



Victoria to New South Wales Interconnector West (VNI West)

Project Assessment Draft Report
(PADR) | Information Session

10 August 2022

Recording in progress

Please Note

This session is being recorded.

**The recording will be published on
AEMO's website, along with this presentation.**

Acknowledgement of Country

In the spirit of reconciliation, I would like to begin by acknowledging the Traditional Custodians of the land on which we meet.

I pay my respects to their Elders past, present and emerging, and extend that respect to all Aboriginal and Torres Strait Islander people participating in this meeting today.

Introductions & Agenda

| Agenda item | Presenter | Organisation |
|---|-----------|-------------------------|
| Welcome | Mark | Transgrid |
| Broader Energy Market Context | Sarah | AEMO Victorian Planning |
| Identified Need / Credible Options / Cost Estimation | Sarah | AEMO Victorian Planning |
| Social and Environmental Considerations | Taryn | Transgrid |
| NPV Results | Ann | HoustonKemp |
| Market Modelling Overview | Nadali | EY |
| Q&A | Louisa | AEMO Victorian Planning |
| Thank you & close - submissions closing date reminder | Mark | Transgrid |

Broader Energy Market Context

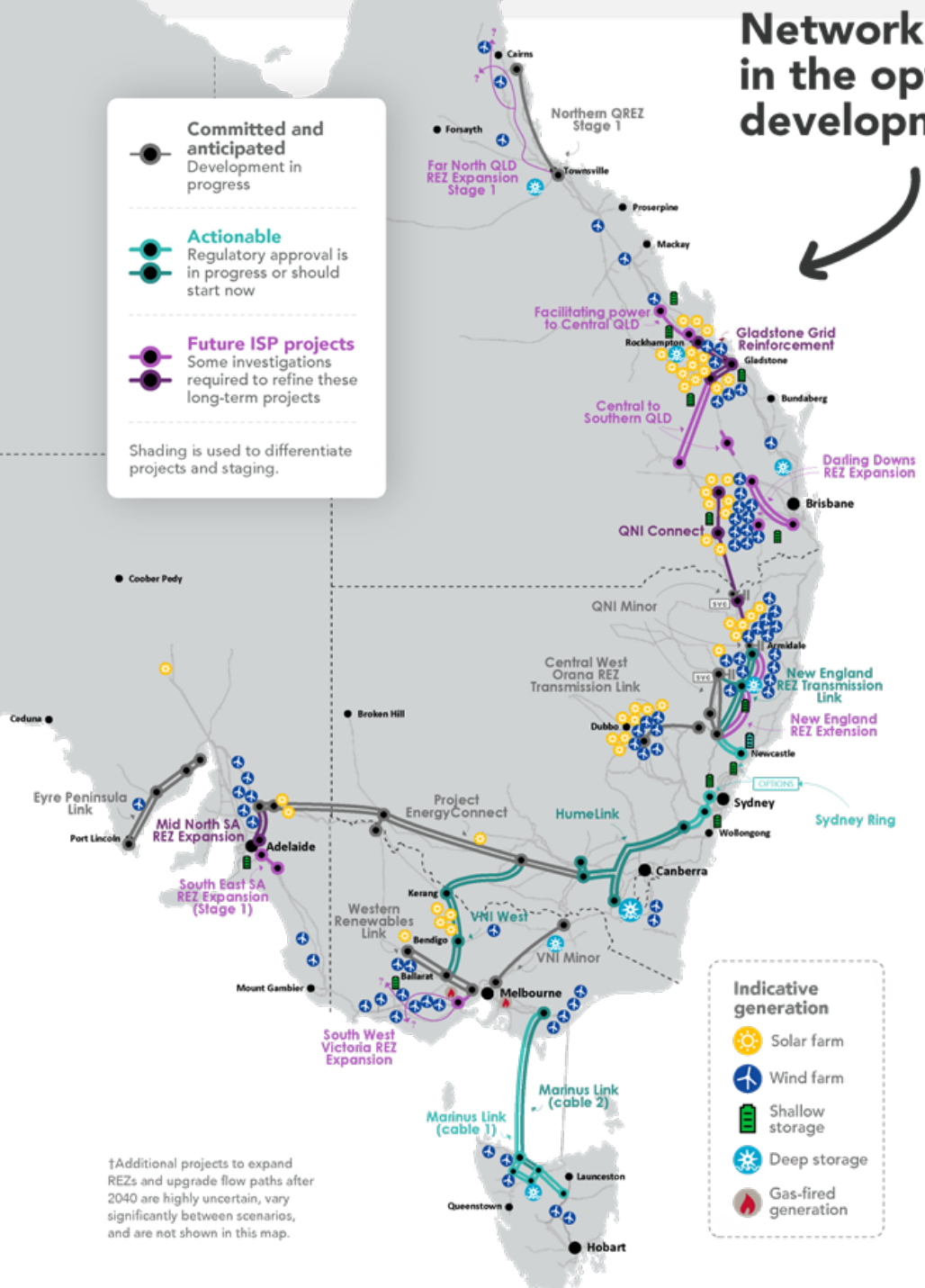


Integrated System Plan

Network projects in the optimal development path

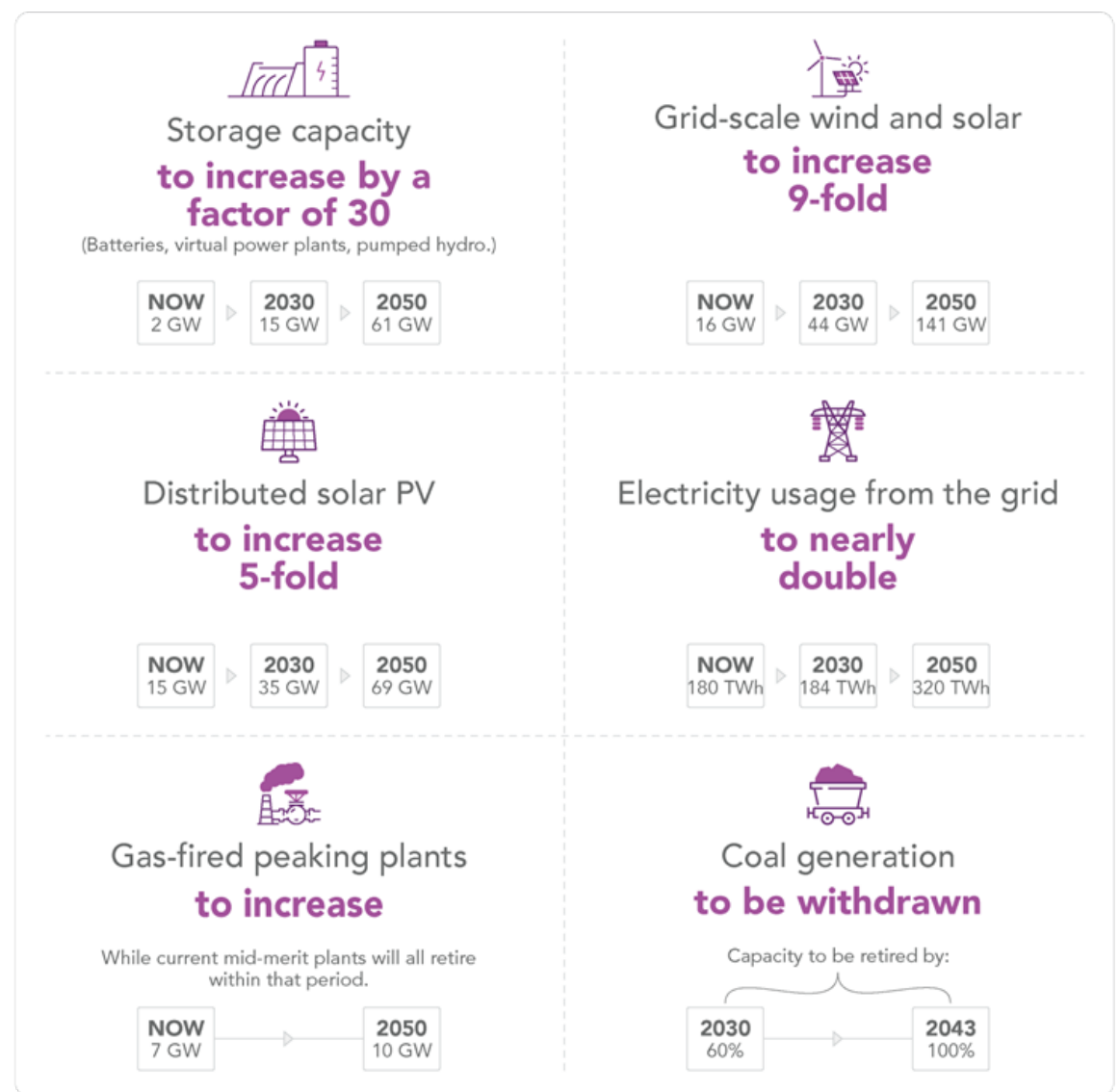
Expected energy transition to 2050 ('Step Change' scenario)

- Committed and anticipated**
Development in progress
 - Actionable**
Regulatory approval is in progress or should start now
 - Future ISP projects**
Some investigations required to refine these long-term projects
- Shading is used to differentiate projects and staging.



- Indicative generation**
- Solar farm
 - Wind farm
 - Shallow storage
 - Deep storage
 - Gas-fired generation

†Additional projects to expand REZs and upgrade flow paths after 2040 are highly uncertain, vary significantly between scenarios, and are not shown in this map.



Identified Need / Credible Options / Cost Estimation

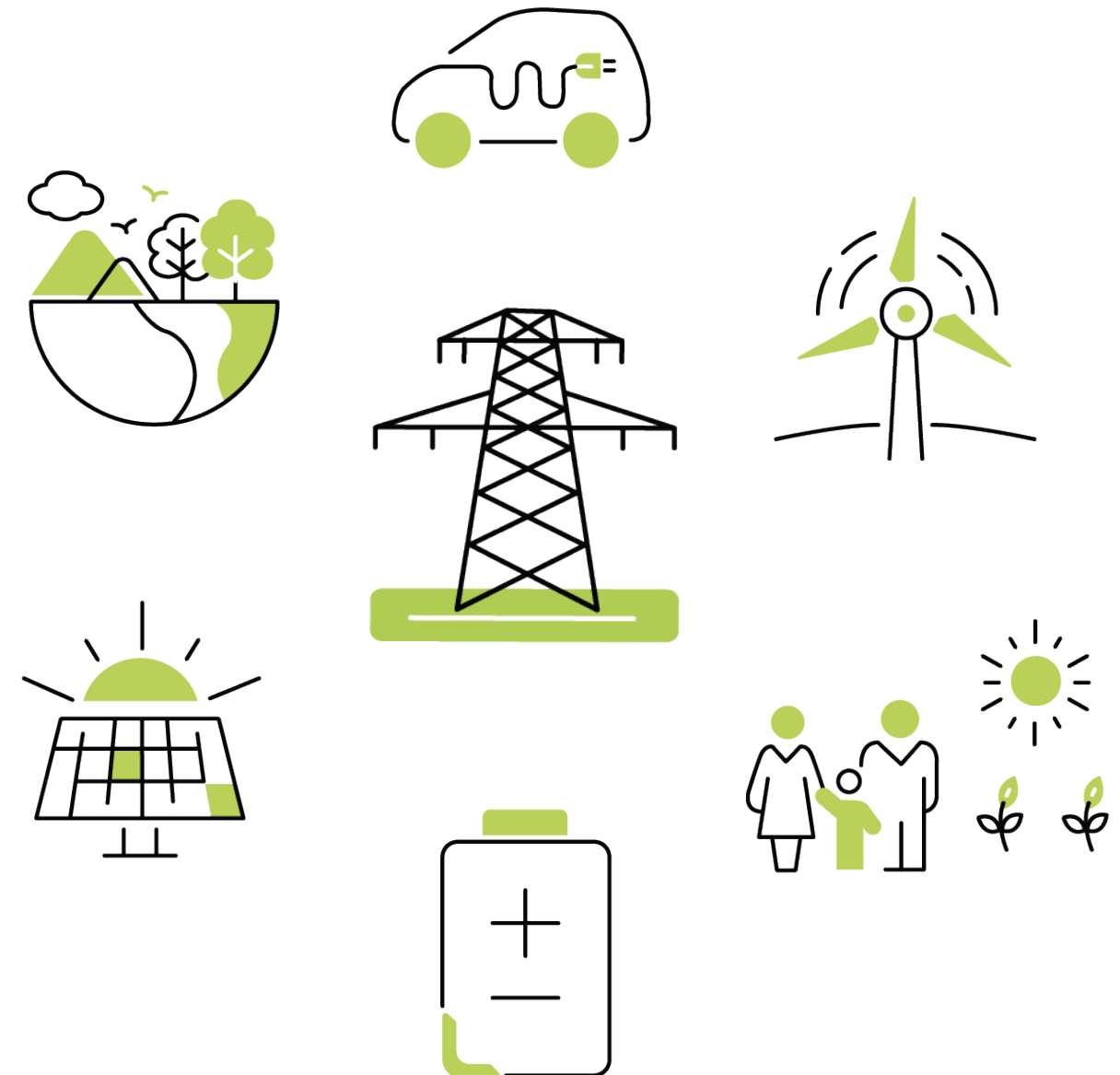


Identified Need

The identified need for the VNI West project has not changed since the 2020 ISP:

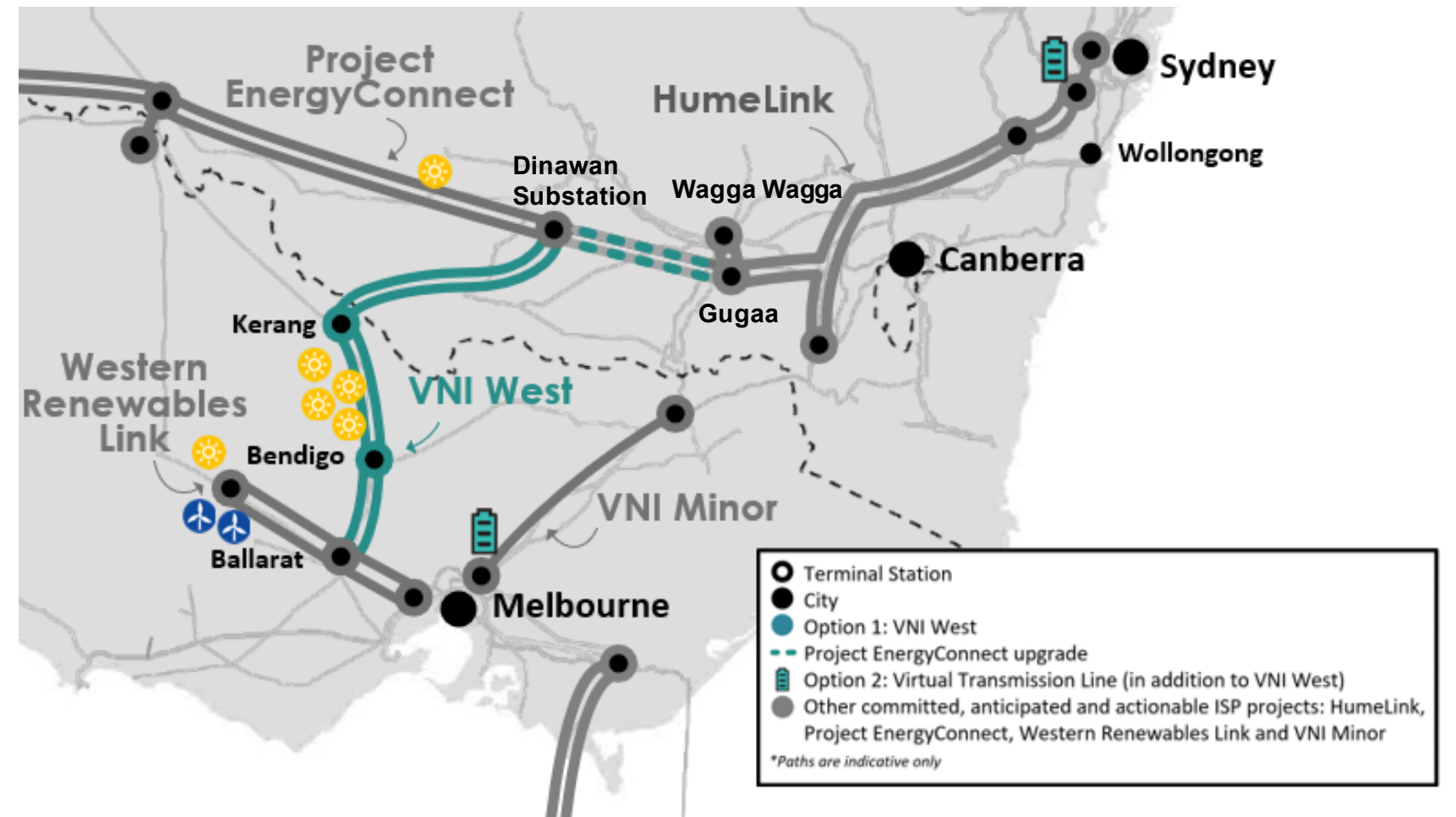
To increase transfer capacity between New South Wales and Victoria to realise net market benefits by:

- *efficiently maintaining supply **reliability in Victoria** following the closure of further coal-fired generation and the decline in aging generator reliability – including mitigation of the risk that existing plant closes earlier than expected,*
- *facilitating efficient development and dispatch of generation in areas with high quality **renewable resources** in Victoria and southern New South Wales through improved network capacity and access to demand centres, and*
- *enabling more efficient **sharing of resources** between NEM regions.*



Credible Options

- **Option 1:** 'VNI West' via new terminal stations near Bendigo and near Kerang
 - Actionable ISP project in 2022 ISP
 - Estimated to cost \$3.26 billion
- **Option 2:** Combination of VNI West with a non-network Virtual Transmission Line (VTL) comprising battery storage near Sydney and Melbourne - enabling the existing interconnector to be operated at a higher capacity, like System Integrity Protection Scheme (SIPS)
 - Estimated to cost \$3.87 billion
- **VNI West relies on the timely delivery of EnergyConnect, HumeLink and Western Renewables Link.**



*paths on this map are indicative only, detailed route selection to be conducted

Cost Estimation

- Significant work done to develop more accurate cost estimates
- Accuracy of +/- 30%, considered 'class 4'
- Greater level of transparency
- Differs from 2022 ISP by approx. \$300 million to account for remediation of social and environmental concerns
- Level of cost accuracy will be further refined and developed through more detailed early works if justified under the RIT-T process

Table 4 Summary of the credible options assessed in this PADR – capital costs, \$m in FY2020-21 dollars

| Cost component | Option 1 VNI West | | Option 2 VTL ahead of VNI West | |
|--|----------------------|--------------|-----------------------------------|--------------|
| | NSW | VIC | NSW | VIC |
| Stage 1 – Early works | | | | |
| Early works – Property/land access/easements | 66 | 56 | 83 | 73 |
| Early works – other | 50 | 88 | 50 | 88 |
| Project EnergyConnect enhanced (incremental line build cost) | 182 | 0 | 182 | 0 |
| Stage 2 - Implementation | | | | |
| Substation works | 354 | 641 | 354 | 641 |
| Line works | 751 | 708 | 751 | 708 |
| Battery costs | 0 | 0 | 288 | 295 |
| Modular power flow controllers | 183 | 89 | 183 | 89 |
| Biodiversity offset costs | 66 | 24 | 66 | 24 |
| Total (by state) | 1,651 | 1,605 | 1,957 | 1,918 |
| Total (all states) | 3,256 | | 3,874 | |

Data Source: Table 4 from the Section 6.1 - VNI West PADR - 29 July 2022

Consideration of Undergrounding

- Stakeholders and communities desire to see possible solutions that could help minimise social and environmental impacts
- Preferred technology selected for VNI West is high voltage alternative current (HVAC) overhead transmission
- This provides network flexibility for new connections and overall efficiency in cost and delivery
- A HVAC undergrounding solution was found to be uneconomical under the RIT-T, costing 10-20 times more than overhead¹
- Partial undergrounding of short distances may be practical in exceptional circumstances: this would be considered in early works stage (route selection).
- If partial undergrounding is required, this would increase capital cost allowance, and reduce benefit.

¹Undergrounding cost range guided by ISP Transmission Cost Database, see: <https://aemo.com.au/en/consultations/current-and-closed-consultations/transmission-costs-for-the-2022-integrated-system-plan>

Social and Environmental Considerations



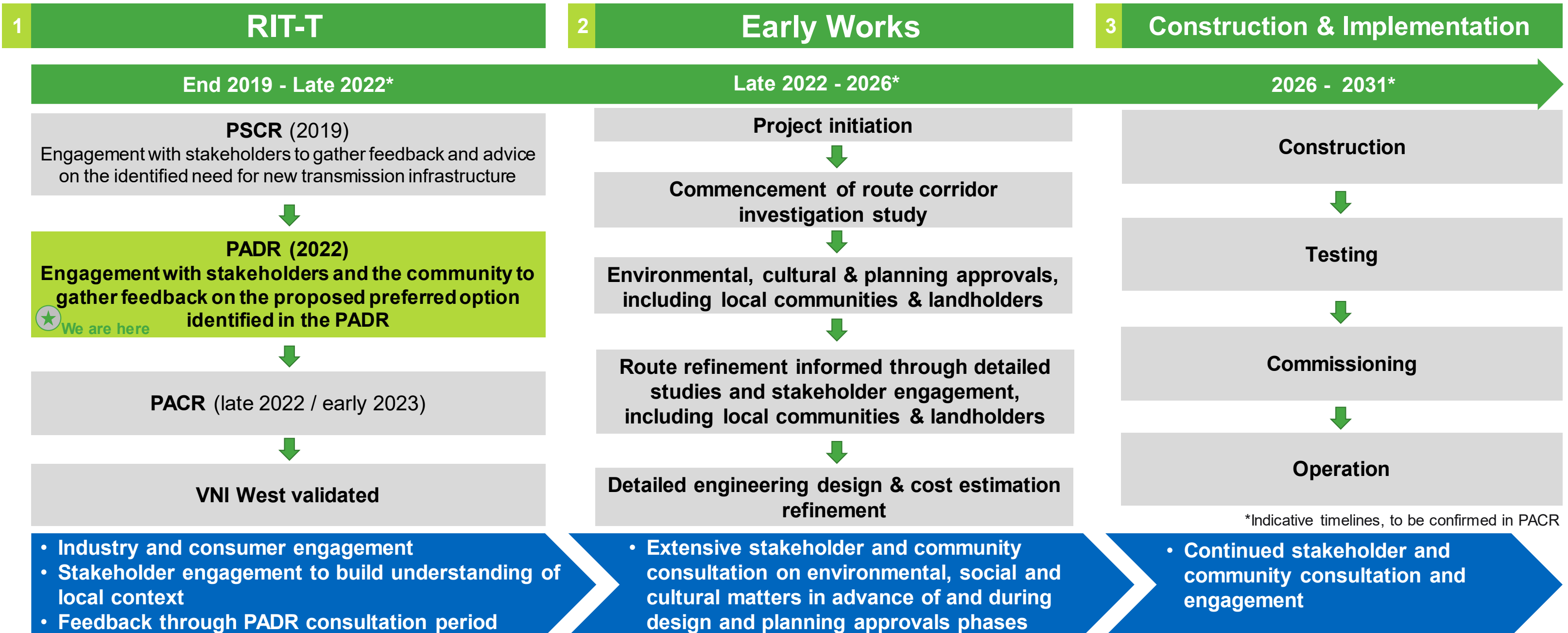
Social and Environmental Considerations

- AEMO Victorian Planning and Transgrid recognise the vital role of communities and landholders in major transmission projects.
- Recent RIT-Ts reinforced the importance of early and meaningful engagement to find mutually beneficial solutions, where possible.
- We are dedicated to continuously improving engagement practices.
 - Engaging with regional stakeholder representatives to facilitate early community input on potential social and other impacts
- Significant environmental, social and cultural matters have been considered to the extent possible, with a range of desktop analysis completed during the RIT-T process to date and some early stakeholder and community engagement.
- During completion of the RIT-T and early development works project route and terminal station locations will be determined through a rigorous engagement process with communities and landholders in support of final detailed designs for the project.

Community & Landowner Considerations

- The RIT-T process has been a technical process, limited in its ability to explore benefits sharing options.
- Collaborating earlier with communities to understand needs and opportunities for co-existence that enable better outcomes is recognised as vitally important.
- VicGrid, the NSW government and others are looking at how to deliver social and economic benefits in ways that are fair, meaningful and participatory and which both Transgrid and AEMO Victorian Planning support.
- Outcomes and principles of potential future frameworks should be incorporated into the various phases of the project where possible.
- We acknowledge and support the Energy Charter's work in developing social licence guidelines for co-existence of transmission infrastructure and agriculture.

Project Phases



*Indicative timelines, to be confirmed in PACR

NPV Results

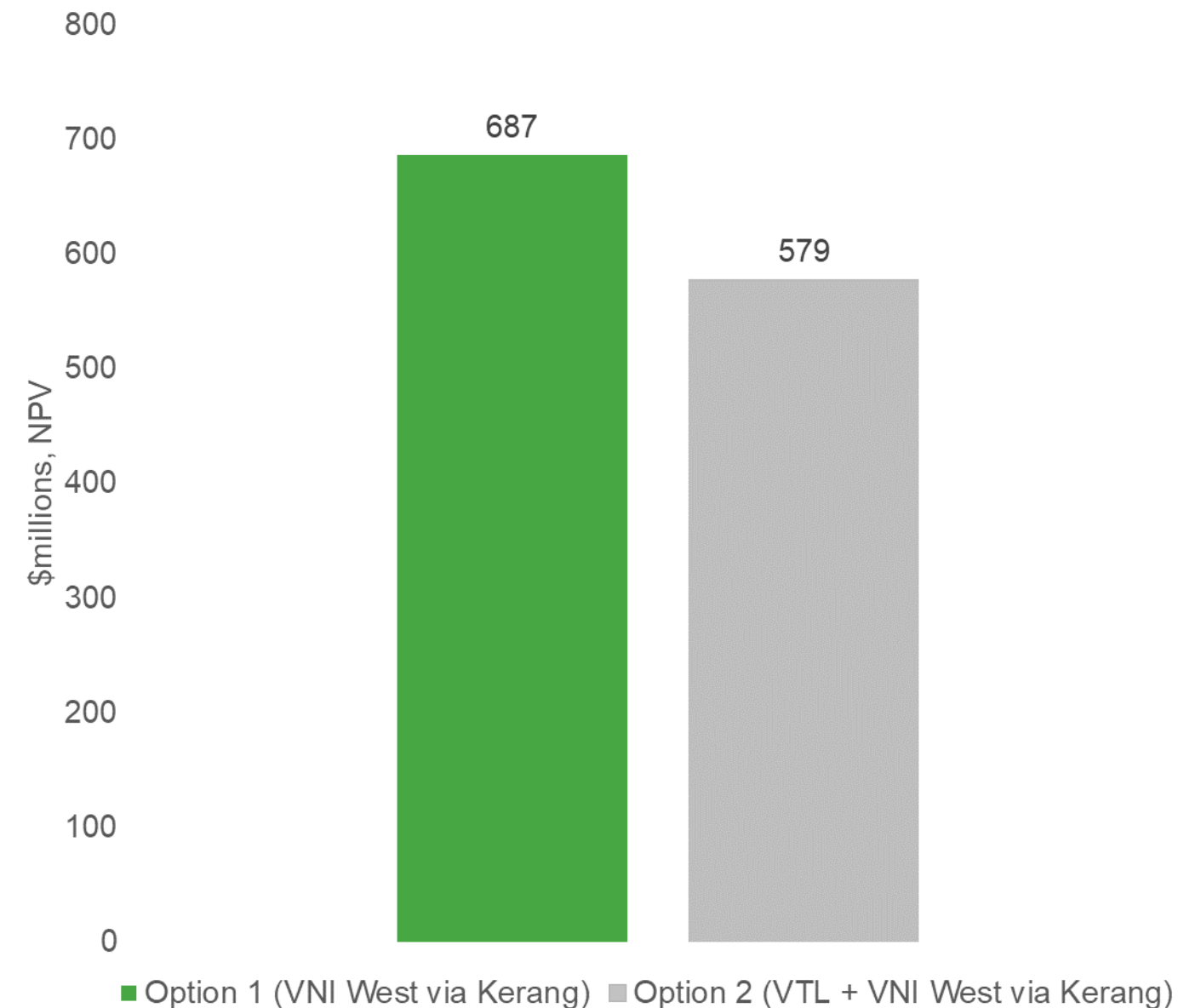


Framework for the NPV analysis

The NPV assessment brings together the assessment of the costs and benefits of each option

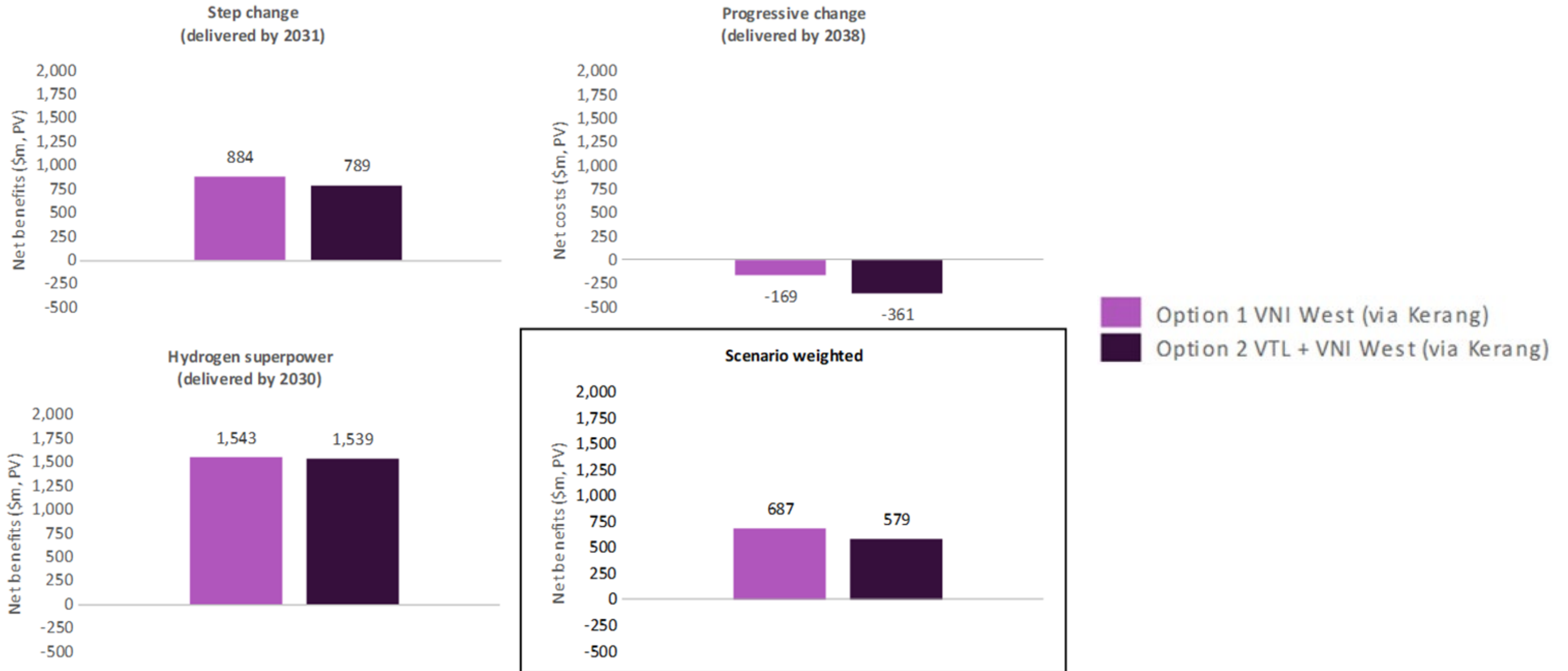
The assessment is relative to a 'base case' in which there is no investment.

- VNI West is an actionable ISP, and therefore the NPV assessment adopts assumptions from the ISP, including scenarios.
- Assessment period is 27 years (2021-22 to 2047-48)
 - Captures the period of early works as well as the construction timetable
 - Includes 25 years of wholesale market modelling
 - Terminal value included to reflect assets life beyond the assessment period
- Discount rate 5.50% real, pre-tax (ISP assumption)
- Assessment undertaken for each ISP scenario and then weighted
 - Tests the robustness of the option NPV rankings

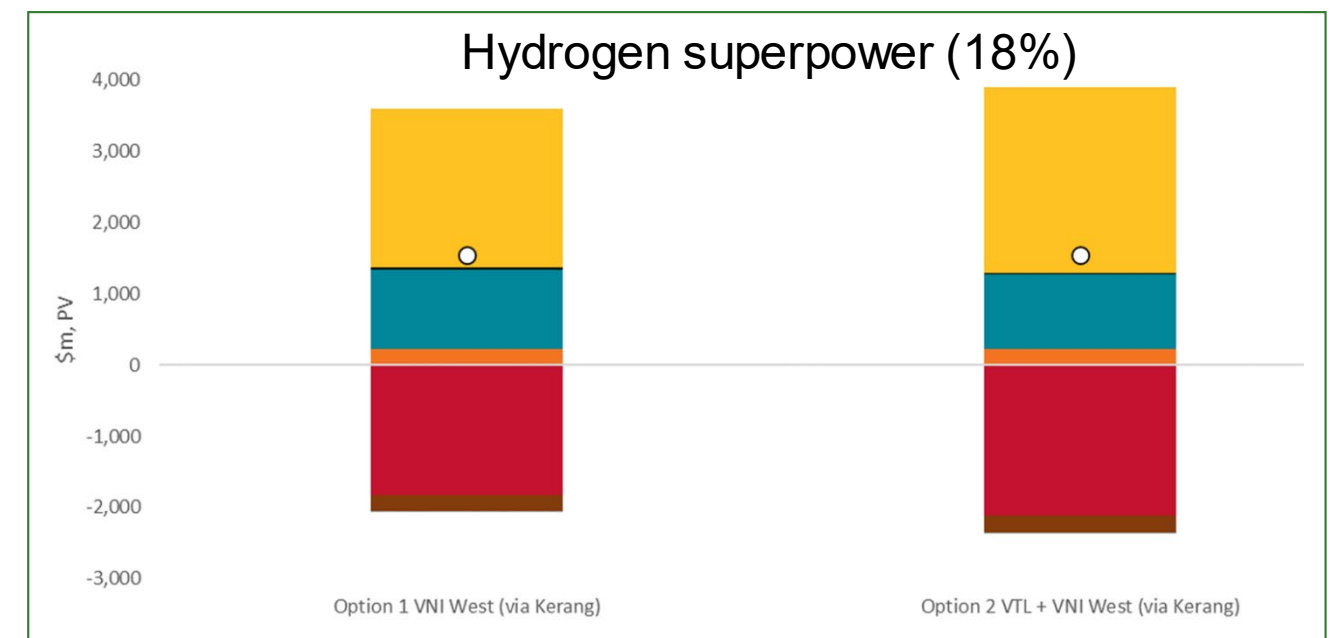
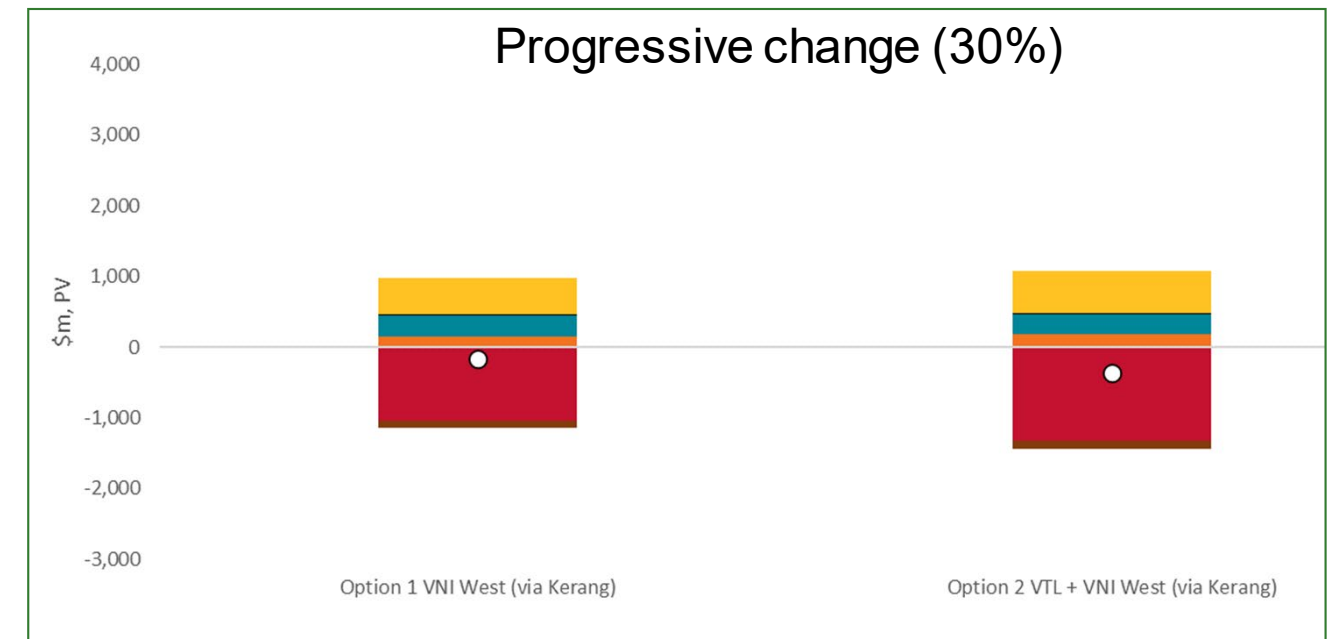
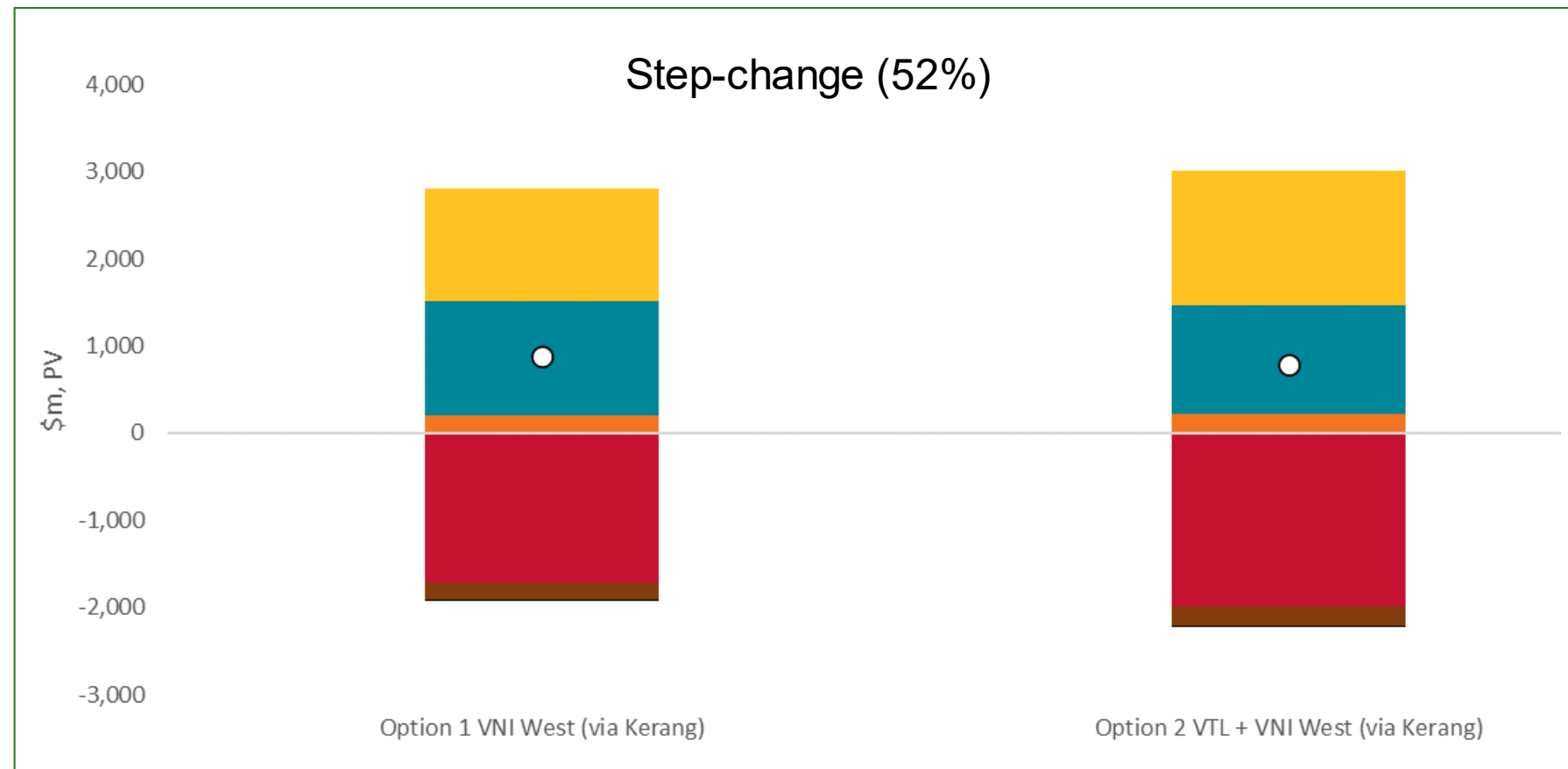


Option 1 (VNI West via Kerang) has 19% (\$108m) greater net benefits than Option 2 (VTL+VNI West via Kerang) on a weighted basis

VNI West is highest ranked option in all scenarios and on a weighted basis

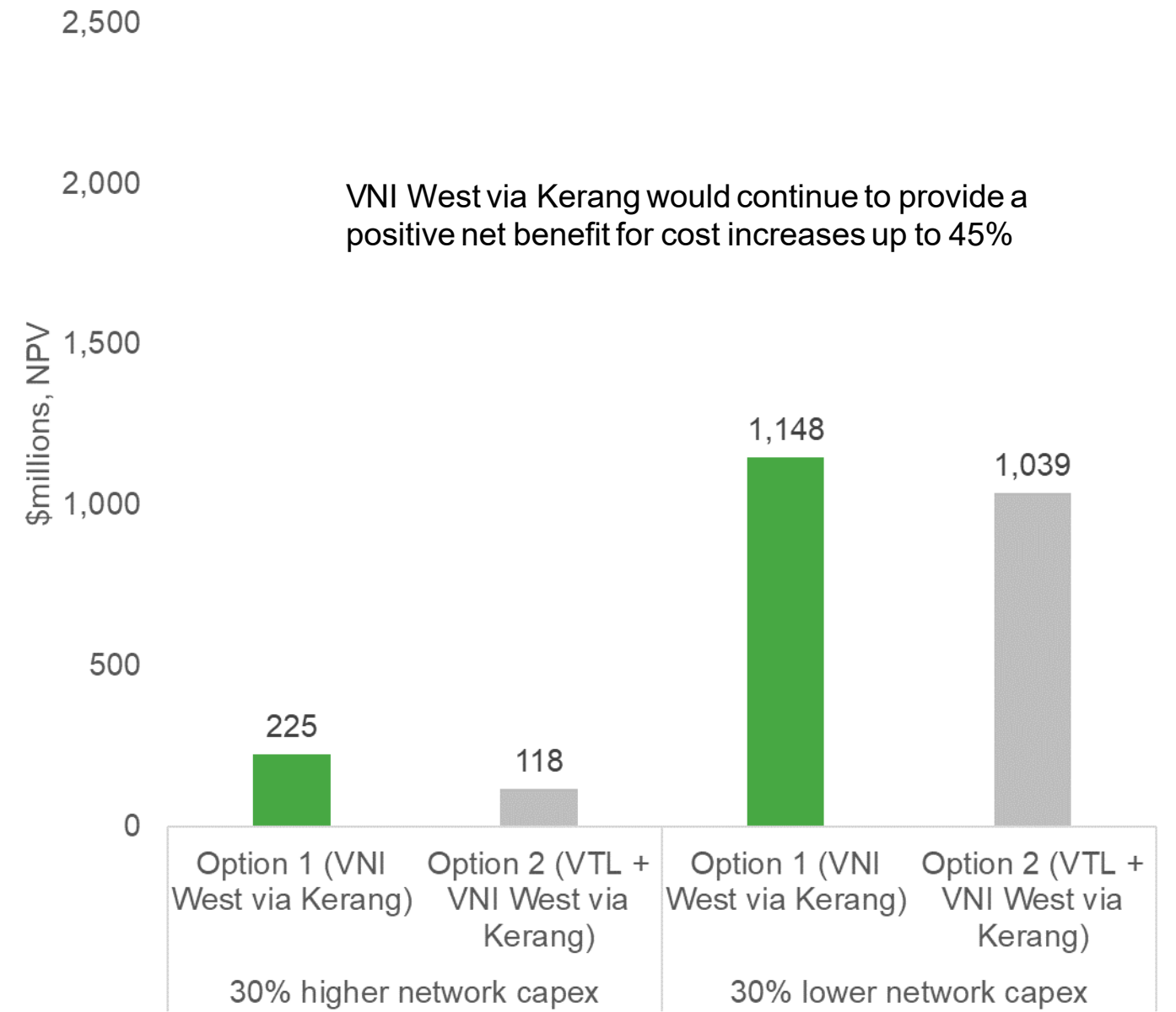
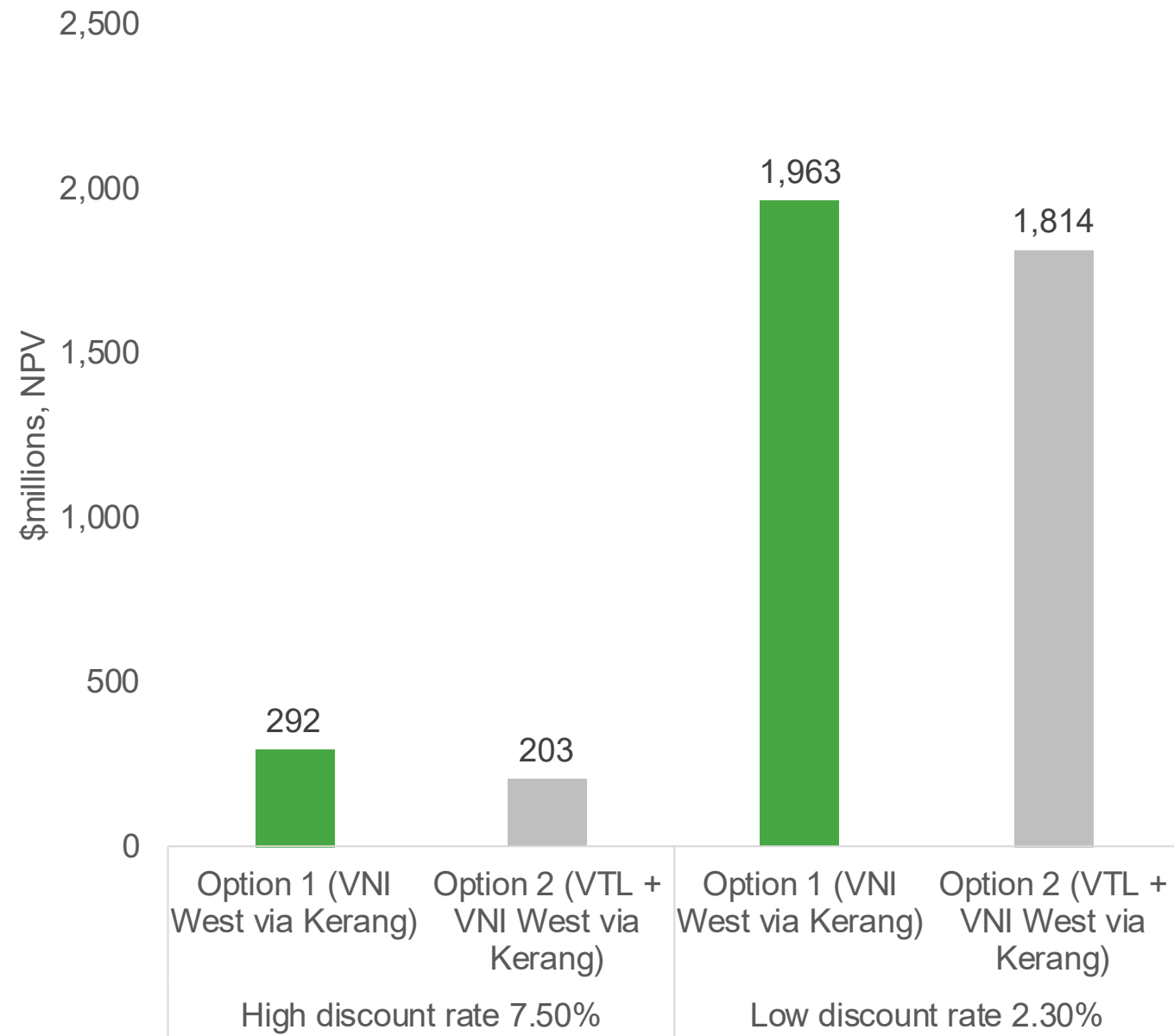


Benefits are driven by avoided generation/storage costs and avoided fuel costs



- Transmission capex
- Transmission opex
- Avoided unserved energy
- Avoided REZ transmission capex
- Avoided fuel costs
- Avoided voluntary load curtailment
- Avoided generation/storage costs (excl. fuel costs)
- NPV

Preferred option is robust to discount rate and capex sensitivities



Market Modelling Overview



Victoria to NSW Interconnector West (VNI West)

Market modelling report forecasting gross market benefits for
the PADR

10 August 2022

Notice

Ernst & Young ("EY") was engaged on the instructions of NSW Electricity Networks Operations Pty Limited, as trustee for NSW Electricity Networks Operations Trust ("Transgrid"), to undertake market modelling of system costs and benefits to assess two options for the Victoria to NSW Interconnector West (VNI West) Regulatory Investment Test for Transmission ("VNI West RIT-T").

The results of EY's work, including the assumptions and qualifications made in preparing the slides ("Slides"), are set out in EY's report ("Report") dated 26 July 2022. The Slides and the Report should be read in conjunction with each other and in their entirety including any disclaimers and attachments, this notice and the notice included in the Report. A reference to the Slides includes any part of the Slides. No further work has been undertaken by EY since the date of the Slides to update it.

EY has prepared the Slides for the benefit of Transgrid and has considered only the interest of Transgrid. EY has not been engaged to act, and has not acted, as advisor to any other party. Accordingly, EY makes no representations as to the appropriateness, accuracy or completeness of the Slides for any other party's purposes. Our work commenced on 22 September 2021 and was completed on 4 May 2022. Therefore, our Slides does not take account of events or circumstances arising after 4 May 2022 and we have no responsibility to update the Slides for such events or circumstances.

No reliance may be placed upon the Slides or any of its contents by any party other than Transgrid ("Third Parties"). Any Third Parties receiving a copy of the Slides must make and rely on their own enquiries in relation to the issues to which the Slides relates, the contents of the Slides and all matters arising from or relating to or in any way connected with the Slides or its contents. EY disclaims all responsibility to any Third Parties for any loss or liability that the Third Parties may suffer or incur arising from or relating to or in any way connected with the contents of the Slides, the provision of the Slides to the Third Parties or the reliance upon the Slides by the Third Parties.

No claim or demand or any actions or proceedings may be brought against EY arising from or connected with the contents of the Slides or the provision of the Slides to the Third Parties. EY will be released and forever discharged from any such claims, demands, actions or proceedings. Our Slides is based, in part, on the information provided to us by Transgrid and other stakeholders engaged in this process. We have relied on the accuracy of the information gathered through these sources. We do not imply, and it should not be construed that we have performed an audit, verification or due diligence procedures on any of the information provided to us. We have not independently verified, nor accept any responsibility or liability for independently verifying, any such information nor do we make any representation as to the accuracy or completeness of the information. We accept no liability for any loss or damage, which may result from your reliance on any research, analyses or information so supplied.

Modelling work performed as part of our scope inherently requires assumptions about future behaviours and market interactions, which may result in forecasts that deviate from future conditions. There will usually be differences between estimated and actual outcomes, because events and circumstances frequently do not occur as expected, and those differences may be material. We take no responsibility that the projected outcomes will be achieved. We highlight that our analysis and Slides do not constitute investment advice or a recommendation to you on a future course of action. We provide no assurance that the scenarios we have modelled will be accepted by any relevant authority or third party.

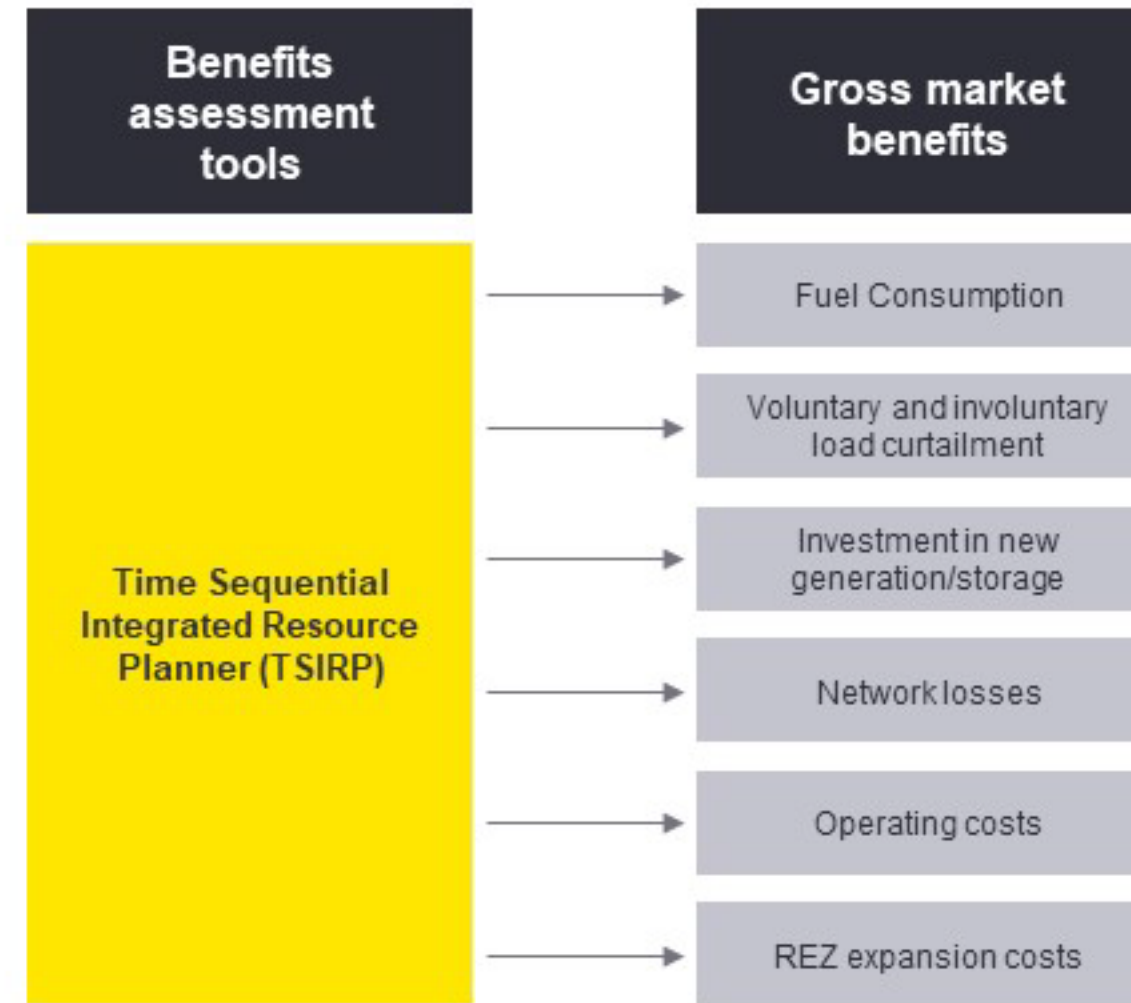
EY has consented to the Slides being published electronically on Transgrid's website for informational purposes only. EY has not consented to distribution or disclosure beyond this. The material contained in the Slides, including the EY logo, is copyright. The copyright in the material contained in the Slides itself, excluding EY logo, vests in Transgrid. The Slides, including the EY logo, cannot be altered without prior written permission from EY.

Readers are advised that the outcomes provided are based on many detailed assumptions underpinning the scenario, and the key assumptions are described in the Slides. These assumptions were selected by Transgrid after public consultation. The modelled scenario represents one possible future option for the development and operation of the National Electricity Market, and it must be acknowledged that many alternative futures exist. Alternative futures beyond those presented have not been evaluated as part of this Slides.

EY's liability is limited by a scheme approved under Professional Standards Legislation.

Modelling methodology

- Least-cost NEM generation expansion model in accordance with AER cost benefits analysis (CBA) guidelines.
- Modelling conducted at hourly time-sequential granularity utilising a least-cost planning model that solves dispatch intervals for 25 years (FY2023-24 to FY2047-48) simultaneously.
- Least cost solution minimises cost of supply to meet demand and other constraints:
 - Generation of each plant including charging and discharging of storage
 - Commissioning new plant installed “linearly”
 - Withdrawing existing plant in the least cost model considering carbon budget constraint
 - Other constraints include minimum loads, generator availability, network, hydro.
- Model utilises 9 year historical trace for hydro inflows, wind and solar availability and demand shape. These traces include concurrent wind and hydro drought years.



The difference between the costs of the Base Case (without VNI West augmentation) and the VNI West option represents gross market benefits

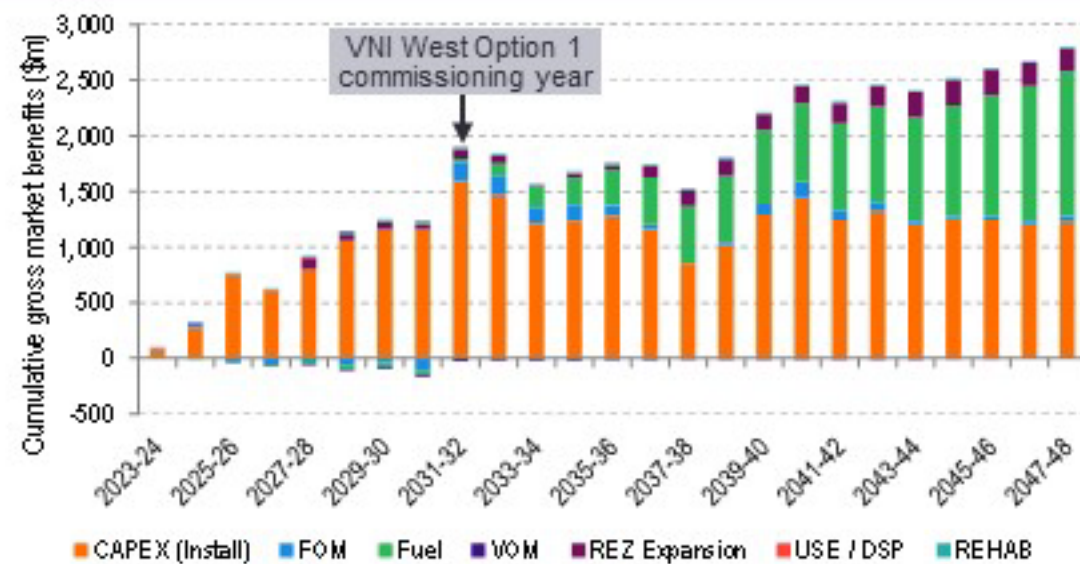
Scenarios

- Three 2022 ISP scenarios assessed, as assigned by AEMO in the ISP:
 - Step Change
 - Progressive Change
 - Hydrogen Superpower
- Input and assumptions:
 - Generally from the 2021 IASR published in December 2021:
 - 2022 ISP demand forecast
 - Carbon budget constraints
 - Capex, fixed and variable operation and maintenance costs
 - Fuel costs
 - State government renewable energy targets and policies
 - Major augmentation timing based on draft 2022 ISP (*generally consistent with the final 2022 ISP*)
 - Latest list of committed and anticipated generators based on February 2022 version of AEMO Generation Information data (*also used in final 2022 ISP*)
- Major changes in the assumptions in the final 2022 ISP:
 - REZ transmission for some REZs including SWNSW REZ

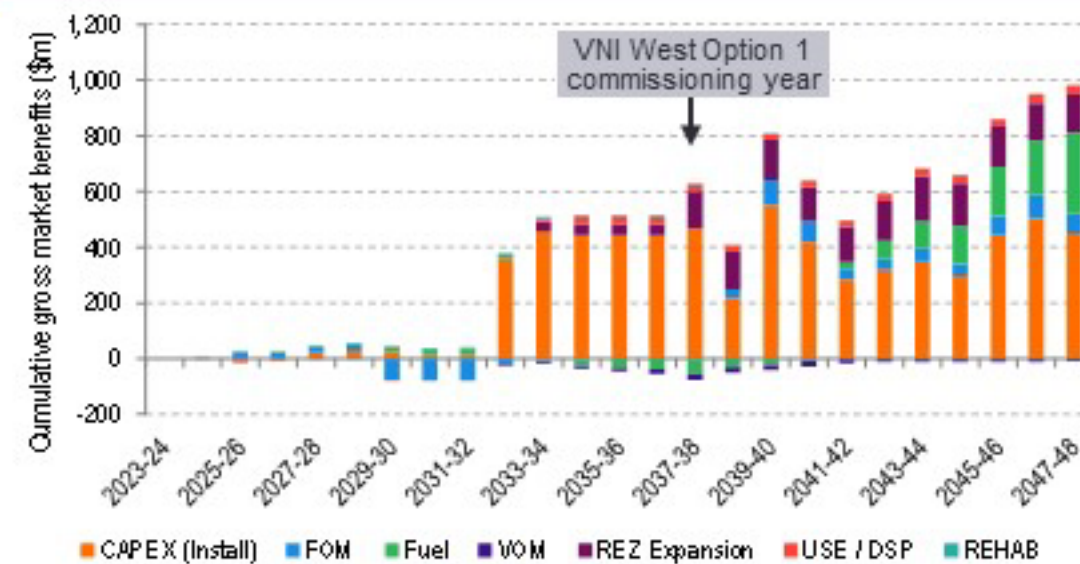
Forecast gross market benefits - Option 1

Millions real June 2021 dollars discounted to June 2021

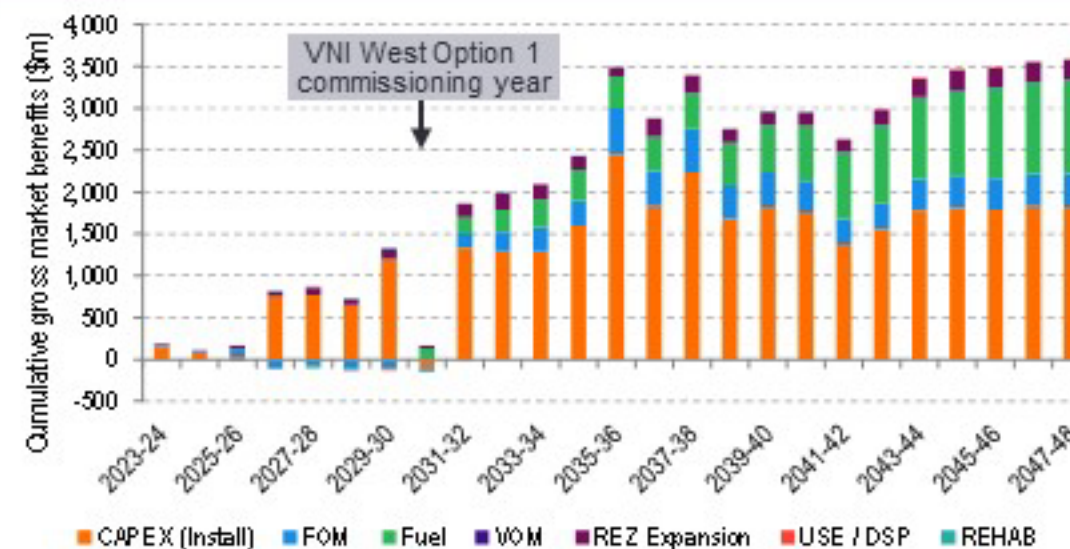
Step change



Progressive change

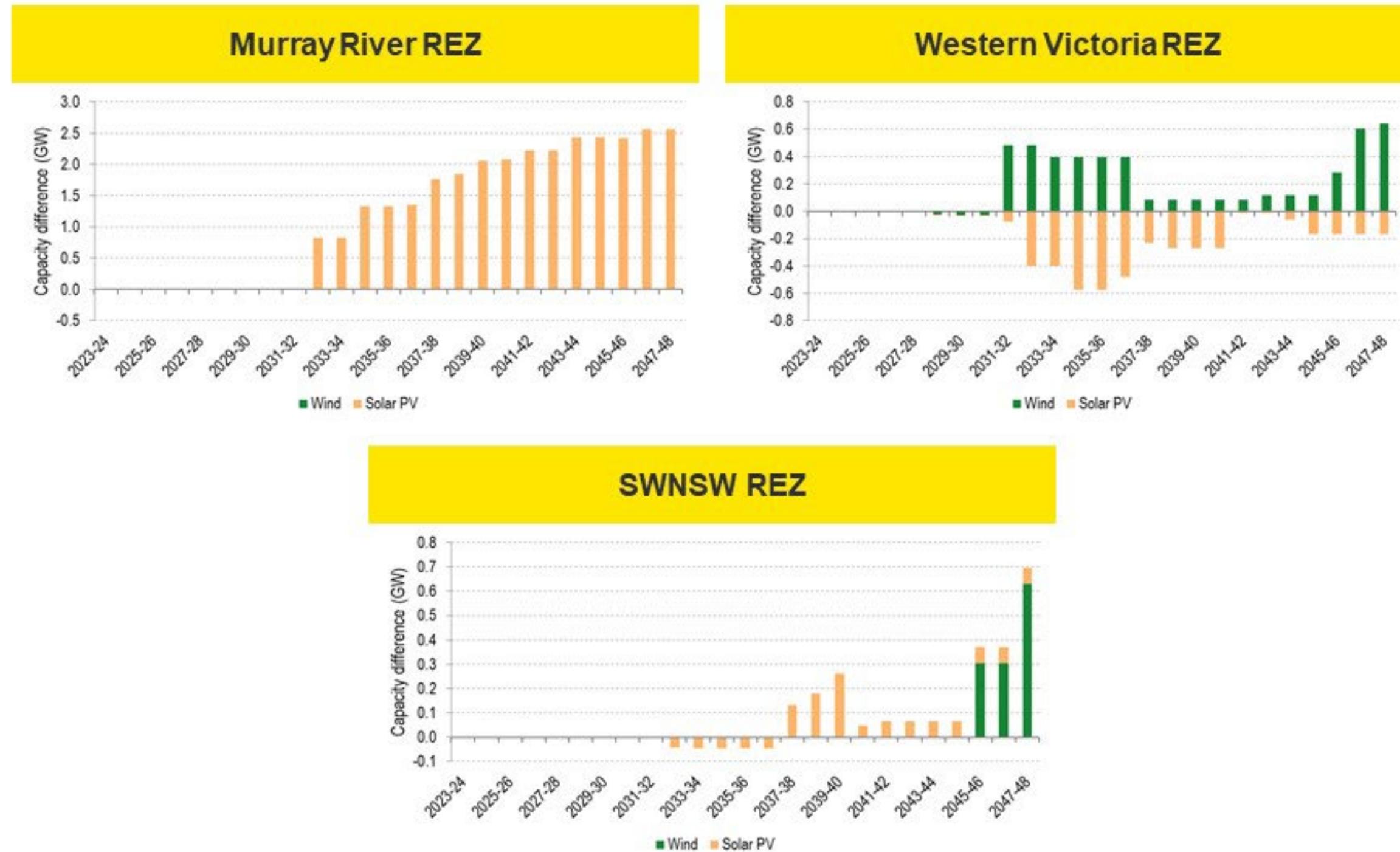


Hydrogen superpower



Renewable Energy Zones (REZ) - Step Change scenario

Changes in capacity with Option 1 relative to the Step Change Base Case



EY | Building a better working world

EY exists to build a better working world, helping to create long-term value for clients, people and society and build trust in the capital markets.

Enabled by data and technology, diverse EY teams in over 150 countries provide trust through assurance and help clients grow, transform and operate.

Working across assurance, consulting, law, strategy, tax and transactions, EY teams ask better questions to find new answers for the complex issues facing our world today.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. Information about how EY collects and uses personal data and a description of the rights individuals have under data protection legislation are available via ey.com/privacy. EY member firms do not practice law where prohibited by local laws. For more information about our organization, please visit ey.com.

© 2022 Ernst & Young, Australia.
All Rights Reserved.

Liability limited by a scheme approved under Professional Standards Legislation.

This communication provides general information which is current at the time of production. The information contained in this communication does not constitute advice and should not be relied on as such. Professional advice should be sought prior to any action being taken in reliance on any of the information. Ernst & Young disclaims all responsibility and liability (including, without limitation, for any direct or indirect or consequential costs, loss or damage or loss of profits) arising from anything done or omitted to be done by any party in reliance, whether wholly or partially, on any of the information. Any party that relies on the information does so at its own risk.

ey.com

Questions & Answers session



Thank you & closing comments



Make a submission

- All stakeholders, including community members, are encouraged to provide written submissions on the PADR.
- Any matters raised through the consultation that are outside of the RIT-T parameters will be noted, then considered and addressed through community and stakeholder consultation as part of early works, and design and planning approvals processes.

More Information

Visit the Transgrid and AVP websites to:

- view a copy of the [PADR](#)
- read the latest [project update](#) and other supporting materials
- register for the second [online information](#) session on 25 August
- find details for email and phone enquiries

PADR Submissions

Written submissions on the PADR are welcome until
5.00 pm, Friday 9 September 2022

E: VNIWestRITT@aemo.com.au



Thank you

