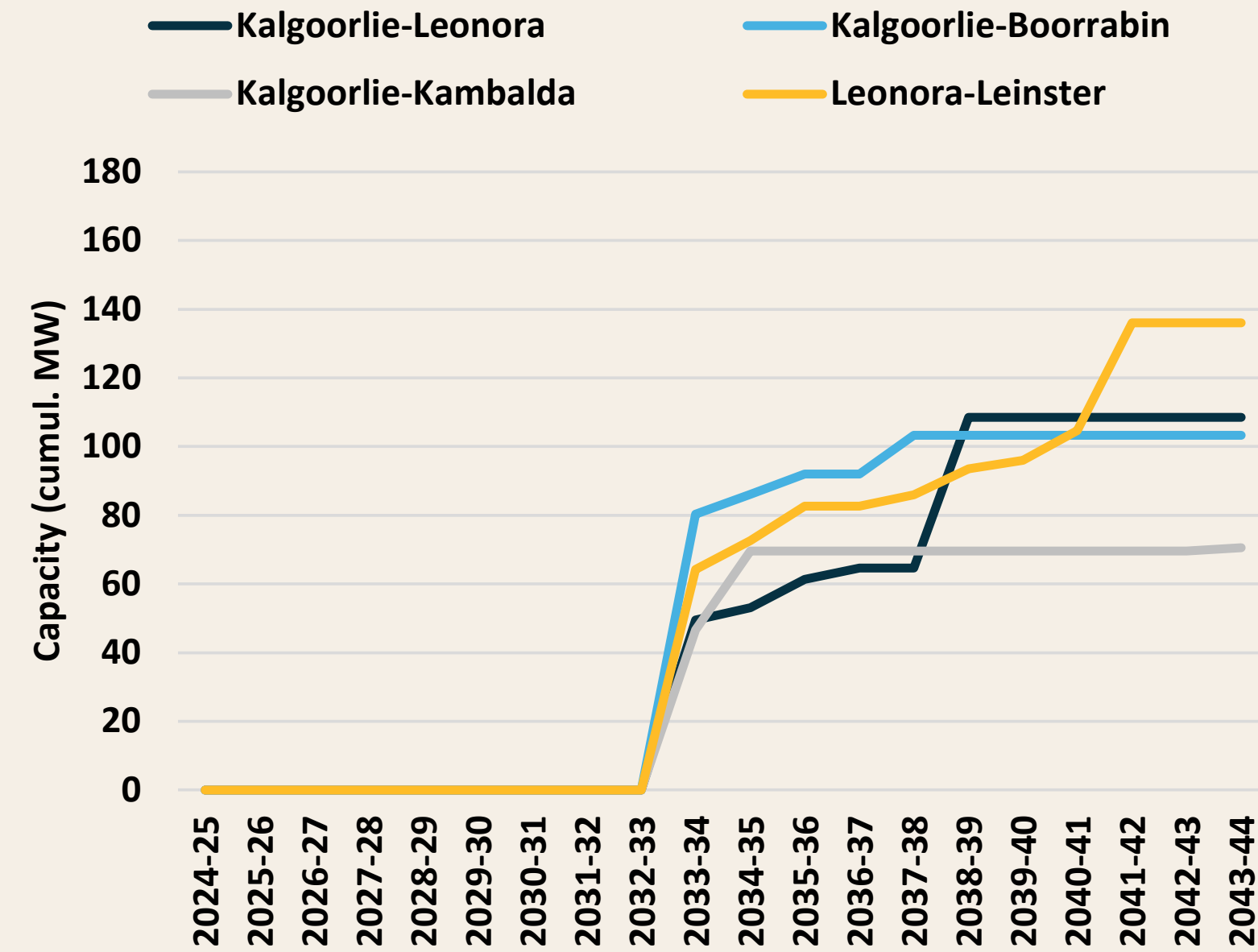
The Steady and Electrification scenarios require **more than 2.5 GW of capacity**, representing a **significant opportunity for developers**.

Modelled Transmission Signals

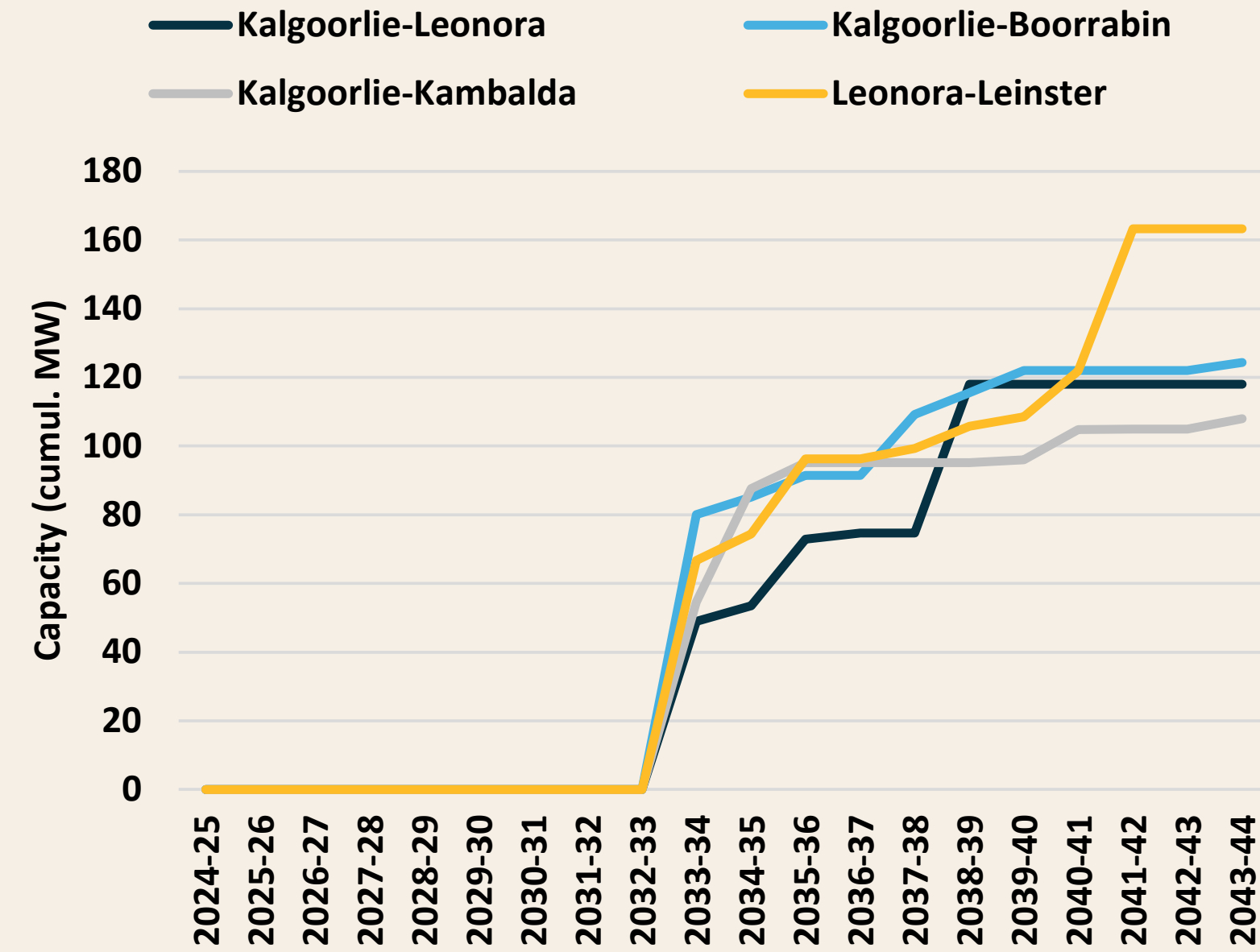
COMMITTED demand scenario (MW)



STEADY demand scenario (MW)



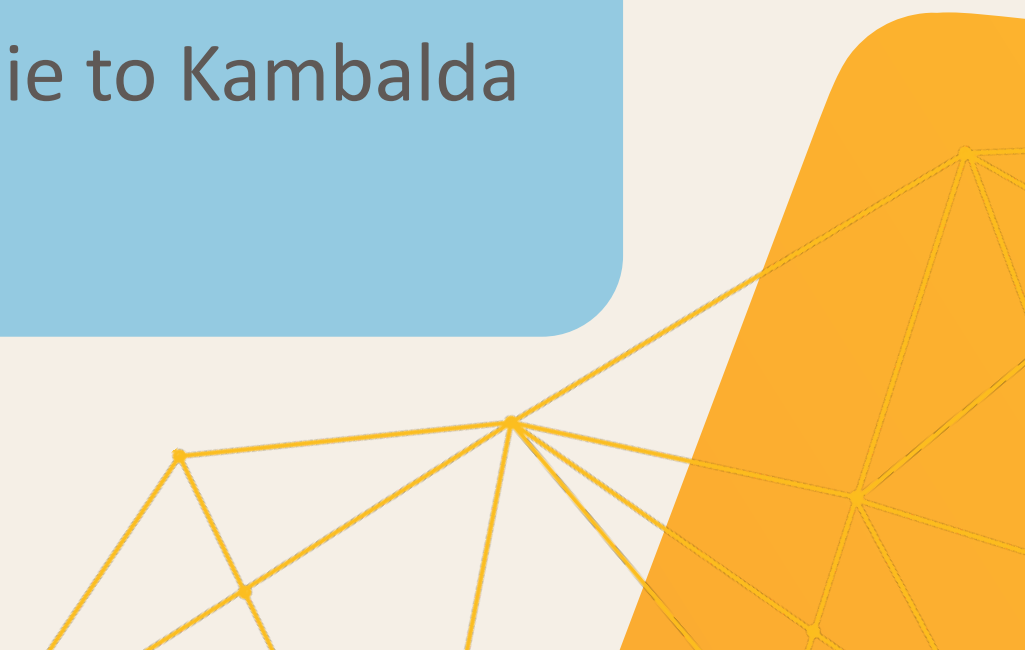
ELECTRIFICATION demand scenario (MW)



All demand scenarios signal that transmission infrastructure should be constructed from Kalgoorlie to Leinster, via Leonora

The Steady and Electrification scenarios:

- Signal construction of transmission infrastructure west from Kalgoorlie to Boorabbin and south from Kalgoorlie to Kambalda
- Suggest a transfer capacity of 150 MW would be required to service the system requirements



Transmission Building Blocks and Costings

Flow path	Distance (km)	Total Capex (\$'m)
Kalgoorlie–Leonora	230	389
Leonora–Leinster	130	220
Kalgoorlie–Boorabbin	120	203
Kalgoorlie–Kambalda	80	135
Total	560	946

Additional Equipment

Item	Capex per Item (\$'m)	Total Capex (\$'m)
4 terminal stations	59	234
8 transformers	13	104
3 static VAR compensators	39	117
Total	–	455

Based on a double circuit 132 kV overhead line with 150 MW of load carrying capability per circuit

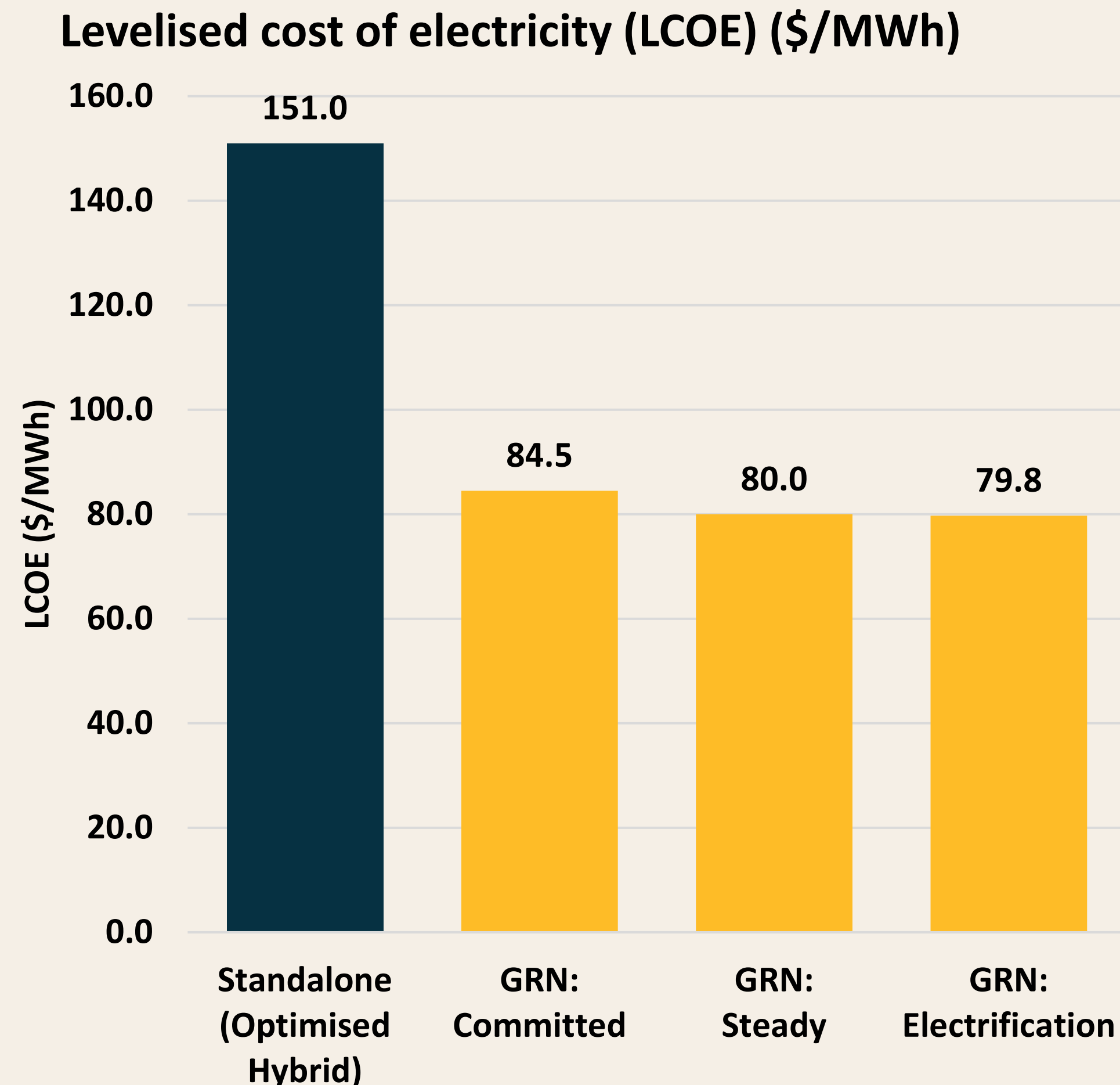
\$946 million

\$455 million

**GRN
Backbone
Capex
Estimate**

\$1.4 billion

Modelling Outcomes and Potential Benefits



Presented LCOE outcomes indicate that the GRN is a more economic solution if the cost of transmission is less than \$60/MWh

- The Standalone case shows the LCOE of an optimised hybrid supply arrangement (gas, wind and solar) – this is likely lower than the cost of supply currently observed in the Goldfields
- A high cost of unserved energy has been assumed to reflect the industry expectation of reliability in the GRN
- Following the introduction of the GRN from 2033-34, the SWIS reliability standard is met in all years and under all demand scenarios but at lower cost under the GRN
- By 2040, under the Steady demand scenario, more than 80% of generation output would be delivered by renewable sources
- Significant emissions reductions are observed in all demand scenarios that assume the GRN is constructed

LCOE reflects the cost of electricity generated by facilities located within the GRN area.

For GRN cases, the LCOE does not include transmission network capex and the cost of occasional electricity imports from the SWIS.

Note that all costs reflected in this slide (and all other slides in this pack) are estimates that are subject to further refinement.

Goldfields Regional Network: Next Steps



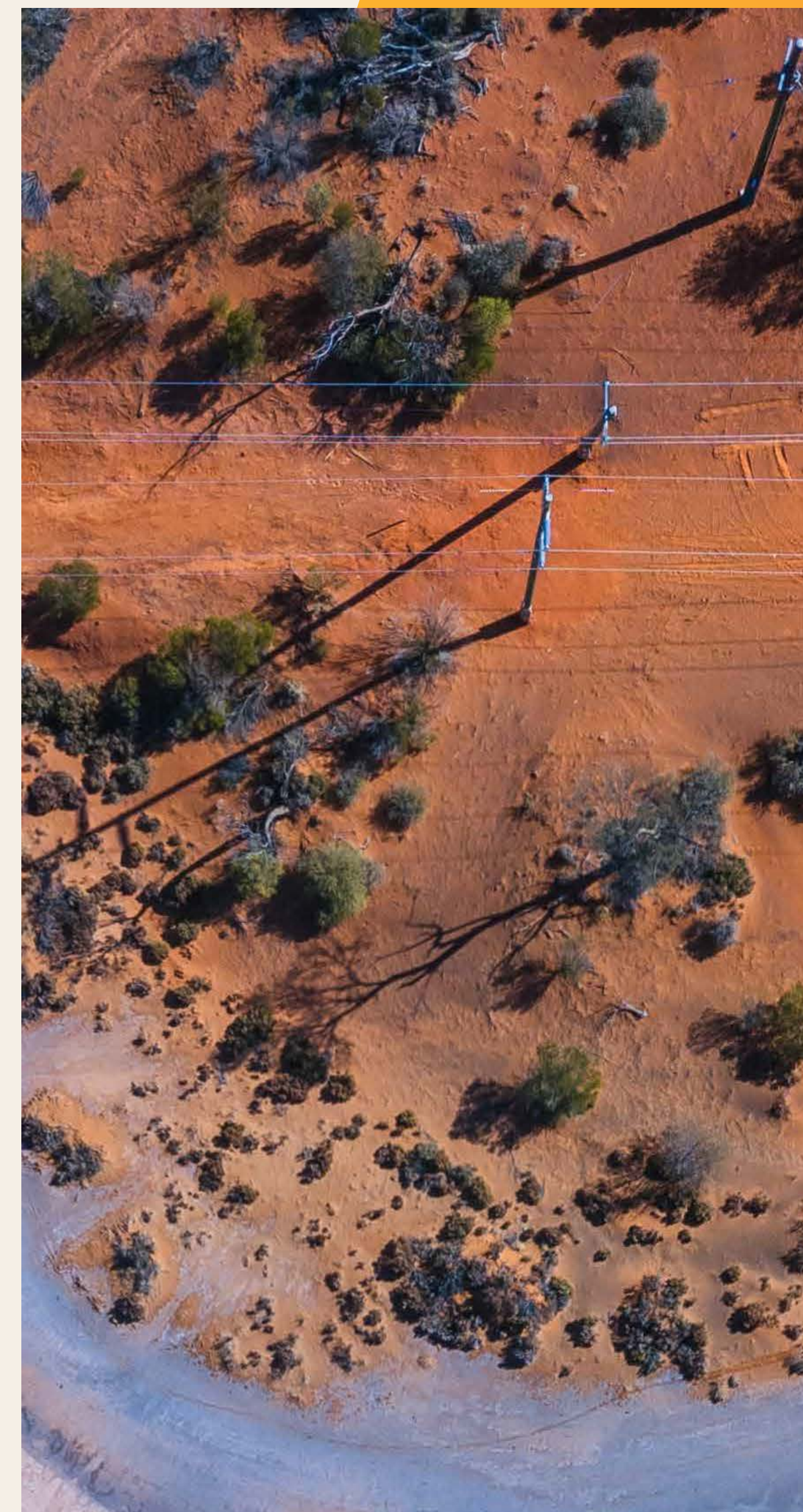
Proposed Next Steps

Preliminary Concept Study Results support the potential viability of the GRN project

There is sufficient evidence to undertake the next steps:

1. Finalise the Stage 1 Concept study (incorporate industry feedback, estimate potential network tariffs, and outline project risks)
 - A more detailed slide pack will be shared on **15 November** with feedback requested by **22 November**
2. Commence Stage 2 (commercial assessment) and Stage 3 (regulatory and market assessments)
 - Including a more detailed assessment of security and reliability
3. Establish working groups, including an Aboriginal engagement working group
4. Continue to meet with key stakeholders to inform project design

Recommendations will be made to the Government to undertake these steps and maintain project momentum



Upcoming Project Stages

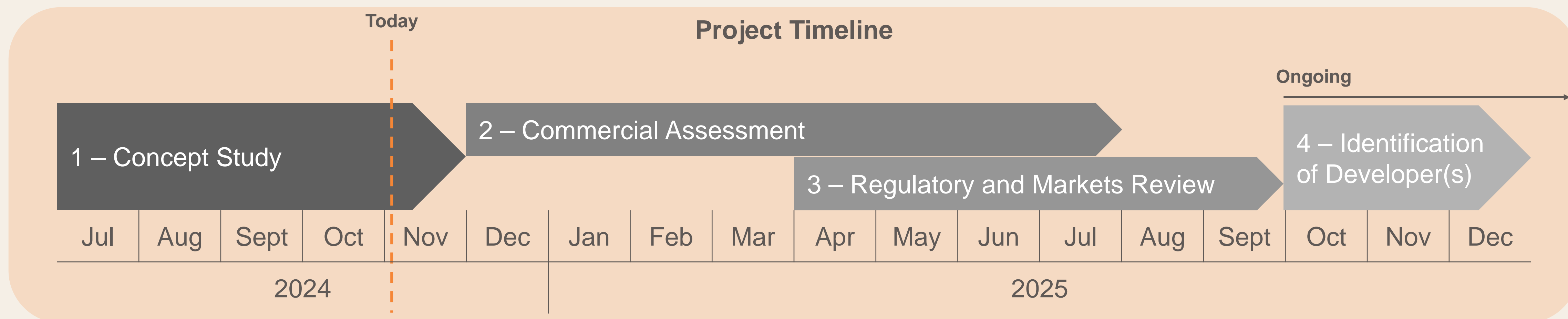
Stage 2 – Commercial Assessment

Assess, refine, and stress-test the outputs and data from Stage 1 to identify a range of commercial arrangements that would likely be acceptable to a project developer and/or network operator, and to users of the GRN.

This stage will include engagement with Aboriginal people in the region.

Stage 3 – Regulatory and Markets Review

Identify and make recommendations on regulatory and market arrangement options that could apply to the GRN, and an assessment of mechanisms available to recover costs associated with developing the GRN.



Future Forums and Working Groups

Information relating to the GRN Forum will be published on PoweringWA's website:

- Terms of Reference, meeting papers, presentations and minutes

The following Forum Working Groups are proposed:

- Industry and Commercial
- Aboriginal Engagement
- Regulatory and Market Arrangements

Stayed tuned for future communications regarding establishment of the Working Groups and the next GRN Forum

For more information visit: wa.gov.au/goldfieldsregionalnetwork



Q&A Panel: Goldfields Beyond 2030

Jai Thomas (Facilitator) | Coordinator of Energy, Energy Policy WA

Gair Landsborough | Executive Manager Asset Management, Western Power

Aaron Walker | Manager and Head of Economics, CME

Stephen Eliot | Principal Advisor, Energy Policy WA

Krystian Krupa | Senior Manager, Electricity Market Modelling, EY



Closing Remarks

Hon. Reece Whitby MLA



PoweringWA

Lunch

Catered by Nikola Ulrich



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Event Close

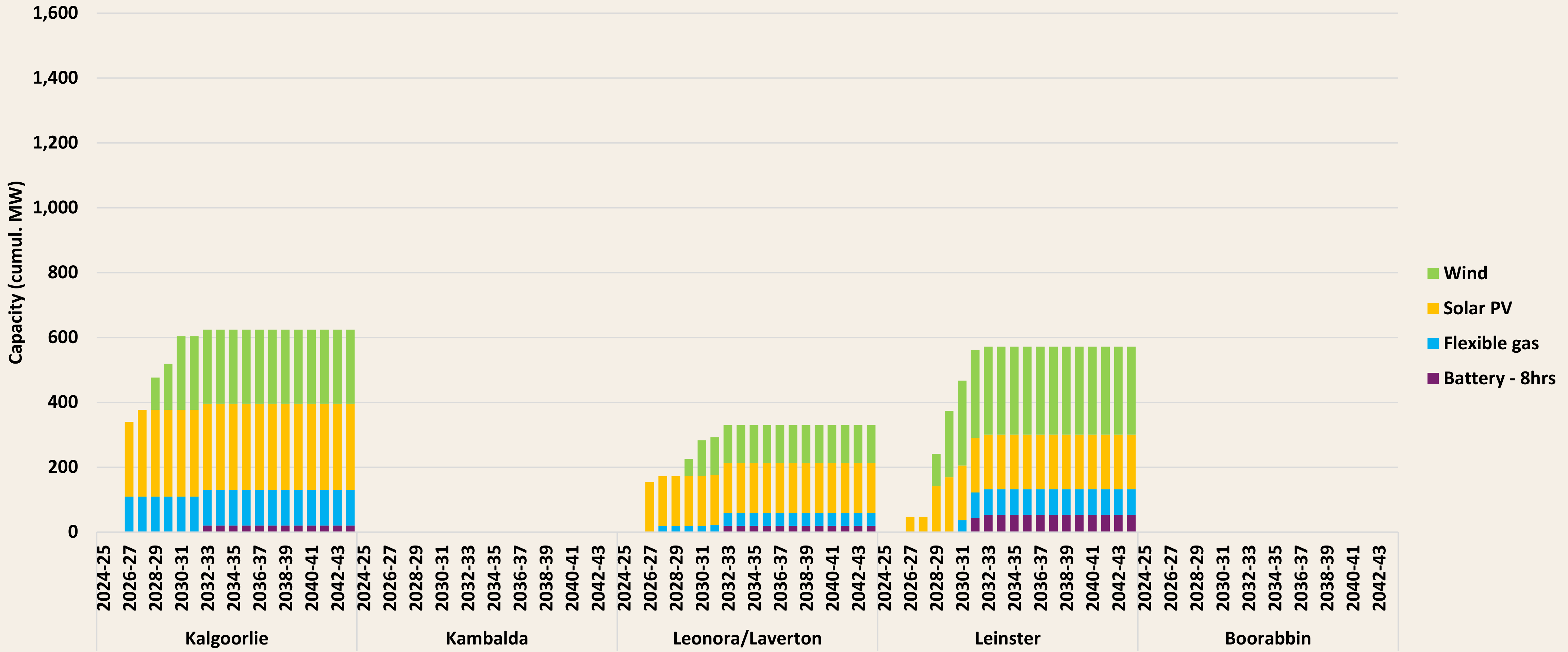
Jai Thomas – Coordinator of Energy, Energy Policy WA



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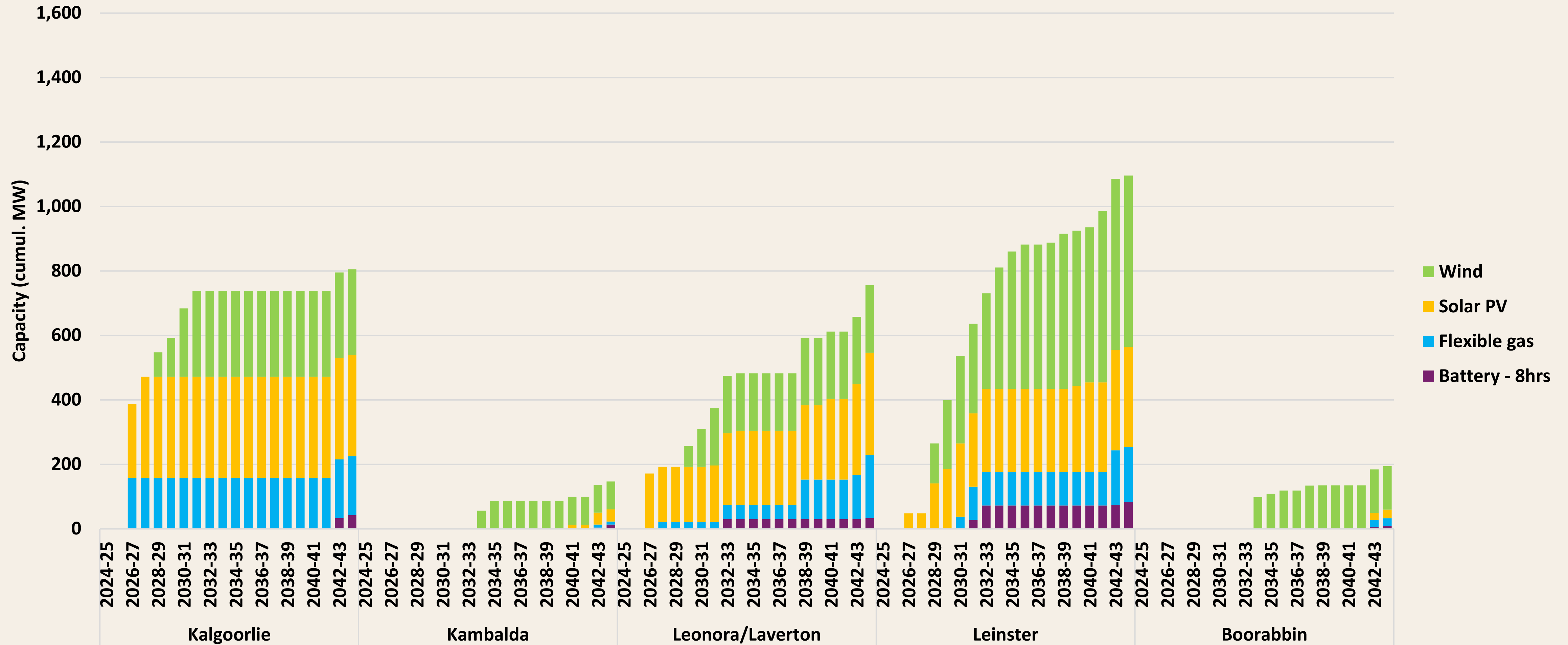
New Generation and Storage Requirements (nodal breakdown, appendix)

COMMITTED demand scenario (MW)



New Generation and Storage Requirements (nodal breakdown, appendix)

STEADY demand scenario (MW)



New Generation and Storage Requirements (nodal breakdown, appendix)

ELECTRIFICATION demand scenario (MW)

