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# Community Owned Renewable Energy: Enabling the Transition Towards Renewable Energy?

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## Introduction

Technical transitions, like the one from fossil fuel-based to renewable-based energy systems, are inherently embedded in social contexts (Bridge et al. 2013; Devine-Wright 2011). The advent of renewable energy (RE) technology enables a more spatially and economically distributed means of organising energy generation, leading to changes in how energy systems are integrated into societies around the world. While distributed generation presents some challenges for integration with incumbent energy systems, it also offers opportunities for social innovation, community participation and benefit sharing. Given that rapid uptake of RE is essential in the light of accelerating climate change, consideration of the social dimensions of the transition

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is particularly important as the social context underpins socio-political acceptance and the institutional shifts needed to drive rapid change (Bauwens & Devine-Wright 2018; MacArthur 2016). Such social dimensions include consideration of who participates and how the burdens and benefits of RE development are distributed (Hicks et al. 2018).

Community owned renewable energy (CORE) is a multifaceted socio-technical phenomenon that encompasses many forms through which communities come together to initiate, develop, own and benefit from RE and energy efficiency (EE) technology across the entire energy supply chain. CORE encompasses many different technologies and scales as well as a range of legal, financial and organisational forms implemented by diverse groups of actors driven by multiple motivations. However, they share a common commitment to decentralising, democratising and decarbonising the electricity system (Hicks et al. 2014). Ultimately, each initiative is also shaped by national policy frameworks, institutional contexts and energy market structures.

CORE is well positioned to contribute to faster and fairer transitions to RE through generating innovative, socially inclusive business models and through helping to create the social impetus for systemic changes (e.g. in policy). Many studies have explored the multiple benefits of CORE and confirm positive impacts on a range of social, technical, environmental, economic and political/policy outcomes (Hicks & Ison 2018; Schweizer-Ries et al. 2010; Seyfang, Park & Smith 2013).

In this chapter, we analyse the institutional contexts that enable CORE to emerge and the outcomes that CORE generates at local and national levels to consider the contribution CORE makes to energy transitions. Our main research questions are: What are the institutional contexts that enable CORE to emerge, and how does CORE contribute to energy transitions? We analyse the RE transitions in Germany and Australia from a community energy perspective to explore the contributions of bottom-up approaches to change. The two country cases offer insights into two very different stages of the energy transition. Germany is an advanced example with 36% share of RE in the electricity generation in the past 25 years. In contrast, Australia has achieved a 19% share of RE over the last 10 years.

The chapter first outlines the fundamental characteristics and benefits of CORE. Next, the two country cases are introduced, including

an analysis of the enabling factors and forms of CORE in each. Finally, a country comparison reflects on the positive outcomes created for the RE transition when CORE is enabled.

## What Is Community-Owned Renewable Energy (CORE)?

Local communities have had a long-term interest in, and influence on, RE development: community ownership of modern RE generation has been in existence since the invention of the technologies themselves. Wind cooperatives in Denmark are heralded as the first forms of CORE, in which local communities co-funded and co-owned single turbine projects, and thus provided fundamental support for developing and testing early models in the 1970s (Kruse & Maegaard 2012; Smith & Ely 2015). Over time, an array of community-led RE projects have been developed to meet the specific needs of local communities around the world (Warren & McFadyen 2010). These projects provide a strong contrast to conventional thinking which reflected the notion that 'a better power station was always a bigger power station farther away' (Devine-Wright 2005; Patterson 2007, p. 61). CORE embeds energy generation at a local level and thus offers a unique setting for influencing the social context of energy transitions.

CORE encompasses a diverse range of activity, including both supply (energy generation, distribution and retail) and demand sides (energy use, including energy efficiency) (Eadson & Foden 2014; Hoffman et al. 2013). CORE includes projects such as a small collectively owned behind-the-meter solar array on a public building, to a wind turbine owned by neighbouring farmers to a bioenergy facility fed by local waste and owned as a joint venture between a local council and residents.

Seyfang, Park and Smith (2013, p. 25) describe community energy as being 'projects where communities (of place or interest) exhibit a high degree of ownership and control of the energy project, as well as benefiting collectively from the outcomes'. Rather than offer singular definitions, some researchers such as Walker and Devine-Wright (2008) and

Hicks and Ison (2018), offer conceptual tools for distinguishing CORE. Both these papers argue that CORE is defined as much by its processes as by its outcomes. The *outcomes* dimension refers to 'how the outcomes of the project are spatially and socially distributed', or 'who the project is for; who is it that benefits particularly in economic and social terms' (Walker & Devine-Wright 2008, p. 498). The *processes* dimension refers to 'who a project is developed and run by, who is involved and has influence' and is 'strongly driven by normative principles of empowerment, participation and capacity-building' (Walker & Devine-Wright 2008, p. 498).

Internationally, there are many thousands of operational CORE projects. For example, the UK government reports 5000 community energy projects as of 2014 (DECC 2014) and Scotland has met its target of 500 MW of CORE (3% of RE) by 2020 (Local Energy Scotland 2017). In Australia, CORE is much newer, with 174 CORE projects in operation (Ison 2018).

Research indicates a range of possible outcomes of CORE, as presented in Fig. 4.1. These outcomes accrue at local, regional and national scales and will be explored further throughout the chapter, particularly with reference to the influence of CORE on wider transitions to RE.

CORE projects deliver obvious environmental benefits of carbon emissions reduction and technological benefits of more MW of RE installed. However, arguably their most valuable and unique contribution is in the range of social outcomes, and the points where social outcomes overlap with economic, environmental, technological and political outcomes, as seen in Fig. 4.1. By engaging people in RE development and involving them as co-owners, CORE helps to increase levels of social awareness of and support for RE (Koirala et al. 2018; Mey & Diesendorf 2018). This has been shown to increase levels of active support for RE uptake (including for other RE developments), for progressive RE policy and for increased environmental behaviour (e.g. energy efficiency) (Hicks 2018). By virtue of involving local stakeholders and being more integrated with local economies, CORE also contributes significantly more per MW to local economies than absentee-owned projects (Okkonen & Lehtonen 2016). Increasing the possibilities for ongoing participation and benefit from RE development

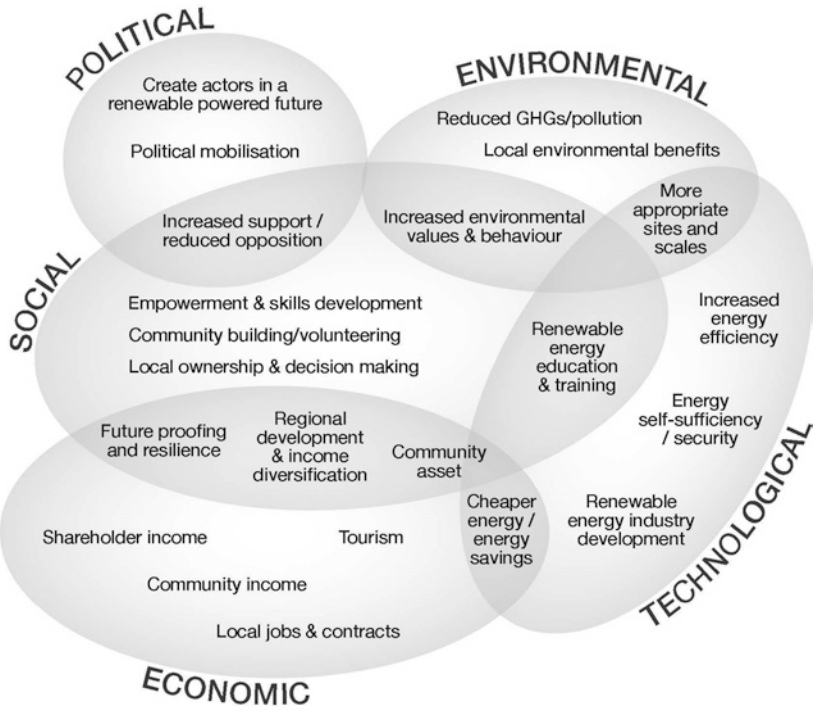


**Fig. 4.1** The range of outcomes from CORE projects (*Source* Hicks & Ison 2012, p. 194)

contributes to CORE's ability to build a strong social license (Devine-Wright 2011). As we will see, these local outcomes have flow-on effects in national level energy transitions. First, however, it is important to understand what enables CORE to become established.

## Germany as Pioneers of CORE

Germany is often heralded as a role model for successful energy transitions, having already reached 36% RE in the electricity supply (BMWE 2018). Further, they are steadily working towards RE targets of 40% by 2025 and 80% by 2050 in order to decarbonise the economy and meet their climate targets (BMWE 2018).

Germany's energy transition has a long history and is intrinsically linked to a community movement. Since the 1990s the incumbent electricity system (based on highly centralised fossil fuel and nuclear generation) has been losing market share to new RE actors (Bontrup & Marquardt 2015). These include small, decentralised actors involved in Bürgerenergie ('citizen energy', such as CORE projects), household RE installations and farmer-owned RE systems. In some regions, CORE is an outstanding feature of RE development. For example, in North Friesland 90% of wind farms are community owned (Falkenberg, Weiß & Nehls 2014). Together these new actors owned almost 50% of all RE capacity in 2013 and have contributed significantly to both the decentralisation and decarbonisation of the electricity system (AEE 2014).

To understand the emergence of CORE in Germany, we must go back to the environmental and anti-nuclear movements in the 1970s and 1980s, which provided the normative impetus for the rise of alternative energy sources. The Chernobyl nuclear accident in 1986 further spurred these movements (Mautz, Byzio & Rosenbaum 2008) and triggered the institutionalisation and political legitimisation of support structures for energy system change. Ultimately, the Chernobyl disaster catalysed widespread grassroots and policy implementation of previously theoretical discussions and niche activities in RE. Thus, both top-down and bottom-up activities mutually reinforced the support of RE (and CORE) and enabled its growth in the following years.

Early RE policy programs and public support structures in the 1980s and 1990s were geared towards smaller actors since the technology scale at the time and the expected economic returns were unattractive to large incumbent players (Mey 2017). The introduction of the *Stromeinspeisungsgesetz* Act (1990) was instrumental to the growth of CORE, as it reduced some of the biggest challenges facing access to the electricity system. This agenda was further progressed through introduction of the *Erneuerbare Energien Gesetz* Act in 2000. This Act made four major contributions to creating opportunities for CORE: (i) it guaranteed remuneration and increased economic viability through a feed-in-tariff and purchase obligations; (ii) it guaranteed

grid access; (iii) it supported a diversity of RE technologies; and (iv) it provided differentiated remuneration according to scale (IEA 2013). This incentivised a range of technology types and system sizes, including small- and medium-scale projects, and created an opening that enabled a greater number of more diverse actors to become involved in RE deployment. In addition, flanking policy measures (e.g. reforms in grid connection processes and local planning rules) contributed to the growth of CORE.

With increased support and impetus for action, the grassroots movement proliferated a range of CORE models emerged, based on a collective vision for decentralisation and participation. These innovations were based on forms of democratic engagement including citizen co-ownership and co-investment. This period saw the emergence of a range of CORE enterprise forms, including cooperatives, associations and companies that involved individuals, local governments, and local businesses (e.g. farmers) in initiating, developing, financing, owning and managing all manner of RE projects. CORE has matured and changed as technology has advanced (in size, costs and output capacity) and following changes in available legal structures (e.g. to accommodate a growing investor base) (Yildiz et al. 2015). Trends over the past 10 years indicate increasing professionalisation and institutionalisation of CORE, as commercial actors and capitalist motivations become more prevalent. In part, this has been enabled by the increased profit margins in RE as the costs of the technology fall and by the greater levels of investment required to fund larger installations.

The growth of CORE in Germany reached a peak in 2011, when 167 new energy cooperatives formed. Since then, the rate has been decreasing (see Fig. 4.2). Although the German policy context provided relative stability and encouragement for CORE up until the mid-2010s, regulatory changes since this time have led to energy system dynamics that challenge CORE's role in the energy transition.

The 2012, 2014 and 2016 revisions of the *Erneuerbare Energien Gesetz* (Renewable Energy Act) have led to a continuous deterioration of conditions for CORE, as the focus shifted towards greater economic efficiency and large-scale development (e.g. introduction of RE auction mechanisms and direct marketing) (Mey 2017). Further decline in

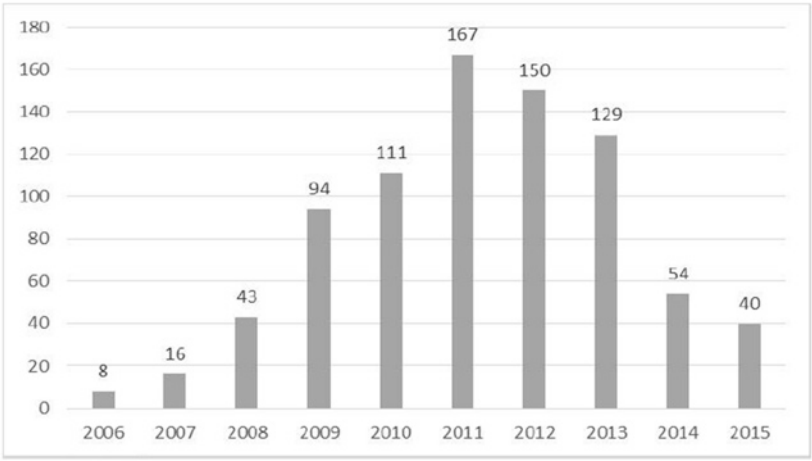


**Fig. 4.2** New energy cooperatives in Germany established between 2006 and 2015 (*Source* Author's illustration adapted from DGRV 2016)

CORE will be inevitable if the government does not solve conflicting goals between cost efficiency and actor diversity. Despite public rhetoric to maintain the broad actor base and adding exemptions for CORE projects to the auction requirements, there is a strong political emphasis to decrease costs. This ultimately goes at the expense of smaller actors which struggle to compete with large corporate investors in the tender process.

It is evident that CORE has played an important role in the energy transition in Germany, in terms of involving greater numbers of people, innovating new business models, supporting early uptake of the technology and increased RE deployment. In addition, CORE had contributed to local economic benefit from RE (Gottschalk et al. 2016), and increase levels of social awareness and support for the energy transition (Rosenbaum & Mautz 2011), which in turn has led to increased political support (Morris & Jungjohann 2016). What remains to be seen in the German context, is the ways that policy changes will impact CORE over time, and if levels of CORE decrease, what impact this has on levels of social involvement in, benefit from, and support for RE.

## Newcomer: Australia's CORE Sector

Like Germany, Australia's energy sector is increasingly embracing RE, driven by the favourable economics of RE, ageing fossil fuel generators and excellent RE resources. Unlike Germany, the policy context for both RE and carbon emissions reduction has been less supportive and more changeable, and has tended to favour large-scale RE projects. Regardless, CORE is an emerging contributor to the RE transition in Australia, motivated largely by the need to accelerate efforts to mitigate climate change.

The Australian Government first introduced policies to support RE in 2000, with the Mandatory Renewable Energy Target (MRET), which was later expanded to the Renewable Energy Target (RET) of 20% by 2020 (Finkel et al. 2017). The RET is based on a quota mechanism which enables RE generators to issue certificates (Renewable Energy Certificates, 'RECs') to achieve annual targets. The scheme is a market-based approach to encourage low-cost large-scale RE systems. In contrast to a feed-in-tariff, this approach presents a high-risk for small-to-medium investors, since there is no guaranteed payment structure or protection against market changes—it also does not guarantee or streamline grid access for RE generators. In addition, the RET has come under successive reviews and has not yet been succeeded by longer-term RE policy. Australia was also the first country in the world to remove a price on carbon. As such, the policy context and political debate on RE in Australia has presented challenges for the fledgling RE (and CORE) sector.

There are, however, some beacons of success. To foster household RE, the RET was split into large-scale and small-scale certificate schemes. Australia now has one of the highest rates of small-scale RE in the world, having reached two million households with solar PV in December 2018 (Clean Energy Regulator 2018). Large-scale wind and solar projects are also gaining momentum, now supplying 7.3% (1.4 GW/h) of national electricity in 2018 (Parkinson 2018). While both the large-scale and small-scale RET schemes have been successful, they have not provided impetus for medium-scale actors, such as local communities and businesses, to participate in the transition.

Despite a challenging policy context, CORE has been emerging since the mid-2000s, with the first project—the cooperatively owned 4.1 MW Hepburn Wind farm near Daylesford/Victoria—becoming operational in 2011. In the last eight years, CORE activity has risen quickly to 147 operating CORE projects. CORE actors are often driven by a motivation to address climate change, especially in the context of weak government leadership, and thus seek to engage people in increased RE awareness, advocacy and uptake at various scales through a diversity of models. However, to date CORE models in Australia have mostly been small (under 99 kW) due to the structure of the RET, and behind-the-meter due to challenges with grid access and limited options for selling the electricity.

In this challenging operating context, CORE projects are seeking options for coping by focusing on business model innovation. CORE business models encompass organisational-legal, financial, technological and community engagement aspects (Hicks et al. 2014). The two most common models are: (i) behind-the-meter solar PV installations owned by community investment vehicles and installed on the roofs of large energy users; and (ii) aggregating households to do a bulk purchase and installation of solar PV. There are also two MW scale community-owned wind farms (the Hepburn Wind farm near Daylesford, in Victoria).

Despite the lack of national support, state-level support has increased in the past 5 years. New South Wales (NSW), Victoria (VIC) and the Australian Capital Territory (ACT) have developed tailored CORE programs (ACT Government 2015; NSW Government 2018; State Government of Victoria 2018). These policy measures have been advocated for and won by CORE proponents working with state governments to design effective CORE support policies (Ison 2018). For example, state governments have provided grant programs for CORE feasibility costs and funding for research and capacity building. Some have earmarked CORE components in RE auction schemes and provided funding to regional institutional support structures to catalyse CORE projects. Increased interest in CORE has also encouraged local governments to support their communities to adopt RE installations and facilitate community RE initiatives (Mey, Diesendorf & MacGill

2016) and triggered two of Australia's three largest political parties to adopt policy platforms advocated for by CORE actors and their allies. The CORE concept also plays an increasing role in mediating between large-scale RE developments and local communities, where interest in community co-investment and co-ownership of large-scale projects (alongside corporate developers) is growing.

## Comparing CORE's Role in Energy Transitions

A cross-country analysis between Germany and Australia reveals that CORE activity is heavily influenced by policy contexts. In both countries, the policy context has shaped the sector's development and influenced the forms that CORE projects take. In Germany, the sector developed over a long period in parallel to RE technological advancement and benefitted from early policy support that was geared towards small and medium scale installations. The removal of significant barriers (e.g. grid connection and accessing a fair price for electricity) for smaller actors encouraged community ownership structures and contributed to mainstream adoption of RE systems at a range of scales with a diversity of actors. Today the CORE sector in Germany is characterised by a great diversity of legal, financial and participatory forms with a high level of professionalism. In Australia, the CORE sector is still maturing, facing a more challenging national policy and regulatory environment. Hence, CORE actors concentrate their efforts on a limited range of innovative models and technologies at smaller scales to achieve their environmental, social and economic goals. Despite this, the public appetite for CORE is growing and policy support from state and local government will promote further community activity in this space. Increased uptake of CORE is also driven by its perceived contribution to accelerating and scaling up RE deployment, enabling broader access to RE to different segments of society and helping to increase the acceptance of large-scale developments.

A cross-country analysis also reveals that CORE plays a unique role in energy transitions. In both countries, CORE can be seen to be playing three key roles to foster the RE transition:

- Mobilising citizens in support of RE policy and specific RE projects;
- Developing innovative forms of RE deployment to enable broader public involvement and benefit; and
- Contributing to RE deployment and thereby supporting RE market development.

These are discussed in turn below.

CORE activities are embedded in social movements which allow it to transcend beyond the local-individual scale, offering alternative solutions in which collectives are mobilised around energy issues. By virtue of being involved in CORE, people's knowledge and awareness of energy issues and the benefits of RE are increased, and their willingness to be mobilised around energy is enhanced (Hicks 2018). This was particularly the case in Germany where CORE was linked with environmental and anti-nuclear movements. In Australia, CORE activities are similarly linked to the climate action movement and motivations to reduce carbon emissions (Mey & Hicks 2015). Further, CORE projects create organisational platforms through which citizens can be mobilised to take action (MacArthur 2016). In both countries, members of CORE projects are being mobilised to participate in RE policy processes (Hicks 2018; Setton 2016). As CORE gains momentum, both countries demonstrate the ability for CORE to mobilise local actors, households and businesses to engage in RE activities and policymaking.

CORE initiatives have spurred the development of innovative, inclusive forms of RE ownership and finance that contribute to an institutionalisation of fairer practice in the energy sector. This is exemplified in the variety of CORE models that facilitate greater actor diversity, which stands in stark contrast to the centralised monopolistic or oligopolistic configuration of the incumbent energy system. The collaborative and democratic models of engagement and ownership often favoured by CORE contribute to greater benefit sharing as their members access lower electricity costs or returns on investment (Mey 2017). CORE offers clear advantages over external, commercially driven developments by contributing to local economic value (Gottschalk et al. 2016; Okkonen & Lehtonen 2016). In contrast to corporate business models of incumbent actors, where decision-making power is accumulated

according to shareholding, CORE projects tend to emphasise equality and participation by allocating voting rights democratically. This gives communities' increased influence in the project, and in the energy transition. Thus, CORE projects act as agents of distributive and procedural justice through which actors are empowered to pursue environmental and participatory interests and to access the socio-economic benefits of the transition.

CORE projects contribute to increasing the uptake of RE technologies and supporting RE market development. The scale and pace of the energy transition in Germany would not have been possible without CORE engagement, which enabled the RE sector to grow in size as well as socio-political impact. Starting as bottom-up niche innovations, the capacities of the CORE sector grew when government interventions and institutional changes enabled the new actors to legitimately penetrate the electricity market. The exponential growth in CORE activities in Australia in the last eight years bodes well for the sector. However, additional policy support is needed to allow the actors to better access the electricity market and contribute to its transformation.

All of these roles for CORE contribute to creating a context of stronger social support for a rapid energy transition.

## Conclusion

This chapter explored conditions for the emergence of CORE and its contributions to energy transitions. We found that CORE has a unique contribution to make, particularly in generating the social conditions that enable a rapid and smooth transition in which a range of stakeholders participate and benefit. Less community involvement in the RE transition risks losing public participation in and acceptance of RE development, which could jeopardise or slow energy system transformation.

This analysis also indicates the transformative powers of CORE necessarily unfolds in an interplay with incumbent actors and government policy. As such, it is important to be mindful of creating institutional and policy enablers for CORE, alongside other scales and models of

RE uptake. It is, thus, paramount to create awareness about CORE activities and their benefits among policy makers, developers and planners, and to provide continuous institutional support.

CORE constitutes an essential element of a comprehensive RE transition and should be valued for the unique role it plays.

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