2024 Transmission Network Forum

Transmission Annual Planning Report (TAPR) Technical Session

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Powerlink Queensland

Powerlink acknowledges the Traditional Owners and their custodianship of the lands and waters of Queensland and in particular the lands on which we operate.

We pay our respect to their Ancestors, Elders and knowledge holders and recognise their deep history and ongoing connection to Country.

Disclaimer

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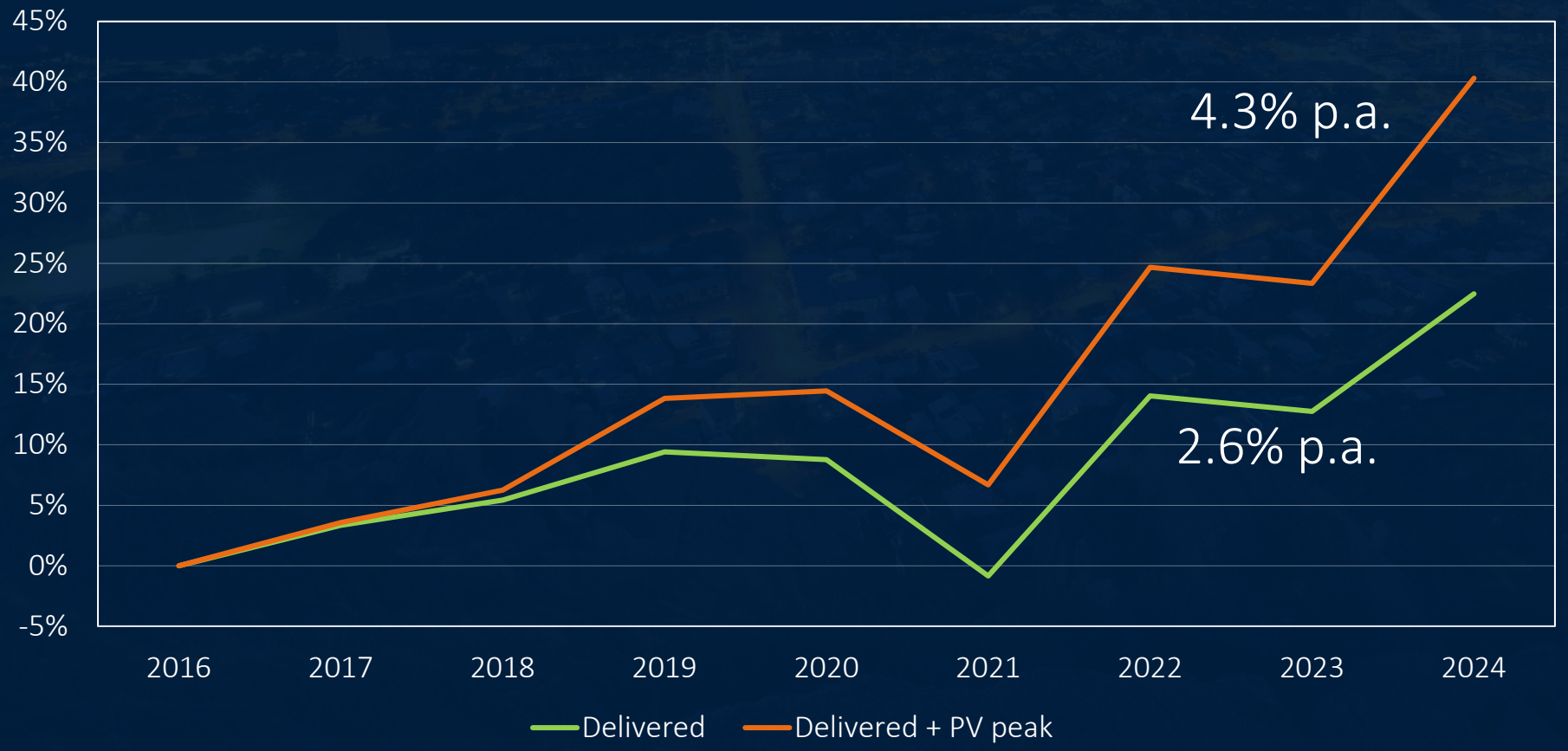
Thank you

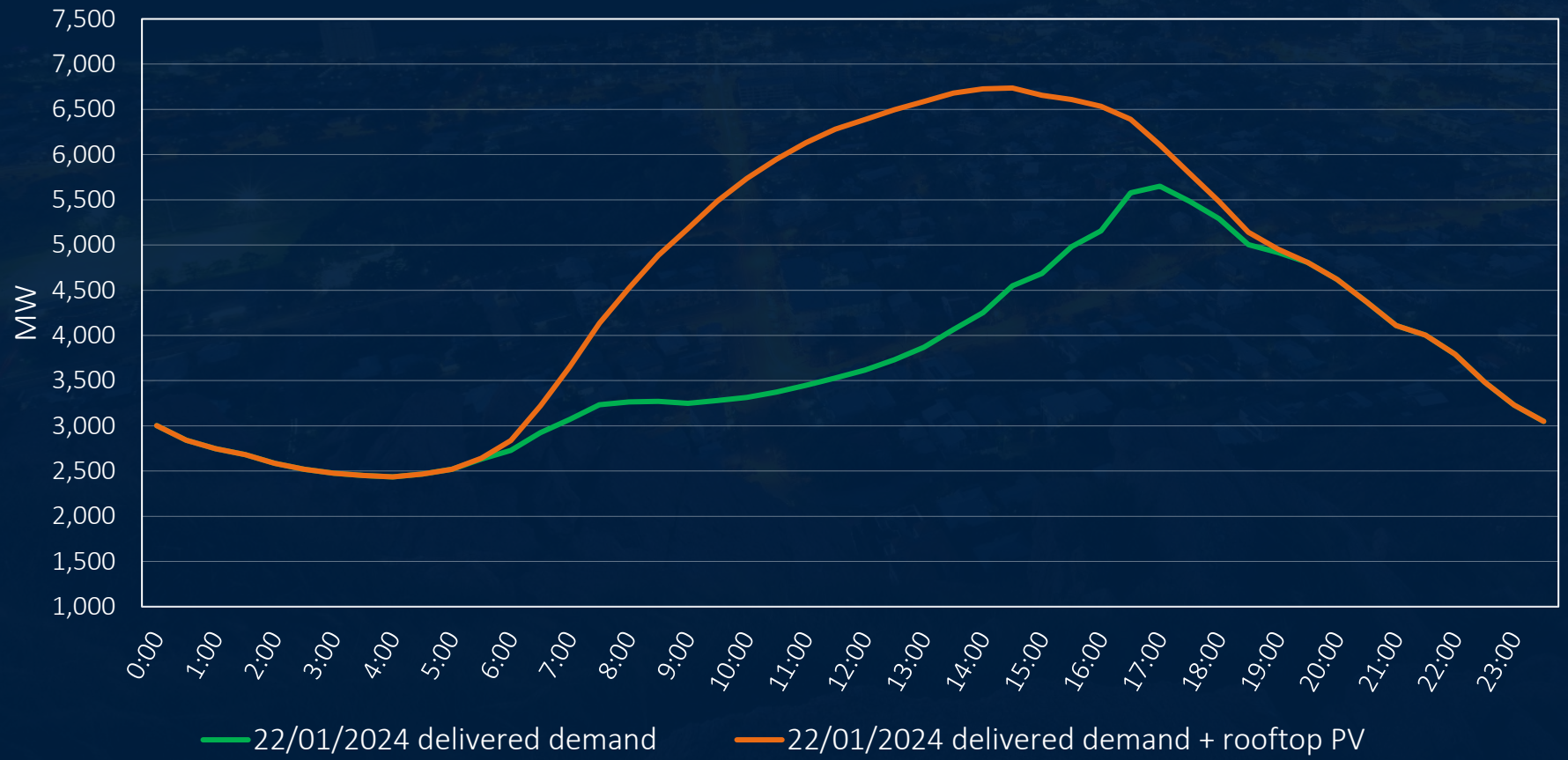
TAPR

- **Demand forecasts**
- Connection pipeline
- Network development
- Ancillary services
- Leverage shared network capacity
- Guide the market

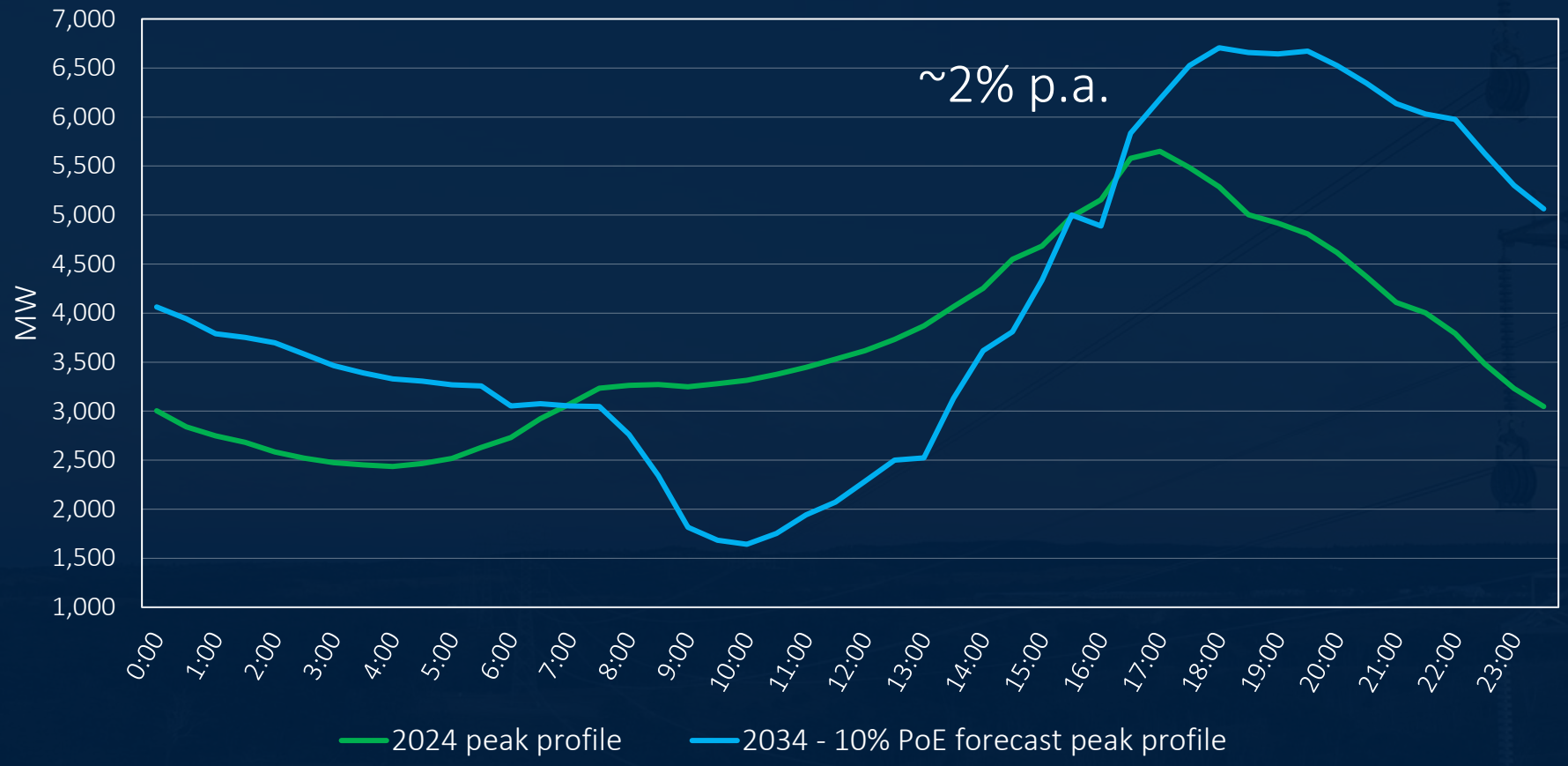
Historical SEQ maximum demand



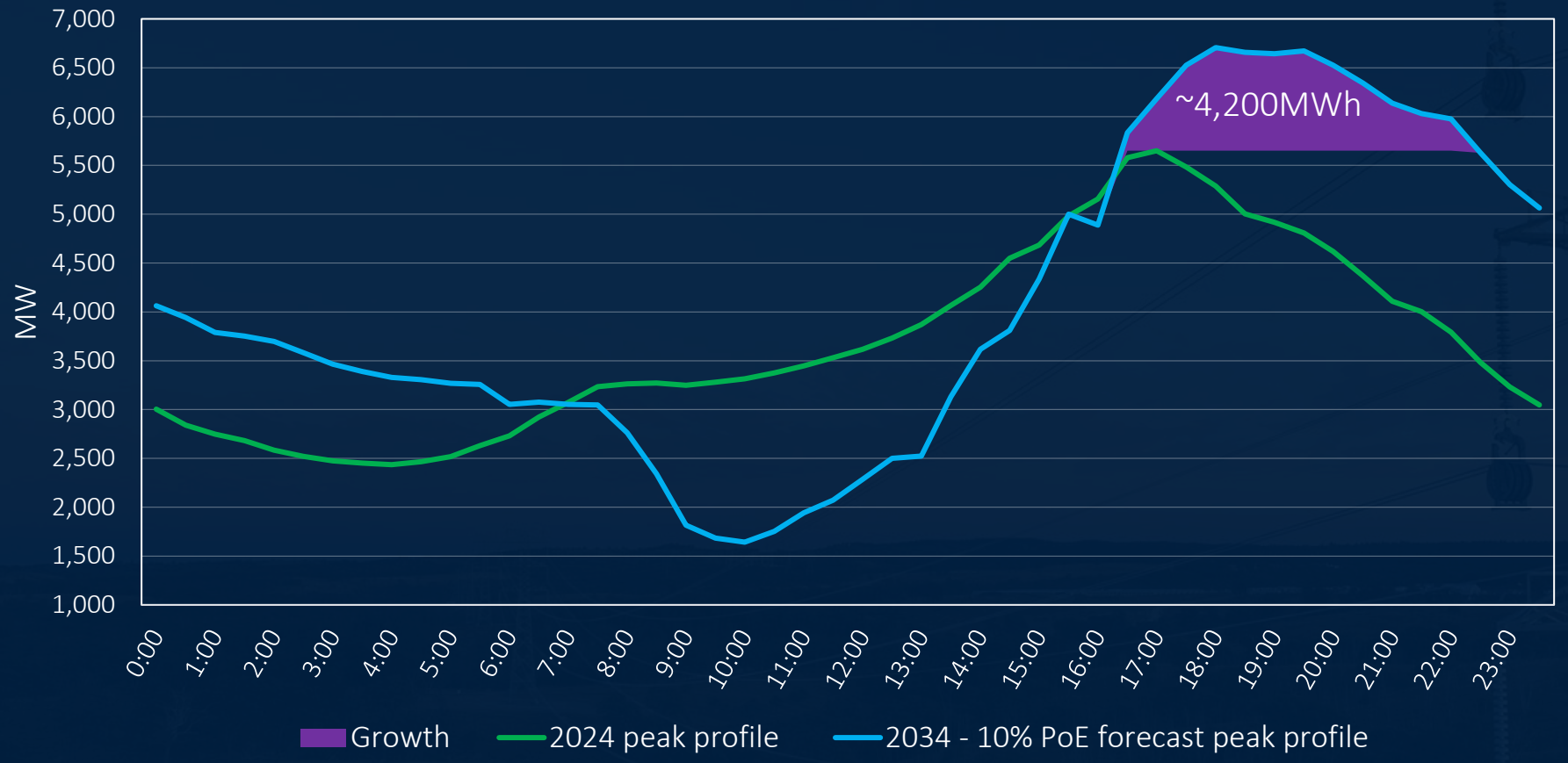
SEQ maximum demand day



Forecast SEQ maximum demand



Moderating SEQ maximum demand



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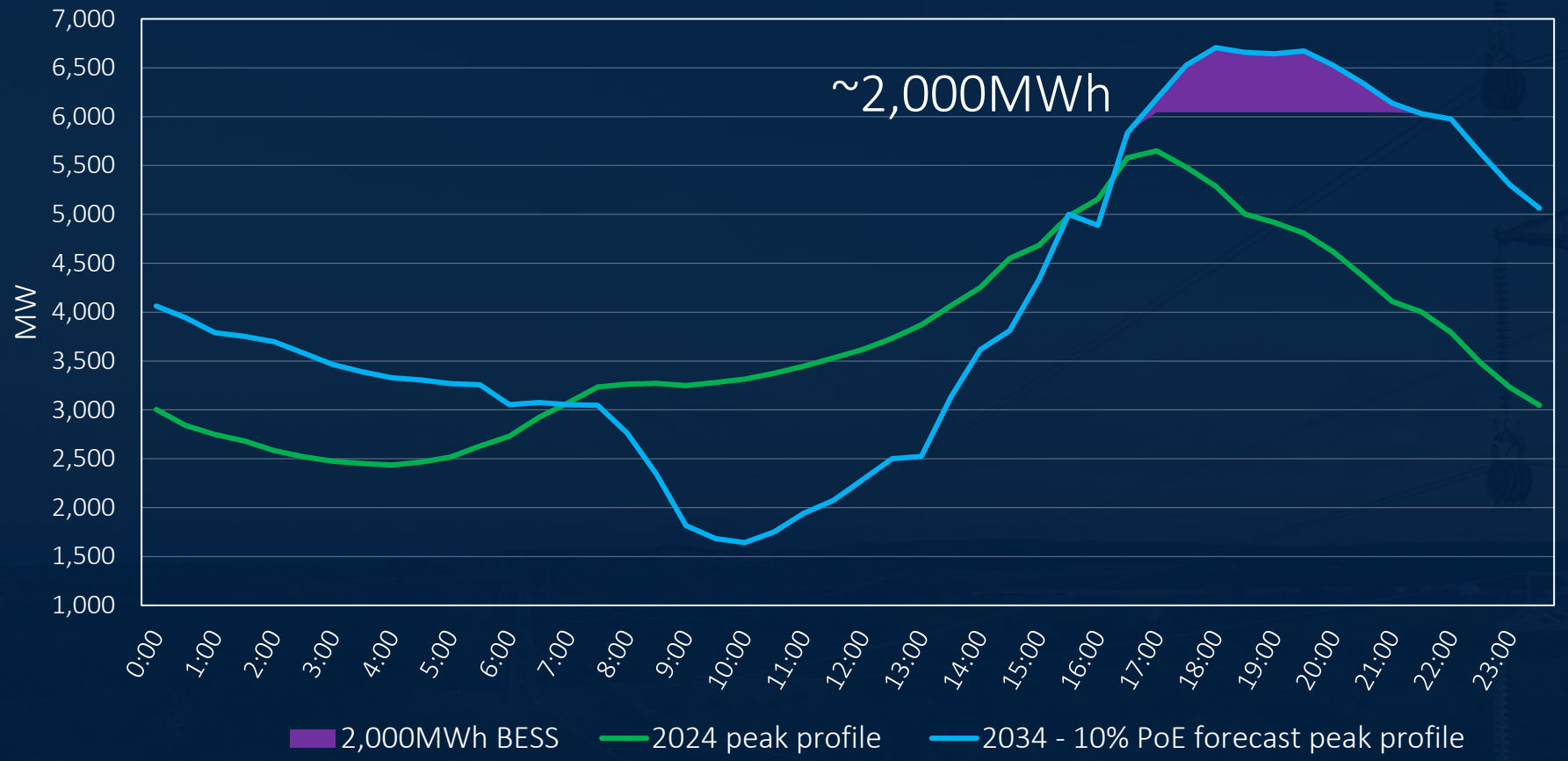
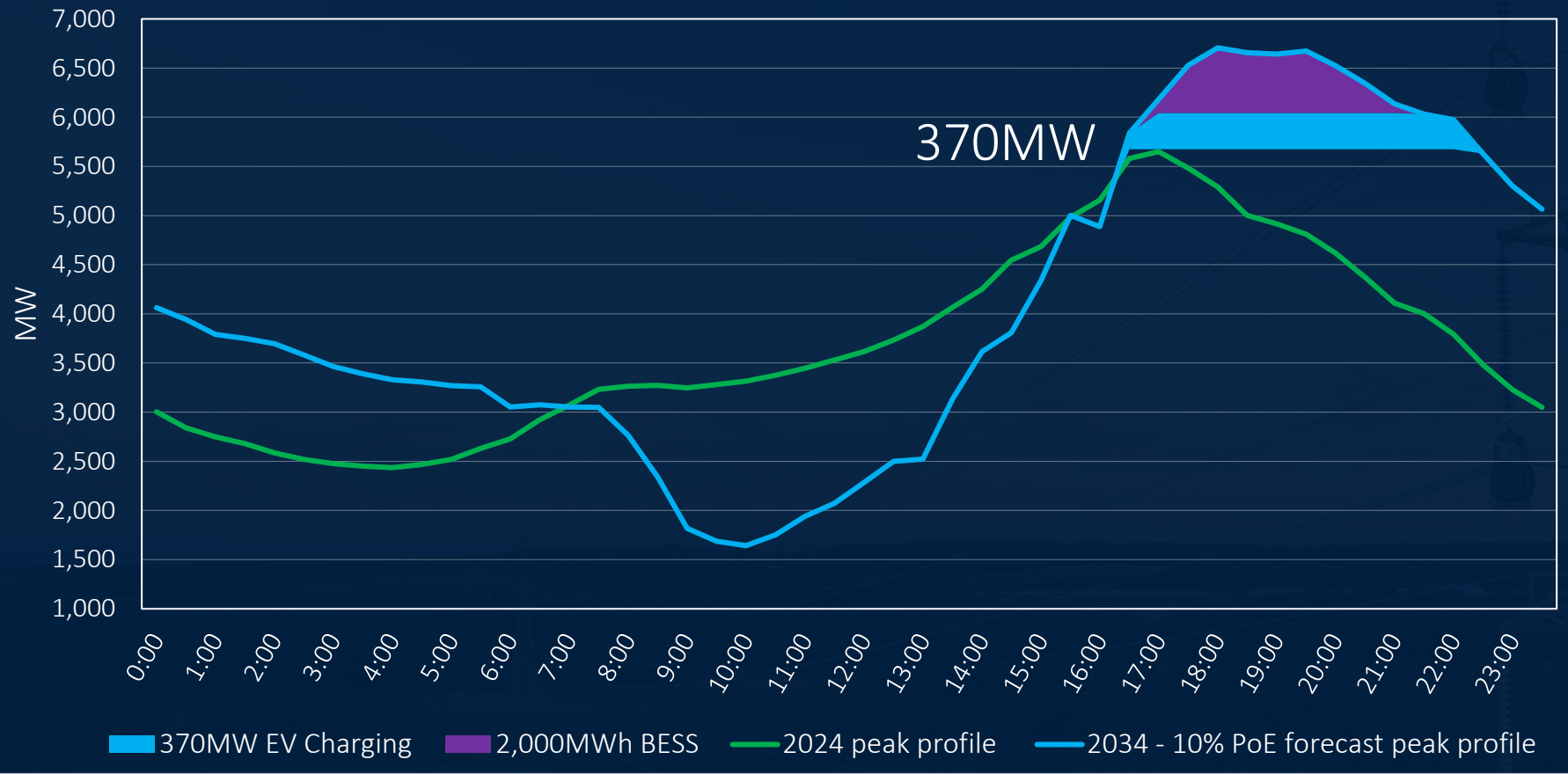
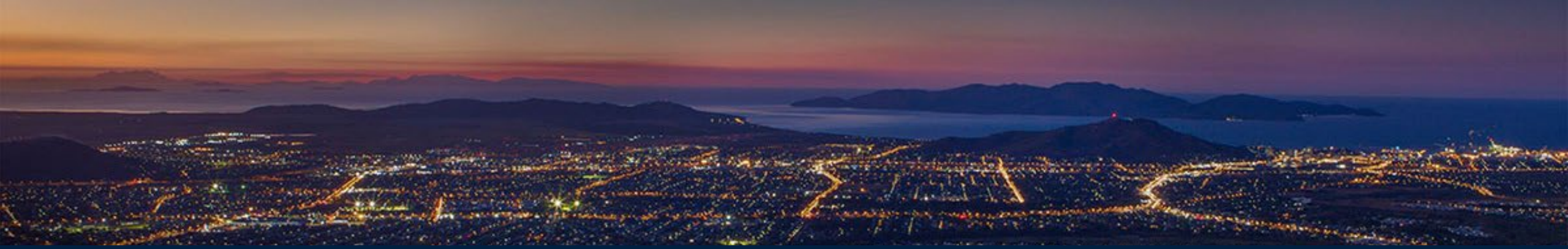


Moderating SEQ maximum demand

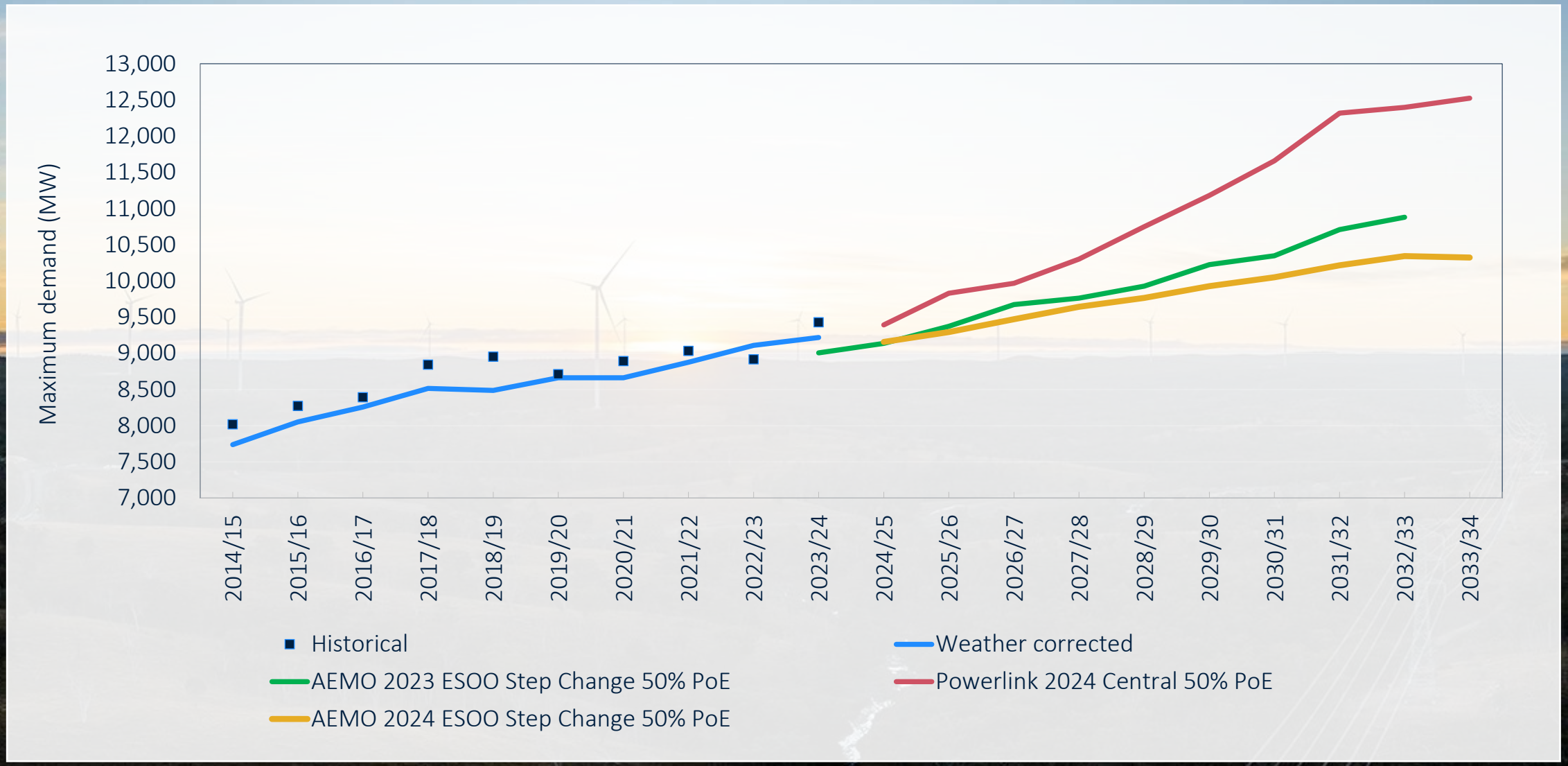




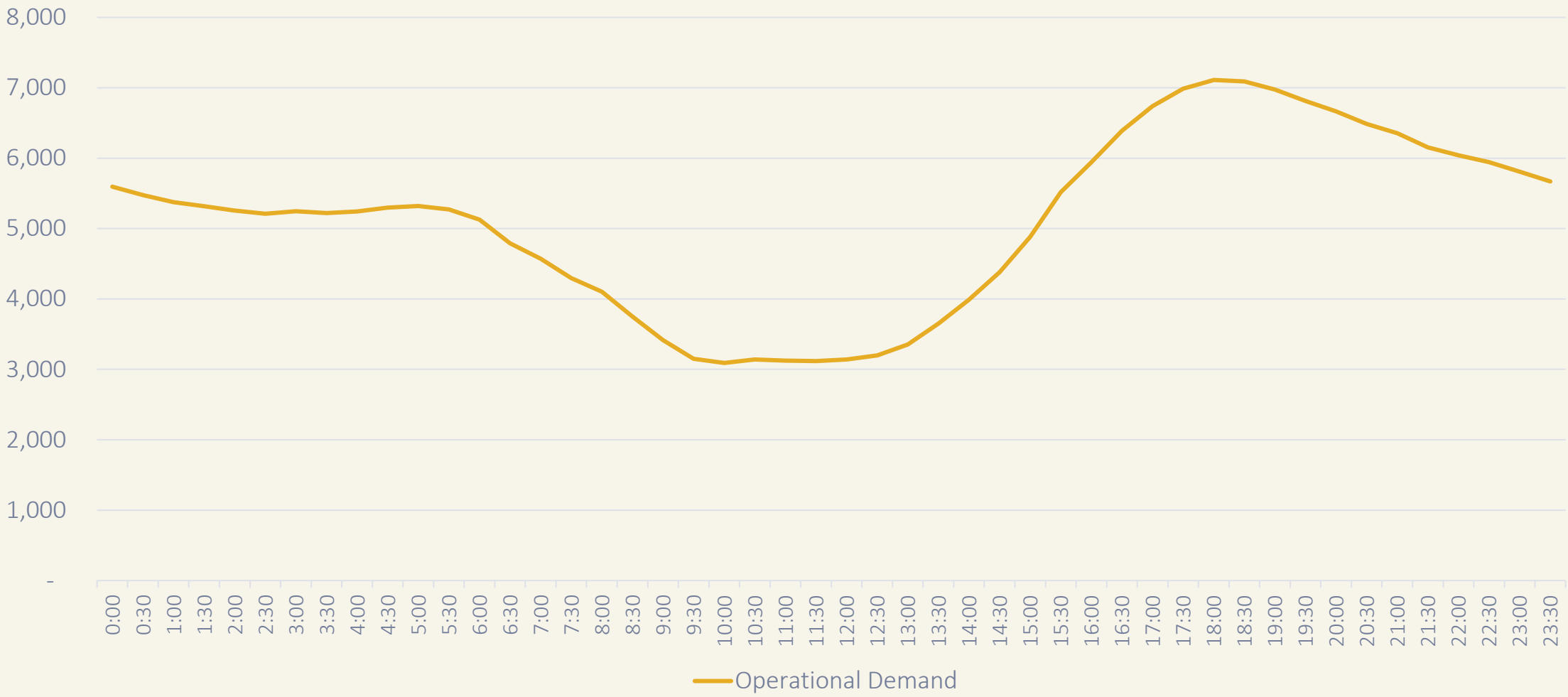
New large industrial loads

Zone	Description	Load in forecast	Possible load
North Queensland	Electrification	~1,500MW	1,600MW
	Manufacturing		
Gladstone	Hydrogen production and liquefaction		3,300 – 7,750MW
	Electrification		
Southern Queensland	Data Centre and industrial		275MW

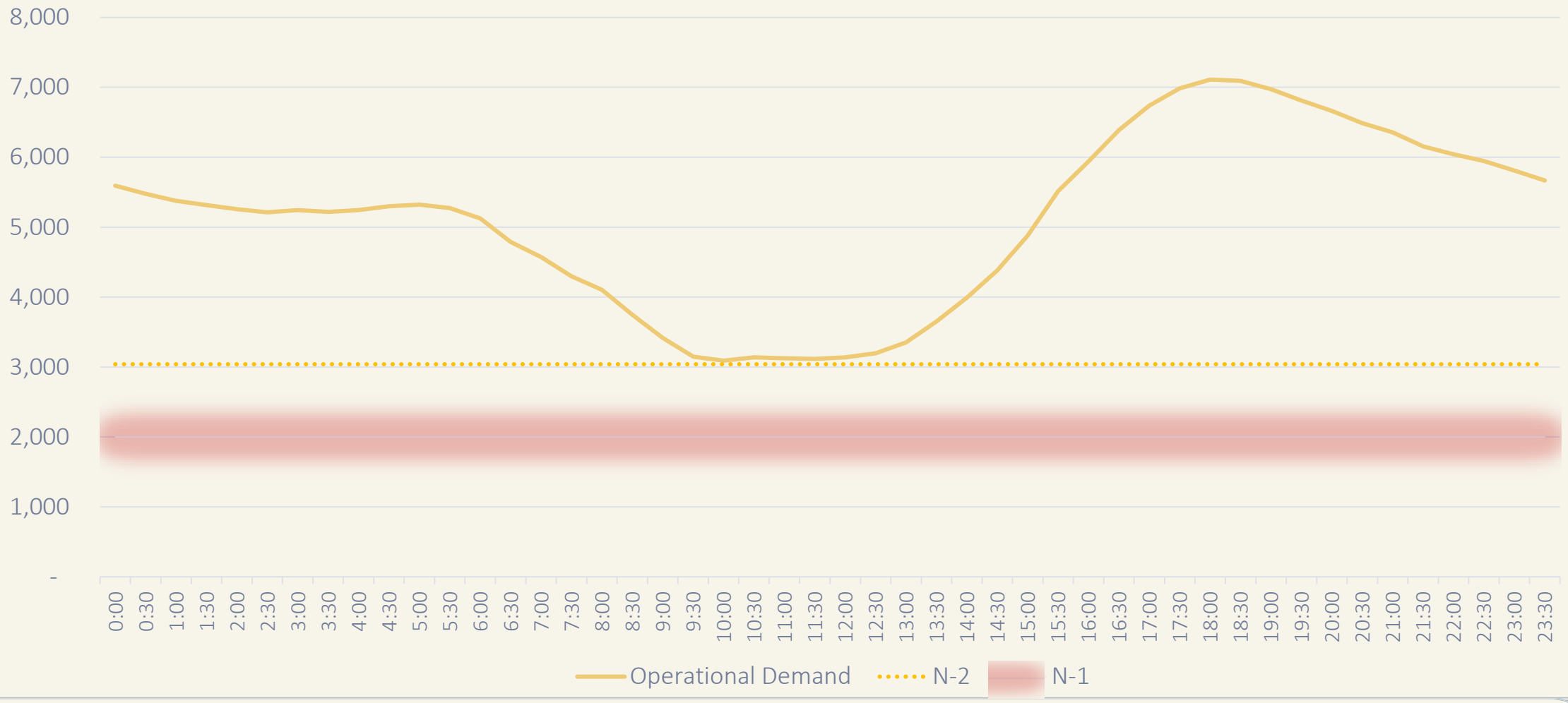
Queensland maximum demand forecast



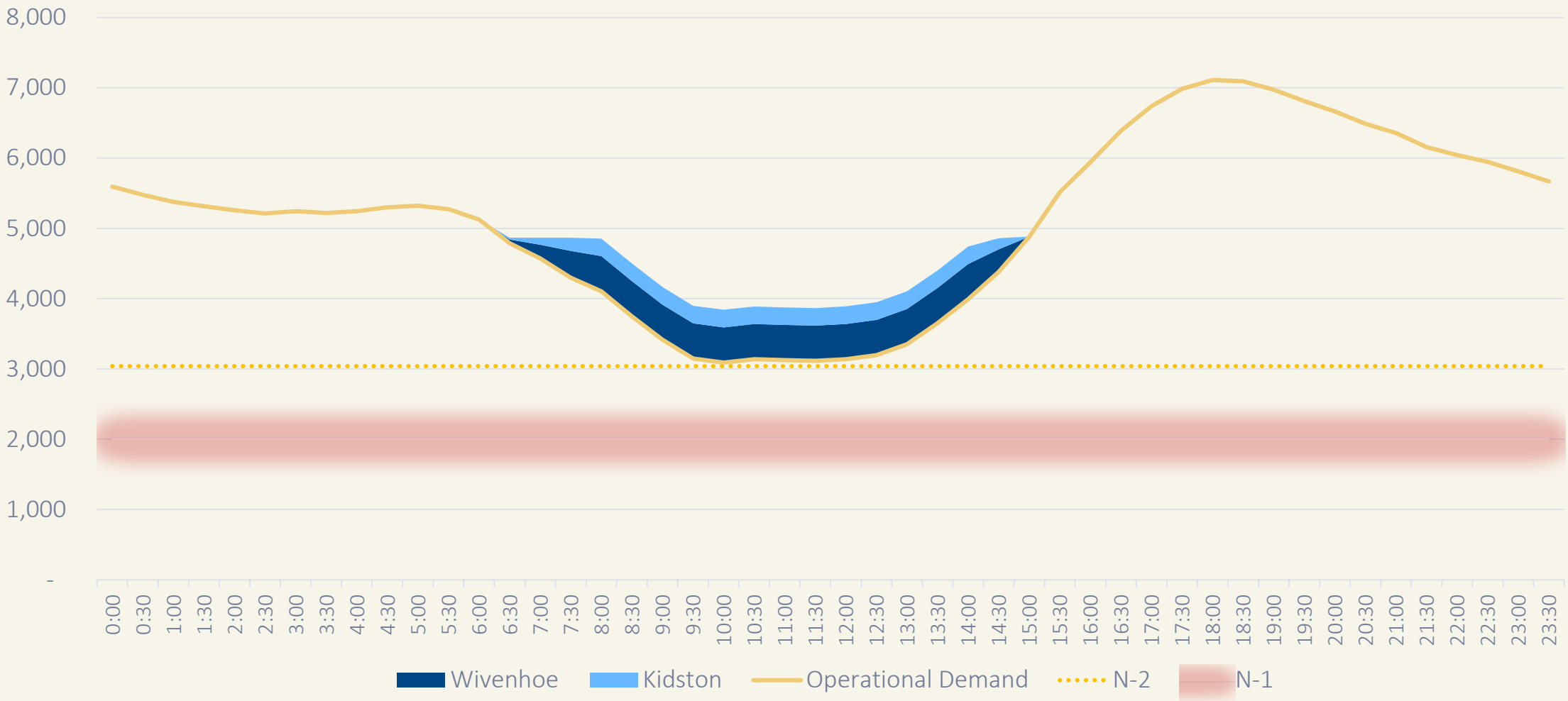
Minimum demand



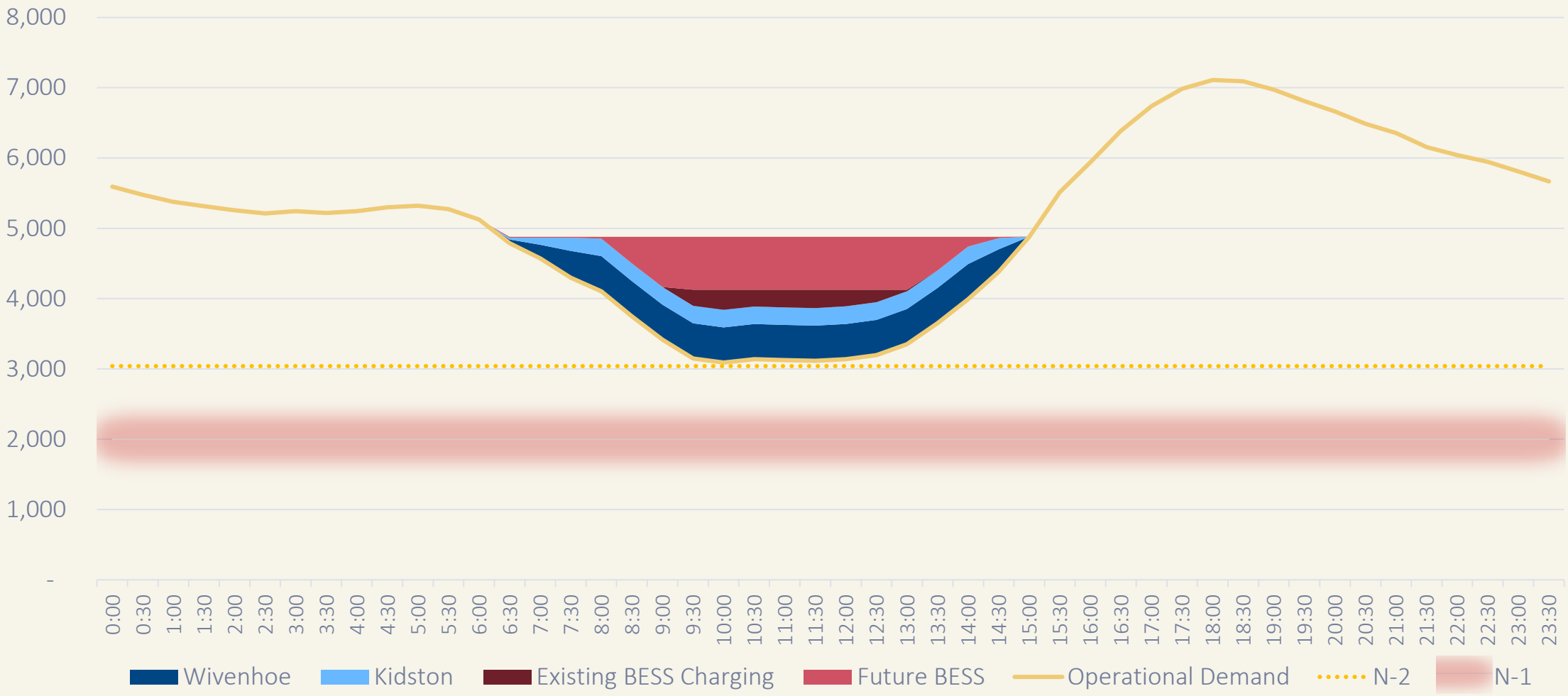
Minimum demand – stability limits



Minimum demand – pumped hydro



Minimum demand – batteries



TAPR

Demand forecasts

Connection pipeline

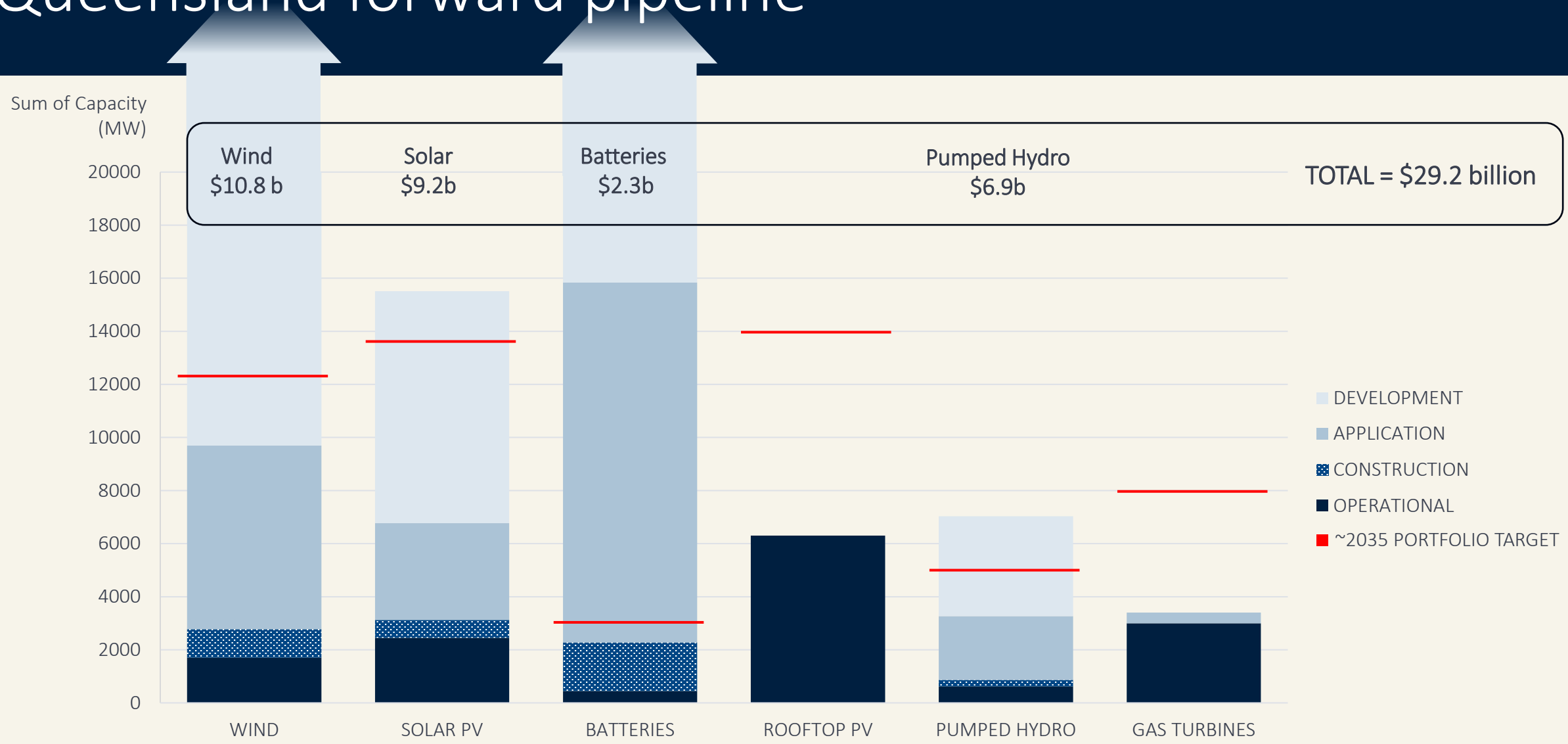
Network development

Ancillary services

Leverage shared network capacity

Guide the market

Queensland forward pipeline



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Demand forecasts

Connection pipeline

Network development - Renewable Energy Zones

Ancillary services

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Renewable Energy Zones

	FAR NORTH QUEENSLAND	SOUTHERN DOWNS	WESTERN DOWNS
Network capacity	~500MW	~ 2,000MW	~1,800MW
Contracted capacity	152MW	890MW	500MW
Application date	September 2019	December 2020	January 2021
Energisation date	October 2022	December 2023	November 2024
Cycle time	3.2 years	3.0 years	3.7 years

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Demand forecasts

Connection pipeline

Network development – SQ-CQ connection

Ancillary services

Leverage shared network capacity

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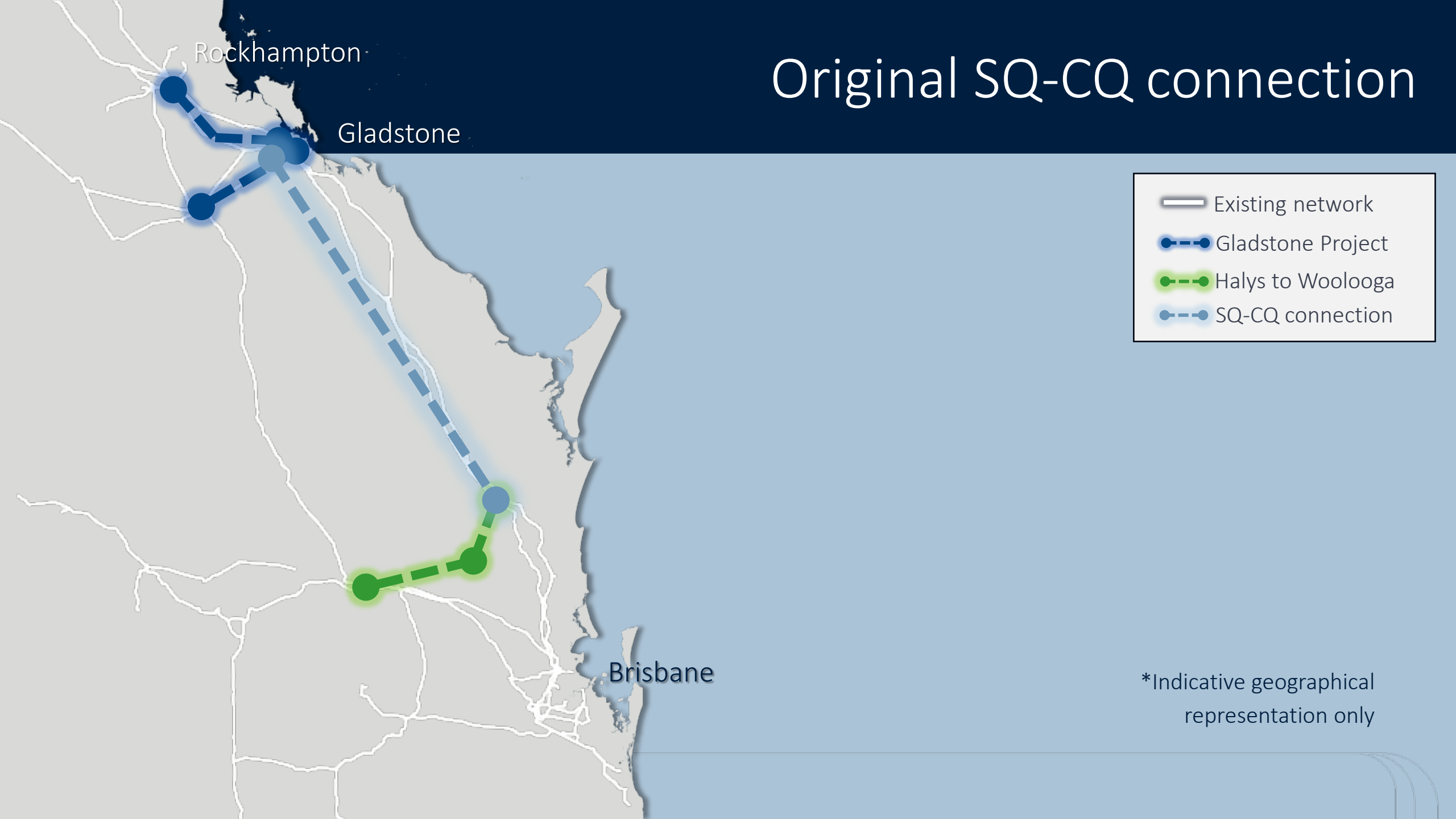
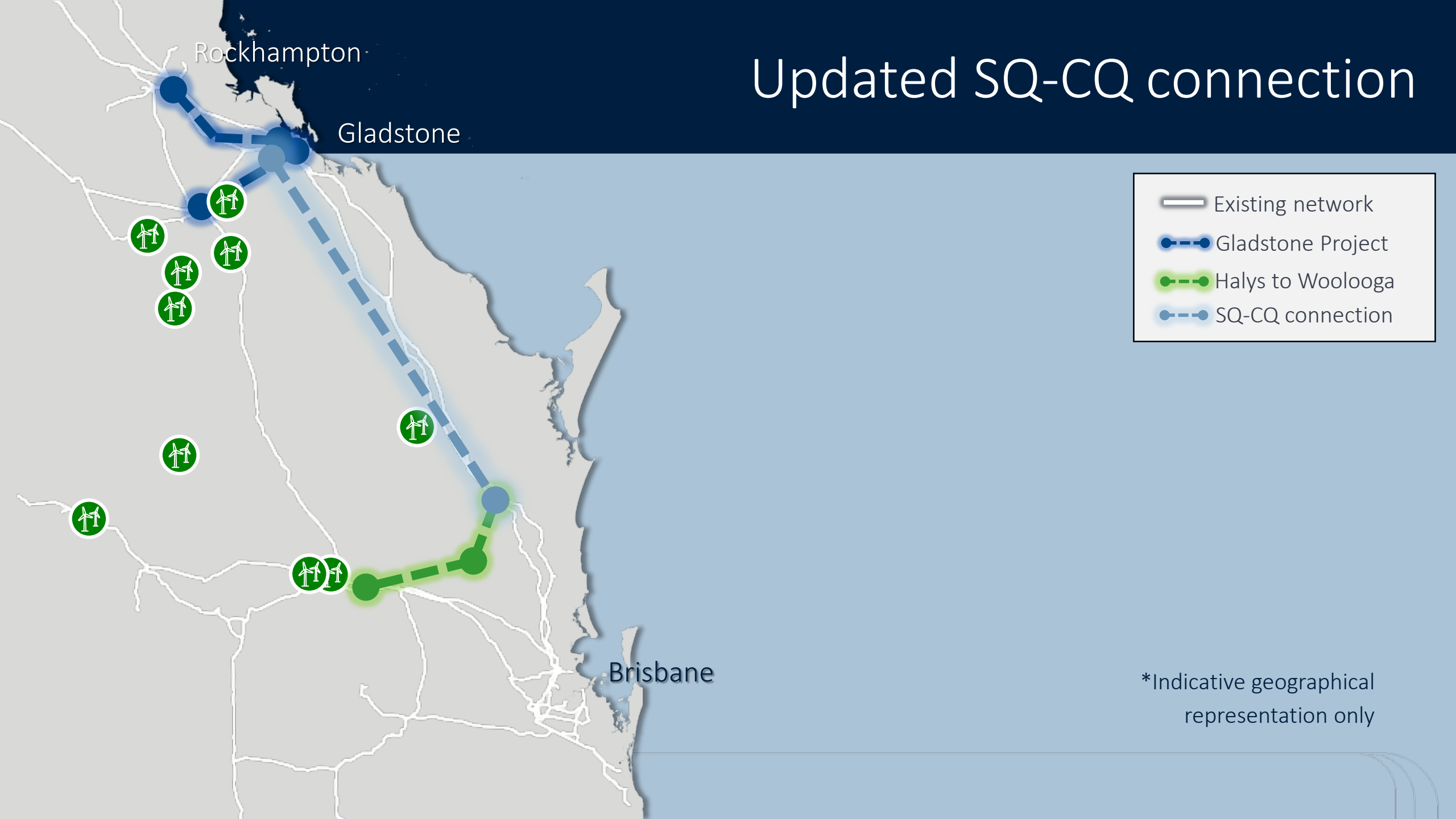
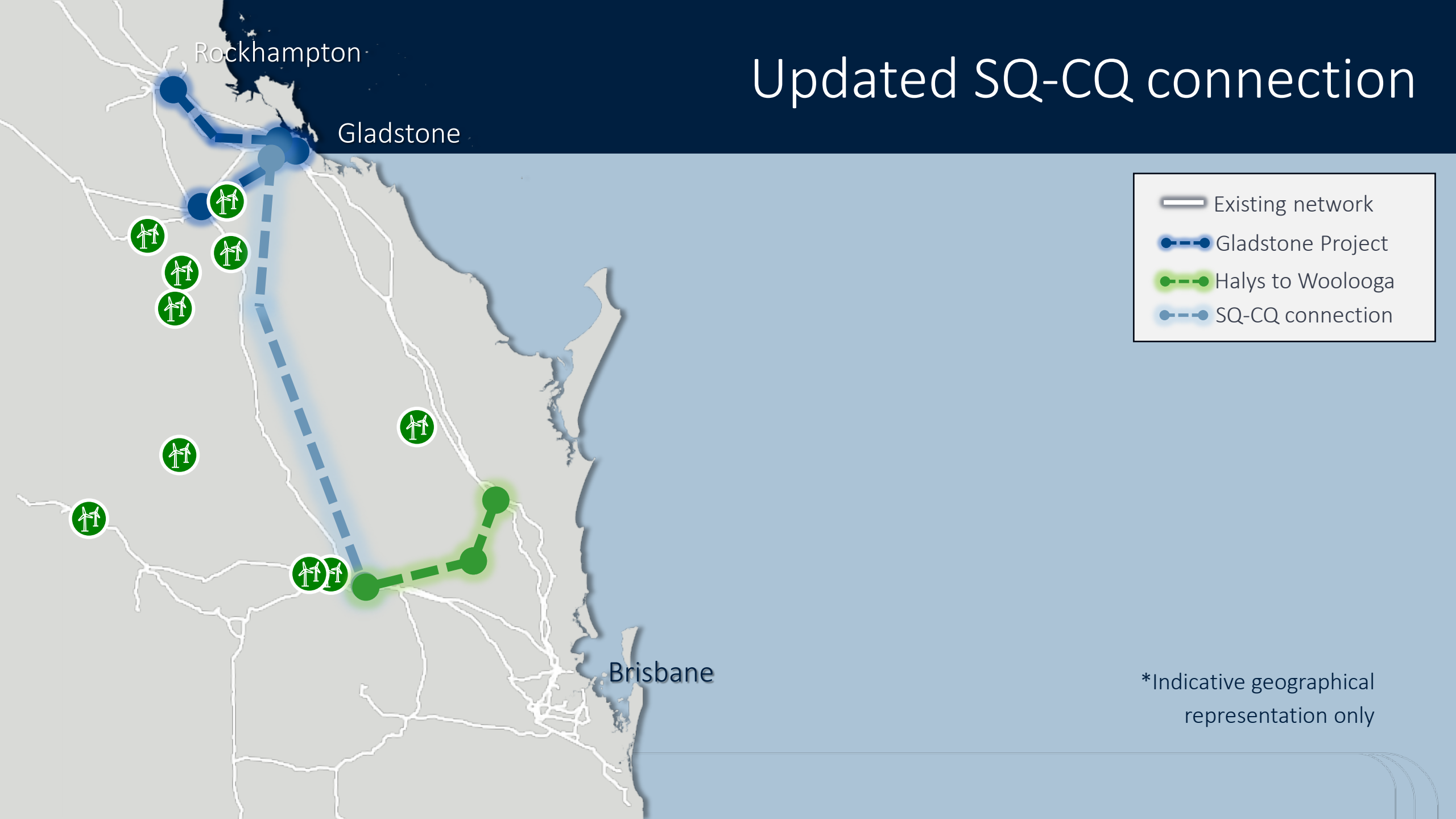
Original SQ-CQ connection



Updated SQ-CQ connection



Updated SQ-CQ connection



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Ancillary services

Technology type	System Strength - protection quality fault level	System Strength - stable voltage waveform	Inertia	Voltage control
Synchronous machines (gas, coal, PHES, syncon)	Yes – High	Yes	Yes – synchronous inertia *(note 2)*	Yes – slow voltage control
Grid forming BESS	Yes – Low *(note 1)*	Yes	Yes – synthetic inertia	Yes – fast voltage control
Grid forming STATCOM	Yes – Low *(note 1)*	Yes	No, without storage, Yes, with energy storage *(note 3)*	Yes – fast voltage control

(1) The magnitude is significantly lower than that of synchronous machines
(2) Synchronous condensers may require flywheels to provide sufficient inertia levels
(3) With an alternative configuration supercapacitors can provide inertia and primary frequency control

System Strength Regulatory Investment Test for Transmission (RIT-T)

- Powerlink is the designated System Strength Service Provider for Queensland, and is responsible for the provision of system strength services from 2 December 2025
- Commenced the RIT-T process to make system strength services available in March 2023
    - Around 80 unique potential solutions from over 20 proponents
- Project Assessment Draft Report published 4 November 2024
    - Technical and economic assessment of five portfolio options
    - Potential need for up to nine new synchronous condensers by 2034
    - Expect other cost-effective solutions to become available

System Strength proposed solution

- Contract with generating units in Southern and Northern Queensland
- Contract with existing gas turbines to install clutches
- Contract with grid forming batteries to enable connection of future renewable generation
- Powerlink to invest in two or three synchronous condensers in Central Queensland
- Maintain flexibility to reopen the regulatory investment test when other projects become committed

Submissions and proposals for non-network solutions due by
Friday, 20 December 2024

Email networkassessments@powerlink.com.au for information

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Demand forecasts

Connection pipeline

Network development

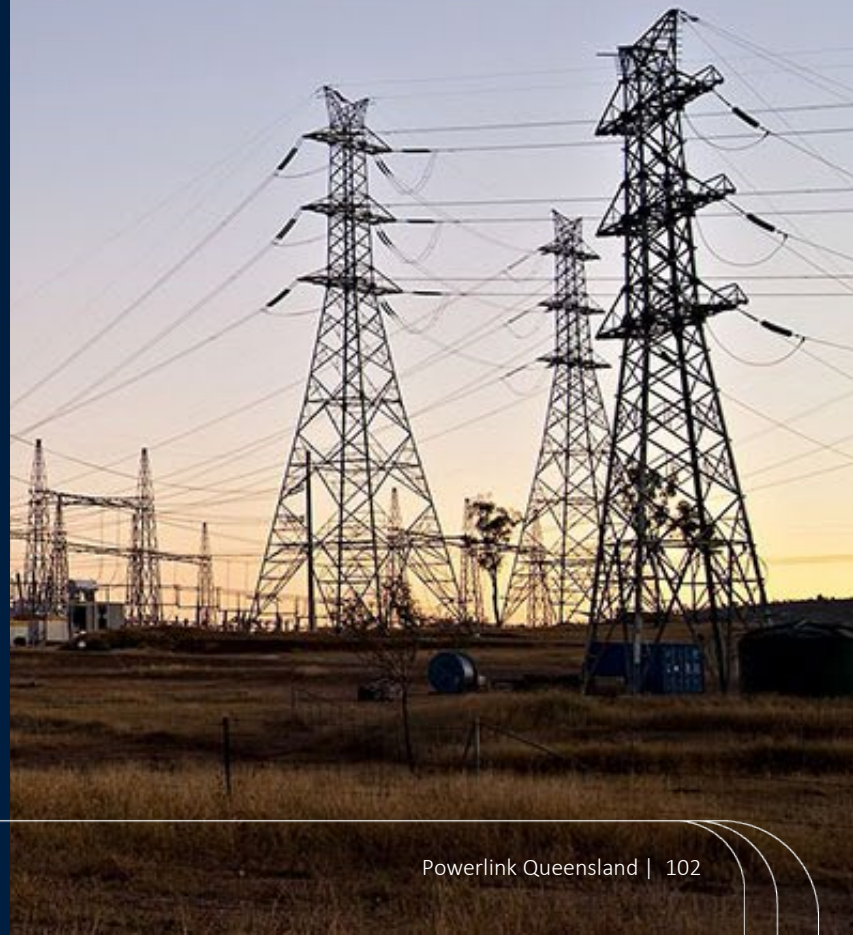
Ancillary services

Leverage shared network capacity

Guide the market

Getting more from what we have

- Wide Area Monitoring Protection and Control (WAMPAC)
  N-2 non-credible event
- Wide Area Monitoring Protection and Control for system strength
- High temperature conductor to provide a higher thermal capacity
- Real-time line ratings
- Virtual transmission line - we can use WAMPAC capability with batteries to get more out of the transmission network
- Leveraging flexible loads to defer augmentations



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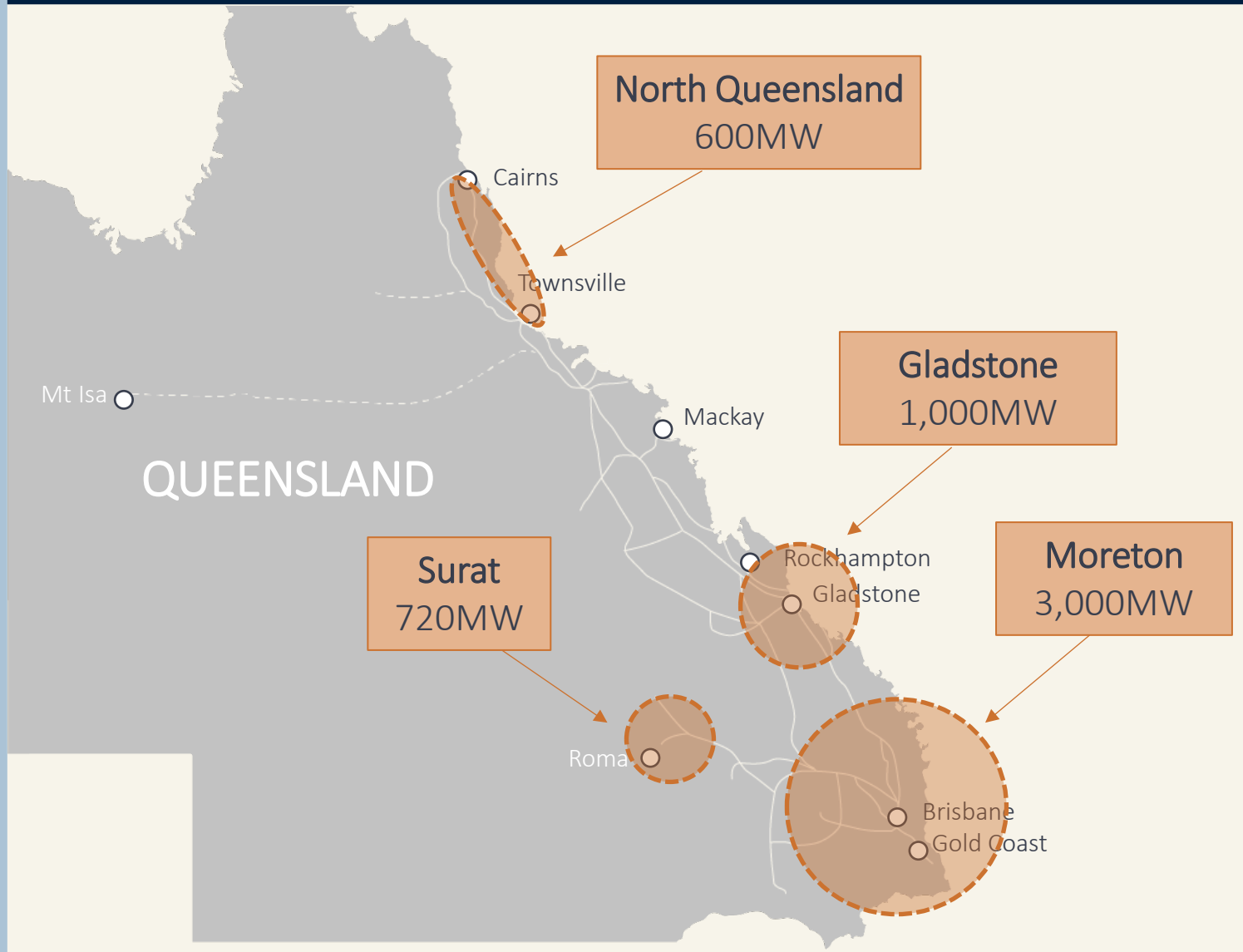
Load centres



Pumped Hydro Energy Storage

EXISTING AND UNDER CONSTRUCTION

- **Kidston** 250MW 2.0GWh
- **Wivenhoe** 570MW 5.7GWh

PROPOSED

- **Borumba** 2000MW 48GWh
- **Capricornia Energy Hub** 750MW 12GWh
- **Cressbrook** (Big T) 400MW 4GWh
- **Flavian** 600MW 10GWh
- **Mt Rawdon** 1000-2000MW 20GWh

Total : ~6GW ~100GWh

Wind

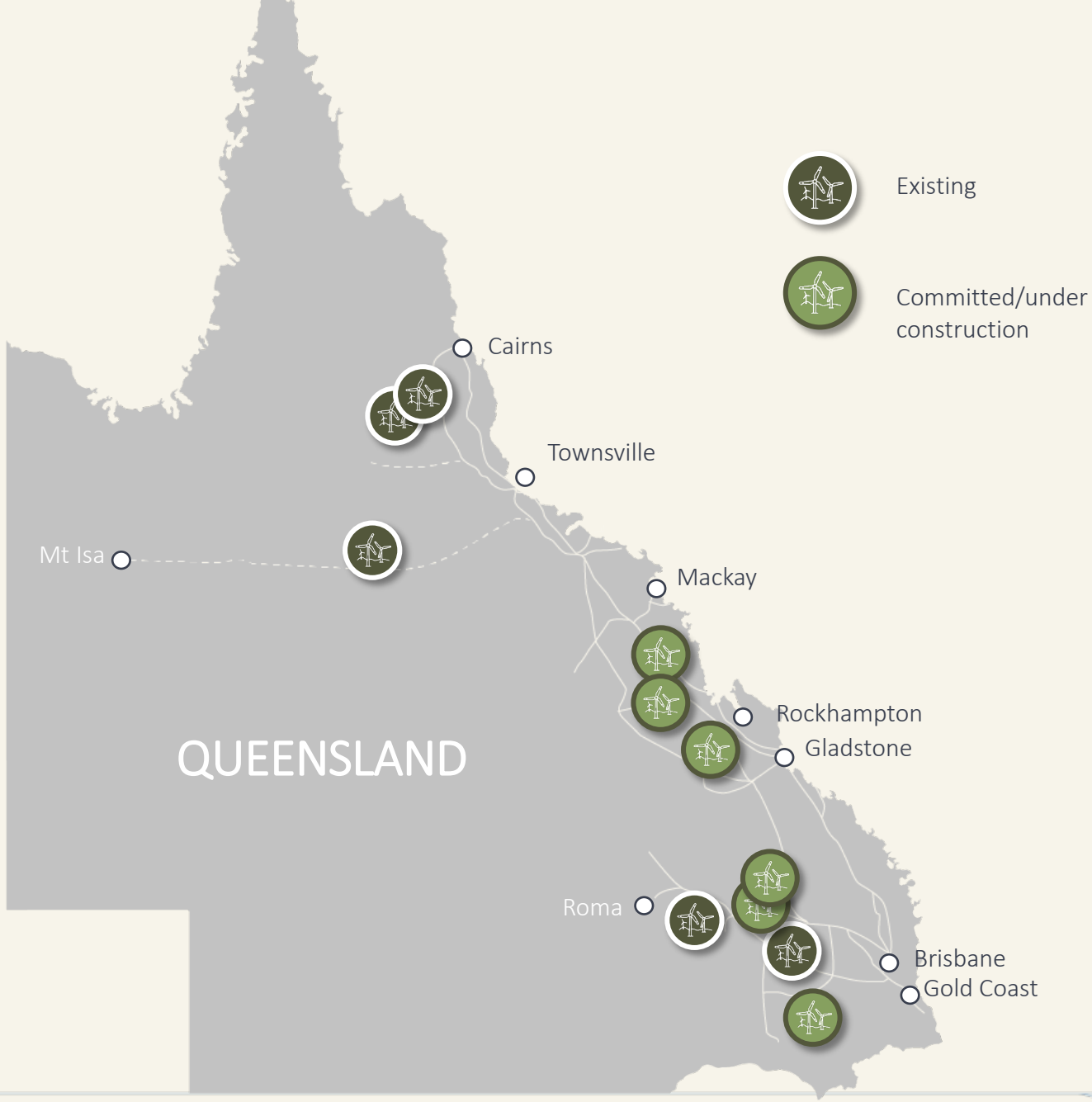
EXISTING

- **Coopers Gap Wind Farm** 440MW
- **Dulacca Renewable Energy Project** 173MW
- **Kaban Green Power Hub** 152MW
- **Kennedy Energy Park** 43MW
- **Mt Emerald Wind Farm** 180MW

UNDER CONSTRUCTION

- **Boulder Creek Wind Farm** 221MW
- **Clarke Creek Wind Farm** 440MW
- **Lotus Creek Wind Farm** 276MW
- **MacIntyre Wind Farm** 890MW
- **Wambo 1 and 2 Wind Farms** 497MW

Total : 3,312MW



Gas Generation

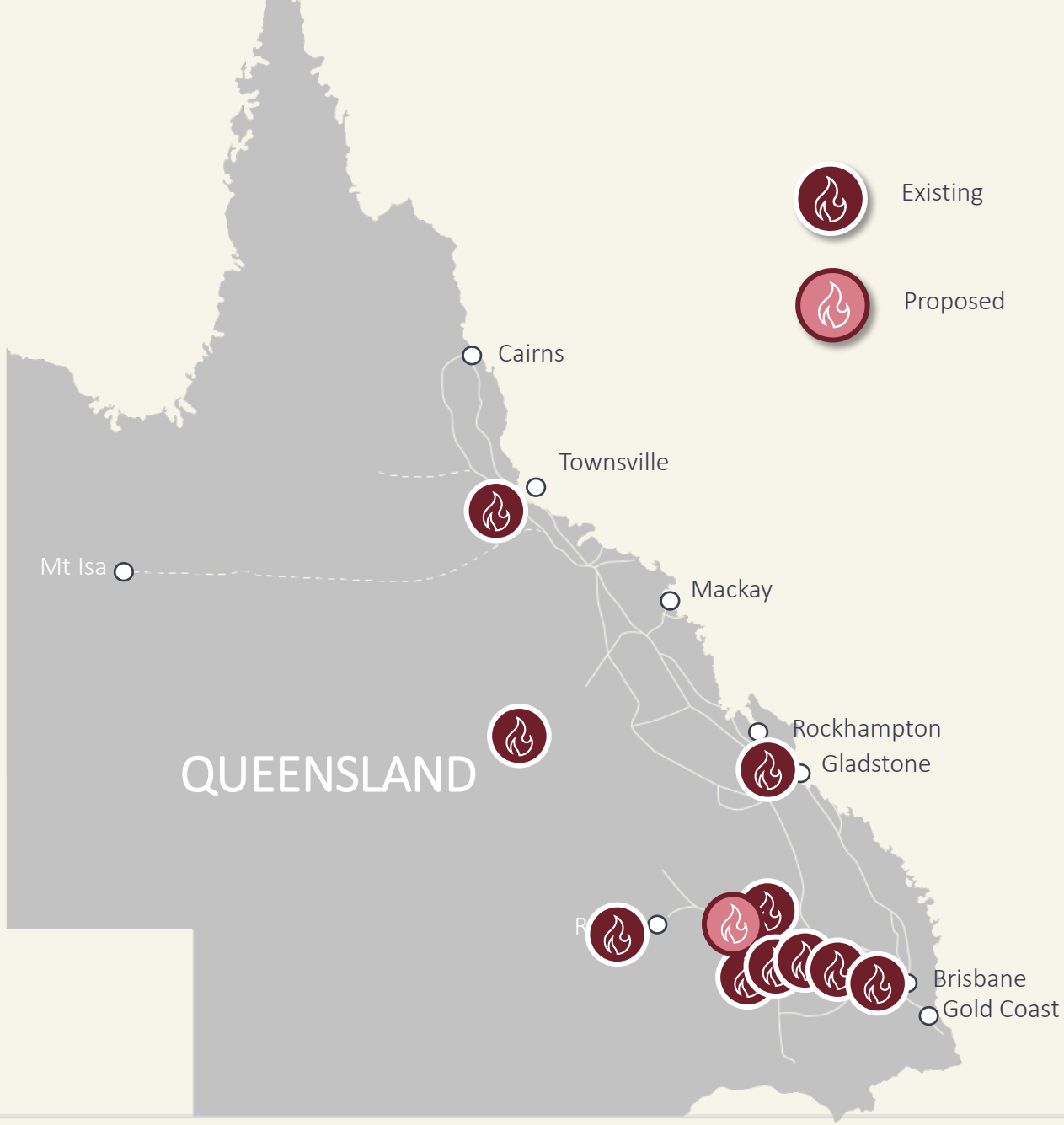
EXISTING

- **Barcaldine** 37MW
- **Braemar 1** 540MW
- **Braemar 2** 520MW
- **Condamine** 144MW
- **Darling Downs** 630MW
- **Oakey** 346MW
- **Roma** 68MW
- **Swanbank E** 365MW
- **Townsville** 240MW
- **Yarwun** 160MW

PROPOSED

- **Brigalow GT** 400MW

Total : 3,450MW



Batteries

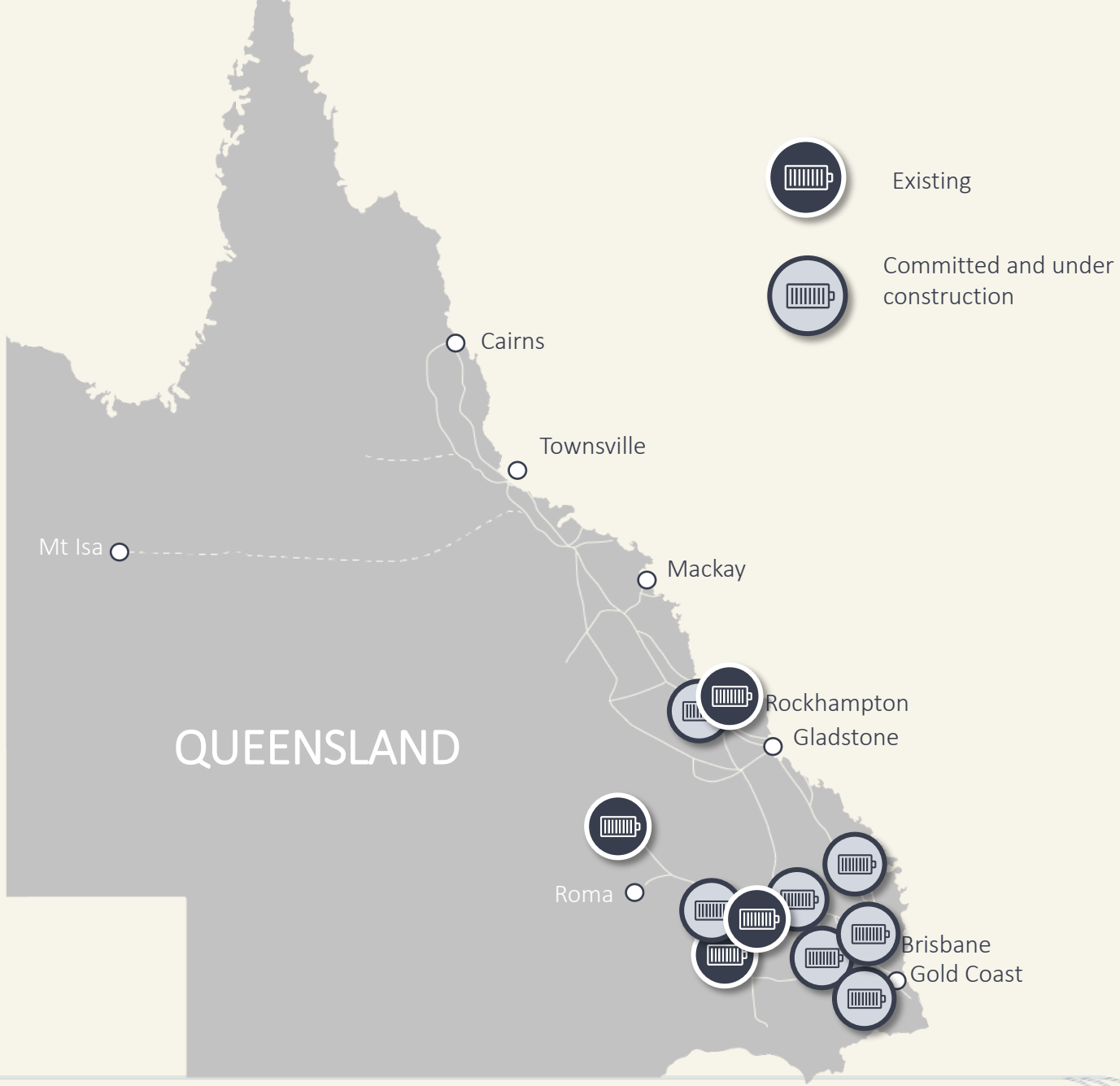
EXISTING

- **Bouldercombe** 50MW 100MWh
- **Chinchilla BESS** 100MW 200MWh
- **Wandoan BESS** 100MW 150MWh
- **Western Downs BESS** 200MW 400MWh

UNDER CONSTRUCTION

- **Central REZ BESS** 300MW 1200MWh
- **Greenbank BESS** 200MW 400MWh
- **Supernode BESS** 500MW 1500MWh
- **Brendale BESS** 205MW 410MWh
- **Swanbank BESS** 250MW 500MWh
- **Tarong REZ BESS** 300MW 600MWh
- **Ulinda BESS** 155MW 298MWh
- **Woolooga BESS** 200MW 400MWh

Total : 2,560MW 6,158MWh



Dynamic Voltage Support

EXISTING

- **Woree** 132kV -80 – 150MVAr
- **Ross** 275kV -80 – 150MVAr
- **Strathmore** 275kV -94 – 260MVAr
- **Nebo** 275kV -80 – 260MVAr
- **Woolooga** 275kV -100 – 350MVAr
- **South Pine** 275kV -100 – 350MVAr
- **Blackwall** 275kV -50 – 250MVAr
- **Greenbank** 275kV -100 – 350MVAr

Questions