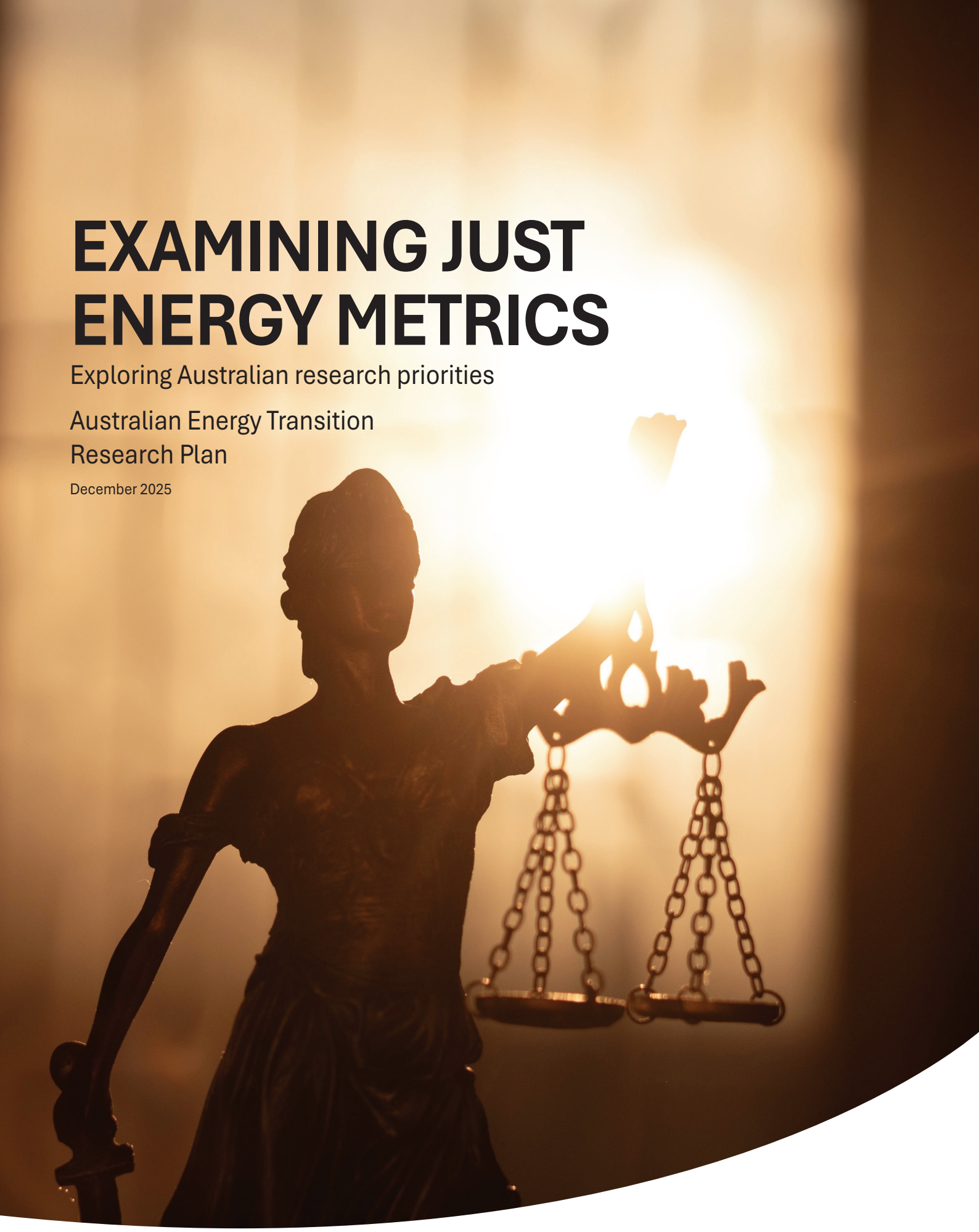
EXAMINING JUST ENERGY METRICS

Exploring Australian research priorities

Australian Energy Transition Research Plan

December 2025



The Australian Council of Learned Academies (ACOLA) is the forum whereby Australia's Learned Academies and our Associate members come together to contribute expert advice to inform national policy; and to develop innovative solutions to complex global problems and emerging national needs.

ACOLA®
AUSTRALIAN COUNCIL OF LEARNED ACADEMIES

GOVERNANCE OF THE AUSTRALIAN ENERGY TRANSITION RESEARCH PLAN

The governance and monitoring of the Australian Energy Transition Research Plan is undertaken by the Australian Council of Learned Academies (ACOLA), an independent, not-for-profit research organisation that brings together Australia's five Learned Academies to provide interdisciplinary advice addressing national priorities and global challenges.

Through the combined expertise of nearly 3,500 Fellows and engagement with academic, public, private and not-for-profit sectors, ACOLA bridges knowledge gaps and translates research and innovation into evidence-based insights that inform policy, drive innovation, and deliver tangible outcomes for Australia.

Oversight of the project is provided by a Steering Committee comprising Fellows from the Learned Academies, who contribute multidisciplinary expertise across the energy and research sectors to ensure that the Research Plan supports a robust, inclusive and evidence-informed energy transition.

Australian Energy Transition Research Plan Steering Committee members: Emeritus Professor Ken Baldwin FTSE (Chair), Professor Fran Baum AO FAHMS FASSA, Professor Lesley Head FAHA FASSA, Professor Thomas Maschmeyer AO FAA FTSE, Emeritus Professor Sue Richardson AM FASSA, Merryn York FTSE

PROJECT MANAGEMENT

Ms Prerana Mehta, CEO
Dr Lauren Palmer, Director, Policy and Projects

AUTHOR

Associate Professor Madeline Taylor

© Australian Council of Learned Academies (ACOLA)

ISBN: 978-0-6459638-3-0

This work is copyright. All material published or otherwise created by the Australian Council of Learned Academies (ACOLA) is licensed under a Creative Commons – Attribution – Non-Commercial 4.0 International (CC BY-NC 4.0) licence.

PEER REVIEW

This report has been reviewed by an independent panel of experts. Members of this review panel were not asked to endorse the report's conclusions and findings. The Review Panel members acted in a personal, not organisational, capacity and were asked to declare any conflicts of interest.

ACOLA gratefully acknowledges their contribution.

Adjunct Professor Trevor Danos AM FTSE
Emeritus Professor Janet McCalman AC FAHA FASSA
Professor David Schlosberg FASSA
Professor Russell Smyth FASSA

DATE OF PUBLICATION

December 2025

PUBLISHER

Australian Council of Learned Academies
Ian Potter House
9 Gordon Street
Acton ACT 2601 Australia
www.acola.org

SUGGESTED CITATION

Taylor, M 2025, *Examining JUST energy metrics: Exploring Australian research priorities*. Report for the Australian Council of Learned Academies (ACOLA) Australian Energy Transition Research Plan. www.acola.org.

ACKNOWLEDGEMENT OF COUNTRY

ACOLA acknowledges all Aboriginal and Torres Strait Islander Traditional Custodians of Country and recognises their continuing connection to land, sea, culture and community. We pay our respect to the Elders, both past and present.

Disclaimer

The opinions and any recommendations in this report are provided for general information only and are not grounded in empirical research. The information provided is for general informational purposes only and does not constitute legal or policy advice. This report reflects policies, laws, and research available up to August 2025. No responsibility or liability is accepted for any errors, omissions, or for any consequences arising from reliance on the information provided.

Associate Professor Madeline Taylor is an Australian Research Council Early Career Industry Fellow at Macquarie University. She is also a board member of RE-Alliance and a Fellow at the Climate Council. The views and analyses presented in this report do not represent the views of, nor are they endorsed by, any of the above organisations or entities.

CONTENTS

Abbreviations and acronyms 4

Executive summary 5

1 Introduction 6

2 Energy justice and the JUST framework: A select literature review 9

2.1 Energy justice 10

2.2 The JUST framework 12

3 Exploring JUST metric taxonomy examples 16

3.1 Regional Strategic Impact Assessments (Justice – distributive justice) 16

3.2 Stakeholder participation and engagement metrics (Justice – procedural justice) 18

3.3 Indigenous engagement metrics (Justice – recognition justice) 20

3.4 Renewable energy recycling and employment metrics (Universality – restorative justice) 22

3.5 Consumer Energy Resources metrics (Space) 24

3.6 Community wellbeing index (Time) 26

4 Australian JUST metric options 28

5 Key research questions to be addressed 31

6 Conclusion..... 34

References 35

Appendices 45

Appendix 1: Additional notable Australian JUST case studies..... 45

Appendix 2: Democratising jUst Sustainability Transitions (DUST) STEP Index structure and questions 46

Appendix 3: DUST STEP Index: 17 indicators 47

Appendix 4: NRG2Peers educational tool 49

Appendix 5: NRG2Peers target readiness indicators for each category in the 'user readiness' section 50

Appendix 6: Community Wellbeing (CWB) Index map 51

Appendix 7: Example of a JUST process 52

Appendix 8: JUST metric matrix scoring 53

ABBREVIATIONS AND ACRONYMS

Term	Meaning
ACOLA	Australian Council of Learned Academies
AEIC	Australian Energy Infrastructure Commissioner
AEMO	Australian Energy Market Operator
BESS	Battery Energy Storage System
CER	Consumer Energy Resources
CE Act	Circular Economy (Scotland) Act 2024 (SC)
CWB	Community Wellbeing Index
EIA	Environmental Impact Assessment
EPBCA	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
ESC	Essential Services Commission (Victoria)
EU	European Union
FPIC	Free, Prior, and Informed Consent
GBA+	Gender-Based Analysis Plus (Canada)
GW	Gigawatt
JUST	Justice, Universality, Space, Time
MW	Megawatt
NEM	National Electricity Market
NGO	Non-Governmental Organisation
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
P2P	Peer-to-Peer
PV	Solar Photovoltaic
REZ	Renewable Energy Zone
SIA	Social Impact Assessment
STEP Index	Stakeholder Engagement and Participation in Policymaking Index
UK	United Kingdom
US	United States

EXECUTIVE SUMMARY

Australia stands at a critical juncture in its energy transition. The Australian Government has committed to the urgent goal of reducing national greenhouse gas emissions by 43% below 2005 levels and achieving 82% renewable electricity generation in the National Electricity Market (NEM) by 2030 (DCCEEW, 2025a). More recently, the Australian Government set a national target to reduce emissions by 62–70% below 2005 levels by 2035 (DCCEEW, 2025a). These ambitious goals raise key research questions on how transparently and fairly Australia can measure and monitor its energy transition. If Australia is to successfully rapidly transform its energy system, drive economic productivity, and position itself as a 'renewable energy superpower' (Garnaut, 2022), it needs to do so by incorporating 'the perspectives and wellbeing of people, in the context of their lives, communities, economy and employment, in a way that is fair' (Clarke et al., 2021, p. 2).

Robust metrics and proactive measuring of Australia's energy transition can support governments to make informed policy decisions that increase efficiencies, reduce costs and manage risks – ensuring that social and economic benefits are distributed inclusively and fairly across all sectors.

Building on the Australian Council of Learned Academies (ACOLA) *Energy Transition Research Plan*, this report expands on the Research Plan's Theme 2: Social Engagement Dynamics (Clarke et al., 2021, p.18) to investigate the current state of energy justice research in Australia. It identifies research gaps and explores how a JUST framework – spanning the pillars of Justice, Universality, Space, and Time (Heffron, 2021b) – supported by qualitative and quantitative metrics, can be used to assess energy justice within Australia's energy transition.

Drawing on insights primarily from the United Kingdom (UK), Canada, and New Zealand, this report compares differing approaches to JUST metrics and highlights potential avenues for future Australian energy transition research. While Australia can learn from these international examples, our unique geographic, economic and social contexts will demand a tailored, locally relevant, cohesive, scalable, and interdisciplinary research agenda to explore JUST metrics in an Australian context.

The report identifies both urgent and strategic Australian-specific research priorities. To understand the potential application of JUST metrics, it presents a matrix that categorises JUST metrics by urgency (reflecting the immediacy and potential impact of the inquiry) and adoptability (indicating the readiness of metric implementation).

Ultimately, this report provides a foundation for **developing metrics and methodologies** to assess and strengthen fairness within the energy transition and offers practical insights to guide future research and collaboration uniquely relevant for Australia.

1 INTRODUCTION

KEY MESSAGES

- **Australia's energy transition lacks clear, calculable, and consistent ways to measure fairness and inclusion.** Despite major technological progress, there are no consistent ways to measure energy justice, including how fairly the benefits and burdens of the transition are shared.
- **'Energy justice' provides a more comprehensive policymaking framework for a fair and inclusive energy transition, building on and extending current approaches based on 'social licence'.** While the concept of social licence has played an important role in addressing local acceptance and community engagement, this report uses the broader concept of energy justice, as it captures long-term equity, inclusion and community benefit, and supports accountability across the social, economic and governance dimensions of the energy transition.
- **Without clear metrics, governments risk costly, reactive decisions.** Proactively measuring and monitoring justice outcomes can derisk and shorten project lead times, reduce costs, and help ensure benefits are distributed equitably.
- **The *JUST framework* can be used to guide future research and policy.** The JUST framework provides a coherent and practical way to identify metrics and approaches that can improve fairness, participation, and accountability in Australia's energy transition.

Australia's accelerating energy transition is accompanied by major technological advances and growing social complexity, but it lacks appropriate ways of measuring energy justice – how fairly the benefits and burdens of this transition are shared. This includes critical questions of equity, participation, and justice (Dyer, 2023).

A fair energy transition depends on clear, calculable and consistent metrics that show who benefits, who bears costs, and how decisions are made. Proactively measuring and monitoring energy justice outcomes can help reduce risks, shorten project lead times, create system-level efficiencies, and ensure the social and economic benefits of the energy transition are distributed more fairly. Without robust metrics, governments risk making costly, reactive decisions, particularly when inequities, delays, or legal challenges arise.

Renewable energy in Australia has become increasingly diverse and decentralised, particularly driven by the rapid and successful uptake of rooftop solar photovoltaics (PV), with around 300,000 new systems installed each year (DCCEEW, 2024a). This shift has brought an expanded and more varied mix of participants into the energy transition, including communities, consumers, energy authorities, and non-government organisations. The evolving social landscape spans all levels of government and involves collaboration across sectors, highlighting the growing importance of the social aspects of Australia's energy transition (Energy and Climate Change Ministerial Council, 2024).

However, overlapping and disjointed policies and regulatory frameworks across local, state and territory, and federal jurisdictions can create inefficiencies, legal uncertainties, and additional costs and delays (Kallies, 2021). The priorities set by the Energy and Climate Change Ministerial Council therefore play a crucial role in shaping national energy policy, particularly within Australia's cooperative federalised system. While respecting constitutional limits and the important role of states and territories in shaping the Australian energy transition, stronger collaboration and alignment across jurisdictions and nationally is needed to ensure policies align, reduce duplication, and provide clearer pathways for investment and community engagement.

Social licence and energy justice

This report uses the broader concept of energy justice. While the concept of social licence has played an important role in addressing local acceptance and community engagement (see breakout box to the right), energy justice captures long-term equity, inclusion and community benefit, and supports accountability across the social, economic and governance dimensions of the energy transition.

Energy justice encompasses the equitable allocation of rights and responsibilities among governments, communities, and the energy sector, with the goal of achieving equity in social and economic participation in the energy system (Initiative for Energy Justice, 2019) and addressing existing socio-economic burdens.

In contrast to social licence to operate, energy justice provides a broader framework for guiding research, policy, and regulation to prevent unjust outcomes and promote sustained societal benefits (Godden, 2020; Energy Consumers Australia, 2025).

Energy justice can also be viewed as a 'social contract' that actively includes underrepresented stakeholders, aiming for universal access to energy services and fairer outcomes (Heffron & De Fontenelle, 2023; Baker et al., 2023; McCauley et al., 2024; Taylor & Taylor, 2022).

Social licence: what it means and why it's hard to measure

Social licence refers to the acceptance of new infrastructure developments by host communities and landholders (AEMO, 2025).

The expansion of Renewable Energy Zones (REZ) and associated transmission infrastructure has prompted renewed focus on the concept of social licence to operate, leading to the development of social licence guidelines (AER, 2023; Energy and Climate Change Ministerial Council, 2024; NSW Government, 2024).

The increased uptake of rooftop solar and home battery storage has reshaped the energy landscape, bringing millions of households into the transition as energy participants. This shift has driven changes in electricity market regulation (AEMO, 2025) and highlighted the importance of ensuring that social licence principles apply not only to large-scale developments but also to consumer engagement and equity across distributed energy systems. The Consumer Energy Resource Roadmap responds to this by promoting more active consumer participation in distributed energy markets through a consumer-centric approach to social licence (DCCEEW, 2025b; Energy and Climate Change Ministerial Council, 2025).

The concept of social licence has been valuable in underscoring the importance of community acceptance and engagement in the Australian energy transition. However, existing social licence approaches can have limitations, such as focusing on managing localised conflict rather than capturing the wider social benefits or activating long-term community support (Glückler & Gutiérrez, 2025; Owen & Kemp, 2013).

Originating in corporate management literature, the social licence to operate framework was initially developed as a reactive tool to respond to community concerns, rather than a proactive mechanism to measure, promote, and monitor systemic social benefits (Stuart et al., 2023; Demuijnck & Fasterling, 2016). These narrower framings of social licence risk overlooking broader opportunities to integrate considerations of justice, inclusion and long-term community benefit more comprehensively in the energy transition (Boutilier, 2021; Condie & Condie, 2025).

Addressing energy injustices requires evidence-based approaches to reduce systemic barriers and improve equitable outcomes (Sovacool et al., 2017). Without research-informed tools to monitor energy justice outcomes, energy transition projects may face delays, persistent inequities, and greater exposure to legal challenges (Clarke et al., 2022). The **JUST framework** – comprising the four pillars of *Justice, Universality, Space,* and *Time* – provides a practical structure for identifying and applying metrics within energy transitions (Heffron, 2021b; Arkhurst et al., 2023).

About this report

Australia's energy transition presents both unique challenges and opportunities to learn from other approaches and case studies.

This report builds on previous work under ACOLA's *Energy Transition Research Plan* (Clarke et al., 2021) by identifying research gaps, developing comparative metrics, and presenting jurisdictional case studies to guide future work on measuring energy justice in Australia.

It presents the first comparative assessment of JUST framework metrics using a socio-legal functional methodology (Legrand & Munday, 2003; Adams & Bomhoff, 2012). It reviews how different legal jurisdictions address similar challenges and opportunities to enable a comparison between different approaches to energy transitions across social contexts. This helps to identify which metrics support or hinder justice in the energy transition (Michaels, 2006)[1].

The report presents a taxonomy of metrics and identifies pathways for further research and collaboration among energy transition stakeholders. It does not aim to provide an exhaustive review of the literature or provide detailed policy recommendations. Rather, it outlines research directions to inform the development of JUST-aligned metrics tailored to Australia's unique policy, legal, and social context.

The analysis in this report primarily draws on comparable Commonwealth countries, such as Australia, the United Kingdom (UK), Canada, and New Zealand, and, where relevant, the European Union, focusing on energy transition technologies and infrastructure. Comparing these jurisdictions provides insights into how different approaches to justice measurement can be adapted for Australia's unique governance context.

The report references the National Electricity Market (NEM) only, rather than the Western Australian Wholesale Electricity Market (WEM) supplying the South West Interconnected System (SWIS).

Snapshot: Towards a fair and inclusive energy future

By developing Australian-specific JUST-aligned metrics grounded in evidence, collaboration, and co-design, Australia can better assess where inequities occur, target interventions, and build trust across communities.

The insights provided through the case studies identified in this report highlight potential avenues for future Australian energy transition research. While Australia can learn from these international examples, our unique geographic, economic and social contexts will demand a tailored, locally relevant, cohesive, scalable, and interdisciplinary research agenda to explore JUST metrics relevant for Australia.

1 While this socio-legal approach is useful for understanding how to measure energy justice, it also has limitations. Further qualitative and quantitative analysis are needed to refine the research questions, metrics, and design of an Australian version of the JUST framework.

2 ENERGY JUSTICE AND THE JUST FRAMEWORK: A SELECT LITERATURE REVIEW

KEY MESSAGES

- **Australia's growing socio-legal research on the energy transition has identified three consistent themes:** the need for multidisciplinary approaches, meaningful community engagement, and long-term intergenerational benefits that distribute gains and burdens fairly.
- **Energy justice provides a useful framework to guide fair and inclusive energy transitions.** It builds on environmental justice principles and includes distributive, procedural, and recognition justice, with growing calls to operationalise these ideas and include Aboriginal and Torres Strait Islander perspectives.
- **Global research and policy leadership on energy justice are concentrated in Europe and the United States.** Australia lacks equivalent national-level policies, highlighting the need for Australian-specific research, tools, and metrics to apply energy justice principles locally.
- **The JUST framework offers a structured way to measure and apply energy justice.** Its four interconnected pillars (Justice, Universality, Space, and Time) help identify where fairness, participation, and accountability can be strengthened in Australia's energy transition.

Australian socio-legal energy transition research has focused on several key areas, including but not limited to community impacts and benefits of existing and emerging energy projects and systems, social attitudes towards the energy transition, energy poverty, regulatory reform on electricity market design, pricing for customers, energy insecurity for Aboriginal and Torres Strait Islander and vulnerable societal groups, energy sovereignty, energy equity, and the just transition for carbon-intensive workforces.[2]

While Australian socio-legal energy transition research is vast and diverse, three key patterns emerge in considering the nexus of social, economic, and cultural challenges in our energy transition (Stambe et al., 2025):

- Research highlights that a successful transition requires a multidisciplinary approach to support the fair distribution of benefits and burdens, particularly in light of previous industrial transitions that may have deepened socio-spatial inequities for marginalised groups (Hunt et al., 2021).

2 For more information on Australian socio-legal energy transition research, please see: Wright et al., 2024 and Riedy, 2025 (emerging energy projects and systems); CSIRO, 2025a, KPMG, 2025 and Bharadwaj et al., 2023 (social attitudes towards the energy transition); Kelly et al., 2020 (energy poverty); Nelson et al., 2019 (regulatory reform on electricity market design); White et al., 2024 (pricing for customers); Riley et al., 2023 (energy insecurity for Aboriginal and Torres Strait Islander and vulnerable societal groups); Quail et al., 2025 (energy sovereignty); Willand et al., 2019 (energy equity); Walters et al., 2025, Tattersall et al., 2025 and Stambe et al., 2025a (just transition for carbon-intensive workforces).

- There is consistent emphasis on the need to actively consider the interests and needs of local and Aboriginal and Torres Strait Islander communities and consumers directly affected by the energy transition (O'Neill & Thorburn, 2025; Paterson & Bourova, 2025). Failing to engage meaningfully can lead to community disempowerment, particularly where projects fail to deliver promised benefits (Colvin et al., 2019).
- Recent research queries whether and how the transition to a net-zero economy can generate measurable intergenerational benefits (Briggs et al., 2022). Growing Australian research shows that energy transition socio-legal studies are complex and can strongly influence how the benefits and burdens of energy systems are shared (Radtke & Renn, 2024).

2.1 Energy justice

Research into energy justice is growing rapidly across multiple fields (McCauley et al., 2019; Jenkins et al., 2021). Researchers from across different disciplines have expanded the concept of justice by examining the needs of differing societal groups in various contexts, including the energy transition (Rawls, 2005; Young, 2016; Fraser, 2012).

Three core principles are widely used in energy justice research:

- **Distributive justice** – ensuring equitable distribution of the benefits and burdens within energy systems.
- **Procedural justice** – promoting transparency and inclusive processes and decision-making within energy systems.
- **Recognition justice** – acknowledging and respecting diverse interests, needs, and rights within the energy transition (Sovacool & Dworkin, 2015; Sovacool et al., 2017).

Energy justice complements but differs from the concept of a just transition, which originated in the 1980s through global trade union advocacy for workers' rights and the creation of low-carbon jobs as essential components of the global energy transition (International Labour Organisation, 2024).

Environmental justice forms the long-standing foundation for the three principles of energy justice. Environmental justice refers to the distribution of environmental risk, recognition of diverse participants and experiences, and participation in environmental policy decision-making to ensure no group bears an unfair share of environmental harms (Schlosberg, 2007). Building on this foundation, energy justice has been expanded to include broader perspectives, such as:

- Cosmopolitan justice, which considers the global impacts of the energy transition (McCauley et al., 2019).
- Multispecies justice, which recognises the effects of environmental and energy systems on non-human life (Celermajer et al., 2021; Chao et al., 2022; Tschakert et al., 2021).
- Restorative justice, which addresses historical inequities (Hazrati & Heffron, 2021).

Emerging literature also calls for non-Western principles of just distribution (Jenkins et al., 2020) to incorporate non-Western philosophical conceptions (Lacey-Barnacle et al., 2020) to embrace diverse perspectives, particularly Aboriginal and Torres Strait Islander communities.[3] Recent critiques argue that justice must be operationalised rather than a 'tokenistic add-on to already made technical decisions' (Santos Ayllón et al., 2025). In response, researchers have sought to provide actionable approaches to energy justice and develop frameworks to design and develop the deployment of energy transition technologies and systems (Taiwo & Tozer, 2025).

However, 60% of energy justice research originates from Europe, while researchers from the Asia-Pacific region (including Australia and New Zealand) account for just 15% of energy justice literature (Jenkins et al., 2021; Clarke et al., 2022). This imbalance reflects the strong policy focus on energy justice in the Global North, including the EU and the United States (US). The European Green Deal, a major EU energy policy framework aimed at reducing greenhouse gas levels by at least 55% by

3 Specific analysis of Aboriginal and Torres Strait Islander JUST concepts, customs, lore, and epistemology are not within the scope of this report. Such analyses require dedicated research led by or in collaboration with Aboriginal and Torres Strait Islander peoples.

2030 compared to 1990 levels (Kuyer et al., 2025), clearly states that the energy transition 'can only succeed if it is conducted in a fair and inclusive way' (EC, 2019). Previously, the US Energy and Environmental Justice Policy required governments to consider how energy policies may create or hinder energy justice in communities (US DOE, 2024).

In contrast, Australia currently lacks federal-level policies that explicitly address justice within the energy transition. **This research gap highlights the need for Australian-specific research and policy tools to understand energy justice in local contexts.** In response, this report explores how the JUST pillars, which encompass energy justice principles, can be translated into measurable metrics. It also identifies key Australian research gaps, opportunities, and existing case studies.

Globally, a wide range of measures and tools aim to support just energy transition outcomes (Herberg et al., 2023; Taylor, 2024). For example, the World Economic Forum's Energy Transition Index assesses 118 countries each year on their energy security, sustainability, and equity, providing insights into how ready each country's energy system is for transition (World Economic Forum, 2025).

In Australia, public participation is one of the main approaches used to promote social inclusion in energy planning and project approvals through consultative processes led by federal, state, and local governments (Dyer, 2023; DCCEEW, 2024b). However, participation alone does not guarantee fairness or justice. Participation may require certain skills and capacities, which can exclude certain stakeholder groups, leading to unbalanced representation (Australian Government, 2024c; Mey et al., 2023).

Energy justice is linked to existing institutional injustices, such as those related to health, age, and housing. Monitoring and measuring public participation in renewable energy projects can help to identify who benefits from these processes and whether existing consultation mechanisms meaningfully advance energy justice in practice (Haldar et al., 2025).

Research question 1: Is there a role for justice in the Australian energy transition, and if so, how could justice be defined and framed in the Australian context to inclusively reflect the interests of all societal stakeholders, including marginalised groups?

2.2 The JUST framework

The JUST framework (Heffron, 2021b) provides a structured way to assess energy transition through four interconnected pillars: *Justice*, *Universality*, *Space*, and *Time*, as illustrated in Figure 1.

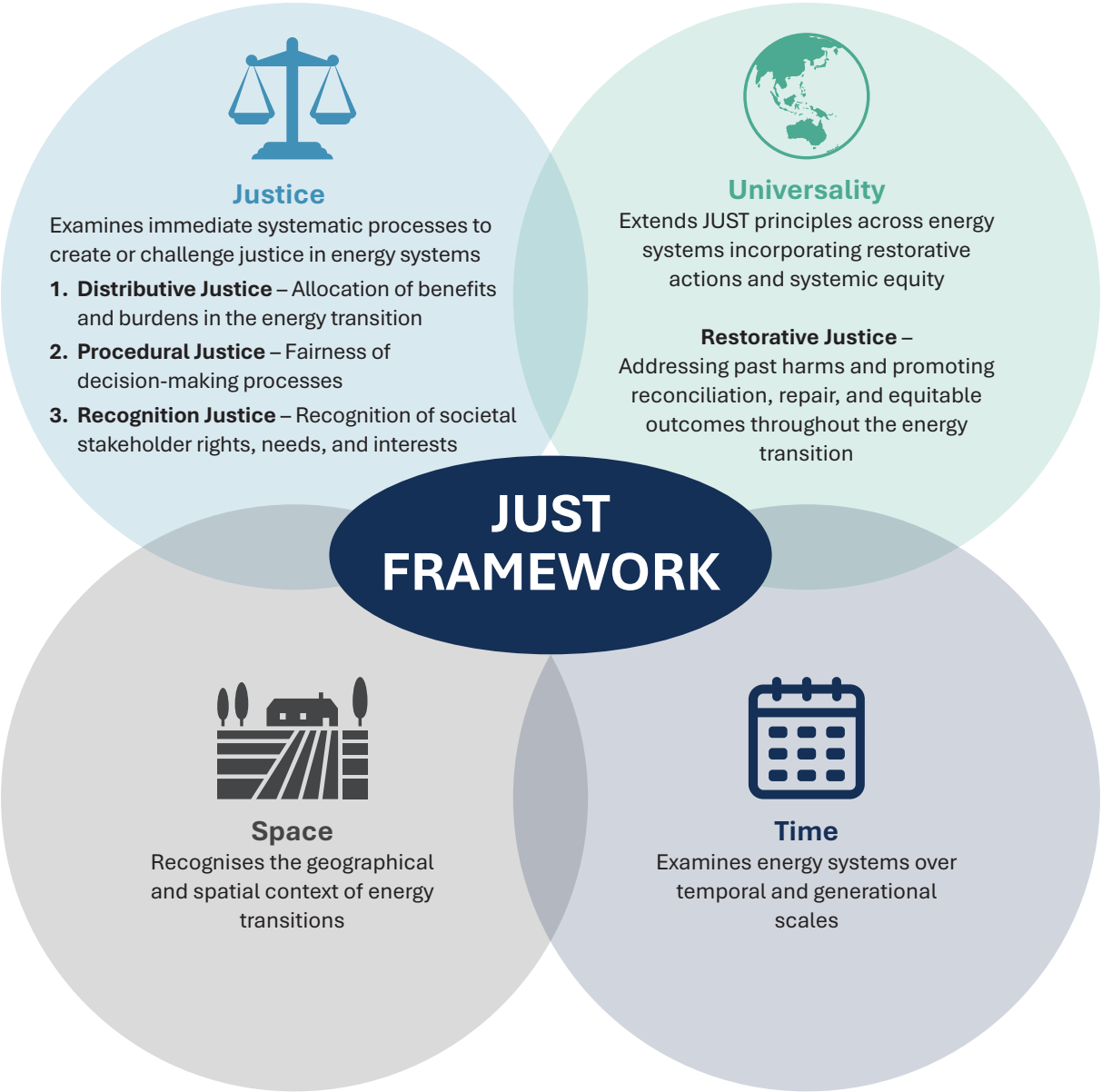


Figure 1: JUST framework visualisation

Source: Compiled by the author, drawing on Heffron & McCauley, 2017 and Heffron, 2021. Overlapping areas indicate shared and overlapping principles within the JUST framework.

Although there are different interpretations of these principles (Heffron, 2021a), this report adopts the traditional justice structure based on the three 'triumvirate of tenets' core justice dimensions: distributive, procedural, and recognition justice (Heffron & McCauley, 2017; McCauley et al., 2013). These core justice principles build on the foundations of environmental justice (Schlosberg, 1999) and examine how energy systems can be designed and governed to deliver fairer social outcomes (McCauley et al., 2013; Taiwo & Tozer, 2025).

Pillars of the JUST Framework

Justice

Focuses on equity within the energy system, including the fair distribution of benefits and burdens, transparent decision-making, and recognition of diverse perspectives.

Justice includes:

- *Distributive justice*, which examines how consultative processes influence the distribution of benefits and costs across social groups to produce more just outcomes (Jarin, 2025).
- *Procedural justice*, which aims to create transparent legal and decision-making procedures to enhance social integration and engagement in the energy transition (Stark et al., 2023).
- *Recognition justice*, which examines how community needs, rights, and interests can be recognised in the energy transition (Hazrati & Heffron, 2021; Van Uffelen et al., 2024).

Universality

Expands the justice principles to the global energy system, encompassing supply chains, energy generation, consumption, and regulation, while addressing the diverse interests of different stakeholder groups (LaBelle, 2017). It includes restorative justice, which seeks to address historical and potential future injustices and to promote fair processes for all stakeholders (Heffron & Hazrati, 2024; Schlosberg, 2012b)[4].

Space

Considers the geographical and spatial contexts of energy transitions, recognising that justice issues play out differently across places and regions (Yenneti et al., 2016).

Time

Explores the success of measures over short, medium and long-term time horizons, acknowledging that the impacts of today's energy policies will extend well beyond 2050 (Santos Ayllón et al., 2025; Sovacool et al., 2017; Schlosberg, 2004; Long, 2015).

4 Universality also traditionally considers global or 'cosmopolitan' justice, which focuses fairness for international stakeholders. However, this report largely focuses on national, state, and local comparative metrics and case studies.

Capabilities approach to justice

While beyond the scope of this report, the 'capabilities approach' to justice seeks to provide normative minimum thresholds of capabilities for all societal stakeholders (Sen, 2008). This approach was originally conceptualised in environmental and climate justice (Schlosberg, 2012a), and also informs the development of global metrics such as the Human Development Index (UNDP, 2025) and the Sustainable Development Goals (UN, 2025).

While the Justice and Universality pillars have been widely studied (Pellegrini-Masini et al., 2020), the integration of Space and Time pillars, and their role in advancing inter- and intra-generational justice and benefits across diverse contexts, remains limited (Hornborg, 2019). This report therefore emphasises the importance of viewing the four pillars of the JUST Framework as interconnected, overlapping, and mutually reinforcing, with no single pillar more important than the others (Wood, 2023; Droubi et al., 2022).

This report outlines six JUST metric typologies, drawing on existing research to highlight current applications and areas for further investigation. These metrics can support more effective decision-making when they are accurate, understandable, and measurable (Kuyer et al., 2025; Baker et al., 2023). Table 1 summarises the measures and indicators for each JUST pillar examined throughout the report.

Each JUST metric typology is conceptualised through examples showing how different countries, such as the UK, New Zealand and Canada, currently assess justice within their energy system. Select case studies from the Australian context are included (see Appendix 1) to prompt future research and guide the development of JUST metrics suited to Australia's energy transition.

Research question 2: How can future research support the definition and practical implementation of a JUST framework in Australia, and in what ways could JUST metrics and tools contribute to advancing measurable energy justice outcomes?

Table 1: JUST pillars and case study descriptions

JUST pillar	JUST pillar description	Metric	Case study	Case study description
Distributive justice	Equitable distribution of the benefits and burdens within energy systems.	Regional Strategic Impact Assessments	Regional Strategic Impact Assessment Tools (Canada)	Assesses cumulative and regional impacts to support fairness in energy transition governance.
Procedural justice	Transparency and inclusive legal processes and decision-making within energy systems.	Decision-Making Processes and Stakeholder Engagement Metrics	STEP Index (EU/UK)	Provides a comparative tool for evaluating inclusiveness and effectiveness in citizen participation during energy transition decision-making.
Recognition justice	Integration of societal stakeholder rights and voices, and recognition of previous systemic injustices.	Indigenous Engagement Metrics	Māori Climate Platform (New Zealand)	Provides a platform for Indigenous climate leadership and integration of Māori values in energy and climate policy.
Universality – Restorative justice	Addresses reparative actions to develop integrated restorative solutions in the energy transition.	Renewable Energy Recycling and Employment Metrics	Emerging Circular Economy Metrics (UK)	Measures material recycling rates, waste diversion, and circular economy social equity goals.
Space	Spatial contexts shaping justice in energy transitions across diverse geographical scales.	Consumer Energy Resource Metrics	Peer-to-Peer Readiness Level Indicator Tool (EU)	Provides a framework to assess how ready communities are for peer-to-peer energy trading.
Time	Examining temporal and generational scales across the lifecycle of energy systems.	Community Wellbeing Indexes	Indigenous Services Canada CWB Index (Canada)	Supports Indigenous wellbeing gap analysis and informs policy guidance.

Source: Compiled by the author, drawing on Heffron & McCauley, 2017 and Heffron, 2021.

3 EXPLORING JUST METRIC TAXONOMY EXAMPLES

KEY MESSAGES

- **Metrics are essential to define and measure justice in the energy transition.** Six key types of metrics are used in this report to track progress and identify challenges across the JUST framework, including distributive justice, procedural justice, recognition justice, restorative justice, space, and time.
- **Regional and social impact assessments can improve distributive justice in how benefits and costs are shared.** Tools such as Social Impact Assessments and Regional Strategic Impact Assessments can help ensure large-scale energy projects deliver fair regional outcomes when supported by accurate data and mapping systems.
- **Inclusive engagement metrics strengthen decision-making and energy justice.** Frameworks like the EU's STEP Index demonstrate how measuring participation quality can improve procedural justice by ensuring diverse community voices are heard and reflected in project design and governance.
- **Recognition and restorative justice require measurable Aboriginal and Torres Strait Islander-centred and circular-economy approaches.** Aboriginal and Torres Strait Islander-centred initiatives in Australia, such as the East Kimberley Clean Energy Project, highlight progress toward co-ownership and self-determination, while metrics linking recycling, decommissioning, and skills development can ensure benefits flow to disadvantaged communities.
- **Tracking justice across space and time is vital for long-term accountability.** Spatial tools, consumer energy resources metrics, and community wellbeing indexes, such as Canada's Community Wellbeing Index, provide models for measuring how energy transition benefits and impacts evolve across regions and generations.

To define and assess each pillar of the JUST framework, different metrics and indicators can be used to track progress and identify challenges in energy transitions (Romero-Lankao et al., 2023). This report focuses on the six key JUST metric types shown in Figure 1 and described in Section 2, which represent emerging or operational metric systems used in other countries.

This section outlines these typologies and draws on Australian case studies to illustrate current practices and highlight future research questions.

3.1 Regional Strategic Impact Assessments (Justice – distributive justice)

Regional Strategic Impact Assessments – strengthen *distributive justice* by mapping cumulative regional benefits and risks, ensuring fairer project outcomes.

Distributive justice examines how consultative processes influence the distribution of benefits and costs across social groups to produce more just outcomes (Jarin, 2025). The Productivity Commission's Interim Report on Australia's Net Zero Transformation identifies equitable impact assessment as a priority.[5] It highlights the potential for the energy transition to revitalise regional economies, activating place-based assessments throughout the energy transition (Productivity Commission, 2025).

5 Many aspects of social vulnerability intersect with adequate participation in energy initiatives, from health, age, housing, and other factors, including within culturally and linguistically diverse communities. These elements are beyond the scope of this report and are explored in the ACOLA Energy Vulnerability Study.

Metrics are required to define agreed energy transition project conditions and monitor outcomes such as energy affordability, access to renewable technologies, and place-based impact assessments.

In Australia, Environmental Impact Assessments (EIAs) and Social Impact Assessments (SIAs) are key tools for assessing the environmental or social risks and benefits of renewable energy Battery Energy Storage System (BESS), hydrogen, bioenergy, transmission, and other energy infrastructure projects. SIAs are increasingly prevalent in energy transition project impact assessments. SIAs can be defined as a process that 'identifies, predicts, evaluates, and develops responses to social or socio-economic impacts as part of an integrated assessment that also considers environmental, economic, and cultural impacts' (Government of Queensland, 2025). New South Wales (NSW), the Australian Capital Territory (ACT), and Queensland have formalised specific SIA guidelines. In Victoria, SIAs are cited in the Victorian Community Engagement and Social Value Guideline, currently under consultation. Queensland has recently revised its SIA guidelines following amendments to the *Planning Act 2016* (Qld). The updates introduce several key requirements. These include:

- assessing the social impacts of development and consulting with the public in the preparation of SIA reports
- mandating community benefit schemes administered by local governments
- requiring large-scale solar and wind energy proponents to complete an SIA report before lodging an Environmental Impact Statement.[6]

In addition, AusEnergy Services Limited (ASL) has developed a Social Value Toolkit to support improved planning and delivery across Australia's renewable energy sector.

The Australian Government is also implementing a National Developer Rating Scheme for renewable energy and transmission developers (DCCEEW, 2025e). This scheme aims to encourage best practices and help governments and communities identify reputable energy transition developers. As participation in the scheme is likely to be voluntary, it is unclear whether the ratings under the scheme will be linked with the award of auctions or other investment incentives, such as the Capacity Investment Scheme.

When communities are meaningfully engaged and project design is adapted in response, EIAs, SIAs, and rating schemes can all strengthen distributive justice. Yet, these tools often focus mainly on individual projects or stakeholders. In comparison, Regional Strategic Impact Assessments look at development across a wider landscape or seascape scale, enabling the identification and assessment of cumulative effects and benefits (Government of Canada, 2025b).

Currently, no Australian state or territory has enacted laws requiring Regional Strategic Impact Assessments specifically for energy transition projects beyond REZ planning.[7] However, related tools, such as Marine Spatial Planning, which incorporates Regional Strategic Impact Assessments (Blue Economy CRC, 2025; Taylor, 2023), are currently being explored for the development of an Australian offshore wind sector project. Marine Spatial Planning can help address actual or perceived injustices between multiple stakeholder groups, including coastal communities, fisheries, defence, and other sectors.

The Australian Government is considering enhancing regional planning assessments under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBCA) to develop nature-positive outcomes, which may be relevant to some future large-scale energy transition projects (DCCEEW, 2025d). If these amendments are enacted, Regional Strategic Impact Assessments could be explored in other regulatory frameworks, such as enabling legislation for REZs. The Productivity Commission's Net Zero Transformation Interim Report also identifies strategic regional planning, particularly within REZs, as a priority area for implementation and reform (Productivity Commission, 2025).

6 An SIA is required in Queensland for all projects subject to the Environmental Impact Assessment Process under the *State Development and Public Works Organisation Act 1971* (Qld) or the *Environmental Protection Act 1994* (Qld).

7 Victoria has recently conducted a strategic land use assessment in preparing its 2024 Victorian Transmission Planning Guidelines. See Government of Victoria, 2024.

Implementing Regional Strategic Impact Assessments requires accurate metrics and spatial mapping tools. The development of a large-scale spatial database to inform Regional Strategic Impact Assessments could build upon the existing Australian RenewMap spatial and project database (RenewMap, 2025). Canada's established Regional Strategic Impact Assessment system (Case study 1) demonstrates how such an approach can inform federal energy policies and laws. Adopting a similar Regional Strategic Impact Assessment approach in Australia, supported by a national database, could strengthen strategic planning, aligning with key recommendations from the Australian Energy Infrastructure Commissioner's Community Engagement Review (Dyer, 2023).

Research question 3: How can research and data inputs be leveraged to activate, effectively assess, and measure distributive justice within Regional Strategic Impact Assessments for energy transition projects across Australia?

3.2 Stakeholder participation and engagement metrics (Justice – procedural justice)

Stakeholder engagement and participation metrics – improve *procedural justice* by tracking how inclusive and effective decision-making processes are.

Procedural justice aims to create transparent legal and decision-making procedures to enhance social integration and engagement in the energy transition (Stark et al., 2023). Existing research suggests procedural justice must be grounded in openness and inclusion to elevate public value and foster deliberative democratic processes (Suboticki et al., 2023; Walker et al., 2023). A key procedural justice opportunity in Australia's energy transition lies in stakeholder participation and community engagement, which are underpinned by

CASE STUDY 1

Canada's Regional Strategic Impact Assessment tools

Strategic Impact Assessments are used in Canada to measure and mitigate environmental, health, and socio-economic effects of relevant major projects. The Canadian Impact Assessment Act 2019 provides the legal foundations for the Canadian government to enhance the efficiency and effectiveness of individual project approvals, including energy transition projects, by assessing cumulative regional benefits and impacts. Originally focused on mitigating environmental harms, Canada's Regional Strategic Impact Assessments have been expanded to address social dimensions and regional energy planning, in collaboration with municipal and territorial authority approvals.

To support ongoing qualitative and quantitative monitoring of these assessments, the Impact Assessment Agency of Canada maintains an interactive public assessment map and database to track energy and infrastructure projects or areas of interest nationwide. The tool allows users to access strategic regional data on energy projects, including data on:

- project footprints, project types, and proximity to other developments and communities (at various levels, including up to 100 km)
- nearby Indigenous communities
- legislative boundaries
- other socio-economic and demographic data overlays.

enabling laws and policies such as the *Electricity Infrastructure Investment Act 2020* (NSW) – the legal instrument enabling REZ development in NSW.

Many energy transition projects and communities across Australia champion benefit sharing in REZ and non-REZ communities, representing examples of distributive justice (CPA, 2025; Hay Shire Council, 2024). Benefit sharing in the context of the energy transition creates financial and non-financial benefits from projects to host communities and stakeholders (Energy and Climate Change Ministerial Council, 2024). An example of benefit sharing can be seen through the Wimmera Southern Mallee Collaboration Program's co-designed Collaboration Agreement with several renewable energy and transmission developers and existing community leadership. The agreement was developed over a 12-month period and strategically identifies community needs within an ongoing Regional Partners Forum (The Energy Charter, 2025). The next phase involves creating a public Commitment Register to measure and assess energy and transmission developer commitments to Traditional Owner groups, local governments, and government agencies, including the timeliness of commitment delivery.

Although the development of benefit sharing provisions marks progress, benefit sharing alone does not guarantee distributive justice across communities (Casella et al., 2025). Addressing overall community-level injustices requires overcoming localised barriers, including the exclusion of particular stakeholders, and the limited capacity of some communities to develop collaborative and measurable benefit sharing strategies and processes (Vrhovac et al., 2025).

Procedural justice cannot be evaluated without examining local social ecosystems (Walker & Day, 2012). Metrics are required to define agreed conditions for energy transition projects and monitor distributive justice outcomes. The UK provides an example within its Stakeholder Engagement and Participation in Policy-Making Processes (STEP) Index (Case study 2).

Research question 4: To what extent can stakeholder engagement metrics, such as the STEP Index, enable the operationalisation of procedural justice and equitable decision-making processes?

CASE STUDY 2

The Stakeholder Engagement and Participation in Policy-Making Processes (STEP) Index

The STEP Index was originally developed by the EU Democratising Just Sustainability Transitions program (DUST, 2024) to evaluate the quality of citizen participation in place-based policies for just sustainability transitions (EU, 2023) and to compare participation in the energy transition process at multiple governance levels.

The STEP Index aims to reduce participation barriers and promote diverse representation in planning to inform decisions and legal processes when developing energy transition technologies and infrastructure. The STEP Index is comprised of dimensions, criteria, indicators, questions, and values. Each of the five dimensions (see Appendix 2) is measured on a scale of 0 to 100% (DUST, 2024). Engagement quality is measured quantitatively according to a metric scale across 17 key indicators (see Appendix 3) to assess potential barriers faced by particular societal groups.

In Scotland, the STEP Index is currently being considered by the Scottish Just Transition Commission as part of the ongoing Just Transition Commission review process to develop further monitoring and evaluation frameworks (Just Transition Commission, 2025). It is intended to complement existing tools such as the Local Energy Scotland map and Projects Index, which tracks the distribution of community benefits, shared ownership, and locally owned energy projects (Local Energy Scotland, 2025).

3.3 Indigenous engagement metrics (Justice – recognition justice)

Indigenous engagement metrics – advance *recognition justice* through co-design, self-determination and shared ownership.

Recognition justice examines how community needs, rights, and interests can be recognised in the energy transition (Hazrati & Heffron, 2021; Van Uffelen et al., 2024). Recognition justice synergistically overlaps and complements restorative justice in particular, which aims to redress previous injustices and harms retrospectively.

A growing body of research examines the role of Aboriginal and Torres Strait Islander leadership in the energy transition, adopting recognition justice approaches (Briggs et al., 2025; O'Neill et al., 2021; O'Neill & Thorburn, 2025). Aboriginal and Torres Strait Islander peoples have been displaced and subjected to severe ongoing injustices, particularly in relation to land ownership and economic opportunities in Australia. The *Native Title Act 1993* (Cth) regulatory framework requires, amongst other legal hurdles, the demonstration of an ongoing connection between Aboriginal and Torres Strait Islander claimant communities and the land. This requirement places an unequal burden of proof on communities that were forcibly removed from their land following colonisation (Brennan et al., 2015).

The energy transition presents a unique opportunity to support Aboriginal and Torres Strait Islander peoples' self-determination, creating long-term economic benefits through ownership and participation in energy transition projects (First Nations Clean Energy Network, 2022). This is a central focus of the Australian Government's First Nations Clean Energy Strategy (Australian Government, 2024a) and Critical Minerals Strategy (Australian Government, 2023).

Several Australian initiatives embed co-design and co-ownership of energy transition projects with Traditional Owners. The East Kimberley Clean Energy Project is a good example (see Case Study 3).

CASE STUDY 3

The East Kimberley Clean Energy Project

The East Kimberley Clean Energy Project is the first Australian model where Traditional Owners will lead the development as majority shareholders and partners in large-scale renewable hydrogen and ammonia development for export to Asian markets. The Traditional Owners partnership consists of four partners (Balanggarra Ventures, MG Corporation, Kimberley Land Council, and Pollination), each owning an equal 25% share.

Located in Western Australia, the project encompasses a 2,000-hectare 900 MW solar farm combined with water electrolysis and hydro energy from the existing 20 MW Ord Hydro Power Plant at Lake Argyle to produce 50,000 tonnes per annum of green hydrogen and green ammonia exports (ARENA, 2024; White et al., 2025).[8]

A defining feature of this Indigenous-led initiative is the integrated development process for Native Title, heritage, engineering, and environmental approaches using a co-design and co-decision making approach. This not only supports profit sharing but enables capacity building, leveraging Traditional Owners' environmental stewardship and cultural knowledge (Australian Government, 2024b).

The project directly advances the goals of the First Nations Clean Energy Strategy 2023–2030 by facilitating Indigenous-led clean energy projects (Australian Government, 2024c). It also advances the objective of facilitating green exports within the *Future Made in Australia (Production Tax Credit and Other Measures) Act 2024* (Cth), and supporting policy.

8 Although renewable hydrogen and green ammonia are unlikely to be used as a direct application for electricity or storage in Australia, they may create valuable export sectors for Australia or act as feedstocks for manufacturing processes. For further analysis on renewable hydrogen, see White et al., 2025.

Despite this progress, Australia is yet to develop national metrics to measure, assess, and track Aboriginal and Torres Strait Islander ownership and benefit sharing. Canada is currently working towards a framework through its Kinship and Prosperity Plan (Government of Canada, 2024), which includes specific criteria to measure community benefits, ownership levels, and the implementation of the right to Free, Prior and Informed Consent (FPIC).

The Gender-based Analysis Plus (GBA Plus) is another important measurable tool for addressing impact and benefit to communities in development projects within Canada (Paterson & Scala, 2021). The GBA Plus tool examines how historical and structural inequalities affect diverse populations, using quantitative statistics, qualitative interviews, and community forums to assess impacts and opportunities for equity-focused interventions (Government of Canada, 2021). The GBA Plus tool could be further extended to measure impacts on a range of communities affected by structural discrimination beyond gender. New Zealand is exploring the development of a potential Māori climate platform to provide an Indigenous-led approach (Case study 4), creating iwi/Māori criteria and metrics to assess the energy transition and wider iwi/Māori benefits, including project ownership (Government of New Zealand, 2024).

Research question 5: How can research support Aboriginal and Torres Strait Islander leadership in developing robust metrics to assess Aboriginal and Torres Strait Islander self-determination, recognition, ownership, and benefits in the Australian energy transition?

CASE STUDY 4

The Māori climate platform

New Zealand/Aotearoa has several iwi/Māori-led and owned energy transition projects, including the Mōkai Geothermal Plant and Hydrogen Project. Developed in 1994 in the Waikato region by Māori landowners within the Tuaropaki Trust, the Mōkai project exemplifies a successful Indigenous-led energy transition project.

The Tuaropaki Power Company, owned by the Trust, holds a 75% stake in the geothermal resource, with Mercury Energy holding the remaining 25%. Together, they operate two geothermal power units with a combined capacity of 110 MW that supply electricity to New Zealand/Aotearoa's national grid (CSIRO, 2020). Throughout its development, the legal right to FPIC was upheld to co-develop the resource in partnership with stakeholders. Building on this foundation, the project expanded in 2017 through a joint venture between Halcyon Power, the Tuaropaki Trust and Obayashi Corporation to establish New Zealand/Aotearoa's first renewable hydrogen pilot plant (Pungao Hauwai, 2024).

New Zealand/Aotearoa is raising its recognition justice ambitions to map and monitor strategic partnerships and support iwi/Māori-led clean energy initiatives in the development of the Māori climate platform. The *Climate Change Response Act 2002* (NZ) requires emissions reduction actions in New Zealand/Aotearoa to consider the impacts on the iwi/Māori and the Crown–iwi/Māori relationship. In response, the Māori climate platform was developed and aims to serve as a central mechanism to foster equitable partnerships with iwi/Māori communities (Government of New Zealand, 2024).

The Māori climate platform was a key recommendation of the He Pou a Rangi Climate Change Commission (Climate Change Commission, 2025), with similar functions to Australia's Climate Change Authority. The Māori climate platform aims to deliver restorative justice outcomes through targeted investments in Māori-led projects. It will likely rely on future iwi/Māori-designed and developed metrics to assess impact, engagement, progress, and partnership quality over time.

3.4 Renewable energy recycling and employment metrics (Universality – restorative justice)

Renewable energy recycling and employment metrics – link *restorative justice* with circular economy goals, addressing end-of-life waste and supporting regional jobs.

Universality is critical to advancing the JUST Framework across multiple scales and jurisdictions (Basil & Heffron, 2025). Universality acknowledges that energy transitions occur across the entire energy system and supply chain, including end-of-life waste streams (Volodzkiene & Streimikiene, 2025). Energy transition policies increasingly acknowledge the wider opportunities of the energy transition to redress injustices for marginalised populations, particularly those disproportionately exposed to pollution, waste, and risk (Sovacool et al., 2019).

Within the JUST Framework, *restorative justice* forms a key sub-pillar of universality. Restorative justice seeks to redress previous injustices experienced by historically marginalised or disadvantaged groups, with a focus on meeting the needs of affected communities (Hazrati & Heffron, 2021). Restorative justice can be applied to address previous historical injustices retrospectively, or proactively through strategic and preventative measures to protect stakeholders at risk of ongoing or future marginalisation (Heffron & Hazrati, 2024).

Restorative justice is also linked to emerging circular economy pathways, which aim to reduce waste and enhance social and environmental value in energy streams. For example, the Waste Electrical and Electronic Equipment Directive (2012/19/EU) mandates EU member states to develop recycling plans that include the collection of solar PV panels and their materials. The recycling of wind turbine components is supported by the wider EU Waste Framework (Directive 2008/98/EC). Complementing these Directives is the proposed EU Ecodesign regulatory framework, which aims to set regulatory standards to promote recyclability and durability of solar PV modules with an additional third-party validated quality assurance system (Foster et al., 2025).

Restorative justice can act as a catalyst to combine decommissioning and the reuse of energy infrastructure (Cerchione et al., 2025) where circular economy industries could emerge (Stambe et al., 2025). Queensland's introduction of mandatory decommissioning bonds from 2025[9] represents one of the first legally required decommissioning financial security arrangements for wind developments in Australia. However, recycling goes beyond decommissioning and may activate intergenerational industrial development (RE-Alliance, 2025). For example, the Clean Energy Council (CEC) national workforce initiative, 'Clean energy, Job ready', proposes an industry-led framework for a digital skills passport, training matrix, and career pathways for energy transition employment (CEC, 2025). This initiative could be paired with renewable energy recycling efforts (such as previous plans between CORENA and Reclaim PV[10] and the Swanbank Renewable Energy and Waste Management Facility in Queensland), to develop employment and recognition justice metrics. These metrics could support the establishment of regional decommissioning and recycling facilities aligned with Australia's Circular Economy Framework to double circularity by 2035 (Australian Government, 2025). These metrics could also support employment and industrial development opportunities.

The circular economy approach requires a fundamental re-examination of production, consumption, and waste management, with a focus on resource efficiency and regeneration (Hanumante et al., 2019). Circular economic principles and their associated metrics have the potential to create more symbiotic benefits in energy, environmental, and equity outcomes (Baker et al., 2023). Despite the circular economy concept and the need to reskill the workforce for the energy transition, research highlights a lack of coordination in integrating these goals into metrics

9 The amendments to the Queensland State Assessment Provisions in State Code 23: Wind Farm Development PO30 requires Decommissioning plans be secured by bonds or financial guarantees or other mechanism/s to safeguard timely compliance.

10 This initiative was never realised as Reclaim PV was wound up in 2023.

(McCauley, 2025). An integrated framework that combines recognition, justice, and circularity goals could be further explored to deliver social and economic benefits across Australian regions and diverse population groups. The UK is one of the first jurisdictions to explore the development of future metrics combining both circular economy and recognition justice goals (Case study 5).

Research question 6: How can restorative justice and circular economy concepts be integrated into a metric that stimulates effective and sustained socio-economic benefits across diverse Australian regions?

CASE STUDY 5

Emerging UK circular economy metrics

The Scottish *Circular Economy (Scotland) Act 2024* (SC) (CE Act) mandates the development of a circular economy strategy underpinned by metrics to monitor progress towards meeting circular economy objectives (Section 1(2)). It also requires consideration of 'encouraging equal opportunities (and) furthering the reduction of inequalities of outcome which result from socio-economic disadvantage' (Section 1(11)). The Scottish CE Act represents one of the first legislative efforts to explicitly link circular economy ambitions with employment and social equity goals.

Although the CE Act and its supporting Circular Economy and Waste Route Map to 2030 are still in development, the Scottish Government has articulated a clear policy direction to align circular economy initiatives with its Green Industrial Strategy and Just Transition Plan (Government of Scotland, 2024). This integration aims to track and measure employment and training opportunities arising from circular economy objectives across several pilot projects. An example is the Hagshaw Energy Cluster, which focuses on recycling, refurbishing, and reusing products from decommissioned wind turbines (Zero Waste Scotland, 2024).

Similarly, in the wider UK context, the Kickstarting the Circular Economy Plan will likely deliver proposed metrics in late 2025, including a skills gaps audit and monitoring mechanism (led by Skills England). This aims to extend beyond the existing Extended Producer Responsibility (EPR) model, to integrate circular economy principles with resource efficiency and economic development (APPG Environment, 2024).

3.5 Consumer Energy Resources metrics (Space)

Consumer Energy Resources metrics – capture *spatial justice* by assessing how households and communities participate in local energy markets and peer-to-peer trading.

Tracking the scale of the energy transition is a critical part of the *Space* pillar within the JUST framework. It is important to examine energy transitions at international, national, and regional levels to understand their spatial justice impacts. Recent research shows that spatial justices and injustices are often connected to the physical geography of resources (Lacey-Barnacle, 2020) and fragmented access to services (Ternes et al., 2024). For example, Bouzarvoski and Simcock (2017) note that local, area-based policy solutions can help address the uneven deployment of renewable energy technologies across regions. Australian research has also explored how connections to place influence energy transitions and environmental justice (Schlosberg et al., 2017; Donnelly, 2023). Spatial tools and metrics can empower stakeholders by providing clear information about the locations and impacts of proposed energy infrastructure to assess alignment with justice principles.

The Household, Income and Labour Dynamics in Australia (HILDA) survey provides an example of quantitative energy-related variables that can be combined with other datasets to help interpret energy transition data (Melbourne Institute of Applied Economic and Social Research, 2024). However, questions remain about the capacity of different regions, local governments, regulators, and stakeholders to engage with and benefit from the transition (Yenneti et al., 2016).

Consumer Energy Resources (CER) offer an important way to involve consumers across different locations. The Australian Government defines CER as consumer-owned resources that generate or store electricity, including flexible loads that can adjust demand in response to external signals. CER examples include rooftop solar, batteries, electric vehicle chargers and controlled energy loads (DCCEEW, 2025b). The NEM Wholesale Review Draft Report (Recommendations 2 and 3) highlights the need for CER policy and regulatory reform, particularly in relation to competition law and consumer protections, to improve the visibility and integration of price-responsive resources and allow consumers to participate more actively in NEM price formation (DCCEEW, 2025c).

Several CER pilots and regulatory reforms are already underway in Australia (AEMC, 2025). Subsidies to enable participation of community housing in Virtual Power Plants were first pioneered in South Australia (Unity Housing, 2024). The current South Australian Energy Masters program offers subsidies of 50–90% on appliances to connect to a Home Energy Management System trial. This system automates household electricity use based on NEM prices and collects data to inform future CER initiatives (Government of South Australia, 2025a).

In NSW, the Haystacks Solar Garden was designed for community members without rooftop solar PV access, such as renters, allowing them to benefit from the 1.5 MW Grong Grong Solar Farm through a community-owned solar cooperative that provides electricity bill credits (Haystacks, 2025). Electricity retailers are also supporting CER integration. Amber Electric is an example of a wholesale electricity retailer that allows Australian NEM households with CER to access real-time pricing and scheduling technology so they can actively participate in the NEM (Amber Electric, 2025). However, CER integration into the NEM raises questions about consumer protections and energy literacy, especially for renters or marginalised communities who may lack the capability to monitor, track, and respond to NEM electricity market fluctuations.

Beyond CER subsidies and Virtual Power Plant trials, growing energy demand will likely accelerate the adoption of peer-to-peer (P2P) energy trading and increase the number of buyers and sellers in electricity markets. P2P trading allows consumers and producers ('prosumers') to exchange energy directly, without an intermediary (Soto et al., 2021). An example is WinZero in the Southern Highlands, NSW – a community-led P2P network connecting consumers (with or without solar PV) to locally generated solar energy resources supported by smart meters and the retailer Energy Locals based on a subscription system (WinZero, 2025).

In Western Australia, the RENeW Nexus project digitally tracks P2P trading through blockchain technology to record local energy trades and map the flow of energy between households (Western

Power, 2025). However, P2P networks may result in fewer consumers contributing to the costs of maintenance and building of new transmission infrastructure, and consumer energy protection regulations for P2P remain inconsistent across Australian jurisdictions (DCCEEW, 2024c).

The EU provides a potential model and example of a P2P readiness level indicator tool to assist in consumer P2P understandings. The U2Demo project is currently developing a digital platform to map P2P uptake spatially (Case study 6).

Research question 7: What challenges and opportunities do peer-to-peer (P2P) energy networks present in Australia (particularly concerning spatial justice, energy literacy, transmission cost distribution, and consumer protection), and how can research-informed metrics be designed to improve accessibility, participation, and equity within P2P energy systems?

CASE STUDY 6

EU's peer-to-peer readiness level indicator tool

The EU's NRG2Peers Readiness Level Indicator Tool was developed to assess user, organisational, and technological and infrastructural readiness for consumers to participate in P2P energy trading models.

This qualitative tool helps to improve energy literacy among potential P2P users while assessing their financial capacity and willingness to engage.

Users complete a survey to determine their P2P 'readiness', based on five areas: user, organisational, technological, market, and institutional readiness (see Appendix 4 and Appendix 5). Each question is scored and weighted according to its importance within these categories.

Nine pilot communities from four EU countries were developed following interaction with the NRG2Peers Readiness Level Indicator Tool (NRG2Peers, 2025). Following the completion of the NRF2Peers project, the U2Demo project is developing a digital platform that integrates P2P monitoring with spatial mapping to support localised energy trading (U2Demo, 2025).

Similar readiness tools are also being explored elsewhere, such as the UK's Ofgem Peer-to-Peer Matching Platform, which connects energy consumers with nearby local generators and provides a pilot framework for matching supply and demand on a geographic basis (Ofgem, 2022).

3.6 Community wellbeing index (Time)

Community wellbeing indices – measure *justice over time* by tracking social and economic outcomes over time.

Mapping energy justice across multiple *timescales* is complex. However, developing metric tools to examine how energy transition objectives change over time is critical for understanding potential emerging cumulative risks, impacts, and benefits over the short, medium, and long term (Ahmed et al., 2025).

Traditionally, energy justice research has focused on the mitigation of injustice with limited consideration of perpetuating future and enduring just outcomes for communities within energy systems planning (Taiwo & Tozer, 2025). Addressing the multi-temporal challenges of impacts and benefits is difficult to define across energy transitions. However, temporal considerations are 'crucial to ensure that a just energy transition in one place and time is, to the extent possible, not offshoring injustice elsewhere or pushing it down the line' (Santos Ayllón et al., 2025, p. 8).

Looking at energy systems over their full lifecycle can help us consider the broader benefits and impacts beyond immediate local geographies (Jenkins et al., 2020). As a result, paying attention to long-term benefits and impacts could help monitor benefits and impacts for future generations (Tait et al., 2025).

One example of a JUST metric over *Time* is community wellbeing indicators. Several Australian states have adopted voluntary community wellbeing indicators, such as South Australia (Government of South Australia, 2025b). The CSIRO is actively tracking community wellbeing and attitudes towards the energy transition in the North Perth Basin (CSIRO, 2025b). Other Australian emerging wellbeing indices include the recently developed Disability Wellbeing Index (DWI, 2025).

Historically, community wellbeing Indicators in Australia have concentrated on social development and wellbeing outcomes for communities affected by carbon-intensive energy infrastructure projects (CSIRO, 2020).

In the UK, Ørsted is currently developing indicators to measure the Social Return on Investment to identify jobs created with their offshore wind projects over time, with pilot projects to commence in 2025 (Ørsted, 2025).

Integrating energy transition-specific measures within community wellbeing indices could create a mappable and measurable process over time to identify collaborative and co-designed community needs and aspirations.

Canada's Community Wellbeing Index (CWB) (Case study 7) offers an example of an established metric system designed to measure the long-term benefits and risks of infrastructure projects on Indigenous communities over time. The CWB has recently been applied in energy transition research, demonstrating its potential use for tracking long-term socio-economic benefits and impacts (Zapata, 2024).

Research question 8: How can energy justice outcomes be effectively measured and tracked over time using research-based metrics, such as the Community Wellbeing Index, to assess the social benefits and impacts of Australia's energy transition at regional and local scales?

CASE STUDY 7

Indigenous Services Canada Community Wellbeing Index

The Indigenous Services Canada Community Wellbeing (CWB) Index identifies gaps and opportunities for reform in wellbeing, particularly across Indigenous and non-Indigenous communities, and variations between First Nations and Inuit communities (Syhlonyk & Seasons, 2021).

The CWB provides a systematic and quantitative measure of the socio-economic wellbeing of communities over time across Canada (Government of Canada, 2025a). It comprises four components, including education, labour force activity, income, and housing. It is further subdivided into six indicators, scored on a scale of 0 to 100, with higher scores representing better socio-economic wellbeing.

The CWB uses data from Canada's national census and household surveys, collected every five years. This limits how often data can be updated and collected but allows longitudinal analysis and spatial visualisation through a mapping platform (see Appendix 6). For example, recent research employing the CWB methodology and data supported the assembly of a First Nations panel of communities to map the effects of renewable energy on community wellbeing across 623 First Nations and 50 Inuit communities during the 1981–2016 period (Zapata, 2024). Findings indicated that communities with majority ownership of renewable energy projects experienced higher community wellbeing, with an average of 10% increase in community wellbeing observed for First Nations communities hosting renewable energy projects.

4 AUSTRALIAN JUST METRIC OPTIONS

KEY MESSAGES

- **Developing an Australian JUST framework and supporting metrics offers a pathway to define, test and refine energy justice measures.** Metrics should be measurable, relevant, understandable, manageable, reliable, cost-effective and timely.
- **Collaboration and empirical data are essential to ensure JUST metrics reflect stakeholder priorities and support practical implementation.** Co-designing metrics with stakeholders and grounding them in evidence will help ensure they are relevant, consistent, well-resourced and capable of guiding effective adoption and long-term monitoring.
- **Early analysis shows the greatest opportunities lie in metrics that are both urgent and ready for deployment, such as stakeholder participation and engagement measures to advance procedural justice.** Other metrics, including Regional Impact Assessments for distributive justice and Indigenous engagement metrics for recognition justice, will require more coordination and capacity building.
- **Building a balanced suite of short- and long-term metrics will help guide Australia's just and inclusive transition to net zero by 2050.** Further research is needed to refine and test these metrics, improve strategic implementation, and ensure future frameworks deliver measurable and equitable outcomes across all justice pillars.

Developing an Australian JUST framework and process, including supporting metrics (see this section and Appendix 7), could provide an iterative pathway to define, test, and refine energy justice measures. Metrics could be designed following established criteria (Feng & Joung, 2020), including:

a. measurable
b. relevant and comprehensive
c. understandable and meaningful
d. manageable
e. reliable
f. cost-effective
g. timely.

However, without collaborative co-design and empirical data, JUST metrics may not meet stakeholder needs or effectively guide energy transition policies and laws. Implementation challenges range from design and adoption to ongoing monitoring, including a lack of standardised methods, insufficient resourcing, incorrect data, and difficulties in accurately defining community needs.

The JUST metric options are presented in a matrix at Figure 2. It considers 'urgency' (assessing immediacy and importance of action) and 'adoptability' (ease of implementation), highlighting priority areas for research as well as quantitative and qualitative metric design (see Appendix 8 for scoring detail).

JUST urgency and adoptability matrix

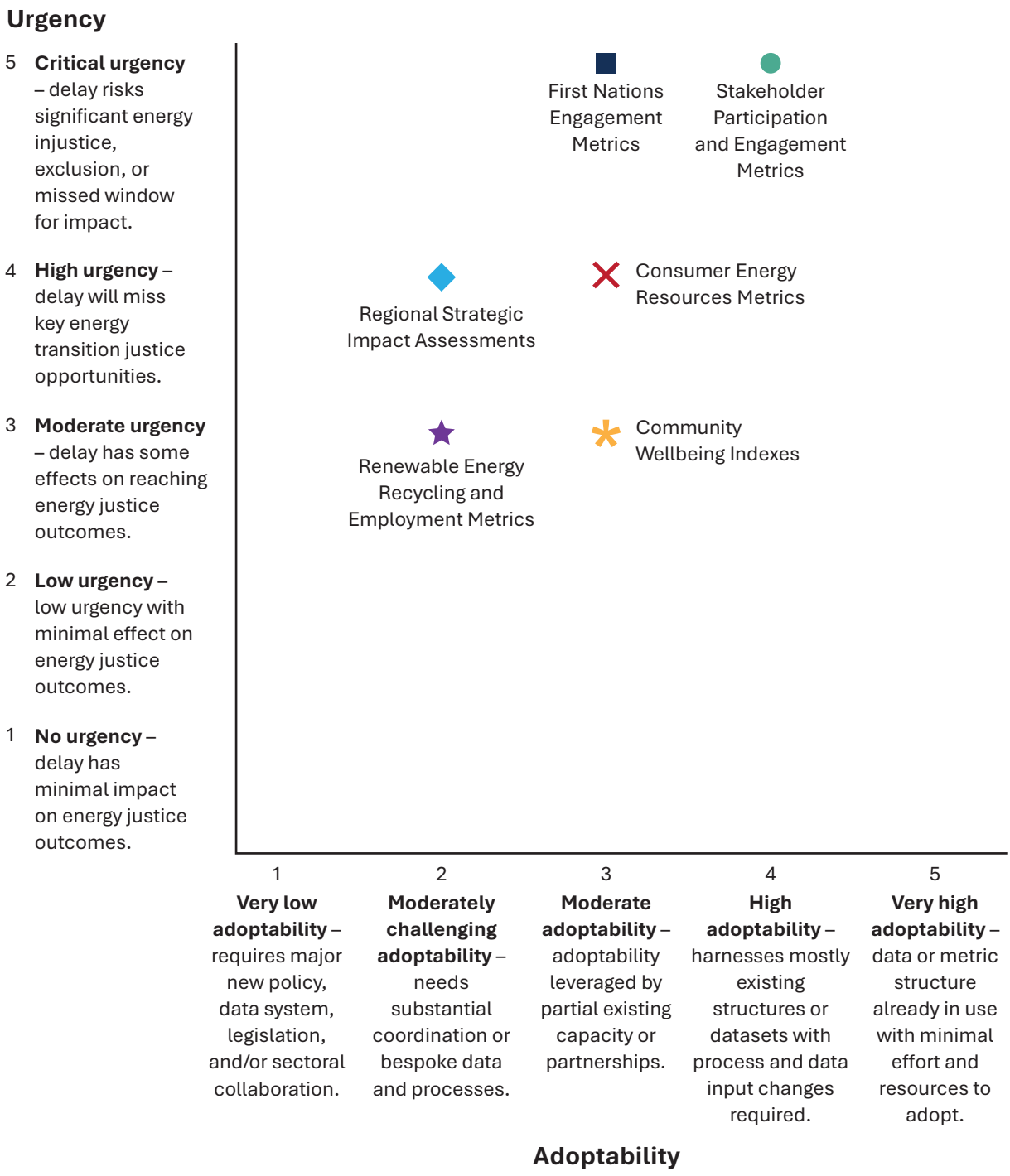


Figure 2: JUST urgency and adoptability matrix in the Australian context

Source: created by the author. Depiction of each metric examined in this report according to urgency and adoptability.

Figure 2 shows how different JUST metrics rank in terms of urgency and ease of implementation.

- **Stakeholder participation and engagement** metrics rank highest for both adoptability (4) and urgency (5), building on existing consultation and engagement methods as a tool that could be deployed to elevate procedural justice with high urgency, particularly in states and territories with REZs.
- **Regional Strategic Impact Assessments** have a high urgency (5) but lower adoptability (2) due to the significant resources and coordination required. Developing Regional Strategic Impact Assessments may play a pivotal role in advancing distributive justice by mapping cumulative benefits and risks in regions, an emerging priority highlighted in recent Productivity Commission reports and EPBCA reforms.
- **Indigenous engagement** metrics are also rated highly urgent for recognition justice (5) but moderately adoptable (3) given the need for co-design and trust-building.
- **Renewable energy recycling and employment** metrics score moderately for urgency (3) and low for adoptability (2), reflecting data gaps, but will become important under the restorative justice pillar as technology deployment expands and projects reach the end of life.
- **Consumer Energy Resources** metrics score moderately for adoptability (3) and urgency (4), and will gain importance under the spatial justice pillar as decentralised energy markets grow.
- **Community Wellbeing Index** scores moderate for both adoptability and urgency (3, 3) and offer value for tracking social outcomes (particularly in pilot regions like South Australia), making it a valuable metric as the energy transition accelerates within the time pillar.

Overall, many of the metrics examined in this report could be designed to address a range of issues across the JUST pillars, reflecting the interconnected and multiscale nature of the JUST framework.

Snapshot: Developing Australian-specific metrics

Applying the JUST framework to the Australian context requires collaboration across disciplines and jurisdictions. Early analysis shows that:

1. The most urgent and ready-to-use metrics relate to **stakeholder engagement and participation**, which build on existing consultation frameworks.
2. **Regional Strategic Impact Assessments** and **Aboriginal and Torres Strait Islander engagement metrics** are high priorities but need coordination, data and trust-building.
3. Longer-term opportunities include metrics for **recycling, employment and community wellbeing**, which can support restorative justice and justice-over-time goals.

Figure 2 also highlights opportunities for research to prioritise metrics that are more likely to be deployable in the shorter term, such as stakeholder engagement measures in REZs, while also identifying strategic longer-term metrics, such as renewable energy recycling and employment metrics. These strategic metrics may become increasingly urgent as energy transition technologies are upgraded and repurposed. Accelerating Australia's energy transition requires significant research that distinguishes between scalable, ready-to-use metrics and longer-term strategic metrics to guide an inclusive, just and evidence-based path to net zero by 2050.

However, Figure 2 is an early conceptual guide, not a comprehensive or empirically tested framework. As highlighted in Section 3 and categorised below in Section 5, further research is needed to understand resource allocation, improve strategic implementation, and develop evidence-based methods for developing and selecting metrics that deliver meaningful justice outcomes.

5 KEY RESEARCH QUESTIONS TO BE ADDRESSED

KEY MESSAGES

- **Addressing energy justice research gaps requires multidisciplinary collaboration.** Australia's energy transition research must integrate insights across and within disciplines to fully capture the social, technological, and institutional dimensions of justice.
- **Urgent research questions focus on near-term challenges in defining and measuring justice.** Priority areas include inclusive definitions of justice, stakeholder engagement metrics, Aboriginal and Torres Strait Islander participation, Regional Impact Assessments, and tracking outcomes through wellbeing indices.
- **Strategic research should build the foundations for long-term frameworks and tools.** Longer-term work is needed to operationalise the JUST framework, integrate justice and circular economy principles, and explore emerging opportunities such as peer-to-peer energy networks.

Section 3 of this report identified key research questions, gaps, and priorities in Australia's current energy transition research. Addressing these priorities will require multidisciplinary, interdisciplinary, and intradisciplinary approaches for use in the Australian context. The eight research questions identified in this report (see Table 2) are categorised and ranked into two groups:

- *Urgent research questions*, where robust answers are needed in the short term to effectively address pressing issues (research questions 1, 3, 4, and 5)
- *Strategic research questions*, which require longer-term investigation to develop comprehensive solutions and inform future policy and practice (research questions 2, 6, 7 and 8).

Table 2: Research questions and their category

Research question	Category	Justification
1: Is there a role for justice in the Australian energy transition, and if so, how could justice be defined and framed in the Australian context to inclusively reflect the interests of all societal stakeholders, including marginalised groups?	Urgent	Foundational to define justice scope for all subsequent work to ensure inclusiveness and representation during rapid transition processes.
2: How can future research support the definition and practical implementation of a JUST framework in Australia, and in what ways could JUST metrics and tools contribute to advancing measurable energy justice outcomes?	Strategic	Complex framework development requiring interdisciplinary and long-term research to shape inclusive and effective justice evaluation systems.
3: How can research and data inputs be leveraged to activate, effectively assess, and measure Regional Strategic Impact Assessments for energy transition projects across Australia?	Urgent	Requires considerable resourcing but urgent given recent policy focus (e.g., Productivity Commission Net Zero Transformation report) and cumulative regional benefits and risks.
4: To what extent can stakeholder engagement metrics, such as the STEP Index, enable the operationalisation of distributive justice in energy transitions through the design and assessment of benefit sharing mechanisms?	Urgent	Builds on existing consultation frameworks; high urgency due to Renewable Energy Zone (REZ) constructions and contestations, thus critical for equitable project delivery.
5: How can research support *Aboriginal and Torres Strait Islander* leadership in developing robust metrics to assess Aboriginal and Torres Strait Islander self-determination, recognition, ownership, and benefits in the Australian energy transition?	Urgent	High urgency for *Aboriginal and Torres Strait Islander* recognition and leadership; adoptability moderate due to need for co-design, coordination, and trust-building efforts.
6: How can restorative justice and circular economy concepts be integrated into a metric that stimulates effective and sustained socio-economic benefits across diverse Australian regions?	Strategic	Integration of multi-dimensional justice concepts is complex and requires sustained research but is necessary for equitable regional benefits and just transitions.
7: What challenges and opportunities do peer-to-peer (P2P) energy networks present in Australia (particularly concerning spatial justice, energy literacy, transmission cost distribution, and consumer protection), and how can research-informed metrics be designed to improve accessibility, participation, and equity within P2P energy systems?	Strategic	Emerging area with growing urgency as decentralised markets mature; moderate adoptability due to existing data from pilot projects in various states.
8: How can energy justice outcomes be effectively measured and tracked over time using research-based metrics, such as the Community Wellbeing Index, to assess the social benefits and impacts of Australia's energy transition at regional and local scales?	Strategic	Builds on existing data, particularly pilots in South Australia; critical and strategic research for ongoing social outcome monitoring throughout accelerating transitions.

Source: Compiled by the author

Snapshot: Key research priorities

The high level themes of the eight research questions to advance Australia's energy justice include:

Urgent priorities

- Define what justice means in the Australian energy transition.
- Strengthen and leverage data and processes for Regional Strategic Impact Assessments.
- Develop stakeholder engagement and benefit sharing metrics.
- Co-design Aboriginal and Torres Strait Islander-led metrics for ownership and participation.

Strategic priorities

- Develop and operationalise the JUST framework in an Australian context.
- Integrate restorative justice and circular economy metrics.
- Explore spatial and equity issues in peer-to-peer energy systems.
- Track social outcomes over time through community wellbeing indices.

Prioritising the research questions helps concentrate research efforts on the most pressing justice challenges, while creating a foundation for longer-term strategic design and planning.

6 CONCLUSION

Addressing energy justice in Australia's energy transition will require both immediate, collaborative research to define and measure justice, and longer-term, cross-disciplinary efforts to build the frameworks and tools that ensure fairness and inclusion over time.

This report proposes a set of potential metrics to assess the justice dimensions of Australia's energy transition, drawing on international socio-legal insights. It reviews international and Australian energy transition metrics, evaluates current research gaps, offers insights into the limitations of these metrics, and identifies research opportunities for further development.

Using the JUST framework and supporting metrics provides a research-led approach to understanding energy transitions across time, geography, processes, and societal groups.

However, it is important to measure what matters for the Australian energy transition, and evaluation tools and systems are only effective when based on rigorous and accurate data and supported by ongoing strong research systems. Effective and well-designed metrics that account for justice can illuminate potential injustices while guiding fairer benefits and outcomes.

Developing an Australian JUST framework supported by quantitative and qualitative metrics will require collaboration between communities, industry, and governments. By advancing the potential research directions identified in this report, Australia can strengthen its leadership in energy justice and build the foundations for intergenerational and intragenerational equity, legitimacy, and support to reduce both present and future inequities.

REFERENCES

Adams, M & Bomhoff, J (eds) 2012, *Practice and theory in comparative law*, Cambridge University Press.

AEMC 2025, *Distributed energy resources*. https://www.aemc.gov.au/energy-system/electricity/electricity-system/distributed-energy-resources.

AEMO 2025a, *2025 Electricity statement of opportunities*. https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2025/2025-electricity-statement-of-opportunities.pdf?rev=8746cf0303364c34a31b7c740b6cb275&sc_lang=en&hash=A3703CC88070C27BC883721B48940F41.

AEMO 2025b, *2025 Inputs, assumptions, and scenarios report*. https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-inputs-assumptions-and-scenarios-report.pdf?la=en.

AER 2023, *Social licence for electricity transmission projects*. https://www.aer.gov.au/industry/registers/resources/reviews/social-licence-electricity-transmission-projects.

Agyeman, J 2005, *Sustainable communities and the challenge of environmental justice*, New York University Press.

Ahmed, IA, Effiong, E, Shanmugasundaram, L, Hummer, L, Orttung, RW & Shittu, E 2025, 'Measuring the invisible: a framework for quantifying energy justice in urban communities in the United States', *Energy Research & Social Science*, vol. 122, p. 103986. https://doi.org/10.1016/j.erss.2025.103986.

Amber Electric 2025, *Home*. https://www.amber.com.au/.

APPG Environment 2024, *Kickstarting the circular economy*. https://eu-west-2.graphassets.com/cm9ba0gla0lrn07mo5ggg8h75/cmc0amhmifckk07l2jpverbww.

ARENA 2024, *East Kimberley clean energy project – stage 1, feasibility study*. https://arena.gov.au/projects/east-kimberley-clean-energy-project/.

Arkhurst, BK, Houghteling, CR, Dutta, NS, Clarke, A, Fu, K, Anderson, K & Gill, E 2023, 'Evaluating energy justice metrics in early-stage science and technology research using the JUST-R metrics framework', *Frontiers in Environmental Science*, vol. 11, p. 1206013. https://doi.org/10.3389/fenvs.2023.1206013.

Australian Government 2023, *Critical minerals strategy 2023–2030*. https://www.industry.gov.au/publications/critical-minerals-strategy-2023-2030.

Australian Government 2024a, *First Nations clean energy strategy*. https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/first-nations-engagement-working-group/first-nations-clean-energy-strategy.

Australian Government 2024b, *First Nations clean energy strategy case study: appendix A*. https://www.energy.gov.au/sites/default/files/2024-12/Appendix%20A%20-%20First%20Nations%20Clean%20Energy%20Strategy%20Case%20Study%20Pack.pdf.

Australian Government 2025, *Australia's circular economy framework*. https://www.dcceew.gov.au/sites/default/files/documents/australias-circular-economy-framework.pdf.

Baker, E, Carley, S, Castellanos, S, Nock, D, Bozeman, JF, Konisky, D, Monyei, CG, Shah, M & Sovacool, B 2023, 'Metrics for decision-making in energy justice', *Annual Review of Environment and Resources*, vol. 48, no. 1, pp. 737–60. https://doi.org/10.1146/annurev-environ-112621-063400.

Basil, CV & Heffron, R 2025, 'A systematic review of the intersection between energy justice and human rights', *Renewable and Sustainable Energy Reviews*, vol. 221, p. 115892. https://doi.org/10.1016/j.rser.2025.115892.

Bharadwaj, B, Weder, F & Ashworth, P 2023, 'More support for hydrogen export than its domestic application in Australia', *Humanities and Social Sciences Communications*, vol. 10, no. 1, p. 7. https://doi.org/10.1057/s41599-022-01476-y.

Blue Economy CRC 2025, *Marine spatial planning*. https://blueeconomycrc.com.au/marine-spatial-planning/.

Boutilier, RG 2021, 'From metaphor to political spin: understanding criticisms of the social licence', *The Extractive Industries and Society*, vol. 8, no. 2, p. 100743. https://doi.org/10.1016/j.exis.2020.05.022.

Brennan, S, Davis, M & Edgeworth, BJ (eds) 2015, *Native title from Mabo to Akiba: a vehicle for change and empowerment?*, The Federation Press.

Briggs, C, Atherton, A, Gill, J, Langdon, R, Rutovitz, J & Nagrath, K 2022, 'Building a "fair and fast" energy transition? Renewable energy employment, skill shortages and social licence in regional areas', *Renewable and Sustainable Energy Transition*, vol. 2, p. 100039. https://doi.org/10.1016/j.rset.2022.100039.

Briggs, C, Tjondro, M, Langdon, R, Niklas, S, Heard, R, Frangos, M & Gerrard, E 2025, 'First Nations people and energy transition: how to increase employment in clean energy', *Cosmopolitan Civil Societies: An Interdisciplinary Journal*, vol. 17, no. 2, pp. 34–53. https://doi.org/10.5130/ccs.v17.i2.9602.

Bullard, RD (ed.) 2005, *The quest for environmental justice: human rights and the politics of pollution*, Sierra Club Books.

Carley, S & Konisky, DM 2020, 'The justice and equity implications of the clean energy transition', *Nature Energy*, vol. 5, no. 8, pp. 569–77. https://doi.org/10.1038/s41560-020-0641-6.

Casella, V, Ferro, G, Parodi, L & Robba, M 2025, 'Maximizing shared benefits in renewable energy communities: a bilevel optimization model', *Applied Energy*, vol. 386, p. 125562. https://doi.org/10.1016/j.apenergy.2025.125562.

CEC 2025, *Clean energy, job ready*. https://cleanenergycouncil.org.au/news-resources/new-clean-energy,-job-ready-program-launches-as-demand-for-skilled-renewable-workforce-grows.

Celermajer, D, Schlosberg, D, Rickards, L, Stewart-Harawira, M, Thaler, M, Tschakert, P, Verlie, B & Winter, C 2021, 'Multispecies justice: theories, challenges, and a research agenda for environmental politics', *Environmental Politics*, vol. 30, no. 1–2, pp. 119–40. https://doi.org/10.1080/09644016.2020.1827608.

Cerchione, R, Morelli, M, Passaro, R & Quinto, I 2025, 'Balancing sustainability and circular justice: the challenge of the energy transition', *Journal of Cleaner Production*, vol. 494, p. 144942. https://doi.org/10.1016/j.jclepro.2025.144942.

Chao, S, Bolender, K & Kirksey, E (eds) 2022, *The promise of multispecies justice*, Duke University Press.

Clarke, D, Baldwin, K, Baum, F, Godfrey, B, Richardson, S & Robin, L 2021, *Australian energy transition research plan*, Report for the Australian Council of Learned Academics (ACOLA), https://acola.org/wp-content/uploads/2021/06/acola-2021-australian-energy-transition-plan.pdf.

Clarke, D, Baldwin, K, Baum, F, Godfrey, B, Richardson, S, Robin, L, Soliman Hunter, T & Taylor, M 2022, *Australian energy transition research plan. Report four: social engagement dynamics*, Report for the Australian Council of Learned Academies, https://acola.org/wp-content/uploads/2022/05/ACOLA-2022-AETRP-Report-4-social-engagement-dynamics.pdf.

Climate Change Commission 2025, *Monitoring report: emissions reduction*. https://www.climatecommission.govt.nz/assets/Monitoring-and-reporting/ERM-2025/CCC-5929-ERM-2025.pdf.

Colvin, RM, Witt, GB, Lacey, J & Witt, K 2019, 'The community cost of consultation: characterising the qualitative social impacts of a wind energy development that failed to proceed in Tasmania, Australia', *Environmental Impact Assessment Review*, vol. 77, pp. 40–48. https://doi.org/10.1016/j.eiar.2019.03.007.

Condie, SA & Condie, CM 2025, 'A graphical theory of social license: applications to climate action, renewable energy and sustainable food production', *Humanities and Social Sciences Communications*, vol. 12, no. 1, p. 433. https://doi.org/10.1057/s41599-025-04741-y.

CPA 2025, *Guide to regional benefit sharing*. https://cpagency.org.au/wp-content/uploads/2025/07/Guide-to-Regional-Benefit-Sharing.pdf.

CSIRO 2020, Community wellbeing and local attitudes to conventioanl gas development in the South-East of South Australia. https://gisera.csiro.au/wp-content/uploads/2020/05/GISERA-Community-attitudes-south-east-SA_final-6.pdf.

CSIRO 2025a, *Australian attitudes toward the renewable energy transition*. https://www.csiro.au/en/research/environmental-impacts/decarbonisation/energy-transition.

CSIRO 2025b, *Progress report: community wellbeing and attitudes to the energy transition in the North Perth Basin*. https://gisera.csiro.au/wp-content/uploads/2025/02/S20-website-progress-February-2025-new-logo.pdf.

DCCEEW 2024a, *Australia's rooftop solar revolution reaches astonishing new heights*. https://minister.dcceew.gov.au/bowen/media-releases/australias-rooftop-solar-revolution-reaches-astonishing-new-heights.

DCCEEW 2024b, *Community engagement for renewable energy infrastructure*. https://www.dcceew.gov.au/energy/renewable/community-engagement#:~:text=running%20smoothly,with%20concerns%20about%20energy%20projects.

DCCEEW 2024c, *National energy customer framework*. https://www.dcceew.gov.au/energy/markets/national-energy-customer-framework.

DCCEEW 2025a, *Setting our 2035 target and path to net zero*. https://www.dcceew.gov.au/about/news/setting-2035-target-path-net-zero.

DCCEEW 2025b, *Consumer energy resources working group*. https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/consumer-energy-resources-working-group.

DCCEEW 2025c, *National Electricity Market wholesale market settings review: draft report*. https://storage.googleapis.com/files-au-climate/climate-au/p/prj36f491a5284dc4c74959e/page/NEM_Review_Draft_Report_August_2025_Final_1.pdf.

DCCEEW 2025d, *Regional planning*. https://www.dcceew.gov.au/environment/epbc/epbc-act-reform/regional-planning.

DCCEEW 2025e, *Registration of interest invited for new renewable energy developer rating scheme*. https://www.dcceew.gov.au/news/about/roi-renewable-energy-developer-rating-scheme.

Demuijnck, G & Fasterling, B 2016, 'The social license to operate', *Journal of Business Ethics*, vol. 136, no. 4, pp. 675–85. https://doi.org/10.1007/s10551-015-2976-7.

Donnelly, K 2023, 'Imagined futures in the context of the energy transition: a case study from the Central Highlands region of Queensland, Australia', *Energy Research & Social Science*, vol. 103, p. 103216. https://doi.org/10.1016/j.erss.2023.103216.

Droubi, S, Heffron, RJ & McCauley, D 2022, 'A critical review of energy democracy: a failure to deliver justice?', *Energy Research & Social Science*, vol. 86, p. 102444. https://doi.org/10.1016/j.erss.2021.102444.

DUST 2024, *Deliverable D2.5: stakeholder engagement and participation (STEP) index: user manual*. https://www.dustproject.eu/_files/ugd/fedab5_b80a4f60d86f4ed79e7bdf1201c86391.pdf.

DWI 2025, *Disability wellbeing index*. https://www.dwi.org.au/.

Dyer, A 2023, *Community engagement review*. https://www.dcceew.gov.au/sites/default/files/documents/community-engagement-review-report-minister-climate-change-energy.pdf.

EC 2019, *The European green deal*. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640.

Energy and Climate Change Ministerial Council 2024, *National guidelines: community engagement and benefits for electricity transmission projects*. https://www.energy.gov.au/sites/default/files/2024-07/national-guidelines-community-engagement-benefits-electricity-transmission-projects.pdf.

Energy and Climate Change Ministerial Council 2025, *National consumer energy resources roadmap*. https://www.energy.gov.au/sites/default/files/2024-07/national-consumer-energy-resources-roadmap.pdf.

Energy Consumers Australia 2025, *Justice*. https://energyconsumersaustralia.com.au/our-targets/justice.

EU 2023, *Just transitions platform working groups*. RQ: How should Australian regulators craft laws and policies concerning energy transition decommissioning?

Feng, S & Joung, C 2020, Development overview of sustainable manufacturing metrics. *Proceedings of the 17th CIRP International Conference on Life Cycle Engineering 2010*. https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=904931.

First Nations Clean Energy Network 2022. *Aboriginal and Torres Strait Islander best practice principles for clean energy projects*. https://assets.nationbuilder.com/fncen/pages/183/attachments/original/1680570396/FNCEN_-_Best_Practice_Principles_for_Clean_Energy_Projects.pdf?1680570396.

Foster, G, Kastanaki, E, Beauson, J, Neuwahl, F, Marschinski, R & European Commission (eds) 2025, *Circular economy strategies for the EU's renewable electricity supply*, Publications Office. https://doi.org/10.2760/5598339.

Fraser, N (ed.) 2012, *Scales of justice: reimagining political space in a globalizing world* (repr), Polity Press.

Garnaut, R (ed.), 2022, *The superpower transformation: building Australia's zero-carbon future*, La Trobe University Press.

Glückler, J & Gutiérrez, D 2025, 'Social license to operate: an institutional critique and research framework', *Resources Policy*, vol. 107, p. 105657. https://doi.org/10.1016/j.resourpol.2025.105657.

Godden, L 2020, 'Energy justice and energy transition in Australia: from remote access to consumer protection', in I Del Guayo, L Godden, DD Zillman, MF Montoya & JJ González (eds), *Energy justice and energy law* (pp. 178–200), Oxford University Press, Oxford. https://doi.org/10.1093/oso/9780198860754.003.0011.

Government of Canada 2021, *Guidance gender-based analysis plus in impact assessment*. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/gender-based-analysis.html.

Government of Canada 2024, *Kinship & prosperity*. https://www.canada.ca/content/dam/nrcan-rncan/site/pdf/Wah-ila-Toos-Report-EN-accessible-nov15.pdf.

Government of Canada 2025a, *About the community well-being index*. https://www.sac-isc.gc.ca/eng/1421245446858/1557321415997.

Government of Canada 2025b, *Regional assessments*. https://www.canada.ca/en/impact-assessment-agency/programs/impact-assessments-101/regional-assessments.html.

Government of New Zealand 2024, *Briefing: Maori climate platform initiative*. https://environment.govt.nz/assets/OIA/Files/OIAD-1119/BRF-4150-Maori-Climate-Platform-Initiative-Redacted.pdf.

Government of Queensland 2025, *Social impact assessment guideline*. https://www.planning.qld.gov.au/__data/assets/pdf_file/0011/100361/social-impact-assessment-guideline.pdf.

Government of Scotland 2024, *Scotland's circular economy and waste route map to 2030*. www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2024/12/scotlands-circular-economy-waste-route-map-2030/documents/scotlands-circular-economy-waste-route-map-2030/scotlands-circular-economy-waste-route-map-2030/govscot%3Adocument/scotlands-circular-economy-waste-route-map-2030.pdf.

Government of South Australia 2025a, *Energy masters*. https://www.saenergymasters.com.au/about-energy-masters#:~:text=Energy%20Masters%20is%20designed%20to,and%20reduce%20their%20carbon%20footprint.

Government of South Australia 2025b, *Wellbeing index*. https://www.preventivehealth.sa.gov.au/evidence-data/explore-and-request-data/wellbeing-index.

Government of Victoria 2024, *Strategic land use assessment*. https://www.energy.vic.gov.au/__data/assets/pdf_file/0031/719383/2024-vtp-guidelines-appendix-a-strategic-land-use-assessment.pdf.

Haldar, S, Grillitsch, M & Bazaz, A 2025, 'A human-centric approach to energy justice: embedding agency and capabilities in transitions discourse', *Local Environment*, pp. 1–27. https://doi.org/10.1080/13549839.2025.2506593.

Hanumante, NC, Shastri, Y & Hoadley, A 2019, 'Assessment of circular economy for global sustainability using an integrated model', *Resources, Conservation and Recycling*, vol. 151, p. 104460. https://doi.org/10.1016/j.resconrec.2019.104460.

Hay Shire Council 2024, *Fundamental principles for successful renewable development in Hay LGA*. https://www.hay.nsw.gov.au/Portals/0/Fundamental%20Principles%20for%20Successful%20Renewal%20Development%20in%20Hay%20LGA.pdf.

Haystacks 2025, *Haystacks solar garden*. https://haystacks.solargarden.org.au/.

Hazrati, M & Heffron, RJ 2021, 'Conceptualising restorative justice in the energy transition: changing the perspectives of fossil fuels', *Energy Research & Social Science*, vol. 78, p. 102115. https://doi.org/10.1016/j.erss.2021.102115.

Heffron, RJ 2021a, *Achieving a just transition to a low-carbon economy*, Springer International Publishing AG.

Heffron, RJ 2021b, 'The just framework', in RJ Heffron, *Achieving a just transition to a low-carbon economy* (pp. 21–42), Springer International Publishing. https://doi.org/10.1007/978-3-030-89460-3_3.

Heffron, RJ & De Fontenelle, L 2023, 'Implementing energy justice through a new social contract', *Journal of Energy & Natural Resources Law*, vol. 41, no. 2, pp. 141–55. https://doi.org/10.1080/02646811.2023.2186626.

Heffron, RJ & Hazrati, M 2024, 'The rise of restorative justice in the energy sector', in RJ Heffron & M Hazrati, *The rise of restorative justice in the energy transition and for climate mitigation* (pp. 39–67), Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-57304-0_3.

Heffron, RJ & McCauley, D 2017, 'The concept of energy justice across the disciplines', *Energy Policy*, vol. 105, pp. 658–67. https://doi.org/10.1016/j.enpol.2017.03.018.

Herberg, J, Drewing, E, Reinermann, J-L, Radtke, J, LaBelle, M, Stojilovska, A & Gürtler, K 2023, 'Energy spaces: bridging scales and standpoints of just energy transitions', *Journal of Environmental Policy & Planning*, vol. 25, no. 2, pp. 135–41. https://doi.org/10.1080/1523908X.2023.2193024.

Hornborg, A 2019, *Nature, society, and justice in the Anthropocene: unraveling the money-energy-technology complex*, Cambridge University Press. https://doi.org/10.1017/9781108554985.

Hunt, J, Riley, B, O'Neill, L & Maynard, G 2021, 'Transition to renewable energy and Indigenous people in Northern Australia: enhancing or inhibiting capabilities?', *Journal of Human Development and Capabilities*, vol. 22, no. 2, pp. 360–78. https://doi.org/10.1080/19452829.2021.1901670.

IAAC 2025, *Interactive map: detailed guide*. https://iaac-aeic.gc.ca/050/evaluations/atlas/guide.

Initiative for Energy Justice 2019, *The energy justice workbook*. https://iejusa.org/wp-content/uploads/2019/12/The-Energy-Justice-Workbook-2019-web.pdf.

International Labour Organization 2024, *The business case for just transition*. https://www.ilo.org/sites/default/files/2024-11/ILO-ACTEMP-The-Business-Case-for-Just-Transition-RGB-21NOV.pdf.

ISC 2025, *CWB*. https://www.sac-isc.gc.ca/SAC-ISC/CWB/index-map-en.html.

Jarin, J-B 2025, 'Comparing electricity policies between the primary and tertiary needs: the need for distributive justice within the energy transition', *Climate Policy*, pp. 1–10. https://doi.org/10.1080/14693062.2025.2467968.

Jenkins, KEH, Sovacool, BK, Mouter, N, Hacking, N, Burns, M-K & McCauley, D 2021, 'The methodologies, geographies, and technologies of energy justice: a systematic and comprehensive review', *Environmental Research Letters*, vol. 16, no. 4, p. 043009. https://doi.org/10.1088/1748-9326/abd78c.

Jenkins, KEH, Spruit, S, Milchram, C, Höffken, J & Taebi, B 2020, 'Synthesizing value sensitive design, responsible research and innovation, and energy justice: a conceptual review', *Energy Research & Social Science*, vol. 69, p. 101727. https://doi.org/10.1016/j.erss.2020.101727.

Just Transition Commission 2025, *Measuring and evaluating success in the Scottish just transition*. https://www.justtransition.scot/wp-content/uploads/2025/03/Measuring-and-evaluating-success-in-the-Scottish-Just-Transition-March-2025.pdf.

Kallies, A 2021, 'The Australian energy transition as a federalism challenge: (un)cooperative energy federalism?', *Transnational Environmental Law*, vol. 10, no. 2, pp. 211–35. https://doi.org/10.1017/S204710252000045X.

Kelly, JA, Clinch, JP, Kelleher, L & Shahab, S 2020, 'Enabling a just transition: a composite indicator for assessing home-heating energy-poverty risk and the impact of environmental policy measures', *Energy Policy*, vol. 146, p. 111791. https://doi.org/10.1016/j.enpol.2020.111791.

KPMG 2025, *The human side of the energy transition: measuring stakeholder engagement and participation*.

Kuyer, P, Shukla, S, O'Brolcháin, F, Doncel, VR & Gordijn, B 2025, 'The ethics of digital nudging for sustainable energy consumption – a closer look at the EU green deal', *Technology in Society*, vol. 83, p. 102990. https://doi.org/10.1016/j.techsoc.2025.102990.

LaBelle, MC 2017, 'In pursuit of energy justice', *Energy Policy*, vol. 107, pp. 615–20. https://doi.org/10.1016/j.enpol.2017.03.054.

Lacey-Barnacle, M 2020, 'Proximities of energy justice: contesting community energy and austerity in England', *Energy Research & Social Science*, vol. 69, p. 101713. https://doi.org/10.1016/j.erss.2020.101713.

Lacey-Barnacle, M, Robison, R & Foulds, C 2020, 'Energy justice in the developing world: a review of theoretical frameworks, key research themes and policy implications', *Energy for Sustainable Development*, vol. 55, pp. 122–38. https://doi.org/10.1016/j.esd.2020.01.010.

Legrand, P & Munday, R (eds) 2003, *Comparative legal studies: traditions and transitions*, Cambridge University Press. https://doi.org/10.1017/CBO9780511522260.

Local Energy Scotland 2025, *Projects index*. https://localenergy.scot/projects-overview/map/.

Long, G 2015, 'The idea of universality in the Sustainable Development Goals', *Ethics & International Affairs*, vol. 29, no. 2, pp. 203–22. https://doi.org/10.1017/S0892679415000076.

McCauley, D 2025, 'Just circularities: intersecting livelihoods, technology, and justice in just transition and circular economy', *Journal of Cleaner Production*, vol. 500, p. 145176. https://doi.org/10.1016/j.jclepro.2025.145176.

McCauley, D, Field, T-L, Heffron, R & Todd, I (eds) 2024, *The future of just transitions: theory and implementation*, Edward Elgar Publishing.

McCauley, D, Heffron, R, Hannes, S & Jenkins, K. (2013), 'Advancing energy justice: the triumvirate of tenets and systems thinking', *International Energy Law Review*, vol. 32, no. 3, pp. 107–16.

McCauley, D, Ramasar, V, Heffron, RJ, Sovacool, BK, Mebratu, D & Mundaca, L 2019, 'Energy justice in the transition to low carbon energy systems: exploring key themes in interdisciplinary research', *Applied Energy*, vols 233–234, pp. 916–21. https://doi.org/10.1016/j.apenergy.2018.10.005.

Melbourne Institute of Applied Economic and Social Research 2024, *The household, income and labour dynamics in Australia survey: selected findings from waves 1 to 22*. https://melbourneinstitute.unimelb.edu.au/__data/assets/pdf_file/0003/5229912/2024-HILDA-Statistical-Report.pdf.

Michaels, R 2006, 'The functional method of comparative law', in M Reimann & R Zimmermann (eds), *The Oxford handbook of comparative law* (pp. 338–82), Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199296064.013.0011.

Nelson, T, Pascoe, O, Calais, P, Mitchell, L & McNeill, J 2019, 'Efficient integration of climate and energy policy in Australia's National Electricity Market', *Economic Analysis and Policy*, vol. 64, pp. 178–93. https://doi.org/10.1016/j.eap.2019.08.001.

NRG2Peers 2025, *Readiness level indicator tool*. https://www.nrg2peers.eu/communityReadiness/aboutCommunityReadiness.

O'Neill, L & Thorburn, K 2025, 'First Nations at the forefront: the changing landscape of clean energy agreements in Australia', *Energy Research & Social Science*, vol. 127, p. 104183. https://doi.org/10.1016/j.erss.2025.104183.

O'Neill, L, Thorburn, K, Riley, B, Maynard, G, Shirlow, E & Hunt, J 2021, 'Renewable energy development on the Indigenous Estate: free, prior and informed consent and best practice in agreement-making in Australia', *Energy Research & Social Science*, vol. 81, p. 102252. https://doi.org/10.1016/j.erss.2021.102252.

Ørsted 2025, *Thriving communities*. https://orsted.com/en/who-we-are/sustainability/community-impact/thriving-communities.

Owen, JR & Kemp, D 2013, 'Social licence and mining: a critical perspective', *Resources Policy*, vol. 38, no. 1, pp. 29–35. https://doi.org/10.1016/j.resourpol.2012.06.016.

Paterson, JM & Bourova, E 2025, *Outcomes-based regulation: proposing an overarching 'consumer duty' within the regulation of essential services*. https://energyconsumersaustralia.com.au/sites/default/files/2025-05/report-doc-duty-care-essential-energy-services-preliminary_0.pdf.

Paterson, S & Scala, F 2021, 'Understanding gender expertise in the post-truth era: media representations of gender-based analysis plus in Canada', *International Review of Public Policy*, vol. 3, no. 3, pp. 247–65. https://doi.org/10.4000/irpp.1562.

Pellegrini-Masini, G, Pirni, A & Maran, S 2020, 'Energy justice revisited: a critical review on the philosophical and political origins of equality', *Energy Research & Social Science*, vol. 59, p. 101310. https://doi.org/10.1016/j.erss.2019.101310.

Productivity Commission 2025, *Investing in cheaper, cleaner energy and the net zero transformation: interim report*.

Pungao Hauwai 2024, *Tuaropaki*. https://tuaropaki.com/business/business/hydrogen-energy/.

Quail, K, Green, D & O'Faircheallaigh, C 2025, 'Large-scale renewable energy developments on the Indigenous Estate: how can participation benefit Australia's First Nations peoples?', *Energy Research & Social Science*, vol. 123, p. 104044. https://doi.org/10.1016/j.erss.2025.104044.

Radtke, J & Renn, O 2024, 'Participation in energy transitions: a comparison of policy styles', *Energy Research & Social Science*, vol. 118, p. 103743. https://doi.org/10.1016/j.erss.2024.103743.

Rawls, J 2005, *A theory of justice*, Harvard University Press. https://doi.org/10.2307/j.ctvjf9z6v.

RE-Alliance 2025, *Retirement age renewables*. https://assets.nationbuilder.com/vicwind/pages/6956/attachments/original/1754903284/Retirement_age_renewables_report.pdf?1754903284.

RenewMap 2025, *RenewMap*. https://renewmap.com.au/.

Riedy, C 2025, 'Enhancing anticipatory governance to accelerate just energy transitions in Australia', *Energy Research & Social Science*, vol. 119, p. 103839. https://doi.org/10.1016/j.erss.2024.103839.

Riley, B, White, LV, Wilson, S, Klerck, M, Napaltjari-Davis, V, Quilty, S, Longden, T, Jupurrurla, NF & Harrington, M 2023, 'Disconnected during disruption: energy insecurity of Indigenous Australian prepay customers during the COVID-19 pandemic', *Energy Research & Social Science*, vol. 99, p. 103049. https://doi.org/10.1016/j.erss.2023.103049.

Romero-Lankao, P, Rosner, N, Brandtner, C, Rea, C, Mejia-Montero, A, Pilo, F, Dokshin, F, Castan-Broto, V, Burch, S & Schnur, S 2023, 'A framework to centre justice in energy transition innovations', *Nature Energy*, vol. 8, no. 11, pp. 1192–8. https://doi.org/10.1038/s41560-023-01351-3.

Rosier, PC (ed.) 2024, *Environmental justice in North America*, Routledge Taylor & Francis.

Santos Ayllón, LM, Jenkins, KEH & Kerr, S 2025, 'Justice by design: integrating energy justice and responsible research and innovation (RRI) to deliver just energy futures', *Energy Research & Social Science*, vol. 125, p. 103998. https://doi.org/10.1016/j.erss.2025.103998.

Schlosberg, D 1999, *Environmental justice and the new pluralism: the challenge of difference for environmentalism*, Oxford University Press.

Schlosberg, D 2004, 'Reconceiving environmental justice: global movements and political theories', *Environmental Politics*, vol. 13, no. 3, pp. 517–40. https://doi.org/10.1080/0964401042000229025.

Schlosberg, D 2007, *Defining environmental justice: theories, movements, and nature*, Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199286294.001.0001.

Schlosberg, D 2012a, 'Climate justice and capabilities: a framework for adaptation policy', *Ethics & International Affairs*, vol. 26, no. 4, pp. 445–61. https://doi.org/10.1017/S0892679412000615.

Schlosberg, D 2012b, 'Justice, ecological integrity, and climate change', in A Thompson & J Bendik-Keymer (eds), *Ethical adaptation to climate change* (pp. 165–83), The MIT Press. https://doi.org/10.7551/mitpress/9780262017534.003.0009.

Schlosberg, D, Rickards, L & Byrne, J 2017, 'Environmental justice and attachment to place: Australian cases', in *The Routledge handbook of environmental justice*, Routledge Taylor & Francis.

Sen, A 2008, 'The idea of justice', *Journal of Human Development*, vol. 9, no. 3, pp. 331–42. https://doi.org/10.1080/14649880802236540.

Soto, EA, Bosman, LB, Wollega, E & Leon-Salas, WD 2021, 'Peer-to-peer energy trading: a review of the literature', *Applied Energy*, vol. 283, p. 116268. https://doi.org/10.1016/j.apenergy.2020.116268.

Sovacool, BK, Burke, M, Baker, L, Kotikalapudi, CK & Wlokas, H 2017, 'New frontiers and conceptual frameworks for energy justice', *Energy Policy*, vol. 105, pp. 677–91. https://doi.org/10.1016/j.enpol.2017.03.005.

Sovacool, BK & Dworkin, MH 2015, 'Energy justice: conceptual insights and practical applications', *Applied Energy*, vol. 142, pp. 435–44. https://doi.org/10.1016/j.apenergy.2015.01.002.

Sovacool, BK, Martiskainen, M, Hook, A & Baker, L 2019, 'Decarbonization and its discontents: a critical energy justice perspective on four low-carbon transitions', *Climatic Change*, vol. 155, no. 4, pp. 581–619. https://doi.org/10.1007/s10584-019-02521-7.

Stambe, R-M, Marston, G, Snell, D & Moss, J 2025, 'Jobs aren't enough: redefining just transitions in Australia with community voices', *Energy Research & Social Science*, vol. 122, p. 103999. https://doi.org/10.1016/j.erss.2025.103999.

Stark, A, Gale, F & Murphy-Gregory, H 2023, 'Just transitions' meanings: a systematic review', *Society & Natural Resources*, vol. 36, no. 10, pp. 1277–97. https://doi.org/10.1080/08941920.2023.2207166.

Stuart, A, Bond, A, Franco, AMA, Baker, J, Gerrard, C, Danino, V & Jones, K 2023, 'Conceptualising social licence to operate', *Resources Policy*, vol. 85, p. 103962. https://doi.org/10.1016/j.resourpol.2023.103962.

Suboticki, I, Heidenreich, S, Ryghaug, M & Skjølsvold, TM 2023, 'Fostering justice through engagement: a literature review of public engagement in energy transitions', *Energy Research & Social Science*, vol. 99, p. 103053. https://doi.org/10.1016/j.erss.2023.103053.

Sultana, F (ed.) 2025, *Confronting climate coloniality: decolonizing pathways for climate justice*, Routledge.

Syhlonyk, A & Seasons, M 2021, 'The concept and measurement of community well-being: lessons for planners', *Planning Practice & Research*, vol. 36, no. 2, pp. 141–56. https://doi.org/10.1080/02697459.2020.1780386.

Tait, N, Hunt, G, Naderian, S & Falcone, G 2025, 'Glasgow's hidden energy patterns: energy clustering and social geospatial analysis for a just transition', *Energy Research & Social Science*, vol. 123, p. 104042. https://doi.org/10.1016/j.erss.2025.104042.

Taiwo, EO & Tozer, L 2025, 'Community energy justice: a review of origins, convergence, and a research agenda', *Energy Research & Social Science*, vol. 123, p. 104036. https://doi.org/10.1016/j.erss.2025.104036.

Tattersall, A, Moore, K, Bennett, J, Evans, C, Johnson, LC, Godden, NJ, Chhetry, DS, Ganley, E, Fisher, S, McCosker, J, Wright, J, Bonner, L, Long, H & Nicholson, N 2025, 'Creating a new climate transition politics? Reflections on a real deal for Australia', *Political Geography*, vol. 121, p. 103347. https://doi.org/10.1016/j.polgeo.2025.103347.

Taylor, M 2023, 'Marine spatial planning and offshore wind: preliminary principles for Australia', *Renewable Energy Law and Policy Review*, vol. 11, no. 2–3, pp. 48–56. https://doi.org/10.4337/relp.2022.02-03.02.

Taylor, M & Taylor, S 2022, 'Applying energy justice principles: a case study of solar energy in Vanuatu', *Journal of World Energy Law & Business*, vol. 15, no. 3, pp. 193–211. https://doi.org/10.1093/jwelb/jwac003.

Ternes, V, Marsden, G & Harrison, G 2024, 'A just transition or just a transition? The understanding and relevance of fairness in planning for a decarbonised transport system', *Energy Research & Social Science*, vol. 113, p. 103549. https://doi.org/10.1016/j.erss.2024.103549.

The Energy Charter 2025, *WSM energy collaboration*. https://www.theenergycharter.com.au/landholder-and-community-social-licence/wimmera-southern-mallee-collaboration-program/.

Tschakert, P, Schlosberg, D, Celermajer, D, Rickards, L, Winter, C, Thaler, M, Stewart-Harawira, M, & Verlie, B 2021, 'Multispecies justice: climate-just futures with, for and beyond humans', *WIREs Climate Change*, vol. 12, no. 2, e699. https://doi.org/10.1002/wcc.699.

U2Demo 2025, *U2Demo*. https://u2demo.eu/.

UN 2025, *SDGs*. https://sdgs.un.org/goals.

Unity Housing 2024, *Power plant first for community housing*. https://unityhousing.org.au/news/power-plant-first-for-community-housing/.

UNDP 2025, *Human development index*. https://hdr.undp.org/data-center/human-development-index.

US DOE 2024, *Energy and environmental justice policy*. https://www.directives.doe.gov/directives-documents/200-series/0120-1-apolicy/@@images/file.

Van Uffelen, N, Taebi, B & Pesch, U 2024, 'Revisiting the energy justice framework: doing justice to normative uncertainties', *Renewable and Sustainable Energy Reviews*, vol. 189, p. 113974. https://doi.org/10.1016/j.rser.2023.113974.

Volodzkiene, L & Streimikiene, D 2025, 'Integrating energy justice and economic realities through insights on energy expenditures, inequality, and renewable energy attitudes', *Scientific Reports*, vol. 15, no. 1, p. 27067. https://doi.org/10.1038/s41598-025-12410-y.

Vrhovac, B, Müller, S, Sun, X, Grêt-Regamey, A & Buchecker, M 2025, 'Advancing shared energy transition through strategic regional future developments', *Renewable Energy*, vol. 240, p. 122128. https://doi.org/10.1016/j.renene.2024.122128.

Walker, C, Ryder, S, Roux, J-P, Chateau, Z & Devine-Wright, P 2023, 'Contested scales of democratic decision-making and procedural justice in energy transitions', in *Energy Democracies for Sustainable Futures* (pp. 317–26), Elsevier. https://doi.org/10.1016/B978-0-12-822796-1.00034-6.

Walker, G & Day, R 2012, 'Fuel poverty as injustice: integrating distribution, recognition and procedure in the struggle for affordable warmth', *Energy Policy*, vol. 49, pp. 69–75. https://doi.org/10.1016/j.enpol.2012.01.044.

Walters, R, Farrelly, M, Novalia, W & Raven, R 2025, 'Headlining justice from coalfields to clean futures: how the Australian newsprint media frames a just energy transition', *Energy Research & Social Science*, vol. 125, p. 104131. https://doi.org/10.1016/j.erss.2025.104131.

Western Power 2025, *Peer to peer energy trading*. https://www.westernpower.com.au/resources-education/network-improvements/network-upgrade-projects/peer-to-peer-energy-sharing/.

White, LV, Fazeli, R, Beck, FJ, Baldwin, KGH & Li, C 2025, 'Implications for cost-competitiveness of misalignment in hydrogen certification: a case study of exports from Australia to the EU', *Energy Policy*, vol. 204, p. 114661. https://doi.org/10.1016/j.enpol.2025.114661.

White, LV, Riley, B, Wilson, S, Markham, F, O'Neill, L, Klerck, M & Davis, VN 2024, 'Geographies of regulatory disparity underlying Australia's energy transition', *Nature Energy*, vol. 9, no. 1, pp. 92–105. https://doi.org/10.1038/s41560-023-01422-5.

Willand, N, Maller, C & Ridley, I 2019, 'Addressing health and equity in residential low carbon transitions – insights from a pragmatic retrofit evaluation in Australia', *Energy Research & Social Science*, vol. 53, pp. 68–84. https://doi.org/10.1016/j.erss.2019.02.017.

WinZero 2025, *WinZero virtual energy pilot*. https://winzero.com.au/virtual-energy-network/.

Wood, N 2023, 'Problematising energy justice: towards conceptual and normative alignment', *Energy Research & Social Science*, vol. 97, p. 102993. https://doi.org/10.1016/j.erss.2023.102993.

World Economic Forum 2025, *Foresting effective energy transition 2025*. https://reports.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_2025.pdf.

Wright, S, Frost, M, Wong, A & Parton, K 2024, 'Australian microgrids: navigating complexity in the regional energy transition', *Energy Research & Social Science*, vol. 113, p. 103540. https://doi.org/10.1016/j.erss.2024.103540.

Yenneti, K, Day, R & Golubchikov, O 2016, 'Spatial justice and the land politics of renewables: dispossessing vulnerable communities through solar energy mega-projects', *Geoforum*, vol. 76, pp. 90–99. https://doi.org/10.1016/j.geoforum.2016.09.004.

Young, IM 2016, 'Justice and the politics of difference', in R. Blaug & J. Schwarzmantel (eds), *Democracy* (pp. 553–7), Columbia University Press. https://doi.org/10.7312/blau17412-114.

Zapata, O 2024, 'Renewable energy and well-being in remote Indigenous communities of Canada: a panel analysis', *Ecological Economics*, vol. 222, p. 108219. https://doi.org/10.1016/j.ecolecon.2024.108219.

Zero Waste Scotland 2024, *Circular economy at Hagshaw Energy Cluster*. https://www.zerowastescotland.org.uk/resources/circular-opportunities-scotlands-energy-sector.

APPENDICES

Appendix 1: Additional notable Australian JUST case studies

Case study	State/ Territory	Reference
Local Volts	ACT, NSW Queensland, South Australia, and Tasmania	https://localvolts.com
Hepburn Wind Farm	Victoria	https://www.hepburnenergy.coop
Goulburn Community Solar Cooperative	NSW	https://goulburnsolarfarm.com.au
Marlinja First-Nations Owned Microgrid	Northern Territory	https://www.originalpower.org.au/marlinja_community_microgrid
Hay Shire Council	NSW	https://www.hay.nsw.gov.au/
Shoalhaven Community Solar Farm	NSW	https://flowpower.com.au/shoalhaven-community-solar-farm/
Newstead Community Energy Project	Victoria	https://renewablenewstead.com.au/
Project Symphony	Western Australia	https://www.aemo.com.au/initiatives/major-programs/wa-der-program/project-symphony
Girgarre Solar Farm	Victoria	https://potentiaenergy.com.au/project/girgarre-solar-farm/
Aldoga Wind Farm	Queensland	https://au.europeanenergy.com/aldoga-wind-farm/

Note: This table is non-exhaustive. Several examples of Australian JUST case studies exist beyond this appendix.

Appendix 2: Democratising jUst Sustainability Transitions (DUST) STEP Index structure and questions

Dimension	Criteria	Indicator	Question
D1	C1	I1	Q1
	C2	I2	Q2
	C3	I3	Q3
			Q4
	C4	I4	Q5
	C5	I5	Q6
D2	C6	I6	Q7
	C7	I7	Q8
	C8	I8	Q9
		I9	Q10
		I10	Q11
	C9	I11	Q12
		I12	Q13
		I13	Q14
			Q15
D3	C10	I14	Q16 (Matrix)
D4	C11	I15	Q17 (Matrix)
D5	C12	I16	Q18
	C13		Q19
	C14	I17	Q20

Dimension "WHAT"

Q1: Do the authorities responsible for the policy planning/implementation clearly outline the objectives of public participation?

Q2: What is the anticipated purpose of the participatory process ?

Q3: Has the process been given the necessary human resources?

Q4: Apart from the human resources, has the process been given all additional economic resources, if such were needed?"

Q5: Is the role of the planners (agents responsible for the planning/implementation process) clearly defined and communicated?

Q6: What is the level of accountability and responsibility on the part of the governing bodies towards the local community?

Dimension "WHO"

Q7: To what extent do the public authorities provide the public meaningful opportunities for remote participation in the process?

Q8: To what extent do public authorities address or remove obstacles, apart from physical access, that hinder meaningful public participation in the participatory process or mechanism?

Q9: Are vulnerable groups explicitly defined?

Q10: Which of the following vulnerable / marginalized / underrepresented groups participate or are represented in the participatory process or mechanism?
Q11: Are inclusive and accessible communication channels for vulnerable groups available, so that they can express their views and participate?

Q12:What measures have been taken to ensure equitable representation of both incumbent and alternative economic sectors?
Q13: Do you identify measures taken by the public authorities to ensure diverse representation of professional and other stakeholder groups?
Q14: What measures have been taken to ensure equitable representation of different age groups?

Q15: Were age-specific recommendations or policies included in the outcomes of citizen participation initiatives?

Dimension "HOW" Engagement methods in the planning phase

Methods of engagement/Strategies (Matrix)

Dimension "HOW" Engagement methods in the implementation phase

Methods of engagement/Strategies (Matrix)

Dimension "Consequences"

Q18: Has a document with results of the process been published?

Q19: Were the results translated into any action, program, or policy? Alternatively, if the result desired by the citizens had been inaction, has their involvement led to the desired result?

Q20: Has a monitoring body with citizen participation been established for follow-up?

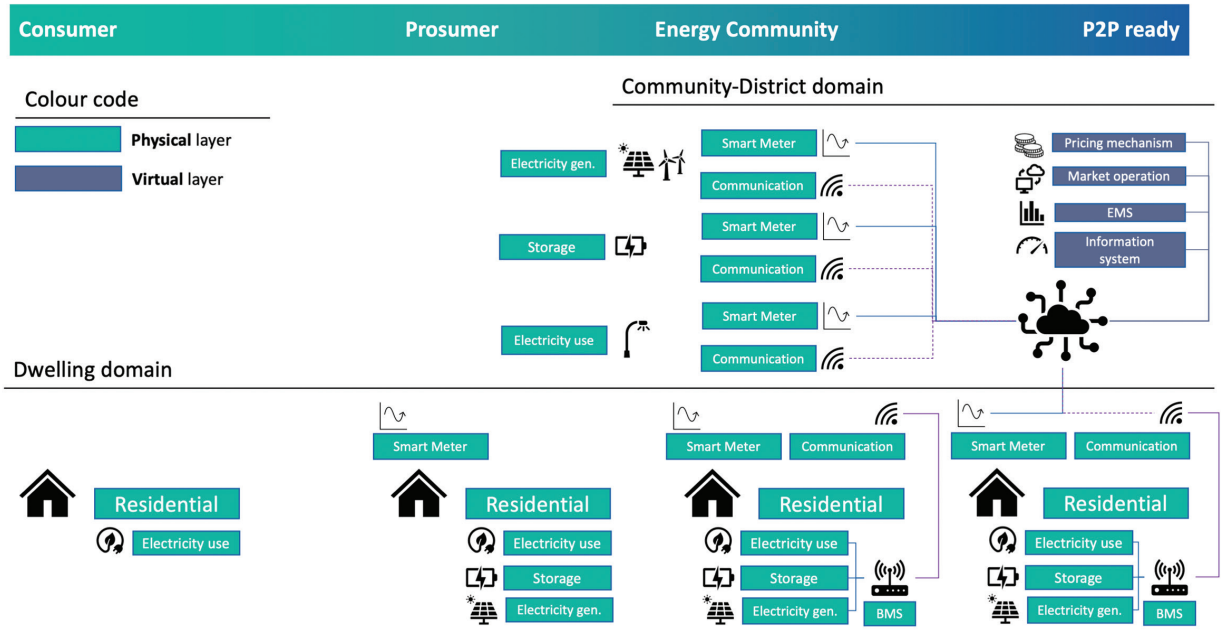
Source: DUST, 2024

Appendix 3: DUST STEP Index: 17 indicators

Dimension	Indicator no.	Indicator name	Brief description
1. Setup of the process (WHAT?)	1	Transparency of participation objective	Is the purpose of stakeholder participation clearly defined and communicated?
	2	Multi-dimensionality of participation objective	Does the process aim for deeper goals beyond formal compliance (e.g. learning, legitimacy)?
	3	Resource sufficiency	Are there enough financial and human resources to support stakeholder engagement?
	4	Role of planners identified	Are the responsibilities of planners clearly documented and accessible?
	5	Level of governance responsibility	Who holds accountability to the local community – local, national, or external actors?
2. Inclusiveness (WHO?)	6	Opportunity for remote participation	Are digital and remote participation mechanisms meaningfully provided?
	7	Response to participation barriers	Are non-physical barriers (e.g. language, time, knowledge) actively addressed?
	8	Definition of vulnerable groups	Are vulnerable or underrepresented groups explicitly identified in the process?
	9	Inclusion of vulnerable/ marginalised groups	Are these groups actually involved or represented in the engagement process?
	10	Special communication channels	Are tailored communication tools used to include vulnerable groups (e.g. easy-read, sign language)?
	11	Representation of economic sectors	Are both incumbent (traditional) and alternative (emerging) sectors included?
	12	Representation of professional categories	Is there diversity in stakeholder professional backgrounds (e.g. SMEs, unions, NGOs)?
	13	Inclusion of different age groups	Are different age groups involved, and are their specific needs reflected in outcomes?

Dimension	Indicator no.	Indicator name	Brief description
3. Engagement methods (planning phase – HOW?)	14	Depth of engagement in planning	Level of participation in planning phase, from informing to co-design decision-making.
4. Engagement methods (implementation phase – HOW?)	15	Depth of engagement in implementation	Depth of stakeholder involvement during policy implementation.
5. Consequences of participation	16	Influence	Was participation influential? Was input published and translated into policies or actions?
	17	Monitoring	Is there a monitoring body that includes citizen participation in follow-up?

Appendix 4: NRG2Peers educational tool



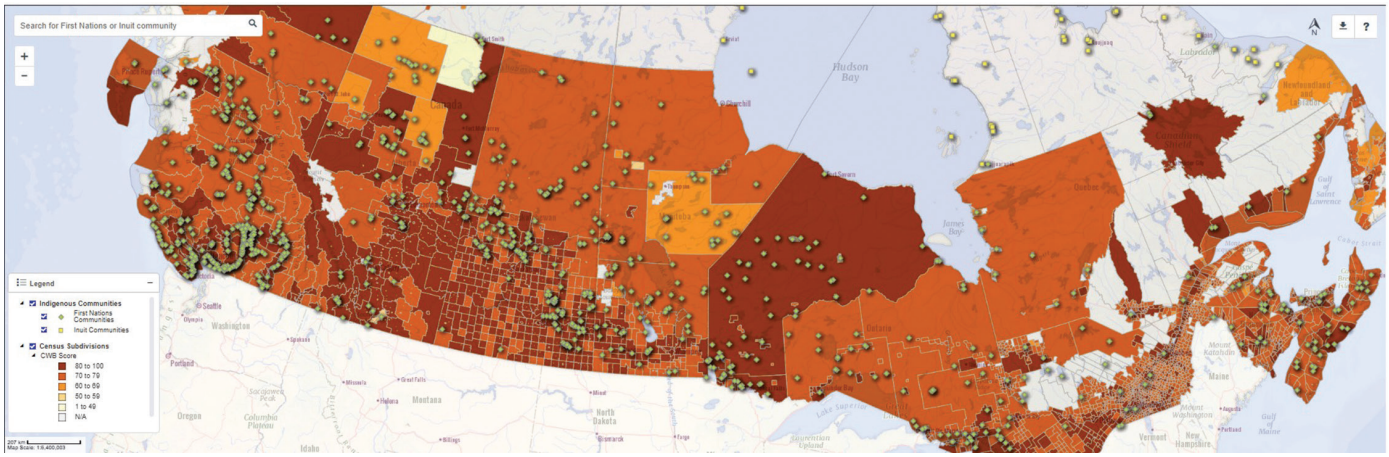
Source: NRG2Peers, 2025

Appendix 5: NRG2Peers target readiness indicators for each category in the 'user readiness' section

Category	Phase	Create, but just starting	Thinking about flexibility	Becoming P2P ready	Created but just starting	Thinking about flexibility	Becoming P2P ready	
	Users	All users	All users	All users	Just the very active ones	Just the very active ones	Just the very active ones	MAX.
Knowledge and awareness		2	8	15	6	15	15	15
Values and goals		4	5	5	5	5	5	5
Willingness and ability		0	4	4	4	4	4	4

Source: NRG2Peers, 2025

Appendix 6: Community Wellbeing (CWB) Index map



Source: ISC, 2025

Appendix 7: Example of a JUST process

Stage 1: Identify and define Australian JUST pillars
Co-develop with key stakeholders in the energy transition (policymakers, regulators, Aboriginal and Torres Strait Isander leaders, communities)

Stage 2: Question existing norms through the frame of existing injustices and opportunities for justice-driven reform with understandings of inclusion, exclusion, responsibility, and accountability framings

Stage 3: Co-design and deliberative engagmeent feedback loops in developing JUST metrics and outcomes (e.g. interviews, focus groups, open forums, citizens assemblies)

Stage 4: Identify key research programs to embed justice across governance scales (local, state, national)

Stage 5: Explore research-led metric tools using a multi-criteria assessment framework, integrating quantative and qualtative measures in a transparent, adaptable, and community-validatable way

Stage 6: Set targets that align with chosen research-led metrics to develop JUST outcomes

Source: Compiled by the author, adapted from Jenkins et al., 2020

Appendix 8: JUST metric matrix scoring

Metric	Symbol	Adoptability	Urgency	Justification	JUST pillar
Regional Strategic Impact Assessments	◆	2	4	Needs considerable resourcing and strategic coordination. However, the recent policy focus on Regional Strategic Impact Assessments (e.g. the Productivity Commission's Net Zero Transformation Interim Report and EPBCA reforms) creates urgency for the adoption of these assessments and critical JUST insights, especially for regional cumulative benefits and risks.	Distributive justice
Stakeholder Participation and Engagement Metrics	●	4	5	Measuring stakeholder engagement and participation could build on existing consultation and engagement structures and engagements across Australian states and territories as a foundational JUST metric. It could be of high urgency due to REZ construction commencing in NSW, and REZ finalisation in other states, such as Victoria.	Procedural justice
Indigenous Engagement Metrics	■	3	5	Requires significant new data and coordination, coupled with intensive co-design and trust building. Urgently needed for restorative justice and to further support Aboriginal and Torres Strait Islander leadership and engagement in shaping Australia's energy transition.	Recognition justice

Metric	Symbol	Adoptability	Urgency	Justification	JUST pillar
Renewable Energy Recycling and Employment Metrics	★	2	3	At present there is limited data and tracing capabilities for renewable energy technologies recycling in Australia, creating significant adoptability hurdles. Urgency is moderate but rising as energy transition technology deployment expands and projects reach end of life, creating the possibility of integrating circular economy and employment metrics.	Restorative justice
Consumer Energy Resources Metrics	✕	3	4	Consumer Energy Resource metrics could be adapted using existing data from P2P projects and trials already deployed across multiple Australian states and territories. Urgency will continue to grow as decentralised markets mature, supported by enabling polices and regulation.	Space
Community Wellbeing Indexes	*	3	3	This metric could build on existing Community Wellbeing Index methods and data, particularly those used in South Australia as a pilot area. This could be critical for tracking social outcomes and benefits as the energy transition accelerates.	Time

Note: Symbols refer to those used in the matrix in Figure 2 in Section 4 of this report.

By providing a forum that brings together great minds, broad perspectives and knowledge, ACOLA is the nexus for true interdisciplinary cooperation to develop integrated problem solving and cutting edge thinking on key issues for the benefit of Australia.

www.acola.org

The Australian Council of Learned Academies (ACOLA) combines the strengths of Australia's Learned Academies.

LEARNED ACADEMIES