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Apples and oranges? A multi-level approach explaining social acceptance of renewable energy in Germany and Australia

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Abstract: Existing research in renewable energy transitions largely seeks to identify success factors needed to improve planning, formulate policy transfer options and enhance the social acceptance of renewable energy, yet lacks in context specificity and assumes static institutional settings. In this paper, we explore institutional factors that promote or hinder energy transitions, employing an institutionalist approach to connect changes in formal and informal institutions at state, regional and local levels. In doing so we intend to create an understanding of the impact of specific institutional constellations that set the framework for defining social acceptance. The analysis of the diffusion of photovoltaic systems in two municipalities in Germany and Australia points to the different energy paths taken by the two countries. By contrasting two differing energy systems, we are able to deduce the evolution of institutional setting, (market-based or government-funded mechanisms) that help explain social acceptance. Furthermore, the findings of the multi-level approach offer insight into how changes can have an impact locally but also how the local setting is affected by national policies and market dynamics.

Keywords: social acceptance; local energy paths; renewable energy; institutionalism; Germany; Australia; energy transition; inter-country comparison.

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~~*This paper is a revised and expanded version of a paper entitled [title] presented at [name, location and date of conference].*~~ [AQ1]

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1 The need to combine social acceptance analysis and institutional change

The topic of renewable energy (RE) and energy transitions has come of age worldwide in the face of anthropogenic climate change (Intergovernmental Panel on Climate Change, 2014), dwindling fossil fuel supplies (Mohr et al., 2015) and declining costs of RE (Nosrat et al., 2014). The ongoing, albeit slow, reconfiguration towards decentralised renewable energy systems brings with it questions of their acceptability to the societies affected by the attendant technological and social changes (Wüstenhagen et al., 2007). Consequently, the analysis of the social acceptance of RE has been central to comparative research in recent years exploring national or supranational energy systems (e.g. Jobert et al., 2007; Raven et al., 2009; Sovacool and Ratan, 2012). These studies are aimed at the formulation of policy advice through the identification of best practices promoting RE installations and raising acceptance. We would suggest, however, that more research is required on conceptual frameworks to better structure and integrate the manifold factors influencing social acceptance.

Recent comparative studies on social acceptance are based on various methodological approaches. Sovacool and Ratan (2012), for example, compare four countries (Germany, Denmark, USA and India) and two different RE technologies (PV and wind energy), treating socio-political, market and community criteria (following Wüstenhagen et al., 2007; see also Upham et al., 2015) as being conditional for social acceptance. The study found that Germany and Denmark were leading the USA and India in relation to social and market acceptance of RE, prompting the authors to suggest that the USA and India "could embark on a pathway similar to Denmark and Germany" (Sovacool and Ratan, 2012, p.5278). We question, however, whether energy systems and societies can be schematically compared, especially when there are substantive differences in countries' institutional structures, and argue that energy transitions need to be understood within a country's specific energy system and its evolution (see also Devine-Wright, 2008).

Development paths in this respect are considered to be dependent on changes in institutions over time. This notion implies that an institution evolves through different developmental phases, where former phases affect later ones due to path dependency. As Lowndes and Roberts (2013, p.113) point out, "[o]nce policy makers have started down a particular path, the probability of remaining on that path increases over time". Hence, the historical institutionalist perspective accepts that path dependency can influence the course of policy and stresses the importance of initial policy choices as a key determinant of development paths (see Bulmer, 1998); in other words, institutions matter. What matters also to our reading in comparative local energy analyses is a focus on national institutional contexts, an emphasis often insufficiently dealt with in current research (see for example Jobert et al., 2007; Raven et al., 2009), which could be developed further by way of adding country-specificity.

We thus question whether an analytical framework that acknowledges institutional differences within energy systems could enhance the quality of comparative studies of social acceptance of RE. Such a framework ought to be based on the specific multi-level context of a given energy system and the changes within to encompass crucial local processes (Mattes et al., 2015). An energy system, in this regard, is defined by social and technical aspects of energy supply (Hamman et al., 2014), meaning both its applied technologies and its formal and informal institutions. The studies by Laird and Stefes (2009), Jacobsson and Lauber (2006) and Lauber and Jacobsson (2016) explore changes within socio-technical systems at a national level with a view to elaborate on their development paths, yet only prepare the ground for an overarching framework of analysis of social acceptance. In light of the abovementioned literature an institutional approach may thus prove adequate for a comparative, context-sensitive and multi-level energy path analysis (Aalto, 2014; Bulmer, 1997; Jobert et al., 2007; Raven et al., 2009; Sovacool and Ratan, 2012).

Concerning the relationship between institutional change and social acceptance, the conceptual framework by Wüstenhagen et al. (2007) offers a point of departure for this study. The authors describe three interdependent dimensions of social acceptance: First there is 'socio-political acceptance' as it relates to attitudes towards relevant policies, technologies or projects by stakeholders and the public. The "market acceptance" of an RE technology (such as wind or PV), evidenced by the private or commercial use of RE, is the second dimension of social acceptance (see Wüstenhagen et al., 2007). The third dimension is 'community acceptance' which refers to the acceptance of concrete projects and location decisions by local stakeholders and the community. While this approach of explaining social acceptance using three 'acceptance-dimensions' is useful, it only gives implicit consideration to the role of institutions and thus the constitution of social acceptance.

The above review highlights the importance of institutions for the analysis of social acceptance (Aalto, 2014; Bulmer, 1997; Jobert et al., 2007; Raven et al., 2009; Sovacool and Ratan, 2012). We thus seek to develop and test a multi-level approach to identify country or region-specific changes in institutional conditions that enable acceptance of RE and to show different and at first sight not comparable 'development paths' towards energy transition on a local level (thus, apples and oranges). We therefore develop a methodology regarding a suitable bilateral comparison between two case study sites – one in Germany (City of Landau) and one in Australia (City of Fremantle). To maintain a manageable scope the emphasis will be placed on PV generation, a technology most relevant to both case study sites.

Overall, the paper is guided by three main research questions:

- Which institutional changes have been central to the (non-)development of RE in the study areas?
- What are the reasons for different development paths of RE systems at the respective local levels?
- How do the identified development paths affect current social acceptance?

In what follows, we describe in Section 2 the method adopted for the purposes of this study, then we contextualise both case study sites in Section 3, offering insights into the structural and regulatory characteristics of both cities' electricity markets. In Section 4 we present the results of the analysis of local development paths in Landau and Fremantle using a historical institutionalist lens, followed by a synthesis (Section 5) and a conclusion (Section 6).

2 Comparative analysis of social acceptance through institutional change: comments on method

For the exploration of institutional changes in RE systems we employ elements of historical institutionalism, which are originated in the political sciences (see Koelble, 1995). Specifically, the sociological branch of historical institutionalism is of interest to this study for it considers not only the interplay between institutions and relevant actors, but also their evolution over time, which enables the identification of different development paths (Lowndes and Roberts, 2013). This sociological approach helps analyse inductively institutions over a longer time period and focus on the role of institutions as being constitutive for interests of relevant actors (Morisse-Schilbach, 2012). Further, this approach allows us to ask "how institutional change is resisted as well as facilitated" (Lowndes and Roberts, 2013, p.116). Within the context of RE usage inside a local energy system, we are able to identify the changes that either act as driving forces and set the local system onto a new direction, or have a limiting effect and maintain the status quo.

Lowndes and Roberts (2013, p.3) characterise institutions as follows:

> *Today 'institution' also refers more generally to forms of social organization (Williams, 1983, p.169). It is a multi-faceted term which is used to refer to social phenomena at many different levels – informal codes of conduct, written contracts, complex organisations. [...] Moreover they show resilience over time, producing 'stable, valued and recurring patterns of behaviour' Huntington (1968, p.12).*

Institutions are further divided into formal and informal institutions, understood here as formal rules and informal norms and values respectively (see North, 1990[AQ2] as well as Aalto, 2014; Lowndes and Roberts, 2013). Formal energy system institutions can be divided further, following Aalto (2014, pp.6–7), into three types of formal institutions: *Hard and soft law regulations* are covered by formal regulations and rules such as written declarations, joint statements and other documents. These are initiated and enacted by *formal organisations (private or state) acting as principals*. These principal

AQ2: References flagged with AQ2 are not included in the reference list. Please provide the reference details to be included in the reference list, or delete the citation (and related text) if not required.

actors can be supported by other *formal organisations acting as agents* which are generally of lower legal status and fulfil particular expert roles. These three formal institutions need to be seen as embedded within underlying informal institutions. These are norms and values that are lacking "precise organisation or written format", and "wield less authority and create weaker obligations" (Aalto, 2014, p.6). In the renewable energy context, social acceptance can thus be understood as resulting from the interplay between informal and formal institutions, which themselves are the product of previous, interlacing institutional changes (Lowndes and Roberts, 2013).

This conceptualisation is applied to the national, state and local levels of the two study areas (Landau and Fremantle) to develop an understanding of the external institutional framework for the usage of PV. Furthermore, a temporal dimension is added to the concept of formal and informal institutions by way of identifying different phases of relative institutional stability, which result from, or are divided by, institutional changes. This approach is intended to help answer how and why energy system institutions are changing and to deduce development paths at the local level. In this context, we distinguish between three causes of institutional change, namely a change by the institution itself, through actors and through external forces (Aalto, 2014; Lowndes and Roberts, 2013, p.136). It is recognised, however, that especially informal institutions tend to be relatively stable, unaffected by institutional change and thus often responsible for the creation of path dependency (North, 1990[AQ2]).

For the purpose of this study, social acceptance is understood to have an attitudinal and behavioural dimension (see Hitzeroth and Megerle, 2013). In this context, we consider the "market acceptance" of PV as an expression of actor behaviour and regard PV usage (number of PV installations) as one of the dimensions of the social acceptance of RE (see Wüstenhagen et al., 2007). The juxtaposing of the institutional processes against the background of the usage of PV will allow for a discussion on causes and effects of specific institutional conditions and the broader notion of social acceptance.

We apply this methodology to two contrasting energy systems, namely that of Germany – a country widely recognised as a pioneer and leader in the RE space (Geißler et al., 2013) – and the Australian energy system which has experienced a 'back to coal' development in recent years (Australian Solar Council, 2014). As the use of RE is decided mainly at the local level, two local cases were selected for this study. Specifically, we focus on two middle-sized cities (approximate population of 35,000) that are actively engaged in energy transitions. The German case, City of Landau (Southwest Germany), participated in a national program for improving RE supply and energy efficiency. The Australian case, City of Fremantle (Western Australia), is considered a pioneer in climate and energy policy and was named in 2009 the first carbon neutral local council in Western Australia (WA).

For the German case study, information was derived from a qualitative study (from 2013 to 2015) of a local actor's network engaged in promoting a local energy transition (following McKenna et al., 2014). The perspectives from local council staff, industry, civil society and academics were collected using semi-structured interviews and analysed using content analysis (Krippendorff, 1980). Australian information was sourced from academic and government publications as well as media content and grey literature. The data were complemented with information sourced from informal face-to-face interviews conducted throughout 2014 and early 2015 with local council staff, industry insiders and academics working in the renewable energy field. Data were analysed thematically (Fereday and Muir-Cochrane, 2006) and subsequently compared to the German data set

by way of cross-case synthesis (Miles and Huberman, 1994; Yin, 2009). For the purpose of analysis, PV installation rates in both cities between 2000 and 2015 serve as an indicator for social acceptance of RE.

3 Setting the scene

Before analysing the development paths of the local renewable energy systems in Landau and Fremantle, we describe the energy systems in Germany and Western Australia with its stand-alone energy market (see below). Conditions for the countries' development paths can be identified through comparison of relevant aspects of their respective energy markets such as production structure, cost and price of electricity generation and organisation of distribution and transmission.

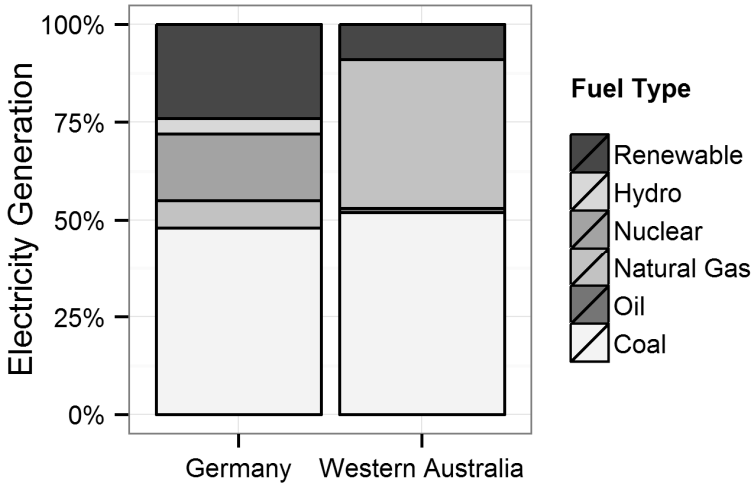
In both countries renewable energy targets are important as prerequisites for the development of RE. Germany has a Renewable Energy Target (RET) of 18% by 2020, which the country already meets (Umwelt Bundesamt, 2015), and Australia has a 23.5% target by 2020. Western Australia, the state with the second highest per capita emissions (31.23 tCO_2e p.a.) in the country (Department of the Environment, 2014) does not have a state-based greenhouse gas emissions reduction target nor a RET (Government of Western Australia, 2011, 2012).

Regarding the electricity production structure, the share of renewables is comparatively large in Germany (25%, see Figure 1), with the other electricity generation sources being coal, gas and nuclear. Yet, the nuclear phase-out decided on in 2011 will lead to considerable structural change in the future. While favoured by natural conditions, the uptake of renewables in Western Australia (9%, see Figure 1) is still limited owing to structural market impediments that advantage coal and gas as main energy carriers for electricity generation. In contrast to Germany, there are no nuclear power plants in Australia.[1]

Globally, the cost of PV-modules has been declining rapidly in recent years, even though marked price differentials remain between different countries. For example, residential PV-module prices in Germany were about 2200 $/kW in 2012 compared to 4200$/ kW in Australia (IRENA, 2013[AQ2]). While at present the cost of fossil fuel-based electricity generation is lower than that of renewables both in WA and in Germany, the next 15 years are expected to see a convergence of these costs, rendering renewables cost competitive (Bureau of Resources and Energy Economics, 2012). According to the International Renewable Energy Agency (2013), levelised costs of energy (LCOE) for PV are slightly lower in Australia when compared to Germany – despite higher PV-module prices – owing to higher levels of insolation in Australia (Sahu, 2015[AQ2]).

Market prices for electricity in Germany are higher than in (Western) Australia particularly due to high tax rates (Carbon and Energy Markets, 2012). This situation, however, is expected to reverse over the next 10 years with Australia facing escalating electricity prices, while Germany is predicted to see a reduction in electricity costs (West, 2011). WA mirrors the Australian national trend where retail prices have risen sharply in recent years and are predicted to continue their upward trend (Australian Energy Market Commission, 2013).

Figure 1 Electricity generation by fuel type in 2013, Germany and Western Australia



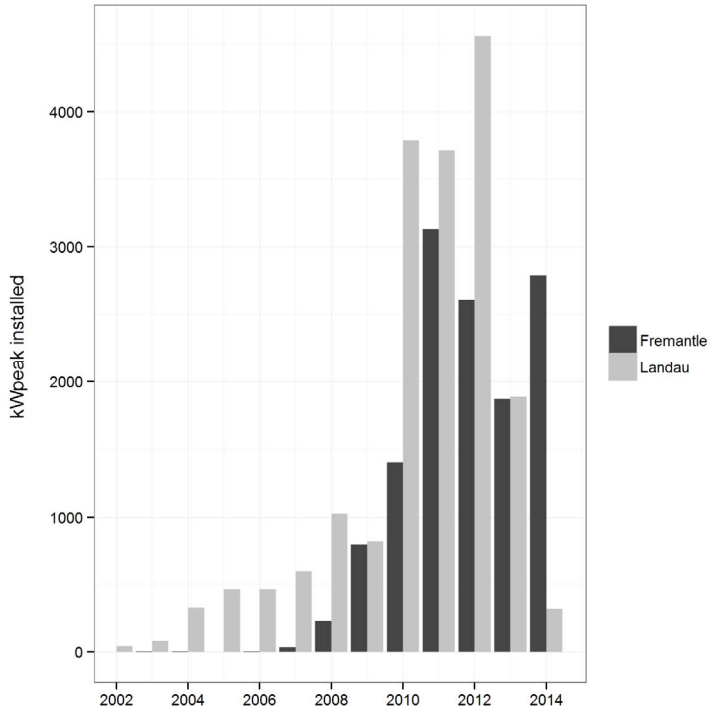
Sources: Burger (2014), Middlehurst (2014)

The German electricity market operates within the EU energy market, which has been in the process of liberalisation since 1998 (Liebau and Ströbele, 2011).[2] The German electricity grid is networked with the European Transmission System Operators (ETSO), which facilitates the balancing of electricity flows (Bundesministerium für Wirtschaft und Energie, 2015) as, for example, excess supply can be exported. In contrast to Australia, municipalities play an important role, as they own parts of the grid – so-called distribution system operators (DSOs) – that supply households and businesses (Pfaffenberger and Chrischilles, 2013[AQ2]) and are thus central stakeholders in supporting the generation and usage of renewable energy.

Western Australia's Wholesale Electricity Market (WEM) operates in the South West Interconnected System (SWIS), which is separate from the rest of the country and represents around 90% of WA's electricity market (Australian Energy Regulator, 2013[AQ2]). Despite liberalisation processes residential electricity customers using less than 50 megawatt hours (MWh) per year are not contestable by other electricity suppliers and served only by the state-owned retailer (Electricity Market Review Steering Committee, 2014). The WEM has a separate capacity mechanism to ensure sufficient generation and demand management to meet overall demand (Independent Market Operator, 2012). The mechanism, which originally was uncapped (in terms of allowable extra supply capacity) and designed to secure back-up supplies during volatile summer peak demand periods, however, is currently being blamed for having led to a capacity glut (Mercer, 2014). In addition, the market currently operates under a so-called 'unconstrained access arrangement', which means that approved generators have the right to transfer their full Designated Send Out Capacity (DSOC) into the network and are given dispatch priority over new market entrants who need to find spare capacity in an already congested grid.

Local RE production occurs in the two cities under investigation. For the purpose of analysing PV's social acceptance in Fremantle and Landau local level RE usage is compared.[3] Usage of RE in Landau started at first with small PV-systems in the 1990s. As shown in Figure 2, from 2000 onwards a more accelerated development can be observed. In Fremantle, the installation rates became noteworthy only from 2008 onwards. Looking more closely at Landau a high increase from 2009 to 2010 is visible. It is followed by a sharp decline over the following two years. Also, in Fremantle installation rates declined in 2013 following years of high growth, yet still exceeded installation rates in Landau in 2014.

Figure 2 Additional PV capacity installed annually in Landau and Fremantle



Sources: Electricity Market Review Steering Committee (2014), Arbeitsgruppe Energiekonzept Südpfalz (2013), EnergieSüdwest (2014, pers. com.)

4 Analysis of social acceptance – elaboration of institutional development paths

For the investigation of social acceptance an analysis of the institutional changes that enable social acceptance is required. The tracking of institutional changes in turn enables the exploration of development paths at the local level. In order to structure the analysis, we apply the conceptualisation of institutional settings and their changes to the two multi-level case studies, analysing the case specific manifestations of formal institutions

and organisations as well as informal institutions at the national, state and local levels. Table 1 depicts the relevant energy-market-related institutions that help guide the following analysis (see Table 1).

Table 1 Analytical framework: institutional setting

National/ state level	
Informal institution	Energy policy consensus
	Climate policy consensus
Formal institution	Market integration of renewable energy:
	- Feed-in tariffs
	- Rebate schemes
	Emission trading scheme
Formal organisation	Large-scale grid provider
	Large-scale energy supplier
	National/federal legislative/executive authorities
Local level	
Informal institution	Local energy or climate policy
	Civil society objectives
Formal institution	Planning documents and concepts regarding energy transition
Formal organisation	Local authority
	Local energy supplier
	Civil society (cooperatives)
	Households as consumer and producer

For both Germany and Australia national and state levels are seen as interacting, external drivers of developments at the local level, providing the framework conditions for regional development paths. Below, grouped under distinct historical phases, we explore the institutional settings and changes within them at the three levels of government within both countries (see synthesis in Table 2).

4.1 Australia – Western Australia - Fremantle

We noted earlier the discernible lag in the uptake of renewable energy in Australia when compared to Germany. The delay in Australia's renewable energy transition can be explained in part by the relatively slow and erratic response at the state and federal level of politics to the sustainability agenda (Dovers, 2005). This is also reflected at the local council level, where responses to the sustainability agenda in general and action on climate in particular have been varied.[4] "While political party affiliations that dominate relationships in other spheres are of minor concern for local governments" (Wild River, 2006), in the case of Fremantle – as is evident from 2009 onwards – they help explain marked differences in the strategies employed by local councils.

4.1.1 Phase I (1989–1995): Climate becomes a political issue

Australia was an early supporter of progressive climate policy with proposals to reduce the country's emissions developed as early as 1989 (Bulkeley, 2000; Talberg et al., 2013). The country was also an early adopter of the Toronto targets in 1990 and signatory to the 1992 United Nations Framework Convention on Climate Change (UNFCCC). Australia was also among the first countries to develop a national strategy to meet its commitments to the UNFCCC (Commonwealth of Australia, 1992). Yet, these early and largely symbolic policy measures failed to effect a departure from the 'business as usual' approach and disappeared from view in 1996 with a change in federal government (Bulkeley, 2000).

At state and local levels the evolving national sustainability agenda had less political traction in part because there was no explicit role for local governments in implementing reductions of greenhouse gas emissions (Lumb et al., 1995). Notwithstanding, the rollout of local Agenda 21 was well underway by the mid 1990s, and many local governments in WA took progressive steps in line with the International Council of Local Environmental Initiatives (ICLEI) framework. ICLEI became a global force in facilitating sustainability through Local Agenda 21 plans and the Cities for Climate Protection (CCP) program, both of which Fremantle adopted. The City completed the fifth and final milestone of the CCP program in 2004 (City of Fremantle, 2011).

4.1.2 Phase II (1996–2007): dawn of renewable energy

Under conservative coalition government rule between 1996 and 2007 federal climate policy was largely characterised by no-regret measures (Hamilton, 2001) that favoured voluntary action and technology-based approaches to emission reduction but avoided structural changes to Australia's energy and electricity markets (Hamilton, 2007; Pearse, 2007). During that period Australia moved from being a vocal advocate for internationally binding emission reduction targets at Rio in 1992 to an agitator against the Kyoto Protocol in 1997, which it subsequently refused to ratify (Beeson and McDonald, 2013). Nevertheless, due to growing political pressure a Mandatory Renewable Energy Target Scheme (MRET) was introduced under the Renewable Energy (Electricity) Act 2000, requiring electricity retailers and other large electricity buyers to source an additional 2% (above 2001 levels of about 8%) of their electricity from renewable or specified waste-product energy sources by 2010 (Talberg et al., 2013). This triggered the first strong investment response in the renewable energy sector.

At the 2001 state election in WA the incoming Gallop Labor government was given a strong environmental mandate. Key to Labor's environmental platform were the creation of Australia's first State Sustainability Strategy (Government of Western Australia, 2003) and the WA Greenhouse Strategy, which committed the state to reduce greenhouse gas (GhG) emissions by at least 60% by 2050. However, pro-environmental policies in the state were short-lived as both strategies were shelved and their targets abandoned by the newly elected conservative Barnett coalition government in 2008 (Brueckner and Pforr, 2011).

In the early 2000s, the City of Fremantle began working with neighbouring local governments on community greenhouse gas abatement through the CCP program and introduced emission reduction measures such as free local public transport service in partnership with the state government, green waste collection and landfill diversion and

composting programs (City of Fremantle, 2011). The City also committed through a public-private partnership to the establishment of a wind farm at the Port of Fremantle. The project, which was meant to be operational in 2004 was not realised, however, due to retail pricing disagreements with Fremantle Ports – the intended buyer of the wind farm's electricity output.

4.1.3 Phase III (2007–2013): height of support for renewable energy

Federal climate policy in Australia changed sharply with the incoming Rudd Labor Government in 2007, which immediately moved to ratify the Kyoto Protocol (Chubb, 2014). In 2009, the Renewable Energy (Electricity) Amendment Bill was introduced, replacing the MRET with a new and renamed RET of 20% (45,000 gigawatt hours (GWh) by 2020. Other measures included the funding of clean energy initiatives, provisioning of grants for projects driving the development, demonstration and commercialisation of RE technologies and the introduction of tradable renewable energy certificates. Another key measure was the introduction of a carbon price for the development of a future emission trading system (ETS) that was to be operational in 2015 and linked to the EU's emission trading system by mid-2018 (Talberg et al., 2013; The Centre for International Economics, 2013). The carbon price covered around 60% of Australia's emissions, including emissions from fuel use in electricity generation and industry as well as households by way of upstream liability on fuel distributors. The price on carbon was determined by government and kept within a defined range with a floor price of A$15 per tonne and a ceiling price of A$20 per tonne (Jotzo, 2012).

This period in WA was marked by a conservative approach to climate policy. Following the abandonment of the state's sustainability and climate strategies, WA was without state-based GhG emissions reduction and renewable energy targets (Government of Western Australia, 2011, 2012). Still, in 2009, the West Australian government introduced – albeit reluctantly – a solar panel rebate scheme, enabling eligible households, small businesses and community organisations to receive an A$0.6 feed-in tariff per kilowatt-hour (KWh) for any excess electricity they generated from small-scale RE systems. The government abolished the program in 2011 as soon as the target of 150 megawatts (MW) of renewable energy capacity was reached.

During this time the City of Fremantle became increasingly focused on GhG emission reductions following the election of a Greens mayor in 2009. In 2008, the City had already committed to a RE purchasing scheme for street lighting, which was enhanced in 2009 to include all of the council's electricity use, resulting in the council achieving 'carbon neutral' status (in operational terms) under the ICLEI carbon neutrality framework (International Council for Local Environmental Initiatives, 2008). In a bid to shift from carbon offsets to renewable energy generation the City installed 30 KW of solar power at a local swimming pool in 2009 and approved two further 2 KW and 1 KW solar power installations at other council properties in 2010. A further 180 KW of solar capacity are envisaged in "the near future". Fremantle also adopted a local planning scheme amendment, permitting solar panels on most dwellings and properties (City of Fremantle, 2011).

4.1.4 Phase IV (2013–2016): back to coal

Following Labor's electoral defeat at the national polls in 2013 the incoming coalition government moved quickly to repeal the carbon price, abolished related instruments and agencies (e.g. Australian Climate Commission) and ordered a review of the RET. These changes took effect under the Clean Energy Legislation (Carbon Tax Repeal) Bill in 2014, and the RET review resulted in a cut to around 33,000 GWh of capacity (Government of Australia, 2015). At the time of writing, the coalition government leadership had changed, yet it remains to be seen whether under the new leadership of the Malcolm Turnbull government the policy approach will be altered. Also, the federal election in July 2016 may bring a whole suite of changes to the country's renewable energy policy should a new government be elected. For now, the centrepiece of the coalition's climate policy agenda is a so-called 'Direct Action Plan' with 26% to 28% emission cut based on 2005 levels as the target for 2030. A $2.55 billion Emissions Reductions Fund has been created to pay businesses for emission reduction projects.

As a result of the country's change of direction in climate policy Australia is currently ranked 57th among the 58 OECD countries listed in the Climate Change Performance Index (Burck et al., 2014). The review of the RET has created significant uncertainty, effectively arresting investments in renewable energy projects (Norman, 2015). The WA state government welcomed the abolishment of the carbon tax and was supportive of federal policy measures that protect fossil fuel interests (SBS News, 2014).

In 2014, the City of Fremantle achieved National Certification under the One Planet Councils Standard (One Planet Living, 2014). Ten One Planet strategies inform the City's vision for the future, which includes the realisation of becoming a zero carbon council. Fremantle seeks to ensure that all buildings and structures within its operational control are 'net zero carbon' by 2020 using renewable energy and carbon offsets (City of Fremantle, 2011). For example, the City seeks to implement real time energy monitoring on all renewable energy installations by 2017 and to mandate that all new commercial, mixed use and multi-residential developments are designed and built at minimum to a 4 Star Green standard (see Green Building Council Australia, 2015).

4.2 Germany – Rhineland-Palatinate – Landau

With regards to the development path in Landau, it bears noting that the state of Rhineland-Palatinate has a far less pronounced role in energy policy compared to the state government level in Australia. This is due to the fact that the energy market is organised nationally (see Section 3), and the state level becomes involved 'only' in connection with siting decisions for RE. While certainly a consideration for wind energy, it is less relevant for residential PV installations, which is the primary focus of this paper. It also bears noting that German energy policy is to a great extent shaped by the requirements of EU energy policy.

4.2.1 Phase I (1991–1999): dawn of renewable energy

The roots of RE usage in Germany can be traced to the 1970s and 1980s when research and development expenditure for RE technology rose sharply. However, the country's energy system at the time – in an econo-political sense – was "largely hostile" towards these emerging technologies (Jacobsson and Lauber, 2006, p.261). The nuclear accident

in Chernobyl in 1986 marked a policy shift when public opinion turned against nuclear power (Jacobsson and Lauber, 2006; Lipp, 2007).[5] Moreover, the Brundtland Report (World Commission on Environment and Development, 1987) in combination with a report by the German Physical Society (Deutsche Physikalische Gesellschaft und Deutsche Meteorologische Gesellschaft, 1987) warning of an impending climate change catastrophe also brought the issue of RE onto the political radar (Jacobsson and Lauber, 2006).

This policy shift under the Conservative government served to align German energy policy with changes in public opinion and the initiatives of dedicated individual politicians who had long been campaigning for a renewable energy transition (see Jacobsson and Lauber 2006; Lauber and Jacobsson 2016). Resulting reforms included the enactment of the Stromeinspeisegesetz (Feed-in Law) in 1991 (Laird and Stefes, 2009; Wüstenhagen and Bilharz, 2006), which required operators to include RE from private producers into the energy system. Through an adapted remuneration of production costs and the right to feed into the national grid RE became part of the energy system. This institutional setting was complemented by subsidies from state programs (Jacobsson and Lauber, 2006).

This phase also saw the liberalisation of the German electricity market. In 1998, the Energiewirtschaftsgesetz (Energy Industry Act) led to the deregulation and the opening of the electricity market, which increased competition among electricity generators and also served to reduce profit margins among small-scale municipal energy distributor (DSO) who lost their monopoly over the operation of local distribution networks. At the time, many local distributors and suppliers were sold to nationally or internationally operating energy corporations or were merged with others (Wüstenhagen and Bilharz, 2006).

At the local level, German municipalities also had an energy transition agenda. Due to their right to self-govern and prevailing structures of municipally-owned energy retailers and generators local authorities have had a broad influence on local energy systems. Many communities at the time developed energy concepts to secure supply and set goals for environmental protection. In Landau, the local Agenda 21 initiative started in 1996 seeking to foster sustainable local development.

4.2.2 Phase II (1999–2004): height of support for renewable energy

A newly elected national Social Democrat-Green coalition government started an ambitious RE agenda (Laird and Stefes, 2009), which included the 100,000 Dächer-Programm (100,000 roof program) in 1999, a low interest loan initiative that targeted households and small and medium enterprises. Also, the Erneuerbare-Energien-Gesetz (EEG) (Renewable Energy Sources Act) was enacted in 2000 (Grau et al., 2012; Wüstenhagen and Bilharz, 2006), accelerating the integration of RE into the national energy system by way of raising remuneration rates for PV and wind systems (Erge et al., 2001). Overall, this phase saw the development of "a robust legal and policy framework, sustained funding of a diversified set of research institutions and an emphasis on price-based rather than quota-based investment incentives" (Pegels and Lütkenhorst, 2014, p.523).

In Landau the liberalisation of the energy market also had consequences for the municipal energy DSO, traditionally in charge of managing the municipal electricity grid. The liberalisation of the energy market meant that the DSO was converted into a public-

private partnership (PPP) structure with the municipality controlling 49% of shares and the remainder held by an international energy corporation. Investments in RE started to gather pace as private households and companies began investing mainly in rooftop PV systems. At the local government and civic engagement level, the Agenda 21 process developed into a forum for RE issues, and in 2004 the finalised guiding principles on sustainable development also included the usage of RE.

4.2.3 Phase III (2004–2011): emergence of local networks

Amendments to the EEG in 2004 strengthened the legal framework for the integration of RE into the electricity-market and the electricity grid, driven by the growing influence of RE technology manufacturers and their associations (Wüstenhagen and Bilharz, 2006). The EEG ensured the purchase of RE by grid operators and set the terms for remuneration, allowing for secure investment conditions and thus driving new PV-installations. With falling production costs and high feed-in tariffs installation rates started to rise significantly, eventually triggering concerns about the social costs and the efficiency of the scheme and prompting amendments to the EEG to decrease feed-in tariffs (Hoppmann et al., 2014, p.1429[AQ2]).

In parallel, in 2005 the EU-wide CO_2 trading mechanism commenced (The European Parliament and the Council, 2009). Yet, since too many emission certificates were issued initially, certificate prices were low and therefore incentives for greater energy efficiency remained low. Further, the Energy Directive 2009/28/EC obliged EU member countries to reach specific RE shares of energy consumption (The European Parliament and the Council, 2009), a goal anchored in German law since April 2011.

At the national level, a climate action plan (Nationale Klimaschutzinitiative) was implemented in 2008 for the integration of energy production and emission reduction concepts.

Within the case study area, two energy cooperatives were formed based on civic initiatives with links to the local cooperative banking sector. This triggered – enabled by feed-in tariffs – investments in PV-systems and the sale of electricity to net providers. Private households were also encouraged to invest in PV systems with small rooftop PV systems attracted through higher feed-in tariffs. These developments also prompted the local DSO to become engaged and invest in RE projects. The DSO became a supplier, generating and distributing electricity.

In 2008, the City of Landau partnered with the local university and successfully applied for national funding for the analysis of local energy efficiency and RE options. Landau also developed further RE pilot projects such as a geothermal district heating system. In 2010, the city joined a European network of municipalities (Convent of Mayors), seeking to reach the EU climate protection targets.

4.2.4 Phase IV (2011–2014): institutionalisation of local initiatives

Following the events in Fukushima in 2011 German energy policy reached a consensus in favour of a phase-out of nuclear power and further support for RE (Evrard, 2013). In 2013, the European emission trading system became entirely market-based, yet prices remained very low.

In Landau, a climate plan was developed that merged existing and future climate action plans into a single strategy to be implemented by the municipality and the local

energy supplier (Stadt Landau in der Pfalz, 2012). While many of the strategy's objectives lacked legal status a number were transferred into binding legislation. For example, the local land use plan was amended to facilitate areas for large-scale PV installations, which enabled a 2 MW PV-farm, built and operated by the DSO. Within the context of the Agenda 21 process, and with support from local actors, a solar cadastre was initiated and published online in 2011, providing information on the suitability of rooftops for PV usage. During this period Landau became actively involved in distributing information and raising awareness about RE, contributing to a local peak in PV system installations. At the same time, civic actors together with the local energy supplier and academics from the local university intensified their efforts to promote the local energy transition and developed RE expansion scenarios for use in public and political debate for public and political debate (McKenna et al., 2014). According to local experts, the local government reduced its engagement during this phase and chose not to participate in the civil society network.

Germany's liberalised electricity market created opportunities for the local, public-private DSO. Together with neighbouring local suppliers the organisation formed a consortium for the development of wind and PV projects, resulting in the construction of a 15 MW wind farm and the installation of a large PV system on an industrial building. Through initiatives such as these regional suppliers morphed from being mere carriers to producers and sellers of electricity.

The rise of local RE initiatives coincided with the first reductions in feed-in tariffs for PV systems, especially large-scale, freestanding PV. While PV installations still accounted for the majority of RE installations in Landau in 2013, the reduction in the feed-in tariff led to a sharp drop in installations in 2014, which in part can also be seen as an early sign of a market reaching saturation.

4.2.5 Phase V (2014–): national stimulus to reduce social costs

2014 saw a shift in the political climate for RE. High RE installation rates triggered reductions in feed-in tariffs, in turn affecting the construction of new PV systems. In particular, interest in PV systems waned among private homeowners who were seen to have benefited the most from high tariffs compared to renters who continued to pay rising energy costs. As a local household survey (Jehling et al., 2014) revealed residents in rental accommodation – in contrast to middle-aged, property-owning households – only have limited access to cheap electricity from RE and overall were found not to be involved in the local energy-cooperative.

As a means of counteracting the effects of the feed-in tariff reduction and averting the loss of momentum in the regional energy transition, the government of Rhineland-Palatinate initiated the "Solarinitiative Rheinland-Pfalz 2015" (Landesregierung Rheinland-Pfalz, 2015) to raise awareness about, and support for the continued roll-out of RE. However, local initiatives and cooperatives in Landau faced difficulties in adapting to the new policy settings resulting in investments coming to a standstill.

The different development phases in German and Australia are summarised in Table 2.

Table 2 Phases of the energy transitions in Germany and Australia

	Nuclear accident of Chernobyl 1986 Brundtland Report 1987	*Phase I: 1989–1995*	*Climate becomes a political issue* Favourable federal government is engaged in international activities National greenhouse response strategy Activities on local agenda 21 begin
Phase I: 1991–1999	*Dawn of renewable energy* Stromeinspeisegesetz Local Agenda 21 started in 1996	*Phase II: 1996–2007*	*Dawn of renewable energy* Conservative government on federal level – no regret measures (modest renewable energy target) Labour government on state level supports sustainability actions Local level active but not institutionalised
Phase II: 1999–2004	*Height of support for RE* Change of government (to SPD-Green) Erneuerbare Energien Gesetz Liberalisation of Energy Market – profitable for local municipal energy suppliers		
Phase III: 2004–2011	*Emergence of local networks* Nationale Klimaschutzinitiative supports RE actions on local level Amendments to decrease feed-in tariffs to reduce social costs	*Phase III: 2007–2013*	*Height of support for RE* Labour government on federal level improved support (Kyoto protocol ratified, renewable energy target increased, carbon taxation, RE funding support) Conservative government on state level – still introduction of rebate scheme
Phase IV: 2011–2014	*Institutionalisation of local networks* Due to Fukushima, nuclear phase-out installed from conservative government Local initiatives strengthened (Energiewende) Further decrease of feed-in tariffs	*Phase IV: 2013–2016*	*Back to coal* Conservative federal government takes back support for RE – effect on installation rates At local level activities strengthen but suffer from weak support from federal/state level
Phase V: 2014–	*National stimulus to reduce social costs* Further considerable reduction in feed-in tariffs Effect on local PV installation rates		

5 Synthesis: explaining social acceptance through institutional change

The local development paths identified above are analysed further in this section to explain the causes that triggered institutional change and to deduce its impact on social acceptance of RE and hence, the energy transition. As suggested previously, changes can be caused by institutions themselves, local or external actors or by exogenous shocks and can occur at different speeds.

In both countries, national level politics need to be understood within a framework that either served to impede or promote RE. In WA, the technical potential for PV and wind was found to be much greater than in Germany, leading to slightly lower LCOE for investments. Despite this, Australia's economic (and political) dependence on coal perpetuates federal and state governments' on-going support for coal-based electricity generation (see Baer, 2016); a preference enshrined in the structure and rules of WA's electricity market. In Germany, by contrast, the exogenous shock of the Chernobyl nuclear accident can be seen as a catalyst for the country's energy transition.[6] In comparison, both the protection of coal in WA and substitution of nuclear energy with renewable energy in Germany can be considered a political and societal consensus and hence an informal institution, principally defining the integration of RE.

Political factors can be seen to have shaped both countries' development paths, with formal institutions affected by, and changed through, both national and international politics and policy-making. For Australia as well as for Germany the initial impulse for investment in RE had come from the national level (external actors). It is noteworthy that relevant formal institutions such as policy measures (feed-in tariff in Germany and MRET in Australia) were initiated by conservative national governments. However, more far-reaching polices were introduced by the Social Democrat-Green coalition (increase in feed-in tariff) and Labor (20% RET and carbon taxation) governments in Germany and Australia respectively with measureable impact on local RE installation rates (for Landau and Fremantle see Figure 2). Analogously, political support for RE waned under conservative rule in later years. It also bears mentioning that in contrast to Australia the formal institution of the feed-in tariff has been a main driver in fostering renewable energy in Germany with a generous, albeit degressive, design. To a lesser extent in WA, measures such as the solar panel rebate scheme helped trigger the growth of RE installations among businesses and households.

Also, the external shock of the Fukushima accident in 2011, which served to strengthen the energy policy consensus in Germany and spurred the country's energy transition, occurred under a conservative-liberal government. In Australia, in contrast, the return of a conservative-liberal government in 2013 had a very adverse effect on RE policy, resulting in formal institutional changes such as the abolishment of carbon taxation or the revision of the RET, which caused uncertainty and stymied the growth of RE. In general, however, the effects of carbon taxation on the development path of the energy systems of both cases appear to have been only limited.

In parallel, the gradual liberalisation of the European energy market put external pressure on German DSOs, which – perceived here as formal organisations – were brought into private-public-partnership structures. This, to some extent, resulted in linking local suppliers with private capital, enhancing the capability of local operators to engage in RE production. Wüstenhagen et al. (2007) argue that local acceptance of RE is largely a matter of siting decisions and social justice, while the political level and the market decide on the actual use of RE. In this regard, we suggest that while following a

local development path, local acceptance also includes specific characteristics of market and policy acceptance, as could be shown in the activities of the local supplier in the case of Landau.

When it comes to the analysis of social acceptance at the local level, we detected similarities between the two case study sites. In Fremantle and Landau, dynamic local grass-root networks emerged seeking to tackle climate issues and foster RE. An example, using RE installation rates (see Figure 2) as a proxy for market acceptance of RE (see Section 2) and being one dimension of social acceptance, is the high installation rates in Landau in 2014, which can be linked to civil (cooperative) engagement and the number of cooperative installations. Notwithstanding, at the community level, RE acceptance needs to be seen primarily in light of state and national energy policy measures

In terms of RE impediments, in WA the uncompetitive and inaccessible local electricity market and electricity oversupply served to undermine the penetration of large RE installations and, hence, investments from local initiatives. For Landau, in contrast, both network and market integration provided a more favourable institutional setting for civic engagement. Further, the local supplier appears as an important formal organisation fostering the local energy transition with a capacity – due to access to private and public capital – to invest in RE; this capability was strengthened further from 2011 onwards through enhanced inter-municipal cooperation. Thus, in Landau one can see a temporal constellation of institutions that seems to enable social acceptance within a local context. Later periods saw PV installations diminish presumably as a result of limited linkages between the supplier and public authorities and reductions in feed-in tariffs. Hence a look at actors at the local level allows us to compare how institutional settings and changes within shape the organisation of, and hence actors in, an energy system.

Since 2012/2013 development paths in terms of changing PV installation rates in Landau and Fremantle converged. Generally, it can be noted that the future development of RE no longer appears to be a cost-effectiveness problem, evidenced by the growing cost competiveness of RE due to the ongoing fall of PV-panel prices globally, affecting the situation both in Germany and Australia. Especially WA's electricity market, in this respect, is approaching a crossroads. The ballooning subsidisation of coal-based electricity leading to rising electricity prices for households has triggered the large-scale adoption of rooftop solar among households and businesses. This trend seems unstoppable especially in light of the state government's own admission that the current system is unsustainable (Parkinson, 2015) and predictions "that more than two-thirds of houses and 90% of businesses could be generating much of their own energy by 2023" (Parkinson, 2014). In other words, market forces may well outmanoeuvre institutional and structural barriers, with market demand for cheap and cleaner electricity potentially driving future changes. Penetration rates of rooftop PV in Australia are already highest in socio-economically weaker areas (Australian Bureau of Statistics, 2006), attesting to the cost argument for RE technology. This shows how an institutional setting favouring the maintenance of a centralised energy supply can be undermined by individual decisions based on price arguments. Our focus on development paths and institutional change enabled us to identify the institutional constellation that on the one hand enabled market acceptance of PV by households, but on the other hand ran counter to what was described earlier as the socio-political consensus on RE. As households, being actors within a local energy system, increase their use of PV, they are bound to effect changes in the institutional setting of their energy system, which would then be reflective of a new socio-political consensus of RE (Becker et al., 2016). Arguably, Western Australia is

approaching such a juncture in the near future with early signs of institutional change on the horizon (see Parkinson, 2015).

In contrast to Australia, the considerable reduction of the feed-in tariff in Germany since 2013 has led to a slowdown in local PV installations in Landau (see Figure 2). Despite growing cost-effectiveness, PV installations in Germany still seem to lack cost competitiveness. Moreover, PV installations in Landau appear to be largely restricted to middle-class, private homeowners (Jehling et al., 2014). With German home ownership just above 40% (Andrews and Sánchez, 2011) and restrictions on cooperative investments in RE, the penetration of RE in Germany is potentially limited and thus at risk of proceeding along socio-economic lines. Thus, to ensure equity in clean energy access, targeted and flexible policy measures may be needed to enable rent-paying households to take advantage of RE solutions. Overall, when seeing state policies and households as part of the broader conceptualisation of institutional change, it becomes apparent that a mere focus on individual policy measures is insufficient to fully explain the acceptance of RE in an energy system.

6 Conclusions

In this paper we developed a method to compare social acceptance of RE. We used a multi-level approach to analyse changing institutions and their effects on the local utilisation of RE. Through the tracing of development paths using historical institutionalism we were able to structure, and create insights into the causes that enable or block social acceptance of RE. The applied institutionalist conceptualisation of social acceptance helped us to compare two cases while considering the context specificity of two very different energy systems.

For Australia and Germany, we identified exogenous causes such as nuclear accidents and climate change considerations as drivers for institutional change within the countries' respective energy systems. Further, we could show that especially changes within local organisational institutions (i.e. local suppliers and cooperatives or absence thereof) play an important role in conjunction with other institutions such as feed-in tariffs. It underscores that the importance of the local level goes beyond the mere spatial context of siting decisions of RE installations and highlights that the integration of the local can shed light on the interplay of institutions, their changes and effects at different levels.

We could also identify specific institutional differences and underlying reasons. In the German case, the local energy system is characterised by a decentralised, liberalised system that is integrated in a larger EU energy market. PV-usage is largely regulated by feed-in-tariffs. This setting – until 2014 – was shown to have favoured PV-installations by private households, local supplier and cooperative actors. The Western Australian case in contrast described a local system as part of an isolated and centralised energy system. The integration of PV within that system was shown to be restricted to small-scale installations by households; however, PV-usage in terms of self-consumption could already be seen to follow market mechanisms. Through application of the institutional lens we were able to scrutinise the similarities between the installation rates of PV observed in Fremantle and Landau and identify different development paths. Based on these insights we were able – despite the detected changes in the installation rates – to

deduce different critical institutional settings with different prospects for future RE transitions in Fremantle and Landau.

In both cases, the integration of RE into the energy system showed clear traits of path dependency. Within an institutional context, feedbacks and (un-)intended effects of policies and measures, such as incentives, could be made visible in the temporal dimension. We thus arrived at an understanding of social acceptance within a specific, albeit changing interplay of institutions. As our analysis was based on development paths, we are also able to conceptualise social acceptance accordingly, acknowledging also that social acceptance goes beyond market acceptance.

When looking at the research findings from both cases, the following picture of social acceptance emerges: In Fremantle, driven by steadily improving cost-arguments, local private actors were found to outmanoeuvre an unfavourable energy policy consensus at national/state level and an obstructive energy market framework, which effectively blocks large-scale PV installations. At the same time, private actors' market engagements were starting to show signs of gradually affecting the energy policy consensus in the WA and thus the future direction of RE. In Landau, market acceptance could be demonstrated through both private and large-scale PV installations. These were backed by a strong national/local energy policy consensus as well as a favourable energy market framework that served to strengthen local suppliers and helped them meet the technical requirements to gain access to the electricity network. Recent reductions in feed-in tariffs for RE, however, especially affected privately driven PV installations, highlighting also persistent cost and efficiency issues surrounding PV in Germany. Importantly, our institutional approach could make explicit the interference of different social acceptance dimensions; namely, market, policy and community acceptance (referring to the conceptualisation of Wüstenhagen et al., 2007).

These results suggest that an analysis of social acceptance with a focus on underlying changing institutional contexts can reveal differentiated insights into social acceptance of RE with the potential to inform policy-making. In particular, the approach presented here may help overcome the common limitations of comparative work on social acceptance of RE in different energy systems, which we described figuratively as 'apples and oranges'.

While in this paper we concentrated on institutional settings that determine the actions of local actors, future comparative research could usefully integrate the attitudes and behaviours of local actors. In this regard, a governance perspective for a more comprehensive analysis of local energy systems may prove fruitful. Finally, we also hope that this study will assist in enabling more context-sensitive, inter-country comparisons of energy transitions and hence improve the ability to benchmark different energy policies.

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References

Aalto, P. (2014) 'Institutions in European and Asian energy markets: a methodological overview', *Energy Policy*, Vol. 74, pp.4–15.

Albanese, A. (2006) 'Chernobyl: 20 years on', *H.V. Evatt Annual Lecture*, Sydney University Labor Club.

Andrews, D. and Sánchez, A.C. (2011) 'The evolution of home ownership rates in selected OECD countries: demographic and public policy influences', *OECD Journal: Economic Studies*, 2011/1.

Arbeitsgruppe Energiekonzept Südpfalz (2013) *Energiekonzept Südpfalz*. Available online at: http://www.energie-suedwest.de/ (accessed on 21 May 2015).

Australian Bureau of Statistics (2006) *Australian Social Trends*, ABS, Canberra.

~~Australian Bureau of Statistics (2014) *National regional profile: Mandurah*, ABS, Canberra.~~ [AQ3]

Australian Energy Market Commission (2013) *2013 residential electricity price trends*, AEMC, Sydney.

~~Australian Housing and Urban Research Institute (2015) *Housing affordability*. Available online at: http://www.ahuri.edu.au/themes/housing_affordability (accessed on 21 May 2015).~~ [AQ3]

Australian Solar Council (2014) *Australia bucks the trend of global renewable advancement*. Available online at: http://solar.org.au/solar-progress/lead-story/australia-bucks-the-trend-of-global-renewable-advancement/ (accessed on 21 May 2015).

Baer, H.A. (2016) 'The nexus of the coal industry and the state in Australia: historical dimensions and contemporary challenges', *Energy Policy* (online pre-print release).

Becker, S., Beveridge, R. and Röhring, A. (2016) 'Energy transitions and institutional change: between structure and agency', in Gailing, L. and Moss, T. (Eds): *Conceptualizing Germany's Energy Transition. Institutions, Materiality, Power, Space*, Palgrave Macmillan; Palgrave Pivot, London, pp.21–41.

Beeson, M. and Mcdonald, M. (2013) 'The politics of climate change in Australia', *Australian Journal of Politics & History*, Vol. 59, pp.331–348.

Brueckner, M. and Pforr, C. (2011) 'Western Australia's short-lived 'sustainability revolution', *Environmental Politics*, Vol. 20, pp.585–589.

Bulkeley, H. (2000) 'Down to Earth: Local government and greenhouse policy in Australia', *Australian Geographer*, Vol. 31, pp.289–308.

Bulmer, S. (1997) 'New institutionalism, the single market and EU governance', *ECSA Conference*, Seattle.

Bulmer, S.J. (1998) 'New institutionalism and the governance of the Single European Market', *Journal of European Public Policy*, Vol. 5, pp.365–386.

Bundesministerium für Wirtschaft und Energie (2015) *Europäische Energiepolitik*. Available online at: http://www.bmwi.de/ (accessed on 21 May 2015).

Burck, J., Marten, F. and Bals, C. (2014) *The climate change performance index. Results 2014*, Germanwatch & Climate Action Network Europe, Berlin & Brussels.

Bureau of Resources and Energy Economics (2012) *Australian energy technology assessment*, BREE, Canberra.

Burger, B. (2014) *Electricity production from solar and wind in Germany in 2013*, Fraunhofer Institute for Solar Energy Systems ISE, Freiburg.

Carbon and Energy Markets (2012) 'Electricity prices in Australia: an international comparison', *A report to the Energy Users Association of Australia*, CEM, Melbourne.

AQ3: References flagged with AQ3 are not cited in the text. Please cite them in the text or delete the publication details from the reference list if not required.

Chubb, P. (2014) *Power failure. The inside story of climate politics under Rudd and Gillard*, Black Inc. Agenda, Collingwood, Vic.

City of Fremantle (2011) *Low carbon city plan 2011–2015*.

Clean Energy Regulator (2015) *Postcode data for small-scale installations*. Available online at: http://www.cleanenergyregulator.gov.au/ (accessed on 21 May 2015). [AQ3]

Collier, U. (1997) 'Local authorities and climate protection in the European Union: Putting subsidiarity into practice?' *Local Environment*, Vol. 2, pp.39–57.

Commonwealth of Australia (1992) *National Greenhouse Response Strategy*, ABPS, Canberra.

Department of the Environment (2014) *State and Territory greenhouse gas inventories 2011-12 Australia's national greenhouse accounts*, DoE, Canberra.

Devine-Wright, P. (2008) 'Reconsidering public acceptance of renewable energy technologies: a critical review', in Jamasb, T., Grubb, M. and Pollitt, M. (Eds): *Delivering a Low Carbon Electricity System: Technologies, Economics and Policy*, Cambridge University Press.

Deutsche Physikalische Gesellschaft und Deutsche Meteorologische Gesellschaft (1987) 'Warnung vor drohenden weltweiten Klima Änderungen durch den Menschen', *Physikalische Blätter*, Vol. 43, pp.347–349.

Dovers, S. (2005) *Environment and Sustainability Policy*, Annandale, NSW, The Federation Press.

Electricity Market Review Steering Committee (2014) *Electricity market review – discussion paper*, Government of Western Australia, Perth.

Erge, T., Hoffmann, V.U. and Kiefer, K. (2001) 'The German experience with grid-connected PV-systems', *Solar Energy*, Vol. 70, pp.479–487.

Evrard, A. (2013) *Contre vents et marées. Politiques des énergies renouvelables en Europe*, Paris, Presses de Sciences Po (Domaine développement durable).

Fereday, J. and Muir-Cochrane, E. (2006) 'Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development', *International Journal of Qualitative Methods*, Vol. 5, pp.1–11.

Geißler, G., Köppel, J. and Gunther, P. (2013) 'Wind energy and environmental assessments – a hard look at two forerunners' approaches: Germany and the United States', *Renewable Energy*, Vol. 51, pp.71–78.

Government of Western Australia (2003) *Hope for the future: The Western Australian state sustainability strategy*, Department of the Premier and Cabinet, Perth.

Government of Western Australia (2011) *Energy 2031. Strategic energy initiative directions paper. A smarter energy future for Western Australians*, Office of Energy, Perth.

Government of Western Australia (2012) *Adapting to our changing climate*, Department of Environment and Conservation, Perth.

Government of Australia (2015) *The Renewable Energy Target (RET) scheme*, Department of the Environment, Canberra.

Grau, T., Huo, M. and Neuhoff, K. (2012) 'Survey of photovoltaic industry and policy in Germany and China', *Energy Policy*, Vol. 51, pp.20–37.

Green Building Council Australia (2015) *Green star – Performance*. Available online at: http://www.gbca.org.au/green-star/green-star-performance/ (accessed on 12 February 2015).

Hamilton, C. (2001) *Running from the storm. The development of climate change policy in Australia*, Sydney, UNSW Press.

Hamilton, C. (2007) *Scorcher. The dirty politics of climate change*, Melbourne, Black Inc. Agenda.

Hamman, P., Jehling, M., Wintz, M. and Christen, G. (Eds) (2014) *Systèmes énergétiques renouvelables en France et en Allemagne*, Éditions l'Harmattan (Orizons), Paris.

Heidelberg Energiegenossenschaft Eg. (2015) *Die Heidelberger Energiegenossenschaft als Stromversorger: 100 % Ökostrom – Von Bürgern für Bürger!* Available online at: http://www.heidelberger-energiegenossenschaft.de (accessed on 21 May 2015). [AQ3]

Hitzeroth, M. (2012) *Institutionelle Kooperationsprobleme auf den Strommärkten in Südosteuropa – Simulation von Liberalisierungs- und Integrationseffekten*, Karlsruhe, KIT Scientific Publishing.

Hitzeroth, M. and Megerle, A. (2013) 'Renewable energy projects: acceptance risks and their management', *Renewable and Sustainable Energy Reviews*, Vol. 27, pp.576–584.

Huntington, S.P. (1968) *Political Order and Changing Societies*, London, Yale University Press.

Independent Market Operator (2012) *Wholesale Electricity Market Design Summary*, IMO, Perth.

Intergovernmental Panel on Climate Change (2014) Climate Change 2014: *Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, IPCC, Geneva, Switzerland.

International Council for Local Environmental Initiatives (2008) *Carbon neutrality framework for local government*, ICLEI Oceania, Melbourne.

International Renewable Energy Agency (2013) *Renewable power generation costs in 2012: An overview*, IRENA, Abu Dhabi, United Arab Emirates.

Jacobsson, S. and Lauber, V. (2006) 'The politics and policy of energy system transformation – explaining the German diffusion of renewable energy technology', *Energy Policy*, Vol. 34, pp.256–276.

Jehling, M., Soylu, T. and Jergentz, S. (2014) 'Bauliche und sozio-ökonomische Rahmenbedingungen der Nutzung von Photovoltaik. Vergleichende deutsch-französische Analyse anhand zweier Fallbeispiele', in Hamman, P., Jehling, M., Wintz, M. and Christen, G. (Eds): *Systèmes énergétiques renouvelables en France et en Allemagne*, Éditions l'Harmattan (Orizons), Paris.

Jobert, A., Laborgne, P. and Mimler, S. (2007) 'Local acceptance of wind energy: factors of success identified in French and German case studies', *Energy Policy*, Vol. 35, pp.2751–2760.

Jotzo, F. (2012) 'Australia's carbon price', *Nature Climate Change*, Vol. 2, pp.475–476.

Koelble, T.A. (1995) 'The new institutionalism in political science and sociology', *Comparative Politics*, Vol. 27, pp.231–243.

Krippendorff, K. (1980) *Content Analysis: An Introduction to Its Methodology*, Beverly Hills, Sage Publications.

Lauber, V. and Jacobsson, S. (2016) 'The politics and economics of constructing, contesting and restricting socio-political space for renewables – the German Renewable Energy Act', *Environmental Innovation and Societal Transitions*, Vol. 18, pp.147–163.

Laird, F.N. and Stefes, C. (2009) 'The diverging paths of German and United States policies for renewable energy: Sources of difference', *Energy Policy*, Vol. 37, pp.2619–2629.

Liebau, B. and Ströbele, W.J. (2011) 'The shortcomings of the architecture of the German electricity market', *The Electricity Journal*, Vol. 24, pp.21–28.

Lipp, J. (2007) 'Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom', *Energy Policy*, Vol. 35, pp.5481–5495.

Lowndes, V. and Roberts, M. (2013) *Why Institutions Matter. The New Institutionalism in Political Science*, Palgrave, New York.

Lumb, M., Pears, A. and Buckley, K. (1995) *Key areas for the review of the National Greenhouse Response Strategy*, Report prepared for the Greenhouse Working Group Intergovernmental Committee for Ecologically Sustainable Development, ICESD, Melbourne.

Mattes, J., Huber, A. and Koehrsen, J. (2015) 'Energy transitions in small-scale regions – What we can learn from a regional innovation systems perspective', *Energy Policy*, Vol. 78, pp.255–264.

McKenna, R., Jehling, M., Mainzer, K., Jergentz, S., Christen, G. and Tamer, S. (2014) 'Die Energiewende am Oberrhein', *BWK*, Vol. 66, pp.61–66.

Mercer, D. (2014) 'IMO fights back on cost rises', *The West Australian*, 27 October.

Middlehurst, T. (2014) *SWIS electricity demand outlook*, Independent Market Operator, Perth.

Miles, M.B. and Huberman, A.M. (1994) *Qualitative Data Analysis: An Expanded Sourcebook*, Sage Publications, Thousand Oaks, CA.

Mohr, S., Wang, J., Ellem, G., Ward, J. and Giurco, D. (2015) 'Projection of world fossil fuels by country', *Fuel*, Vol. 141, pp.120–135.

Morisse-Schilbach, M. (2012) 'Historischer Institutionalismus', in Bieling, H.-J. and Lerch, M. (Eds): *Theorien der Europäischen Integration*, 3rd ed., Wiesbaden.

~~Morton, A. and Arup, T. (2015) 'China and other big emitters challenge Australia over its climate change policies', *Sydney Morning Herald*, 20 April.~~ [AQ3]

Norman, J. (2015) 'Government, Labor reach breakthrough in negotiations over Renewable Energy Target', *ABC News*, 18 May.

Nosrat, A.H., Swan, L.G. and Pearce, J.M. (2014) 'Simulations of greenhouse gas emission reductions from low-cost hybrid solar photovoltaic and cogeneration systems for new communities', *Sustainable Energy Technologies and Assessments*, Vol. 8, pp.34–41.

One Planet Living (2014) *City of Fremantle – On becoming a one planet council*. Available online at: http://oneplanetliving.org.au/2014/10/city-of-fremantle-on-becoming-a-one-planet-council/ (accessed on 16 February 2015).

Parkinson, G. (2014) 'Solar shifts peak in WA, installations forecast to treble', *Reneweconomy*, 3 July.

Parkinson, G. (2015) 'WA to go solar – may be the only way out of energy mess', *Reneweconomy*, 25 March.

Pearse, G. (2007) *High and dry: John Howard, climate change and the selling of Australia's future*, Penguin, Camberwell, Vic.

Pegels, A. and Lütkenhorst, W. (2014) 'Is Germany's energy transition a case of successful green industrial policy? Contrasting wind and solar PV', *Energy Policy*, Vol. 74, pp.522–534.

Raven, R., Mourik, R., Feenstra, C. and Heiskanen, E. (2009) 'Modulating societal acceptance in new energy projects: towards a toolkit methodology for project managers', *Energy*, Vol. 34, pp.564–574.

SBS News (2014) 'Carbon tax axe 'a win for WA households', 17 July.

Sovacool, B.K. and Ratan, P.L. (2012) 'Conceptualizing the acceptance of wind and solar electricity', *Renewable and Sustainable Energy Reviews*, Vol. 16, pp.5268–5279.

Stadt Landau in Der Pfalz (2012) *Integriertes Klimaschutzkonzept: Sustainable Energy Action Plan*, Landau in der Pfalz.

Talberg, A., Hui, S. and Loynes, K. (2013) *Australian climate change policy: a chronology*, Parliament of Australia: Science, Technology, Environment and Resources Section, Canberra.

The Centre for International Economics (2013) *The renewable energy target. How it works and what it costs*, CIE, Canberra.

~~The Climate Council (2014) *The Australian renewable energy race: Which states are winning or losing?* The Climate Council of Australia, Sydney.~~ [AQ3]

The European Parliament and the Council (2009) 'Directive 2009/28/ on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC', *Official Journal of the European Union*, L 140, pp.16–62.

Umwelt Bundesamt (2015) *Ausbauziele der erneuerbaren Energien*. Available online at: http://www.umweltbundesamt.de (accessed on 21 May 2015).

Upham, P., Oltra, C. and Boso, À. (2015) 'Towards a cross-paradigmatic framework of the social acceptance of energy systems', *Energy Research & Social Science*, Vol. 8, pp.100–112.

West, J. (2011) 'A comparative analysis of the future cost of electricity generation in OECD and non-OECD countries', *Discussion Papers Finance No. 2011-05*, Griffith Business School, Griffith University, Southport, Qld.

Wild River, S. (2006) *The role of local government in environmental and heritage management*, Department of Environment and Heritage, Canberra.

Williams, R. (1983) *Keywords: A vocabulary of culture and society*, Fontana, London.

World Commission on Environment and Development (1987) *Our Common Future*, Oxford University Press, Oxford.

Wüstenhagen, R. and Bilharz, M. (2006) 'Green energy market development in Germany: effective public policy and emerging customer demand', *Energy Policy*, Vol. 34, pp.1681–1696.

Wüstenhagen, R., Wolsink, M. and Bürer, M.J. (2007) 'Social acceptance of renewable energy innovation: an introduction to the concept', *Energy Policy*, Vol. 35, pp.2683–2691.

Yin, R.K. (2009) *Case Study Research: Design and Methods*, Sage, Thousand Oaks, CA.

Notes

1 Anti-nuclear sentiment in Australia following the Three Mile Island (1979) and Chernobyl (1986) incidents helped prevent the establishment of a nuclear energy industry in the country (Albanese, 2006).

2 The liberalisation of the EU's energy market principally entailed the unbundling of electricity generation, transmission, distribution and supply. Especially important is the possibility of third party electricity suppliers to gain access to the transmission grid. Another important aspect of the EU energy market liberalisation is the enabling of competition between generators, wholesale trader, retailers and end consumers (Hitzeroth, 2012). These changes, inter alia, served to break up Germany's oligopoly of electricity generators, enabling local energy suppliers – previously responsible only for the local distribution of electricity – to enter the market as electricity generators.

3 The comparison of absolute PV-installation capacity is feasible due to commensurate population numbers in Landau and Fremantle.

4 Australia has a federal system of government with specific powers distributed between a federal government (the Commonwealth) and six States and three Territories with self-government arrangements. While the federal government has specific areas of legislative power, including taxation, defence, foreign affairs and postal and telecommunications services, the states retain legislative power over all other matters that occur within their borders, including police, hospitals, education and public transport.

5 Collier (1997) speaks of the important role of the symbolic rejection of nuclear power that coexists parallel to concerns about climate change, with renewable energy only being a minor aspect within this context. Moreover, owing to its relative proximity to Chernobyl – compared to Australia – Germany has been partially exposed to the impacts of the nuclear accident.

6 Contrary to the German experience, the Chernobyl reactor accident did not have as pronounced an impact on the Australian climate change or energy debates. However, the event triggered renewed public discussion on uranium mining and Australia's role in the nuclear fuel cycle.