2020

Local Renewable Energy Initiatives in Germany and Japan in a Changing National Policy Environment

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Citation

Hager, Carol and Nicole Hamagami. 2020. "Local Renewable Energy Initiatives in Germany and Japan in a Changing National Policy Environment." *Review of Policy Research* 37.3: 386-411.

Local Renewable Energy Initiatives in Germany and Japan in a Changing National Policy Environment

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Abstract

Our article explores the contribution of local initiatives to the creation of path dependencies for energy transition in Germany and Japan in the face of resistance from entrenched incumbents at the national level. We use a process-tracing methodology based partly on interviews with local participants. In particular, we explore the role of local initiatives in securing "socio-political space" for the expansion of renewable energy and in embedding themselves in "ecosystems" of public and private institutions. German energy activists were more successful than their Japanese counterparts in expanding this space and creating positive feedbacks in part because they were able to build horizontal networks that anchored the energy transition firmly in local communities. Although problems with grid technology have led to retrenchment in both cases, Japanese activists' reliance on vertical networks has limited their ability to weather a backlash from national government and utility actors. Our study demonstrates the interaction of political, economic/technological, and legitimation paths to energy transition and highlights the importance of the latter two.

I. Introduction

Local action plays an important role in the global transition to renewable energy sources. Cooperation between community-level actors and governments is necessary in order for the transition to succeed. Local citizens are not simply recipients of policy changes at higher levels of governance, however. Often they are forerunners and innovators in energy transition (Morris & Jungjohann, 2016; Ornetzeder & Rohracher, 2013; Toke, 2011). Our focus in this article is on local-level renewable energy initiatives, which have become tools not only for energy security and economic benefits, but also for community building (Seyfang & Haxeltine, 2012). "Transition towns" and "plus-energy communities" have proliferated worldwide. Our aim is to explore the role of local initiatives in creating path dependencies for successful energy transition in the face of resistance from entrenched incumbents.

Our cases are Germany and Japan, two of the world's largest economies. Germany's transition began decades before Japan's and is more ambitious, but the cases have important similarities. They share a corporatist style of governance with powerful traditional utilities and economics ministries that until recently showed little interest in promoting renewable energy (RE) (Haddad, 2010; Jacobsson & Lauber, 2006; Lipp, 2007). Opposition to nuclear power was a focal point for pro-RE mobilization in both cases. Energy activism at the level of individual towns and villages arose before a supportive national framework existed and helped bolster the efforts of renewables advocates at the national level (Aldrich, 2008; Mautz, 2007). Parliaments in both countries eventually passed legislation to open energy markets to greater competition. FIT laws enabled small producers to feed renewable electricity into the grid at a guaranteed price. These policy changes facilitated a boom particularly in solar energy production (see Figures 1 and 3).

Local RE projects yielded benefits beyond their economic returns. They aided in community building in an era of negative demographic change. In Germany, networks of renewables activists expanded into many areas of social, economic, and political life, producing positive spillover effects. In Japan, their structure was not as conducive to a self-reinforcing pattern; they tended either to depend on cooperation with government and industry partners or to be nearly autarkic.

Unresolved problems with grid technology provided an opening for incumbent energy players to reposition themselves in both countries. In Germany, these problems were amplified by arguments about socioeconomic justice (Paulos, 2014; Bruns, Futterlieb, Ohlhorst, & Wenzel, 2014; Karapin, this volume) and local conflicts over energy installations vs. landscapes (Schreurs & Ohlhorst, 2015; Stellmach, 2016). The Conservative-led coalition in the federal parliament,

the Economics Ministry, and the reconfigured incumbent utilities helped craft revisions to the national energy law that curtailed the expansion of the most popular forms of local investment. They have replaced the FIT with auctions for onshore wind installations that have introduced new hurdles to local participation (Knight, 2017b; Knight, 2018). Additionally, planning is underway for government-backed high-voltage transmission lines from wind installations in the north of the country to population centers in the south (Bundesnetzagentur, 2019). Local renewables advocates have responded by developing new forms of community investment on the one hand and mobilizing opposition to centralizing initiatives on the other, even when those initiatives have to do with renewable energy (Galvin, 2018).

In Japan, incumbent utilities, backed by the powerful Ministry of Economics, Trade, and Industry (METI), cited problems of regional grid incompatibility as grounds to resist decentralization of the energy system. The national government has continued to work closely with major utilities to curtail local energy access to the national grid, deferring much of the oversight of electricity distribution and transmission to these companies (Dewit, 2017; Haddad, 2014). Local RE activists have been unable to build self-reinforcing momentum. However, they have begun to leverage the liberalization of the electricity market to promote local electricity retailing and quietly reject the old utility model.

Policy change at higher levels of governance reshapes opportunities for community initiatives and vice-versa. In Germany this interaction has transformed the energy transition into a contest between centralized and distributed models. In Japan it has thus far dampened local initiatives, but strong public anti-nuclear sentiment and growing municipal participation in energy production and distribution may limit the retrenchment.

II. Local-national interactions in energy transitions

The global climate crisis highlights the importance of designing policies that "stick" by creating positive feedbacks that lead to path dependencies (Jordan & Matt, 2014; Levin, Cashore, Bernstein, & Auld, 2012). Scholars in a number of related fields - innovation studies, public policy analysis, sociotechnical transitions - have begun to highlight the importance of the *politics* of energy transition for this task (Breetz, Mildenberger, & Stokes, 2018; Cherp, Vinichenko, Jewell, Suzuku, & Antal, 2017; Meadowcroft, 2009). This special issue contributes to the discussion by developing a framework for understanding the politics of resistance to energy transitions grounded in theories of institutional change (Stefes, this volume). There is already a substantial literature on the power of entrenched incumbents to create negative feedbacks that block or reverse national-level policy change (Geels, 2014; Lauber & Jacobsson, 2016; Stokes & Breetz, 2018). These actors may be aided by exogenous events that offer opportunities for repositioning (Stefes, 2016). The ways in which local actors contribute to these processes is less well understood (Thelen 2003, p. 232). Our paper offers empirical evidence of the impact of community-level initiatives on the trajectories of energy transitions in the electricity sector.

Many studies proceed from the standpoint of policy as the primary driver of innovation; they tend to conceptualize community actors as recipients of policy decisions, focusing on factors that promote or inhibit local acceptance (Jordan & Matt, 2014; Muriyama, Nishikido, & Iida, 2007; Musall & Kuik, 2011). We instead emphasize politics as a primary driver. We focus on grassroots energy activism in particular, which provided the impetus for the passage of laws promoting renewable energy in Germany and Japan in the first place (Hager, 2016; Hughes, 2016). Local communities are often first to recognize the economic and demographic co-benefits

of investing in renewable energy (Bündnis Bürgerenergie, 2015). As such, they are a key component of developing "socio-political space" for the expansion of renewable energy technologies (Lauber & Jacobsson, 2016, p. 148). They are thus also key to stabilizing a country's path to energy transition and preventing the rollback of low-carbon policies. Rosenbloom, Meadowcroft, and Cashore (2019) propose that stabilization requires embedding the transition in society, in part by creating a supportive "ecosystem" of public and private institutions (p. 173).

Our article contributes to this literature by explaining how particular communities attempt to expand the socio-political space and create supportive ecosystems for RE. We find that differences in the structure of activist networks affect the resilience of local RE initiatives. German groups cultivated both horizontal and vertical ties; Japanese groups established primarily vertical ties. While community-level initiatives in both countries have suffered from policy reversals at the national level favoring entrenched incumbents, German initiatives have diversified their activities and mounted protests while Japanese initiatives have dropped out or adopted a holding pattern.

In his framing article for this special issue, Christoph Stefes proposes a conceptual separation of political, economic/technological, and legitimation "meso-paths" to energy transition. We develop this idea further in our two empirical case studies in order to highlight the interaction of local and supra-local processes. In Germany, complications on the economic/technological path toward implementing energy transition opened possibilities for political repositioning by incumbent utilities and their allies in national government. They made weak veto prospects into stronger ones, allowing these players to achieve policy layering to slow and recentralize the energy transition. The reactive trend is limited, however, by very strong

public support for the decentralized energy transition and the solid anchoring of renewable energy in local communities. This is where the legitimation path, with reinforcing feedbacks at the local level, becomes central to the analysis.

In Japan, complications on the economic/technological path enabled incumbent utilities to resist grid upgrades that would have facilitated a more decentralized energy transition. The opportunity that arose for Japanese RE advocates due to shifts in political party power at the national level thus waned before emerging RE players could position themselves (Hughes, 2016). Policy drift is the result. Japan's legitimation path differs from Germany's. Public opposition to nuclear power is high and has limited the reopening of nuclear plants after the Fukushima disaster (Murphy, 2014). Forms of local participation in RE, however, have been more dependent on collaboration with central players than in Germany. As those possibilities contract, RE communities respond by withdrawing.

When the three paths have converged, RE uptake has been rapid. This is most visible in Germany from the passage of the Feed-In Law of 1990 until the Renewable Energy Act revisions of 2009. In Japan it can be seen most clearly from the defeat of the LDP government in 2009 until the implementation of the new energy law in 2016. The energy transitions were aided in both of these cases by exogenous events. When the paths have diverged, for example in Germany when electricity transmission and storage problems arose, positive feedbacks have been interrupted. In both countries, local and national RE initiatives are currently at cross-purposes.

Our research proceeded in two phases. First, we identified the major forms of local participation in the energy transition in each country and described their development in general terms. Then we identified particular communities that were early adopters of each form. In

Germany, we chose Schönau, Freiamt, and St. Peter, located in the region of Baden-Württemberg that has become known for solar energy. In Japan, we chose Miyama City, Fujino, and Yusuhara.[1] Using a process-tracing methodology, we reconstructed the patterns of local-national interactions and feedbacks in each case (George & Bennett, 2005, ch. 10). For this phase, we utilized local and national media sources, documents, archival materials, and municipal as well as renewable energy organization websites, supplemented by a total of 18 semi-structured interviews with key local participants, nine in each country. Our interviewees included representatives of each type of renewable energy initiative, municipal officials, and representatives of research and professional organizations. Nine of the interviews were conducted in person and nine by email. The bulk of the interviews took place between October 2017 and October 2019, although for the German case we used information from two interviews conducted earlier (2014). We asked respondents about the motivation for their energy initiatives, their choice of form, their main community partners and opponents, the resonance of their activities in their towns and beyond, their responses to changes in parameters at the national level, and their future plans.

III. The German Energy Transition

A. National and EU policy framework

The German government has set ambitious targets for energy transition, including an 80% share for renewable energy in gross electricity consumption and a 95% reduction in greenhouse gas emissions (from 1990 levels) by 2050. Its medium term goals include a complete shutdown of nuclear power by 2022 and a 65% RE share by 2030 (Bundesregierung, 2018). German renewable energy policy is based on two federal laws. The Feed-In Law (1990) granted access to

the grid to small energy producers at a guaranteed price. The Renewable Energy Act (EEG, 2000) stabilized this system and guaranteed feed-in prices to renewable energy producers for a 20-year period. The 2000 EEG removed the cap on expansion of RE and mandated priority grid access for RE generators. Figure 1 shows the explosive growth of RE technologies after 2000.

[FIGURE 1 HERE]

While individual member states have substantial sovereignty in the field of energy policy, the EU has made strides to promote harmonization in renewable energy development and in the creation of a European energy market (Schreurs, 2016, p. 100). EU regulators mandated the liberalization of the energy sector that was completed in the 1990s. This broke up the regional supply monopolies of the large German energy companies but resulted in consolidation of the sector into four even larger companies. More recently, the European Commission has pushed Germany to phase out its FIT in favor of competitive auctions for new RE projects in order to encourage market competition (Lauber & Jacobsson, 2016).

B. Forms of local participation

Citizens began investing in local-level renewable energy projects in the 1970s. In fact, it was citizen movements, some connected with anti-nuclear activism, that put renewable energy on the national agenda in Germany. RE arose in the context of popular opposition to corporatist energy policymaking (Hager, 2015; Rucht, 1980). The renewable energy laws were the result of an advocacy coalition of local producers, RE organizations, and parliamentary backbenchers (Stefes, 2010). The EEG provided the stability and financial security necessary to encourage more cautious small investors to participate in local energy projects (Toke, 2011). Here we describe the most prevalent forms of citizen investment developed since the 1990s.

1. Renewable energy cooperatives

The most popular form of local participation in the *Energiewende*, the energy cooperative, accounted for about 55% of the estimated 1,747 citizen energy companies in 2017 (Kahla, Holstenkamp, Müller, & Degenhart, 2017, p. 16).[2] Co-ops have a long tradition in Germany. They are formed by inhabitants of the same village or region. Every member gets a vote regardless of the amount of her investment. Members are owners, managers, and customers at the same time. Most energy cooperatives in Germany focus on energy generation, although a minority operate local electricity grids or heating networks. Solar PV is by far their most popular investment, followed by biomass, hydroelectric, and wind (DGRV, 2019, p. 11).

2. Limited partnerships with a limited liability company as a general partner

Limited partnerships (GmbH & Co. KG) are another popular form of local energy activism, comprising about 37% of citizen energy companies in 2017 (Kahla et al., 2017, 16). These offer small investors a way to participate in community wind and solar projects that require relatively high investment sums and raise more issues of liability and risk than small PV projects do. In contrast to co-ops, limited partnerships have a separate management responsible for initiating and maintaining projects in addition to investors who simply pay a certain sum to be part of the project (Yildiz et al., 61). There is a minimum and often a maximum investment sum. These organizations commonly require all or a certain proportion of the investors to be local residents. This gives the community a stake in the installation and helps ensure local support. Investors generally earn a small but reliable annual return. Some 40% of all wind installations in Germany are owned by citizen energy companies, most of which are limited partnerships (Agora Energiewende, 2017, 118, 120).

3. Bio-energy villages

Whole villages can participate in the energy transition through a “bio-energy village” (*Bioenergiedorf*) program sponsored by the Ministry of Food and Agriculture. A bio-energy village produces the majority of its heating and electricity needs from regionally available renewable sources (wood and biomass). Often the plants are owned by local citizens or co-ops, who partner with farmers and foresters to supply the biofuels for the plant. Bio-energy villages are promoted as a way for communities to work together toward energy autonomy; the biomass plants are often supplemented by other sources of locally produced renewable energy, such as solar and wind. Currently there are 150 bio-energy villages in Germany, with an additional 43 in process (FNR, 2019).

C. Benefits of local energy initiatives

Community energy projects have brought a number of benefits to participating towns and villages. Among the most commonly cited by participants are social capital spillover effects. A number of recent studies confirm that people join RE co-ops and limited partnerships primarily out of a desire to do something for and with their communities. They are particularly attracted by the participatory aspect of co-ops (Holstenkamp & Kahla, 2016, p. 120; Romero-Rubio & Diaz, 2015, p. 402). This finding is underscored by our interviews in several "plus-energy" communities in Baden-Württemberg. Owning something as a village, doing something together for the future, “gives citizens a whole different kind of strength,” says a RE co-op co-founder in the bioenergy village of St. Peter (CEG1).[3]

Local engagement in RE projects also leads to technology/innovation spillover effects. In fact, it was local residents experimenting with backyard turbines who were responsible for some of the early breakthroughs in wind technology (Krauss, 2010; Toke, 2011). Energy co-ops tend to diversify their activities over time. Communities and organizations that invest successfully in

one renewable energy project tend to invest in others. This kind of spillover effect anchors the energy transition firmly in local communities. While expanding its cogeneration plant to supply heat to nearly the whole village, for example, the co-op in St. Peter helped the neighboring village design a cogeneration plant similar to its own. Villagers from Schönau, who achieved international fame by buying the local grid and setting up a renewables-based electricity co-op, next sponsored a successful wind farm project in the region (EWS, 2019).

Citizen owned RE projects also demonstrably enhance local economic vitality. Their returns are commonly reinvested in the local and regional economy and accrue to a broad spectrum of participants (Reuter, 2016; Schönberger & Reiche, 2016). They produce value added in terms of profits from projects, income from RE jobs, and taxes paid to municipalities. Jobs in RE are long-term and desirable (Bündnis Bürgerenergie, 2015; Antoni, Janser, & Lehmer, 2015), and they can be a boon to communities in demographically declining areas. Often local investors can implement a project that large investors would not undertake at all because of high transaction costs (Monstadt & Scheiner, 2014). Leasing land from six different owners for a single wind turbine project, as was accomplished in the Black Forest village of Freiamt, is one example.

Local ownership also boosts acceptance of RE installations. Germany is noteworthy for the robustness of popular support for the energy transition. In a September 2018 survey by the Renewable Energies Agency, 93% of respondents supported greater renewable energy use and expansion, a level matched in few (if any) other countries (AEE, 2018). Germans have also long supported the local energy transition. In a 2013 survey, for example, 75% agreed that "citizen managed, decentralized renewable energy should be prioritized" (Reuter, 2013). This support is important for overcoming resistance to particular projects, especially wind farms. Community

participation accelerates the uptake of wind and solar, as recent studies demonstrate (Reuter, 2016; Musall & Kuik, 2011). These studies find that residents are much more resistant to energy projects financed by outside investors than they are to locally financed ones. Our interviews confirm these findings. In Freiamt, local farmers refused to lease their property to outside investors, deciding instead to finance their own wind turbines, a decision that enjoyed widespread support and led, according to a local official, to a "clear rise in the self-confidence of villagers." RE, she adds, has become "part of our identity" (GG1).

D. Changing local opportunities in the EEG context since 2009

As we have described, the EEG reinforced local initiatives that were already underway and helped create a socio-political space for the expansion of renewables, empowering citizens nationwide to become energy entrepreneurs and investors. As of 2013, roughly half of installed renewables capacity was locally owned by individuals and farmers, while only 5 percent was owned by the large utilities (AEE, 2013). The bottom-up energy transition was so popular that the German government was compelled to make "preserving the diversity of participants" a primary goal in subsequent revisions of the EEG (Ohlhorst, 2018, p. 102).

Entrenched incumbents at the national level have responded. Utilities with coal and nuclear assets have much to lose from a rapid, decentralized energy transition. The EEG mandates priority grid access for renewables. Traditional utilities argue that they cannot power conventional or nuclear plants up and down fast enough to cover for intermittent RE and avoid producing excess power (Fraunhofer ISE, 2017, pp. 29, 37). So long as there is no effective storage technology for RE, they argue, the practice of myriad small producers feeding into the grid is unsustainable ("Einfach Wahnsinn!", 2012).

The national-level governing coalition has sided with the utilities. Concerned that a decentralized energy system would prevent Germany from meeting its long-term transition targets, the government argues that large-scale transmission grid expansion is necessary to connect the main wind energy producing areas in the north to the population centers in the south (Bundesnetzagentur, 2019). A north-south "energy superhighway" will also eventually serve the build out of large offshore wind farms.

Obstacles along the economic/technological path to energy transition have also provided an opening for other subnational and supranational actors who oppose particular aspects of the energy transition. The Bavarian government, concerned about the negative impacts of wind turbines on tourism, promulgated distance requirements between RE installations and existing structures that eliminate the vast majority of possible wind and large solar sites (Gsänger & Karl, 2019, p. 12). The government of North Rhine-Westphalia, acting to protect coal interests in the state, followed suit with its own distance requirements in spring 2018 (Knight, 2018). Other critics raised concerns over the uneven socioeconomic benefits of the localized energy transition, discussed by Roger Karapin in this volume. The European Commission pressured Germany to phase out the FIT in favor of competitive tenders for new projects (Lauber & Jacobsson, 2016).

Solar energy was targeted first by government and industry critics claiming that there was too much RE in the grid. EEG revisions since 2009 reduced the FIT more sharply for solar than for other forms of RE, but private solar installations continued to overshoot government targets ("Förderung für Solarstrom", 2011). The Merkel government also wanted to restrict expansion of biomass, a favorite of bio-energy villages. The 2014 EEG revisions therefore designated “corridors” for development of RE with target limits to each form and a hard cap for solar expansion. Additionally, the EEG now levies a surcharge on those who produce solar power for

their own use (rooftop solar on family homes is still exempted) (Holstenkamp & Kahla, 2016, p. 120). “Energy intensive” industries, which made up almost 1/5 of Germany’s entire power consumption in 2015, are exempted from the surcharge (Fraunhofer ISE, 2017, p. 16). Thus, the burden falls primarily on medium-sized installations popular with co-ops.

Starting in 2017, new RE projects are awarded through a process of competitive tenders. These replace the more predictable returns that wind and solar producers could earn through the FIT. Repowering of wind turbines after expiration of the original FIT period is now also subject to auction. At first, the proposal contained no provisions to help community energy projects compete. It would have awarded permits to the lowest bidders, which would probably always have been large companies. Also, bidders would have needed a valid construction permit (through the Federal Immission Control Law) in hand at the time of the auction. The permitting process required a large upfront investment that could not be recouped if the bid failed.

The German Cooperatives Association launched a campaign against the changes, as did the Alliance for Citizen Energy ("Bürger gegen", 2016). The objections led to some adjustments in the law. Citizen wind projects in the first rounds of auctions (2017) were not required to obtain a construction permit before submitting a bid. They also received a longer time period to implement approved projects: 4.5 years rather than the 2.5 years that other bidders received. After "citizen energy" projects won 93% of the projects in the May 2017 round, the government eliminated the permit exemptions starting in 2018. Their concern was that many of the awarded citizen projects would ultimately fail to acquire the permit, throwing off the targeted timetable for the energy transition (Wehrmann, 2017).

E. Local responses to national policy changes

National-level efforts to restructure the energy transition have prompted a variety of responses.

1. Effects on founding and types of new citizen energy companies

Although the overall number of citizen energy companies is still rising, since 2014 the rate at which new organizations are founded has plummeted. At the same time, the number of companies disbanding has risen (Figure 2).

[FIGURE 2 HERE]

The figures for RE co-ops by themselves are more telling. Whereas in the boom years of 2011-2013, close to 200 new co-ops were founded annually, the number dropped to 65 in 2014 and to 27 in 2016, while the number of co-ops disbanding rose to a historic high of 16, leaving a net growth of only 11 co-ops in 2016 (Kahla et al., 2017, p. 26). In 2018, only 14 co-ops were founded (DGRV, 2019).

The changes in the EEG since 2009 have also had the intended effect of shifting local investment away from solar and biomass and more in the direction of wind. The Fraunhofer Institute for Solar Energy Systems reported a more than 80% decline in new solar installations from 2013 to 2016 (2017, p. 12). Solar and biomass fell short of their already low 2016 and 2017 corridor targets. The decline in federal support for solar and biomass is also likely the main reason for the local move away from the co-op model and toward various forms of limited partnership (Kahla et al., 2017, p. 15). To many participants, the decline of co-ops represents a loss in the more general community empowerment that these organizations facilitated. It also contradicts the goal of the law to preserve the diversity of stakeholders in the energy transition. Spillover effects are still occurring, however. Co-ops are becoming more creative in their activities to cope with the new constraints. While the vast majority (4 out of 5) in the past focused on electricity production, new co-ops as well as older ones are turning to projects like e-mobility and carsharing, cogeneration, local heating networks, self-supply, and energy efficiency

(DGRV, 2019, p. 11; Gsänger & Karl, 2019, pp, 14-15). Cogeneration has become particularly popular among co-ops in the Black Forest region we studied, where wood resources are plentiful.

2. Effects on existing citizen energy companies and energy villages

The changing parameters for participation in the energy transition have created an atmosphere of uncertainty for local activist communities. The apparent triumph of citizen energy companies in the first couple of onshore wind auctions may have been overstated. In the May 2017 auction, for example, a single project developer was behind 68% of the winning bids (Knight, 2017b). This developer worked with local investors so as to qualify in each case as a citizen energy company under the law. Of the 826 MW of wind power it has built, it has sold roughly 500 MW to outside investors, including large companies. Thus, as local investment moves toward the limited partnership model, the competitive tender system gives incentives for limited partnerships to move away from local ownership.

Now that all bidders must have a construction permit in hand (since 2018), citizen energy companies face steep upfront costs that they can only recover if their bids are accepted. Under these new conditions, however, the share of winning bids from citizen energy companies has dropped to less than 20% in 2018 and *zero* in the August 2019 round (Gsänger & Karl, 2019).

Early adopters of local RE, such as Freiamt and St. Peter, face an uphill battle as their 20-year FIT periods expire. Re-powering of older wind turbines is now also subject to auction, and at the current low electricity prices, few would stand to make a profit. As some 6,000 wind turbines nationwide will be in this position at the end of 2020, and about 1,600 per year after that until 2026, the effects of their shutdown on German wind capacity could be "dramatic" (Knight, 2017a). A Freiamt interviewee converted her family farm from beef to biogas production in 2001 in order to earn a more predictable living. They now own two cogeneration plants that feed

power into the grid and pipe heat to public buildings and neighboring homes. As their installations near the end of the 20-year contract period, their farm, like others in the region, faces an uncertain future. Asked if she would do it again, she replies, "I honestly don't know whether it would be worthwhile" (CEG3).

The Merkel government's concern that citizen wind energy projects approved in 2017 without permits would later fail to attain those permits was well founded. The permitting process slowed markedly in 2018 and 2019, falling far below federal targets (Buchsbaum, 2019). Wind energy advocates blame permitting bottlenecks at the regional level and local opposition for the delays (Deign, 2019). The rate at which new projects are proposed has slowed as well. Onshore wind auctions since 2018 have been undersubscribed, the latest (in August 2019) awarding only about half the available capacity. Problems can be expected with a new process, and adjustments are being made to lessen the negative effects. But one lesson seems to be that competitive tenders are less appealing to investors than the FIT they replaced (Götze, 2018). The overall trend is a dramatically less attractive market for smaller citizen energy companies investing in wind power. Together with the restrictions on small solar and biomass, these changes all point to a decline in local ownership of the energy transition and thus also in the "soft" benefits of local RE. While it is too early to demonstrate definitively a causal relationship, it is plausible that declining local participation contributes to the rising opposition to RE projects that is currently slowing the permit process for new installations.

3. Local mobilization against the energy transition from above

The grid modernization proposed by the Merkel government has proved more fraught than expected, not least because of citizen opposition to high-voltage transmission lines near towns

and villages. But local citizens are also suspicious of the large utilities, which, having lost out on the RE boom, now stand to make large returns as grid operators (Appun, 2018).[4]

Networks of local groups have formed to protest particular north-south lines. The Federal Association of Citizen Initiatives Against Südlink, for example, includes 47 local groups. Its membership favors the energy transition but opposes the lines, advocating for "a return to a decentralized energy planning and energy politics" (Bundesverband Bürgerinitiativen gegen Südlink, 2019). Local, regional, and state governments have also spoken out against the megaproject. A recent study of community opposition to Südlink in Lower Franconia found that locals were mainly concerned the project "would compete unfairly with Lower Franconia's own renewable electricity production, threatening the local economy and the delicate threads that maintain a Lower Franconian way of life..." (Galvin, 2018, p. 121) These new groups bring energy protest full circle, invoking the tradition of citizen mobilization against corporatist energy policymaking that dates back to the 1970s.

IV. The Energy Transition in Japan

A. Japan's National Energy Policy Framework

In 2015, METI released a forecast for the country's 2030 energy supply mix that envisions a growth in the share of RE to 22-24% (from 14.8% in 2016) and a revival of nuclear power to 22% (ISEP, 2017). Greenhouse gas emissions are targeted to drop by 26% by 2030 and by 80% by 2050 (from 2013 levels) (METI, 2018; Buckley, 2017).

Prior to the 2011 Fukushima disaster, Japan's energy policy remained largely unchanged in the post-World War II era. Nuclear power accounted for approximately 30% of Japan's electricity (World Nuclear Association, 2019). Following the accident, all 50+ of Japan's nuclear

reactors were shut down due to widespread public protests against nuclear power. As of September 2018, only nine of the now 42 operable nuclear reactors had resumed commercial operation. Consequently, Japan has become increasingly dependent on fossil fuel imports to compensate for the loss in nuclear power. In an ongoing effort to increase the country's energy self-sufficiency, the national government has also taken steps to promote renewable energy (Aldrich, 2012; Kingston, 2012).

1. 2012 FIT Scheme

Japan's renewable energy policy consists mainly of feed-in tariffs for solar and wind power introduced in July 2012. The successful introduction of the FIT reflects a shift in political power at the time that created a window of opportunity for RE. In 2009, the Democratic Party of Japan (DPJ) defeated the incumbent Liberal Democratic Party, which had consistently supported nuclear power and maintained a close relationship with the traditional utilities. As the DPJ grew more skeptical toward nuclear energy, the Fukushima disaster weakened the power of the traditional utilities and shifted government support further toward expansion of RE (Aldrich, 2012; Hughes, 2016).

As in Germany, the FIT was designed to increase the competitiveness of renewable energy by obliging utilities to purchase electricity generated by RE sources. The FIT was remarkably successful in promoting the growth of commercial and large-scale solar power (greater than 10kW) relative to other forms of RE, as Figure 3 shows. Commercial solar power less than 1MW includes enterprises from local energy companies and community power groups. The FIT also led to a smaller, but steady increase in small-scale (less than 10kW) residential solar projects.

[FIGURE 3 HERE]

2. Energy Market Reform

For decades, Japan's power sector has been dominated by 10 vertically integrated companies. In the early 1990s, a broad consensus for the need to decentralize began to develop. The LDP briefly lost control of the executive and legislative branches of government between 1993-1994 (and would again lose control between 2009-2012, leading to the introduction of the 2012 FIT), allowing the Japan New Party, a then newly formed coalition party, to place decentralization on the political agenda. In 1995, the government revised the Electric Business Law for the first time in 31 years, calling for greater access for new suppliers (Hughes, 2016). Further revisions enacted in 2000 and 2004 established a gradual liberalization of the electricity market that enabled large-scale users to choose their power companies without restrictions (Agency for Natural Resources and Energy, 2016).

However, these efforts to partially liberalize the energy market failed to introduce competition beyond the 10 major utilities. It was the Fukushima Disaster in 2011 that exposed serious weaknesses in Japan’s power system, prompting the DJP-led government to propose further amendments to the Electricity Business Law. The amendments called for a set of market reforms aimed at securing a stable, cross-regional supply of energy, implementing full liberalization of the electricity market, promoting fair competition, and increasing opportunities for new energy businesses (Agency for Natural Resources and Energy, 2014; Act for Partial Revision of the Electricity Business Act and Other Related Acts of 2015).

B. Forms of local participation

Citizen participation in local-level RE projects is not as widespread in Japan as it is in Germany. Nonetheless, Japan has experienced growth in community projects since the early 2000s,

especially in the aftermath of the Fukushima disaster. Here we briefly outline the major forms of local participation.

1. Community-Based Power Projects

Inspired by local initiatives in Denmark and Germany, community power projects emerged in Japan in the early 2000s. Similar to German co-ops, they are characterized by local ownership and control. These projects often rely on municipality support as well as local electricity developers to facilitate efficient distribution and transmission. Miyama City is one community that has supported citizen-owned power projects as a tool for economic revitalization. In 2015, the city established Miyama Smart Energy, a local energy company modeled on Germany's municipal utilities, which retails RE sourced within the city's borders and provides additional social and infrastructural services to participating citizens (GJ3). These efforts differ from national government-backed city programs in their emphasis on independently owned, locally produced and locally consumed energy. In the five years following 3.11, over 180 community power projects were established throughout the country, mostly based on solar and wind energy (Koshiba, 2008).

2. Transition Towns

The Transition Towns (TT) Movement is an international movement that originated in 2005 from a desire to apply the concept of permaculture to community revitalization. The Fukushima disaster helped mobilize the TT movement by highlighting the potential benefits of energy localization and sovereignty (Otsuki, 2014; Yoneda, 2012). Transition Towns function distinctly from some of the other forms of local participation in that they seek little recognition from the national government. An energy activist in Fujino, Japan's first Transition Town, states that the major impetus was "not big energy, but rather for individuals to be able to generate energy

themselves" (CEJ1). This sense of autarky is reinforced by the town's use of a local currency, "Yorozuya", to promote networking among community members. Thus, Transition Towns are distinguished from community power projects in that their primary goal is strengthening a community culture of sustainability rather than establishing formal local control over energy production and consumption.

3. Eco-Model Cities

The Japanese government created the Eco-Model City (EMC) program in 2008. The goal was to market leadership and societal innovation by showcasing cities that have set an example for low-carbon living and sustainable development. 13 cities currently receive financial support to achieve their renewable energy goals under this program. One is Yusuhara, a small town located on Kyushu island. Over 91% of its area is covered in forest. Yusuhara leverages its natural resources to address issues of unemployment and depopulation. The town has implemented the Woody Biomass Community Circulation Model Project, a cogeneration project similar to that of St. Peter, Germany, which has helped reactivate the local forestry industry while generating heat and electricity. In addition to environmental sustainability, Eco-Model Cities have set energy independence and community revitalization as their major goals, aligning themselves with the Japanese government's own agenda for energy sovereignty (Yusuhara; "FutureCity" Initiative, 2016). EMCs differ from community power projects in their dependency on national government support.

4. Private-Public Collaboration for Disaster Prevention and/or Sustainability

The backlash against its neglect of public safety in the wake of Fukushima helped shift the government's interest toward promoting distributed renewable energy for the sake of disaster resilience and national security. "Smart communities", some directly impacted by the Fukushima

disaster, collaborate with business partners and national government institutions, including METI, to maximize the distribution and efficiency of diverse forms of renewable energy resources (RPOJ2). Corporate actors play a major role in these partnerships, working with smart communities to provide energy infrastructure expertise and advanced technology (i.e. microgrid technology). In 2015, eight communities were selected by METI to participate in smart city projects.

C. Benefits of local energy initiatives

As in Germany, community energy projects in Japan provide diverse benefits to their participants. The local economic benefits of RE help counter negative demographic change. Community power projects that involve partnerships with local businesses have boosted local economies. Communities like Yusuhara have leveraged natural resources to increase employment and thereby recruit seasonal and permanent residents. According to a Yusuhara official, tangible progress made on these efforts has expanded community awareness of climate and sustainability issues (GJ1).

For Transition Towns like Fujino, building social capital through energy autonomy is an explicit goal. While other communities cite energy self-sufficiency and economic disaster recovery as major reasons for their initial involvement in local RE projects, they have also benefited from social capital spillover effects that provide a sense of community and individual empowerment to "take matters into their own hands" (CEJ1; see also Maruyama et al., 2007; Knight, 2015). Technological spillover effects are also common. Transition Town Fujino hosts annual educational PV conventions and workshops for community members. Miyama Smart Energy developed an integrated Home Energy Management System (HEMS) designed for the city's growing elderly population to track energy consumption and provide other social services

such as grocery shopping and health check-ups (Movellan, 2016). Community involvement in renewable energy projects reveals important changes in a civil society that until recently accepted the corporatist government-industry status quo without question.

D. Top-down directives and subsequent challenges to citizen energy

1. Changes to the 2012 FIT scheme

In both Germany and Japan, issues with grid technology led incumbent utilities to try to slow RE uptake. In September 2014, Kyushu Electric Company, one of the 10 major Japanese power utilities, announced it would restrict new applications for grid connection from renewable energy producers in its service area. Like its German counterparts, the company cited concerns over maintaining a stable electricity supply due to imbalances in supply and demand caused by surges in PV generation and an overwhelming number of applications from solar power producers. Many of the other large utilities followed suit, suspending responses to applications from RE producers.

Strains caused by rapid growth in renewables are underscored by a historically fragmented transmission system that was organized to serve the vertically integrated utility monopolies. The country's electricity grid is further divided since the utilities in east and west transmit power at two distinct frequencies, with limited methods for conversion and transmission across the two parts of the country (Ydstie, 2011). The grid infrastructure requires major upgrades to incorporate a growing share of renewables. However, power companies must bear the costs for these enhancements. As a result, utilities have essentially refused to establish these connections, despite their FIT obligations (with some exceptions) (Matsubara, 2015).

The Japanese government has responded to utilities' increasing concerns over the country's connection capacity. First, the government approved the regional power companies'

curtailment of solar power from the grid. Second, in April 2017, METI launched a comprehensive set of changes to the 2012 FIT program that includes an auction system similar to Germany's for large PV solar projects with a cap at 2GW for the sector (Clover, 2016; Colthorpe, 2017). Auctions are attractive to policymakers because they provide ratepayers protection against "overpayment". METI believes the bid system will also help streamline RE deployment and control its growth relative to overall grid capacity. However, as we observed in Germany, this new system makes further RE growth vulnerable. It increases the risk for project developers, since there is no guarantee that a winning project will subsequently be successfully contracted and completed.

Japan held its first solar PV auction in October 2017, with disappointing results. Only 141 MW of the 500MW available were awarded. Of this amount, only 4 projects totaling 41 MW paid the secondary deposit, while the other 100MW worth of projects withdrew (Beetz, 2018; Publicover, 2018). The auction's lack of subscription has been attributed to the government's as well as utilities' inability to guarantee project sites and grid connection for interested developers. With the conclusion of a fourth auction in September 2019, yielding similarly disappointing results despite minor improvements in bid price reduction, future auctions are being met with skepticism (SmartJapan, 2019).

The Japanese government and incumbent utilities underestimated the extent to which RE generation, specifically solar, would rise following introduction of the 2012 FIT. As in Germany, solar power is the most popular choice for local investment. Solar has been targeted by the government and by regional power companies who complain of excess RE in the grid. With the recent changes to the FIT and the limited success of PV tenders, the solar market is expected to shift to rooftops. However, in contrast to Germany, residential customers in Japan pay a

surcharge for use of their own electricity in lieu of purchasing electricity from the grid. And decreases in the FIT for residential customers, along with increasing restrictions by utilities on solar entry into the grid, have made homeowners wary of investing in RE (RTS Corporation, 2017). Overall, METI's efforts to combat infrastructural challenges raised by the surge in RE and to limit the number of uncompleted projects (30GW worth at the end of 2017), combined with increased curtailment of solar by the traditional power companies, effectively threaten to limit community and residential participation in RE generation.

2. Challenges of Electricity Market Liberalization

As a result of the liberalization of the electricity market in April 2016, consumers can now choose their energy supplier. This expansion was expected to help establish a level playing field for new entrants, particularly renewable energy developers. However, a year after the liberalization, only an estimated 5 percent of consumers had applied to switch their power supplier (Brasor, 2017). A number of factors explain the lack of competition observed in the new energy market.

First, renewable energy suppliers face increasingly restrictive conditions from the consumer perspective. The revised FIT restricts the sale of RE by increasing its cost at the production, transmission, and distribution stages. Furthermore, the Guidelines Concerning the Management of the Electricity Retail Business, issued in January 2016, do not oblige retailers to disclose information about their energy mix, such as share of renewable energy sources and amount of nuclear waste produced, and only require a "concerted effort" on the part of the retailer to include this information (Dokei et al., 2016; METI, 2016). This discrepancy prevents consumers from accurately comparing utilities and retail suppliers when choosing the source of

their electricity. Consumers who want to participate in RE advocacy cannot do so effectively because of the lack of transparency in the energy market.

Another limitation is the lack of priority dispatch for RE. This is a major difference from Germany. While the 2012 FIT scheme specified a limited version of a "priority connection" obligation, METI replaced this rule in favor of an "open access" principle, ostensibly to ensure a diversified energy mix (Matsubara, 2016). Responding to concerns raised by incumbent utilities that RE could reduce grid stability, METI effectively gave its formal blessing to the utilities to reject the entrance of renewables. Thus, it is clear that despite some efforts at the national level to open the electricity market to RE, conventional energy players are still in control.

E. Local responses to national-level policy changes

Japan's national energy policy is currently in a state of flux. The changes seem designed to limit the spread of RE, but they could also reflect a national government that is attempting to mitigate the infrastructural and financial problems arising from its lack of adequate planning for RE. While incumbent utilities actively oppose local RE, the government is struggling to accommodate local-level players in the face of a national grid that was simply not built for them.

A Transition Town Fujino interviewee reports that, despite ongoing efforts to take control of its own energy production and use, the town must still rely on the central grid to transmit its locally produced energy. It must also purchase some energy from industrial suppliers in order to cover its needs. While Fujino and other local communities may technically have permission to sell their locally generated electricity, they are still bound by regulations put in place by the utilities that control energy transmission and distribution networks (CEJ1).

A Yusuhara City politician voices concerns over delayed local RE development. Yusuhara has limited solar generation capacity due to its heavily wooded setting and has had

difficulty securing other local RE sources. Wind power is limited by a dearth of local transmission lines and the high cost of constructing new lines, as well as technological restrictions to improving power plants. He also cites the extensive process for investigating the legal possibilities for local hydropower and the difficulty of meeting goals for the manufacture and sale of biomass pellets (GJ1). Yusuhara's experience illustrates the ongoing challenges Japanese communities face in achieving the kinds of technological spillover effects our German communities experienced.

Following liberalization of the electricity market, barriers to national grid entry, as observed in towns like Fujino and Yusuhara, have in fact promoted an increase in small, local energy companies that sell locally generated RE strictly within municipal borders. This method promotes a decentralized energy framework, as towns begin plans to invest in "home-grown" energy or to construct microgrids rather than attempt to enter the national macro-grid.

Miyama is one of the first municipalities to establish its own energy retailer, Miyama Smart Energy Co. The company buys electricity from RE suppliers within the municipality's borders. The Miyama municipal government has invested in solar projects and provided subsidies for households to install rooftop PV, purchasing electricity from these projects at slightly over the FIT rate. Currently, more than 10 percent of Miyama's citizens have rooftop panels. Overall, 31 municipalities have recently founded companies to generate and sell mainly RE within their borders (Stapczynski, 2017). Miyama City officials point to the incumbent utility's efforts to win back customers by imposing increased surcharges on new, local suppliers as a sign that community energy will be an uphill battle (GJ3).

The introduction of the FIT in 2012 prompted a surge in citizen co-owned RE installations. However, Figure 4 shows a decreasing rate of new citizen-led power installations

since 2015. Decreasing FIT rates for RE, limited access to the grid, and RE curtailment measures have all contributed to this decline. Thus, despite increasing momentum at the local level to disrupt the traditional energy model, the growth of RE continues to fluctuate as local players navigate reactive energy policies at the national level.

[FIGURE 4 HERE]

Despite METI's stated goal to diversify the energy mix, the recent policy changes are detrimental to local energy producers, who have been the energy transition's most ardent supporters. The government has elected to limit solar and wind (via revisions to the 2012 FIT)—the RE forms that energy communities prefer to invest in. And while the electricity market liberalization has granted local citizens greater freedom to choose renewable energy suppliers as well as sell locally produced energy, without a corresponding unbundling of electricity generation from distribution and transmission in favor of a neutral system not owned by the traditional utility monopolies, energy communities are unable to break conventional barriers to promoting RE.

A Yusuhara representative explains that "despite our desire to make progress on our own (by all means), it is difficult to progress this way" (GJ2). He and other interviewees argue that the "do it yourself" mentality taken by many energy communities makes for limited progress, and that it is necessary to maintain collaborative ties to government, incumbent utilities, and other stakeholders in cooperatively addressing the needs of the city and the future vision for the country. However, it is clear that the national government and local-level participants have yet to agree on a framework for effective implementation of the RE transition.

V. Comparative Discussion and Conclusion

Our process-tracing analysis confirms the importance of local communities for creating the socio-political space for energy transition that Lauber and Jacobsson describe and for challenging corporatist energy policymaking in Germany and Japan. Yet our comparison reveals important differences in the two cases that have implications for theory and future research. The German pattern of local/national interactions is depicted in Figure 5. The Chernobyl nuclear accident and German reunification aided the passage of federal RE laws in 1990 and 2000, which brought national and local initiatives into harmony and fostered positive feedbacks that led to rapid RE uptake. Incumbent utilities largely waited out the changes until technological and economic issues raised questions about the feasibility of a decentralized energy transition. They were forced to abandon nuclear power after Fukushima but largely got their way in the EEG revisions of 2014, after which the national government's trajectory moved closer to theirs, away from that of local participants.

The EEG changes, promoted by the national government, incumbent utilities, and the European Commission, interrupted the positive feedbacks of the local energy transition, despite the government's efforts to preserve the diversity of participants and to favor citizen energy companies in the early rounds of auctions. While the founding of new co-ops and citizen energy companies has slowed, our respondents confirm a willingness to diversify their activities. Their horizontal networks of cooperation make diversification feasible. General support for the energy transition remains high, but the recent turn to protest against large RE projects reveals that its legitimacy is tied to local ownership. There remains a lingering distrust of the traditional utilities and their political allies.

[FIGURE 5 HERE]

The Japanese pattern of local/national interactions is depicted in Figure 6. Political turnover in 2009 and the Fukushima disaster in 2011 encouraged energy policy reform and recognition of a local RE movement that had been largely overlooked. The 2012 FIT law brought the national government closer to local participants as it fostered a boom in solar energy and provided various incentives for RE development. These programs nevertheless failed to disrupt the incumbent utilities' political and technological control over Japan's energy infrastructure. As in Germany, the utilities bided their time, and after Kyushu Electric refused grid access to new RE producers in 2014, others followed suit.

Local Japanese activists were unable to generate the positive feedbacks necessary for a self-reinforcing RE expansion. Consequently, their trajectory diverged from those of the national government and incumbent utilities. Some local RE activists attempted to go at it alone, either through autarkic Transition Towns or independent local energy companies. However, these same local RE activists maintain that true independence is difficult because top-down interventions are so entrenched in every facet of energy production and distribution. Market liberalization appeared at first to offer an opportunity for citizen support of RE, but it failed to reverse the divergence of the three paths.

[FIGURE 6 HERE]

Our analysis makes five related points that contribute to the current discussion of ways to accelerate action against climate change and also suggest directions for future research. First, local actors can be drivers of change in their own right, creating positive feedbacks that result in rapid RE uptake when paired with appropriate national-level policies. Our cases support Lauber and Jacobsson's claim that energy activists create socio-political space for renewables. We would augment their account by noting that this space includes economic, technological, and social

capital spillover effects that can help anchor RE in local communities. Our results suggest exploring further ways in which to join the policy literature on energy transitions to literature on social capital and resilience.

Our research also offers several caveats to a conception of local initiatives driving energy transitions. Our analysis highlights the importance of exogenous events for creating opportunities especially for RE activists. Popular opposition to nuclear power was a background factor in both Germany and Japan. Nuclear accidents galvanized local communities to mobilize for national energy policy change on the one hand and to develop local alternatives to nuclear power on the other. This emphasis on local autonomy was particularly strong in Japan but existed in both cases. While the importance of exogenous events makes generalizing from individual case studies difficult, it also suggests that the impact of local activism might be amplified in other cases by events that seem to reveal a gap between national policy choices and local wellbeing.

Third, our analysis shows how technology can be both a driving and a limiting factor in energy transitions. The rapid growth of small- and medium-scale solar in both cases helped local energy activists disrupt the power of entrenched incumbents. Subsequently, however, those incumbents were able to cite technological difficulties with grid modernization in order to slow local RE expansion and reassert control. The role of technology in the politics of energy transitions may be a fruitful area for future research.

Fourth, Rosenbloom et al.'s claim that stabilization of a path to energy transition requires development of an "ecosystem" of supportive institutions, both public and private, is borne out in our cases. But our comparison shows that the *type* of ecosystem is critical. German activists built both horizontal and vertical networks, while Japanese activists' networks were almost exclusively vertical. Although the energy transition was slowed from above in both cases, their

horizontal networks made the German community initiatives more resilient. This is our most important comparative finding. It suggests that future case study research exploring social capital in energy transitions should focus on the impacts of fostering different types of networking.

Finally, with regard to Stefes's analytical framework, our study highlights the importance of both the economic/technological path (discussed above) and the legitimation path to analyses of the politics of energy transitions. With regard to legitimation, local communities were among the energy transition's earliest and most enthusiastic proponents in both Germany and Japan. Leveraging their support seems the great missed opportunity of national RE policymaking thus far. In Germany, local ownership is critical to public support for the energy transition. German policymakers appear to realize this, but it remains to be seen whether they will temper the current trend toward recentralization with a renewed commitment to fostering the diversity of participants. In Japan, local enthusiasm for RE is dampened by the rigidity of the energy system. Activists' current options - dependency on reluctant industry and government partners or separation from national-level participants - limit their capacity to push for broader change, but opposition to nuclear power may continue to be a mobilizing factor.

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[1] It should be noted that the Japanese early adopters, unlike the German ones, are not regionally clustered.

[2] The term “citizen energy company” (*Bürgerenergiegesellschaft*) can refer to a variety of groups whose main feature is the inclusion of local citizens in the investor pool. The 2017 EEG defines “citizen energy company” as a legal term for the first time: it consists of at least 10 natural persons as voting members, of which at least 51% are natural persons who have had their primary residence in the region (*Landkreis* or *kreisfreie Stadt*) where the wind installation will be built for at least one year, and among whom no member of the company holds more than 10% of the voting rights. In cases of a company formed by a combination of natural persons and associations it is adequate that every individual member of the company fulfill these obligations (EEG 2017, Section 3, Nr. 15, my translation).

[3] We have coded interviewees by type of participant: CE denotes community energy (followed by G or J according to country), G denotes government, and RPO denotes research or professional organization.

[4] E.On and RWE restructured after the 2014 EEG revisions, in effect splitting their companies in two by separating their conventional power generation assets from their renewable energy assets (Morris, 2016).

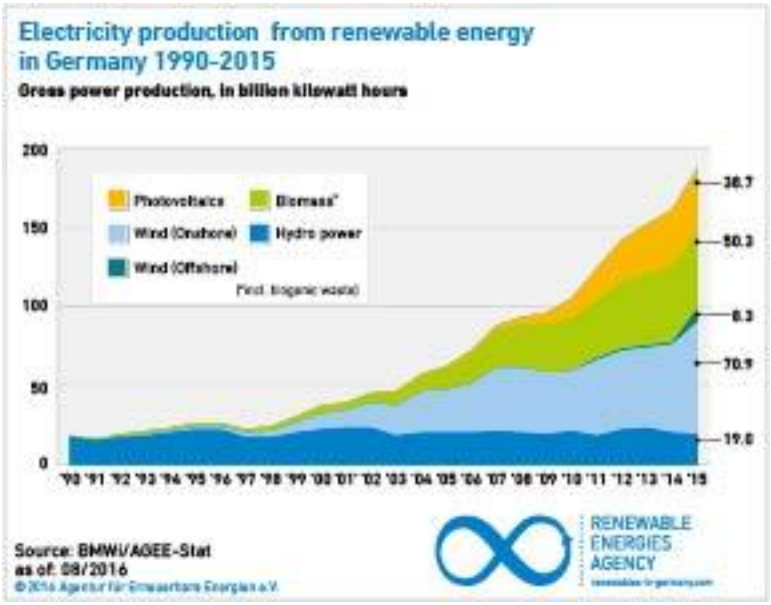

FIGURE 1 - Energy Production from Renewable Sources in Germany 1990-2015
Gross electricity generation by energy source in billion kWh

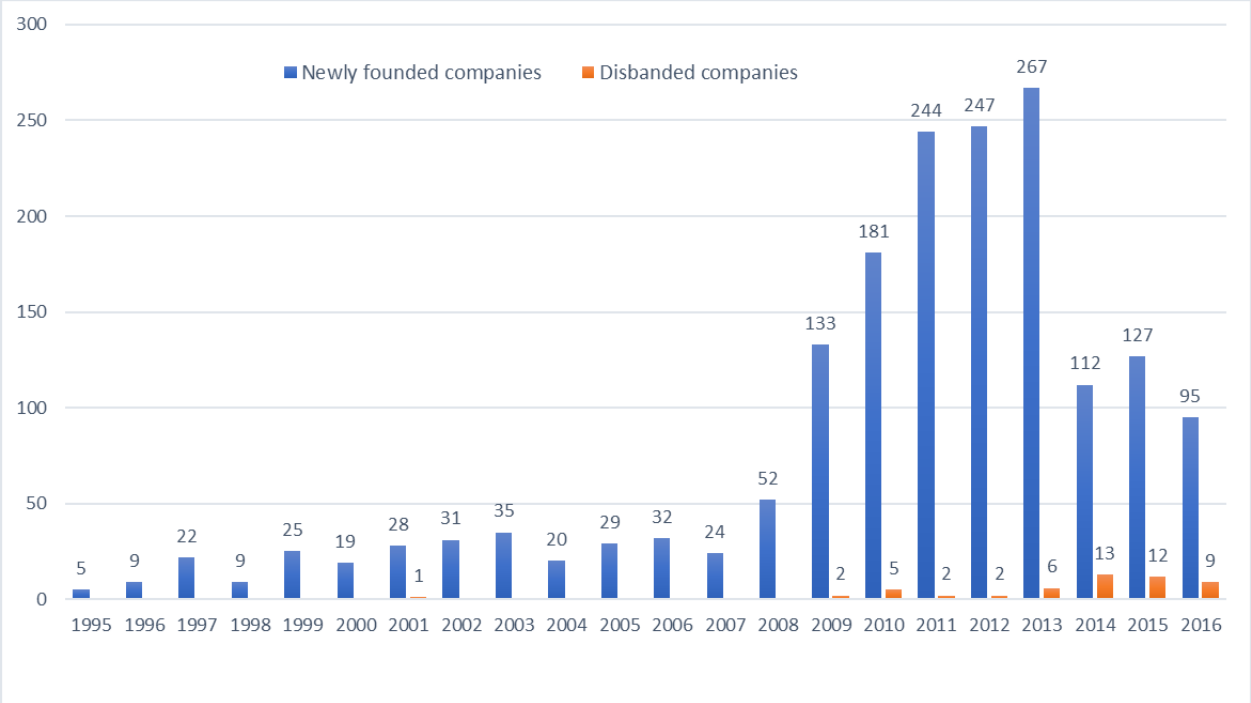

FIGURE 2 - Founding and Disbanding of Citizen Energy Companies (including Co-ops) by Year

Source: Kahla, Holstenkamp, Müller, & Deggenhart (2017)

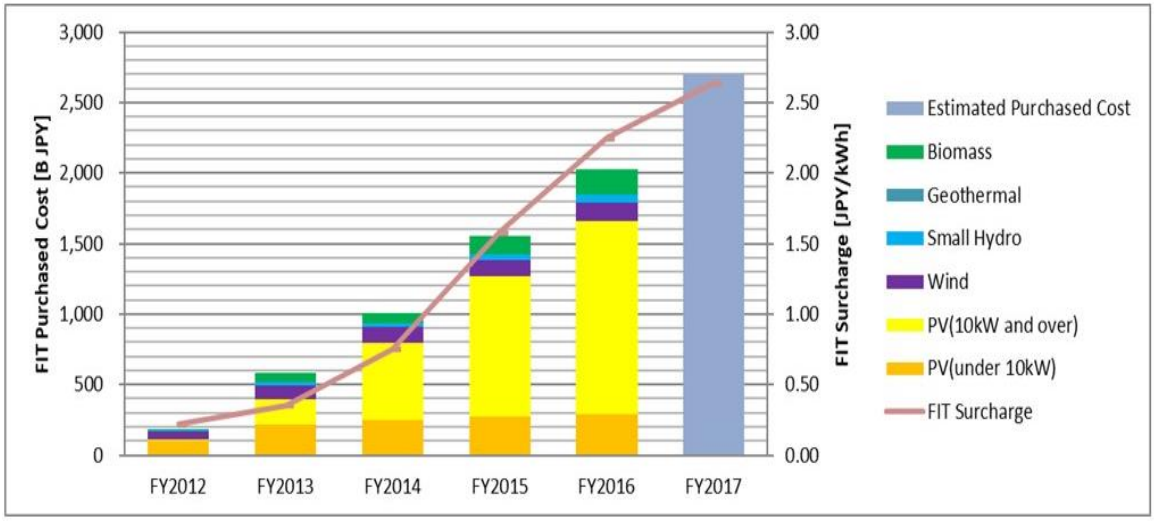

FIGURE 3 —Renewable Energy Investment in Japan from FY2012 to FY2017
Source: Institute for Sustainable Energy Policies. (2017). Status of Renewable Energies in Japan.

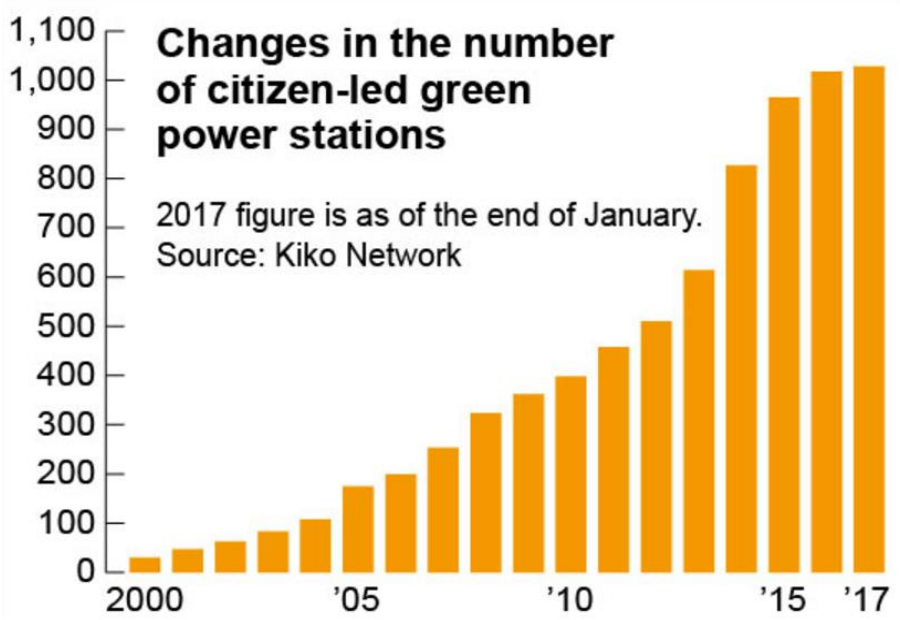

FIGURE 4 - Trend in Number of Citizen Co-Owned RE Power Facilities
Source: Kiko Network from Toru Ishii. (2017). Growth slows for citizen-led green power stations; state help urged. *The Asahi Shimbun*.

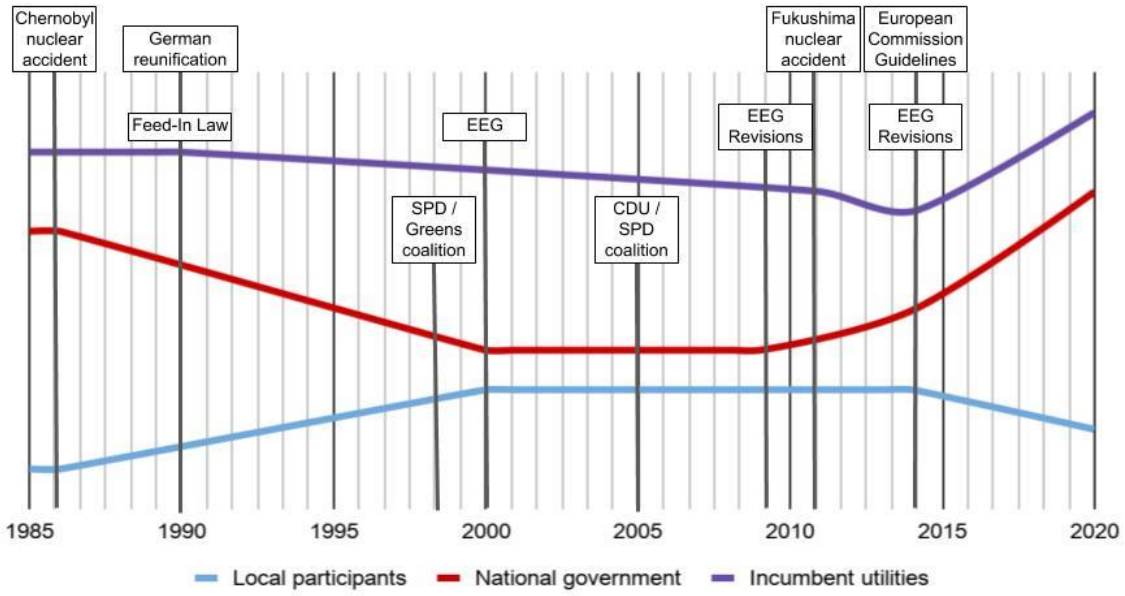

FIGURE 5. Local-National Interactions in the German Energy Transition

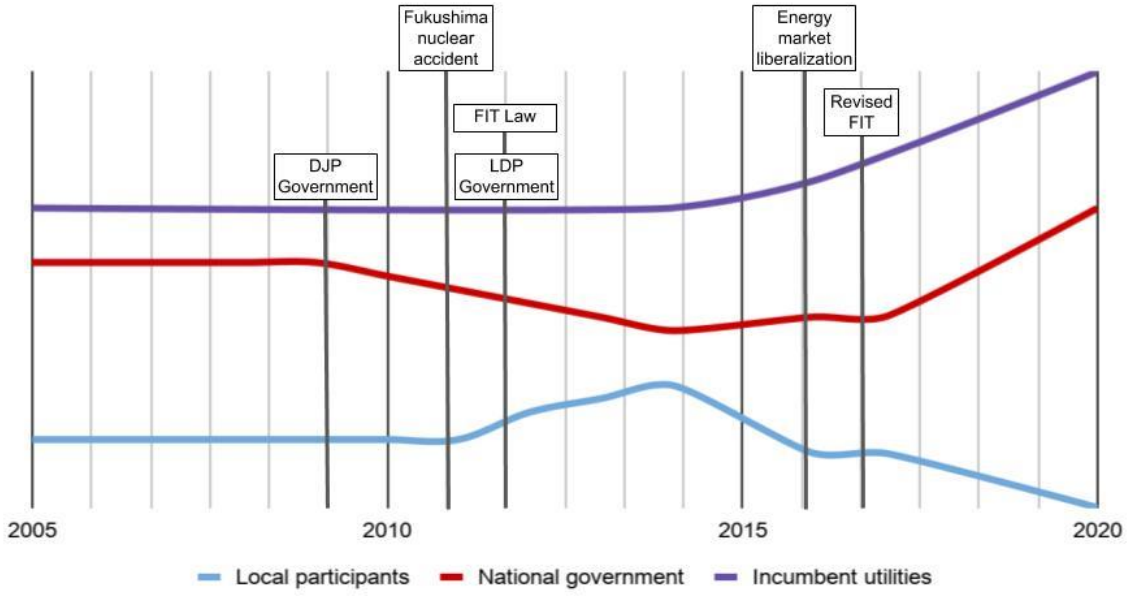

FIGURE 6. Local-National Interactions in the Japanese Energy Transition