# Scenario Analysis and Task Force on Climate-related Financial Disclosure (TCFD) Reporting

1 June 2020

# TCFD analysis is an essential component of AGL's reporting

## As Australia's largest electricity generator and carbon emitter, we have an important responsibility for clear disclosure, transparency and responsible transition

We recognise the large part we can play in Australia's transition to a low carbon economy

TCFD reporting deepens our assessment of climate and carbon risk and how our strategy considers decarbonisation

Our approach assesses how a range of forward-looking scenarios impact our business, and test our resilience

The 2020 modelling shows, under all scenarios:

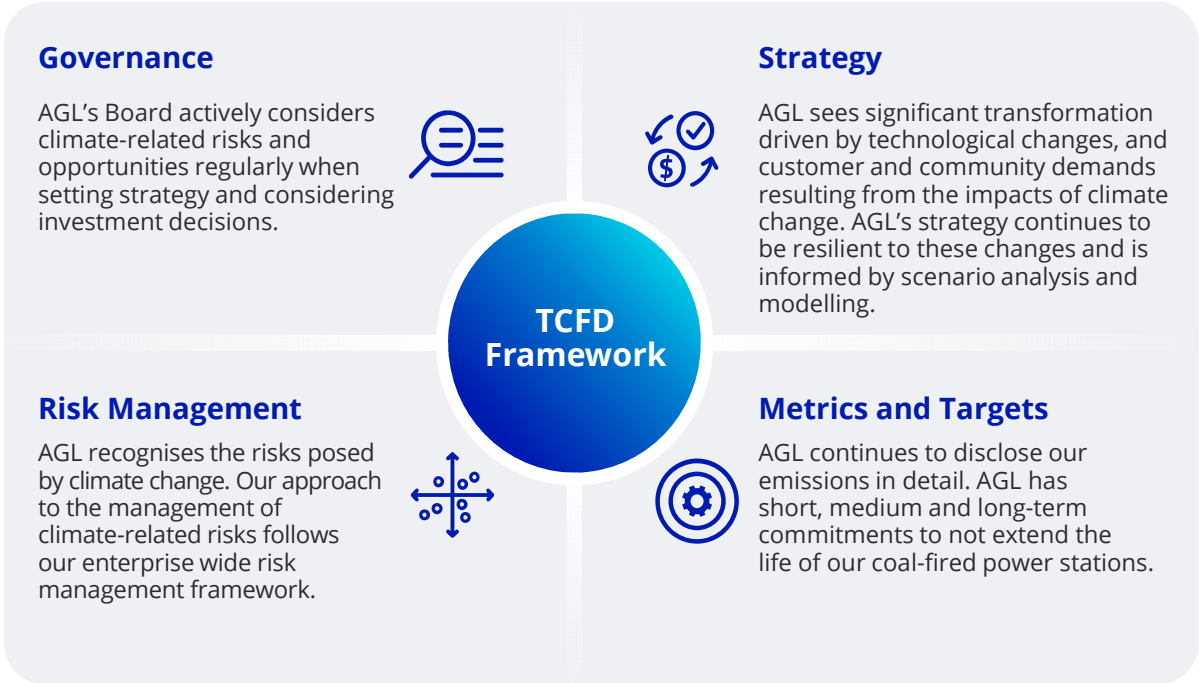
- Significant decarbonisation of the Australian electricity sector by 2050
- AGL in effect achieving net zero emissions from electricity generation by 2050 or earlier
- AGL being resilient and positioned to benefit from opportunities created by the transition

Coopers Gap Wind Farm, Queensland

Photo courtesy of PARF

# We remain committed to transparency as the transition to a lower carbon economy unfolds

A core element of the TCFD Framework is the use of scenario analysis to demonstrate potential impacts of climate change under four key categories: **Governance, Strategy, Risk Management** and **Metrics and Targets**



# Our approach to the 2020 scenario analysis reflected international standards and expert third-party input

- AGL developed scenarios "top down" to facilitate comparability with global and national scenario modelling and ensure the global context of the impacts of climate change were considered
- The scenarios were developed to be consistent with the scenario development principles outlined in the TCFD framework
- AGL engaged KPMG and Aurora Energy Research to support development of the scenarios and modelling to ensure they were robust

| TCFD Principles | Application |
|---|---|
| Plausible | Each scenario was developed using a range of credible global and domestic sources including the AEMO *2020 Integrated System Plan,* and the Intergovernmental Panel on Climate Change RCPs and SSPs. * |
| Distinctive | The scenarios were developed to test a range of possible, and distinct, future outcomes and trajectories. |
| Consistent | The scenarios were developed using a consistent set of inputs including globally developed RCP and SSP narratives, aligned with domestic electricity sector input assumptions sourced from Aurora and AEMO. |
| Relevant | The scenarios address current issues being considered by the energy industry and broader economy in Australia. Each scenario provides insight associated with a decarbonisation pathway to facilitate consideration by AGL. |
| Challenging | Each scenario requires different aspects to be the material factor in decarbonisation, whilst offering insight into the challenges that would be faced. |

* RCP: Representative Concentration Pathway, concentration pathways for greenhouse gases and aerosols, demonstrating possible future emissions and radiative forcing (i.e. temperature intensity) scenarios for the world until 2100, as defined by the IPCC

SSP: Shared Socioeconomic Pathways, which describe how socioeconomic trends around the world may evolve over time, as defined by the IPCC (2017)

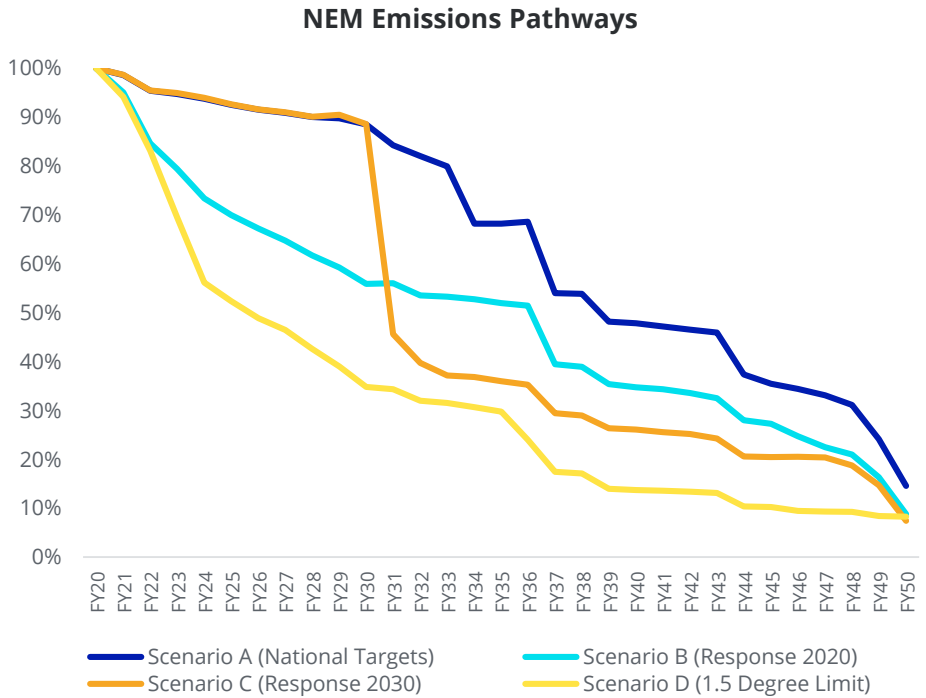
# Our four scenarios were based upon scenarios defined by the IPCC and AEMO

| | Description | Temperature outcome (°C) | Global References | | AEMO ISP Scenarios |
|---|---|---|---|---|---|
| | | | RCP | SSP | |
| **Scenario A –** National Targets | Current industry commitments and policy settings are maintained over the medium to long-term without material change<br>Assumes AGL meets its Paris commitments of reducing emissions by 26% to 28% of 2005 levels by 2030 | Not assessed | N/A | SSP3 | Central |
| **Scenario B –** Response 2020 | Policies and technology allow for a steady, market-led decarbonisation | 1.7 - 3.2 | RCP4.5 | SSP2 | Fast Change |
| **Scenario C –** Response 2030 | Limited action over the short to medium term prior to stronger policy intervention for rapid decarbonisation from 2030 | 1.7 – 3.2 | Blended (~RCP4.5)<br>RCP6.0 (2020-2030) /<br>RCP2.6 (2030-2050) | Blended<br>SSP3 (2020-2030) /<br>SSP1 (2030-2050) | Central and Fast Change |
| **Scenario D –** 1.5 Degree Limit | Coordinated, cooperative and immediate decarbonisation approach with combined government intervention, policy and market approaches to achieve rapid decarbonisation | 0.9 – 2.3 | RCP2.6 | SSP1 | Step Change |

# Summary of modelled emissions reduction pathways across the NEM from 2020 TCFD scenario analysis

Modelling results show progressive decarbonisation of the electricity sector to 2050 occurs under all scenarios, with the electricity sector achieving net zero emissions by 2050 under scenarios Response 2020, Response 2030 and 1.5 Degree Limit

The emissions remaining in 2050 under each scenario can be offset using currently available carbon dioxide removal technologies



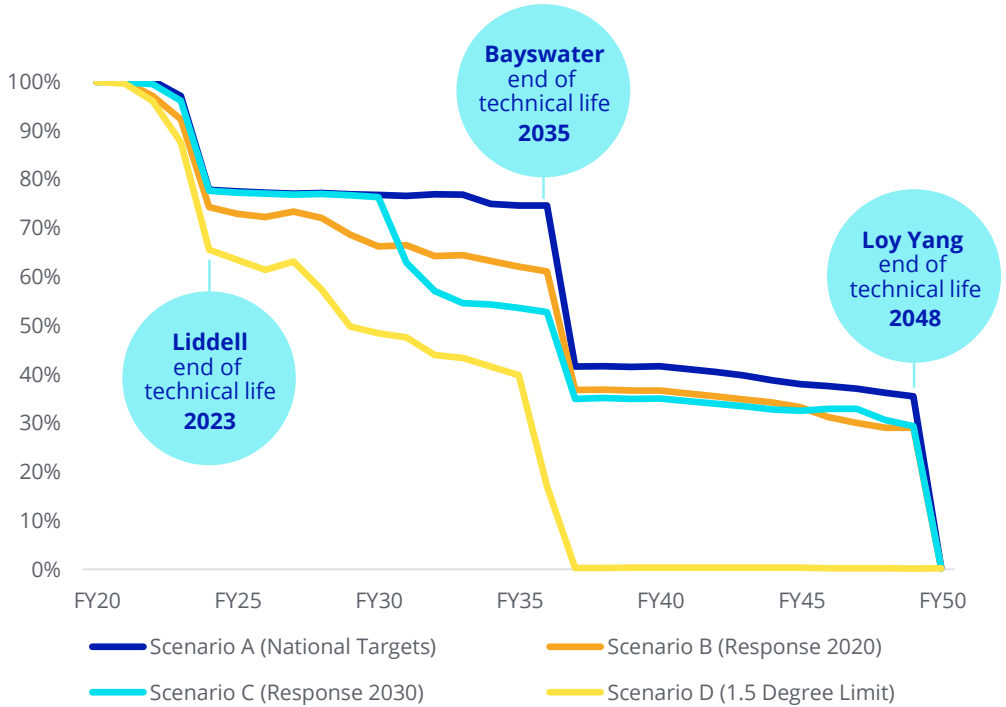
# Summary of AGL's modelled emissions reduction pathways under 2020 TCFD scenario analysis

## Modelling of Scope 1 emissions projects net zero emissions by 2050 or earlier

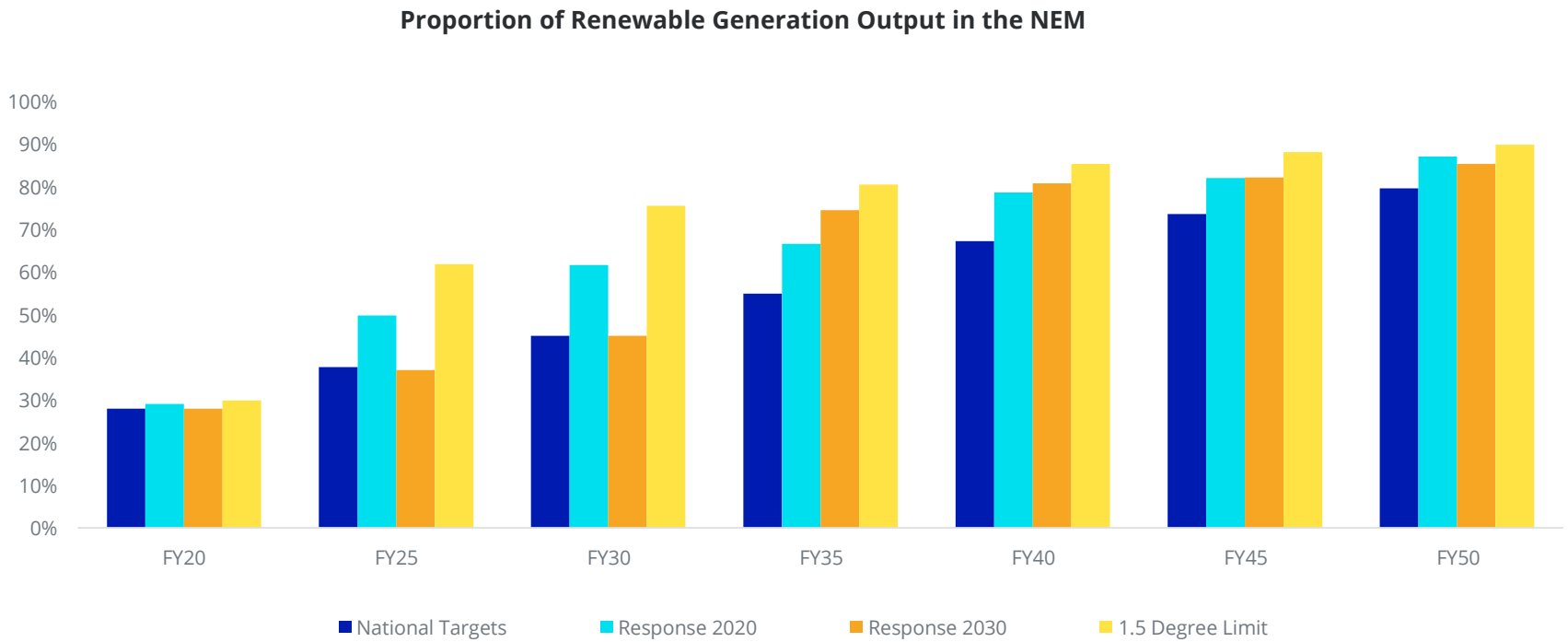
AGL emissions from grid-connected generation assets in the NEM decline under all scenarios, achieving net zero by FY50 or earlier

Scenarios National Targets, Response 2020 and Response 2030 are all consistent with AGL's present expectations for closure dates

Variance in the pace of emissions reduction between scenarios arises from varying load factors driven by the carbon constraints assumed in each scenario



# All four scenarios would result in an increase in renewable generation to 80% of NEM output by FY50

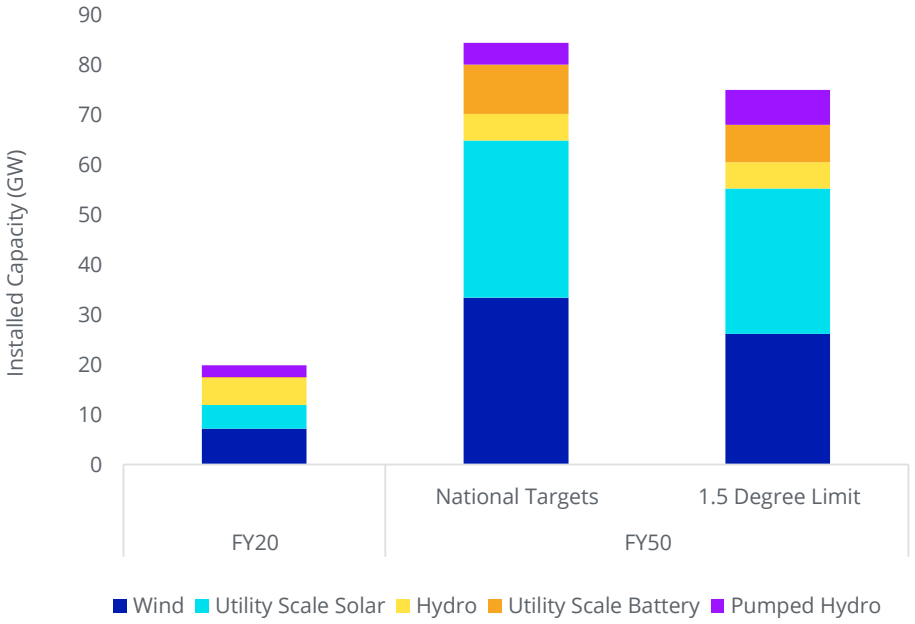


# There is considerable opportunity for further investment in the NEM, driven by customer demand

**Additional NEM wide customer opportunities between FY20 and FY50**

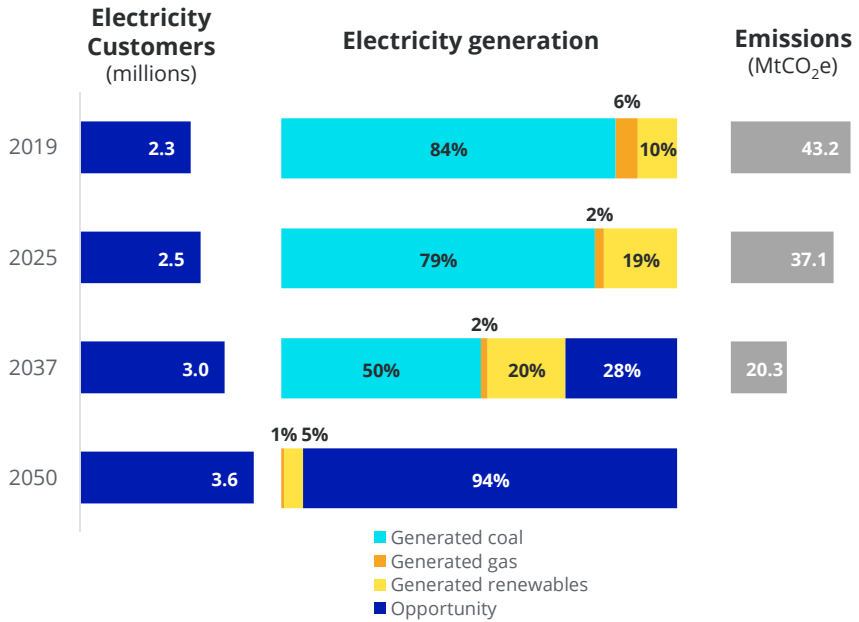
| Technology | National Targets - NEM | 1.5 Degree Limit - NEM |
|---|---|---|
| Behind the meter battery | + 8GW capacity | + 16GW capacity |
| Rooftop solar | + 13GW capacity | + 31GW capacity |
| Electric vehicles | + 41TWh demand | + 42TWh demand |

**NEM Renewable & Storage Capacities**

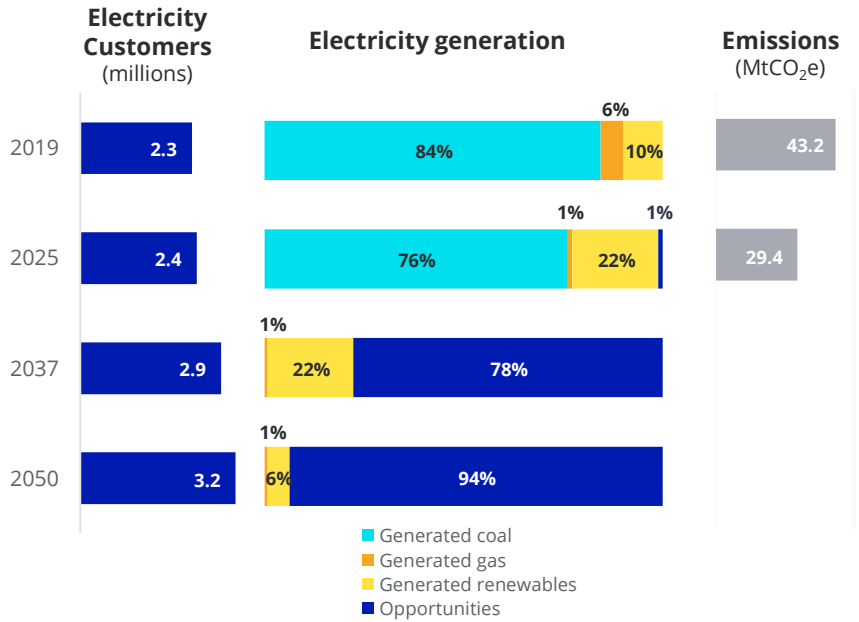


# AGL's existing assets and new opportunities drive value creation during the transition to lower carbon

## National Targets: Customer & generation roadmap




## 1.5 Degree Limit: Customer & generation roadmap




Assumes AGL maintains balanced generation position and customer demand is constant.

# Conclusion

## AGL's business and strategy is resilient and flexible to adapt to all scenarios

- The full finalised report will be released on 13 August with our Annual Report
- The finalised report will include:
  - Full results, risks and opportunities analysis
  - Implied closure dates under each scenario
  - Quantum and type of renewable capacity investment necessary
  - Financial impacts – coal asset NPVs under the different scenarios
- The next steps in our TCFD journey will be defined via consultation with you our external stakeholders and the senior leaders within our business

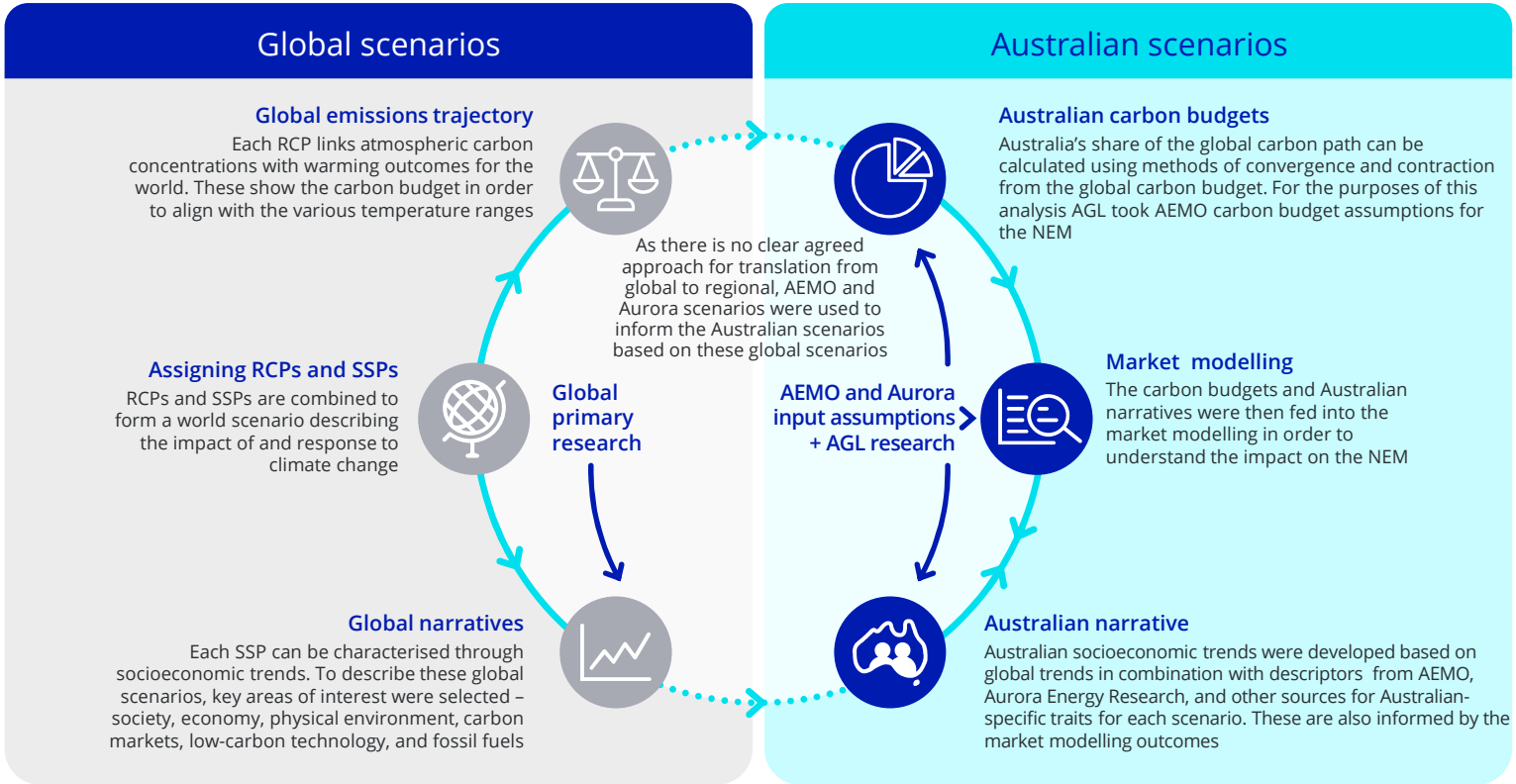
Broken Hill Solar Farm, NSW

Photo courtesy of PARF

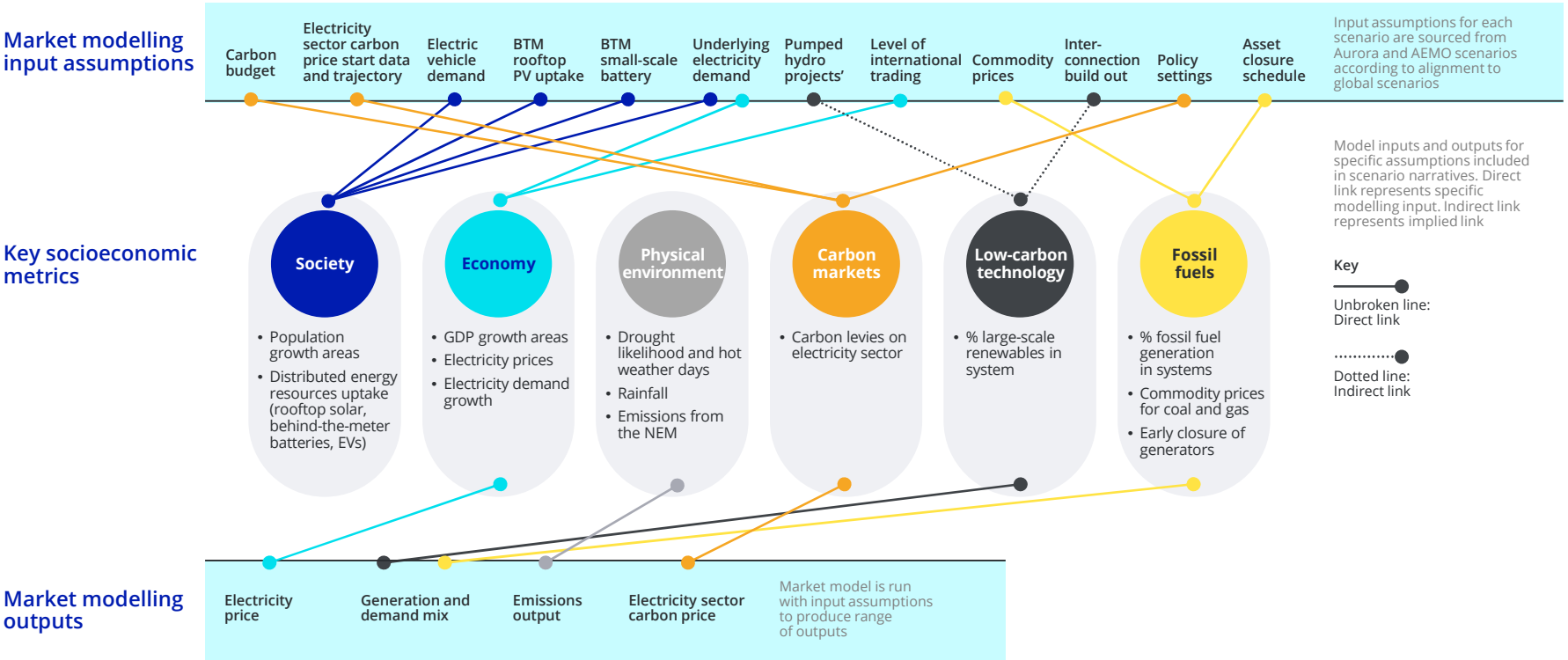
# Supplementary information

Macarthur Wind Farm, Victoria

# Modelling process detail



# Modelling process detail (2)



# Scenario analysis – approach

## In order to define the scenarios, globally recognised scenarios were used to inform the development of Australian scenarios

### Global context

- The IPCC publishes assessments through comprehensive Assessment Reports which cover modelling results and outcomes for a range of climate change scenarios
- Assessment Report 5 defines Representative Concentration Pathways (RCPs) for various scenarios outlining concentration pathways for greenhouse gases, which demonstrates possible future emissions and radiative forcing (i.e. temperature intensity) for the world until 2100
- A set of Shared Socioeconomic Pathways (SSPs) were developed and published by the IPCC in 2017, which describe how socioeconomic trends around the world may evolve over time
- AGL used both RCPs and SSPs together as inputs to design our global climate scenarios

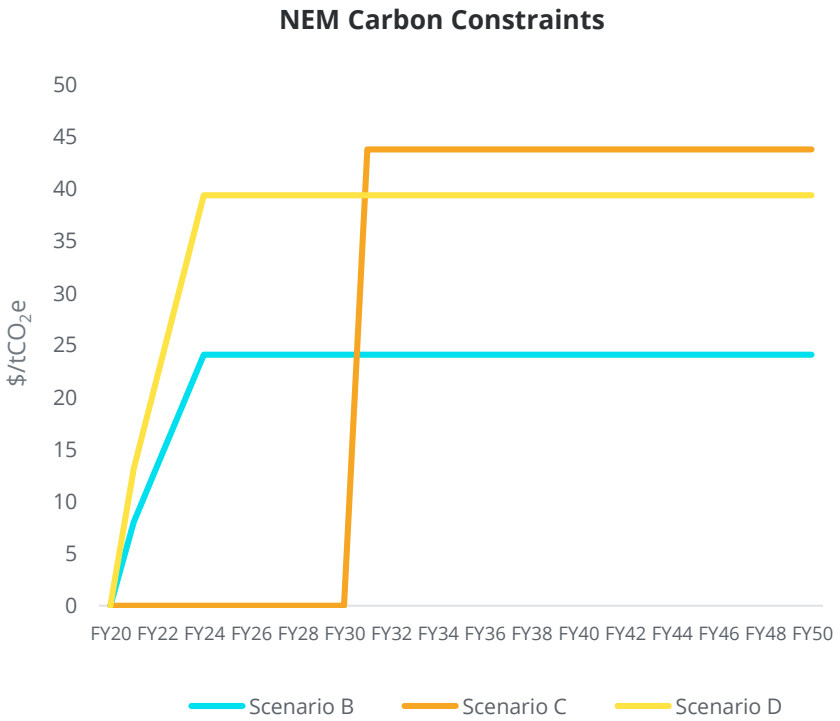
### Australian context

- AEMO's Integrated System Plan 2020 (ISP) outlines several scenarios the development of the electricity sector in Australia, including climate change scenarios
- For AGL's scenarios the global emissions trajectories were translated into Australian trajectories using methods from literature
- The Australian trajectory was then adjusted to align with scenario descriptors around the electricity sector's contribution (leading, parallel, lagging) to global emission reduction utilising the AEMO ISP
- Electrification of other sectors (transport, gas) is assumed to be delivered through "zero-emissions" supply
- Trajectories are converted into a cumulative carbon budget

# Carbon budgets and constraints

| Scenarios | Derived NEM carbon budgets |
|---|---|
| Scenario A – National Targets | N/A |
| Scenario B – Response 2020 | 2,208 $MtCO_2e$ |
| Scenario C – Response 2030 | 2,208 $MtCO_2e$ |
| Scenario D – 1.5 Degree Limit | 1,465 $MtCO_2e$ |

- The modelling assumes a carbon constraint is applied to the NEM across Scenarios B, C and D to ensure the predetermined carbon budget for each scenario is met.
- The model is policy agnostic and therefore the carbon constraint is applied in the model by placing a value on carbon, an effective 'price', at the minimum level to drive the decarbonisation required to meet the budget.
- The modelling process used a 'net zero' rather than 'absolute zero' approach to emission reduction by 2050, resulting in remaining budget being left at 2030.
- The carbon constraint is iteratively solved for in the model. Hence the resulting carbon price from the constraint is a fundamental input to the model.
- Under Scenarios B and D, the carbon constraint was applied by ramping up the constraint over three years from FY20, whereas in Scenario C the constraint was applied in 2031.



# Scenario assumptions and limitations

| | |
|---|---|
| **Alignment of scenarios to RCPs** | This work has been undertaken with reference to the IPCC Assessment Report 5 (AR5), and uses the RCPs as outlined within. We note that the RCPs will differ in AR6 however AR6 is still under development and is not referenced. |
| **Translating global emissions trajectories into Australian carbon budgets** | There are a range of methodologies for deriving Australian carbon budgets for the purposes of our analysis we have relied on AEMO's assumptions for Australia's contribution to global carbon reductions under each relevant RCP. |
| | There is a risk that other countries may not reduce emissions in line with AEMO assumptions, or that Australia's share may be in excess of that described by AEMO. This risk has not been modelled. |
| | Carbon budgets associated with the AEMO scenarios do not assume the use of Kyoto carryover credits, and as a result this modelling does not assume their use. |
| **Role of other sectors in Australia** | The role of sectors other than electricity in contributing to Australia's emissions reduction is out of scope of this modelling. We have relied on AEMO's assumptions for these. No economic modelling or impact of other sectors on the electricity sector has been performed. |
| | We note if mechanisms to achieve decarbonisation are required for other Australian sectors, this may have feedback loops and impacts on the wider economy and electricity market assumptions. These risks have not been modelled. |

| | |
|---|---|
| **NEM market structure** | The electricity sector market modelling assumes that the market structure for the NEM does not change over the modelling period to 2050. |
| **Refit costs for coal power stations** | The market model does not include refit costs for coal fire power stations. It was determined that the fairest approach to take in the modelling was to exclude that cost for all generators. |
| **Physical climate change impacts** | Modelling physical climate change impacts on the electricity sector (and broader economy) is out of scope for the purposes of this report, and physical climate change impacts have been considered as part of our scenario narratives only. |
| **General** | The FY20 model outputs do not represent actual data and do not take into account the Loy Yang outage or the current pandemic. |
| **COVID-19** | The impacts of the broad economic disruptions resulting from the COVID-19 pandemic have not been accounted for in AGL's scenario analysis as the modelling was undertaken prior to the outbreak reaching the pandemic stage. Further details on the overall impact of the pandemic on the modelling well be disclosed once that impact is better understood. |

# Disclaimer and important information

- The material in this presentation is general information about AGL's activities as at the date of this presentation. It is provided in summary form and does not purport to be complete. It should be read in conjunction with AGL's periodic reporting and other announcements lodged with the Australian Securities Exchange.
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- Statutory Profit is prepared in accordance with the Corporations Act 2001 and Australian Accounting Standards, which comply with International Financial Reporting Standards.
- Underlying Profit is Statutory Profit adjusted for significant items and changes in fair value of financial instruments.
- Underlying Profit is presented with reference to the Australian Securities & Investments Commission's Regulatory Guide 230 "Disclosing non-IFRS financial information" issued in December 2011. AGL's policy for reporting Underlying Profit is consistent with this guidance. The Directors have had the consistency of the application of the policy reviewed by the external auditor of AGL Energy Limited.
- Amounts presented as Statutory Profit and Underlying Profit are those amounts attributable to owners of AGL Energy Limited.

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