How to make net zero happen

Mobilisation report

Public launch | 12 July 2023

NET ZERO AUSTRALIA

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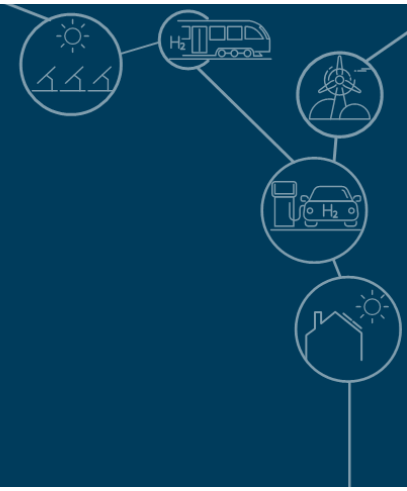
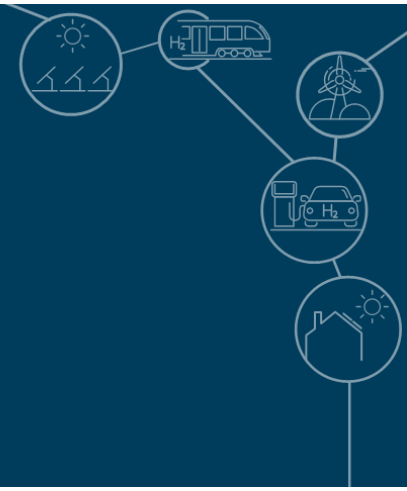
Acknowledgement of Country



Welcome

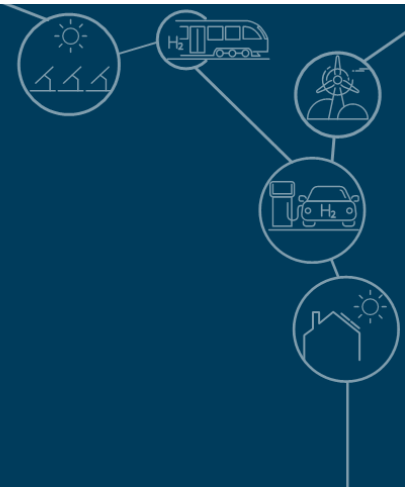
Professor Mark Cassidy

(Dean, Faculty of Engineering & IT, University of Melbourne)



Introduction

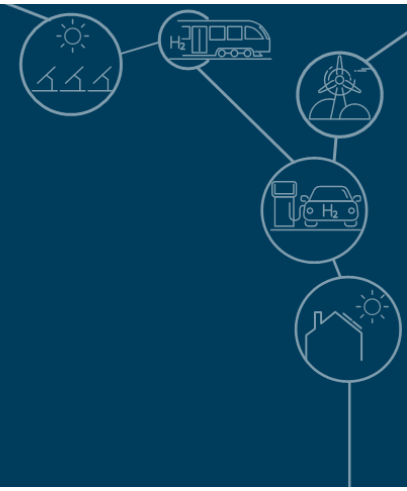
Professor Robin Batterham
(Chair, Net Zero Australia study)



Outline of today's presentation

Introduction	 Robin Batterham
Overview of the report	 Richard Bolt
Reflections	
Introduction and global context	 Katherin Domansky
First Nations and net zero	 Jamie Lowe
Decarbonisation and the environment	 Kelly O'Shanassy
Supporting low-income consumers	 Gavin Dufty
Reflections on a just transition	 Louise Olney
Panel discussion	
NZAu Phase II and close	 Michael Brear

About the Net Zero Australia study



About Net Zero Australia

The Net Zero Australia project (NZAu) is analysing net zero pathways that reflect the boundaries of the Australian debate, for both our domestic and export emissions

The study is:

Net Zero Australia is a partnership between the **University of Melbourne,** the **University of Queensland, Princeton University,** and management consultancy **Nous Group.**

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NZAu uses the modelling method developed by Princeton University and Evolved Energy Research for its 2020 ***Net-Zero America study.***

NZAu is funded by gifts and grants, and engages broadly

SPONSORS

Generous financial support has enabled this study

Gift and grant agreements protect the project's independence

ADVISORY GROUP

Crucial input is being provided by diverse advisers

INDEPENDENT MEMBERS

SPONSOR NOMINEES

ENGAGEMENT

Numerous briefings have been provided to:

COMMONWEALTH MINISTERS AND DEPARTMENTS

STATE MINISTERS AND DEPARTMENTS

NON-GOVERNMENT ORGANISATIONS

RESEARCH BODIES

For more, explore the website:
netzeroaustralia.net.au

NZAu has consulted widely with the project's sponsors, Advisory Group members and many stakeholders, but is independent of all of them.
NZAu does not purport to represent their positions or imply that they have agreed to our methodologies or results.

The Net Zero Australia team

STEERING COMMITTEE

Robin Batterham
University of Melbourne & Chair

Katherin Domansky
Independent Member

Michael Brear
University of Melbourne

Simon Smart
University of Queensland

Chris Greig
Princeton University

Richard Bolt
Nous Group

RESEARCHERS and ADVISERS

THE UNIVERSITY OF MELBOURNE

Rodney Keenan

Richard Eckard

Dominic Davis

Julian McCoy

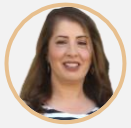
Yimin Zhang

Anita La Rosa

Claire Vincent

Pierluigi Mancarella

Maria Lopez Peralta



Franca Tomaras

Andrea Vecchi

Brendan Cullen

Erin Mayfield

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James Watson

Andrew Pascale

Bishal Bharadwaj

Jordan Beiraghi

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Mojgan Tabatabaei

Oscar Vosshage

Utkarsh Kiri

April Reside

Kirsty Fraser

Eloise Larsen

Tapan Saha

Michelle Ward

PRINCETON UNIVERSITY

Eric Larson

Jesse Jenkins

Molly Seltzer

Ben Finch

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Tom Strawhorn

Sarah Simon

Alasdair McCall

Georgie Pickett-Heaps

Nathalie Swainston

Izzy Cronin

Tenaya King

Ben Saxton

Alannah Tran

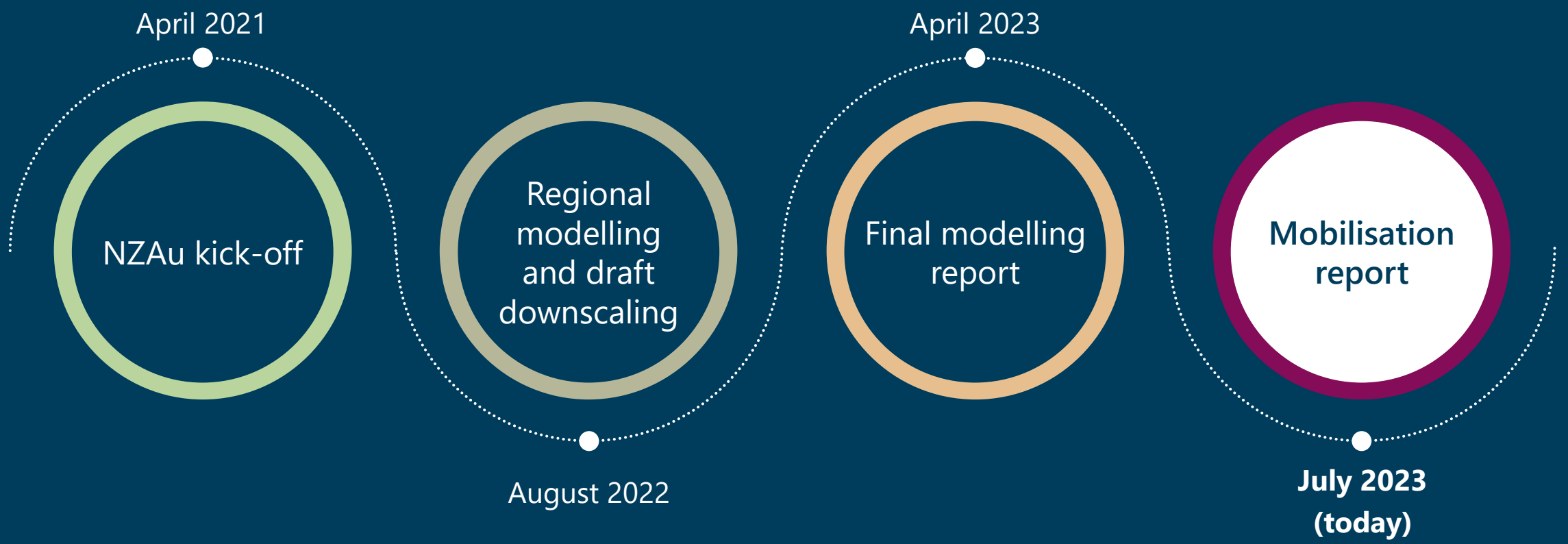
EVOLVED ENERGY RESEARCH

Ben Haley

Ryan Jones

Today we are presenting our mobilisation report

NET ZERO AUSTRALIA STUDY TIMELINE



Refresher: we modelled six Core Scenarios

REF

REFERENCE

- Projects historical trends, does not model cost impacts of fossil fuel supply constraints
- No new greenhouse gas emission constraints imposed domestically *or* on exports
- Policy settings frozen from 2020 onwards.

E+

RAPID ELECTRIFICATION

- Nearly full electrification of transport and buildings by 2050
- Renewable rollout rate almost unconstrained
- Lower cap on underground carbon storage rate.

E-

SLOWER ELECTRIFICATION

- Slower electrification of transport and buildings compared to E+
- Renewable rollout rate almost unconstrained
- Lower cap on underground carbon storage rate.

E+ RE+

FULL RENEWABLES ROLLOUT

- No fossil fuel use allowed by 2050
- Renewable rollout rate almost unconstrained
- Lower cap on underground carbon storage rate, which is only used for non-fossil fuel sources post 2050 (e.g. cement production).

E+ RE-

CONSTRAINED RENEWABLES ROLLOUT

- Renewable rollout rate limited to several times historical levels (to examine supply chain and social licence constraints)
- Much higher cap on underground carbon storage (to make net zero achievable).

E+ ONS

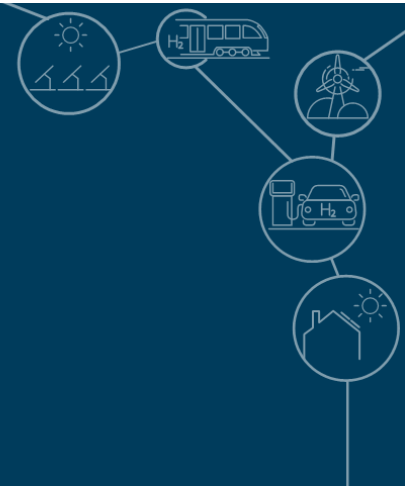
ONSHORING

- Domestic production of iron and aluminum using clean energy
- Progressively displaces exports of iron ore, bauxite, alumina and fossil fuels.

The Reference Scenario has *no emissions objective*. All other Scenarios are 'net zero' for both the domestic and exported emissions separately, and start from current emissions, and track in a line to net zero emissions by 2050 (domestic) and 2060 (export). None of the Scenarios are forecasts.

How to make net zero happen?

Richard Bolt
(Net Zero Australia Project Director - Nous Group)



Purpose of the report

This mobilisation report does …

- **Suggest** what should be done – using modelling and other evidence.
- **Identify** strategic directions.
- **Highlight** priority actions for 2030.
- **Provide** insights to governments, business, households and communities.

… but **does not**:

- **Ask** whether we *should* reach net zero.
- **Critique** governments or companies.
- **Express** philosophical preferences.
- Explore **sectoral** or **regional** transitions.

This report explores four broad mobilisation topics

NET ZERO OPTIONS

Which essential net-zero options should we prioritise and accelerate?

1

EXPORTS, INVESTMENT & JOBS

What role in global decarbonisation do we want to play?

How should we distribute export investment and jobs across the nation?

2

IMPACTS

How should we share net zero's costs and benefits among Australians?

How can we roll out renewables while improving the environment?

3

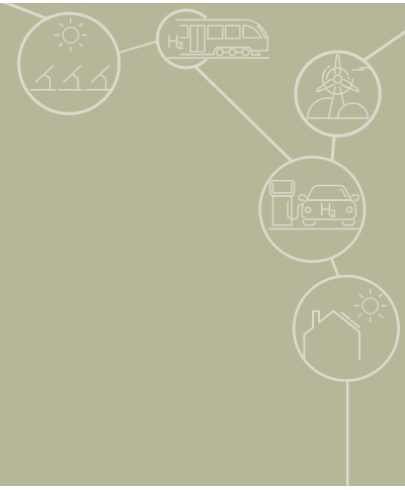
ROLES & COORDINATION

What more should governments, businesses, communities, and households do?

4

HOW TO MAKE NET ZERO HAPPEN

1. Net zero options



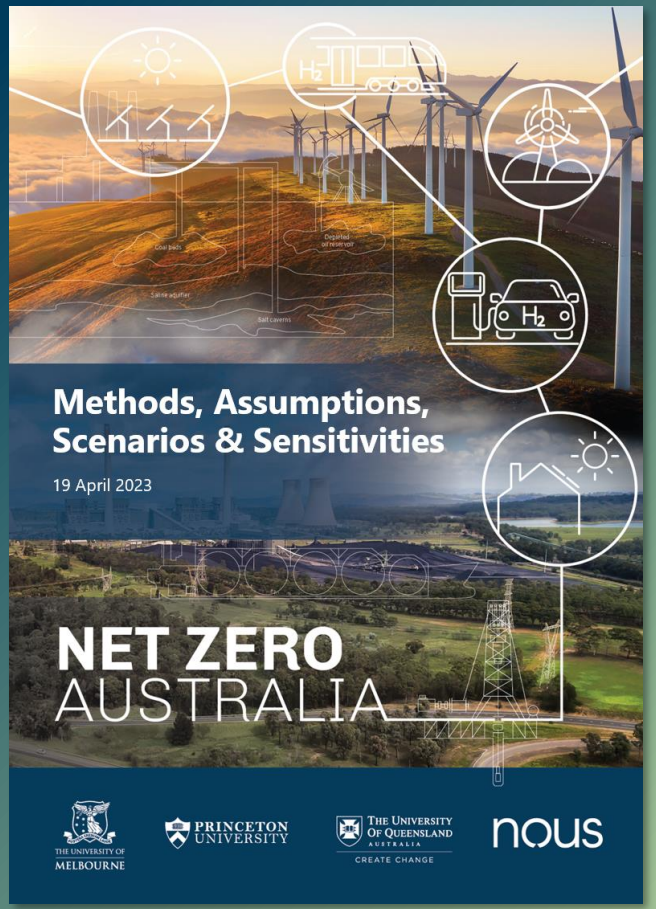
Overview | **Options**

Long-range assumptions are **uncertain**.

Priorities will change through the transition.

Eliminating options too early could be costly.

All material net zero options should be accelerated.

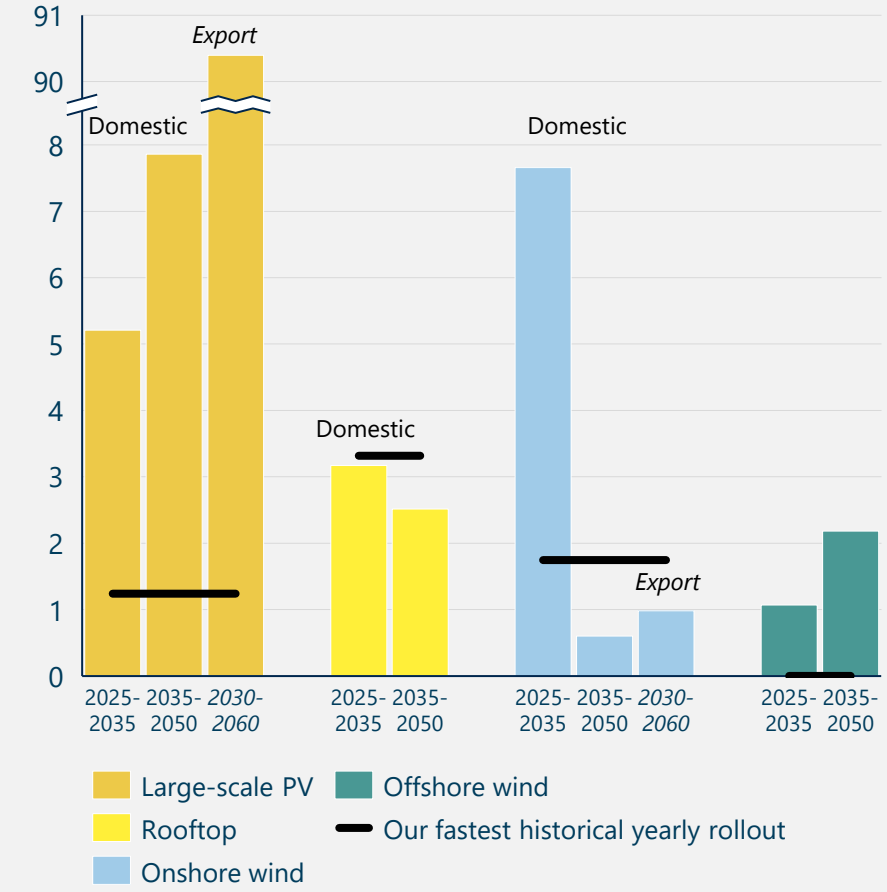


What should happen by 2030? (1/3)

- Accelerate **renewables, transmission** and **storage**.
- Establish drivers of a large **gas-fired fleet**.
- Begin planning **clean hydrogen infrastructure**.
- Base hydrogen support on **emissions intensity**.
- Determine a realistic role for **bioenergy**.

Progress is slower than the modelled rates.

Annual domestic and export capacity additions, E+ Scenario (GW/year), alongside historical data deployment rates.

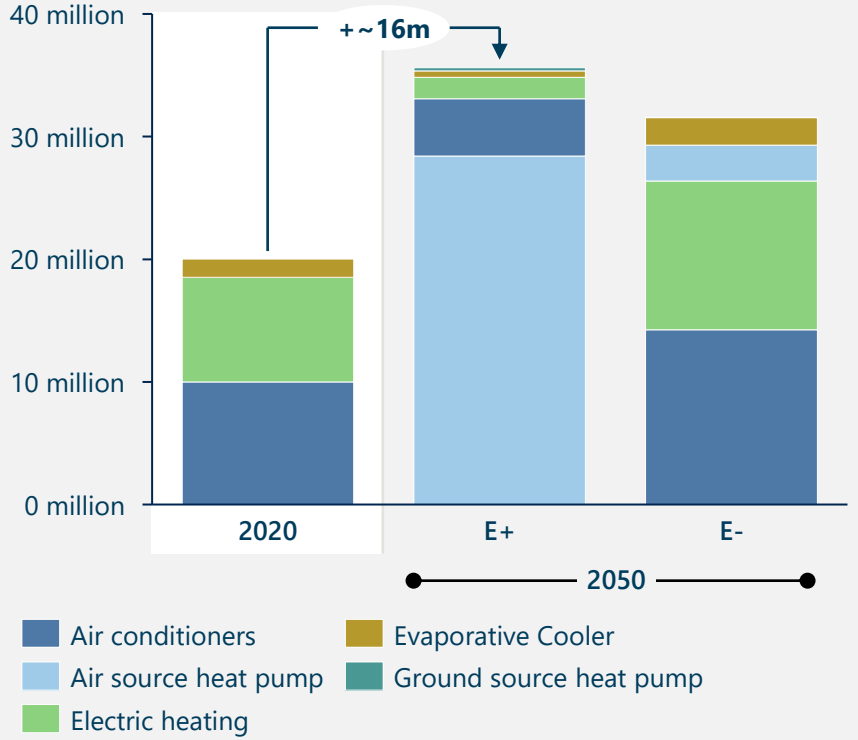


What should happen by 2030? (2/3)

- Increase energy productivity of **buildings**.
- Decide the future of **gas distribution**.
- Demonstrate and plan **industry** decarbonisation.
- Accelerate decarbonisation of **land transport**.

Electrification is the primary means by which household building emissions are reduced in the modelling, however planning is needed.

Electric residential heating, ventilation and air conditioning stock (units).

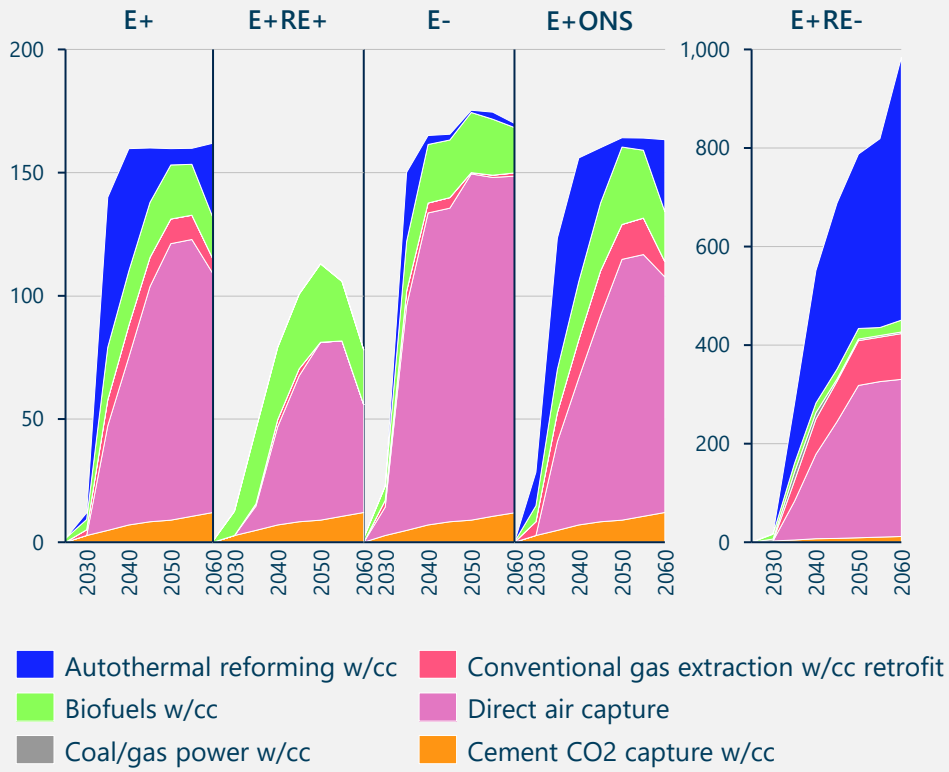


What should happen by 2030? (3/3)

- Prepare for large scale **carbon capture, utilisation and storage.**
- Prioritise **revegetation** in the land sector.
- Plan for the land sector to be an **offset purchaser**.
- Do not factor **nuclear power** into targets.

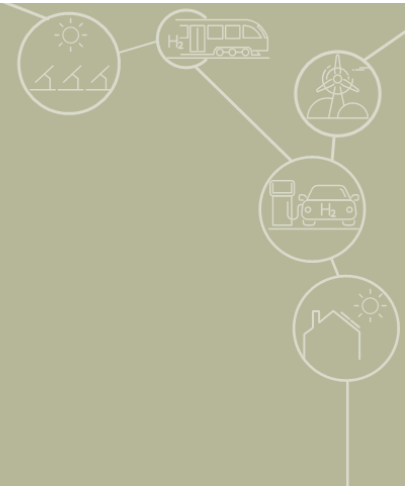
CCUS grows to high levels in all Scenarios.

Projected CO2 supply, by technology (Mt-CO2/year), note different axis for E+RE-.



HOW TO MAKE NET ZERO HAPPEN

2. Exports, investment, and jobs



Overview | **Exports, investment, and jobs**

Australia has a strategic and self-interest in **clean exports**.

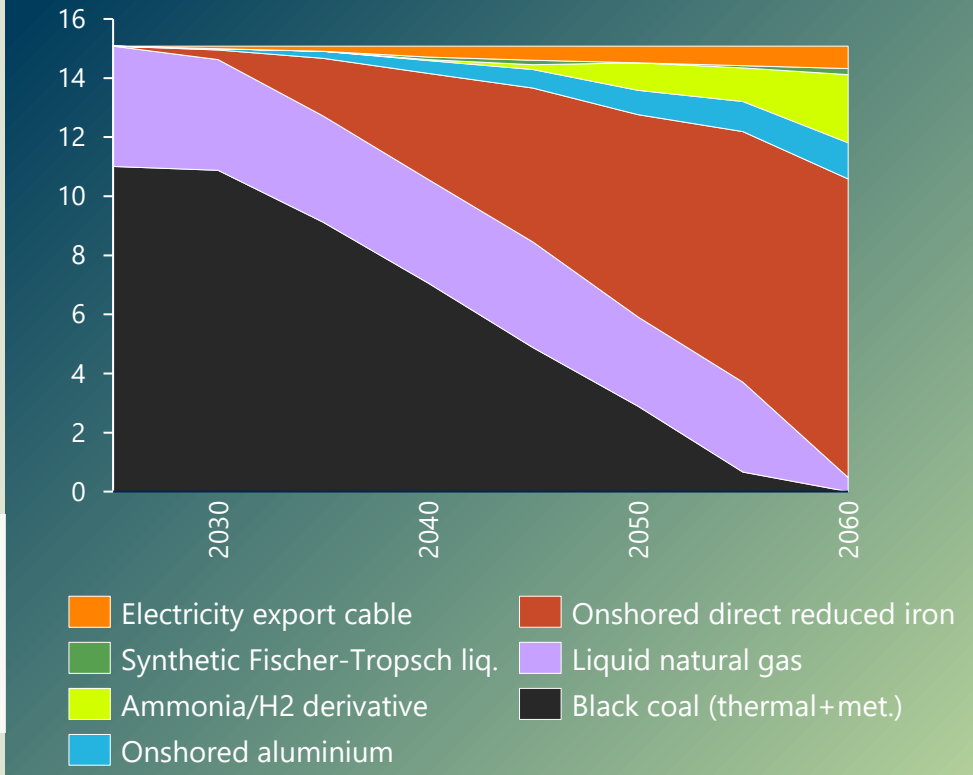
We should also support an **orderly and just transition**.

Fossil fuel exports will be scrutinised over that transition.

The export transition needs careful management.

Fossil energy exports are replaced by low-emissions energy carriers.

Projected form of export energy (EJ/year), E+ONS Scenario.



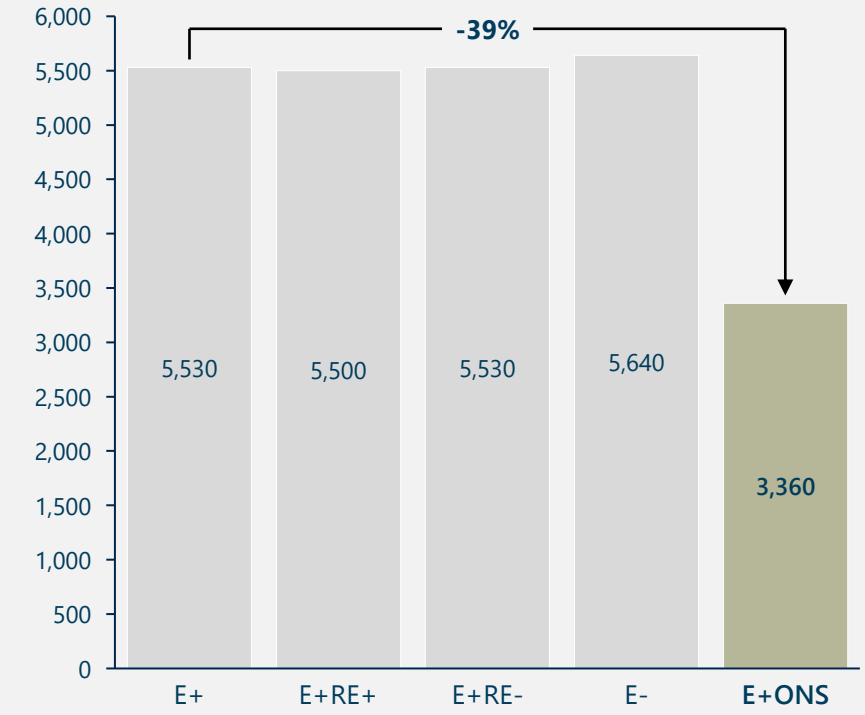
What should happen by 2030? (1/2)

2. EXPORTS, INVESTMENTS AND JOBS

- Establish a **clean energy export framework** with key stakeholders.
- Pursue exports of **clean energy** and **minerals**.
- Plan the **location** of clean export hubs.
- Boost skilled workforce through **education** and **immigration**.

Onshoring production is ~40% cheaper than exporting primary clean energy.

Levelized export system cost at 2060 by Scenario (2020 $AUD billion)



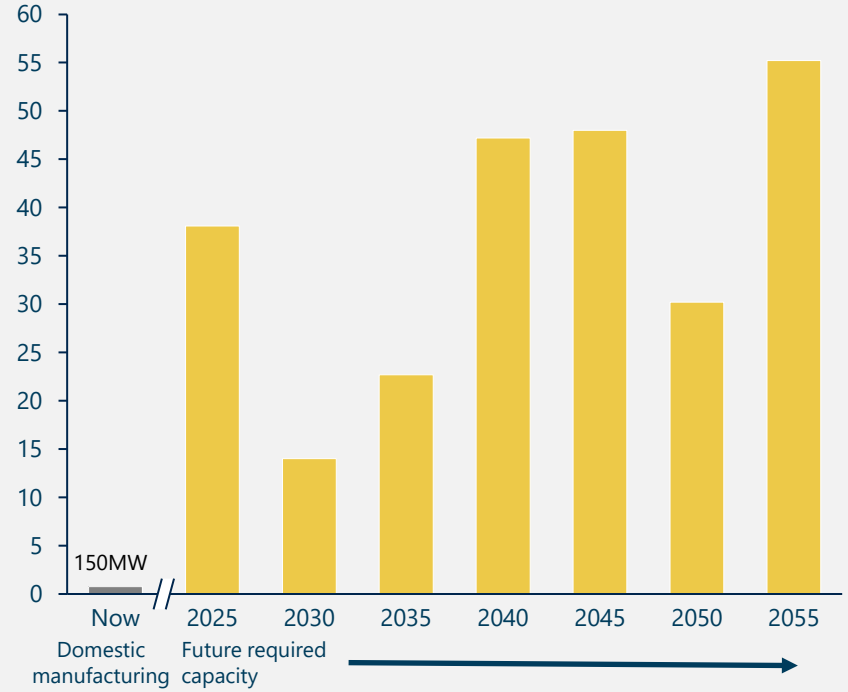
What should happen by 2030? (2/2)

2. EXPORTS, INVESTMENTS AND JOBS

- Identify **import replacement** opportunities.
- Identify opportunities for **industry participation.**
- Assume responsibility for Australia's share of **international aviation and shipping** emissions.

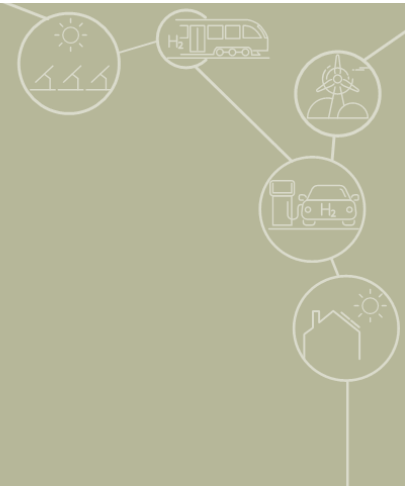
Australia will be a net importer of technology, capital and skills.

GW large-scale solar capacity required/5-years compared to historic domestic manufacturing (E+ Scenario).



HOW TO MAKE NET ZERO HAPPEN

3. Impacts



Overview | **Impacts**

Land use change will impact **First Nations**, **farming communities** and **biodiversity**.

Fossil fuel regions will experience losses.

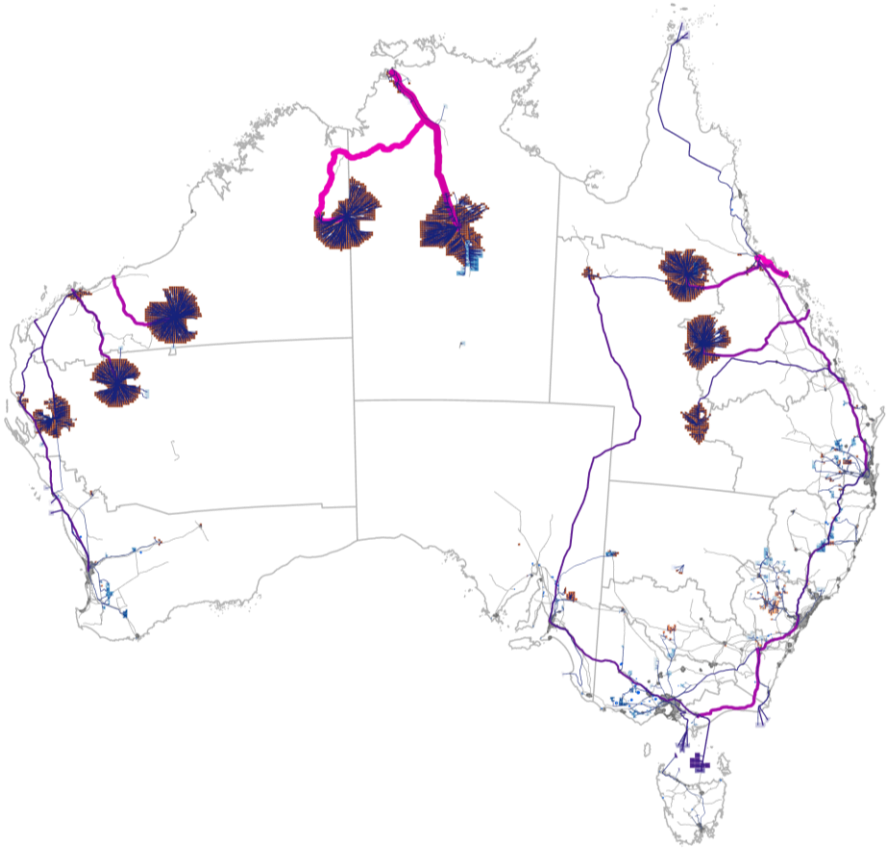
Low-income consumers will face costs.

Disorderly transition is a major risk.

Impact reduction and benefit sharing are critical.

Solar, wind and electricity transmission siting.

E+ Scenario, 2060.

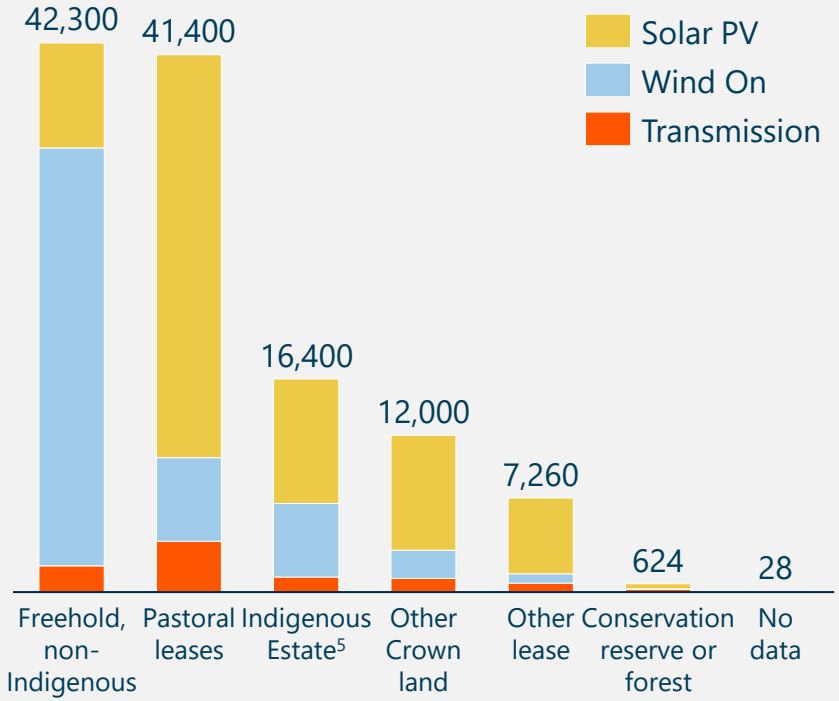


What should happen by 2030? (1/2)

- Establish **benefit sharing** with **First Nations** and **farming communities.**
- Pursue net gain for the **environment**.
- Reform **planning and environment approvals**.

NZAu developments require significant amounts of land change.

Total VRE and transmission infrastructure footprint area (km squared) for the E+ scenario in 2060.



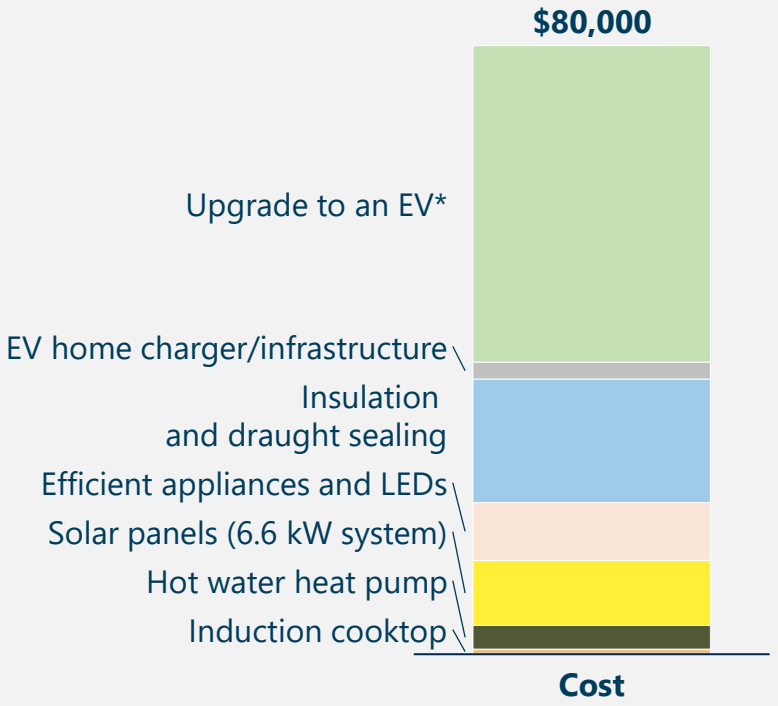
What should happen by 2030? (2/2)

3. IMPACTS

- Support **vulnerable households** and **renters**.
- Establish mechanisms for **orderly asset closures**.
- Develop new **anchor industries** to mitigate impacts of decarbonisation on fossil fuel regions.

Today's upfront cost for an electrified household is significant.

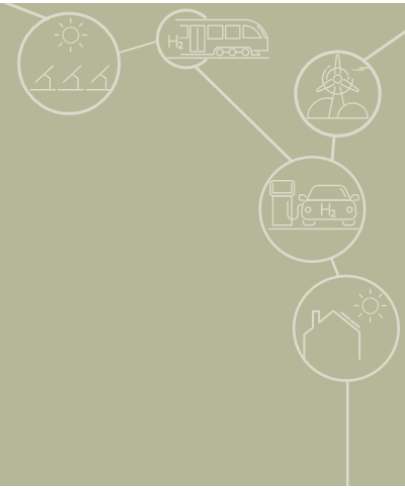
Indicative costs ($) for solar panels, upgrading to Australia's best-selling EV, and other retrofitting and appliances.



*Additional cost compared to a top 10 selling conventional vehicle and x1.8, to note the average number of vehicles per household.

HOW TO MAKE NET ZERO HAPPEN

4. Roles and coordination



Overview | **Roles and coordination**

Investment will mostly be done by **business**, and also **households**.

Governments must stimulate and coordinate action – and decide who pays.

The transition must be a **high priority** for decades.

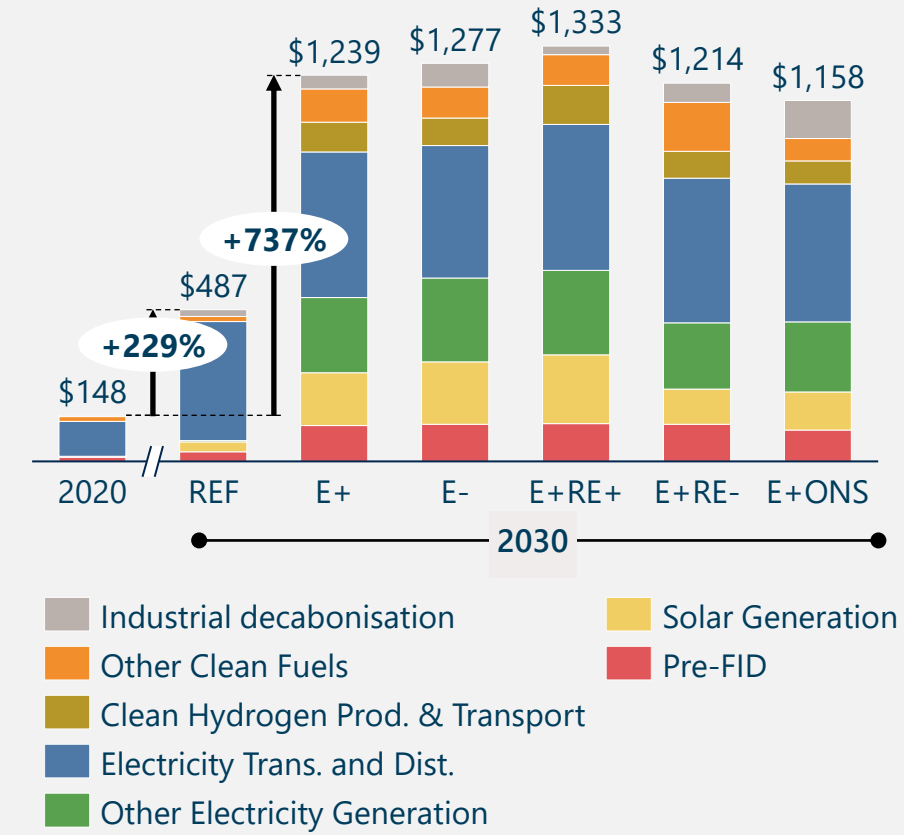
Net zero needs sustained commitment – and trust.

What should happen by 2030? (1/1)

- Build **trust** with engagement and transparency.
- **De-risk** investments to unlock capital.
- Establish **mechanisms** to accelerate action.
- Strengthen **governments' skill** and **capacity**.
- Comprehensively track and **report progress**.

In reaching net zero, massive additional investment is needed by 2030.

AUD *billion* of investment required to 2030, by Scenario.



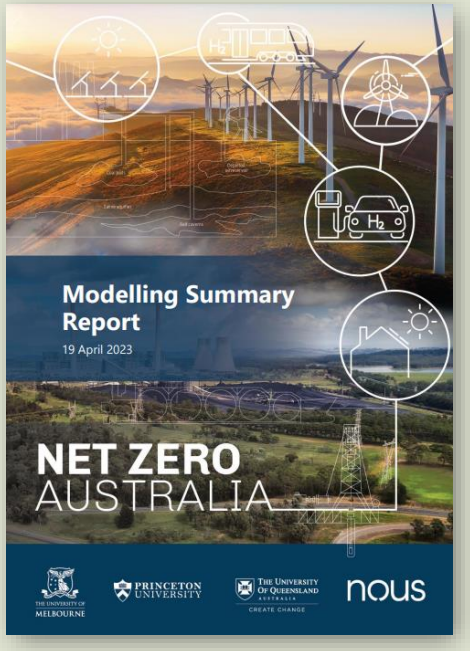
This is a summary of our detailed mobilisation report, based on robust modelling – see the website for more

LATEST RELEASE

Detailed mobilisation report (~70 pages)

MODELLING RESULTS

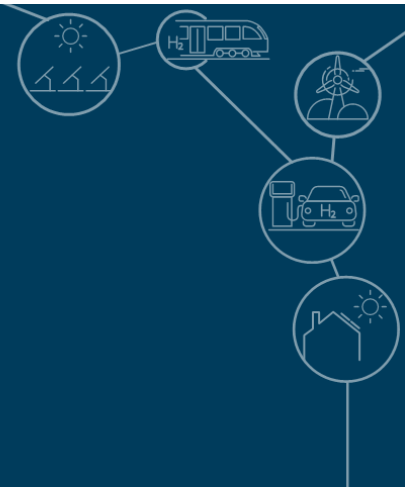
Modelling summary report (~100 pages)



Downscaling reports (17 reports)

www.netzeroaustralia.net.au

Reflections



INTRODUCTION AND GLOBAL CONTEXT

Katherin Domansky, Net Zero Australia Project

Independent Member

FIRST NATIONS AND NET ZERO

Jamie Lowe, National Native Title Council

DECARBONISATION AND THE ENVIRONMENT

Kelly O'Shanassy, Australian Conservation Foundation

Decarbonisation and the environment

Kelly O'Shanassy, Chief Executive Officer, Australian Conservation Foundation

SUPPORTING LOW-INCOME CONSUMERS

Gavin Dufty, St Vincent de Paul

Supporting low-income consumers

Gavin Dufty, Manager, Policy and Research, St Vincent de Paul Society

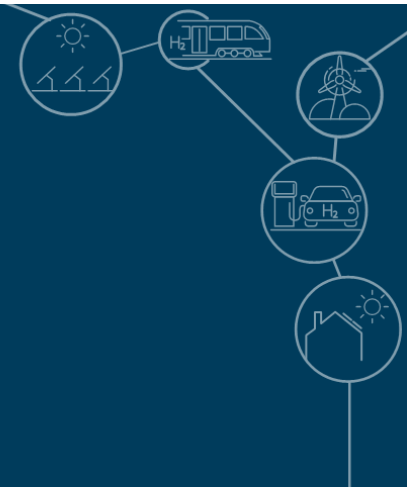
REFLECTIONS ON A JUST TRANSITION

Louise Olney, Minderoo Foundation

Reflections on a just transition

Louise Olney, Director, Building Communities, Minderoo Foundation

Panel discussion



Panel discussion with the Steering Committee

Robin Batterham
University of Melbourne and Chair

Katherin Domansky
Independent Member

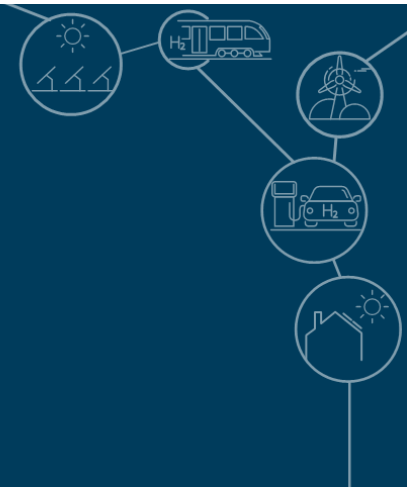
Michael Brear
University of Melbourne

Simon Smart
University of Queensland

Chris Greig
Princeton University

Richard Bolt
Nous Group

Phase II



Potential NZAu phase II focus areas

STATE-BY-STATE ANALYSIS

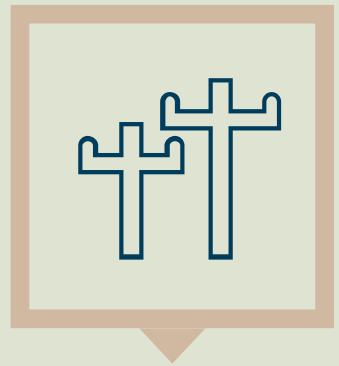
(Integrated mobilisation thinking)

NATIONAL PROGRESS TRACKER

(Capacity, investment & jobs)

ENABLERS OF THE TRANSITION

(Supply chains, strategic reserves, finance, policy)



NETWORK RESILIENCE

(Options to maintain security and reliability)

netzeroaustralia.net.au

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