

Article



Governing Fair Building Electrification in Australia and California

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Abstract: Building electrification can reduce emissions by replacing fossil gas, but its effects on households depend on how the transition is managed. This paper compares Australia and California to examine how institutional arrangements affect the equity of the gas-to-electricity transition. The analysis draws on a review of 35 policy, regulatory and academic documents, supplemented by 14 stakeholder consultations undertaken between 2023 and 2025. The consultations were used to test interpretation of the documentary evidence and clarify institutional and implementation issues rather than to provide a representative qualitative dataset. Three areas are examined: planning and institutional coordination, management of declining gas infrastructure, and impacts on household energy costs and participation. Australia's electricity planning framework provides a basis for least-cost planning, but does not yet provide an explicit framework for retiring distribution gas networks or allocating associated costs. California has substantial climate and energy policy capacity but a more fragmented regulatory system, including federal constraints on local action. The review identifies distributional differences and affordability pressures in both jurisdictions, including higher energy expenditure among Australian renters and substantial electricity tariff increases in California. The comparison suggests three areas for policy attention: considering equity in infrastructure planning, actively managing declining gas networks, and improving coordination between institutions. Building electrification is therefore not only a technology and investment issue but also a question of how infrastructure costs, network decline and household participation are governed.

Keywords: building electrification; energy justice; gas decommissioning; utility regulation; equity outcomes; comparative policy analysis

1. Introduction

Buildings are a major source of global energy demand and greenhouse gas emissions [1]. Buildings are affected by policy because they interact with energy markets, housing regulation, and network cost-recovery. In countries with established electricity systems, direct combustion of fossil gas for space heating, water heating, and cooking remain important sources of building energy use and emissions [2].

Building electrification paired with a rapidly decarbonising electricity supply is an important part of many net-zero strategies [3,4]. Modelling suggests that earlier electrification can reduce long-run energy system costs by reducing continued investment in fossil fuel infrastructure and supporting deeper decarbonisation [5].

The transition from gas to electricity in buildings involves more than replacing one technology with another. It is increasingly understood as a governance, institutional design, and equity challenge, where distributional outcomes depend heavily on regulatory frameworks, infrastructure ownership models, and policy coordination across energy, housing, and consumer protection domains [6–8].



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1.1. Comparative Approach and Case Focus

This study compares two jurisdictions with different governance arrangements. Australia and California represent useful cases for comparison: both face decarbonisation pressures, have advanced electricity systems, and have adopted strong electrification policies. They differ substantially in their governance and regulatory arrangements.

In Australia, the Integrated System Plan (ISP) applies to the National Electricity Market (NEM), which covers Queensland, New South Wales, Victoria, South Australia, Tasmania and the Australian Capital Territory, and is developed by the Australian Energy Market Operator (AEMO). California, by contrast, has responsibilities divided between state agencies, local governments and investor-owned utilities. We consider the NEM and relevant Australian state/territory institutions as one integrated energy system and California's state-level electricity and gas system, involving the California Public Utilities Commission (CPUC), California Energy Commission (CEC), utilities and local government. The case selection was to better understand the treatment of equity in the energy transition, through:

- (1) distributional effects on household energy bills by income and tenure;
- (2) participation in electrification by tenure type and housing type; and
- (3) targeted protections for households facing constraints, including renters, low-income households and apartment residents.

1.2. Energy System Context

Australia's and California's energy systems provide useful contexts for the comparison. Australia we focus on the National Electricity Market (NEM) where AEMO's Integrated System Plan provides a long-term planning framework. It identifies an optimal development path for generation, storage and transmission investment, and part of that process includes electrification and energy efficiency modelling. The 2024 ISP described renewable generation connected through transmission and distribution, supported by storage and gas generation, as the lowest-cost pathway for the NEM's transition to net zero [9]. The 2026 ISP retains this broad planning role [10].

Australian gas infrastructure is governed differently. Gas distribution networks are regulated through state and territory arrangements rather than through the ISP. This creates an institutional distinction between electricity-system planning and the management of declining gas distribution networks. Building electrification therefore interacts with two different planning and regulatory structures: a relatively coordinated electricity planning process and more jurisdictionally differentiated gas arrangements. This distinction is important to the comparison.

California has a different institutional structure. Electricity and gas services are provided through investor-owned and publicly owned utilities and are subject to state regulation, while local governments retain important responsibilities for buildings and land-use regulation. The California Public Utilities Commission regulates investor-owned utilities, while the California Energy Commission has responsibilities for energy planning, building standards and statewide energy assessment. The California Energy Commission's energy-resource and reliability assessments consider both electricity and natural gas resources and reliability across investor-owned and publicly owned utilities.

California has, therefore, substantial policy capacity but distributes decision-making across institutions with different responsibilities. Building electrification therefore interacts with utility regulation, building standards, local government decisions and federal legal constraints. The result is different from Australia's NEM planning model: California has substantial state-level climate and energy policy capacity but less centralised coordination of energy infrastructure decisions.

2. Methods

This paper uses a comparative policy review of Australia and California, supplemented by stakeholder consultation. The review examines how institutional arrangements affect the management of building electrification, declining gas networks and household impacts.

2.1. Review Design

The analysis examines governance of building electrification in Australia and California, with particular attention to equity, infrastructure transition, and institutional design. The research design draws on research on energy transitions and considers changes in technology, infrastructure, regulation and consumer behaviour [11,12].

2.2. Case Selection and Scope

Australia and California were selected as comparative cases rather than as representative samples. Both feature advanced electricity systems, decarbonisation commitments and increasing electrification, but have different governance and utility regulation. Australia represents nationally coordinated electricity market planning and institutional coordination, whereas California has a more fragmented governance structure shaped by investor-owned utility regulation. This analysis focuses primarily on residential buildings, with particular attention to space heating, water heating and cooking. Commercial buildings face distinct electrification constraints that are not examined systematically in this analysis. The comparison therefore operates at different institutional levels: the NEM provides the principal electricity-planning frame for the Australian case, while California is examined as a single state with multiple electricity, gas, building and local-government institutions. The cases are not treated as equivalent administrative units. Rather, they are compared because each illustrates a different institutional configuration through which building electrification and declining gas demand are governed. The scope is illustrated in Table 1.

Table 1. Documentary Evidence and Consultation Scope.

Analytical Issue	Australia Documentary Evidence	Australia Consultation	California Documentary Evidence	California Consultation
Planning coordination	ISP, AER and state policy documents	Regulatory and network perspectives	CPUC, CEC and legislative documents	CPUC and utility perspectives
Gas network decline	Regulatory and gas-network documents	Gas/network perspectives	CPUC, SB 1221 and utility documents	CPUC and utility perspectives
Household equity	Energy affordability studies & consumer documents	Research evidence	CPUC tariff and consumer documents	Consumer advocacy perspectives

2.3. Document Review

The method was a review of policy, regulatory, and planning documents relevant to building electrification and gas network transition. A total of 35 documents were reviewed. The documentary dataset comprised policy, regulatory, planning, and research sources selected to capture the institutional contexts shaping building electrification and gas network transition pathways in Australia and California. The Australian research included national energy planning documents, regulation, state energy strategies, academic and stakeholder analyses. The Californian research included CPUC rulemakings and decisions, utility rate case determinations, building energy regulations, policy documents, legislation, tariff analysis, judicial decisions, and stakeholders. Documents were selected according to three criteria:

- (1) relevance to gas and electricity use in buildings;
- (2) influence on infrastructure planning, utility cost recovery, or regulation;
- (3) implications for consumer affordability, and equity outcomes.

To broaden the document review and improve completeness, document identification combined citation snowballing from key scholarly literature, searches of official regulatory repositories, and cross-referencing of stakeholder submissions and cited materials within regulatory proceedings. Stakeholder consultations were used to test the interpretation of the documentary evidence and clarify institutional and implementation issues.

2.4. Analytical Framework

We used an analytical framework based on energy transition and energy justice research to compare the two jurisdictions. Three analytical domains guide the assessment:

- (1) Planning and institutional coordination: whether electrification policy, energy market rules and system planning are coordinated.
- (2) Gas infrastructure decline management: whether mechanisms exist for network retirement.
- (3) Equity and distributional impacts: affordability, consumer protection and the ability of households facing constraints to participate in electrification.

We reviewed the documents thematically to identify how governance arrangements affect equity as gas demand declines.

2.5. Stakeholder Consultation

The documentary analysis was supplemented by stakeholder consultations undertaken between 2023 and 2025 in the course of the author's professional work on building electrification, energy-system planning and gas-network transition. Fourteen stakeholders contributed, eight in Australia and six in California, including people working in regulation, networks, government policy, consumer advocacy and energy transition.

The consultations were not designed as a representative qualitative sample or as a separate empirical dataset. They were used to test the author's interpretation of documentary evidence, clarify institutional responsibilities and identify implementation issues that were not readily apparent from published documents. Discussions were semi-structured and generally lasted 45–60 min, and were not recorded or transcribed and were not subject to qualitative coding. Notes and reflections from the discussions were used to refine the interpretation presented in the paper.

Participants were given an opportunity to review quotations or findings arising from their contributions, though participants did not review the manuscript as a whole. Because the consultations arose from professional interactions rather than formal research recruitment, participants were not specifically promised anonymity. Individual participants are therefore not identified.

The consultations are therefore treated as contextual and interpretive material rather than as an empirical dataset. They were used to identify institutional relationships, clarify implementation arrangements and test interpretations emerging from the documentary review. Claims about prevalence, distributional effects and causal relationships are based on published policy, regulatory and academic sources.

2.6. Limitations

This study has several limitations. First, as a comparative analysis, it focuses on institutional interpretation rather than statistical estimation of causal effects. Second, reliance on publicly available documents may not capture all informal negotiation, particularly as California's gas planning arrangements have changed following SB 1221 [13]. Third, both jurisdictions exhibit internal diversity across states, agencies, and regulatory proceedings, so some simplification was necessary for comparison. Fourth, commercial buildings face distinct electrification constraints not fully addressed in this residential-sector focused analysis. Finally, stakeholder-informed insights reflect positionality and cannot encompass all perspectives, and in particular may not represent vulnerable people in energy poverty. We addressed these limitations by comparing different types of documents, using peer-reviewed literature and focusing on mechanisms that may apply beyond the two jurisdictions.

3. Australia: Building Electrification and Gas Decline

Australian energy policy increasingly treats building electrification as part of least-cost decarbonisation, particularly as electricity supply rapidly shifts toward renewables [9]. But, institutional and policy arrangements for the gas-to-electric transition have developed more slowly than the electricity transition. The main issue is therefore how to manage declining gas demand, network use and cost recovery.

3.1. Planning and Institutional Coordination (Australia)

Australia's nationally coordinated electricity planning architecture provides a basis for anticipating and managing changes in gas demand. The AEMO Integrated System Plan (ISP) integrates demand-side change and treats electrification as a system resource that shapes generation and network investment [9]. This provides a structural advantage relative to jurisdictions where planning responsibilities are more fragmented.

However, Australian planning has not yet developed coordinated frameworks for distribution-level gas network retirement and equitable cost allocation. This gap partly reflects the division of responsibilities between institutions, which is because AEMO divides responsibility with the Australian Energy Regulator (AER) across roles in electricity planning and regulation, and gas distribution networks remain regulated by state and territory authorities. For example, Victoria's 2023 ban on gas connections to new buildings does not automatically trigger managed decline of existing networks nor establish mechanisms for protecting remaining customers from cost escalation [14].

3.2. Gas Network Decline (Australia)

One important equity risk arises from the fixed costs of gas distribution networks. One example of a managed decline strategy for Australia could be via suburb-scale retirements aligned with gas distribution planning that:

- (1) identifies where retirement is feasible and beneficial;

- (2) sequences electrification investments to minimise stranded costs and shield vulnerable customers;
- (3) coordinates consumer protections, building upgrades, and finance [14].

As electrification reduces gas use, the fixed costs of the network have to be recovered from fewer customers, increasing the cost per customer [15]. The risk is that households least able to electrify face a growing share of the remaining network costs [8,10].

3.3. Household Affordability and Participation (Australia)

Building electrification can create different opportunities and constraints across Australian households. Published evidence indicates that renters spend around 8% more on residential energy than otherwise similar owner-occupiers, despite lower average energy use, with wealth and housing characteristics contributing to this difference [16]. Renters and apartment residents may also have less control over appliance replacement, building upgrades and other investments needed for electrification. More broadly, household participation in energy transitions depends on the roles, capabilities and opportunities available to consumers, rather than treating households simply as energy users [17]. These constraints mean that household participation in electrification cannot be considered separately from tenure, housing type and access to capital [18]. The distributional effects of declining gas demand therefore depend not only on network cost recovery but also on which households are able to leave the gas network, or households who are stuck on the network. The households that are more likely to remain on the gas network include lower income households, apartment residents and renters. This illustrates the different energy-cost position of renters and owner-occupiers and the potential importance of tenure in assessing the distributional effects of electrification.

3.4. Equity Protections (Australia)

The Australian evidence suggests that general electrification incentives may not adequately address the constraints faced by renters, low-income households and apartment residents. Australian household electrification analysis also identifies substantial potential economic benefits from combining efficient electric appliances with distributed energy technologies [19]. State-based concessions provide an important consumer-protection mechanism, but they do not directly address the split incentives (between renters and their landlords) and limited control over building investment that can constrain electrification in rental and multi-unit housing. Equity protections could therefore combine affordability assistance with measures that improve access to dwelling upgrades, electrification finance and landlord participation [20]. Such measures would also help reduce the risk that households unable to electrify become concentrated among the remaining gas customers and bear a larger share of network costs.

4. California: Electrification under Fragmented Governance and Federal Constraint

California has adopted ambitious climate policies and a range of measures supporting building electrification. The California case shows, however, that ambitious policy does not necessarily produce equitable outcomes. Electrification is shaped by fragmented institutional authority, legacy gas-utility regulation, and federal legal constraints, which make managed gas decline more difficult and create distributional risks [8].

4.1. Planning and Institutional Coordination (California)

The City of Berkeley had banned gas pipes in new buildings but a 2023 Ninth Circuit Court decision in *California Restaurant Association v. City of Berkeley* [21] found that the federal Energy Policy and Conservation Act (EPCA) preempts the Berkeley ban [22]. Then in January 2024, the Ninth Circuit denied a petition for rehearing and issued a modified opinion affirming the preemption holding. This decision had wide implications because more than 70 local and state jurisdictions had adopted all-electric building standards or gas piping bans. Berkeley settled the case in August 2024 by agreeing to repeal its ordinance [23].

This decision has important implications for California. Unlike Australia, where states can mandate electrification in building codes without national-level legal barriers, California cities can no longer rely on local land-use authority to advance all-electric development. Instead, California needs to pursue electrification through state-level coordination and utility-scale planning mechanisms. This increases the influence of investor-owned utility regulation, where utilities have obligations to serve customers and recover network costs (with consequent risks for equity).

4.2. Gas Network Decline (California)

Investor-owned utilities continue to operate under regulatory arrangements that emphasise service obligations and cost recovery. Gas utilities have a statutory obligation-to-serve, maintaining gas availability even as public policy encourages demand reduction. This creates a tension: policy encourages lower gas use while the regulatory system continues to recover the costs of the existing network. If customer exit occurs without corresponding decisions about network retirement, depreciation and cost recovery, remaining customers may face higher costs [25].

These issues are made more difficult by the division of responsibilities in California where responsibilities are distributed across state agencies, the CPUC, local governments, and program administrators with differing mandates and timelines. Municipal actions to favour all-electric buildings or restrict new gas connections do not automatically translate into coordinated gas-retirement planning at the system level, particularly now that local zoning authorities are constrained by federal preemption as discussed in Section 4.1.

An important development on gas network decline is state law SB 1221, which establishes a voluntary neighbourhood decarbonisation pilot program [13]. It requires gas corporations to submit annual maps of potential gas distribution line replacement projects, disadvantaged communities, and tribal boundaries (by 1 July 2025 and annually thereafter). The CPUC must then designate priority neighbourhood decarbonisation zones annually and establish voluntary pilots.

For SB 1221, pilot projects generally require consent from at least 67% of property owners within the project area [13]. The program is limited to 30 projects statewide, although projects achieving 100% property-owner consent do not count towards this cap. The program is also limited to affecting no more than 1% of each participating natural gas corporation's customers within its service territory. The CPUC framework requires proposed projects to be cost-effective, provide reliable and affordable replacement energy services, coordinate with local communities and electric providers, and allow portions of the gas system to be safely retired [26].

However, SB 1221 implementation remains uneven and the voluntary nature of these pilots means that without explicit equity requirements, there may be limited prioritisation of disadvantaged neighbourhoods.

4.3. Household Affordability and Participation (California)

California electricity rates have nearly doubled over the past decade, significantly exceeding inflation [24]. In response, the CPUC approved tiered fixed monthly charges in Decision 24-05-028 (May 2024), with the aim of lowering volumetric electricity rates [34]. However, the reform has created new distributional considerations. Standard customers face a \$24.15/month fixed charge, while California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance (FERA) customers face charges of \$6.00 and \$12.08/month, respectively [34]. US research also identifies retrofit capital requirements and supply-chain constraints as factors affecting the practical feasibility of replacing gas appliances [27].

California modelling of residential building electrification examines consumer economics, emissions benefits and grid impacts, and indicates that distributional consequences depend on both household economics and system conditions [28].

Fixed charges are also expected to increase electricity bills for more than 4 million households even if they have lower volumetric rates [29]. The reform creates distributional effects because households with relatively low electricity consumption are more exposed to the fixed charge. Simultaneously, costs shifted from rooftop solar customers to non-solar customers have risen from \$3.4 billion annually in 2021 to \$8.5 billion in 2024, creating cross-subsidy effects that have raised equity concerns [24].

4.4. Equity Protections (California)

California has implemented low-income assistance programs (CARE, FERA) and income-tiered rate structures more extensive than Australia's state-based concession systems. However, underlying tariff design such as fixed charges that penalise low-consumption households can reduce the benefits of these programs and create barriers to electrification for some households. California's fixed-charge reforms illustrate the distributional consequences that can arise from tariff design, particularly where fixed charges and volumetric prices affect households differently [34]. These effects may influence the relative costs and benefits of electrification for lower-income and low-consumption households.

5. Comparative Analysis and Governance Lessons

We explore equity with three questions suggested by Jenkins et al. [30].

- (1) Distributional Justice: Who bears the costs and receives the benefits of electrification and gas-network decline?

- (2) Procedural Justice: Who participates in decisions about network retirement, tariffs and electrification?
- (3) Recognition Justice: Is there recognition of households with different tenure, income and housing characteristics as facing different constraints?

The equity effects of building electrification depend on how institutions manage declining-customer-base effects on gas infrastructure as well as on the availability of electrification technologies [30]. Both Australia and California recognise electrification as critical for decarbonising buildings, yet the outcome depends in part on whether policymakers manage gas network decline or allow costs to be recovered from a shrinking customer base.

5.1. Distributional Justice

Recent research identifies several equity issues associated with electrification and declining gas use. In Australia, Best and Burke [16] find that, after controlling for net wealth, renters spend around 8% more on energy than otherwise similar non-renters. The authors also note that renters consumed around 15% less residential electricity in the underlying 2012 data. This disparity may be attributable to capital constraints and landlord–tenant barriers. Modelling by the Institute for Energy Economics and Financial Analysis (IEEFA) suggests that comprehensive rental property upgrades could save renters A\$106.9 billion cumulatively by 2050, but current policy does not yet provide a clear mechanism for achieving this at scale [31].

California’s experience shows that the distributional consequences of electrification can vary substantially between households depending on their exposure to electricity and gas pricing and their capacity to participate in building-level investment [32]. The state’s CARE and FERA programs provide targeted bill assistance for lower-income households, illustrating how broader energy-transition reforms can be complemented by mechanisms that protect households with limited capacity to absorb higher energy costs. At the same time, California’s experience with rooftop solar cost shifting demonstrates that policies designed to accelerate clean-energy adoption can redistribute costs between participating and non-participating households, making the design of cost recovery an important component of distributional equity.

5.2. Procedural Justice

Australia’s nationally coordinated electricity planning with the Integrated System Plan (ISP) treats electrification as an internal system resource shaping network investment. This structural coherence provides a clear procedural advantage for embedding equity into system-level planning. However, this procedural integration fails to extend to distribution gas networks, which remain fragmented under state-based regulation. As a result, Australia lacks a unified procedural mechanism to link electricity planning with distribution-level gas decommissioning.

California operates under procedural fragmentation because authority is distributed across state agencies (CPUC, CEC), local governments, and investor-owned utilities, while federal preemption limits local zoning authority. This institutional division restricts coordinated oversight of equity outcomes. Although SB 1221 establishes a statutory pathway for voluntary neighbourhood decarbonisation pilot zones, utility obligations-to-serve and protected cost-recovery arrangements maintain strong regulatory inertia.

Crucially, both Australia and California exhibit a shared procedural justice gap and neither formalises a meaningful role for affected communities in decisions regarding network retirement timing or geography. Tariff design and asset retirement decisions take place within complex, legalistic regulatory venues (such as CPUC rate cases or AER determinations) where low-income households and renters lack the institutional standing and resources to participate effectively. This procedural asymmetry leaves unrepresented cohorts vulnerable to cost increases as gas demand declines.

5.3. Recognition Justice

In both contexts, recognition justice is undermined by policy frameworks that default to an implicit owner-occupier norm, failing to acknowledge non-owner households and apartment residents as distinct policy cohorts. Rather than recognising how tenure, housing type, and split incentives create unique structural constraints, current governance arrangements treat energy consumers as a homogenous group.

This institutional misrecognition leaves renters and multi-family residents politically invisible in primary electrification design [30]. The consequences of this non-recognition are evident in empirical outcomes: Australian renters spend 8% more on energy despite consuming less [16], while Californian renters disproportionately occupy multi-family buildings with limited appliance control [33]. This reflects a broader challenge in the energy transition where households are not simply passive consumers but have different capacities and opportunities to participate

in the changing energy systems [18]. Because neither jurisdiction formally recognises tenure or housing type as core policy categories, existing interventions rely on generic low-income measures that fail to address the underlying status and agency constraints of non-owner cohorts.

5.4. Comparative Evidence Table

Figure 1 illustrates the importance of institutional coordination to achieving equitable outcomes. Both Australia and California could include explicit equity integration from the outset. The comparative analysis of Australia and California shown in Table 2 suggests that equity outcomes are shaped less by climate ambition than by governance, regulatory design, and infrastructure planning.

Comparative Framework: Australia and California for Gas Transition and Building Electrification		
	 AUSTRALIA	 CALIFORNIA
1  Institutional configuration ↓	- Federal system with national energy market - States lead energy policy and building regulation - AEMO, AER and state regulators with defined roles - Gas and electricity networks separately regulated	- State-level governance under CPUC authority - Strong state leadership on climate and energy policy - CPUC oversees gas and electric utilities and planning - Integrated state policies (legislation, regulation, standards)
2  Planning and regulatory arrangements ↓	- ISP by AEMO informs market and investment - Regulatory determinations set network revenue and standards - State strategies guide policy, incentives and programs - Building codes and standards evolving by state/territory	- CPUC long-term gas planning rulemakings - General rate cases determine utility revenues and investments - Building energy standards (Title 24) and local reach codes - Appliance standards and efficiency regulations
3  Management of gas-network decline ↓	- Transition planning emerging; no mandated phase-out - Focus on reliability, optionality and market-driven change - Limited frameworks for decommissioning and stranded asset risk - Cost recovery via regulated revenue model	- Statutory direction to plan for gas system decline (SB 1221) - Decommissioning frameworks and pilots underway - Consumer protections and hardship considerations - Cost recovery scrutiny and transition cost allocation
4  Household participation / cost allocation ↓	- Incentives for electrification vary across states - Network costs recovered through tariffs and charges - Limited targeted protections for low-income households - Participation mainly via market and policy programs	- Incentives and programs for electrification and efficiency - Rate design and affordability programs under CPUC oversight - Protections for low-income and vulnerable customers - Stakeholder engagement in rulemakings and proceedings
5  Three equity dimensions	 1. Distribution Who bears costs and who receives benefits?	 1. Distribution Who bears costs and who receives benefits?
	 2. Participation / procedural access Who is able to participate in decisions and how?	 2. Participation / procedural access Who is able to participate in decisions and how?
	 3. Recognition of differentiated constraints Are diverse needs, circumstances and constraints recognised?	 3. Recognition of differentiated constraints Are diverse needs, circumstances and constraints recognised?

Figure 1. Comparative institutional arrangements relevant to building electrification in Australia and California.

Table 2. Comparative institutional and equity characteristics in Australia and California.

Indicator	Australia	California
Distributional effects	Evidence of higher energy expenditure among renters; evidence of gas affordability pressures	Evidence on electricity tariff increases and fixed-charge impacts
Participation	Split incentives and renter/apartment barriers	Split incentives and multi-family/renter barriers

Table 2. *Cont.*

Indicator	Australia	California
Targeted protection	State-based concessions and consumer protections	CARE, FERA and emerging neighbourhood decarbonisation arrangements
Gas decline management	No integrated distribution-gas retirement framework identified	SB 1221 provides a limited pilot pathway
Planning coordination	AEMO ISP provides NEM-level electricity coordination	Multiple institutions share electricity, gas, building and local-government responsibilities

Table 2 is not intended to rank the two jurisdictions. It identifies differences in institutional arrangements and the types of equity issues identified in the documentary review.

5.5. Three Governance Lessons

The first lesson is that equity can be considered when infrastructure is planned. Once infrastructure investment and cost-recovery arrangements are established, changing their distributional effects can be difficult. It would be better if equity impacts are considered during infrastructure planning rather than relying entirely on assistance programs after investment decisions have been made. Planning and modelling could value demand-side change, network retirement, and social outcomes *ex ante*. To do this, Australia's ISP methodology could be modified to include distributional impact assessment alongside cost and emissions metrics and California's SB 1221 pilot program could incorporate mandatory equity outcomes reporting (see the first recommendation under Section 6.3). Both jurisdictions should establish baseline equity metrics and track distributional impacts as a core regulatory obligation, providing the basis to formally recognise the differentiated constraints facing renters, low-income households and apartment residents identified in Section 5.3.

Secondly, the declining-customer-base for gas networks can be managed. Unmanaged decline may contribute to tariff escalation and stranded-asset recovery with regressive effects because if customers exit without corresponding decisions about network retirement the remaining customers may face higher costs [6,15]. Evidence from Australia already points to this as an emerging risk for renters and apartment residents [16]. In addition, California's existing regulatory arrangements provide limited mechanisms for utilities to coordinate gas-network retirement with equity objectives. Managed decline ideally would include clarity on depreciation and cost allocation (see the second recommendation under Section 6.1 and the second recommendation under Section 6.3).

Thirdly, procedural equity depends on institutional coordination: California has strong climate policy but decision-making is distributed across state agencies, utilities and local government. Australia has stronger coordination of NEM electricity planning, but this does not extend in the same way to distribution gas networks. The comparison suggests that procedural equity, understood here as coordinated and accessible decision-making, is easier to achieve where the institutions responsible for planning, regulation and consumer protection can consider these issues together.

6. Policy Implications

Building electrification can thus be seen as a governance and institutional design challenge, not just a technological one, which is consistent with research on Australia's and California's transition [13,14]. Decarbonisation outcomes are mediated by regulatory institutions, infrastructure ownership, and market rules, rather than technology or cost alone [5,8,30]. We now consider what recommendations would apply to both Australia and California, and then which are specific to Australian and then specific to California.

6.1. Cross-Cutting Recommendations (Both Jurisdictions)

- (1) Incorporate distributional assessment into system planning: AEMO's ISP methodology and California's long-term planning processes could assess potential bill impacts across income, tenure and housing type alongside conventional cost and emissions measures.
- (2) Establish statutory frameworks for managed gas decommissioning: Clarify depreciation schedules, cost allocation rules, and procedures for orderly network retirement, distinguishing between areas where retirement is feasible and beneficial.
- (3) Strengthen protections for households facing affordability constraints: Concession and hardship arrangements could be assessed against actual changes in household energy costs and complemented by

- targeted protections during periods of network transition.
- (4) Couple electrification incentives with dwelling upgrades and wiring readiness: Electrification finance could be bundled with thermal shell improvements, electrical panel upgrades, and heat pump installation to maximise bill benefits and system efficiency [20].
 - (5) Establish transparent, accountable equity outcome monitoring: Annual public reporting of electrification rates by income, tenure, and housing type; tariff impacts by consumer cohort; and progress toward specified equity targets [35,36].

6.2. Australia-Specific Recommendations

- (1) Consider how gas-network retirement planning could be connected with AEMO's electricity-system planning and state-based distribution planning: this could include transparency on asset conditions, customer use to identify areas of decline, depreciation that is fair and identification of retirement areas. This might include integration of AEMO system-level electrification scenarios with AER distribution planning to establish precinct-scale gas retirements and network transition timelines.
- (2) Trial managed retirement in selected locations: Where network condition, customer characteristics, electrification readiness and potential avoided network costs indicate that a coordinated approach may be feasible.
- (3) Establish minimum concession standards: Harmonise state-based energy concession schemes to provide consistent baseline support, indexed to inflation and actual energy price increases.
- (4) Develop landlord incentive frameworks: Enable rental property electrification finance with regulatory certainty on cost recovery mechanisms, addressing split incentives between landlords and tenants.

6.3. California-Specific Recommendations

- (1) Implement SB 1221 pilots with mandatory equity outcomes: Ensure neighbourhood decarbonisation zones are designated in disadvantaged communities first; establish minimum consent thresholds; explore annual equity impact reporting.
- (2) Clarify obligation-to-serve boundaries and retirement pathways: The California case suggests that further consideration of utility obligations, cost recovery and retirement arrangements would assist in managing declining gas demand.
- (3) Authorise non-pipes alternatives prioritising low-income electrification: Enable infrastructure-lite pathways, with regulatory mechanisms to support affordability.

7. Conclusions

The comparison of Australia and California indicates that the equity of building electrification depends not only on the availability and cost of technologies but also on the institutions through which infrastructure investment, network regulation and consumer protection are managed. The evidence reviewed here identifies three areas for attention: consideration of equity in infrastructure planning, active management of declining gas networks, and coordination between institutions with responsibility for energy, housing and consumer policy.

The analysis does not establish causal relationships between these institutional arrangements and household outcomes. Rather, the two cases illustrate how governance arrangements can create or constrain opportunities for equitable electrification. In both jurisdictions, renters, apartment residents and lower-income households may face greater barriers because they have less control over building investment and fewer resources to finance electrification. Declining gas demand may also create future cost-allocation risks if network retirement and cost recovery are not considered together.

The comparison therefore suggests that building electrification is partly a governance issue as well as a technology and investment issue. Further research could test the mechanisms identified here using household-level, network-level and tariff data, particularly to examine how changes in demand affect network costs and how different policy arrangements affect household participation in electrification.

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Institutional Review Board Statement

The stakeholder consultations referred to in this paper arose from professional meetings undertaken in the course of the author's work on energy policy. They are used as contextual and interpretive material to inform the analysis of publicly available policy and regulatory evidence. They were conducted to inform and test interpretation of publicly available policy and regulatory evidence. They were not conducted as a formally recruited human-participant research study, were not recorded or transcribed and were not subjected to qualitative coding. Participants were not recruited for the purpose of generating a representative research sample. Participants were given an opportunity to review quotations or findings arising from their contributions before publication. This activity is defined as "out of scope" of University of Melbourne Human Research Ethics and Safeguards (MPF1385) in Section 2.4.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The documentary sources used in this review are publicly available. The stakeholder consultations did not generate a formal interview dataset: discussions were not recorded or transcribed and no coded qualitative dataset was created. Consultation notes were used by the author to inform interpretation and are not publicly available.

Conflicts of Interest

The author declares no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this manuscript, the author used artificial intelligence (AI) tool Claude to assist with language editing, including improving clarity, grammar, structure and readability. AI tools were also used to assist with limited editorial tasks, such as identifying areas of repetition and suggesting alternative wording.

The author reviewed and verified all AI-assisted outputs and remains fully responsible for the content of the manuscript, including the research design, analysis, interpretation of evidence, citations and conclusions. No AI tool was used to generate or determine the research findings or conclusions.

References

1. Ürge-Vorsatz, D.; Lucon, O.; Zain Ahmed, A.; et al. Buildings. In *Climate Change 2014: Mitigation of Climate Change: Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK, 2014; pp. 671–738. <https://doi.org/10.1017/CBO9781107415416.015>.
2. Ürge-Vorsatz, D.; Cabeza, L.F.; Serrano, S.; et al. Heating and cooling energy trends and drivers in buildings. *Renew. Sustain. Energy Rev.* **2015**, *41*, 85–98. <https://doi.org/10.1016/j.rser.2014.08.039>.
3. Rosenow, J.; Cowart, R.; Bayer, E.; et al. Electrification and efficiency: The pathway to net zero. *Energy Res. Soc. Sci.* **2020**, *64*, 101425. <https://doi.org/10.1016/j.erss.2019.101425>.
4. International Energy Agency. The Future of Heat Pumps. IEA Publications. 2022. Available online: <https://www.iea.org/reports/the-future-of-heat-pumps> (accessed on 2 October 2026).
5. Markard, J. The next phase of the energy transition and its implications for research and policy. *Nat. Energy* **2018**, *3*, 628–633. <https://doi.org/10.1038/s41560-018-0171-7>.
6. Carley, S.; Konisky, D.M. The justice and equity implications of the clean energy transition. *Nat. Energy* **2020**, *5*, 569–577. <https://doi.org/10.1038/s41560-020-0641-6>.
7. Jenkins, K.; McCauley, D.; Heffron, R.; et al. Energy justice: A conceptual review. *Energy Res. Soc. Sci.* **2016**, *11*, 174–182. <https://doi.org/10.1016/j.erss.2015.10.004>.
8. Sovacool, B.K.; Burke, M.; Baker, L.; et al. New frontiers and conceptual frameworks for energy justice. *Energy Policy* **2017**, *105*, 677–691. <https://doi.org/10.1016/j.enpol.2017.03.005>.
9. Australian Energy Market Operator. 2024 Integrated System Plan for the National Electricity Market. AEMO. 2024. Available online: <https://www.aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp> (accessed on 2 October 2026).

10. Australian Energy Market Operator. 2026 Integrated System Plan for the National Electricity Market. AEMO. 2026. Available online: <https://www.aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2026-integrated-system-plan-isp> (accessed on 2 October 2026).
11. Markard, J.; Raven, R.; Truffer, B. Sustainability transitions: An emerging field of research and its prospects. *Res. Policy* **2012**, *41*, 955–967. <https://doi.org/10.1016/j.respol.2012.02.013>.
12. Geels, F.W. Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Res. Policy* **2002**, *31*, 1257–1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8).
13. California Legislation Senate Bill 1221 2024. Available online: https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB1221 (accessed on 2 October 2026).
14. Currie, G.T. Comparing the Californian energy transition with Australia. Energy Consumers Australia. 2025. Available online: <https://energyconsumersaustralia.com.au/sites/default/files/2025-10/website-doc-gill-owen-scholarship-2025-research-conclusions-glen-currie-updated-oct.pdf> (accessed on 2 October 2026).
15. Kime, S.; Jacome, V.; Pellow, D.; et al. Evaluating equity and justice in low-carbon energy transitions. *Environ. Res. Lett.* **2023**, *18*, 123003. <https://doi.org/10.1088/1748-9326/ac6ae1>.
16. Best, R.; Burke, P.J. Effects of renting on household energy expenditure: Evidence from Australia. *Energy Policy* **2022**, *166*, 113022. <https://doi.org/10.1016/j.enpol.2022.113022>.
17. Currie, G.T. *Australia's Energy Transition: Balancing Competing Demands and Consumer Roles*, 1st ed.; Springer Nature: Singapore, 2020. <https://doi.org/10.1007/978-981-15-6145-0>.
18. Strengers, Y. Beyond demand management: Co-managing energy and water practices with Australian households. *Policy Stud.* **2011**, *32*, 35–58. <https://doi.org/10.1080/01442872.2010.526413>.
19. Chandrashekeran, S.; de Bruyn, J.; Sullivan, D.; et al. Electrification and lower-income households in Australia: An integrated analysis of adaptive capacity and hardship. *Energy Res. Soc. Sci.* **2024**, *116*, 103688. <https://doi.org/10.1016/j.erss.2024.103688>.
20. Climateworks Centre. Renovations and Rewiring Can Multiply the Decarbonisation Dividend. Monash University. 2024. Available online: <https://climateworkscentre.org/news/renovations-and-rewiring-can-multiply-the-decarbonisation-dividend> (accessed on 2 October 2026).
21. California Restaurant Association v. City of Berkeley, Opinion. 2023. Available online: <https://cdn.ca9.uscourts.gov/datastore/opinions/2023/04/17/21-16278.pdf> (accessed on 2 October 2026).
22. California Restaurant Association v. City of Berkeley, Order and Amended Opinion. 2024. Available online: <https://cdn.ca9.uscourts.gov/datastore/opinions/2024/01/02/21-16278.pdf> (accessed on 2 October 2026).
23. California Restaurant Association. California Restaurant Association and Berkeley Settle Gas Ban Lawsuit: Berkeley Will Not Enforce Its Ban. 2024. Available online: <https://www.calrest.org/news/california-restaurant-association-and-berkeley-settle-gas-ban-lawsuit-berkeley-will-not-enforce> (accessed on 2 October 2026).
24. California Public Utilities Commission, Public Advocates Office. 2024 Q4 Electric Rates Report. CPUC. 2024. Available online: <https://www.publicadvocates.cpuc.ca.gov/press-room/reports-and-analyses/2024-q4-electric-rates-report> (accessed on 2 October 2026).
25. Borenstein, S.; Fowlie, M.; Sallee, J. *Designing Electricity Rates for An Equitable Energy Transition*; Working Paper No. 314; Energy Institute at Haas, UC Berkeley: Berkeley, CA, USA, 2021. Available online: <https://escholarship.org/uc/item/9fq4z64x> (accessed on 2 October 2026).
26. California Public Utilities Commission. 2025 Annual Report: Neighborhood Decarbonization Zone Pilot Projects. CPUC. 2026. Available online: <https://ccag.ca.gov/wp-content/uploads/2026/03/4A1-2025-Annual-Report-Neighborhood-Decarbonization-Zone-Pilot-Projects.pdf> (accessed on 2 October 2026).
27. Deason, J.; Wei, M.; Leventis, G.; et al. *Electrification of Buildings and Industry in the United States: Drivers, Barriers, Prospects, and Policy Approaches*; Lawrence Berkeley National Laboratory: Berkeley, CA, USA, 2018. Available online: <https://escholarship.org/content/qt8qz0n90q/qt8qz0n90q.pdf> (accessed on 2 October 2026).
28. Mahone, A.; Li, C.; Subin, Z.; et al. *Residential Building Electrification in California*; Energy and Environmental Economics (E3): San Francisco, CA, USA, 2019. Available online: https://www.ethree.com/wp-content/uploads/2019/07/CA_Res_Building_Electrification_Final_Presentation.pdf (accessed on 2 October 2026).
29. CALPIRG. Statement: California Utility Commission Increases Bills on Millions, Devalues Energy Conservation. California Public Interest Research Group. 2024. Available online: <https://pirg.org/california/media-center/statement-california-utility-commission-increases-bills-on-millions-devalues-energy-conservation/> (accessed on 2 October 2026).
30. Jenkins, K.; Sovacool, B.K.; McCauley, D. Humanizing sociotechnical transitions through energy justice: An ethical framework for global transformative change. *Energy Policy* **2018**, *117*, 66–74. <https://doi.org/10.1016/j.enpol.2018.02.036>.
31. Institute for Energy Economics and Financial Analysis. Home Upgrades Can Save Renters Billions in Energy Bills. IEEFA. 2026. Available online: <https://ieefa.org/articles/home-upgrades-can-save-renters-billions-energy-bills> (accessed on 2 October 2026).

32. Granqvist, H.; Grover, D. Distributive fairness in paying for clean energy infrastructure. *Ecol. Econ.* **2016**, *126*, 87–97. <https://doi.org/10.1016/j.ecolecon.2016.02.012>.
33. Emmett Institute on Climate Change and the Environment. Tenant-Friendly Building Decarbonization in Los Angeles. UCLA School of Law. 2023. Available online: <https://law.ucla.edu/sites/default/files/PDFs/Publications/Emmett%20Institute/Tenant-Friendly%20Building%20Decarb%20in%20LA%20-%20Final%20Digital%206-14.pdf> (accessed on 2 October 2026).
34. California Public Utilities Commission. Decision 24-05-028: Decision Addressing Assembly Bill 205 Requirements for Electric Utilities. CPUC, 2024. Available online: <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M531/K686/531686019.PDF> (accessed on 2 October 2026).
35. Cina-Sklar, Z. Decarbonization at the Neighborhood Scale: Challenges, Learnings and Opportunities in an Emerging Model. Master's Thesis, Massachusetts Institute of Technology, Cambridge, MA, USA, 2025. Available online: <https://hdl.handle.net/1721.1/162145> (accessed on 2 October 2026).
36. Borenstein, S.; Davis, L.W. *The Distributional Effects of U.S. Tax Credits for Heat Pumps, Solar Panels, and Electric Vehicles*; NBER Working Paper No. 32688; National Bureau of Economic Research: Cambridge, MA, USA, 2024. <https://doi.org/10.3386/w32688>.