SELINUS UNIVERSITY
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Global Renewable Energy Growth and Challenges: A Comparative Study of Sri Lanka and Australia in the South Asian Context

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ABSTRACT

This thesis presents a comprehensive comparative analysis of the drivers, challenges, and solution pathways shaping the renewable energy transitions of Sri Lanka and Australia, with particular emphasis on policy design, financial mechanisms, technological capability, and governance performance. Employing a mixed-methods research design comprising statistical analysis, policy and regulatory review, and semi-structured expert interviews, the study generates evidence-based insights and actionable recommendations to support the acceleration of Sri Lanka's renewable energy transition in alignment with global best practice.

The global transition towards renewable energy is being propelled by binding international climate commitments, rapid cost reductions in solar and wind technologies, and the rising strategic importance of energy security. Nevertheless, national transition trajectories differ substantially due to variations in institutional maturity, economic structure, and political context. Australia demonstrates strong performance in renewable energy deployment, driven by stable and independent regulatory institutions, market-based policy instruments, high levels of private sector participation, and a technically skilled workforce. Consistent policy signals and the expansion of green finance frameworks have been central to this progress.

Sri Lanka, while setting ambitious renewable energy targets, faces persistent structural and institutional barriers including outdated grid infrastructure, policy inconsistency, constrained access to capital, and fragmented governance arrangements. Despite these limitations, the country possesses strong solar and wind resources, rising domestic demand for energy security, and sustained interest from international development partners.

The comparative analysis identifies several transferable lessons from the Australian experience—most notably the value of independent regulation, transparent long-term planning, innovative financing mechanisms, and structured community engagement. The study underscores, however, that any institutional or policy adaptation must be grounded in Sri Lanka's unique political economy and socio-cultural dynamics.

Key recommendations include establishing an independent energy regulatory authority to promote policy stability and investor confidence; developing a national green fund and sovereign green bond programme to mobilise private and international capital; prioritising grid modernisation and digitalisation to improve system reliability and renewable energy integration; expanding community and decentralised energy initiatives supported by targeted workforce development; and instituting continuous monitoring, evaluation, and adaptive policy management to respond to emerging challenges.

Future research opportunities include examining the role of digital technologies, gender-inclusive workforce strategies, decentralised energy systems, and innovative climate-finance instruments within South Asian renewable energy transitions. Enhanced South–South cooperation and structured knowledge exchange among developing countries are critical for accelerating equitable and resilient energy transitions.

The findings of this thesis offer valuable guidance not only for Sri Lanka but also for other developing economies seeking to design effective renewable energy policy frameworks informed by the experience of global leaders and regional peers.

CHAPTER 1

1 INTRODUCTION & AIM

1.1 Background of the Study

The urgent global transition to renewable energy is one of the most significant challenges and opportunities of the 21st century. Renewable energy, primarily solar, wind, and hydropower offers a pathway to decarbonize economies, enhance energy security, and promote sustainable development. The 2015 Paris Agreement and subsequent climate commitments have placed further pressure on countries to rapidly decarbonize their energy sectors (IEA, 2023).

While advanced economies like Australia have established supportive frameworks and invested heavily in renewable technologies, many developing nations continue to lag behind due to a web of interconnected obstacles. In South Asia, Sri Lanka exemplifies the struggles of smaller developing countries: despite ambitious renewable energy targets, progress is hindered by technical limitations, inconsistent policy, weak institutional capacity, and a challenging investment environment.

Australia, as a member of the Organization for Economic Cooperation and Development (OECD), has experienced a robust growth in renewables, driven by political commitment, financial innovation, and mature technologies (Nelson et al., 2023). By contrast, Sri Lanka’s efforts, though commendable in vision, are often stymied by outdated infrastructure, financing gaps, and political interference (ADB, 2021).

This thesis situates Sri Lanka's renewable energy journey within both the regional context of South Asia and a comparative framework with Australia, aiming to generate actionable insights for overcoming barriers and accelerating clean energy adoption.

1.2 Statement of the Problem

Despite the global momentum toward renewables, Sri Lanka's adoption remains slow and uneven. The principal barriers are:

- Technological: Inadequate and outdated grid infrastructure, limited access to new generation and storage technologies, and insufficient technical capacity.
- Financial: Challenges in mobilizing investments, high capital costs, and limited access to concessional finance or green bonds.
- Policy: Fragmented and inconsistent regulatory frameworks, lack of long-term policy certainty, and weak implementation mechanisms.
- Political: Frequent policy reversals, interference in regulatory processes, and political instability.

Meanwhile, Australia has been able to address similar challenges through stable governance, independent regulatory bodies, innovative finance mechanisms, and public-private partnerships. Understanding these contrasts and identifying transferrable solutions is crucial to advancing Sri Lanka's renewable energy agenda.

1.3 Research Aim and Objectives

Aim:

To examine the global expansion of renewable energy and identify critical challenges in Sri Lanka compared to Australia, focusing on technological, financial, policy, and political dimensions.

Specific Objectives:

1. To assess global and regional trends in renewable energy development.
2. To identify and evaluate the technological, financial, policy, and political barriers in Sri Lanka.
3. To compare these challenges with Australia's renewable energy landscape and solutions.
4. To provide strategic policy and governance recommendations tailored for Sri Lanka.

1.4 Research Questions

1. What are the global trends in renewable energy adoption?
2. What are the major barriers in Sri Lanka's renewable energy sector relating to technology, finance, policy, and politics?
3. How has Australia addressed similar challenges in its energy transition?
4. What lessons and strategies can Sri Lanka adopt from Australia's experience?

Refer Interview Questionnaire for details

1.5 Significance of the Study

This research is significant for several reasons:

- It bridges a gap in comparative energy policy literature between developed and developing countries, particularly in the South Asian context.
- Provides actionable recommendations for policymakers and stakeholders in Sri Lanka and similar nations.
- Offers insights for international donors and regional organizations (e.g., ADB, SAARC) to design more effective support mechanisms.
- Contributes to academic discourse on policy transfer and adaptation in renewable energy governance (Bößne, et al., 2021).

1.6 Scope of the Study

- Geographical: Sri Lanka and Australia, with contextual references to broader South Asia.
- Temporal: Focus on developments from 2010–2025, with projections and strategic recommendations for 2025–2035.
- Technological: Focus on solar, wind, and hydropower and energy storage acknowledging other sources where relevant.
- Thematic: Emphasis on policy, financial, technological, and political dimensions.

1.7 Structure of the Thesis

Chapter 1: INTRODUCTION & AIM

Outlines research context, aims, questions, significance, and scope.

Chapter 2: LITERATURE REVIEW

Synthesizes existing research on global/regional renewable energy trends, barriers, and comparative policy models.

Chapter 3: METHODOLOGY

Describes the mixed-methods approach, data sources, and analytical frameworks.

Chapter 4: DATA ANALYSIS - SRI LANKA VS. AUSTRALIA

Presents a detailed comparison of Sri Lanka and Australia across key dimensions.

Chapter 5: DISCUSSIONS AND RECOMMENDATIONS

Provides targeted recommendations and strategic action plans for Sri Lanka.

Chapter 6: CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Summarizes findings, discusses implications, and suggests areas for further study.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

The literature review synthesizes existing scholarship, reports, and policy documents related to the global expansion of renewable energy, the specific experiences of Sri Lanka and Australia, and the broader South Asian context. By critically examining previous work, this chapter identifies gaps, informs the research design, and justifies the comparative approach.

2.2 Global Trends in Renewable Energy

2.2.1 Historical Growth and Current Status

The global renewable energy sector has grown rapidly over the last two decades, driven by declining technology costs, supportive policies, and increasing awareness of climate change (REN 21, 2023). Between 2010 and 2022, renewable energy capacity more than doubled worldwide, with solar and wind leading the transformation (IEA 2023).

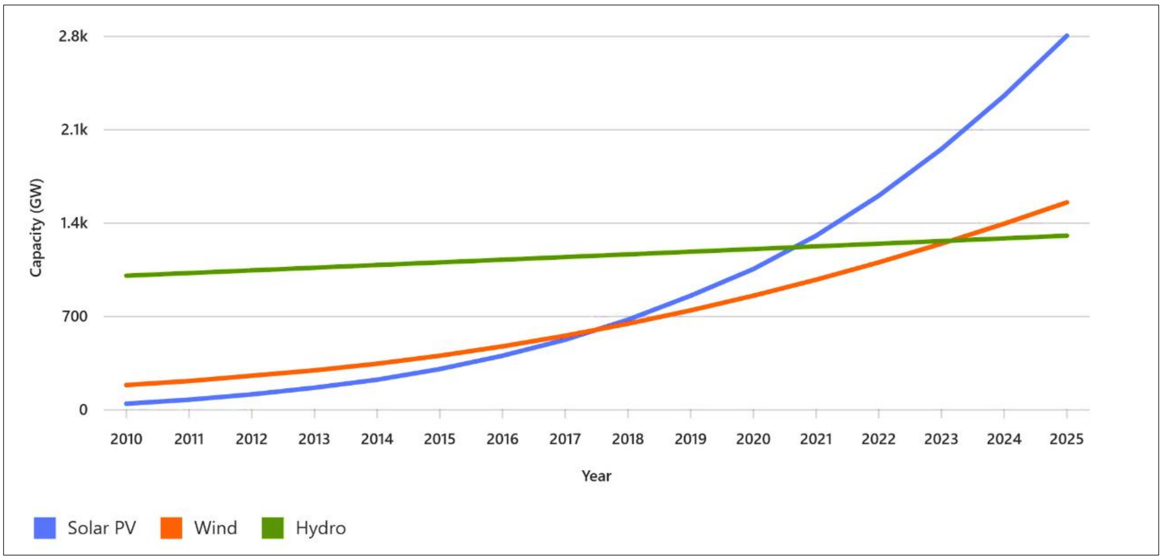

Figure 1. Global renewable energy capacity growth (IRENA 2025)

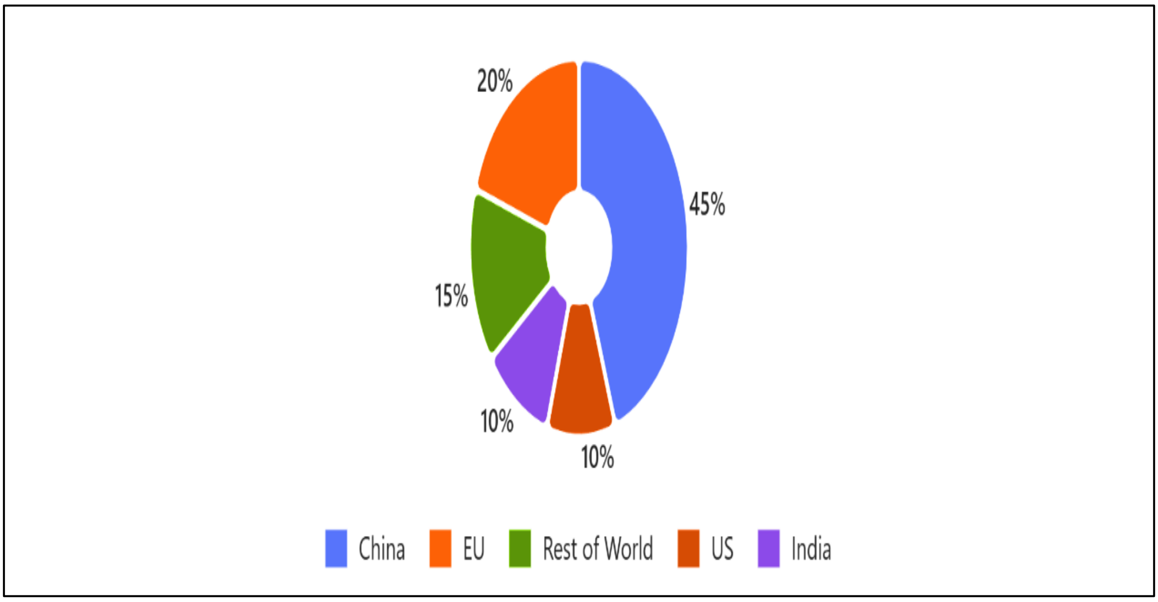

Figure 2. Capacity contribution (IRENA 2025)

- **Solar PV**: Once prohibitively expensive, costs have fallen by over 80% since 2010, leading to mass adoption in countries ranging from China to Germany to Australia.
- **Wind Power**: Both onshore and offshore wind have expanded rapidly, with innovations in turbine technology and grid integration.

- **Hydropower**: Still the largest single source of renewable electricity globally, though growth is slower compared to solar and wind due to environmental and social concerns.

2.2.2 Key Drivers

- Policy frameworks (such as feed-in tariffs, renewable portfolio standards)
- International climate agreements (Paris Agreement, SDGs)
- Technological innovation (e.g., grid-scale batteries, smart grids)
- Private sector investment

2.2.3 Global Barriers and Challenges

Despite the positive trajectory, challenges remain:

- Grid integration of variable renewables (explained: integrating solar/wind, which fluctuate, into existing electricity networks)
- Financing barriers in developing economies
- Regulatory and policy uncertainty
- Political resistance and vested interests

2.3 Regional Focus: South Asia

2.3.1 South Asia's Energy Landscape

South Asia is home to nearly two billion people, with rising energy demand but significant reliance on fossil fuels. While the region's renewable energy potential is vast, especially in solar and hydropower, realization has lagged due to institutional and infrastructural barriers (World Bank, 2022). This study identifies India, Pakistan, Bangladesh, and Sri Lanka as key contributors to the renewable energy landscape in South Asia.

India: Regional leader in renewables, significant solar and wind installations. Solar and wind energy continued to dominate renewable capacity expansion, jointly accounting for 96.6% of all net renewable additions in 2024. The year 2024 marks the highest annual increase in renewable generation capacity and the highest growth on record in percentage terms, mainly solar. (IRENA 2025).

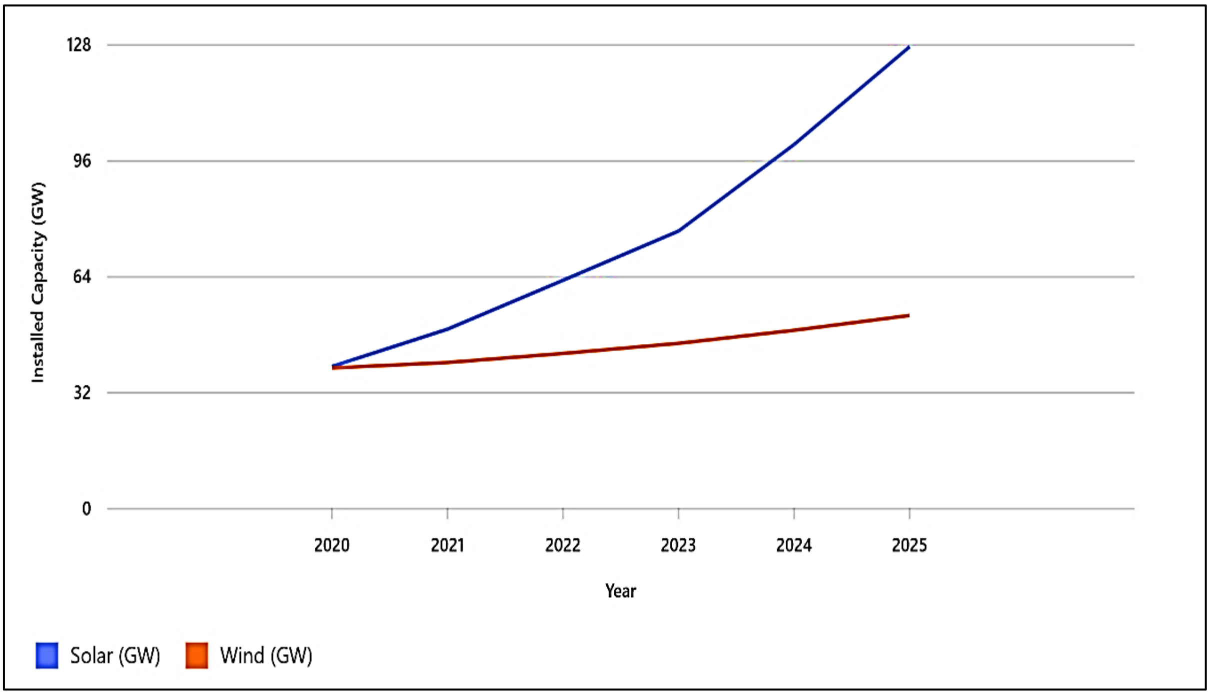

Figure 3. India's renewable energy growth: Solar Vs Wind (2020–2025) (MNRE)[1]

[1] Ministry of New and Renewable Energy

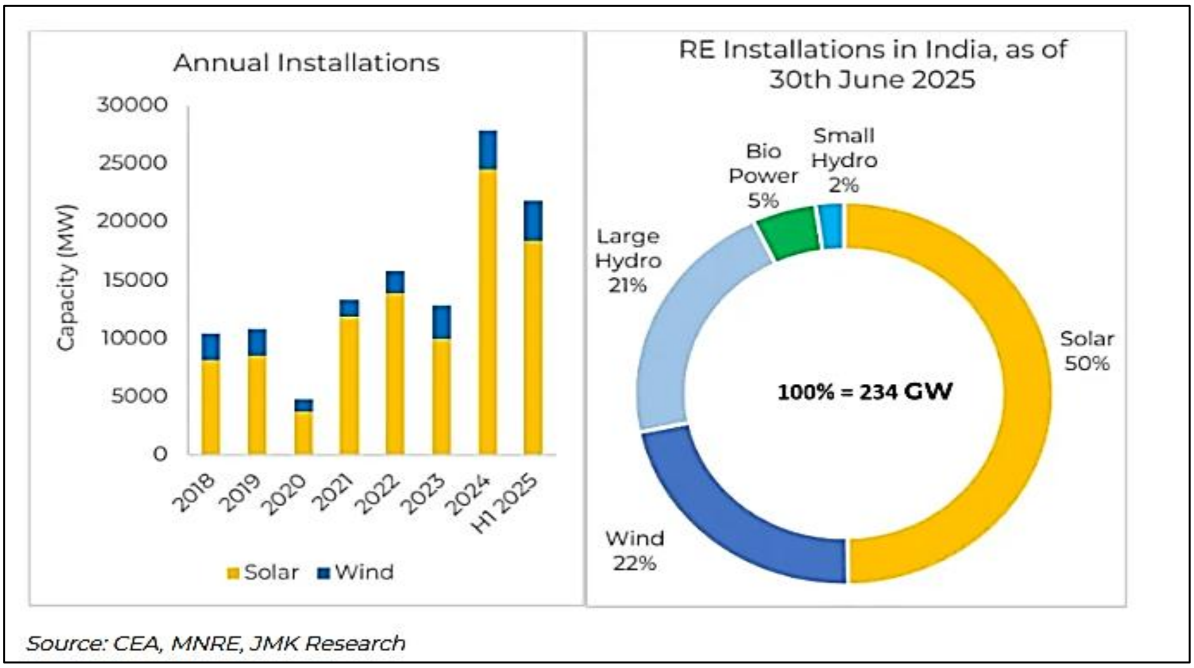

Figure 4. India's renewable energy growth & distribution (CEA, MNRE, JMK)

Pakistan, Bangladesh, Nepal:

Pakistan accumulated 5.3 GW of net-metering capacity by the end of April 2025 (Think tank Renewables First, 2025). The total represents continued growth in Pakistan's net-metering installed capacity, which surpassed 4 GW in 2024 and it hit 4.9 GW by the end of March 2025 (Renewables First's Pakistan Electricity Review, 2025). In 2025, Bangladesh's renewable energy sector reached an estimated installed capacity of approximately 850 MW, reflecting steady growth over the past 15 years. The expansion has been primarily driven by solar energy, which accounts for the largest share at around 700 MW, supported by government initiatives and international partnerships.

Wind energy remains modest, contributing about 22 MW, while hydropower has remained stable at approximately 60 MW, largely due to limited geographic potential for further development. This distribution highlights Bangladesh's strategic focus on solar as the cornerstone of its renewable energy transition, complemented by small-scale wind and hydro projects (IRENA Energy profile Bangladesh, 2025).

Out of Nepal’s estimated 83,000 MW theoretical hydropower capacity, approximately 43,000 MW is considered economically viable. Yet, as of 16 July 2025, only 175 operational hydropower plants, representing a combined licensed capacity of 3,388.744 MW, have been commissioned (DOED, 2025).

This substantial underdevelopment highlights a persistent gap between potential and realization. In response, the Government of Nepal has intensified its hydropower development efforts to meet surging domestic demand and to capitalize on regional electricity trade opportunities. An additional 259 hydropower projects, amounting to 10,691.546 MW in total capacity, are currently under construction or awaiting financial closure (DOED, 2025). In addition, hydropower projects with a combined capacity of 17,000 MW are under consideration either in the feasibility stage or awaiting government approval for Power Purchase Agreements (PPAs).

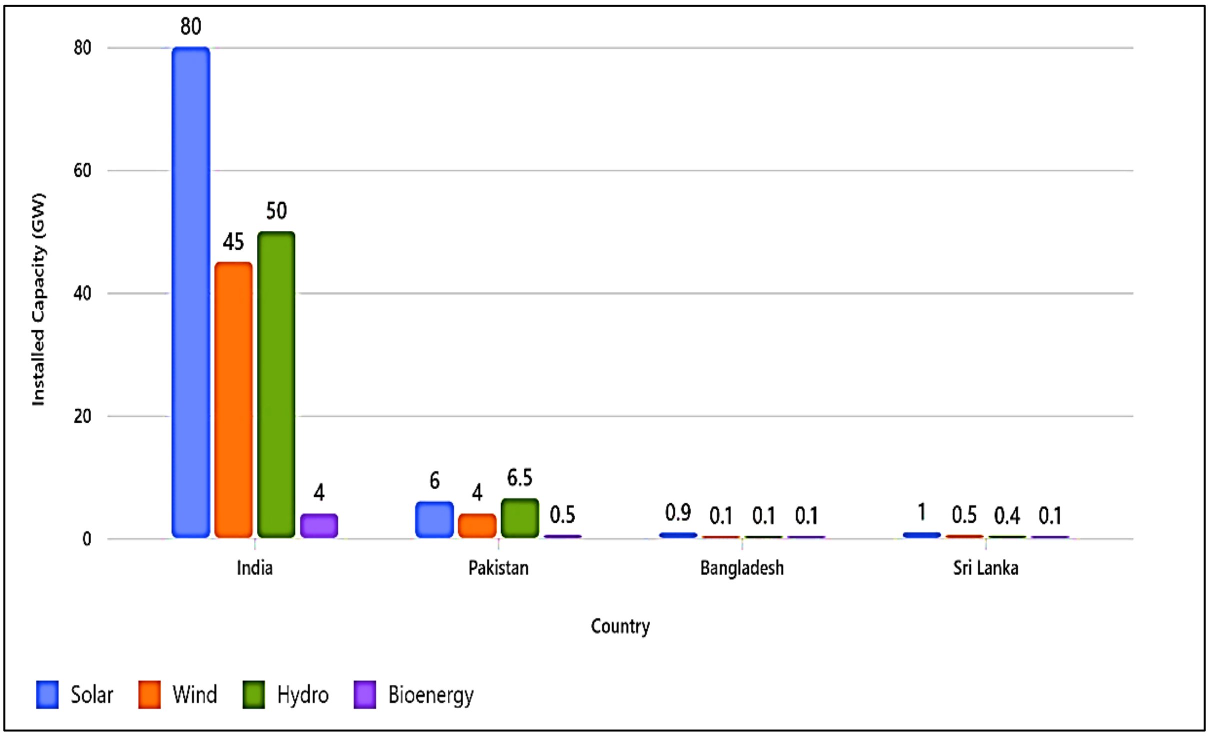

Figure 5. Installed renewable energy capacities across South Asian countries in 2025

Sri Lanka: Sri Lanka has set forth ambitious targets for renewable energy development, aiming to significantly increase its share of clean energy in the national mix. However, the country faces notable challenges that hinder the realization of these goals. Chief among these are the limitations posed by its relatively small energy market, which restricts economies of scale, and infrastructural constraints, particularly in grid capacity and integration. These factors, coupled with limited access to financing and investment, present structural barriers to scaling up renewable energy deployment despite strong policy intent**.**

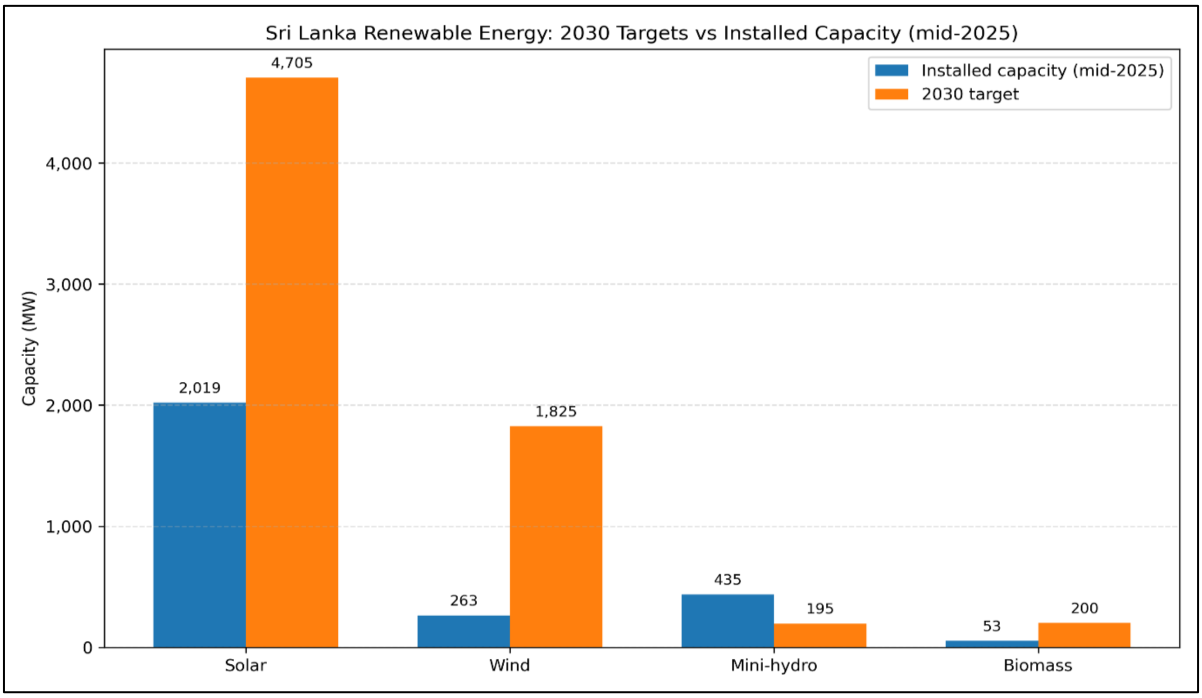

Figure 6. Sri Lanka's renewable energy targets for 2030 Vs Installed capacity (PUCSL)

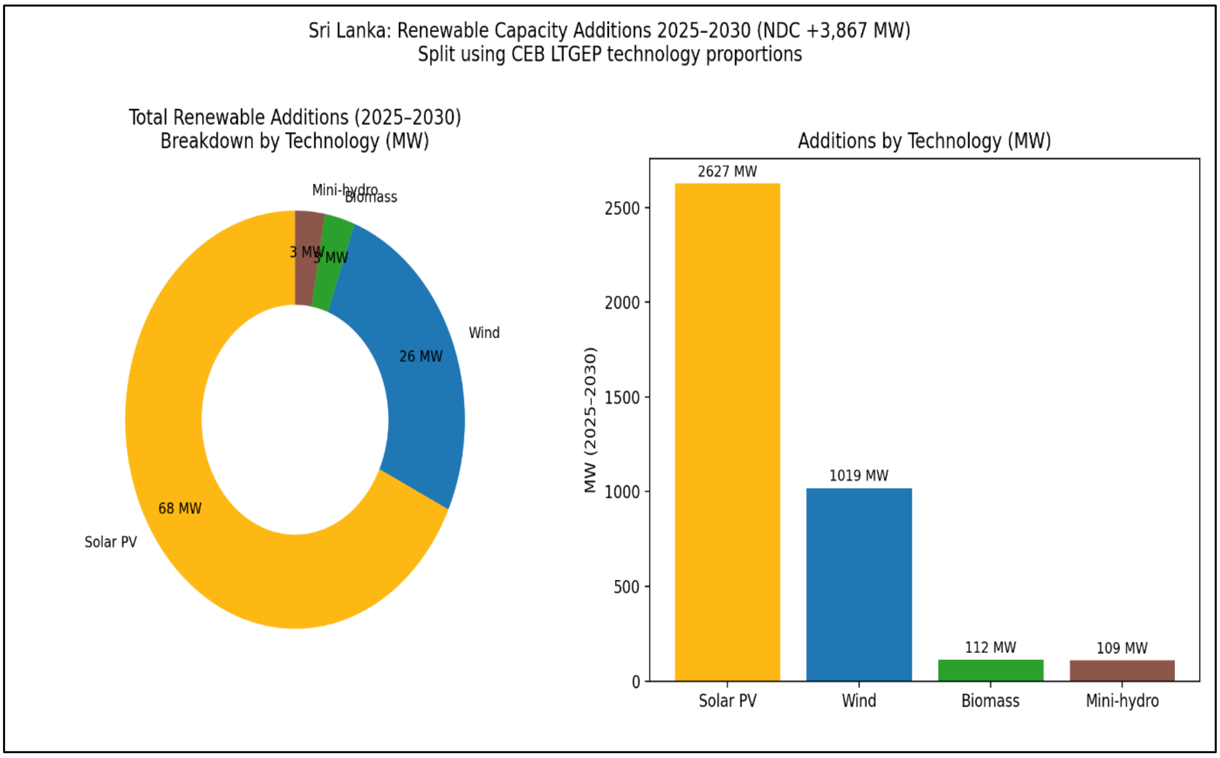

Figure 7. Renewable capacity additions Sri Lanka needs to meet its 2030 targets (CEB)

2.3.2 Regional Initiatives and Cooperation

Regional cooperation in South Asia has seen promising developments in the energy sector, particularly through initiatives like the SAARC Energy Centre. This institution plays a pivotal role in fostering cross-border energy trade and collaboration among member states, aiming to enhance energy security and sustainability across the region. Complementing this effort are regional grid initiatives, which seek to establish transnational electricity markets that could significantly improve energy access and efficiency. However, despite their technical and economic potential, these initiatives often face substantial hurdles due to political sensitivities and inter-country tensions. Such challenges underscore the need for stronger diplomatic engagement and trust-building measures to unlock the full benefits of regional energy integration.

2.3.3 Key Barriers in South Asia

- Weak institutional frameworks
- Limited access to capital
- Policy inconsistency
- Political instability
- Infrastructure and grid limitations

2.4 Australia’s Renewable Energy Journey

2.4.1 Policy Evolution and Milestones

Australia’s renewable energy sector has transformed from a marginal contributor to a mainstream power source over the last two decades (Clean Energy Council, 2022). Australia’s Renewable Energy Target (RET) goals by 2030, as outlined by the

Australian Renewable Energy Agency (ARENA), are centered around the Solar 30-30-30 initiative.

This ambitious program aims to achieve:

- 30% solar module efficiency
- 30 cents per watt installed cost
- By the year 2030

These targets are part of ARENA's broader strategy to unlock ultra low-cost solar (ULCS), which is seen as critical to decarbonising Australia's electricity system and enabling the growth of future industries such as renewable hydrogen and low-emissions metals. The initiative also supports the goal of reaching 1 terawatt of installed solar PV capacity by 2050.

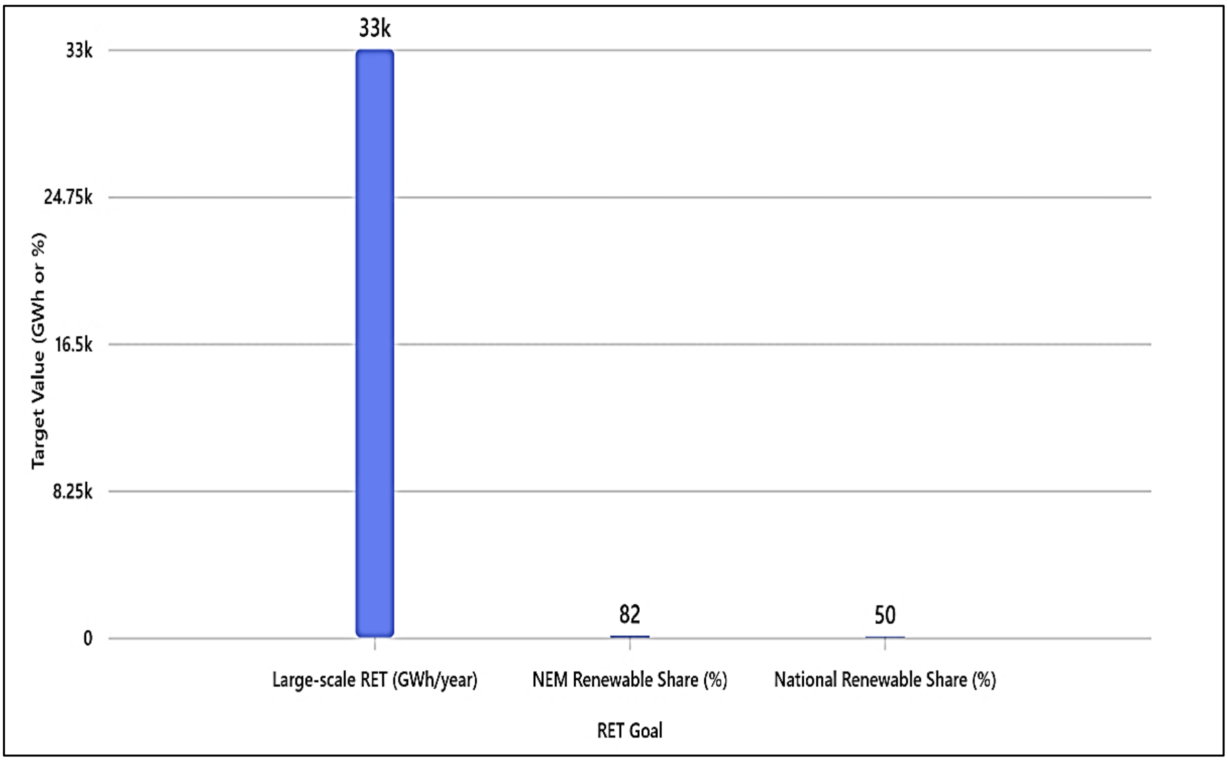

Figure 8. Australia's renewable energy target (RET) goals by 2030 (ARENA, 2025)

State-level leadership: South Australia, Victoria, and Queensland have set ambitious targets. Australia's renewable energy policy evolution has increasingly been shaped by state-level leadership, with South Australia, Victoria, and Queensland setting ambitious targets that exceed national benchmarks. South Australia has legislated a 200% renewable energy target by 2040, aiming to become a net exporter of clean energy. It also targets a 50% reduction in greenhouse gas emissions below 2005 levels by 2030, and net zero emissions by 2050.

Victoria has committed to 95% renewable electricity by 2035, supported by strong investment in energy storage and transmission infrastructure. The state also has a legislated net-zero emissions target by 2045.

Queensland aims for 70% renewable electricity by 2032, with interim goals including a 35% emissions reduction by 2030 compared to 2005 levels, and net zero emissions by 2050. The state is also investing heavily in Renewable Energy Zones (REZs) and hydrogen development.

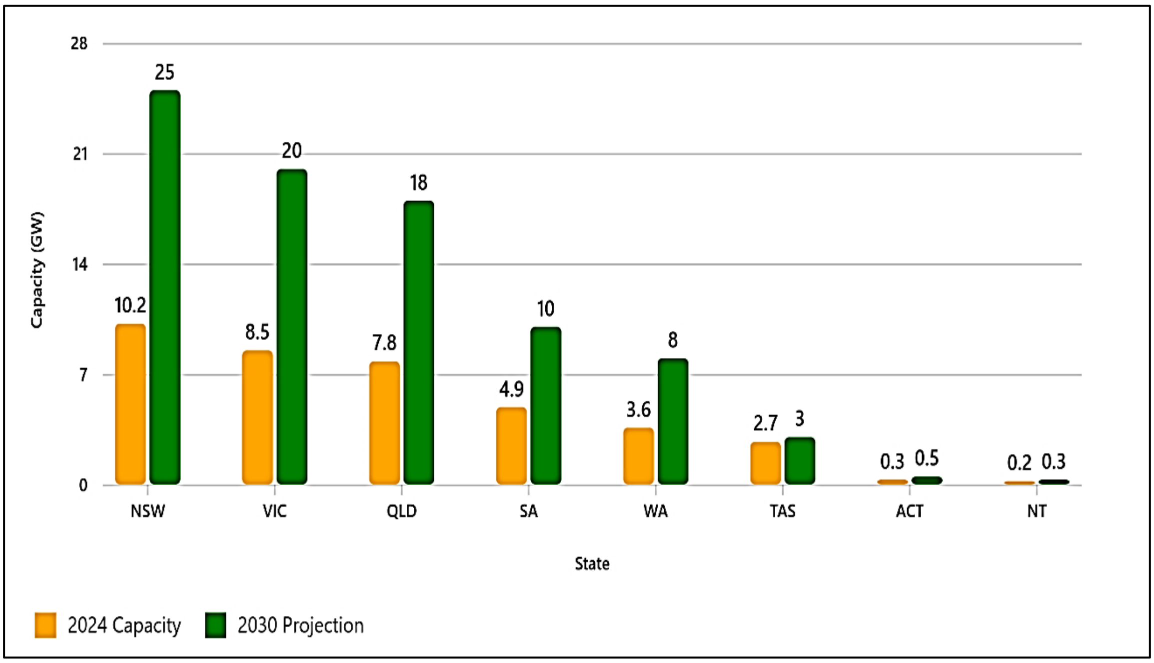

Figure 9. Australia's state-level renewable energy capacity in 2024 vs Projected capacity in 2030 (CER[2] 2025)

These state-level initiatives reflect a decentralised approach to energy transition, where subnational governments play a critical role in driving innovation, investment, and policy ambition.

Feed-in tariffs and green certificates

Feed-in Tariffs (FiTs) have played a pivotal role in Australia's renewable energy transition, particularly in promoting the uptake of small-scale solar PV and wind systems**.** Initially introduced as generous, fixed-rate incentives to encourage early adoption, FiTs allowed households and businesses to receive payments for excess electricity exported to the grid (SER, 2025).

[2] Clean Energy Regulator_ Australia

Over time, as solar technology costs declined and market penetration increased, FiT schemes evolved into market-based or retailer-determined rates**,** varying by state and electricity provider. Today, FiTs are still available across most states, such as NSW, Queensland, South Australia**,** Tasmania, and the ACT, but the rates are generally lower and reflect wholesale electricity prices and grid demand (Energy Gov). This shift marks a transition from subsidy-driven deployment to a more market-integrated model**,** aligning with broader energy market reforms and the integration of distributed energy resources.

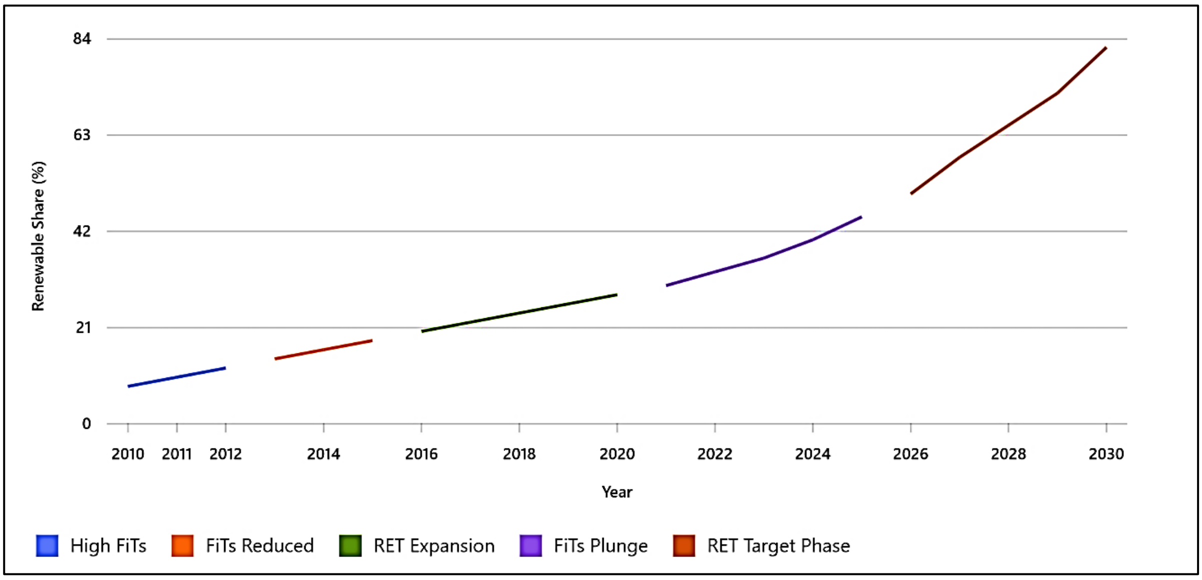

Figure 10. Australia's renewable energy development from 2010 to 2030. [3]

2.4.2 Technological Advances

Australia leads in renewable energy technology through its deployment of grid-scale batteries and smart grids. The Hornsdale Power Reserve in South Australia (Neoen & Tesla, 2017/2020) is a 150 MW/194 MWh lithium-ion system that enhances grid

[3] **Feed-in Tariffs (FiTs) & Green Certificates (LGC s/STC s) (SER 2025)**

stability, frequency regulation, and inertia support via Tesla's Virtual Machine Mode (Neoen & Tesla, 2023). Simultaneously, the Australian Government has advanced smart grid initiatives supported by CSIRO and multiple universities to integrate distributed solar and wind generation through advanced sensors, digital communications, and automated controls (Department of Resources, Energy and Tourism, 2011).

2.4.2.1 Grid scale battery State-wide contribution

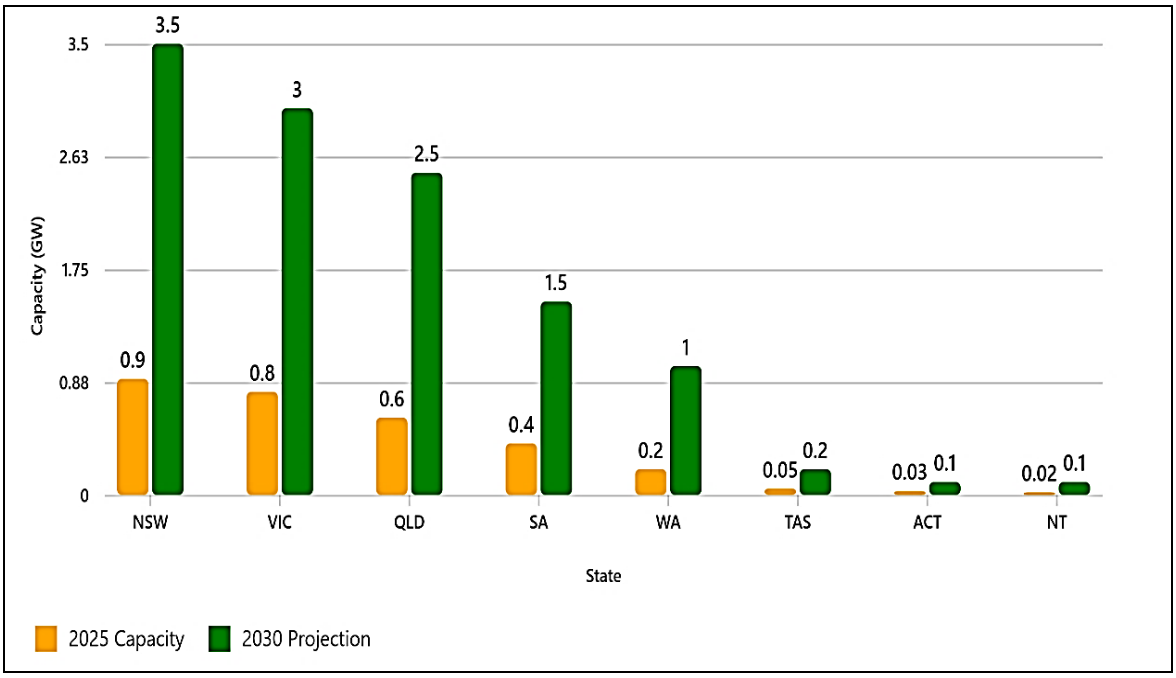

Figure 11. Projected grid-scale battery capacity growth by Australian state (2025-2030) [4]

[4] NEM

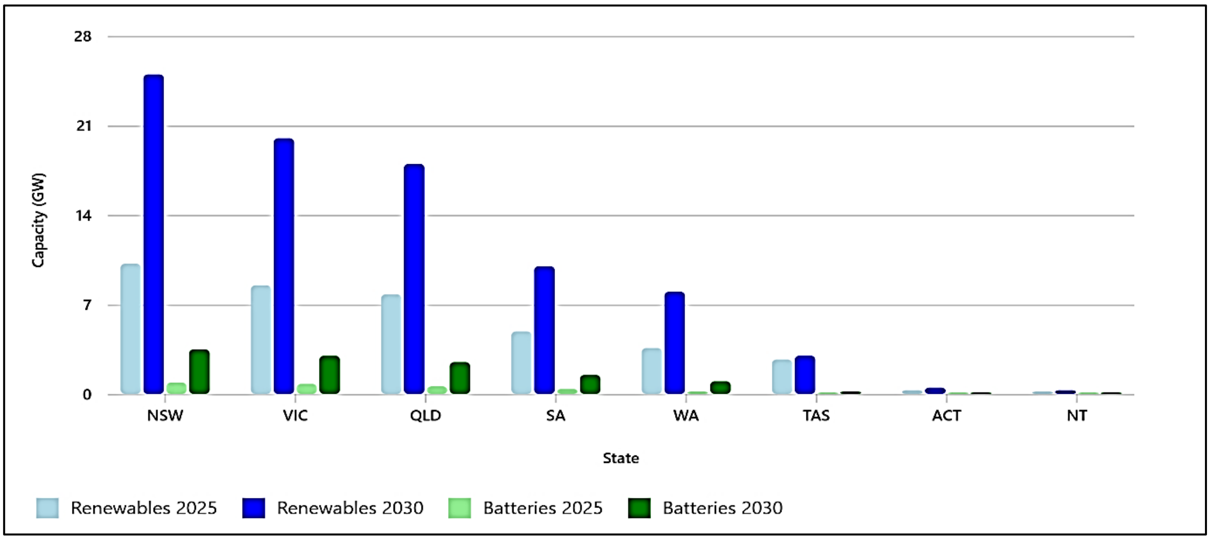

Figure 12. Renewable energy and grid-scale battery capacity growth by Australian state (2025 to 2030)

2.4.2.2 Smart grid deployment in Australia

Smart grids incorporate information and communications technology into every aspect of electricity generation, delivery and consumption in order to minimise environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency (EPRI 2013).

These technologies can be implemented at every level, from generation technologies to consumer appliances. As a result, smart grids can play a crucial role in the transition to a sustainable energy future in several ways; facilitating smooth integration of high shares of variable renewables; supporting the decentralised production of power; creating new business models through enhanced information flows, consumer engagement and improved system control; and providing flexibility on the demand side.

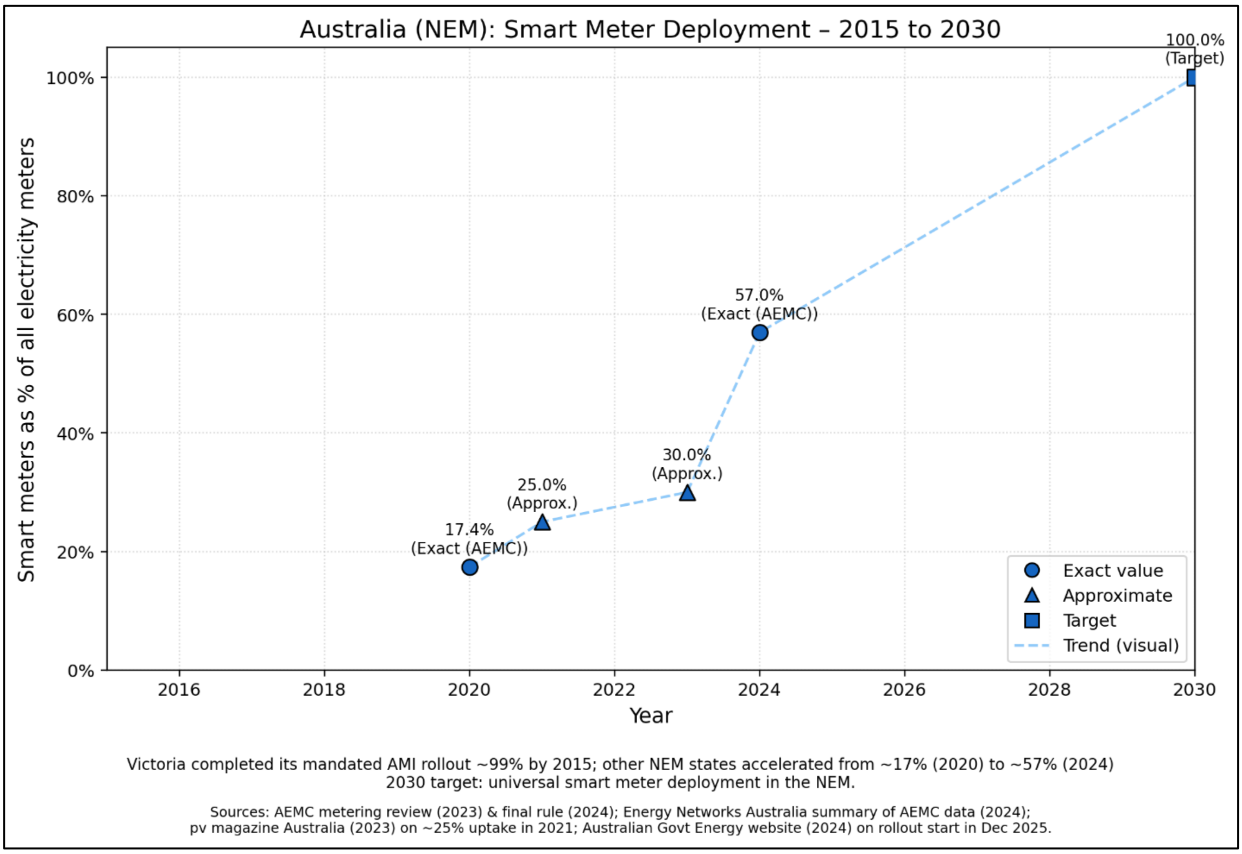

Figure 13. Deployment of smart meters in Australia from 2015 - 2030 [5]

2.4.3 Market and Investment Dynamics

2.4.3.1 Private sector participation

Private sector participation has driven significant growth in Australia's renewable energy sector. From under AUD 0.5 billion in 2005 to nearly AUD 9 billion by 2025, large-scale renewable investments surged, marking a record-breaking expansion in capital inflows. Concurrently, the number of privately led renewable energy projects has risen markedly; as of mid-2025, 97 large-scale projects were under construction, reflecting sustained market confidence. Annual renewable capacity additions have also

[5] **Energygov.au/AEMC**

soared from approximately 50 MW to over 1,100 MW in recent years highlighting the private sector's pivotal role in expanding Australia’s clean energy infrastructure. (CEC,2025).

Year	Investment (Billion AUD)	Projects Led	Capacity Added (MW)
2005	0.2	2	50
2006	0.3	3	60
2007	0.4	4	70
2008	0.5	5	80
2009	0.6	6	100
2010	0.8	8	120
2011	1	10	150
2012	1.2	12	180
2013	1.5	15	220
2014	1.8	18	260
2015	2.2	22	300
2016	2.5	26	350
2017	3	30	400
2018	3.5	35	450
2019	4	40	500
2020	4.8	48	600
2021	5.5	55	700
2022	6.2	62	800
2023	7	70	900
2024	8	80	1000
2025	9	90	1100

Table 1. Private sector investment on renewable Energy (2005–2025)

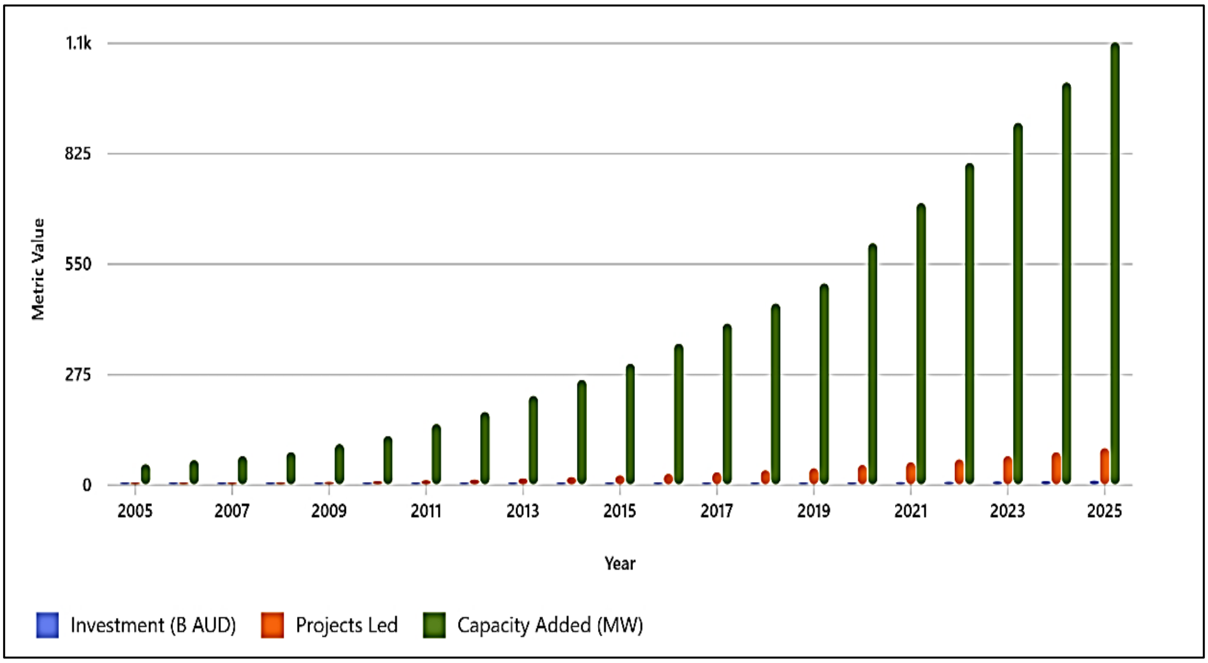

Figure 14. Private sector investment impact on renewable energy (2005–2025)

2.4.3.2 Green finance instruments:

Green finance instruments have significantly accelerated renewable energy deployment in Australia by enabling capital flow into low-carbon infrastructure. Tools such as green bonds, sustainability-linked loans, and climate-aligned investment funds have reduced financing risk and improved bankability for large-scale solar, wind, and hydrogen projects. (Nalau et al, 2025).

Government-backed instruments, including Green Treasury Bonds and programs like Rewiring the Nation, have supported grid upgrades and DER integration. Regulatory developments, such as a national sustainable finance taxonomy and enhanced climate disclosure standards, are further aligning financial markets with Australia’s decarbonization goals (AOFM).

Year	Green Bond Issuance (B AUD)	Projects Funded	Renewable Capacity Added (MW)
2008	0	0	0
2009	0.1	2	100
2010	0.2	4	200
2011	0.3	6	300
2012	0.5	10	500
2013	0.8	15	700
2014	1	20	900
2015	1.5	25	1100
2016	2	30	1300
2017	2.5	35	1500
2018	3	40	1700
2019	3.8	50	2000
2020	4.5	60	2300
2021	5.2	70	2600
2022	6	80	2900
2023	7	90	3200
2024	8.5	100	3500
2025	10	110	3800

Table 2. Impact of green finance instruments (ARENA, 2025) [6]

2.4.4 Barriers and Overcoming Them

Grid constraints and "**duck curve**" (mismatch between solar generation and evening demand) are key barriers. Intense energy production from solar PV cells on rooftops throughout the day followed by next to zero production when the sun sets do little to meet energy demand which ramps up sharply in the afternoon. This phenomenon is captured by the "duck curve". The duck curve named due to its shape helps us understand the challenge of renewables integration through a useful graphical

[6] **Source:** https://www.aofm.gov.au

depiction of how network energy demand (i.e. demand from the electricity grid itself, excluding rooftop solar PV) typically varies over a day.

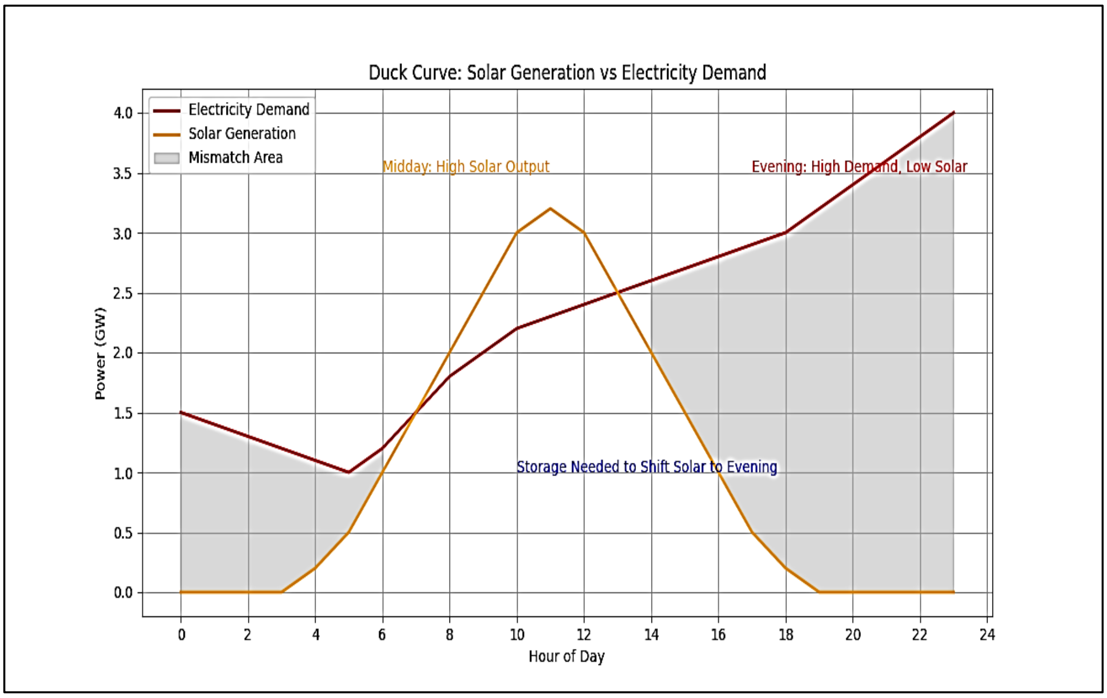

Figure 15. Solar generation VS Electricity demand (Duck Curve) (CEC 2022)

Political debates over climate policy, but generally stable investment environment due to regulatory clarity. (Clean Energy Australia Report, 2022). The CEC launched the “Clean Energy Works for Australia” campaign to counter growing misinformation and politicization of renewable energy. Their research showed that 68% of Australians support more renewable energy, with rooftop solar (80%) and hydropower (73%) receiving the highest approval. However, the rise of anti-renewables narratives has created uncertainty among voters, especially regarding cost-of-living impacts and energy reliability. (CEC 2025).

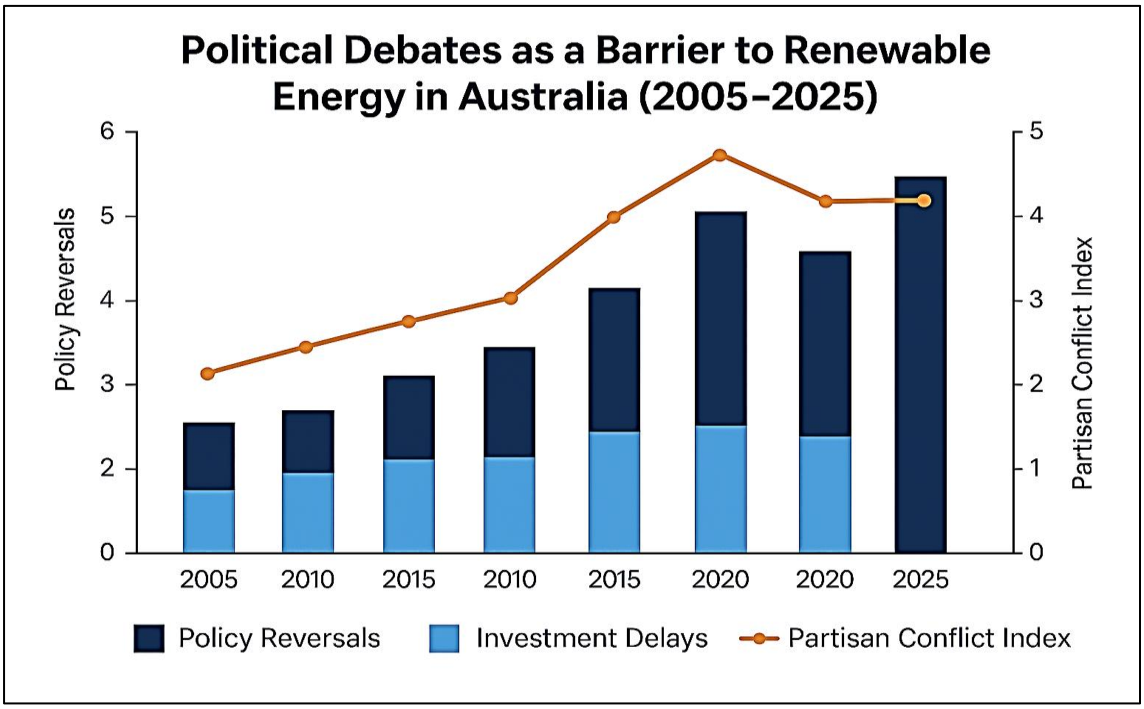

Figure 16. Political debates over climate policy [7]

2.4.4.1 Why Policy reversal peaked in 2025?

The peak in policy reversals in 2025 reflects:

- Political tension during an election year [lens.monash.edu]
- Mixed signals from government on fossil fuels vs renewables
  [www.climat...recard.org] [techxplore.com]
- Delays in delivering key climate strategies
- Rising public and expert pressure to act decisively

[7] **Lens.Monash.edu**

2.5 Sri Lanka's Renewable Energy Landscape

2.5.1 Ambitious Targets

In 2025, Sri Lanka's renewable energy landscape is undergoing a significant transformation, driven by ambitious national targets and international support. The government aims to achieve 70% of electricity generation from renewable sources by 2030 and carbon neutrality in the power sector by 2050.

As of 2023, the country had an installed capacity of 5,191 MW, with nearly half still reliant on thermal power. To address this, the Asian Development Bank (ADB) approved a $200 million loan to modernize transmission and distribution infrastructure, integrate grid-scale battery storage, and implement digital grid management systems. These upgrades are critical for accommodating variable renewable energy sources like solar and wind. Additionally, Sri Lanka is establishing a Renewable Energy Centre to enhance forecasting and system planning. Despite challenges such as fossil fuel and grid limitations, the country is making steady progress toward a more resilient, low-carbon energy future. (ADB & SSEA).

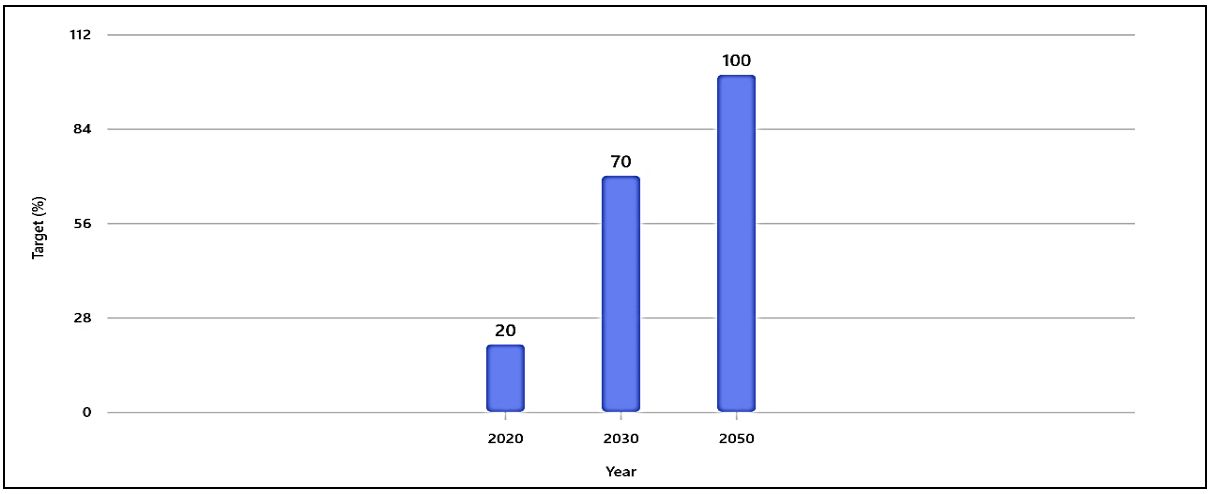

Figure 17. Sri Lanka's renewable energy targets (SLSEA)

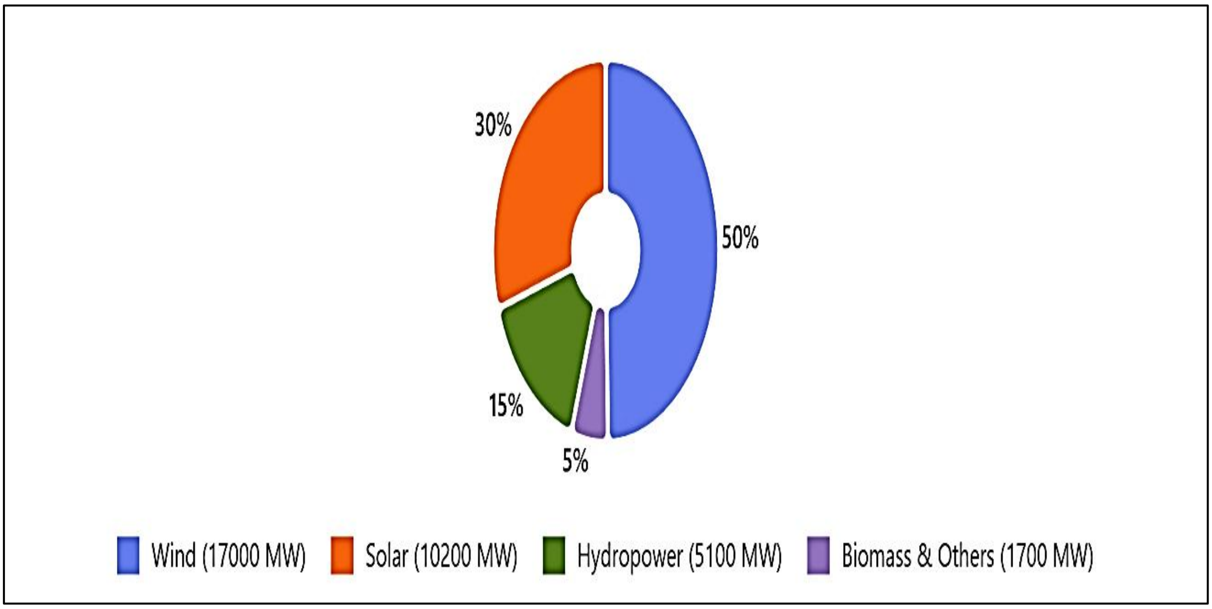

Figure 18 .Sri Lanka's renewable energy targets in MWs by 2050 (ADB)

2.5.2 Institutional and Policy Context

- Sri Lanka Sustainable Energy Authority (SLSEA)
- Ceylon Electricity Board (CEB)
- Policy incentives (feed-in tariffs, net metering), but inconsistent implementation

Institutional Role: SLSEA manages renewable energy resources and promotes energy efficiency to support sustainable development.

Policy Context: Aligning with national carbon neutrality goals and implementing strategic renewable energy development plans.

Stakeholder Engagement: Collaborating with NGOs, conducting public consultations, and integrating scientific research in policymaking.

Challenges & Opportunities: Addressing land availability issues and increasing private sector involvement for renewable projects.

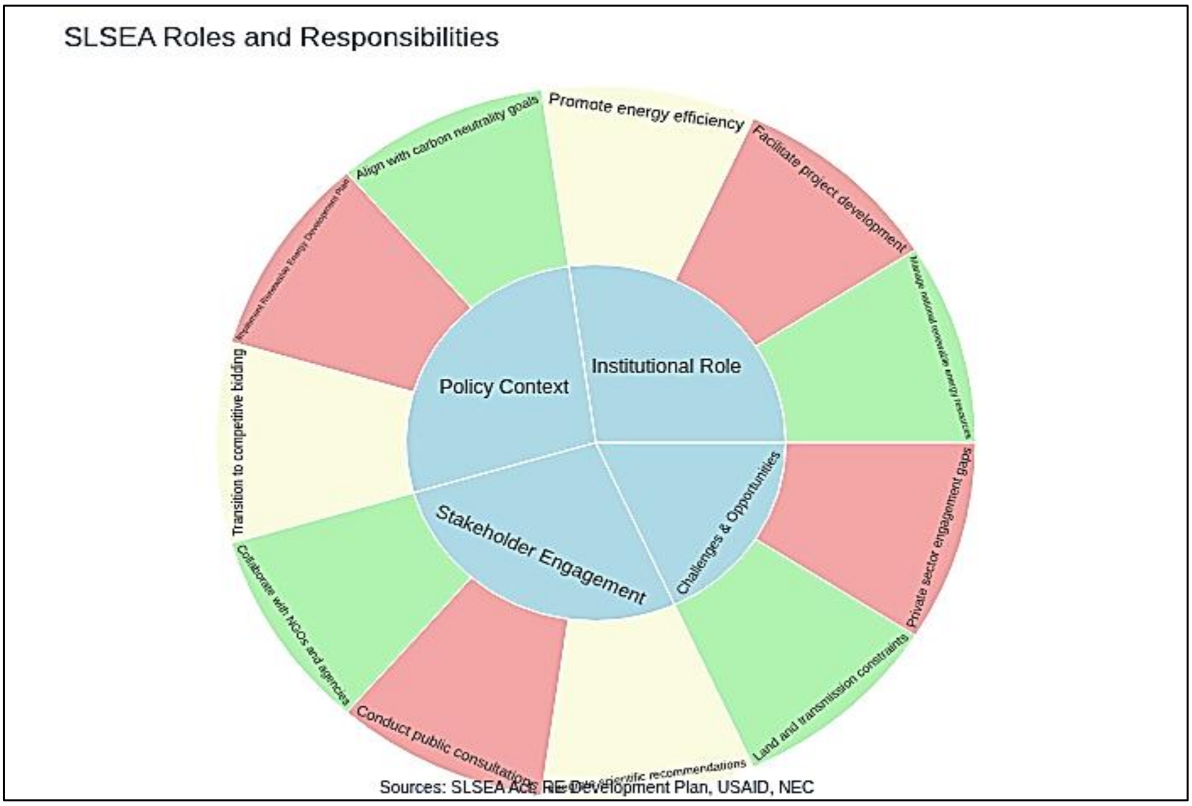

Figure 19. SLSEA Institutional and Policy role (SLSEA)

<u>Institutional Role</u>: Ceylon Electricity Board (CEB) plays grid operations, project development and storage integration role.

Policy Context: Electricity Act reforms, unbundling, competitive procurement

Strategic Goals: 70% renewables by 2030, carbon neutrality by 2050

Challenges: Reform resistance, union opposition, governance issues

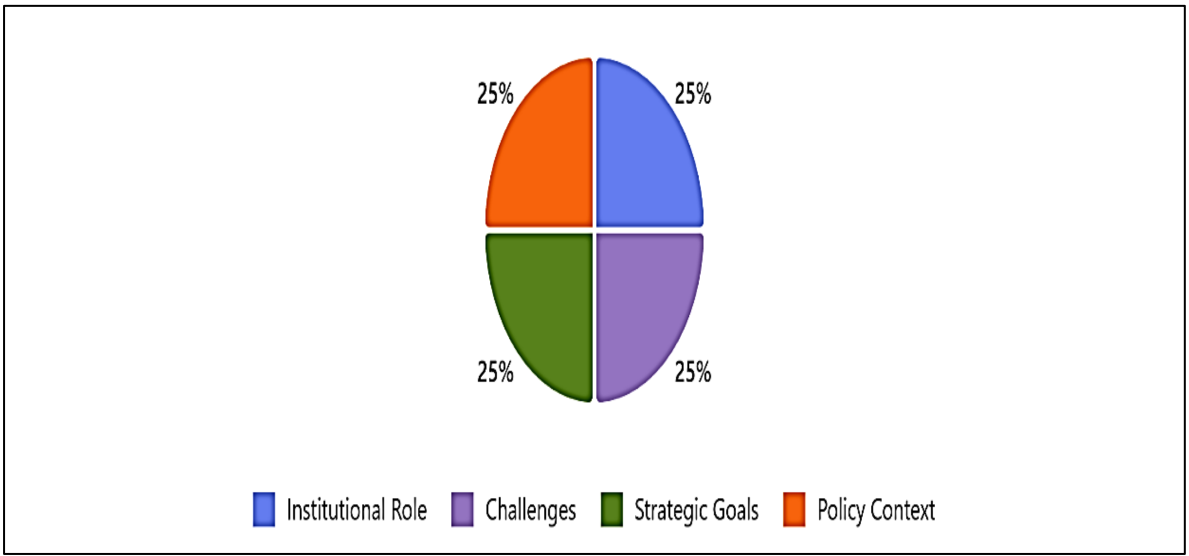

Figure 20. Sri Lanka’s renewable energy institutional and policy context (CEB)

2.5.2.1 Sri Lanka’s renewable energy institutional and policy context

Sri Lanka’s renewable energy institutional and policy framework is underpinned by the strategic roles played by the Ceylon Electricity Board (CEB) and the Sri Lanka Sustainable Energy Authority (SLSEA) in planning, regulation, and implementation

2.5.2.2 Comparison between SLSEA and CEB

SLSEA's Strategic Role:

- SLSEA leads in resource management, policy leadership, and stakeholder engagement driving energy efficiency initiatives.

CEB's Operational Role:

- CEB manages grid operations, infrastructure development, and implements long-term energy planning for energy distribution.

Institutional Dynamics:

- SLSEA's proactive, collaborative approach contrasts with CEB's internal resistance and governance challenges.
- Shared National Goals
- Both SLSEA and CEB contribute to Sri Lanka's targets of 70% renewable energy by 2030 and carbon neutrality by 2050.

2.5.3 Technological and Infrastructure Barriers

Sri Lanka faces key technological and infrastructure barriers to renewable energy adoption, including an aging grid, limited capacity to handle variable renewables, and a lack of energy storage solution solutions.

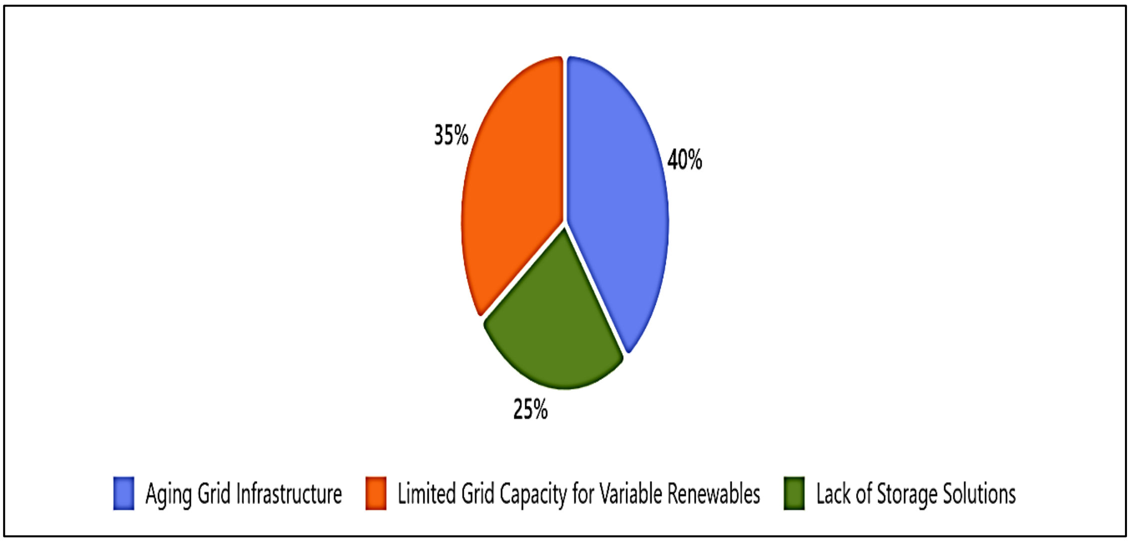

Figure 21. Breakdown of Technological and Infrastructural Barriers (CEB) [8]

[8]**Source**: Renewable Energy Resource Development Plan 2021-2026

2.5.4 Financial and Investment Barriers

Limited access to concessional loans and green bonds presents a major barrier to financing renewable energy projects, especially in emerging markets. These projects also suffer from high upfront capital requirements often deemed prohibitive forcing reliance on foreign aid and development bank funding to bridge the investment gap (Dutt et al., 2025).

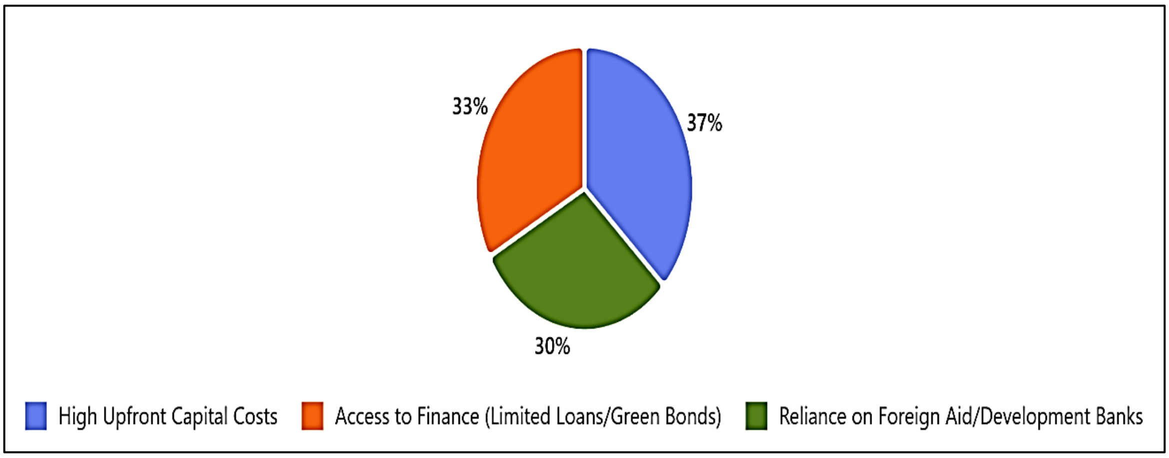

Figure 22. Breakdown of Financial and Investment Barriers (PUCSL)

2.5.5 Policy and Political Challenges

Frequent policy shifts, political interference, and regulatory opacity in Sri Lanka's energy sector have eroded private sector confidence. Inconsistent policy implementation disrupts project pipelines, while political influence over tariffs and procurement undermines transparency. These factors elevate investment risk, delay project execution, and constrain capital inflow into renewable energy development.

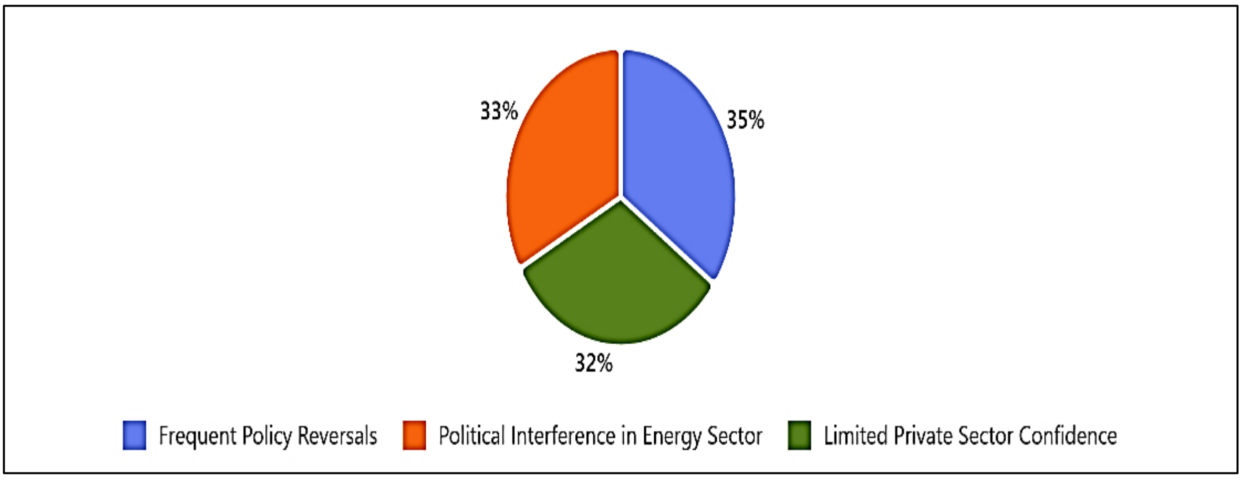

Figure 23. Distribution policy and political challenges in developing renewable energy in Sri Lanka [9]

2.5.6 Ongoing Initiatives

a) Wind and solar pilot projects

b) Mini-hydropower development

2.6 Theoretical Frameworks

2.6.1 Innovation Diffusion Theory (IDT)

Everett Rogers' Innovation Diffusion Theory (IDT) outlines how new ideas and technologies spread through societies over time (Rogers, 2003). It's especially useful for understanding the adoption of renewable energy technologies.

The IDT outlines how innovations are adopted through five key stages and adopter categories, in the context of renewable energy.

The theory is built around several key concepts:

[9] **Source:** Energy **Policy Evolution in Sri Lanka**

Innovation: Introduction of technologies like solar PV, wind turbines, or smart meters.

Communication Channels: Information spreads via media, government programs, peer networks, and industry bodies.

Time: Adoption occurs gradually, influenced by awareness, trialability, and perceived benefits.

Social System: Cultural, economic, and policy environments shape adoption rates.

2.6.2 Policy Transfer and Policy Learning

Sri Lanka's renewable energy strategy can be significantly enhanced through both policy transfer and policy learning. Policy transfer involves adopting or adapting successful frameworks and practices from other countries, such as Australia's Renewable Energy Target (RET) and coordinated "Powering Australia" plan to the local Sri Lankan context to accelerate deployment of clean energy solutions. Policy learning, on the other hand, encompasses iterative reforms and refinements in domestic policy design, guided by comparative analyses of international policy outcomes. By leveraging Australia's experience, particularly in integrating grid-scale renewables, developing incentive mechanisms, and implementing regulatory structures, Sri Lanka can strengthen its institutional frameworks and improve policy effectiveness in accelerating its energy transition.

2.6.3 Multi-Level Governance

Multi-level governance refers to the distribution of decision-making authority across different levels of government; local, national, and supranational and is increasingly relevant in the context of renewable energy policy. This framework is particularly useful for comparing governance structures in federal systems like Australia, where states and territories play a significant role in energy policy, with unitary systems such as Sri Lanka, where central government decisions dominate. Understanding how responsibilities and resources are allocated across these levels can illuminate the challenges and opportunities in implementing cohesive and effective renewable energy strategies (Hooghe & Marks, 2003).

2.7 Comparative Studies in Renewable Energy Policy

Comparative studies in renewable energy policy have traditionally focused on contrasts between developed and developing countries, offering insights into structural, financial, and institutional differences. However, there is a notable gap in research specifically comparing Australia and Sri Lanka, or more broadly, South Asian contexts (International Energy Agency [IEA], 2023). Lessons drawn from regions such as Europe, Latin America, and Africa consistently highlight the importance of policy stability, independent regulatory bodies, and targeted financial mechanisms as key enablers of successful energy transitions. These findings suggest that similar principles could be adapted to strengthen renewable energy governance and implementation in Sri Lanka.

2.8 Identified Research Gaps

A limited body of comparative research exists examining the barriers to, and potential solutions for, renewable energy development in Sri Lanka and Australia. Furthermore, there is a notable shortage of region-specific policy transfer studies relevant to the South Asian context. Consequently, there remains a clear need for integrated analytical approaches that incorporate technical, financial, policy, and political dimensions to more comprehensively address the challenges associated with renewable energy transitions.

2.9 Chapter Summary

This review demonstrates that while global renewable energy adoption is accelerating, developing countries like Sri Lanka face distinctive challenges compared to developed economies such as Australia. Policy, technology, finance, and politics interact to create unique barriers, but lessons can be learned from successful transitions elsewhere. The comparative focus of this study addresses a key gap in both academic and policy literature.

CHAPTER 3

3 METHODOLOGY

3.1 Introduction

This chapter provides a comprehensive overview of the methodological approach for this comparative study. By adopting a mixed-methods strategy, the research aims to capture both macro-level trends and the nuanced experiences of stakeholders involved in renewable energy transitions in Sri Lanka and Australia.

3.2 Research Design

3.2.1 Justification for Mixed-Methods Approach

The complex, multi-layered challenges of renewable energy transitions cannot be fully understood through a single method (Creswell & Plano Clark, 2018). Quantitative data is critical for identifying trends in capacity growth, investment flows, and policy effectiveness, while qualitative data provides depth by exploring stakeholder perspectives, institutional challenges, and political dynamics.

3.2.2 Comparative Case Study Methodology

A comparative case study enables deep, context-sensitive analysis of how and why renewable energy transitions unfold differently in Sri Lanka and Australia. Each country serves as a case, and the method involves:

Describing: The policy and market landscape in each context.

Explaining: The factors driving differences and similarities.

Learning: Which elements of Australia's model may be adapted to Sri Lanka.

3.2.3 Why these countries?

Australia exemplifies a developed nation with advanced energy integration, while Sri Lanka illustrates a developing country facing typical barriers of the South Asian region.

3.3 Data Collection Methods

3.3.1 Secondary Data Collection

3.3.1.1 Data Sources

a.) International databases: IEA, IRENA, REN21, World Bank, Asian Development Bank (ADB).

b.) National sources: Sri Lanka Sustainable Energy Authority (SLSEA), Ceylon Electricity Board (CEB), Australia's Department of Climate Change, Clean Energy Council.

c.) Academic literature: Peer-reviewed journals, books, previous case studies.

d.) Grey literature: NGO reports, conference proceedings, industry white papers.

3.3.1.2 Data Types

1) **Quantitative:** Installed capacity (MW), share of renewables (%), investment amounts (USD), policy target achievements.
2) **Qualitative:** Policy texts, regulatory frameworks, reports on implementation challenges, stakeholder perspectives and interviews.

3.3.1.3 Data Collection Process

I. Systematic search using keywords: “renewable energy,” “Sri Lanka,” “Australia,” “policy,” “finance,” “technology,” “governance.”

II. Inclusion/exclusion criteria: Only data from 2010–2025, preference for peer-reviewed and official sources.

3.3.1.4 Data Reliability

In rigorous renewable energy research, ensuring data reliability involves two key methodological strategies. First, scholars often conduct cross-validation between multiple authoritative sources, such as corroborating national or government reported statistics with datasets from the International Energy Agency (IEA). This approach helps reconcile discrepancies, standardize measurement units, and reinforce confidence in reported capacities, production figures, and projections by leveraging the methodological robustness of sources like the IEA’s Renewable Energy Progress Tracker. Second, qualitative insights such as findings from expert interviews are systematically triangulated with quantitative datasets (Leech et al 2007) emphasize this formal triangulation, which employs multiple analytical tools (e.g., constant comparison, domain, or taxonomic analysis) to validate emerging patterns across data types and thus enhance the credibility and completeness of research conclusions. By embedding these strategies cross-checking statistical records and triangulating qualitative evidence researchers strengthen the internal validity and overall robustness of renewable energy assessments cross-checking between sources (government data with IEA datasets).

3.3.2 Primary Data Collection

3.3.2.1 Expert Interviews

1) Participant Selection:

Criteria: Minimum 2 years of experience in energy sector policy, development, regulation, or project implementation.

Sources: LinkedIn, professional associations, government directories, academic & industry networks (Ceylon Electricity Board (www.ceb.lk) from Sri Lanka & Energy Queensland (www.energyqueensland from Australia.

Target: more than 10 expert participants from Sri Lanka & Australia respectively.

2) Interview Design:

Semi-structured format: Allows both comparison and depth.

Key Survey Questions: Majority Structured as Multiple-Choice Items

a) Can you describe the key policy/technology barriers facing renewable energy in your country?

b) What role does political stability play in investment decisions?

c) Have you observed successful approaches in other countries that could be adapted locally?

Refer Interview Questionnaire for the details.

3) Logistics:

"Google Form" is used to collect information from experts in Sri Lanka as well as in Australia (fastest electronic media). Refer appendix 1-3 for details.

Duration: Approximately 15 minutes per interview.

3.3.3 Document Analysis

Documents reviewed: National renewable energy action plans, strategic frameworks, legislative texts, regulatory agency annual reports, major investment agreements.

3.3.3.1 Purpose

In renewable energy research, purpose of document analysis is used to uncover gaps between policy intentions and actual implementation, and to compare the structural differences in regulatory frameworks across regions. This method helps researchers assess how effectively policies translate into practice and how regulatory designs influence renewable energy outcomes (Fransen et al.,2025).

3.3.3.2 Analytical approach

Use of coding sheets/checklists to assess document scope, clarity, and evidence of policy learning or transfer.

3.4 Data Analysis Methods

3.4.1 Quantitative Data Analysis steps:

3.4.1.1 Descriptive statistics:

a) Mean, median, annual growth rate of renewable capacity and investment.

b) Time-series analysis to show trends pre- and post-major policy changes.

c) Comparative tables/graphs (Capacity growth in Sri Lanka vs. Australia 2010–2035)

3.4.2 Qualitative Data Analysis

3.4.2.1 Steps of Thematic Analysis

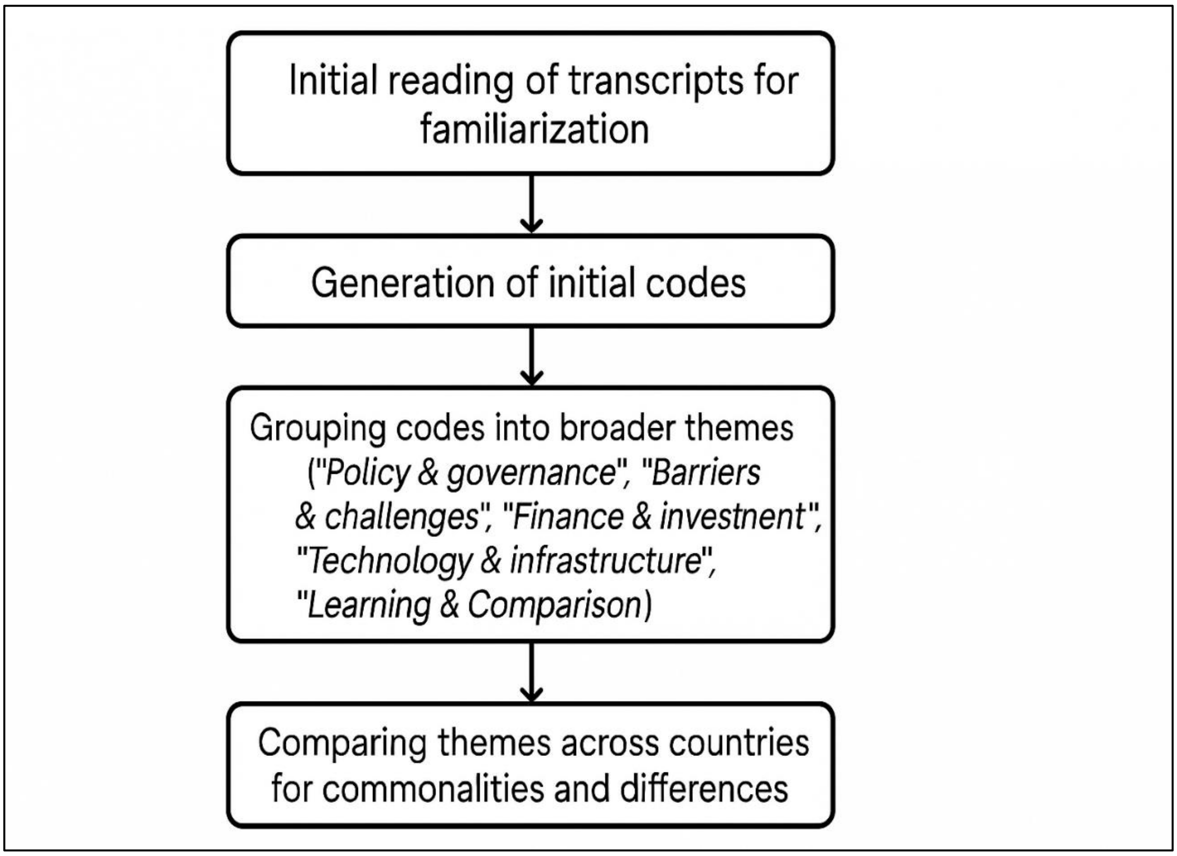

Figure 24. Flow chart of Thematic analysis (Braun & Clarke, 2006)

3.4.3 Policy Content Analysis

Compare how policy documents address (or fail to address) core challenges and identify presence of “policy transfer” (explicit mention of adopting foreign best practices).

3.4.4 Integration with Quantitative Data

Narrative synthesis bringing together statistical trends and qualitative findings for each research question.

3.5 Validity and Reliability

3.5.1 Ensuring Validity

1.) Data triangulation:

Cross-validate findings from interviews, documents, and quantitative dataset

2.) Respondent validation (member checking):

Share summaries with interviewees for confirmation or clarification.

3.) Peer debriefing:

Regular consultations with academic supervisors or expert panels to review analytical approach and findings.

3.5.2 Ensuring Reliability

Audit trail: Detailed documentation of every step from data collection to final analysis.

3.6 Ethical Considerations

1.) Ethics Approval: Approval obtained from institution's ethical policies.

2.) Informed Consent: All participants briefed on the study's purpose, their rights, and confidentiality protections

3.7 Data Security

Interview files stored on encrypted devices & secure cloud storage; only research team member has access. In conducting this research, rigorous attention will be directed towards identifying and mitigating potential risks, particularly those associated with heightened political sensitivities in the study regions. To ensure the protection of all participants; especially individuals contributing perspectives from Sri Lanka, all quotations, contextual details, and any potentially identifiable information will be thoroughly anonymised to safeguard their privacy and personal security. Furthermore, the project will uphold strict standards of transparency by formally declaring all sources of funding, research sponsorships, and any prior professional affiliations. This approach is intended to maintain the highest level of research integrity, minimise perceived or actual conflicts of interest, and reinforce the credibility and independence of the study.

3.8 Limitations

1.) Data Accessibility: Difficulty in accessing the most current or granular data for Sri Lanka, particularly on investment flows or grid performance.

2.) Interview Challenges: Some key informants may decline to participate, especially on politically sensitive topics.

3.) Comparability: Structural differences (population size, market scale) acknowledged as influencing findings results are interpretative, not predictive.

4.) Language: Some Sri Lanka documents are in Sinhala or Tamil languages where translation is required.

3.9 Chapter Summary

The chapter has detailed a rigorous, multi-method research strategy for examining renewable energy transitions in Sri Lanka and Australia. Through careful data collection, analytical triangulation, and strict adherence to ethical standards, this study aims to provide robust, actionable policy recommendations, while acknowledging limitations inherent in comparative energy policy research. A strong sample interview guide is critical for high-quality qualitative research.

CHAPTER 4

4 DATA ANALYSIS - SRI LANKA VS. AUSTRALIA

4.1 Introduction

This chapter provides a rigorous comparative analysis of the renewable energy sectors in Sri Lanka and Australia. It draws upon a combination of statistical datasets, policy documents, and qualitative perspectives sourced from subject matter experts and key industry stakeholders. Through this integrated evidence base, the chapter examines critical points of convergence and divergence across technology adoption, financing mechanisms, policy architecture, and broader political and institutional environments. Data reliability and validity procedures were systematically applied to ensure analytical robustness. The thematic discussion is organised around the principal barriers and enabling factors identified in Chapters 2 and 3, establishing a foundation for interpreting the dynamics that shape renewable energy development in both national contexts.

4.2 Overview of Renewable Energy Growth: 2010–2025

4.2.1 Sri Lanka: Key Trends

Between 2010 and 2025, Sri Lanka's installed renewable energy capacity demonstrated consistent year-over-year growth, rising from approximately 1,435 MW in 2010 (embedded within a total capacity of ~2,847 MW) to 3,612 MW by mid-2024, and reaching 4,031 MW by early 2025 and 11.6 % increase over the previous year (PUCSL, 2024.a; PUCSL, 2024.b; PUCSL, 2025). This trend is projected to accelerate during 2026–2035, with higher average annual growth rates fuelled by stronger policy support and investment. Under a medium-growth scenario, total installed capacity is expected to reach 6,531 MW by 2035, marking an overall increase of 4,031 MW from its 2010 baseline. Notably, 2026 is anticipated to be the peak growth year, with a projected 6.4 % annual increase, reflecting the impact of scaled renewable deployment and grid integration (PUCSL, 2025).

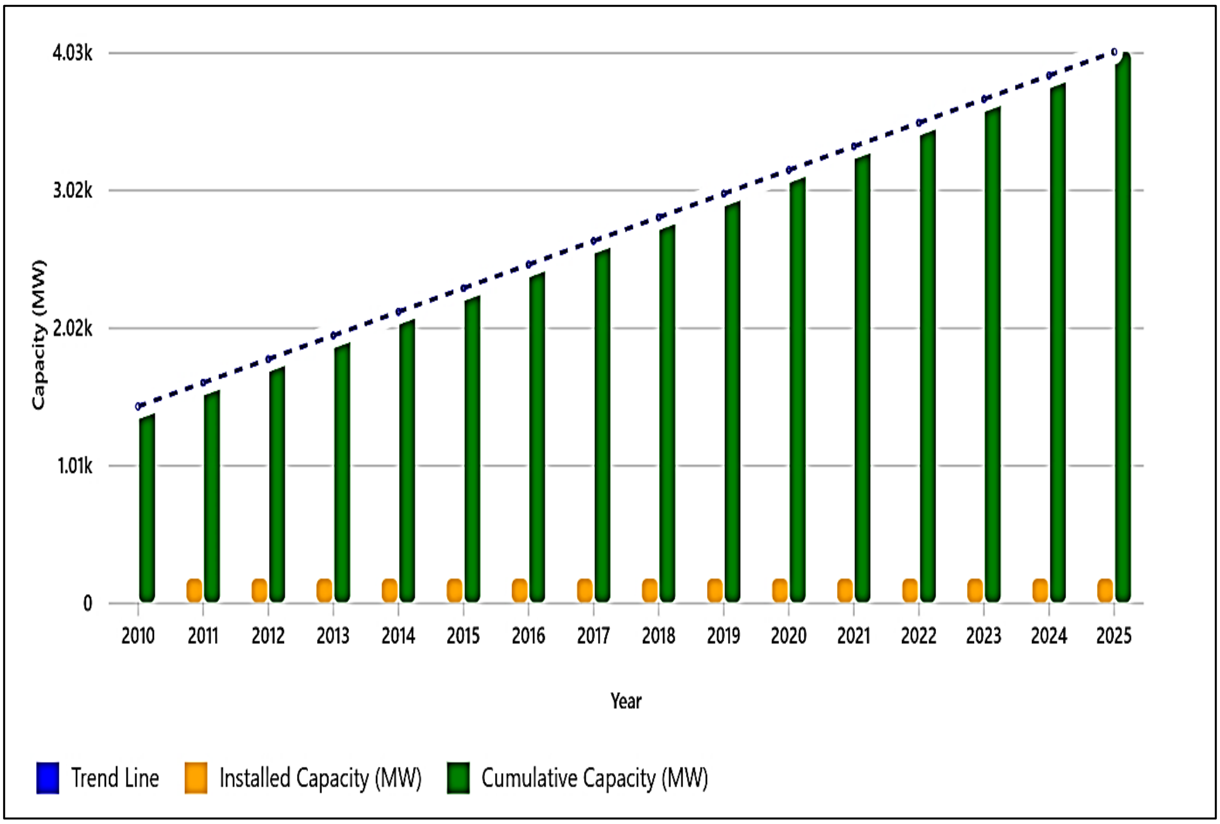

Figure 25. Sri Lanka renewable energy installed capacity growth trend (PUCSL)

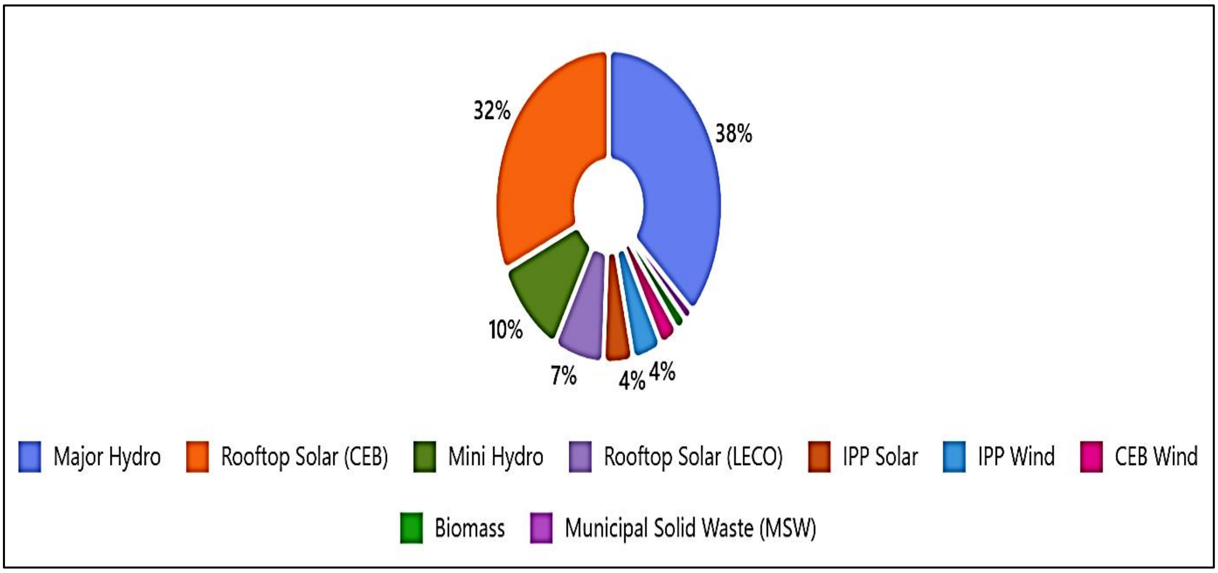

Figure 26. Sri Lanka renewable energy Installed capacity in 2025 by source (PUCSL)

4.2.2 Australia: Key Trends

Between 2010 and 2024, Australia's installed renewable energy capacity increased approximately fourfold, climbing from around 15 GW to an estimated 60 GW (IRENA, 2025, Clean Energy Regulator, 2024). The year 2024 marked a record-breaking

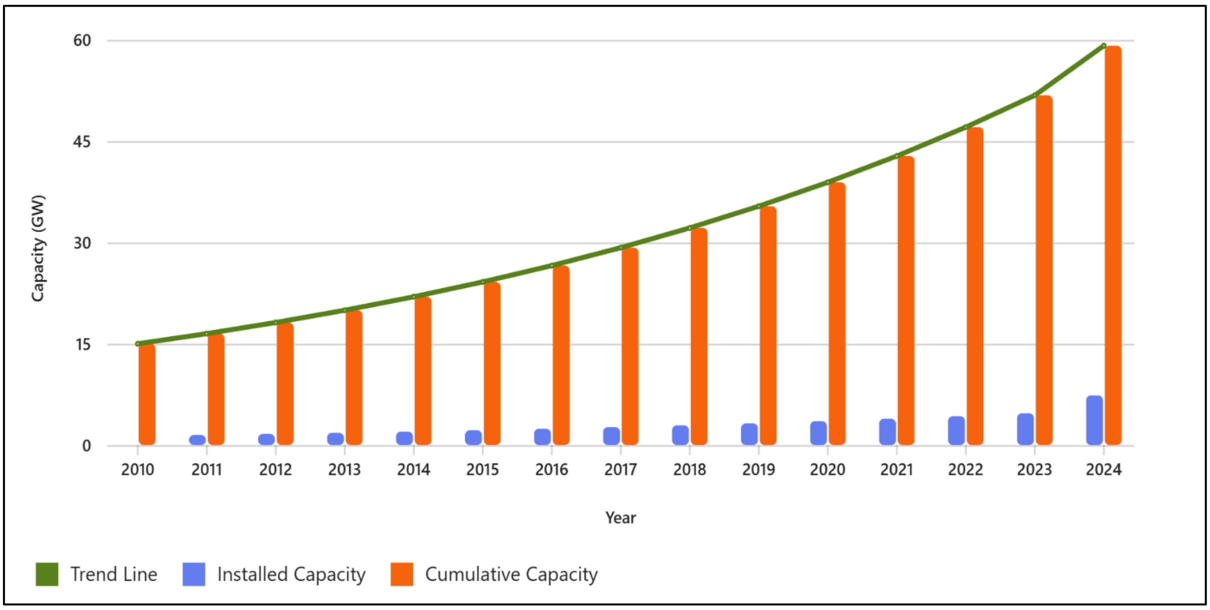

Figure 27. Australia renewable energy installed capacity growth trend (CER, 2024)

expansion, with 7.2–7.5 GW of new solar and wind capacity added; comprising 4.3 GW of large-scale projects and 3.2 GW of rooftop solar installations (Clean Energy Regulator, 2024; AEMO, 2025). By early 2025, renewable sources accounted for 43 % of electricity generation in the National Electricity Market (AEMO, 2025), reflecting the maturity and integration of this expanding capacity. The average annual growth rate over the period was therefore around 10 %, with 2024 emerging as the highest year of capacity addition. This sustained trajectory underscores Australia's accelerated transition toward a clean energy system, supported by robust deployment across both utility-scale and distributed renewable assets.

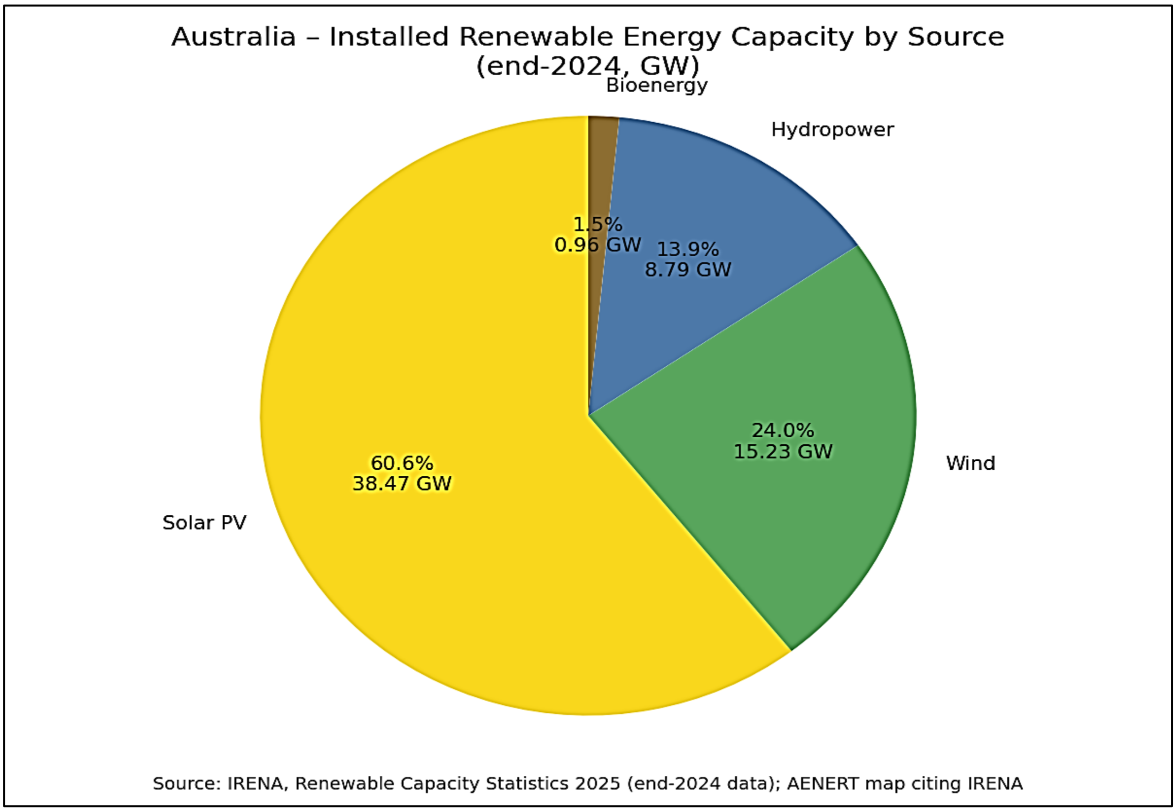

Figure 28. Australia renewable energy installed capacity in 2025 by source (IRENA)

4.2.3 Descriptive statistics

4.2.3.1 Capacity and investment measures

Measure	Sri Lanka Capacity (MW)	Australia Capacity (MW)	Sri Lanka Investment USD million	Australia Investment USD million
Mean	635	13812	87.5	1750
Median	625	13500	87.5	1750
Annual growth rate	4.30%	6.60%	5.60%	6.30%

Table 3. Capacity & investment measures of renewable energy (Australia Vs Sri Lanka)

Notes & Caveats:

1. Sri Lanka capacity figures lack full annual data; estimates based on aggregated trends.
2. Sri Lanka investment data is insufficient for robust calculation.
3. Australia data is comprehensive and based on IRENA and national statistics.
4. 2024–2025 investment reflects unusually high surges and may skew

4.3 Technology and Infrastructure

4.3.1 Sri Lanka

Sri Lanka’s transition towards a renewable-powered grid is constrained by its aging transmission infrastructure, which hampers the absorption of intermittent solar and wind energy. Key transmission corridors such as the over 45 years old lines; linking Matthew’s region lack the dynamic capacity and voltage control required for high variable renewable energy (VRE) penetration, resulting in routine curtailment during peak solar generation periods. Studies show that grid instability, reduced system inertia, and overvoltage in distribution networks are becoming increasingly prevalent as rooftop solar and wind capacity expands, highlighting the urgent need for upgrades such as on-load tap changers, synchronous condensers, and static VAR compensators. [aiib.org], [ft.lk] [researchgate.net].

On the storage front, Sri Lanka has limited utility-scale energy storage, only pilot projects are underway. The nation's first pumped hydro storage project, the 600 MW Maha Oya facility, is still under development, while the Ceylon Electricity Board has issued tenders for a 160 MW/640 MWh battery energy storage system (BESS) portfolio slated for completion by mid-2026. These early-stage initiatives suggest that large-scale storage is nascent but gaining traction as a critical enabler of grid flexibility.

4.3.1.1 Stakeholder insight

Stakeholder consultations reveal four binding constraints to scaling variable renewable energy (VRE) in Sri Lanka. First, the aging transmission and distribution network was not designed for high penetrations of solar and wind generation, leading to congestion, voltage instability, and frequent curtailment, particularly during midday solar peaks. Meeting national renewable energy targets requires significant grid modernisation, including targeted corridor reinforcement, timely substation upgrades, modern SCADA/EMS-based protection and control, improved reactive power and voltage management, enhanced VRE forecasting, and flexible interconnection standards such as ride-through capability, active power control, and dynamic line rating to improve system observability and controllability.

Second, uncompensated curtailment of renewable output erodes project bankability and deters investment, directly undermining confidence in achieving the 70%

renewable share by 2030. Stakeholders call for transparent curtailment protocols (thresholds, triggers, reporting), equitable compensation mechanisms, and regulatory clarity on priority dispatch, complemented by market reforms such as ancillary service markets, congestion management tools, and standardised curtailment clauses in Power Purchase Agreements (PPA).

Third, the lag in large-scale storage deployment (pumped hydro and utility-scale batteries) is viewed as a critical bottleneck for balancing intermittent generation, without operational storage, the system relies on curtailment and conventional units, limiting the integration of surplus solar and constraining frequency stability. Stakeholders advocate for an enabling framework that recognises storage as a distinct asset class with clear revenue streams (energy shifting, capacity, ancillary services), streamlined permitting, bankable procurement (auctions or contracts-for-difference), and near-term pilots to de-risk technologies and build institutional capability. Finally, a skills gap; particularly outside urban centres affects installation quality, grid integration, commissioning, and O&M performance. Recommended actions include expanding TVET and tertiary programmes with VRE and storage modules, nationally recognised certifications, utility developer training partnerships, manufacturer-supported apprenticeships, and rigorous safety and quality standards. In summary, stakeholders converge on coordinated grid modernisation, fair curtailment and market design, accelerated storage deployment, and workforce development as the core enablers to credibly and cost-effectively scale renewables.

4.3.2 Australia

Australia’s renewable energy transition is supported by a robust technical foundation. The National Electricity Market (NEM) has evolved to accommodate high penetrations of variable renewable energy (VRE), with renewables contributing over 40% of annual generation and instantaneous shares exceeding 75% in 2024. This capability is underpinned by ongoing grid modernization initiatives, including advanced frequency control services, inverter-based resource integration, and deployment of smart meters and digital control systems to enable real-time demand response and distributed energy resource management (Australian Energy Market Operator [AEMO], 2024; Australian Energy Market Commission [AEMC], 2025). These measures collectively enhance system flexibility and resilience as Australia progresses toward its 82% renewable electricity target by 2030.

Australia is also a global leader in energy storage, exemplified by the Hornsdale Power Reserve in South Australia; a pioneering 150 MW/194 MWh battery system that demonstrated the economic and technical benefits of fast frequency response and grid stability. Building on this success, large-scale projects such as the Victorian Big Battery and Collie BESS, alongside rapid residential battery uptake, position Australia at the forefront of storage innovation (Clean Energy Council, 2025). Complementing these infrastructure advances is a strong technical workforce pipeline, supported by university-industry partnerships, vocational training programs, and national upskilling initiatives such as the Clean Energy Council’s “Job Ready” program. These efforts aim to address skill shortages and ensure a qualified workforce for the expanding renewable sector (Clean Energy Council, 2025; Federation University, 2023).

4.3.2.1 Stakeholder insight

Stakeholders in Australia's energy sector acknowledge that while the grid is technically advanced, stability remains a challenge under high renewable penetration. As one senior engineer from AEMO stated, "Grid stability is a challenge, but we're investing heavily in digital solutions, smart controls, real-time monitoring, and inverter-based resources to keep the system secure" (AEMO, 2025). Similarly, a project manager involved in the Hornsdale Power Reserve emphasized, "Battery storage is no longer optional; it's the backbone of our renewable future" (Clean Energy Council, 2025). These perspectives reflect a broader industry consensus that digital grid modernization, advanced storage systems, and distributed energy resource orchestration are critical to achieving Australia's 82% renewable electricity target by 2030. Stakeholders also highlight the importance of workforce readiness, with a university-industry partner noting, "Upskilling programs are essential & we need technicians who understand both traditional grid operations and emerging digital platforms" (Federation University, 2023).

4.3.3 Comparative analysis

Australia's proactive investments and regulatory incentives have enabled a more flexible grid. Sri Lanka lags due to funding and skills shortages.

Dimension	Australia	Sri Lanka	Key Notes
Grid Capacity	NEM supports high VRE penetration; advanced digital controls, smart meters	Aging transmission infrastructure; limited dynamic control	Australia invests in SCADA, inverter-based resources. Sri Lanka needs upgrades
Storage	Global leader in battery projects (Hornsdale, Victorian Big Battery); pumped hydro pipeline	Minimal utility-scale storage; pilot BESS and pumped hydro projects in planning	Storage critical for VRE integration. Australia demonstrates cost and stability benefits
Technical Workforce	Strong university-industry pipeline; national upskilling programs	Skills gap, especially in rural areas & vocational training	Workforce readiness influences project execution and O&M quality

Table 4. Comparative analysis of technology and infrastructure [10]

4.4 Finance and Investment

4.4.1 Sri Lanka

Sources	Instruments	Challenges
Financing is dominated by multilateral donors (ADB, World Bank) and government allocations, with limited participation from private capital.	Policy instruments include feed-in tariffs and net metering for small projects; implementation has been inconsistent, and no domestic green bonds had been issued as of 2023.	High perceived country and project risk deters international investors, while currency risk and bureaucratic hurdles undermine bankability and slow execution.

Table 5. Summary of analysis of finance and investment challenges in Sri Lanka

[10] (ADB, 2024/AEMC, 2025)

4.4.2 Australia

Sources	Instruments	Challenges
Significant private investment, active green bond market, superannuation (pension) fund participation	Government "green banks," reverse auctions, long-term contracts	Regulatory risk (policy debates), grid congestion in high-growth regions

Table 6. Summary of analysis of finance and investment challenges in Australia

4.4.3 Comparative analysis

Australia's advanced project-finance ecosystem and enabling regulatory regime, underpinned by diversified sources of risk capital and innovative blended-finance mechanisms, differ markedly from Sri Lanka's reliance on external development assistance and the conservative, collateral-dependent underwriting practices prevalent in its banking sector.

Metric	Sri Lanka	Australia
Total RE investment (USD)	$1.5–2 billion	$25–30 billion
Key Sources of Finance	Multilaterals, state budget, few PPPs	Private sector, green bonds, super funds
Green Bonds	None issued locally (2023)	>$10 B issued since 2016
Average Project Size	1–50 MW	50–300 MW
Risk Mitigation Tools	Few, mainly donor-driven	Insurance, hedging, government "green bank"
Policy Incentives	Feed-in tariffs, VAT exemptions, net metering (patchy)	Large-scale Renewable Energy Target, reverse auctions, tax credits

Table 7. Comparative analysis of finance and investment

4.5 Policy and Regulatory Frameworks

4.5.1 Key renewable energy policies & their Impact

4.5.1.1 Australia

Australia's policy landscape is more mature, with strong state-level leadership and rapidly growing renewable capacity. The country is shifting from a coal-dominated system toward a high-renewable grid supported by storage and transmission reforms.

1.) Renewable Energy Target (RET)

The Renewable Energy Target (RET) was designed to mandate the delivery of 33,000 GWh of renewable electricity by 2020, creating a national framework to accelerate Australia’s transition away from fossil-fuel-based generation. To operationalise this target, the scheme introduced two certificate mechanisms: Large-scale Generation Certificates (LGCs) to incentivise utility-scale projects, and Small-scale Technology Certificates (STCs) to support household and small-business installations. Together, these instruments established a market-driven approach that linked renewable output with compliance obligations for electricity retailers.

The RET was instrumental in triggering Australia’s first major wave of utility-scale wind and solar development, significantly expanding renewable capacity and lowering technology costs. By providing investment certainty, it helped mature the renewable energy sector and bolster investor confidence in long-term project viability. Although the 2020 target has been met, LGCs continue to play a meaningful role in driving additional renewable deployment, as ongoing demand for certificates sustains market incentives beyond the formal completion of the scheme.

2.) Rewiring the Nation (2022+)

Rewiring the Nation, launched in 2022, is a federal initiative that commits A$20 billion to accelerate the development of critical transmission infrastructure across Australia. Its primary aim is to enable the construction of renewable energy zones and major interstate interconnectors, creating a modern grid capable of integrating large volumes of renewable generation. By addressing long-standing constraints in the national transmission network, the policy seeks to provide the essential backbone for Australia’s clean energy transition.

The program removes one of the most significant barriers to renewable deployment, the lack of transmission capacity and thereby unlocking gigawatts of potential large-scale solar, wind, and storage projects. Strengthening interconnection between regions also enhances grid reliability and helps absorb the operational impacts of ageing coal-fired power station retirements. Overall, Rewiring the Nation is expected to improve system stability, support decarbonisation objectives, and lower long-term energy costs through increased access to renewable resources.

3.) Capacity Investment Scheme (CIS) – 2023 onward

The Capacity Investment Scheme (CIS), introduced from 2023 onward, is a federal mechanism designed to underwrite new renewable generation and energy-storage capacity through competitive tenders. Its core policy target is to accelerate investment in firmed renewable energy by providing incentives for utility-scale batteries, pumped hydro and other long-duration storage technologies. By offering revenue-stabilising arrangements, the CIS aims to create a secure investment environment that brings forward the development of reliable, dispatchable clean-energy assets. The scheme's impact is expected to be significant across the energy sector. It supports rapid build-out of new renewable and storage projects, providing developers with financial certainty that reduces project risk and unlocks capital. Critically, the CIS helps ensure system reliability as ageing coal-fired plants retire, enabling renewable energy to replace this capacity without compromising grid stability. Overall, it strengthens Australia's pathway toward a cleaner, more resilient electricity system.

4.) State-level Renewable Energy Zones (NSW, QLD, VIC)

State-level Renewable Energy Zones (REZs) in New South Wales, Queensland and Victoria establish designated regions where renewable generation can be efficiently developed through coordinated planning. These zones provide pre-planned transmission access, streamlined development and environmental approvals, and competitive auction processes that allocate capacity to developers. By reducing regulatory uncertainty and aligning transmission and generation investment, REZs create clearer, lower-risk pathways for large-scale solar and wind projects.

The establishment of REZs has become one of the most significant drivers of Australia’s rapid renewable energy expansion. Queensland and Victoria, in particular, have emerged as some of the fastest-growing renewable energy jurisdictions in the Asia–Pacific region, supported by strong state-level policy commitments and investor-ready frameworks. These zones attract substantial global investment by offering predictable planning, clear procurement mechanisms, and long-term project visibility, strengthening Australia’s position as a competitive renewable energy market.

5.) Hydrogen Strategy (2020, updated 2023)

Australia’s Hydrogen Strategy (2020, updated in 2023) sets out a national ambition to establish the country as a leading global exporter of green hydrogen. The policy framework drives large-scale deployment of renewable-powered electrolysers, supports the creation of hydrogen hubs across key industrial regions, and funds early-stage trials in hydrogen transport and supply-chain logistics. Together, these measures aim to accelerate commercial readiness, build domestic capability, and position hydrogen as a central pillar of Australia’s future energy and export economy.
The strategy has catalysed significant investment in new renewable energy generation, particularly large solar and wind projects designed to supply electricity for green hydrogen production. It has also strengthened Australia’s role in emerging international hydrogen markets, with major partnerships established with countries such as Japan, Singapore and members of the European Union. These collaborations enhance technology transfer, secure future export pathways, and reinforce Australia's potential to become a key supplier in the global transition to low-carbon fuels.

6.) Safeguard Mechanism Reforms (2023+)

The Safeguard Mechanism reforms introduced from 2023 aim to reduce emissions from Australia's largest industrial facilities by requiring them to meet progressively declining emissions baselines. By tightening these baselines over time, the policy encourages industries to adopt cleaner technologies, invest in renewable energy, and pursue electrification as part of their operational transition. The reforms are designed to align major emitters with national climate goals while maintaining competitiveness across heavy-industry sectors. These changes have significant implications for Australia's energy landscape. As industries seek low-emissions pathways, demand for renewable electricity and supporting infrastructure is expected to grow, indirectly stimulating the expansion of the renewable energy sector. The mechanism therefore plays a key enabling role in Australia's broader decarbonisation strategy, supporting the nation's long-term trajectory toward net-zero emissions by promoting cleaner industrial practices and accelerating low-carbon investment.

Policy Targets	Policy Design	Regulation
Federal and state-level targets (e.g., 50%+ renewables in some states by 2030)	Independent market operators and regulators. Consistent, well-enforced frameworks (Renewable Energy Target, feed-in tariffs, etc.).	Strong, independent; limited political interference at the implementation level

Table 8. Impacts of renewable energy policy in Australia

4.5.2 Time-series analysis: Trends pre- and post-major policy changes

4.5.2.1 Sri Lanka

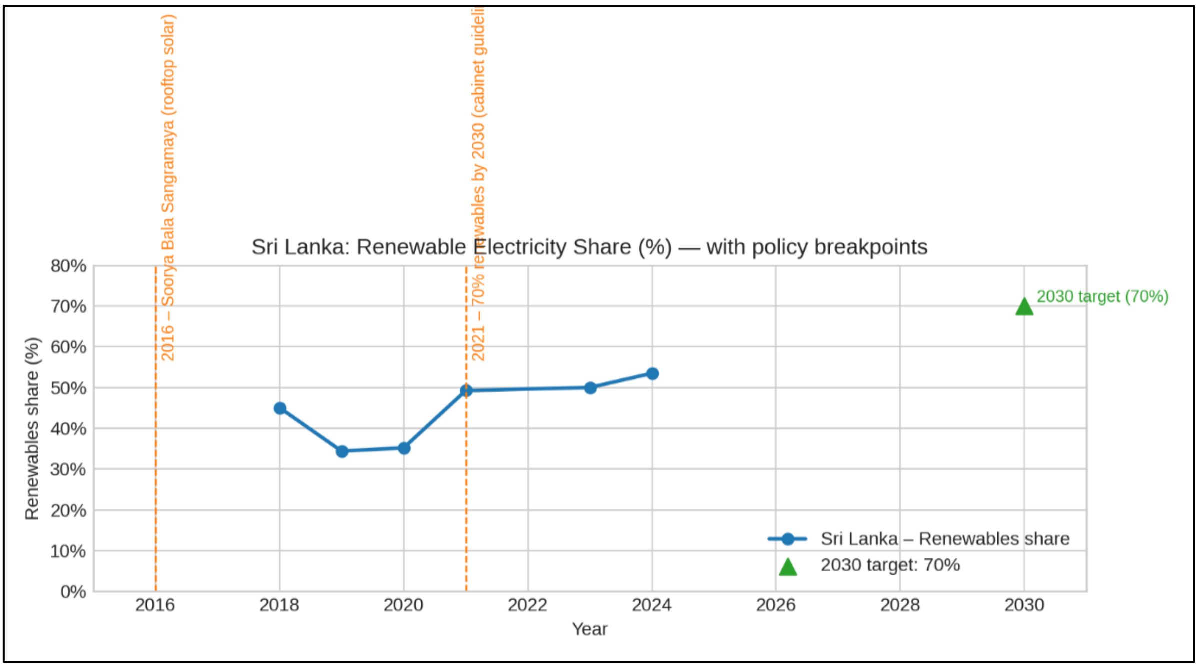

Figure 29. Sri Lanka_ renewable energy share with policy lines (PUCSL)

4.5.2.2 Australia

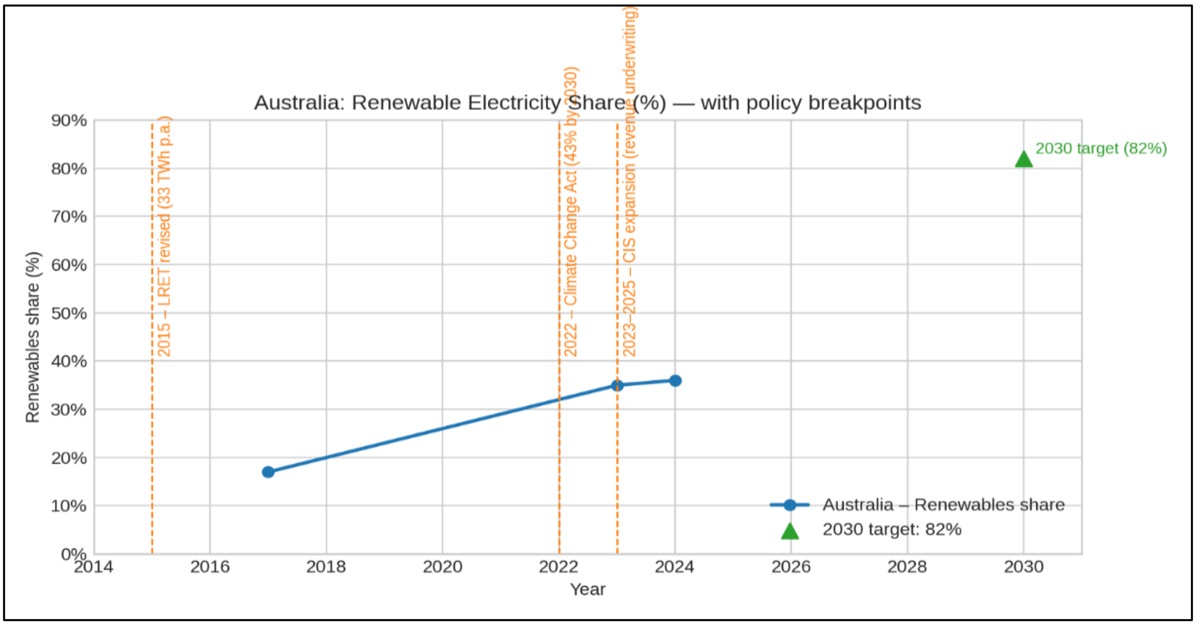

Figure 30. Australia_Renewable energy share with policy lines (CEC)

4.5.3 Comparative analysis

Sri Lanka and Australia present contrasting yet instructive policy environments for understanding renewable-energy transitions in diverse economic and institutional contexts. Sri Lanka's renewable-energy policy landscape is predominantly motivated by energy-security concerns, fiscal pressures arising from the heavy dependence on imported fossil fuels, and national commitments to climate mitigation. Central to this policy framework is the government's target of achieving 70% renewable electricity by 2030, supported by initiatives such as the *Soorya Bala Sangramaya* rooftop-solar program and recent amendments to the Sri Lanka Electricity Act aimed at expanding private-sector participation in generation. Despite these ambitions, the efficacy of Sri Lanka's policy implementation remains constrained by structural barriers, including the financial instability of the Ceylon Electricity Board (CEB), prolonged project approval processes, and limited transmission-system capacity. These systemic challenges have slowed deployment rates, resulting in an uneven growth trajectory despite favourable national targets and substantial technical potential (Asian Development Bank, 2023; International Energy Agency, 2022).

In contrast, Australia's renewable-energy transition is driven primarily by decarbonisation imperatives, market liberalisation, and the strategic need to replace ageing coal-fired generation assets. Following the successful implementation of the Renewable Energy Target (RET), Australia's expansion is now propelled by a suite of integrated policy instruments, including Renewable Energy Zones (REZs), the Capacity Investment Scheme (CIS), and the Rewiring the Nation transmission-infrastructure program. These mechanisms reduce investor risk, provide long-term revenue certainty, and address grid-integration challenges by coordinating generation and transmission development. Supported by a liberalised electricity market and robust regulatory institutions, Australia has achieved one of the world's fastest per-capita deployments of solar and wind capacity, aided by comprehensive infrastructure-planning frameworks and supportive state–federal policy alignment (CSIRO, 2023; Australian Department of Climate Change, Energy, the Environment and Water, 2024).

Taken together, the comparison highlights that while Sri Lanka's policy framework is aspirational and security-driven, its progress is hindered by financial and institutional constraints conversely, Australia's policy ecosystem is characterised by coordinated market-based mechanisms and investment certainty, facilitating a more rapid and consistent scaling of renewable-energy capacity (IEA, 2023; Energy Security Board Australia, 2024). This divergence provides valuable insight into how institutional capacity, economic resilience, and regulatory maturity shape the translation of renewable-energy policies into measurable deployment outcomes.

Further, the qualitative analysis conducted through expert interviews revealed that this factor was emphasised by 82% of participants in Sri Lanka and 66% of participants in Australia.

4.6 Political and Governance Factors

4.6.1 Sri Lanka

Political instability	Impacts
Changes in government disrupt continuity. Appointments to energy agencies often politicized.	Project delays, contract cancellations, loss of investor confidence

Table 9. Impacts of political and governance factor on renewable energy in Sri Lanka

4.6.2 Australia

Political context:

- Debate over climate ambition, but core energy market rules remain steady
- Regulatory agencies largely shielded from direct political interference

4.6.3 Comparative analysis:

The qualitative analysis conducted through expert interviews confirmed that this factor was emphasised by 54% of participants in Sri Lanka and 25% of participants in Australia. Depoliticizing energy governance is a major lesson that Sri Lanka can draw from Australia.

Indicator	Sri Lanka	Australia
Political Stability (2010–2023)	Low-moderate (multiple transitions, economic crisis 2022)	High-moderate (some political debate, but market continuity)
Government Interference	Frequent project awards, policy reversals	Low agencies operate independently

Corruption Perception[11]	Higher (transparency Int'l CPI: 36/100)	Lower (CPI: 75/100)
Policy Reversal Frequency	Every 3–5 years, sometimes faster	Rare core rules stable since 2000s

Table 10. Comparative analysis of factors of impact

4.7 Social and Human Capital Factors

4.7.1 Sri Lanka

Social and human capital factors play a critical role in shaping the success of renewable energy development in Sri Lanka, as recent research highlights that socio-cultural barrier, limited public support, and insufficient technical expertise significantly slow down the adoption of renewable technologies. Findings show that despite the strong theoretical potential for solar, wind, mini-hydro, and biogas, projects often face resistance from communities, especially where land acquisition or relocation is involved, while gaps in skilled labour and institutional capacity further constrain progress. These human centered challenges, combined with inconsistent regulatory frameworks and financing difficulties, underscore that technological solutions alone are not enough; meaningful community engagement, public awareness, and investment in human capital are essential to strengthen Sri Lanka's transition toward sustainable energy (Kankanamge & Pathmadewa, 2025).

[11] Corruption Perceptions Index (CPI): Higher score = less corruption

Community Engagement	Skills Gap	Gender/Equity
Mixed; high for small hydro, lower for wind/solar in some areas	Limited trained professionals, especially in rural zones	Underrepresentation of women and marginalized groups in energy decision-making

Table 11 Social & human capital factors in Sri Lanka

4.7.2 Australia

Community Engagement	Skills Gap	Gender/Equity
Growing emphasis, including “community energy” projects	Government and industry programs for upskilling	Improving, but still gaps at senior levels

Table 12. Social & human capital factors in Australia

4.7.3 Comparative analysis

Australia’s investment in skills and community participation provides models for Sri Lanka’s human capital development.

Aspect	Sri Lanka	Australia
Skills Pipeline	Under-resourced universities, few energy programs	Strong university-industry collaboration
Training Programs	Limited, mostly donor/NGO funded	Ongoing, funded by gov’t/industry
Gender Balance	<20% women in sector	~25–30%, increasing efforts
Community Engagement	Mixed: High for some hydropower, low for wind/solar	High: “community energy” projects, public consultations

Table 13. Comparison of community engagement and skill development status

4.8 Lessons Learned and Best Practices

Dimension	Sri Lanka Barriers	Australia Enablers	Lessons for Sri Lanka
Policy/Regulation	Instability, overlap, weak enforcement	Stable, independent regulation	Depoliticize, streamline agencies
Finance	Donor dependence, risk aversion	Active private/green finance	Develop green bonds, risk mitigation
Technology	Outdated grid, little storage	Smart grid, storage pilots	Invest in grid modernization
Skills	Shortages, rural-urban gap	Ongoing training, partnerships	Technical education investment
Political	High interference	Shielded agencies	Institutional independence

Table 14. Summary of Barriers, Enablers, and Lessons for Policy Transfer

4.9 Case Studies

Case 1: Successful Solar Project (Australia)

Location: Queensland Solar Farm

Key features: Private-public partnership, long-term power purchase agreement, advanced grid integration

Outcome: Exceeded expected output, strong community support

Case 2: Wind Project Delays (Sri Lanka)

Location: Mannar Wind Power Project

Key issues: Policy delays, grid bottlenecks, local opposition

Outcome: Significant delays, revised project design after consultations

4.10 Synthesis and Discussion

To build on the insights discussed above, the following section presents a comparative analysis that evaluates these findings across the selected contexts.

4.10.1 Comparative analysis

4.10.1.1 Grid modernization

Australia's proactive grid upgrades (smart meters, digital controls, and battery storage) have enabled high renewable penetration without major blackouts. Sri Lanka's grid, by contrast, remains a bottleneck; technical experts across all focus groups emphasized the urgent need for both infrastructure investment and grid operator training. The qualitative findings from expert interviews indicated that grid flexibility within the existing network in Sri Lanka is a significant challenge and a bottleneck for renewable energy growth, with 82% of participants in Sri Lanka. Refer

4.10.1.2 Finance

The presence of a "green bank" and the regular issuance of green bonds in Australia dramatically lowered the cost of capital and attracted pension fund money into renewables. In Sri Lanka, projects remain heavily reliant on donor funds and must navigate currency risk, policy risk, and lack of domestic financial innovation. The qualitative findings derived from expert interviews indicate that limited access to finance for renewable energy projects constitutes a critical structural barrier in Sri Lanka, with 72% of Sri Lankan participants identifying this constraint as a key impediment to sectoral advancement. Refer 3.1

4.10.1.3 Policy stability

Australian regulatory agencies (e.g., AEMO, AER) provide investor confidence. The result is a “virtuous cycle” of investment, job creation, and political buy-in. Sri Lanka’s agencies are more vulnerable to political interference; nearly every policy focus group pointed to a major project delayed by leadership change. The qualitative insights from expert interviews reveal that political resistance and policy instability are major structural obstacles in Sri Lanka, with 54% and 82% of Sri Lankan respondents respectively identifying these factors as significant impediments to the sector’s progress.

4.10.1.4 Human capital

Australia’s collaboration between industry and universities has created a strong pipeline for renewable energy engineers and technicians, while Sri Lanka’s sector struggles with brain drain and underfunded training programs.

4.10.1.5 Community engagement

Australia’s model of “community energy” (where locals co-own or invest in projects) has increased public support and eased permitting challenges. This could be adapted for Sri Lanka’s small hydro and rooftop solar programs.

This comparative analysis demonstrates that while both countries face challenges scaling renewables, Australia’s policy stability, regulatory independence, and financial innovation have enabled rapid growth. Sri Lanka’s path is constrained by policy volatility, financial risk, and infrastructural limitations but can accelerate progress by adapting relevant elements from the Australian model, always with local context in mind.

Quote: "We can't just transplant policies, but we can learn from Australia's independent regulatory approach and robust finance mechanisms." (Sri Lankan policymaker)

4.10.2 Conclusion of comparative analysis

The comparative analysis demonstrates that renewable energy transitions depend as much on coherent policy and institutional capability as on technological and financial factors. While Sri Lanka requires context-specific adaptation rather than direct transfer of Australian models, the study identifies several mechanisms with clear relevance: legislated renewable targets integrated with long-term planning, REZ-based competitive procurement supported by bankable PPAs, strengthened grid and market governance, and innovative public-sector financing. Sequencing these reforms, establishing grid and payment security foundations before scaling auctions and system services markets, offers a practical and credible pathway for Sri Lanka to accelerate renewable uptake while maintaining reliability and social licence. Together, these findings underscore the importance of stable policy, empowered institutions, and strategic investment in enabling effective and sustainable energy transitions.

Feature	**Sri Lanka**	**Australia**
National RE Target	~70% by 2030 (not on track)	~50% by 2030 (some states higher)
Policy Stability	Low, changes with governments	High, rare major reversals

Independent Regulator	No (politically appointed)	Yes (Australian Energy Regulator, AEMO)
Policy Incentives	Feed-in tariffs, net metering	Renewable Energy Target, auction schemes
Agency Overlap	High (SLSEA, CEB, others)	Low, clear mandates
Enforcement Capacity	Weak	Strong

Table 15. Comparative summary of key features between Sri Lanka and Australia

4.10.3 Thematic Cross-Country Matrix

Theme	Sri Lanka: Key Barrier	Australia: Successful Solution	Transferability/Notes
Grid Modernization	Outdated, cannot absorb high RE	Massive grid upgrades, battery storage pilots	Requires funding, donor/private collaboration
Policy Stability	Frequent changes, politicized agencies	Independent regulators, cross-party support	Challenging but essential, legal reform needed
Financing	Elevated risk, donor dependence, few incentives	Green bank, green bonds, clear market signals	Build local capital markets, partner with IFIs [12]
Skills/Human Capital	Rural/urban gap, few energy programs	Training pipelines, skills recognition	Leverage Australian training partnerships
Political Interference	High; delays, reversals	Low, agencies shielded by law	Legislative change, international pressure
Community Engagement	Uneven, local opposition to some projects	Consultations, “community energy” shareholding	Adapt community ownership models

Table 16. Summary of key barriers & transferable solutions to Sri Lanka

[12] International Financial Institutes

CHAPTER 5

5 DISCUSSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter translates the findings of the comparative analysis into actionable recommendations for Sri Lanka, focusing on policy, institutional, financial, technical, and social dimensions. The recommendations are informed by Australia's successes and Sri Lanka's specific barriers, with clear steps for adaptation, implementation, and monitoring.

5.2 Guiding Principles for Policy Transfer

Before proposing specific measures, it is vital to recognize that:

- **Policy transfer is not policy copying**: What works in Australia may need adaptation to Sri Lankan realities—political, cultural, and economic.
- **Stakeholder engagement is critical**: Solutions must be locally owned and sensitive to diverse interests.
- **Phased, iterative reform is best**: Start with quick wins, pilot projects, and build toward systemic change.

5.3 Institutional and governance reforms

Establishing an independent energy regulator is a key component of the broader institutional and governance reforms.

5.3.1 Establish an independent energy regulator

Rationale:

Australia's independent energy regulators (e.g., AER, AEMO) have created stable, investor-friendly environments by reducing political interference.

Sri Lanka Action Plan:

- Pass legislation to create an independent energy regulatory authority.
- Ensure appointments are merit-based, with cross-party oversight.
- Grant clear mandates for tariff setting, grid access, dispute resolution, and policy enforcement.
- Include consumer and civil society representation on oversight boards.

5.3.2 Streamline agency mandates

Rationale:

Overlapping mandates (SLSEA, CEB, MoE) slow policy and project approvals.

Action Plan:

- Review and revise roles/responsibilities.
- Merge or coordinate agencies to reduce duplication.
- Digitize approval processes for transparency and speed.

5.4 Policy and Regulatory Frameworks

A national renewable energy roadmap is essential because it provides the strategic direction needed to align and integrate rigorous policy and regulatory frameworks.

5.4.1 Create a national renewable energy roadmap

Rationale:

Australia's clear, multi-decade targets provided certainty for investment and planning.

Action Plan:

- Develop and publish a binding roadmap to 2035, with interim milestones for 2025, 2030, and 2035.
- Align with Paris Agreement and SDG targets.
- Include periodic reviews, with stakeholder consultation.
- Codify targets in law to protect from political cycles.

5.4.2 Incentivize private sector and foreign investment

Rationale:

Australia leverages private and institutional capital via incentives and de-risking.

Action Plan:

- Expand feed-in tariffs and introduce reverse auctions for utility-scale RE projects.
- Offer long-term power purchase agreements (PPAs) with guaranteed terms.
- Provide tax breaks and duty waivers for RE equipment imports.
- Develop one-stop shops for investors.

5.5 Financing Mechanisms

5.5.1 Establish a National Green Fund

Rationale:

Australia's Clean Energy Finance Corporation (CEFC) catalysed billions in investment.

Action Plan:

- Capitalize a Green Fund with a mix of government, donor, and private funds.
- Mandate lending to high-impact solar, wind, storage, and grid modernization projects.
- Leverage international green climate finance.

5.5.2 Promote "Green Bonds" and blended finance

Action Plan:

- Partner with banks to issue Sri Lanka's first green bonds.
- Use blended finance to reduce risk for private investors (e.g., partial guarantees).
- Attract diaspora investment in national RE projects.

5.5.3 Reduce foreign exchange (FX) and policy risks

Action Plan:

- Offer hedging products for FX risk.
- Build reputation for honouring PPAs and regulatory consistency.

5.6 Technology, Grid, and Infrastructure

5.6.1 Accelerate grid modernization

Rationale

Australia shows that modern grids supported by smart meters, digital controls, and large-scale battery storage are crucial for reliably integrating high renewable energy levels.

Action Plan:

1. Prioritize donor and Green Fund resources for grid upgrades in high-renewable regions.
2. Deploy smart meters, digital controls, and modern SCADA systems.
3. Begin pilot projects for battery storage (drawing on Australian case studies).

5.6.2 Support distributed and community energy

Action Plan:

1. Create incentives for rooftop solar, mini-grids, and community-owned wind/solar projects.
2. Simplify net metering and grid interconnection.
3. Provide technical and financial support to rural cooperatives.

5.7 Human Capital and Skills Development

5.7.1 Invest in renewable energy education and training

Rationale:

Australia's renewable energy success shows that strong vocational training and industry-aligned programs are critical for building the skilled workforce needed to scale renewables.

Action Plan:

1. Launch technical education programs in partnership with universities and industry (modelled on Australian TAFE and apprenticeship systems).
2. Offer scholarships and incentives for women and marginalized groups to enter RE fields.
3. Create certification/accreditation for RE technicians and installers.

5.7.2 Knowledge exchange and regional partnerships

Action Plan:

1. Facilitate ongoing government and industry exchanges with Australia/other suitable countries (study tours, workshops, online platforms).
2. Engage with IRENA and SAARC for regional capacity building.

5.8 Community Engagement and Equity

5.8.1 Increase local stakeholder participation

Action Plan:

1. Mandate community consultations for all major RE projects.
2. Pilot “community energy” models with local shareholding.
3. Prioritize rural electrification and job creation in project siting.

5.8.2 Address gender and social inclusion

Action Plan:

1. Set gender targets for workforce participation.
2. Fund women led RE entrepreneurship initiatives.
3. Monitor and report on equity impacts.

5.9 Monitoring, Evaluation, and Learning

5.9.1 Establish a results framework

Action Plan:

1. Develop key performance indicators (KPIs) for grid reliability, capacity additions, private investment, gender inclusion, and emissions reduction.
2. Set up an annual review mechanism with public reporting and external audits.
3. Build adaptive learning loops, policies should be adjusted based on evidence and feedback.

5.10 Strategic Roadmap: 2026–2035

Proposed Timeline of Actions (subject to review with other factors)

Year	Actions
2026	Establish independent regulator; launch Green Fund; pilot battery storage in selected regions
2026	First green bond issued; national RE roadmap codified in law; begin grid upgrades in most congested provinces
2027	Launch skills initiative; introduce reverse auction for wind/solar
2028	First community energy pilots operational; rural electrification push
2029	Evaluation & scale-up: expand successful models, adjust policy incentives
2030+	Regular roadmap reviews, new target setting, region-wide knowledge exchange

Table 17. Proposed Strategic timeline

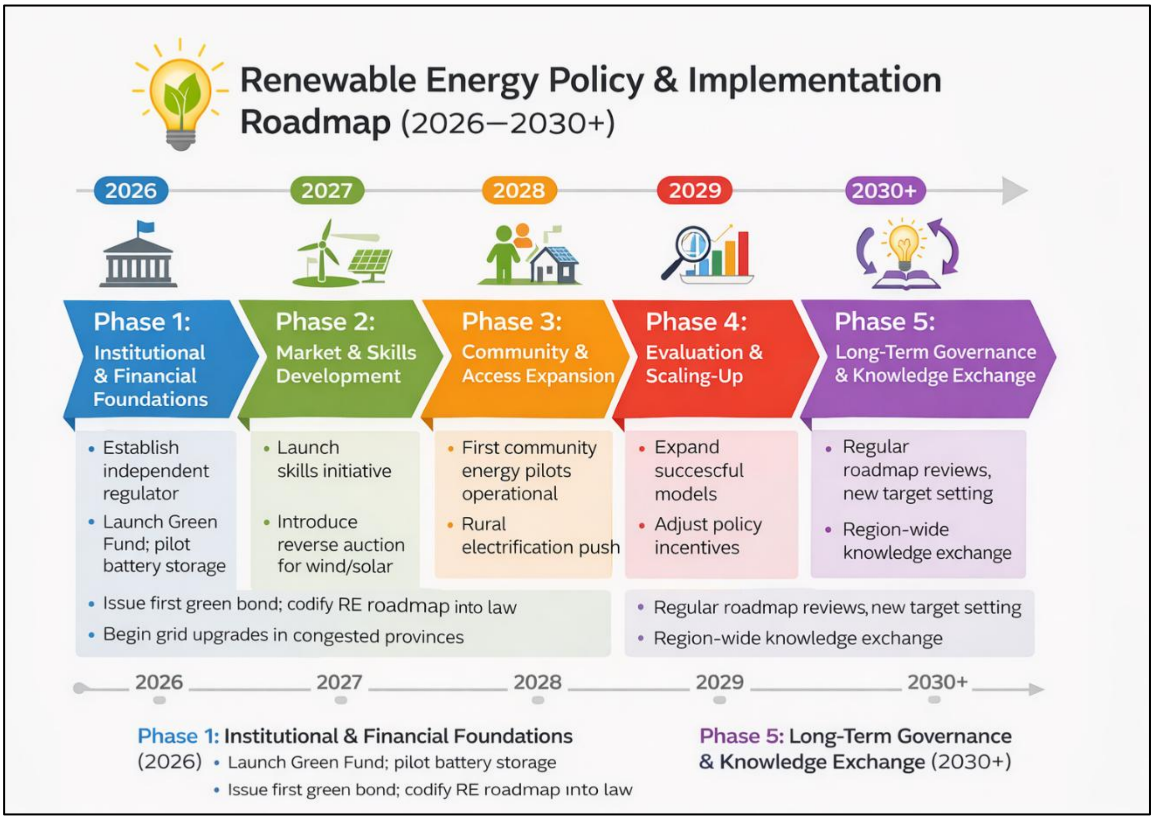

Figure 31 Proposed timeline roadmap for Sri Lanka

5.11 Risks and Mitigation Strategies

Risk	Mitigation Action
Political interference	Legal safeguards, stakeholder engagement, transparency
Donor/foreign finance delays	Broaden funding sources, develop local capital markets
Skills shortages	Accelerate training programs, incentivize diaspora return
Grid reliability	Phased RE integration, battery/storage pilots
Social opposition	Early and ongoing community engagement, fair compensation mechanisms

Table 18. Summary of risk mitigation strategies

5.12 Adaptation: Tailoring Australian Lessons to Sri Lanka

Key Principle: Policy transfer should be context-driven, not a "copy-paste."

What to emulate: Independent regulation, green finance innovation, intense training pipeline.

What to adapt: Community models, regulatory enforcement (local legal context), investment incentives.

What to avoid: Over-complexity, solutions that rely on scale/economies only possible in Australia.

5.13 Chapter Summary

Sri Lanka's transition toward a resilient and sustainable renewable energy sector demands an integrated, multi-dimensional approach encompassing policy reform, financial innovation, technological modernisation, workforce development, and social equity. By selectively adopting and contextualising successful strategies implemented in Australia, particularly in areas such as regulatory consistency, market-based investment frameworks, grid integration technologies, and community-centred transition models, Sri Lanka can meaningfully accelerate its decarbonisation trajectory. Such an approach will enhance national energy security, support the achievement of climate commitments, and facilitate a just and inclusive energy transformation that benefits all segments of society.

CHAPTER 6

6 CONCLUSION AND FUTURE RESEARCH DIRECTIONS

6.1 Introduction

This chapter synthesizes the findings from the preceding chapters, underscores the significance of the comparative analysis between Sri Lanka and Australia, and outlines the implications for renewable energy policy and practice in the South Asian context. It concludes with reflections on limitations and offers a roadmap for future research in renewable energy transitions.

6.2 Summary of Major Findings

The comparative study has revealed critical insights regarding the global growth and challenges of renewable energy, with a special focus on Sri Lanka and Australia:

1) **Global Trends:** There is a clear global momentum toward increasing renewable energy deployment, driven by falling technology costs, international climate commitments, and heightened investor and public interest.
2) **Sri Lanka's Context:** Despite ambitious targets, Sri Lanka faces persistent barriers: outdated grid infrastructure, fragmented governance, limited financing mechanisms, and policy instability. However, its high renewable resource potential, especially for solar and wind, remains underutilized.
3) **Australia's Experience:** Australia demonstrates the benefits of stable institutions, robust policy frameworks, and innovative financing. It has successfully scaled

renewables through market-based incentives, independent regulation, and a strong technical workforce.

4) **Comparative Lessons:** Sri Lanka can accelerate its energy transition by adapting key Australian strategies, especially institutional independence, green finance, and community engagement, while tailoring them to local realities.

6.3 Policy and Practical Implications

The findings of this thesis inform both policymakers and practitioners:

1) **For Policymakers:** Clear, stable, and independent regulation is critical for investor confidence and sector growth. Policy continuity and stakeholder participation must be institutionalized to prevent reversals.
2) **For Investors and Developers:** Improved financial instruments, such as green bonds and blended finance, will be essential for scaling projects beyond donor dependence.
3) **For Civil Society and Communities:** Inclusive community energy models and workforce development will foster local ownership and job creation, reducing resistance and maximizing benefits.

6.4 Limitations of the Study

While this thesis has offered valuable insights, several limitations should be noted:

- **Data Gaps:** Some data (especially recent or region-specific investment figures) were not publicly available or were inconsistent between sources.

- **Stakeholder Representation:** Despite efforts to engage diverse voices, certain groups (such as rural women, small investors, or local politicians) may have been underrepresented in interviews and focus groups.
- **Comparative Generalizability:** Australia's context differs significantly in terms of scale, resources, and political culture, not all lessons are directly transferable.

6.5 Future Research Directions

Building on the findings and limitations, future research should address the following areas:

1. **Digitalization and Smart Grids:** Explore how digital technologies, AI, and data analytics can enhance grid management, integrate distributed renewables, and increase system resilience in developing contexts.
2. **Decentralized and Off-grid Solutions:** Assess the impact of mini-grids, peer-to-peer energy trading, and community-owned renewable projects in rural and marginalized communities.
3. **Gender and Social Equity in Energy Transitions:** Conduct in-depth studies on the role of gender, youth, and other marginalized groups in shaping and benefiting from renewable energy initiatives.
4. **Climate Finance and Risk Mitigation:** Analyse the effectiveness of new financial instruments and risk-sharing models for attracting large-scale, long-term private investment.
5. **Policy Diffusion and South-Asian Cooperation:** Investigate mechanisms for knowledge transfer and regional collaboration between South Asian nations, beyond bilateral comparisons.

6. **Impact of Political Transitions:** Further research is needed on how political cycles, crises, and institutional reforms impact the continuity of renewable energy policy implementation.

6.6 Final Reflections

This thesis demonstrates that Sri Lanka's renewable energy transition is urgent yet feasible, provided international lessons are adapted to local conditions and reforms are sequenced systematically. Success rests on integrated planning, credible regulation, grid modernisation, and market mechanisms that value flexibility and system services. By investing in human capability, institutional strength, and innovation, through targeted training, digitalisation, and fit-for-purpose grid and market design, Sri Lanka can achieve energy security, economic growth, and climate resilience over the long term.

7 BIBLIOGRAPHY

Armour, C., Hunt, D., & Lwin, J. (2023). Green and sustainable finance in Australia. Reserve Bank of Australia. https://www.rba.gov.au/publications/bulletin/2023/sep/pdf/green-and-sustainable-finance-in-australia.pdf

Arora, S., Veeralakshmi, B. (2025). Green Bonds and Their Role in Sustainable Development.

In: Khanna, K., Alam, M.S., Irfan, M., Dincer, H. (eds) From Poverty to Prosperity. Information Systems Engineering and Management, vol 64. Springer, Cham. https://doi.org/10.1007/978-3-031-99166-0_19

Asian Development Bank. (2021). *Promoting increased renewable energy deployment, energy efficiency, and power system resilience: Technical assistance report (Project No. 55079-002).* https://www.adb.org/projects/documents/sri-55079-002-tar

Asian Development Bank. (2021). Promoting increased renewable energy deployment, energy efficiency, and power system resilience: Technical assistance report (Project No. 55079-002). https://www.adb.org/projects/documents/sri-55079-002-tar

Atthanayake, I. U. (2025). Energy policy evolution in Sri Lanka. International Journal of Advance Research Publication and Reviews, 2(5), 465–469. https://ijarpr.com/uploads/V2ISSUE5/IJARPR0622.pdf

Australian Energy Market Commission. (2025). *Smart meter rollout and digital grid modernization*. Retrieved from https://aemc.gov.au

Australian Energy Market Operator. (2023). National Electricity Market Overview. https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem

Australian Energy Market Operator. (2025). *Australia's grid hits record 43 per cent renewables in 2025*. Green Review. Retrieved from https://greenreview.com.au/energy/australias-grid-hits-record-43-per-cent-renewables-in-2025/

Australian Energy Regulator. (2023). Annual Report 2022–23. https://www.aer.gov.au/publications/corporate-documents/annual-report-2022-23

Australian Government. (2025). Green Treasury Bond Allocation and Impact Report. https://www.aofm.gov.au/sites/default/files/2025-02-28/2025%20Australian%20Government%20Green%20Treasury%20Bond%20Allocation%20and%20Impact%20Report_0.pdf

Australian Renewable Energy Agency. (2025). *Advancing Renewables Program*. https://arena.gov.au/funding/advancing-renewables-program/ [arena.gov.au]

Bößne, S., Suljada, T., Johnson, F.X. *et al.* Policy transfers processes and renewable energy penetration: a comparative analysis of Peru, Thailand, and Uganda. *Sustain Earth* **3**, 2 (2020). https://doi.org/10.1186/s42055-019-0019-4

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Ceylon Electricity Board. (2023). Annual Report 2023. https://ceb.lk/front_end/img/pdf/CEB_Annual_Report_2023.pdf

Clean Energy Council. (2022). Clean Energy Australia Report 2022. https://cleanenergycouncil.org.au/cec/media/background/resources/clean-energy-australia-report-2022.pdf

Clean Energy Council. (2022). Clean Energy Australia Report 2022. https://www.cleanenergycouncil.org.au/resources/resources-hub/clean-energy-australia-report-2022

Clean Energy Finance Corporation. (2023). Annual Report 2023. https://www.cefc.com.au/media/nh3b5v4f/cefc-annual-report-2023.pdf

Clean Energy Regulator. (2023). Renewable Energy Target. https://www.cleanenergyregulator.gov.au/RET

Clean Energy Works for Australia - Industry launches new campaign as national energy debate heats up | Clean Energy Council

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Dutt, A. (2020). Accelerating renewable energy investments in Sri Lanka: Drivers, risks, and opportunities. Council on Energy, Environment and Water. https://www.ceew.in/cef/solutions-factory/publications/accelerating-investments-in-renewable-energy-in-sri-lanka-drivers-risks-and-opportunities.pdf

Ejiyi, C. J., Cai, D., Thomas, D., Obiora, S., Osei-Mensah, E., Acen, C., Eze, F. O., Sam, F., Zhang, Q., & Bamisile, O. O. (2025). Comprehensive review of artificial intelligence applications in renewable energy systems: Current implementations and emerging trends. Journal of Big Data, 12, Article 169. https://journalofbigdata.springeropen.com/articles/10.1186/s40537-025-01178-7

Federation University. (2023). *Asia Pacific Renewable Energy Training Centre*. Retrieved from https://federation.edu.au

Federation University. (2023). *Asia Pacific Renewable Energy Training Centre workforce development report*.

Hopkinson, W., & Tobin, P. (2025). From 'Lost Decade' to incomplete 'transformation': Australian climate policy via ideas, interests, and institutions. Australian Journal of Political Science. https://www.msn.com/en-us/news/technology/the-lost-decade-why-australia-is-playing-climate-catch-up/ar-AA1O4UeC

https://link.springer.com/chapter/10.1007/978-981-96-8301-7_25

https://www.cefc.com.au/media/nh3b5v4f/cefc-annual-report-2023.pdf

International Energy Agency. (2022). Renewables 2022: Analysis and forecasts to 2027. https://www.iea.org/reports/renewables-2022

International Energy Agency. (2023). *Renewables 2023: Analysis and forecasts to 2028.* https://www.iea.org/reports/renewables-2023

International Energy Agency. (2025). Renewables 2025: *Renewable electricity – Analysis and key findings*. https://www.iea.org/reports/renewables-2025/renewable-electricity

International Renewable Energy Agency. (2023). IRENA Annual Report 2023. https://www.irena.org/publications/2023/Jun/Annual-Report-2023

International Renewable Energy Agency. (2023). Renewable capacity statistics 2023. https://www.irena.org/Statistics/View-Data-by-Topic/Capacity-and-Generation/Statistics-Time-Series

Island.lk. (2025, April 21). Policy flip-flops and grid woes jeopardise green transition. https://island.lk/policy-flip-flops-and-grid-woes-jeopardise-green-transition/

JRTE. (2025, October 11). Energy transition and sustainability challenges in Sri Lanka – A policy perspective. https://www.jrte.org/2025/10/11/energy-transition-and-sustainability-challenges-in-sri-lanka-a-policy-perspective/

Kankanamge, I. S. M., & Pathmadewa, A. H. K. K. (2025). Evaluating the viability of renewable energy sources in Sri Lanka: Implications and opportunities. In Proceedings of the 15th International Conference on Sustainable Built Environment (pp. 332–344). Springer.

Kankanamge, I.S.M., Pathmadewa, A.H.K.K. (2025). *Evaluating the Viability of Renewable Energy Sources in Sri Lanka*: Proceedings of the 15th International Conference on Sustainable Built Environment. ICSBE 2024 2024. https://doi.org/10.1007/978-981-96-8301-7_25

Leech, N. L., & Onwuegbuzie, A. J. (2007). An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly, 22*(4), 557–584. https://doi.org/10.1037/1045-3830.22.4.557

Ministry of Energy. (2025). Green Energy Acceleration Plan 2025–2030. https://www.newswire.lk/2025/02/28/energy-ministrys-5-year-renewable-energy-development-plan-launched/

Nalau, J., & Howden, M. (2025). Climate change is causing ever more disruption. Can Australia's new adaptation plan help? ANU Institute for Climate, Energy & Disaster Solutions. https://iceds.anu.edu.au/news-events/news/climate-change-causing-ever-more-disruption-can-australia%E2%80%99s-new-adaptation-plan

Nelson, T., Nolan, T., & Gilmore, J. (2023). *Effective policy to achieve the Australian Government's commitment to 82% renewable energy by 2030*. Centre for Applied Energy Economics and Policy Research, Griffith University. https://www.griffith.edu.au/__data/assets/pdf_file/0031/1868305/No.2023-15-Effective-policy-82-renewable-energy-by-2030.pdf

Public Utilities Commission of Sri Lanka. (2024). Renewable Generation Report Q4 2023. https://www.pucsl.gov.lk/wp-content/uploads/2024/04/Renewable-Generation-Report-Q4-2023-Final.pdf

Public Utilities Commission of Sri Lanka. (2024). Renewable Generation Report Q1 2024. https://www.pucsl.gov.lk/wp-content/uploads/2024/09/Renewable-Generation-Report-Q1-2024-V1.pdf

PUCSL. (2024a). *Renewable Generation Report Q2 2024*. Public Utilities Commission of Sri Lanka.

PUCSL. (2024b). *Environment and Renewable Energy Overview*. Public Utilities Commission of Sri Lanka PUCSL. (2025). *Renewable Generation Report Q1 2025*. Public Utilities Commission of Sri Lanka.

REN21. (2023). Renewables 2023 Global Status Report. https://www.ren21.net/gsr-2023/

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Sri Lanka Electricity (Amendment) Act, No. 14 of 2025. (2025). Parliament of Sri Lanka. https://parliament.lk/uploads/acts/gbills/english/6385.pdf

Sri Lanka Electricity Act, No. 36 of 2024. (2024). Parliament of Sri Lanka. https://parliament.lk/uploads/acts/gbills/english/6347.pdf

Sri Lanka Sustainable Energy Authority. (2021). Renewable Energy Resource Development Plan

Sri Lanka Sustainable Energy Authority. (2021). Renewable Energy Resource Development Plan 2021–2026. https://www.energy.gov.lk/images/renewable-energy/renewable-energy-resource-development-plan-en.pdf

Sri Lanka Sustainable Energy Authority. (2022). Annual Report 2022. https://www.energy.gov.lk/images/resources/downloads/slsea-ar-2022-en.pdf

Sri Lanka Sustainable Energy Authority. (2023). Renewable Energy Resource Development Plan 2021–2026. https://www.energy.gov.lk/images/renewable-energy/renewable-energy-resource-development-plan-en.pdf

Sri Lanka Sustainable Energy Authority. (2024). Renewable Energy Resource Development Plan 2021–2026. https://www.energy.gov.lk/images/renewable-energy/re-development-plan-english.pdf

Tilakaratna, I., & Iveson, M. (2024). Strengthening engagement in Australia–Sri Lanka relations. Lakshman Kadirgamar Institute. https://lki.lk/wp-content/uploads/2024/07/Strengthening-Engagement-in-Australia-Sri-Lanka-Relations-Final.pdf

Vitanage, P. W. (1970). A study of geomorphology and morphotectonics in Ceylon. In Proceedings of the Seminar on Geochemical Prospecting Methods and Techniques (pp. 391–401). University of Ceylon, Peradeniya.

World Bank. (2022). South Asia: Navigating green energy transitions, together. https://blogs.worldbank.org/en/endpovertyinsouthasia/south-asia-navigating-green-energy-transitions-together

Appendix 1- Questionnaire

1.1 Interview Questionnaire

Based on the questionnaire below a “Google Form” has been developed to collect data from industry expert (regulator, investor, project developer*)* in Sri Lank and Australia

Section 1: Background and Role

1.) Can you briefly describe your role and experience in the renewable energy sector?

2.) How long have you been involved in energy policy/project development/investment in [Sri Lanka/Australia]?

Section 2: Sector Trends and Status

3.) How would you describe the current state of renewable energy development in your country?

Section 3**:** Key Barriers and Challenges

4.)What are the key barriers to scaling up renewable energy in your country? (technology, finance, policy, politics, grid integration, skills)

5.)To what extent do you think these challenges are unique to your country, or are they common across similar nations?

6.)What could be the most negatively impacted barrier for the success of a renewable energy projects or an investment in Sri Lanka/Australia to your knowledge?

7.) What two technologies are the most advanced in your country?

Section 4: Policy and Governance

8.) Are existing energy policies and regulations clear and consistent?

If not, which of the following areas not clear the most?

9.) How often do energy policies and regulations change?

10.) Is there a strong independent regulator for the sector?

11.) What impact does the presence of an independent regulator have for renewable energy growth?

12.) What role does political stability play in renewable energy development?

Section 5: Financing and Investment

13.) How accessible is financing for renewable energy projects?

14.) What are the most influential factors for a successful project financing?

Section 6: Technology and Infrastructure

15.) Is the existing grid capable to handle more renewables?

16.) What are the main technical bottlenecks for renewable energy growth?

Section 7: Learning and Comparison

17.) Have you observed successful approaches abroad that could be adopted locally?

18.) If yes, which country/ies?

Section 8**:** Recommendations and Future Outlook

19) What changes would you recommend to policymakers?

20) Any other factors to add?

21) If yes, please summarise.

Appendix 2- Qualitative Coding Framework for Thematic Analysis

2.1 Purpose

To systematically analyse interview and focus group transcripts by identifying recurring themes, patterns, and outliers.

2.2 Focus Group Themes

Three focus groups were conducted:

Sri Lanka – Group 1: Policymakers and utility officials

Sri Lanka – Group 2: Private sector representatives and NGOs

Australia – Group 3: Mixed sector experts including regulators, developers, and investors.

The discussions explored challenges, opportunities, and perceptions of renewable energy growth. Data were coded using a step-wise thematic analysis process, resulting in the emergence of seven major themes. Below is the consolidated thematic summary.

Theme 1: Policy and Regulatory instability_Barrier

Across all Sri Lankan groups, participants described frequent changes in energy policy and regulation as the most significant barrier.

"Every time there's a new government, the whole renewable plan changes. Investors lose confidence." — Policymaker, Sri Lanka

Utility representatives noted that regulatory agencies lack enforcement power, making it difficult to maintain policy continuity.

In contrast, Australian participants reported relative policy stability:

“While there’s political debate, the basic framework—like the Renewable Energy Target—has stayed intact.” (Australia, investor)

1.1 Analysis:

This theme delineates the overarching requirement for institutionally independent and sufficiently empowered regulatory authorities, supported by sustained policy coherence and continuity. The findings exhibit strong convergence with the interview-derived evidence and indicate that this constraint constitutes the principal structural impediment to sectoral progress, thereby underscoring the imperative for comprehensive governance and institutional reform in Sri Lanka.

Theme 2: Financial and Investment Barriers

Sri Lankan participants unanimously cited limited access to finance as a core issue. Private sector attendees mentioned the absence of local green bonds and difficulties securing foreign investment:

“We rely on donor funding. Banks are reluctant to lend without government guarantees.” (Sri Lanka, developer)

In Australia, finance was seen as less of a hurdle:

“We have a strong green bond market and private investors are quite active.” (Australia, financier)

2.1 Analysis:

The cross-country contrast suggests Sri Lanka would benefit from targeted financial instruments and risk-mitigation mechanisms. Policy learning from Australia’s green finance success is relevant. The findings are consistent with interview data, and it is the 2nd largest barrier, reinforcing the importance of governance reform in Sri Lanka.

Theme 3: Grid and Technological Constraints

Sri Lankan focus group members repeatedly mentioned the aging and inflexible grid as a technical bottleneck:

“Our grid can’t take more solar and wind without upgrades and better management.” (Sri Lanka, utility engineer)

Australian stakeholders discussed storage and grid digitalization as current priorities, referencing successful pilots:

“Battery storage is scaling up fast—our market operator has been proactive.” (Australia, engineer)

3.1 Analysis:

Technological modernization and pilot projects (including Australian collaboration) were identified as urgent needs in Sri Lanka. The findings are consistent with interview data and aging and inflexible grid is the major constraint within others in Sri Lanka.

Theme 4: Political Interference and Governance

Sri Lankan participants were frank about political interference:

“Major projects are often delayed or cancelled for political reasons, not technical ones.” (Sri Lanka, NGO) Australian participants noted less interference but acknowledged political debate over climate ambition.

4.1 Analysis:

Political dynamics, especially in developing contexts, strongly influence renewable energy progress—reinforcing the need for depoliticized, transparent institutions.

Theme 5: Skills Gap and Human Capital

Sri Lankan groups highlighted a shortage of trained engineers and policy staff:

“We don’t have enough technical people, especially in rural areas.” (Sri Lanka, developer) Australian focus group members saw skills as a concern for future scaling, but less urgent due to robust training pipelines.

5.1 Analysis:

Human capital development—especially technical training—is a cross-cutting need in Sri Lanka.

Theme 6: Best Practice Adoption and Policy Learning

Both Sri Lankan and Australian participants emphasized the value of policy learning:

“Australia’s experience with community renewables could be very useful for us.” (Sri Lanka, policymaker)

However, participants cautioned that contextual adaptation is critical:

6.1 Analysis:

“We can’t just copy-paste; our grid and politics are different.” (Sri Lanka, utility)

Theme 7: Future Vision and Recommendations

All groups were optimistic but stressed urgency:

“If we fix the regulatory and investment climate, we could double our renewables in five years.” (Sri Lanka, NGO)

Australian stakeholders stressed the need for ongoing innovation:

“Continuous market reform is key to integrating even more renewables.”

7.1 Analysis:

Focus group consensus supports policy recommendations for regulatory reform, grid investment, new financing tools, and skills development in Sri Lanka—drawing on, but not simply replicating, Australian models.

2.2.1 Thematic Analysis of Google Form responses

A Google Form was used to collect qualitative responses from experts in Sri Lanka and Australia. The analysis followed the standard qualitative thematic method:

Step 1. Exporting Data

- Data were exported as CSV from Google Forms.
- The dataset was imported into Excel/Google Sheets for organisation.

Step 2. Familiarization

All responses were read multiple times to identify initial patterns, concepts, and recurring issues.

Step 3. Cleaning and Organisation

- Irrelevant fields (timestamps, emails, etc.) were removed.
- Only open-ended questions were retained for thematic coding.

Step 4. Generate Initial Codes

- Key ideas and phrases were highlighted.
- Short labels (codes) were assigned (e.g., policy instability, finance barriers, grid limits, skills shortage).

Step 5. Group Codes into Themes

Codes were clustered into broader categories that reflected underlying patterns.

These matched closely with focus group themes.

Step 6. Review and Refine Themes

Themes were checked for internal consistency and alignment with research objectives.

Some themes were merged or redefined based on content density.

Step 7. Define and Name Themes

Seven thematic categories were finalised, consistent with both interview and focus-group findings.

Step 8. Present Findings

Themes were visualised through tables and narrative summaries.

Representative quotes were extracted to support interpretation

9. Final Themes & Codes

Themes	Codes
1. Policy & Regulation	Instability, Regulatory capacity, Policy learning
2. Finance & Investment	Barriers, Green bonds
3. Technology & Infrastructure	Grid constraints, Storage solutions
4. Politics & Governance	Political interference, Institutional fragmentation, Social & human capital
5. Community Engagement & Human Capital	Community engagement, Skills gap, Gender/equity
6. Innovation & Success	Best practice adoption, Case studies
7. Vision & Future-Outlook	Long-term outlook

Table 19 Themes and Codes

Appendix 3- Qualitative Analysis

3.1 Google Form and results

3.1.1 Responses from experts _ Sri Lanka

Renewable Energy growth and Application in Sri Lanka

11 responses

Section 1 (Background & Role)

1. Can you briefly describe your role and experience in the renewable energy sector?

11 responses

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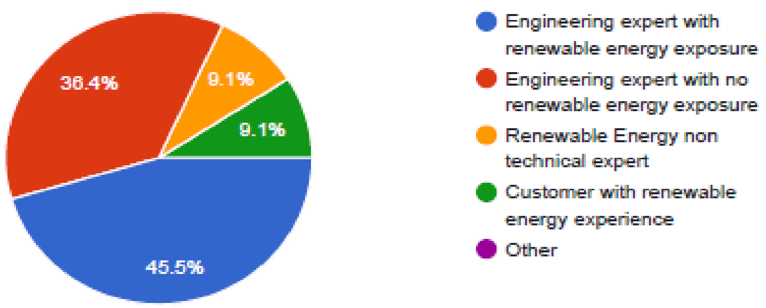

Section 1

2. How long have you been involved in energy policy/project development/investment in Sri Lanka/Asia?

11 responses

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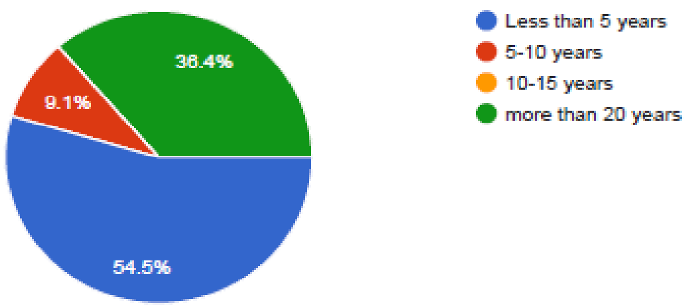

Section 2 (Sector Tends & Status)

3. How would you describe the current state of renewable energy development in Sri Lanka?

11 responses

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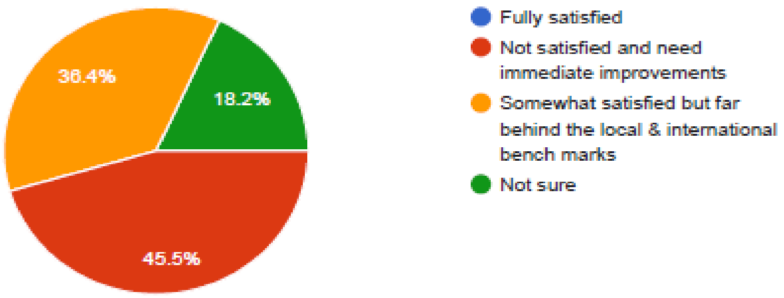

Section 3 (Barriers & Challenges)

4. What are the Key barriers to scaling up renewable energy in Sri Lanka?

11 responses

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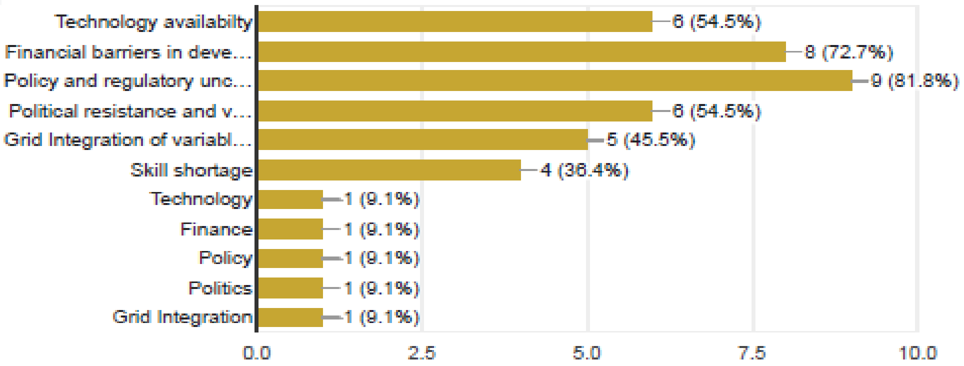

Section 3

5. To what extent do you think these challenges are unique to your country, or are they common across similar nations?

11 responses

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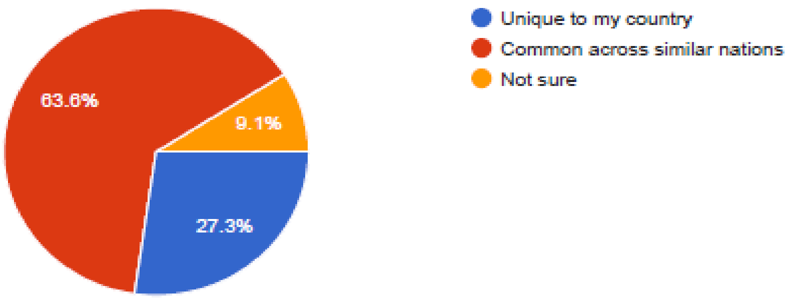

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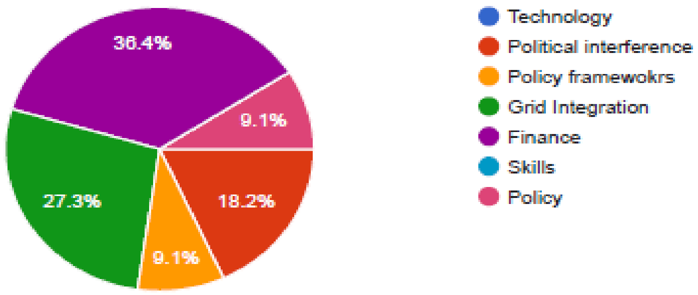
Section 3 Copy

6. What could be the most negatively impacted barrier for the success of a renewable energy project or an investments in Sri Lanka to your knowledge ?

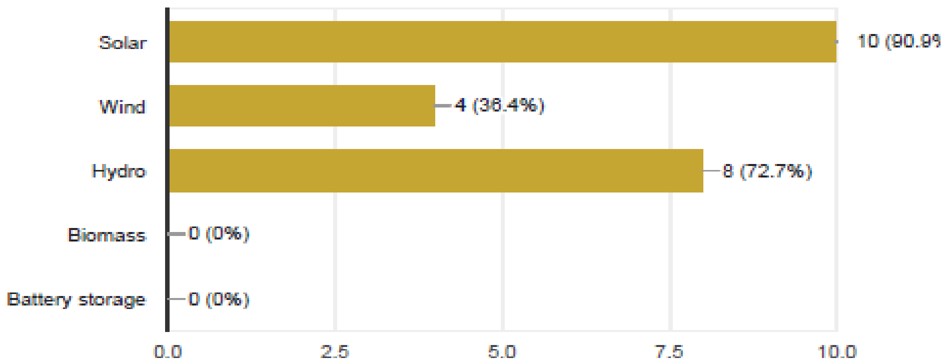
11 responses



Section 3 Copy

7. What two technologies are most advanced in your country?

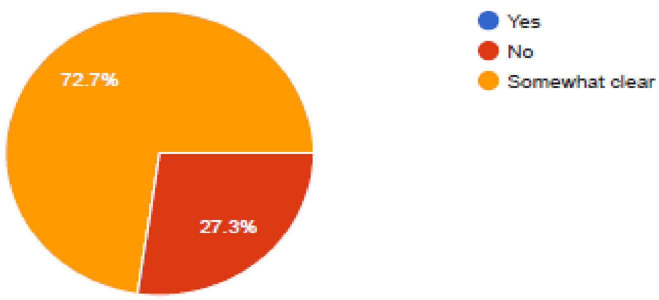
11 responses



Section 4 (Policy & Governance) Copy

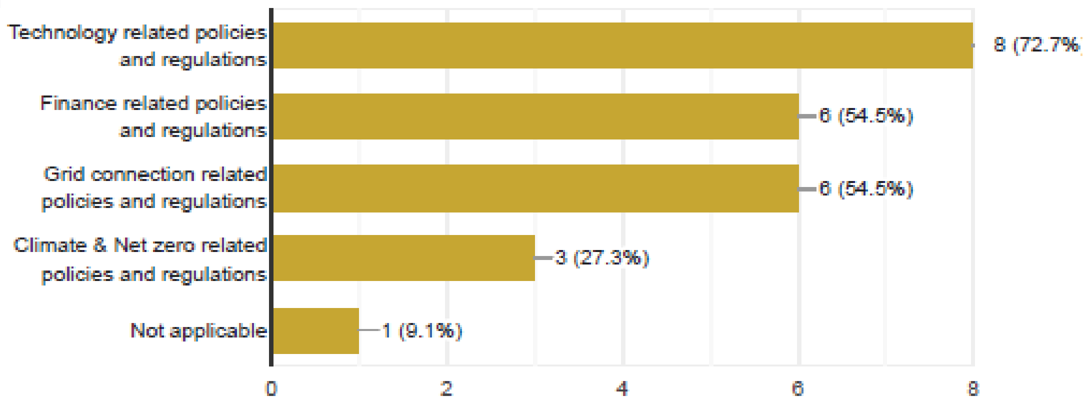
8. Are existing energy policies and regulations clear and consistent?

11 responses



If not, which of the following areas are the least clear?

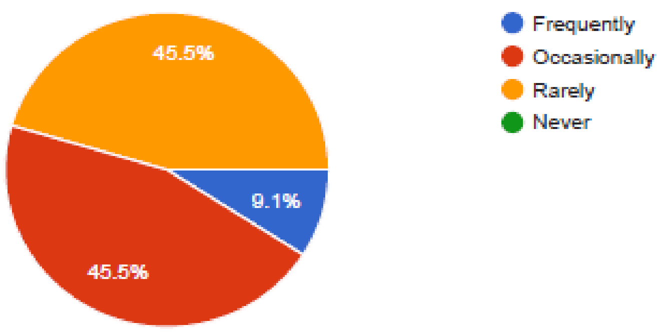
11 responses



Section 4

9. How often do energy policies and regulations change?

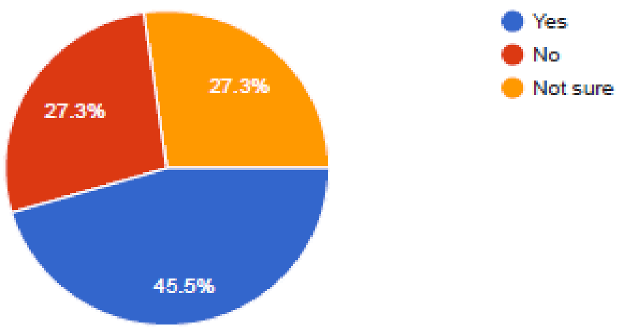
11 responses



Section 4

10. Is there a strong independent regulator for the sector?

11 responses



Section 4

11. What impact does the presence of an independent regulator have for renewable energy growth?

11 responses

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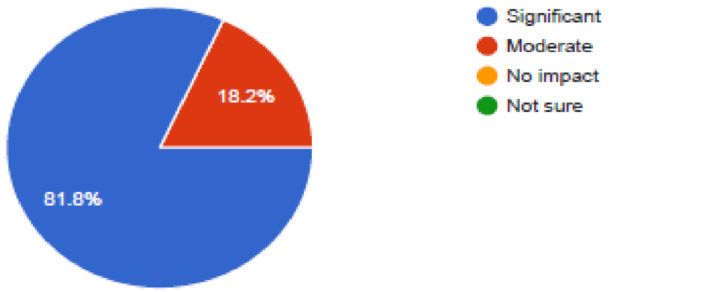

Section 4

12. What role does political stability play in renewable energy development?

11 responses

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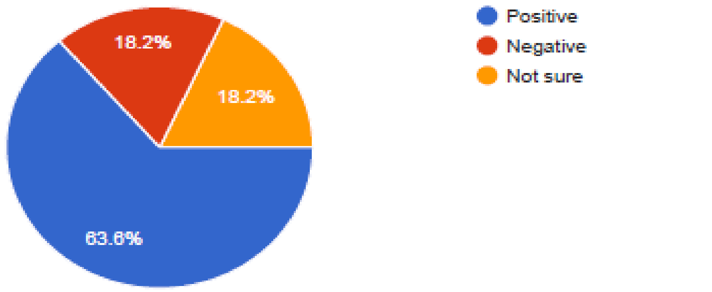

Section 5 (Finance & Investment)

13. How accessible is financing for renewable energy projects (domestic and foreign)?

11 responses

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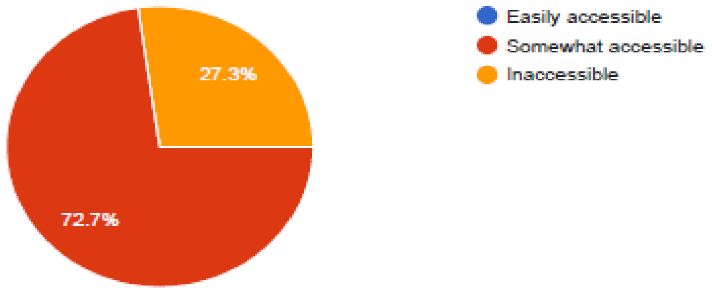

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Section 5

14. What are the most influential key factors for a successful financing and investing in renewable energy project?

11 responses

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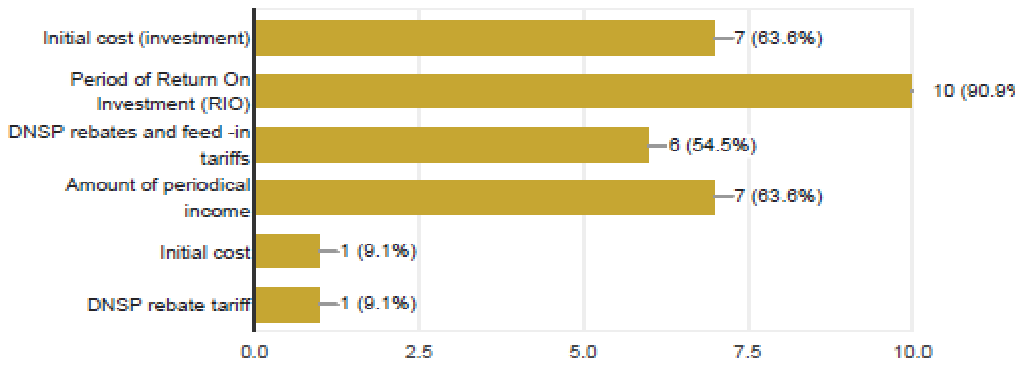

Section 6 (Technology & Infrastructure)

15. Is the existing grid capable to handle more renewables?

11 responses

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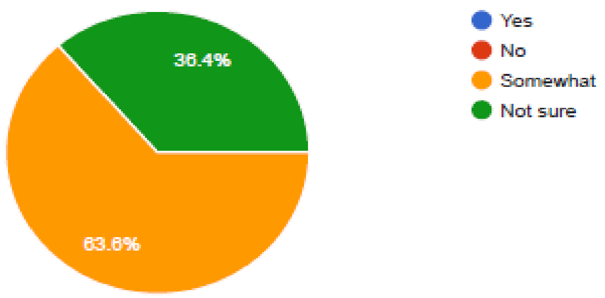

Section 6

16. What are the main technical bottlenecks for renewable energy growth in Sri Lanka?

11 responses

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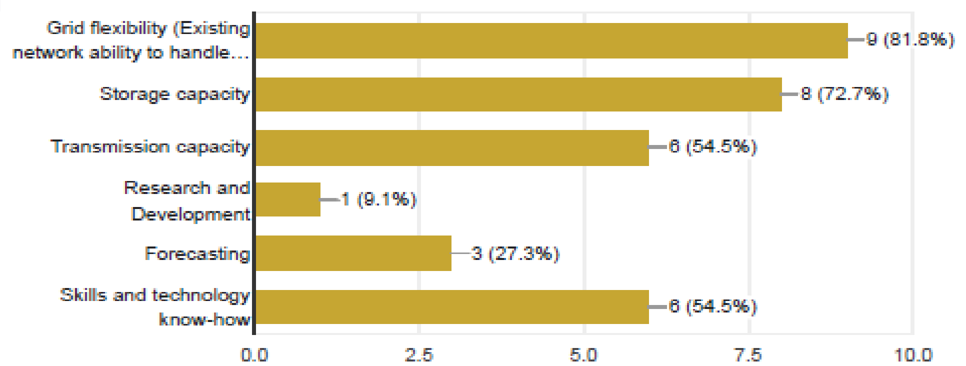

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Section 7 (Learning and Comparison)

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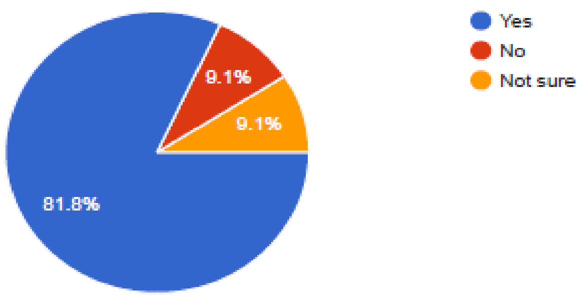
17. Have you observed successful approaches on other countries that could be adopted locally for renewable energy policy, technology or financial models?

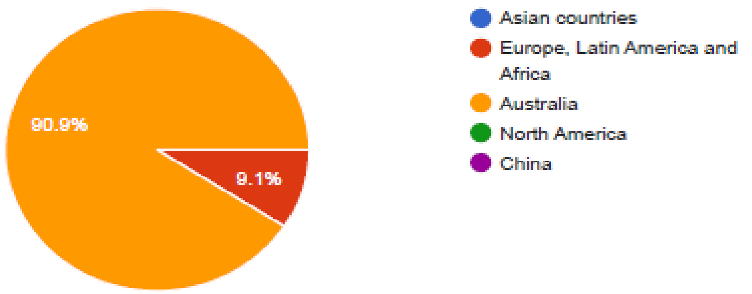
11 responses



18. If yes, which country/ies?

Copy

11 responses



Section 8 (Recommendation and Future outlook)

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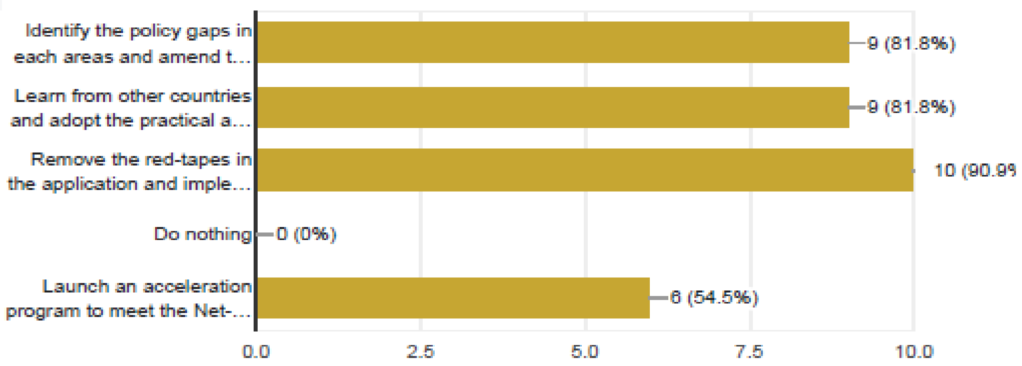
19. What changes would you recommend to policy makers to accelerate renewable energy growth in Sri Lanka?

11 responses



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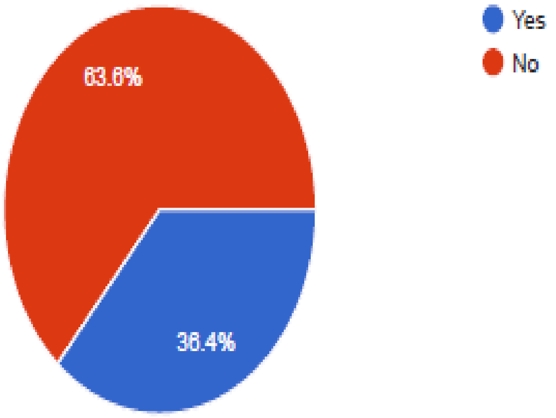
20. Are there any other factors you'd like to add that we have not covered here ?

Copy

11 responses



21. If yes, please enter in a few words?

5 responses

Need government support and more rebates in Initial cost

curtailment and backstop mechanism challenges

system stability during high solar generation at minimum load

backstop mechanism if solar connections become too high at Minimum System load condition

NA

3.1.2 Responses from experts_ Australia

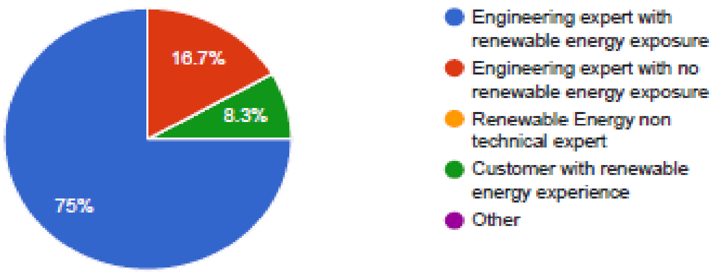
Renewable Energy growth and application in Australia

12 responses

Section 1 (Background & Role)

1. Can you briefly describe your role and experience in the renewable energy sector?

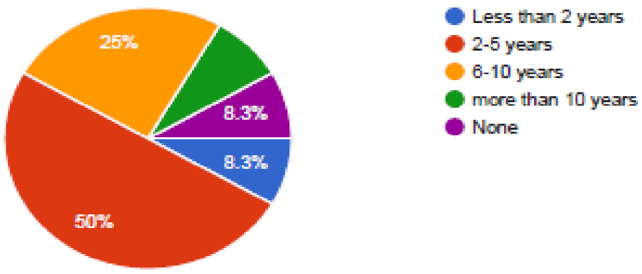
12 responses



Section1

2. How long have you been involved in energy policy/project development/investment in Australia?

12 responses



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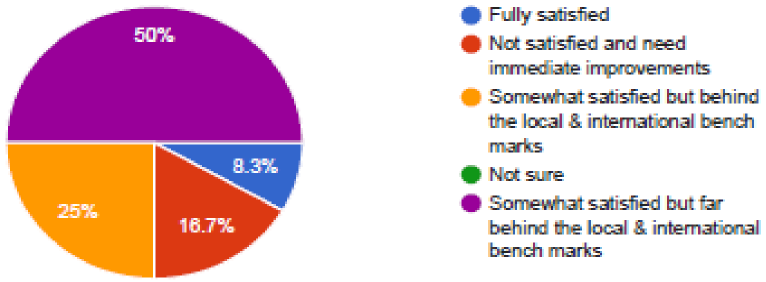
Section 2 (Sector Tends & Status)

3. How would you describe the current state of renewable energy development in Australia?

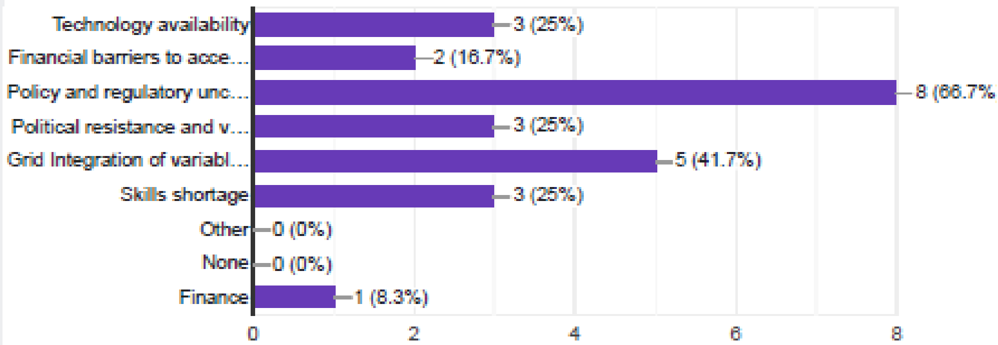
12 responses



Section 3 (Barriers and Challenges)

4. What are the key barriers to scaling up renewable energy in Australia?

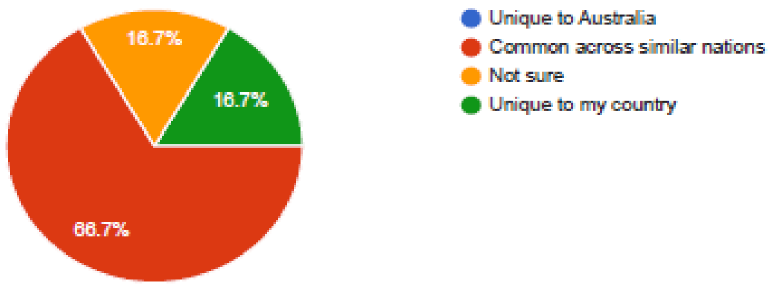
12 responses



Section 3

5. To what extent do you think these challenges are unique to Australia or are they common across similar nations?

12 responses



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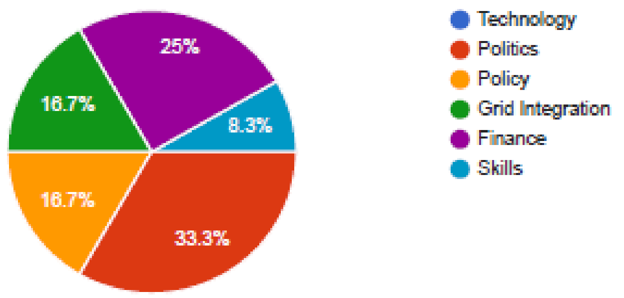
Section 3

6.What could be the most negatively impacted barriers for the success of a renewable energy projects or investments in Australia ?

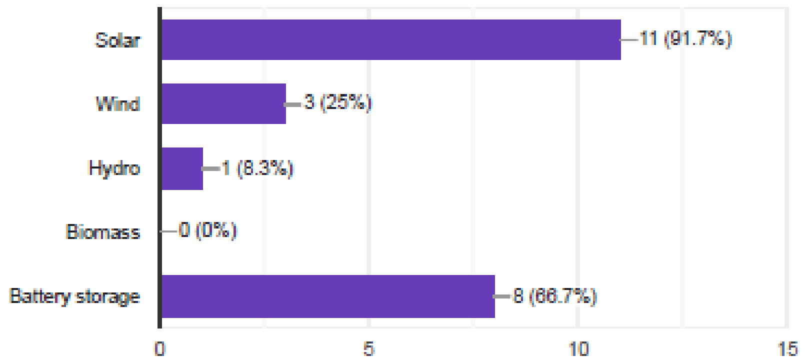
12 responses



Section 3

7 . What two technologies are most advanced in Australia ?

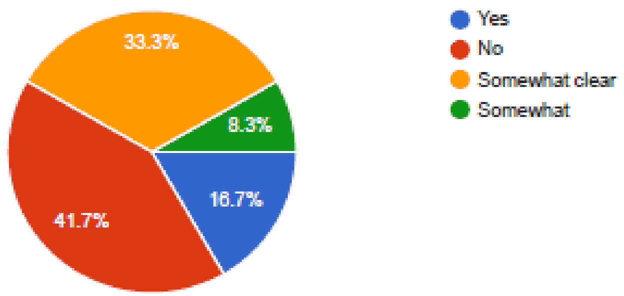
12 responses



Section 4 (Policy and Governance)

8. Are existing energy policies and regulations clear and consistent?

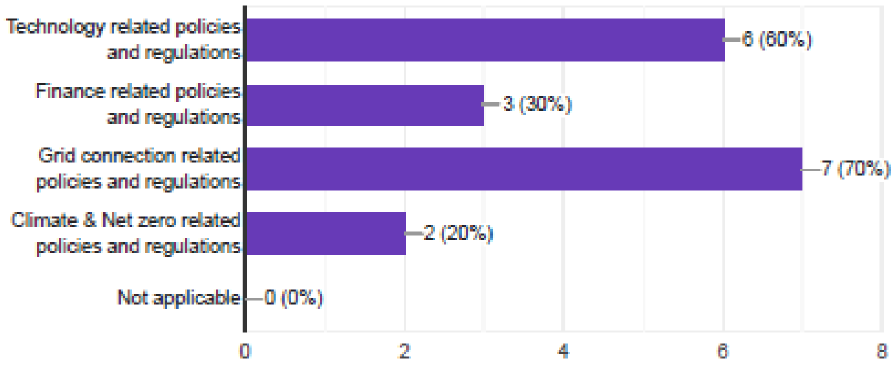
12 responses



ps://docs.google.com/forms/d/1RbKrlNpqc9um4poTWMz_jCbrwlrAFBTq5Gp7101gd08/viewanalytics 3/9

If no, which of the following areas not clear the most??

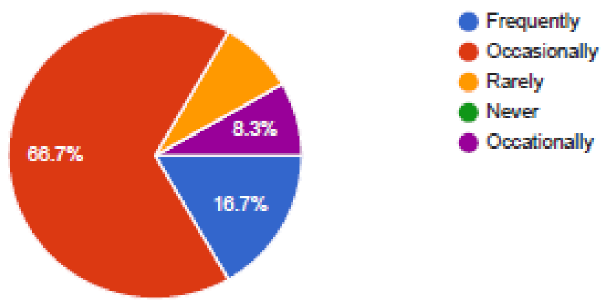
10 responses



Section 4

9. How often do energy policies and regulations change?

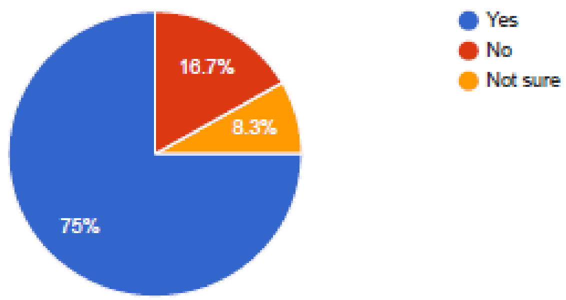
12 responses



Section 4

10. Is there a strong independent regulator for the sector?

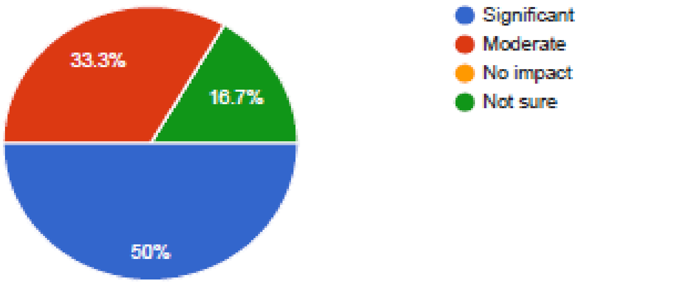
12 responses



Section 4

11. What impact does the presence of an independent regulator have for renewable energy growth?

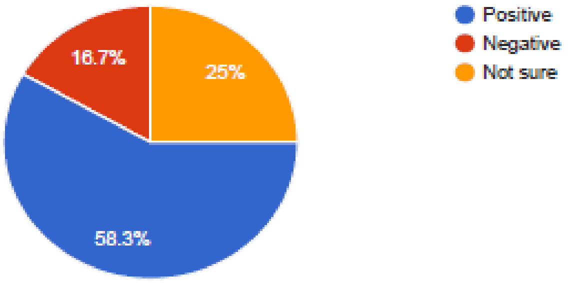
12 responses



Section 4

12. What role does political stability play in renewable energy development?

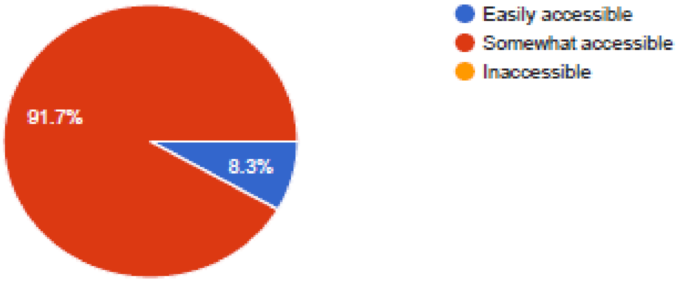
12 responses



Section 5 (Finance and Investment)

13. How accessible is financing for renewable energy projects in Australia ?

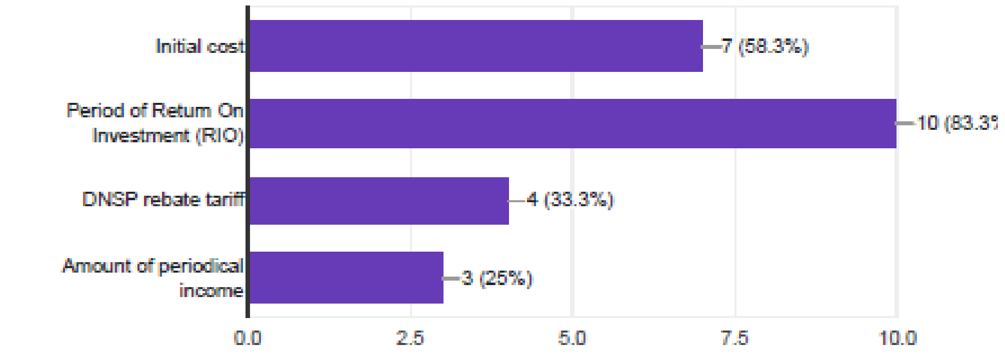
12 responses



Section 5

14 . What are the most influential key factors for a successful financing case in renewable energy projects?

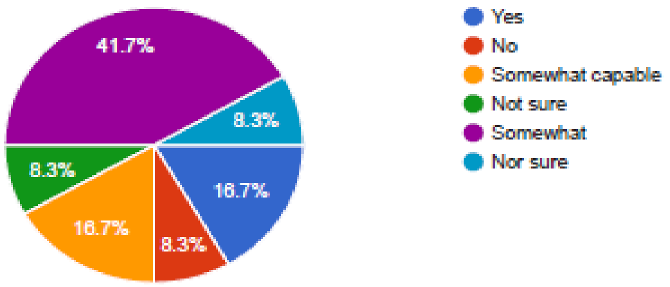
12 responses



Section 6 (Technology and Infrastructure)

15. Is the existing grid capable to handle more renewables?

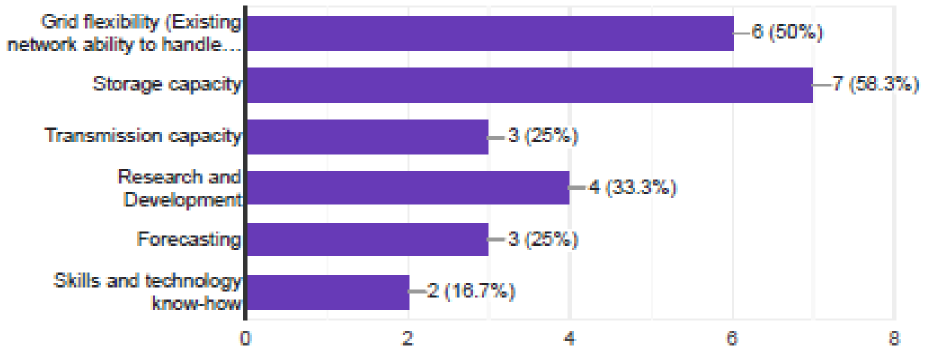
12 responses



Section 6

16. What are the main technical bottlenecks for renewable energy growth in Australia?

12 responses



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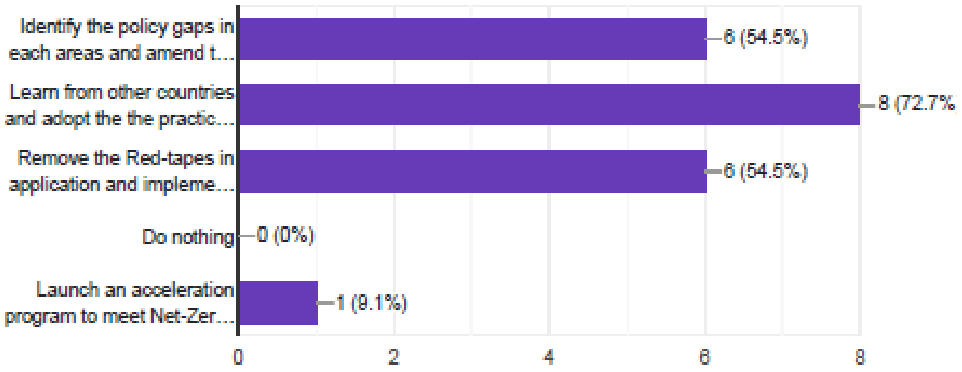
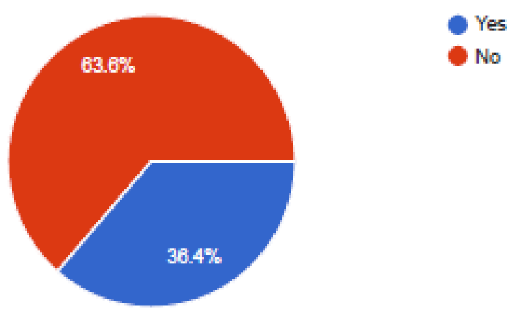
Section 8 (Recommendations and Future outlook)
19. What changes would you recommend to policy makers to accelerate renewable energy growth in Australia?

11 responses



Section 8
20. Are there any other factors you'd like add that we have not covered here?

11 responses



Section 8
21. If yes, please enter in a few words.

3 responses

Australia is a leader and has a weak, distributed grid which makes it unique in many ways.

backstop mechansm and curtailment scheemd when Minimum System Load condition occurs