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Article

Who Beats the Dutch Tax Department? Tracing 20 Years of Niche–Regime Interactions on Collective Solar PV Production in The Netherlands

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Abstract: In the past years, Dutch citizens have experimented with various kinds of innovations to organize the collective production of renewable energy, including shared wind power and solar PV installations. Most of these attempts failed mainly due to legal issues and tax rules. Yet, one model for solar PV on collective roofs was implemented more widely, namely the postcode rose (PCR, postcoderoos): a form of cooperative solar PV production within a set of adjacent postcode areas. Set within a broader transition perspective, this article studies the emergence and evolution of the PCR as an example of a successful social innovation in the energy transition, through an innovation biography and mapping of the evolution of the social and institutional network around the innovation. The various attempts for collective solar PV, with different degrees of success and uptake into the regime, present a key aspect of niche development, namely associational work (circulation and mobilization) focused on regime change. In conclusion, the innovation path of the PCR emphasizes the importance of the political and associational in the energy transition and in transition thinking.

Keywords: renewable energy; innovation biography; multi-level perspective; actor network theory (ANT); grassroots innovation

1. Introduction

To contribute towards the implementation of new Renewable Energy (RE) technologies, scholars have introduced the multi-level perspective (MLP) to understand the birth of new technologies and their struggle for competitiveness within established systems [1]. Within MLP, the locus of innovations is primarily situated in niches, sheltered spaces that are free of strict regulations and market forces and have room for experimentation. Niches are nurtured and expanded through interaction with the wider regime of prevalent rules, resource allocations, and practices. This paper contributes to the debate on the political nature of sustainable transitions and the possibilities for niches to increase their impact within existing regimes, to ‘roll out’ and ‘scale up’. The aim of this paper is to gain further insight into niche–regime interactions with particular attention towards the process of capacity building of niches enabling such rolling out. It does so through an analysis of 20 years of attempts by Dutch niches to make collective RE production possible. This longitudinal focus enables to draw conclusions beyond single case studies, and to see niche–regime interactions in a political rather than technological-managerial perspective [2]. Furthermore, it enables to go beyond caricatures of challenger-incumbent distinctions [3]. To do so, this paper introduces a novel understanding of sustainability innovations from relational geography and adopts the methodology of the innovation biography [4]: a mapping of the evolution of the (social) network around the innovation in its time-space dimension.

Other European countries, such as Germany, Italy [5], and Denmark [6], used a long-term Feed-in-Tariff (FIT) to promote innovative renewable technologies such as wind energy or solar PV. Despite lobbying for a FIT [7], The Netherlands used a net-metering scheme to promote small-scale RE-installations [8,9], resulting in considerably less small RE installations than the above mentioned countries [10]. Therefore, this paper zooms in onto trajectories of innovations in The Netherlands aiming for collective RE production. There have been multiple attempts by Dutch citizens to organize renewable energy production in a collective way in The Netherlands, e.g., through wind power cooperatives and solar PV on collective roofs. Most of these innovations did not materialize or grow beyond the phase of pilot projects, apart from a handful of wind cooperatives. The projects faced challenges such as financial, organizational, and [7] legal restrictions and unfavorable tax rules. From these multiple attempts, one model provided a viable option for the production of solar PV on collective roofs, namely the 'postcode rose' (PCR, postcoderoos) [8]. This form of collective RE production provides an example of an evolution from a niche to struggles with the regime, and ultimately to further developments, negotiations, and alignment that led to the adoption of an innovative model for solar PV on collective roofs into the regime. The structure of the paper is as follows. First, we elaborate our conceptual approach, based on transition theory and actor-network thinking, and our methodological approach, based on the 'innovation biography'. Then follows an in-depth discussion of the emergence and evolution of collective solar projects, culminating in the PCR. Theoretically and practically, the conclusion responds to the question of how regime change was provoked by niche developments.

2. Theory

Our theoretical approach is built around a four-step argument regarding niche–regime interaction. First, although it also embraces more technical and organizational aspects, the niche–regime interaction is inherently political. Second, niche work should be seen as primarily associational, that is, as forging relations determining positions, roles, and capacities of relevant actors. Third, this results in the ability of niche innovations to learn and travel and, forth, to create political mobilization. Through these steps, discussed consecutively below, we move our theoretical focus from transition theory to actor-network thinking.

2.1. Transformation beyond the Niche

The transformation from a fossil-fuel based energy system towards a low-carbon RE system requires a transition of technical, social, and economic systems [11]. These transitions imply a move away from incumbent energy systems towards new technologies and actors in a transformed energy system. However, new energy technologies and actors face established energy systems, which are highly efficient in economic terms, and have a high density of regulation and strong presence of vested interests, which hinder straightforward implementation of new RE technologies.

Overcoming such barriers presents a key theme in strategic niche management literature (SNM) [12]. In strategic niches, sustainability innovations are protected from regime and market forces in order to freely experiment and develop into robust and replicable models that, on rolling out, can withstand market forces. This approach rests on (1) the identification of necessary technological and institutional changes for the new technology, (2) learning about the technical, economic, and social desirability of options, (3) encouraging the further development of the new technology enabling diffusion and (4) actively building a support network. Besides their technological roles, niches should play a role in institutional adaptation [13]. Smith and Raven (2012) identify two types of niche empowerment: fit and conform, and stretch and conform. The first refers to the situation in which niches are empowered to engage with institutional adaptation without changing the basic regime structure, whereas the latter refers to empowerment also targeting regime changes. An important role is played by intermediaries in connecting to regime actors and in upscaling and diffusion of the more mature models, aimed by success factors and step-by-step plans [14,15].

Despite their institutional sensitivity, SNM has been criticized for its ‘unworldly’ perspective due to lack of political and power-laden awareness [16–18]. Behind the scholarly insights from SNM and the MLP on how niches ought to be managed and empowered, lies the mundane reality in which niche actors struggle to survive in difficult social and political environments cf. [19]. Therefore, attention has recently shifted to the political nature of transitions and the power relations involved with niche empowerment and institutional embedding cf. [17,19–23]: “The politics of grassroots innovation manifest itself through practical experimentation, learning, organizing, and mobilization that enables communities to position themselves in opposition to the unsustainable and unjust systems that to a significant extent characterize our world, and to build up their power to develop alternatives” [24].

Two political perspectives on sustainability niches stand out. The first perspective, ‘niche policy advocacy’, addresses the criticism on SNM and pays explicit attention to the political network building around niches [19]. This perspective dedicates a critical role to niche advocacy actors, who try to raise political support through forging alliances with (regime) actors. These advocacy actors are of a more intermediary nature, who try to connect niches to resources and political supporters. Yet, this poses a risk. The alignment of resources and politics may turn niche innovations more ‘mainstream’. Niche policy advocacy, accordingly, is susceptible to co-optation. Since it provides the incumbents with the full contours of change and innovation, it gives them the opportunity to attune and tame, and to make the transition as harmless for the regime as possible. ‘Niche policy advocacy’ therefore requires a certain level of shared commitment and vision at the regime level.

The second perspective pays attention to ‘critical niches’ as radical voices that challenge traditional discourses on fundamental issues of sustainability. Where SNM and advocacy perspectives ultimately deal with niches that sprout from or connect to existing knowledge and worldviews, critical niches act on a different level, speaking from a different knowledge base and worldview [25]. Their aim is not so much to ‘mainstream’ radical innovations, but to challenge dominant discourses and act as ultimate antagonists cf. [26]. Although alternative worldviews offer an endless creative and productive potential, critical niches are hardly recognized as ‘niches’ in MLP-terms. Here, the main risk is that of isolation and confinement. Ultimately, without reaching out, the transformative potential of critical niches remains unheard and untapped.

The challenge is to provide a perspective able to accommodate critical niches with advocacy capacity, avoiding the co-optation of advocacy niches and isolation of critical niche. So what should such a perspective entail? In our view, such niches can emerge through associational work along two lines. First, network building leading to effective exchange of knowledge and practices, fuelling niches with the capacity to trial, demonstrate, and roll-out change. Second, forging of relations through which, in a more ‘affective’ way, changes mind-sets and perspectives at the wider (regime) level. We consider such associational work, in a fundamental way, as constitutive of the niches, the networks it which they operate and the wider regime. Accordingly, the perspective elaborated here departs from the singular focus on empowering niches. Instead, it assumes that innovations are invented, developed, and implemented in networks of actors, conceptualized as network-based grassroots innovations (GIs) with niches as evolving sites of operation.

2.2. An Associational Approach to Transition

Conceptually, our approach builds upon insights from Actor-Network Theory (ANT) [27,28], which offers a rich vocabulary helps to observe and analyze associations and associational work. In brief, ‘associations’ emerge in three steps, namely through ‘interestment’ (creating mutual affect), ‘enrolment’ (relation building), and ‘mobilization’ (aligning of elements to make an effective network) [27,29,30]. Each successful act of association, e.g., when something new is being related to a grassroots site, alters both the site and the network. Moreover, in ANT-terms, when a network emerges, it forges new agency and establishes a single identity or ‘spokesperson’ for its network. In doing so, the network itself gets backgrounded in favor of the spokesperson representing the network. To give an example, from the moment local activities are being recognized as innovative and as a distinctive set

of practices, this translates into a representation or 'model'. This 'model', in turn, attracts the attention, pushing the network of activities from which it was created to the background.

Recent thinking along these lines has identified two basic of associational processes, one based on circulation and one based on making presences and absences [31,32]. ANT's emphasis on circulation [33,34] highlights the ways in which, through associations, innovations, ideas, and practices travel from place to place, inspiring and affecting local processes of GI development along the way. In order to travel, entities need to be scripted, that is, turned into concrete protocols, tools, and devices for action, upon which GIs draw. Scripting takes material, semantic, and semiotic forms (spec-lists, blue-prints of technological protocols, organizational models, policy documents, etc.). This presents a rich repertoire on which sites of innovation can draw, through cycles of adoption (with standard enrolment and translation), and adaptation (through negotiation and creative translation) [35]. Circulation, in this way, presents the engine of capacity building and knowledge proliferation driving transition.

Where circulation yields capacities, in an 'effective' sense, presences and absences refer more to inspiration and motivation, in an 'affective' sense [36]. Presences serve to underpin certain associational practices and strategies, while discouraging others. For GIs, on the one hand, this entails the logics and stories that frame innovations in the light of a more sustainable, well-shared and comfortable world. Regimes, on the other, manifest established patterns of presences and absences underpinning their core characteristics. There are, moreover, two kinds of absences: first, those logics and stories which are recognized, but pushed to the background and ignored, because they are not considered of significance or relevance anymore; second, logics and stories which are neglected and denied, because if they were recognized, they could not be ignored. In associational work, such 'othering' is important to keep processes manageable and practical, as well as emotional. It also, clearly, poses a major dilemma, since it makes a site blind to threats and opportunities. How to deal with presences and absences, accordingly, is key aspect of the politics of transition. In the context of associational work, such politics entails the work of 'framing', that is, in the words of Callon: "to select, to sever links and finally to make trajectories (at least temporarily) irreversible" [37].

2.3. Learning: Capacity Building in Topological Settings

In an effective sense, associational work results in a connective tissue through which knowledge, tools, and resources can be exchanged and evolve. Accordingly, learning takes place alternately or simultaneously in different spaces, constituting a 'learning network'. Circulation of innovative practices across sites in learning networks leads to mutations, intensification and hence proliferation of niche practices. Whether or not innovative practices circulate and connect somewhere else depends on wider environmental factors. Connections can only be made selectively, towards other parts of the learning network that are accessible and open to the practice. Factors such as regulation, resource allocation, communication infrastructure, education, and innovation policy, attitudes towards collaboration, risk-taking, and innovativeness all bear upon which forms of association and circulation can and do arise. This is where the regime comes in.

The circulation within learning networks, in turn, creates path dependencies, in which certain capacities stemming from innovative practice are built, nurtured and embedded, including organizational, commercial, and technological competencies. This leads to association and circulation as an evolutionary trajectory during which niche practices develop within a learning network. The result is further specialization of both practice and network, which may make it actually harder for the practice to connect with other networks. Consequently, despite the existence of many global platforms of exchange, deep learning networks often manifest marked spatial patterns, due to the many constraints faced in associational processes and capacity building to cross institutional-administrative and cultural boundaries [38]. Within these limits, what is important to recognize is how incremental learning, supported by some form of oversight, agenda-setting, and dissemination, forms a key driver through which grassroots innovations contribute to transition movements.

2.4. Political Mobilization

To impact upon concrete policy-making and regulatory regimes, political mobilization primarily plays the affective card. Following Meadowcroft's ideas on 'everyday politics', transitions require that "appeal must be made to broader coalitions for social change" [17] through associational efforts. Benefiting from their autonomous and independent position, and their capacity to create alternative learning networks and marshal public support, GIs can contribute to coalitions for, and agendas of energy transitions, both in more incremental and more radical ways [39]. The key of mobilization is thus to bring more and more agents under the spell of the transition ambitions and agenda. Mobilization prompts GIs activities to convey transition ambitions by invoking images of a better, greener, hopeful future, as 'practical anticipations of more sustainable societies' [24]. This requires, in other words, bringing certain images and stories to presence, through acts of framing and story-telling. To gain further outreach, an important strategy of attracting public support for transition is the framing and presenting of energy issues and (long-term) solutions in different forms of media [40]. Today, the media (including social-media) feature as an important arena for changing public opinion on issues like climate change and energy transition, that is, for creating wider 'interessement'. The tone exhibited toward specific initiatives and innovations in the media has an important effect on how persuasive framing is [41], for example through positive or negative tones, the representation of cause-effect relations, the perceived sense of urgency, and any possible erroneous stories. An important affective means, as will discuss further below, is the capacity to irritate established actors and powers. While persuasion paves the way for interessement, it is often irritation, also called 'perturbations' [42,43], which triggers further action. True innovations provoke reactions from regime actors and institutions: the incumbent energy system is irritated, and has to deal with this innovation. Reactions may vary from ignoring the innovation to fighting innovation, or co-opting and incorporating innovation by incumbents. In any case, there will always be a response, targeting the innovation, accommodating, or ignoring it, often prompted by the wish to protect and even better markets position for instance through merger activity.

3. Materials and Methods

3.1. Methods: The Innovation Biography

The innovation biography is a biography of a clearly labeled innovation, whose history is described on the basis of interviews with the actors involved and content analysis. According to Butzin and Widmaier "the key methodological principle [of an innovation biography] is to follow an innovation idea over time by analyzing the interactions of innovation actors and by applying an open, inductive approach to data analysis" [4]. The biography is shaped with the help of a time-space perspective and a mapping of the evolution of the (social) network around the innovation. This way, the developments of an innovation, including details of associational work, can be traced over time.

For the selection criteria of cases of innovations this research firstly mapped the grassroots sites in The Netherlands which resulted in a database of 360 initiatives for the results, see a previous work [8]. From this database, innovative initiatives were identified, which resulted in 32 initiatives. A further selection criteria was the presence of 'irritations'. One innovation with a visible history that caused irritation to the regime was the PCR, which has been subject to negotiations between community groups, the Dutch government, and the tax department during the past years. An initial trace of its history revealed more conflict and multiple different attempts to realize collective solar PV, which is why the case was adopted.

3.2. Data Collection and Analysis

The research used three strategies for data collection. Firstly, Parliamentary reports and documents which represented the reactions from the regime were analyzed (see Appendix A). Secondly, key grassroots representatives were interviewed to understand GI's associational work

(see Appendix B). Thirdly, we conducted participatory observations during events to understand the broader societal discussions around the innovations (see Appendix C). On the basis of the parliamentary reports and documents of grassroots, a reconstruction was made of the chains of events, which were discussed and corrected during the interviews with the key actors. The content analysis was based on the coding of key terms from our associational vocabulary (see Section 2).

4. Results

4.1. *The Social Innovation Question: How to Create a Feasible Business Case for Collective RE Production?*

Compared to 'grey' energy, 'green' energy is relatively expensive, as negative externalities such as contributing to climate change or air pollution are not calculated in the price of energy based on fossil fuel sources. As a consequence, RE faces difficulties in entering the energy market. Historically, collective RE production in the form of wind power was first enabled through the 1989 Electricity Act, which allowed for grid access and competitive rates [8]. Direct supply of collective RE to owners was not technically feasible, therefore, members owned shares in collective production (primarily wind turbines), and sold the electricity on the market. They had individual contracts with energy companies for their consumption, including a 'normal' tax regime imposing energy tax and VAT. When the price of (Chinese) PV roof panels dropped dramatically from the late 2000s onwards, self-supply (nontaxed) PV energy became economically viable for individual households. However, Dutch Citizen's cooperatives were also seeking to consume 'their own' produced RE directly, without interference of tax administration, as a means to make 'green' energy economically more competitive to 'grey' energy and implement collectively what was already done at household level: a form of net metering. Therefore, collective RE production can be seen as social innovation challenge pressing for institutional change [44]. Tracing back the social innovation of collective RE production, we distinguish three critical attempts to make collective RE production possible. Although other attempts exist [45,46], we illustrate these three typical niche attempts to circulate grassroots innovations and create alliances, namely on self-supply, collective supply, and virtual balancing.

4.2. *Learning: Three Attempts of Capacity Building for Collective RE Production*

De Windvogel: In 1998, Dick van Elk, founder and the then chairman of cooperative de Windvogel started the organization SGEP (Samenwerkende Groene Energie Producenten) as a way to build support to make consumption of self-supplied RE possible, but legal constraints blocked this first initiative. Years later, in 2009, de Windvogel initiated a successful pilot project on self-supply with the ENECO energy company, which ran until May 2010. This pilot project was continued in 2011 with another energy company, called ANODE, which included the energy self-supply of 200 Windvogel members. Essentially, the argument was that an owner should have the right to use electricity self-produced elsewhere, without interference of the Tax administration. Since this was compared with harvesting one's own vegetables in a community garden, this was called the 'lettuce model' ('kropje sla' model). Such framing served to inspire and motivate other actors to cooperate. Together with ANODE, the cooperative provoked a test case to see whether this was legally sound. Yet, in 2012 the Tax inspector ruled against self-supply thwarting further circulation of the innovation. De Windvogel objected at the Tax judge in The Hague, and tried to work via Parliament. However, in July 2013 the judge ruled once more in favor of the tax inspector, and the same happened when ANODE appealed. These first attempts thus demonstrated that active experimentation and strong framing were unable to counter core incumbent interests and positions.

De Ster, Nijmegen: In 2011 in Nijmegen, a local initiative started to build a collective PV installation of 259 solar panels on a roof of school building, 'De Ster'). To do so, local entrepreneur Felix Sommerdijk initiated Zonnepark Nederland, composed of the municipality and inhabitants from Lent. Besides the individual citizens from the neighborhood (Lent), the 'Zonnepark' collective was joined by the owner of the school building and the municipality of Nijmegen; it was supported by Alliander and Liander

(net operator). The project gained a lot of national attention, as it was presented as a radically new way to enable communally produced renewable energy. Because of the newness of distant net metering, it presented a pilot case to test the tax system. The risk that distant net metering would not be allowed was mentioned to interested participants, but nobody assumed that the tax department would not grant an exception. The project received broad political support, including from the Ministry of Economic Affairs. On 23 August 2012 was the big launch of the solar park, together with national MP Jolande Sap, and after production of PV had started, the tax department finally had to respond. To everyone's surprise, the tax department did not allow the virtual net metering by participants that would enable them to deduct the electricity from their private consumption and make a profit on their investment. This caused the initiative to fail. However, the individual members were saved from a financial loss by the municipality of Nijmegen, which bought all the PV panels from the individual citizens and now privately owns the installation. The case taught a costly lesson to Nijmegen municipality: even for technically, economically, and socially desirable projects, one cannot count on actors or rules of the regime to change in order to accommodate the innovation.

Net metering, Amsterdam: 2011 marked the next conscious attempt from a collective PV project to provoke a regime reaction. Despite knowing the limitations for virtual metering in the Energy Act, the municipality of Amsterdam announced to start with a program for Owners Associations to collectively produce electricity. The municipality presented this initiative as a chance to produce PV energy on the abundant flat rooftops of the city, as this was currently impossible due to metering regulations. In the spring of 2012, three pilot projects (de Vrolijke Eik II, Nieuwe Kerkstraat, and Renswouderstraat) started to test 'virtual net metering' (virtueel salderen) to make collective RE production financially feasible. As energy tax benefits were possible for individual home owners ('behind' the meter), but not for Owners Associations owning the rooftop ('before' the meter), a smart combination of the individual meters and collective rooftop was constructed. The collectively produced electricity was to be deducted from the energy bills of each participant, each receiving a virtual share of the electricity that matched the size of their investment. As most roofs in Amsterdam are collectively owned, the municipality viewed this construction as a means to reach their municipal PV production targets. Capacity building was established through participation of energy company NUON and grid operator Liander, and the solar panels were installed by Zonnestroom in September 2012. However, like before, the initiators anticipated leniency from the Ministry of Economic Affairs and the tax department, but this did not come forward, and the pilot project was not continued after 2012 [45].

Now that provoking the system through presenting it with near-finished projects had not worked, initiators resorted to lobbying for changes in regulation and taxation laws. They started seeking support through further enrolling municipalities and network operators. Two of these attempts were specifically set up to challenge the tax system. However, the Tax department of the central government refused to engage in further debate, referring to the Electricity Act that prohibits any net metering 'before the meter'. Further legal explorations and cases made clear that the current laws around tax and duties proved hard to change.

4.3. Responses from the (Tax) Regime: Present Absences and Othering

Lobbying continued with mobilizing two Members of Parliament (MP), Diederik Samsom of the social democrats (PVDA), and Paulus Jansen from the socialist party (SP) who made four attempts for regime change. Firstly, in November 2008, MP Samsom requested an inquiry into the possibilities of self-supply, presented and framed as the 'Lettuce model', which was endorsed by parliament [47]. The then Minister of Economic Affairs, Maria van der Hoeven, however, was reluctant to follow up the ideas [48]. Presenting a good example of constructing 'present absences', she side-lined the arguments and proposed other means to increase local support for wind energy projects. Secondly, in June 2011 Samsom made another attempt by benefiting from the Emergency Investment Act ('Crisis-en Herstelwet') which had been issued to abate the impact to the global economic crisis. He proposed a legal solution enabling collective production of electricity for members of cooperatives. Once more,

he failed to muster support from but the Minister and Parliament [49]. Thirdly, Jansen then tried the same by requesting the Cabinet to change law and policy via a parliamentary resolution [50]. However, this was not carried out by Cabinet. Finally, in December 2011, MPs Samsom and Jansen posed a motion on self-sufficiency (*zelflevering*), but a small majority rejected the amendment [51]. It appeared that despite large political support for visible pilot projects, the more abstract notion of virtual net metering did not yield the political consensus to install more favorable tax rules.

In the end, the four attempts did not change the energy and tax regime. Yet, it made clear that all the 'irritation' had produced political support for facilitation collective RE production, albeit not via the Lettuce-model or self-sufficiency model. The Cabinet and their coalition parties feared that such tax exemptions would be too costly for the treasury. Yet the idea of making serious changes in energy supply and distribution remained; there was no 'othering'. This became manifest when, at the fall of the Cabinet on 23 April 2012, the Parliament agreed on the so-called Spring Agreement (*Lenteakkoord*; 26 April 2012). This budget agreement introduced a subsidy on PV installations for individual households and promised research to test the feasibility of collective net metering [52].

4.4. Capacity Building: The Introduction of the Postcode Rose as a Model for Collective RE Production

After the Parliamentary elections of 12 September 2012, in their coalition agreement, the new Cabinet presented the idea of an Energy tax discount for cooperatives producing their own local energy [53]. MP Samsom, whose party PVDA moved from opposition to cabinet, and who coauthored the coalition agreement, played a major role in this. According to the vision of the Cabinet, citizens appreciate the possibility to produce their own RE [54]. Subsequently, the idea was copied literally into the Energy Agreement of 2013 [55]. The Energy Agreement was signed by a broad coalition of societal organizations, including business organizations and environmental organizations, and was supported by government, and consequently created a larger network for the elaboration of the Energy tax discount. Pushing for innovative institutional adaptation, the agreement introduced the Postcode Rose (PCR), which demarcated the geographical range of citizens who could join a collective RE project. It stipulated that citizens participating in energy cooperatives or Homeowner Associations could enjoy an Energy tax discount of € 7.5 ct/kWh excl. VAT, provided that the collective production facility is situated within their own or adjacent postal codes (hence the 'rose'). This energy tax was originally an environmental taxation scheme (Regulating Energy Tax; REB), installed in 1996, as a kind of CO₂ taxation, but was never presented as such. In 2004 the REB was transformed into an the Energy Tax, as part of the general environmental taxation scheme [56]. A large network of cooperatives and other stakeholders was created through the Energy Agreement, which enabled the circulation of the new ideas and measures.

From 2014 onwards, two energy umbrella organizations, 'ODEdecentraal' and 'HIER opgewekt' started to systematically collect knowledge on the PCR, what it entailed, how it could work and how to implement it. This led to a codified model, which had some general characteristics, but also allowed for major variations to accommodate different local settings and conditions (e.g., support from local and regional government, businesses, etc.). These lessons and further discussions resulted in two major calls. First, the need arose for a long period (ten years) of tax certainty, to secure the investments made by the energy cooperatives [57]. Second, it was recognized that local energy had the potential to contribute to the goals of the national energy policy, and could be a source of innovation and 'energy-consciousness'. Consequently, citizens participating in collective production of RE would be rewarded with net metering and PCR tax discount [54]. With the inclusion of these two amendments, the PCR was adopted and formalized in the national Tax Plan of 2014.

For energy cooperatives, however, the amendments turned out to be insufficient in practice to enable sustainable business models, for several reasons. They started to express their concerns about feasibility almost immediately after the approval of the Tax plan [58]: the local business case for a PCR was too thin due to continuing high levels of VAT, the window for tax certainty (calling for 15 years), the narrow spatial demarcation (calling for municipal borders instead of postcode

zones). Additional issues were that the technical requirement for suppliers to build a second grid connection proved rather costly, and that only private households could participate, excluding entrepreneurs and self-employed businesses. The concerns were confirmed through the research of a consultancy firm Atrivé [59]. The initial response from the Cabinet was to moot these concerns. In effect, rather than prioritizing small, local projects the Cabinet continued to express a preference for large scale, centralized, and commercially oriented approaches to meeting national RE targets. However, due to mounting 'irritation', this position could not be held for long.

4.5. Mobilization through Associations and Framing of the PCR

In 2014, the chairmen of the cooperative 'Morgen Groene Energie' (MGE) and the umbrella organization ODEdecentraal entered into negotiations with the Ministries of Economic Affairs and Finance (including the Tax Administration) to improve PCR's feasibility. The negotiations centered on PCR's feasibility as initially calculated for the Energy Agreement, questioning the assumptions underpinning the costs of a PCR business used by the government. The employees of the Ministry of Economic Affairs were very cooperative, as it was their Minister who signed the Energy Agreement. The Minister himself also repeatedly stressed that this regulation had to become a success and that he was dedicated to make this happen in practice [60]. Therefore, the negotiations focused on the exact PCR rules, regulations, and ways of implementing, in a coordinated manner that was workable for the Tax Administration. In the end, the Cabinet largely acknowledged the grassroots' implementation model and business calculations of the PCR, but refused to act on it, to the great frustration of the representatives of the community energy movement.

Alongside the negotiations, the energy cooperatives informed MPs about their concerns [61] resulting in various solutions. The costs for the second grid connection were resolved. Entrepreneurs were allowed to join and the tax certainty period was raised to 15 years [60,62]. The biggest issue remained the VAT, the sole responsibility of the Tax administration, which put grassroots initiatives at a competitive disadvantage. To improve the business case of the PCR, the network of the grassroots needed to be enlarged. Both chairmen of MGE and ODEdecentraal were well connected with several parties within Parliament, and consequently, they knew that there was a majority in Parliament in favor of further improvements to the PCR. However, the Departments of Economic Affairs and Finance had already taken action to improve the regulations of the PCR, so MPs saw no political need for further action.

To push the MPs and ministers of Economic Affairs and Finance to improve the feasibility of the PCR, MGE and ODEdecentraal further broadcasted their version and calculations of the PCR. To this end, they used the media attention given by the TV show 'EenVandaag' (25 October 2014). They also mobilized their contacts at the standing committee of the national Socio-Economic Council (SER). The committee is charged with safeguarding the Energy Agreement of 2013, and has a directly influence on the Minister of Economic Affairs. The two chairmen also continued negotiating with employees of the Departments of Economics and Finance/Tax Administration [63], through the exchange and discussions of spreadsheets detailing the business case of the PCR. The calculations were put online and debated with the wider community of energy cooperatives, also via blogs [64] and the website of umbrella organization HIER Opgewekt.

Bringing the business case to presence this way finally proved successful. In September 2015, Ed. Nijpels, director of the SER standing committee negotiated with the Cabinet for a tax benefit of 9 ct/kwh, which consequently became effective in 2016. Subsequently, an amendment on the 2016 Tax plan by Schouten, Grashoff, and Van Weyenberg (17 November 2015) proposed to exempt PCR projects from tax, which was adopted by parliament. This was done in tandem with raising the energy tax on gas, in order to compensate the Treasury for the loss in tax. In addition, this amendment adopted the possibility of locating the production installation not only in the center of the PCR, but also in one of the 'leaves' of the PCR [65]. This extension (also characterized as the 'postal code caterpillar',

postcoderups), meant that although the local focus is maintained, projects got more freedom to expand the area in which the project is offered to participants.

While conditions have substantially improved, PCR's time frame is still limited. So far, the PCR model has gained in popularity, with 63 new PCR projects in 2017. However, the subsequent rise in the costs of the model have been cause for concern of the Department of Economic Affairs. The 2018 Climate Agreement foresees the termination of the PCR by 2020, after which cooperatives have to resort to the basic RE subsidy (SDE+) for large solar projects, which has a capped annual budget and thus a limited number of approved applications per year. What scope there will be for grassroots innovations either private households or local collectives remains to be seen.

5. Conclusions and Discussion

Who was able to beat the Dutch Tax Department? Our initial question receives a clear answer from our case: nobody did! Not even the Department of Economic Affairs could resolve the VAT issue to create a feasible business case or grant exceptions for the early pilot projects whose ideas they supported. Although both Ministries partook in the PCR negotiations, neither of the two Ministries wanted to bear the financial brunt. The Schouten tax reduction amendment only worked out because it was compensated by increasing the energy tax.

This case illustrates the political and power-laden nature of sustainability transitions, going beyond the focus on organizational and technological challenges for niche growth and upscaling. Following an associational approach, examining processes of learning, framing, and mobilization, we have traced the way PCR, as an alternative model, has made its way through political circuits. During almost twenty years, various innovations were launched that would make it feasible to collectively produce RE, from self-supply to virtual balancing, but they were all blocked by the regime. Regime rules were clear: self-supply and the lettuce-model were not legal. They were side-lined, and even 'othered'. In response, grassroots networks caused 'irritation', through provoking reactions from the Tax Department, tax judges, and other regime actors. The result was that, in 2012, the policy statement of the incoming government provided scope within the energy regime for grassroots actors [53]. In a path dependent way, the PCR model was developed during further negotiations leading up to signing the Energy Agreement [55]. Yet this path also produced rigidity. The Cabinet feared that changing parts of the Energy Agreement would open the door for other actors demanding similar changes, and eventually the breakdown of the complete agreement or overburdening government budget. They thus blocked further change and limited the time frame in which grassroots innovations can foster in order to keep the RE budget manageable.

This development demonstrates the two sides of associational work. On the one hand, there is the effective grasping and circulation of technical knowledge (including business models), resulting in capacity building and the mobilization of stakeholders to induce change. On the other, our case demonstrates the significance of acts of framing, through which issues and concerns are selectively brought to presence, and through which support and clout emerged by forging alliances with natural allies. In addition, by constantly reframing the issue, also through extending the network with media partners, MPs and the SER standing committee, cabinet needed to take a stance as well. Continual irritation played a vital role.

Concerning the concept of regime, our emphasis on associational work calls for a more nuanced view towards the niche–regime distinction. Within the regime, we have witnessed clear differences in way actors cooperate with grassroots innovations. Because the minister of Economic Affairs committed himself to the PCR by signing the Energy Agreement, his ministry was dedicated towards accommodating the PCR, while the Ministry of Finance only feared negative financial impact and resisted. We also noted how MPs and other regime actors actively engage with niches. Our case show that these positions are not straightforward and should not be treated too simplistically [23].

In addition, our associational approach enables a perspective upon social innovation as evolution of models with alternating 'parents'. Although the forms, labels and actors were different during

the two decades of evolution, an innovative model developed, which was in alignment with several actor-networks. This was enabled by a process of learning, through mobilizing other actors for support and framing the model in the media or via MPs. In this context, the chairs of MGE and ODEdecentraal can be seen as ‘pragmatic system builders’ [23], connecting with MPs and engaging with the ‘everyday politics’ of sustainability transitions cf. [17]. Consequently, in terms of transition thinking, no hard distinctions between fit and conform or stretch and conform could be drawn cf. [19].

Although these pragmatic system builders engage with regime actors to improve the rules of the game, the energy game is still tailored to a centralized energy system [6], which is reflected in the way the Energy Tax is shaped. If the system is to be changed towards a decentralized energy system, connections with critical niches are necessary. The question is how to connect to critical niches without having them losing their critical edge [3]. We think that our associational approach could contribute in connecting radical niches to intermediaries.

On a more applied level, the use of innovation biography raises questions about the room for innovation and learning in the RE sector. Decentral renewable energy production is a topic that becomes increasingly urgent and politically recognized, but the balance between openness to innovation and budget keeping has consistently favored larger scale RE production and capped budgets. The reluctance to really transform energy tax and financing thwarts organizational and financial innovations such as the PCR, leaving a lot of potential RE production and local involvement and support for the energy transition untapped. In attempting to change the status quo, bringing successful pilot projects to presence does not seem to yield much result. Yet, the visibility of upscaling failures helped to strengthen the ongoing lobby that initiators maintained for years. For the moment, incremental changes such as the adaptations to the original PCR model appear more feasible but do not guarantee the embedment of the innovation into the regime. Hopefully, if the PCR is abandoned shortly, this lobby will provoke change going beyond the current traditional subsidy system.

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Appendix A. Parliamentary Reports and Documents Analysed

- E-Decentraal, Duurzame Energie Koepel. (2014). Notitie decentrale duurzame energie–Verbeterpunten bij uitvoering Energieakkoord. Utrecht: ODE decentraal.
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Appendix B. Interviews

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Appendix C. Participatory Observations during the Following Events:

- HIER opgewekt discussion meeting with Simon Visbeek (Ús Koöperaasje) and Marieke Wiersma (Grunneger Power). The Hague. 18 November 2016.

- Sustainable Energy Tour Gelderland. 7 October 2016.
- Gelderland Energy Agreement annual conference. Duiven. 17 March 2016.
- Monthly participatory observations during board meetings of ODE umbrella organization 2014–2015 as secretary of the board.

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