# Interaction between energy incumbents and solar entrants: Relationship status complicated

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#### Abstract

The literature on niche-regime interaction in sustainability transitions generally presumes a mode of conflict between niche and regime actors. However, this perspective fails to describe and explain collaboration between such actors. This paper sheds further light on the interaction between niche and regime actors through a multiple case study of six business relationships between solar firms and municipal electric utilities in Sweden, focusing on activity links, resource ties and actor bonds. We find that these relationships initially created mutual benefits, combining the utilities' brand and sales channels with the solar firms' technology competence. Most collaborations later turned into conflict due to the solar firms' strengthened network positions and the clash between their private sector logic and the utilities' public sector logic. The study shows that niche-regime interactions are dependent on organizational goals, strategies, and values and that relationships between actors are key to understanding micro-level transition processes.

Keywords: Transitions, niche, regime, solar PV, collaboration, organizations

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- 25 activity links, resource ties and actor bonds. We find that these relationships initially created
- 26 mutual benefits, combining the utilities' brand and sales channels with the solar firms'
- 27 technology competence. Most collaborations later turned into conflict due to the solar firms'
- 28 strengthened network positions and the clash between their private sector logic and the
- 29 utilities' public sector logic. The study shows that niche-regime interactions are dependent on
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#### 34 **1. Introduction**

- "We have been working with solar for quite many years, I think already in 2011
  we started a project which was, here in Sweden, really early. But we wanted to
  try solar. So we did sort of a pilot test and we had a partnership with a solar
- 38 company who sells solar plants. The goal was to have 100 customers who
  39 wanted to produce solar electricity, and that was really popular ..." (Municipal
  40 Electric Utility in Sweden)
- 41 The quote above takes us right into the initial period of collaboration between Swedish
- 42 municipal electric utilities and solar firms, running pilot projects for selling solar photovoltaic
- 43 (PV) turnkey systems. The dynamics of this collaboration is the empirical focus of this paper.
- 44 In the past two decades, the market price of solar modules and systems has decreased
- 45 substantially worldwide (Goodstein and Lovins, 2019; Horváth and Szabó, 2018) and solar
- 46 PV technology has been made available to new markets (Strupeit and Palm, 2016). This
- 47 includes Sweden, where the residential market for turnkey systems has expanded rapidly in
- 48 the last decade (Lindahl et al., 2021). This implies increasing decentralization of the energy
- 49 system as well as intensified competition in the electricity market (albeit still at a small
- 50 scale), as consumers start to micro produce their own electricity and, consequently, start to
- 51 compete with established energy companies. In Sweden and elsewhere, solar PV has also
- 52 become an attractive market for new entrants into the energy system (Dewald and Truffer,
- 2012; Yang et al., 2021). Specialized solar installation firms provide turnkey systems and
   other types of solar-related goods and services to residential and business customers, thereby
- 54 other types of solar-related goods and services to residential and business customers, thereby
- 55 enabling solar PV diffusion and increased prosumption (Aspeteg and Bergek, 2020; Aspeteg
- 56 and Mignon, 2019; Fabrizio and Hawn, 2013; Palm, 2015, Palm, 2018).
- 57 At a first glance, this seems to be a rather traditional story of a sociotechnical transition, as
- 58 conceptualized in the multi-level perspective (MLP) and described in numerous empirical
- 59 case studies. An emerging niche innovation develops and following processes of internal
- 60 learning and accumulation as well as regime destabilization starts to challenge the
- 61 sociotechnical regime, which eventually leads to a reconfiguration of established
- 62 sociotechnical systems, actor networks (in particular the relative position of energy
- 63 incumbents vis-á-vis new entrants), and institutions (Geels et al., 2017). In essence, this is a
- 64 story about niche-regime interaction. Indeed, as described by Geels et al. (2017, p. 465)
- 65 "the MLP argues that socio-technical transitions involve interactions between the
  66 incumbent regime, radical 'niche innovations,' and the 'socio-technical landscape.' ...
  67 [Its] key claim is that transitions come about through the alignment of processes within
  68 and between the three levels ... Hence, to fully explain transitions it is necessary to
  69 identify these processes and the complex interactions between them ...".
- 70 While it has been acknowledged repeatedly that our understanding of niche-regime
- 71 interaction is limited (cf. Bui et al., 2016; Diaz et al., 2013; Elzen et al., 2012; Ingram, 2015),
- 72 this line of thought has been further developed by several authors in order to explain how
- 73 niche innovations become linked or anchored to regimes (e.g. Elzen et al., 2012; Smith and

- Raven, 2012) and how incumbents respond to the threat of such emerging niche innovations
- 75 (Smink et al., 2015a; Späth et al., 2016; Turnheim and Sovacool, 2020).
- 76 However, at closer scrutiny the empirical case of solar PV in Sweden differs from the
- standard MLP story. Indeed, in the Swedish solar PV case incumbent energy companies are
- very much involved in the downstream development and scaling up of the emerging niche
- 79 innovation and have, in fact, been collaborating with new entrant solar firms to develop the
- turnkey solar business model for almost a decade (Lindahl et al., 2021; Wadin et al., 2017).
- 81 Similar collaborative patterns have also been observed, for instance, in Finland, both for solar
- 82 PV and other energy-related technologies (Apajalahti et al., 2018; Heiskanen et al., 2018;
- 83 Kangas et al., 2021; Ruggiero et al., 2021).
- 84 In light of this, current conceptualizations and studies of niche-regime interactions seem to
- 85 suffer from three main shortcomings. First, previous literature suffers from an *asymmetrical*
- 86 *treatment of niches and regimes*, as most of the reviewed literature focuses on how either
- 87 niches or regimes influence the other (Mylan et al., 2019). For example, some studies
- 88 investigate how niches build links with regimes (Bui et al., 2016; Diaz et al., 2013; Ingram,
- 89 2015) or manage tensions with incumbents (Kangas et al., 2021), while other studies show
- 90 how regime actors try to block or reframe niches to suit their own interests (Smink et al.,
- 91 2015a; Späth et al., 2016). There is, thus, a need to study niche-regime interaction as a bi-
- 92 directional process (Mylan et al., 2019; Yang et al., 2021). Second, there is a *confrontation*
- *bias* in that the literature focuses on conflicts between niche innovations and regimes, often
- 94 concretized as competitive tensions between new entrants (that build niches) and incumbent
- actors (that resist change) (e.g., Hess, 2016; Pekkarinen and Melkas, 2019; Smink et al.,
  2015a, 2015b). However, the balance between cooperation and competition can vary between
- 2015a, 2015b). However, the balance between cooperation and competition can vary between
   cases (Kangas et al., 2021). In cases such as ours which is characterized by a high degree of
- 98 collaboration a one-sided focus on competition and conflict is clearly insufficient. Third,
- 99 there is a *lack of attention to the business side* of niche-regime interaction. Indeed, even
- 100 though both incumbents and new entrants tend to be "firms-in-industries" (cf. Geels, 2014),
- 101 much of the literature focuses primarily on their institutional or political strategies (Bui et al.,
- 102 2016; Geels, 2006a; Hess, 2016; Smink et al., 2015a; Yang et al., 2021) or clashes between
- 103 different institutional logics (Smink et al., 2015b). In our case, this becomes especially
- 104 problematic, as the collaboration in focus concerns the development of a joint business
- 105 model.
- 106 Taken together, these shortcomings indicate that an approach that focuses on reciprocal,
- 107 business-related collaboration between incumbents and new entrants would further our
- 108 understanding of niche-regime interaction. In our view, this requires a micro-level analysis,
- 109 which can capture actor-level heterogeneity within both niches and regimes (cf. Laakso et al.,
- 110 2021; Yang et al., 2021) as well as the "messy dynamics" that characterize collaboration in
- 111 actor networks (Ingram, 2015; see also Diaz et al., 2013). In line with this, the purpose of this
- 112 paper is to advance the understanding of the substance and evolution of business relationships
- 113 between incumbents and new entrants over time.

- 114 In order to achieve this purpose, we use an analytical framework from the field of industrial
- 115 marketing and purchasing, developed specifically to study business relationships between
- 116 industrial firms at the actor network level: the Activities, Resources, and Actor bonds (ARA)
- 117 framework (Håkansson and Johanson, 1992; Håkansson and Snehota, 1995). We apply this
- 118 framework in a multiple case study of relationships between municipal energy incumbents
- and new entrant solar firms. We analyse how these relationships change over time and
- 120 contribute to the field of transition studies by showing that (1) collaboration and conflict in
- relationships between niche actors and regime actors can co-exist, (2) the resulting
- 122 interactions are dependent on the goals, strategies, and values of the involved niche and
- regime actors, and (3) the relationships between actors are key to understanding micro-level
- 124 transitions processes such as niche-regime linkages.

#### 125 **2.** Analytical framework

126 As conceptualized in the industrial marketing and purchasing literature, business

- 127 relationships result from continued "mutually oriented interaction between two reciprocally
- 128 committed parties" (Håkansson and Snehota, 1995, p. 25). A core assumption is that the
- 129 collaboration creates value which neither of the firms could achieve in isolation. While this
- 130 definition focuses on "dyads" of two actors, the interactions in such relationships are also
- 131 dependent on the microstructure surrounding the dyad (Madhavan et al., 2004) and the larger
- 132 networks in which the two parties are embedded (Ford et al., 2010). In the example of service
- 133 delivery, such as the sales of PV turnkey systems, the dyad is embedded in a "triadic" context
- 134 with customers (Vedel et al., 2016), as well as a surrounding network consisting of
- 135 equipment manufacturers and other partner firms. Changes in relationships with one business
- 136 partner can, therefore, have a significant impact on other partner relationships (Håkansson
- 137 and Snehota 2017).
- 138 In order to understand business relationships, their substance should be studied in three
- 139 layers: activity links, resource ties and actor bonds (in short: ARA) (Håkansson and
- 140 Johanson, 1992; Håkansson and Snehota, 1995). In analysing how the three ARA layers
- 141 contribute to value, or mutual benefits, in business relationships, it is relevant to focus on the
- 142 *connections*, i.e. the links, ties and bonds, rather than the activities, resources and actors in
- 143 themselves. Table 1 summarizes examples of links, ties and bonds, which will be described in
- 144 the following.
- 145 In the first layer, technical, administrative, commercial or other *activities* in both firms are
- 146 linked and coordinated with each other (Ford et al., 2010; Håkansson and Snehota, 1995).
- 147 Examples include quality control and product development (Baraldi et al., 2014), as well as
- 148 the coordination of goods, location, pick-up and delivery times (Andersson et al., 2019). This
- 149 layer is the most straight-forward to observe and illustrate as it usually describes the division
- 150 of labour or the 'who does what' in a collaboration (Håkansson and Snehota, 2017). Potential
- 151 conflicts can emerge from power asymmetries, control and coordination (Li and Choi, 2009;
- 152 Nätti et al., 2014; Vlachos and Dyra, 2020). In this regard, the literature on niche-regime
- 153 interaction highlights adaptations of value chains and organisational models (Elzen et al.,

- 154 2012; Pekkarinen and Melkas, 2019), shifting actor roles (Bui et al., 2016), changing
- 155 interactions within networks (e.g. intensified exchanges or new forms of coordination) (Bui et
- al., 2016; Elzen et al., 2012), and joint experimentation (Späth et al., 2016; Wadin et al.,
- 157 2017).

158 In the second layer, *resources* create ties as two parties adapt their resources to one another, 159 and interdependencies emerge. As firms can hold a competitive advantage due to, for

160 instance, rare or valuable resources (Barney, 1991), collaboration can facilitate access to

- 161 other firms' resources (Sundquist and Melander, 2021) and, ultimately, lead to innovation
- 162 (Adner and Kapoor, 2010; Laage-Hellman et al., 2021; Palo and Tähtinen, 2013). Resources
- 163 can be tangible, such as production facilities and equipment, as well as intangible, such as
- 164 knowledge (Ford et al., 2010; Håkansson and Snehota, 1995). Studies of resource ties
- 165 investigate, for instance, material flows (Andersson et al., 2019; Finch et al., 2010), IT
- 166 systems and interfaces (Andersson et al., 2019), and knowledge transfer and learning (Yang
- 167 et al., 2011). The literature on sustainability transitions emphasizes how incumbent actors
- 168 tend to have large and diverse sets of resources that can be applied to forming and
- 169 accelerating niches (e.g. production capacity, customer bases, and legitimacy) (Bui et al.,
- 170 2016; Kangas et al., 2021; Turnheim and Sovacool, 2020; Wadin et al., 2017), which can
- 171 complement (or exploit) the technical knowledge and innovation capabilities held by niche
- 172 actors (Kangas et al., 2021; Wadin et al., 2017).

In the third layer, actors in both firms connect and form bonds and become committed to the 173 174 relationship as they develop mutual goals and agendas (Ford et al., 2010; Håkansson and 175 Snehota, 1995). Actor bonds are, thus, about the human aspect of the business relationship (Finch et al., 2010). For instance, the communication at a first meeting, sharing common 176 177 values and 'getting along with each other' can determine the future of an entire business 178 relationship (Escher and Brzustewicz, 2020). They are therefore probably the most difficult 179 layer to grasp. Conceptualizations of actor bonds often focus on trust, which includes both the individual and firm-level (Arvidsson and Melander, 2020). While interpersonal trust includes 180 factors such as the competence, credibility, knowledge, willingness and honesty of the 181 182 individual, (inter-)organizational trust involves the stability of the firm, their past experience 183 and performance, the technology they use, contractual integrity as well as the alignment of goals and values (Arvidsson and Melander, 2020). While some authors consider 184 185 formalization of agreements (legally and organizationally) as a success factor of business relationships (Laage-Hellman et al., 2021), the original ARA considers it a lack of sufficient 186 trust between the two parties (Håkansson and Snehota, 1995). A failure of sustaining actor 187 188 bonds can lead to information asymmetries, opportunism, and goal (in)congruence (Hartmann and Herb, 2014; van der Valk and Van Iwaarden, 2011). Niche-regime interaction can be 189 190 especially challenging in this regard, as niche and regime actors do not always share the same

- 191 culture, beliefs, visions, or institutional logics and therefore can find it difficult to link up to 192 each other (Ingram, 2015; Pekkarinen and Melkas, 2019; Smink et al., 2015a).
- 193

194	Table 1. ARA	layers with a	associated	categories	and example	ès
		2		<u> </u>	1	

ARA	Categories	Examples	Niche-regime interaction in transitions
Activity links	Technical, administrative, commercial, and other	<ul> <li>Coordination and control of activities</li> <li>Division of labour between partners</li> </ul>	<ul> <li>Adaptations of value chains and organisational models</li> <li>Shifting actor roles</li> <li>Changing interactions within networks</li> <li>Joint experimentation</li> </ul>
Resource ties	Tangible and intangible resources	<ul> <li>Material flows</li> <li>Interfaces enabling resource sharing</li> <li>Learning and knowledge exchange</li> </ul>	<ul> <li>Potential acceleration (or exploitation) of niches through incumbent resources</li> </ul>
Actor bonds	Trust at interpersonal and (inter)- organizational level	<ul> <li>Competence, knowledge, honesty and commitment between individuals</li> <li>Stability, performance, contractual integrity and alignment of goals and agendas</li> </ul>	<ul> <li>Mismatch of culture, beliefs, visions or institutional logics between niche and regime actors</li> </ul>

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196 Figure 1 illustrates the interdependence between the three layers, with examples of how the

- 197 layers relate to one another. Consequently, the three layers should not be interpreted in
- 198 isolation. Any analysis of business relationships should, therefore, incorporate cross-cutting
- themes.



200 201

Figure 1: Interdependencies between layers of ARA framework (based on Håkansson and Snehota (1995, p. 35))

# 202 3. Methodology

The idea for this study was sparked by electric utilities taking over some of the activities and responsibilities that previously had been held by solar firms as the main coordinators in the

- solar PV turnkey systems business model. This model includes the value proposition of
- 206 providing residential and business customers with hassle-free configuration, installation, and
- 207 maintenance of a complete and operational solar PV system (Aspeteg and Bergek, 2020;
- Aspeteg and Mignon, 2019). It seemed counter-intuitive to share profit margins with an
- additional actor (the electric utilities) for an already well-functioning business model and we
- 210 therefore became interested in studying this relationship further.

#### 211 **3.1** Study design and case selection

- 212 Since the research was of an exploratory character, we chose a case study approach as our
- study design. Case studies involve examining a small number of instances of a particular
- 214 phenomenon under investigation, about which rich empirical descriptions are formulated
- based on multiple data sources (Easton, 2010; Eisenhardt and Graebner, 2007). They are
  suitable for studies exploring broad research questions, when it is important to understand
- 216 suitable for studies exploring broad research questions, when it is important to understand
- 217 "the rich, real-world context in which the phenomena occur" (Eisenhardt and Graebner,218 2007). They are also the main method of choice in previous research of industrial networks,
- as they "resonate well with interactions and relationships as basic units of analysis" (Dubois
- as they resonate wen with interactions and relationships as basic units of analysis (Dubois and Araujo, 2005, p. 210). In order to be able to understand our focal phenomenon better, we
- decided to do a comparative study of several cases, highlighting both similarities and
- 222 differences between them.
- 223 When studying industrial networks, case definition and delineation is most often not
- straightforward, as such networks do not have any "natural" or clear boundaries that can be
- defined beforehand (Dubois and Araujo, 2005). Case boundaries are therefore often redefined
- 226 during the research process in an interplay between theory and insights from empirical
- studies. In our case, we defined the cases in terms of dyadic relationships between one
- 228 electric utility and one solar installation firm.
- 229 Our case selection was made in two steps. As a basis for identifying the cases, we first started
- 230 by mapping all electric utilities selling PV turnkey systems in Sweden (42 companies in
- total). This list was compiled for this study based on pre-interviews and information from
- 232 company websites. Among these, we chose to focus on municipal energy companies, since
- they have a special position in the Swedish energy system. On the one hand, they are highly
- established actors that in most cases have existed for over a century (Högselius and Kaijser,
- 235 2010). In that, they epitomize the concept of 'incumbents' (Altunay et al., 2021). On the other
- hand, they are an important instrument for the municipalities' strive to achieve their
- 237 sustainability goals (Gustafsson and Mignon, 2020) and can, therefore, be seen as the
- 238 'extended arm' of local policymakers in driving the energy transition forward. This is also
- one reason why they have started to offer solar turnkey systems and engage with other solar
- 240 business models (Altunay et al., 2021).
- 241 Second, we collected more detailed information of the municipal energy companies'
- 242 involvement in the solar turnkey model and their partners and identified a number of
- 243 interesting cases based on a combination of criteria: (a) the selected companies had to have a
- 244 more active role than just forwarding 'leads' from the customer to an installation firm; (b) the

- 245 cases should include solar firms active on different geographical scales; and (c) the cases
- should include electric utilities that worked with more than one installer as well as installers
- that worked with several utilities. Even though the cases were not theoretically sampled in the
- strict sense (cf. e.g. Eisenhardt and Graebner, 2007), this helped us select a varied enough set
- of cases to provide interesting patterns that could shed light on the interactions between these
- actors. The final case selection consisted of six dyadic relationships between four municipal
- 251 electric utilities and three solar firms, where most firms have multiple relationship
- connections as shown in Figure 2. The case firms were anonymized and are referred to, for
- example, as "Electric Utility A" and "Solar East". The case selection was also limited by the
- willingness of both parts of the business relationship to participate in the study.



255 Figure 2: Dyads of solar firms and electric utilities in this study

#### 256 **3.2** Data collection and analysis

While some case study researchers advocate starting with theoretically derived hypotheses or propositions (see, e.g., Yin, 1984), others are purely inductive and empirically "grounded" (cf., e.g., Glaser and Strauss, 1967). We adopted an abductive approach similar to "systematic combining" (Dubois and Gadde, 2014, 2002), in which theory is used to position the study and to develop a preliminary analytical framework with some key concepts, which guides the initial data collection but is revised as the work proceeds and the researchers' understanding of the case(s) and the focal phenomenon increases. As such, the framework presented in

264 Section 2 is partly an outcome of the research process rather than the starting point.

The research process started with familiarizing ourselves with the industrial marketing and purchasing literature and discussing concepts that could be expected to be relevant based on

- 267 our previous knowledge of the actors on the solar PV market. This resulted in an interview
- 268 guide covering general questions about the firm, its current and future strategy, and the
- 269 activities, resources, and actor bonds regarding the sales of PV turnkey systems. The
- 270 interviews included both open-ended questions such as "how do you organize the sales of
- solar PV turnkey systems?" as well as detailed questions, such as "how often do you meet
- 272 with your partner firm and which questions do you discuss during these meetings?". The
- 273 guiding questions for electric utilities and solar firms were slightly different and the content
- and order of questions were adjusted throughout the research process.
- As described above, six dyadic relationships were part of this study, including seven firms.
  Ten semi-structured interviews were conducted between March and September 2021, with

several interviewees informing multiple relationships (see Table 2). The interview statements were triangulated with additional interviews with customers, other electric utilities and solar firms, secondary data such as market reports and newspaper articles, discussions at industry conferences, as well as the authors' own knowledge of the solar PV market in Sweden. While the period in which this study was conducted was well-suited to the purpose of illustrating the development of business relationships over time, it should be noted that the involved parties were still experimenting with different partners and business models. As such, we could not

- 284 draw definite conclusions about the future development of these business relationships.
- 285 Table 2. Interviewees

Case	Firm	Scope	Interviewee position	Duration (h:m)
А	Electric Utility A	Local	Business developer services	00:54
	Solar South	International	CEO	01:51
В	Electric Utility B	National	Business developer services	01:08
	Solar South	International	CEO	*
	Solar South	International	Partner relations manager	00:29
	Solar North	National	Founder	00:55
С	Electric Utility C	Regional	Business developer services	00:36
	Solar North	National	Founder	*
	Solar South	International	CEO	*
D	Electric Utility D	Local	Business developer solar	01:08
	Electric Utility D	Local	Salesperson (solar specialist)	00:35
	Solar East	Regional	Head of installations	00:40
	Solar East	National	Sales manager	00:27

<sup>286 \*</sup>The marked interviews belong to multiple dyads.

- sequential. Single-case summaries and analysis of early interviews improved the
- 289 understanding of critical aspects from the interviewee perspective and led to adjustments in
- 290 later interviews. After finishing the data collection, the interviews were analysed in three
- 291 rounds, using the MAXQDA software. First, all interviews were manually coded top-down
- 292 with activity links, resource ties, and actor bonds as broad categories, refining the
- 293 understanding of the data at hand. A second round of manual coding scrutinized the data from
- the bottom-up, coding inductively and in-vivo, as close to the interviewee words as possible.
- 295 These two rounds of coding resulted in the dimensions of business relationships presented in
- chapter 5, which were inspired by earlier studies using the ARA (see examples presented in
- chapter 2). The final themes in chapter 6 evolved from a meta-analysis, in which the authors
- 298 identified links between the characteristics of the studied business relationships and
- transitions literature. The final choice of themes to be presented in the paper was creative and
- 300 subjective, given the abductive approach chosen in this study.

<sup>287</sup> The process of conducting, transcribing, and analysing interviews was both simultaneous and

#### **301 4.** Empirical context

302 Up until the late 2000s, the Swedish market for solar PV consisted of off-grid applications,

303 such as holiday cottages and caravans, and a small market for publicly owned grid-connected

304 systems (Lindahl et al., 2021). However, in 2009 an investment subsidy was introduced for

305 all kinds of small-scale on-grid solar PV systems. Together with a change in regulation in

- 306 2010, which removed the grid connection fee and grid tariff for small solar PV systems
- 307 (Lindahl, 2011), this resulted in a rapid expansion of grid-connected, roof mounted systems
- 308 for households and companies.
- 309 As a consequence of both economies of scale (as installers could buy larger volumes) and
- 310 falling prices for modules and system components in the international market, prices for
- 311 turnkey systems fell and solar PV became increasingly competitive (Lindahl, 2014, 2013,
- 312 2012, 2011). At the same time, the number of distribution and installation firms increased
- 313 rapidly (to over 100 firms at the end of 2013) (Lindahl, 2014). This resulted in intensified
- downstream competition, which pushed system prices down even further (Lindahl, 2013).
- 315 Another change in the industry in this period was that established energy companies started to
- 316 pay attention to solar (see Figure 3). First, several electric utilities (both electricity retailers
- 317 and grid operators) started to introduce different types of compensations schemes for micro-
- 318 producers feeding their surplus electricity into the grid around 2009, ranging from spot
- 319 market prices to significantly higher feed-in tariffs (Altunay et al., 2021). In addition, some
- 320 grid operators introduced net metering (Lindahl, 2012). In 2012, some electric utilities started
- 321 to offer small turnkey systems to owners of residential houses in collaboration with (local)
- 322 installation companies (Lindahl, 2014, 2013).



323 Figure 3: Timeline of business relationships between electric utilities and solar firms

324 Around this time (2011-2013), Solar East, Solar South and Solar North all started their

325 operations and, thus, took part in the industry's initial attempts of introducing a novel

326 technology as a 'plug-and-play' (or *turnkey*) solution to the market. This required them to

327 sort out the bits-and-pieces of a novel technology and the complementary services needed to

328 make it work. They developed a model in which they purchased solar PV equipment from

- 329 Asia, handled storage and distribution, and offered installation and service for solar PV
- 330 plants.

- 331 In order to experiment with and scale up this new model quickly, Solar South and Solar
- 332 North both proactively invited various types of established firms (including but not restricted
- to electric utilities) to enter into a collaboration with them:

334	"And the business looked quite different by that time. So basically, by just
335	having an offer that was fully functional to the customer, it was sort of an
336	innovation by that time. And we came with them with a full package and said,
337	hey, guys, you have the, you have the market channels and we have the
338	knowledge and let's collaborate. And we gave them a pretty much off the shelf
339	solution that we could plug into pretty much any energy company." (Solar
340	South, CEO)

- 341 In the beginning, few municipal electric utilities were interested in their offer, but both Solar
- 342 North and Solar South were able to spark an interest in their local utilities. Over time, many

343 other utilities also changed their minds, as their ambition to retain their existing customers

- 344 and grow their customer base beyond regional boundaries increased. This became possible as
- 345 some of the installers started to build up national networks of sub-suppliers for distributing
- 346 equipment and performing installations all over Sweden. In the following decade, this
- 347 collaborative turnkey model, which is the focus of this paper, became a quite widespread way
- of selling PV turnkey systems.

#### 349 **5.** Business relationships

- 350 The relationship between the electric utilities and solar firms is presented along the three
- dimensions introduced in the analytical framework: activity links, resource ties and actorbonds.

#### 353 **5.1** Activity links

The activity links in the business relationships between the solar firms and the electric utilities can be described along two core dimensions, which are neither exhaustive nor mutually exclusive: project operations and training.

#### 357 5.1.1 Project operations

358 In the initiation phase of the collaborations (from 2011-2013 onward), the electric utilities had in most cases a passive and more administrative role, mainly invoicing the customer, 359 whereas the solar firms were the main service providers and handled all project operations, 360 i.e., setting prices, communicating with end customers, and coordinating installations of PV 361 362 turnkey plants. Some solar firms performed the installations themselves, while others contracted sub-suppliers. They also handled formal registrations of the PV turnkey system 363 before and after the installation. It is noteworthy that electric utilities usually did not perform 364 any quality control during or after installations (although a technical control of the system 365 366 was performed by the grid operator). Thus, the solar firms accompanied the end-customers 367 through their journey and were responsible for customer satisfaction.

Over time, the division of labour changed. While the solar firms continued to perform
 installations of PV systems and handle all formal registrations related to that, the electric
 utilities were able to take over responsibility for system configuration and customer service:

- 371 "In the beginning when we [Electric Utility D] didn't have any expertise
  372 ourselves, we needed them on a project-by-project basis more. ... [I]n the very
  373 beginning, they [Solar East] were involved in the sales as well. And now they
  374 are not at all [involved] in the customer interaction... part of the sales."
  375 (Electric Utility D, business developer solar)
- 376 "They [Electric Utility B] have their own sales personnel, so they make the
  377 offer and everything and the projection of the solar installation for the customer
  378 usually without our help. And so before, I helped them a lot with their offering
  379 and their sales, but now they are doing most parts themselves. It's been a
  380 learning process for them." (Solar South, partner relations)
- 381 "So I would say that the difference was, before, we sold an external service.
  382 Today, we own the customer journey, but then we take in external knowledge
  383 and execution of just putting the solar panel on the roof." (Electric Utility C,
  384 business developer services)

In the new division of labour, electric utilities became the sole point of contact for end 385 386 customers, except for the installation itself. They, thus, took on a coordinative role, where they communicated with both other parties, held contracts and controlled financial flows. 387 This position is illustrated by electric utilities coordinating the installation date for the other 388 two parties, but even more by problem solving: If problems occurred, end customers would 389 390 contact their electric utility, which they had a signed contract with, and the electric utility 391 would, in turn, solve the problem together with the solar firm. As project operations were 392 now a shared responsibility (the configuration of PV systems, for instance), the two parties 393 needed to communicate and coordinate projects daily.

#### 394 5.1.2 Training

395 The shift in project operation responsibilities was enabled by training the electric utilities had 396 received from the solar firms. This was established already from the beginning of the 397 collaborations. In settings where the electric utility took as little responsibility as possible for 398 project operations, this training could be as simple as establishing joint invoicing workflows. 399 However, many electric utilities were eager to develop their own solar competence from the 400 start. This required them to get the management team on board and build a sales organization 401 which could configure PV systems and manage customer services, as described by Solar 402 North and Solar South:

403 "And some said that, yeah, this is very interesting. We are going to build our
404 own competence centre. We want to be part of this. Please teach us. We have
405 we had some energy companies said that it's mandatory for the management
406 teams to get educations. We were training management teams on energy

- 407companies. Explain to them, you know, basics from the from the beginning: how408direct current versus alternate current works and how inverter works and how409you can put them off." (Solar North, founder)
- 410 *"Teaching them what the customer really are looking for and want. ... I mean,*
- 411 *it's one thing just this is the package they want, but like, how do you sell it to*
- 412 them? How do you present it? What are their main concerns? I mean, what type
- 413 of questions will they be asking and why? And so, it's really about
  414 understanding regular sales coaching." (Solar South, CEO)
- +1+ understanding regular sales coaching. (Solar South, CEO)

415 To build up a solar business unit with a more exhaustive competence on the electric utility

- 416 side, rather intense training was required, which involved frequent meetings. Developing
- 417 solar competence together did not only require training but also mutual commitment to
- 418 common visions and goals (see 5.3.3).
- 419 As a result of a steep learning curve in the initial period, training activities decreased, and as
- 420 frequent interactions became established on the level of project operations, training sessions
- 421 were replaced by semi-annual technical meetings for introducing novel technologies and
- 422 work routines.

#### 423 **5.2** Resource ties

424 The resource ties that have been created between solar firms and electric utilities can be

425 grouped into three main categories: technology and competence, brand and sales channels,

426 and local connections.

# 427 5.2.1 Technology and competence

- The solar firms brought PV turnkey systems into the business relationships (as described in section 4), as well as networks of sub-suppliers and a focus on end-customers. In addition, the solar firms developed customized software for project cost calculations and/or project
- 430 solar firms developed customized soltware for project cost calculations and/or project431 management. As the electric utilities entered into collaborations with these firms, they were
- 432 introduced to and taught how to use the firm-specific software. Moreover, explicit as well as
- 433 tacit knowledge was transferred from the solar firms to the electric utilities through the
- 434 training activities described in section 5.1. After the electric utilities learned to use the solar
- 435 firms' software, no significant novelties were introduced at later stages of the collaboration.
- 436 However, Solar East and Electric Utility D were collaboratively developing a new
- 437 technological interface during the interview period.
- 438 As the market for solar PV matured, the former novelty of PV turnkey systems became a
- 439 standard offer, which was available all over Sweden and offered by an expanding number of
- 440 firms (as described in section 4). Moreover, the electric utilities acquired the knowledge to
- 441 work with the solar firms' software and to manage customer service themselves.
- 442 Meanwhile, two other resources increased in importance: the solar firms' purchasing supply
- 443 chains and their installation competence. Bulk purchasing became a valuable resource of the

solar firms in their relationship with the electric utilities as a consequence of the expansion of
their sales volumes and partner network. Through that, the purchased quantities of solar
modules grew, creating economies of scale, which led to a more beneficial position in price
negotiations.

- "[Y]ou need the scale and that's sort of the reason why we're scaling so, so
  quickly. (...) [I]f you're less than 100 megawatts per year, you will have a
  really hard time to compete in the future. And the reason I'm bringing that
  number is up is ... because that's where you start to get critical volumes in
  procurement, and you start to become actually a major player on the
  procurement side. And if you can take down the price on the panels, like two,
  three, four percentage points, it actually makes sense (...)" (Solar South, CEO)
- 455 As a consequence of the initiation and development of the solar PV downstream market in
- 456 Sweden, the demand for solar firms' installation competence grew larger than the supply, as 457 illustrated in the following quotes:
- 458 "You know, we have scarce resources right now, there's not enough installers
  459 and there's like kind of a queue everywhere and everybody's trying to get the
  460 best installers and they move around, and they know their value in gold. They
  461 are really well paid today." (Solar North, founder)
- 462 "At the same time, we know that [installation] is the part where it's most
  463 difficult to find resources." (Electric Utility D, business developer solar)
- 464 "It is a really 'hot' sector right now, where they have a lot to do, they are just
  465 moving from job, to job, to job" (Electric Utility A, business developer services
  466 (translated from Swedish))
- 467 5.2.2 Brand and sales channels

As the electric utilities' brand recognition (through electricity sales) was a central resource
for the initiation of the collaboration, most projects were conducted under the electric
utilities' brand:

- 471 "Some said: 'Yeah, we want to sell this, but we don't want to do anything, you can do everything for us. Basically, here is a list of our customers, call them, pretend to be us, and then sell it to them'." (Solar North, founder)
  474 "But they more or less sold the service and Solar South was the one doing the service. So, the only thing that we did was kind of adding our brand and kind of the sale." (Electric Utility C, business developer services)
- However, the solar firms simultaneously worked on establishing their own brand names in
  the market. The collaboration with the electric utilities was both positive and negative in this
  regard. On the one hand, the utilities' strong brand name spilled over on the solar firms. Solar
- 480 South also hoped that successful initial collaborations would lead to further collaborations

with other electric utilities, as they were aware that municipal electric utilities collaborate
with each other. On the other hand, there was not much transparency about the solar firm
providing the service, leaving their brand unrecognized:

- 484 "From a selfish perspective, if you look at sort of rewind, one of our major
  485 success factors has been to working really closely to electric utilities and sort of
  486 piggybacking on their brand names. ... And the more we're working with the
  487 energy suppliers and or electric utilities, we get a stronger brand, and we get
  488 more traction on our own. (...) I mean, the main downside for us is sort of that
  489 our brand is in the shadow." (Solar South, CEO)
- 490 Over time, as the solar firms expanded their networks and established their own brand, most
  491 electric utilities began communicating the brand name of their partner firms to their
  492 customers, as, for instance, Electric Utilities A and D:
- 493 "I think that Electric Utility D is pretty good to communicate with the customer
  494 that Solar East will arrive and do the installation. I never heard that they were
  495 surprised, no." (Solar East, head of installations)
- 496"We have to respect that Solar South also is a company that must live and be497seen if they do a good job and have a good collaboration with us. We do not498disadvantage them to be seen that way. So, we are quite open about whom we499work with." (Electric Utility A, business developer services (translated from500Swedish))
- 501 As the solar firms accumulated more collaborations and showcased projects (e.g. in a
- 502 competition to build the largest solar park in Sweden), the value of the electric utilities' brand 503 and customer base for the collaboration decreased.
- 504 5.2.3 Local connection
- 505 The very first collaborations of the interviewed solar firms were all established locally with 506 the municipal electric utility, meaning that the solar firms and the electric utilities shared the 507 same 'home turf'. This local connection brought a confidence advantage to the relationship, 508 which enabled informal communication channels:<sup>1</sup>
- 509"One of the reasons [for collaborating with Solar East] is their local presence,510which means that they could be very responsive, especially in the beginning511when we didn't have any expertise ourselves." (Electric Utility D, business512developer solar)

<sup>&</sup>lt;sup>1</sup> Regarding Solar North and South, the electric utilities they initially collaborated with were unfortunately not available for interviews. Therefore, this interpretation is based on the solar firms' perception and confirmed by the authors' knowledge of the solar market.

513 At a later stage, the solar firms started to spur their company growth by signing more

- 514 partners. This weakened the local connection as their partner networks spanned a larger
- 515 geographical area. However, the local collaboration in case D seems to have been more
- 516 successful in this respect. Excellent customer service was key to sustaining a good reputation
- 517 when operating and living close to end-customers. As described in the case description, Solar
- 518 East only offers installation services to local partners. Solar East was aware of Electric Utility
- 519 D's closeness to its customers, which makes formal quality controls superfluous, compared
- 520 with its other electric utility partner who has a much tighter control system.
- 521 "They have a really close relationship with their customers, because they are ...
  522 strong locally in City D. And they have another relation with [them] because ...
  523 they meet the customer at his house, and they have a discussion with them."
  524 (Solar East, head of installations)
- 525"We don't want to be the bad salesmen's people here because we live here as526well. They're going to hunt us down." (Electric Utility D, salesperson)
- 527 "You know, it's owned by municipality D. They are they are successful. They're
  528 good. They really have a strong, strong brand. I've been talking to some people
  529 in City D and the reliability is high for Electric Utility D. And I believe that this
  530 is the right method to sell these types of products. It's a long decision for the
  531 end consumer, you know, you need someone that you can have faith in." (Solar
  532 East, Sales manager)

#### **533 5.3** Actor bonds

- 534 At the layer of actor bonds, the main dimensions are upper management interaction,
- 535 formalization of agreements, goals and strategies, and conflicts. While the findings
- 536 concerning activities (5.1) and resources (5.2) often allowed for generalization across cases,
- 537 this sub-chapter also highlights some divergence between them.
- 538 5.3.1 Upper management interaction
- 539 At the very beginning of the collaborations, communication usually took place between
- 540 members of the upper management, founders of solar firms and a dedicated solar
- 541 representative at the electric utility. As the solar firms basically only consisted of their
- 542 founders at that time, their time commitment illustrates the relevance of these collaborations:

543 "For example, we started off with Electric Utility X where I personally put a lot
544 of time to get that collaboration going. We sold a lot of systems in City X. (...) I
545 spent a lot of time just going through and ensure that their sales team was, you
546 know, at par with our sales team, like, really train them full speed. And we were
547 part of them." (Solar South, CEO)
548 "And because I mean, we started this business, we the founders, were basically
549 involved in all aspects of running the business. You know, at the point at that

- time, we were climbing roofs and running trucks and working in the warehouse.
  But that means also that I know every aspect of the company." (Solar North, founder)
- 553 "At that time, I was doing more or less everything, I was the one visiting the
  554 customers, I was doing the sales and everything." (Electric Utility D, business
  555 developer solar)

556 As time moved on, the frequent interaction between members of upper management 557 decreased and was replaced by operational project interaction between specialists (see 558 Section 5.1.1). Only in cases where new collaborative agreements were signed, frequent 559 strategic interaction was required. Moreover, as the solar firms signed more collaborations 560 and turned from local to national collaborations, the communication became more distant 561 (see 5.2.3) and formalized (see 5.3.2). Solar North and Solar South both employed partner 562 relations managers (or similar) for a majority of their collaborations. An exception is Case D, 563 where both partners remained anchored in the same region, had smaller-scale growth targets, 564 and continued working with the same contact persons over years.

#### 565 5.3.2 Formalization of agreements

Most often, no formal contracts existed between the two parties at the beginning of the 566 567 collaborations. As the solar firms' founders were directly involved with the local energy utilities (as described in 5.3.1), they based their work on verbal agreements. These verbal 568 569 agreements were non-exclusive, meaning that both parties could have the same type of 570 agreement with other firms and choose different firms for different projects (i.e., rooftop versus ground-mounted PV installations). One reason for having informal agreements was 571 572 that the new business model including new technology was characterized by uncertainty and 573 learning, as illustrated in this quote by Solar North:

- 574 "The first three or four years, we didn't have any solid agreements. We still sold
  575 systems, but more kind of, you know, like this [annotation: makes a gesture,
  576 putting saliva on the index finger to estimate the direction of the wind, meaning
  577 "guessing rather than knowing exactly"]." (Solar North, founder)
- 578 A formalization of contracts could be observed for the turnkey service business model over a 579 time of 3-5 years after its initiation. The most common contract was non-exclusive and long-580 term, where payments occurred on a project basis. These covered the delivery of products and 581 division of labour, fines, and services, and served as reference points for setting goals and
- 582 measuring performance or breaches of obligations.
- 583 In line with this development, Solar North's agreements and obligations became substantiated
- 584 in formal, written contracts, especially after experiencing minor conflicts with their first
- 585 collaboration partner because of delayed deliveries. While Solar North considered to have
- 586 reached contractual integrity, Electric Utility C experienced tensions in its collaboration with
- 587 Solar North:

- 588"We've been having some issues in regards of the hand-over in the projects and589where we've had different pictures of what we've actually agreed on. (...) I590think that's our major problem with Solar North for the moment is that they591have a process. They want us to work in their process. We do not think that592their process is the right one. And they are um... They have signed an593agreement with us, which puts them in a very bad situation, if they don't follow594our process [laughing]." (Electric Utility C, business developer services)
- In contrast to Solar North, Solar South kept their agreements more open and informal,
  because Solar South was convinced that its partners would remain in the collaboration as long
  as they were satisfied. However, Electric Utility C did not perceive Solar South's open
  agreements as beneficial, but rather as a risk.
- 599 "I mean, to be honest, we try to keep the contracts super simple and build on
  600 intentions (...) if they're not happy with what we are doing, they can sort of
  601 cancel the contract because then it keeps us on our toes." (Solar South, CEO)
- 602"That was, from my perspective, a big risk because we had agreements with603Solar South which were not bullet-proof, but we took the full responsibility. And604that's been a problem afterwards as well for us." (Electric Utility C, business605developer services)
- 606 5.3.3 Goals and strategies
- In the beginning, the collaborations were driven by the common goal to establish a solar PV
   market in Sweden as well as by individual and at that time mutually conducive goals to
   expand the sales channels (solar firms) or retain existing customers (electric utilities).
- "Just to make the people understand that solar power actually works in 610 611 Sweden. That was, number one, convince the people that it works. Because, of course, we got all the arguments. It doesn't work here. It's too cold. ( ... ) And 612 613 we said, no...solar power is good. (...) It's not that we started kind of with an 614 agreement or so, but we were we were calling and asking for meetings with energy companies. Are you interested? (...) Two maybe younger, more 615 616 foreseeing guys and girls saying that. 'Yeah, for sure we're interested, but we 617 don't know anything about this. Tell us.' You know, so we ... developed this 618 partly in a joint venture with some of these energy companies." (Solar North, 619 founder)
- However, as the collaboration reached this common goal and the market for solar PV in Sweden stabilized (see Section 4), first conflicts emerged because of diverging goals and strategies, which have shaken the future existence of the collaborations (see 5.3.4). On the one hand, the electric utilities' motive to be involved in solar PV sales is sustainability and playing a role in the transition of the energy system:

625 "And we are a municipal energy company owned by the citizens of City A, so
626 we should ... we exist for them. Of course, the simplest thing could be to send
627 everyone, everything and all work to Solar South, but we also want to be part of
628 raising our competence in this energy transition and be 'onboard'. [...] we
629 want to be involved in transforming the energy system." (Electric Utility A,
630 business developer services (translated from Swedish))

631 The quote by Electric Utility A clearly illustrates their municipal ownership and their 632 interests being broader than only of economic nature. The attention to social and 633 environmental sustainability is a pattern which we have observed in this and earlier studies 634 among municipal electricity electric utilities in Sweden: the electric utilities used solar PV as 635 a means to reach social and environmental sustainability goals. On the other hand, the solar 636 firms pursued other interests. Most notably, Solar South's main goal was company growth, 637 which led Electric Utility C to believe that their collaboration has not been prioritized enough 638 and choose to switch to Solar North:

639 "I think that that's also in the market, maturing, and the CEO is driving Solar
640 South bigger and bigger. We are big enough to have an impact on Solar North
641 business model, and way of working. We are not big enough to have an impact
642 on Solar South. So, for us, it's the better match. I think so, for Solar North as
643 well. (Electric Utility C, business developer services)

644 An exception from these illustrations is Case D, where the local connection is based on the 645 local strategies of the collaborating firms and the common goal to reach high customer 646 satisfaction:

647	"We were for anyone that could help us on a local basis. And we found Solar
648	East being based in City D, which is very close by here. () And we found that
649	they could give us the best benefits. And I think partly because we were not just
650	looking for a 'grossist' [wholesaler for materials], we were looking for a
651	partner. () We have a common goal to sell as much as possible (). They
652	know that we will be around and that we need to have happy customers. So that
653	is extremely important for us." (Electric Utility D, business developer solar)
654	"We're only doing business with resellers and partners around in Sweden, but
655	we help them to grow. And we're focused mainly on local strong customers. We
656	believe that with a strong network, with local suppliers, local customers, we can
657	grow together with them in a much stronger way. () we've always been
658	focusing on high level support. And we always, we usually go see our
659	[business] customers a couple of times a year and help them." (Solar East,
660	Sales manager)

#### 661 5.3.4 Conflicts

662 From the interviews and overall knowledge of the solar market, there seemed to have been 663 few conflicts in the early phases, except for Solar North's late deliveries. Therefore, this sub-664 chapter does not describe a shift in time but the situation at the time of the interviews.

665 Despite the short time period (less than one year) which Electric Utilities B and C have been 666 working with Solar North, they already experienced issues influencing customer satisfaction 667 in a negative way. On the part of Electric Utility B, Solar North has increased prices abruptly, 668 while on the part of Electric Utility C, it has not shown a sufficient level of determination 669 towards satisfied customers:

- 670 "I think that we have some issues in the regards of us being very dependent,
  671 that the customer is happy afterwards, whereas Solar North kind of they only
  672 need to kind of deliver what they said and then send the bill and they don't care
  673 afterwards in the same way, I think, in the steering of our common goal, I think
  674 that's an issue that we need to tackle." (Electric Utility C, business developer
  675 services)
- 676 "All of these solar firms have a very high quality at their work. But we have had
  677 some problems in another way. We have problems with Solar North that their
  678 pricing is raising with pretty short announcement before. We got some message
  679 that the next week we are increasing the price if it's five or six percent and so
  680 on, and that's hard to work in that short term." (Electric Utility B, business
  681 developer services)
- However, these are minor issues compared to the opportunistic behaviour which all
  interviewed collaboration partners experienced with Solar South:
- 684 "Solar South can offer customers a lower price than us" (Electric Utility B,
  685 business developer services)
- 686 "In regards to Solar South, we have several cases where Solar South has sent
  687 an offering to the end customer and then we send the same exact the same
  688 offering, but we with a twenty five percent higher price. And that customer was
  689 like, OK, so why should I buy it from you guys when you're ripping me off
  690 twenty five percent for the exact same thing?" (Electric Utility C, business
  691 developer services)
- 692
  693
  694
  694
  695
  696 *"We are quite vigilant when we think, for example, that we have both competed for the same customer. They have 'priced themselves in' so that they can offer much cheaper solar plants than what we offer, sort of. Then you can start to question our cooperation, what it exists for." (Electric Utility A, business developer services (translated from Swedish)*)

Both Electric Utility B and C considered this a major breach of trust and decided to enter
new/additional collaborations with Solar North. Solar North was in a beneficial position as
they did not compete with end-customers directly:

"Solar North put themselves in the part of the value chain where they well,
they're not our direct competition. (...) They could take a step backward and
kind of being just the operational hand rather than going towards the end
customer." (Electric Utility C, business developer services)

All three electric utilities (A, B and C) also started to consider other alternatives, such as
 acquiring a solar installation firm or building up a solar subsidiary in collaboration with other
 electric utilities:

- 707 "I think this is a nut to crack for the energy companies. Depending on where we 708 want to be in the value chain, either we can continue with Solar North, as is, 709 but then we will be pretty dependent on them, or we can do as others and ... go 710 with the competition who is Solar South. Or a third option, doing the Electric 711 utility L style, kind of buying our own 'grossist' [wholesaler] purchasing hub 712 and installation. We will be too small to do that ourselves. But in collaboration 713 with those other energy companies, that could be a point of view as well to 714 purchase a company and kind of doing it in our brand." (Electric Utility C, 715 business developer services)
- 716"My boss has told me to look for companies in that way, yes. I haven't found717anything for the moment." (Electric Utility B, business developer services)
- "But we might be able to make better business if we built up a small purchasing
  department on our own and had our own installers and so on. But that comes
  with a whole lot of other things as well. ... I think we are too small today ... it
  would require collaboration ..." (Electric Utility A, business developer services
  (translated from Swedish))

Solar South was well aware of this issue but might not have fully understood how serious it
was for the electric utilities, as illustrated by the first quote below. The CEO also continued to
justify the double strategy by referring to service levels:

"From time to time, we like end up meeting each other with the same customer, 726 727 right? [laughing] So we offer the same customer sometimes. But our main goal is not to, of course." (Solar South, partner relations) 728 729 "We need to build it in a way, where we are not sort of competing our electric 730 utilities, because then they wouldn't be with us. It's a fine line. (...) If we go into 731 an area and if they are sort of approaching a customer, if they're approaching 732 that customer, we will not directly go after that customer, obviously, because 733 we're in a collaboration. (...) And we are sort of justifying that by saying that 734 one of the reasons why we need to do this is to ensure that we have good quality with local installers that we can have in that area. And if we are working with a
small energy company, it's very tough for us to have that service level that we
need by just supplying them. And so far, I'm not seeing a huge conflict with that
in any of our suppliers." (Solar South, CEO)

#### 739 **6.** Discussion

- 740 This chapter merges the findings on activity links, resource ties, and actor bonds by
- 741 discussing a number of themes which span all three layers. For instance, the creation of
- 742 mutual benefits illustrates ties in the *resource* layer, is enabled by *activity* links and requires
- bonds between individual *actors*. Each theme is further discussed in the context of niche-
- 744 regime interaction from a transitions perspective.

#### 745 **6.1** Creation of mutual benefits

Access to resources was the central driver for all parties to enter these collaborations. When 746 electric utilities entered collaborations with solar firms, the solar firms' technology and 747 748 competence were 'rare' (unavailable on the market), while the electric utilities' sales channels and trust in their brand were 'imperfectly imitable' (cf. Barney, 1991). This 749 750 perspective from the resource-based-view assumes that a firm's competitive advantage lies 751 within the firm. However, when studying business relationships in industrial networks, a 752 central assumption is that the value of a resource depends on its combination with other resources across firm boundaries (Håkansson and Snehota, 2017; Sundquist and Melander, 753 754 2021). Thus, synergetic value is created by combining complementary resources and tying 755 them across company boundaries (Dyer and Singh, 1998). Our study illustrates this, as it was 756 the combination of resources from the solar firms and the electric utilities that enabled them 757 to establish a flourishing solar market in Sweden and propel the growth of their respective 758 company. It also illustrates how incumbents can employ their resources to accelerate niches 759 and support transformative change (cf. Turnheim and Sovacool, 2020).

760 The motive of creating mutual benefits is common in co-opetition between entrants and incumbents (cf. Kangas et al., 2021), such as in the case of "Big Energy" and "Small Solar" 761 762 described by Wadin et al. (2017). In this case, similar to the business relationships studied in this article, collaborations were formed because the solar firm brought a novel technology 763 764 and capabilities and the energy incumbent firm had established marketing and distribution 765 channels. However, Big Energy entered the collaboration with a competitive intention and 766 only aimed at extracting as much value as possible from Small Solar, thus exploiting its partner firms' competence (Wadin et al., 2017). In contrast to this rather exploitative 767 behaviour by the electric utility, the relationships in our study created synergies over years. 768 769 However, our study also shows that – in spite of the successful creation of mutual benefits 770 (market and company growth) through resource exchange – the value of some resources 771 changed (and to some extent dwindled) over time, which impacted the relationship dynamics. 772 After years of collaboration, the solar firms' installation competence became a standard 773 product (albeit still somewhat rare because of limited capacity to meet the rapidly increasing

demand), while their negotiation and purchasing quantities facing Asian suppliers turned into
a valuable resource. Thus, although the electric utilities had acquired sales knowledge and a
service mindset towards customers through the training activities and common operations, the
solar firms still had something to offer them. The solar firms, however, became less
dependent on the electric utilities' brand names and sales channels as they built up their own

brand.

#### 780 6.2 Misalignment of logics

781 In the beginning of the business relationships, the resource synergies served a common 782 purpose: to establish solar PV in Sweden. Thus far, one could argue that solar firms and 783 electric utilities were able to create a shared vision in which the niche actors could take a 784 leading role and the electric utilities could create new identities, as required for a 785 reconfiguration of established regime structures (Yang et al., 2021). However, once this goal 786 had been (partly) achieved, conflicts started to arise in the relationships. The solar firms had 787 entered the solar PV market mainly because of its economic prospects and the promise of 788 company growth. In contrast, the electric utilities had several reasons to engage with solar; 789 while they needed to create new ways of retaining customers in order to survive in the long 790 run, they also wanted to be part of the energy transition and meet their social goals by 791 enabling customers to become prosumers (Altunay et al., 2021). This indicates an 792 incongruence of long-term strategies and respective values behind their common goal (cf. 793 Hartmann and Herb, 2014; van der Valk and Van Iwaarden, 2011), which displayed itself in 794 the breaches of agreements by Solar North and the opportunistic behaviour by Solar South 795 competing for the same end-customers and bypassing their electric utility partners in order to 796 reach grand international expansion targets.

797 This could be interpreted as a misalignment of institutional logics between niche and regime 798 actors (cf. Smink et al., 2015b), but with swapped roles compared with the traditional 799 storyline, in which regime actors are assumed to be 'villains' (Turnheim and Sovacool, 2020) 800 and entrants 'challengers' (Lee and Hess, 2019). In our case, some new entrant solar firms 801 were the ones determined to reach economic targets through national and international 802 expansion, following a private sector logic, while the incumbent municipal electric utilities 803 used solar PV to define their role in the energy transition and reach broader sustainability 804 targets (including access to prosumption for their citizens), following a public sector logic.<sup>2</sup> 805 This contradictory behaviour compared with previous literature illustrates that niche and 806 regime actors can play different roles in different contexts. In addition, we observed 807 differences within the group of new entrants, explicitly Solar East's local goals and collaborative behaviour being an exception compared with the other solar firms. 808

 $<sup>^{2}</sup>$  Even if solar firms can contribute to environmental sustainability goals, the interviewees did not stress this as a main motive for entering the market.

#### 809 6.3 Shifts of power

- 810 At a first glance, at the start of the collaboration, the position of power seems to have been in
- 811 the favour of the electric utilities (the typical incumbents) in contrast to the new entrant solar
- firms, which had no established sales channels, brand recognition, or professional 812
- connections. As explained in Section 6.1, however, both parties entered the collaboration 813
- 814 with a certain power given their respective resources. Most notably, the electric utilities were
- 815 dependent on the solar firms' competence and willpower to build up a market for solar PV,
- and the solar firms were dependent on the electric utilities' market channels. As the division 816 817
- of labour changed and the electric utilities developed the competence to handle both sales and 818 customer services, the solar firms' connection with the customers increasingly weakened, as
- 819 illustrated in Figure 3. This would commonly be interpreted as a loss of power. This shift in
- 820 the micro-structure of the dyad in relation to its customers, however, occurred in mutual
- 821 agreement and did not lead to any perceived negative influence on the business relationship.



822

823 Figure 4: Shift in relation to customers

In order to understand dynamics of power and influence over time, their position in the larger 824 825 network also needs to be taken into consideration (Ford et al., 2010; Håkansson and Johanson, 1992; Håkansson and Snehota, 2017). In this regard, an exchange of indirect 826 827 resources took place behind the scenes, namely the solar firms' growing brand recognition 828 through word-of-mouth spreading in the electric utilities' partner networks. By signing more 829 contracts with electric utilities, the solar firms expanded, signed more contracts, and got the 830 chance to realize more showcase projects (such as large solar parks). This, in turn, increased 831 their brand recognition in society as whole, allowing them to establish their own sales 832 channels to both household and business customers. Consequently, their dependence on the 833 electric utilities' resources decreased by achieving a superior position in the network (cf. 834 Madhavan et al., 2004; Raskovic, 2015), which Solar South (mis)used to bypass their electric 835 utility partners to compete directly for customers.

- 836 Thus, in contrast to the assumptions in previous literature, the niche-regime interaction did not start with conflict because of the niche trying to enter the regime (cf. Geels, 2006b). The 837 collaborations in all studied cases rather started harmonically, where substantial knowledge 838 839 exchange took place and mutual benefits were created. Moreover, the conflicts that did occur 840 later were not due to the electric utilities acting as 'villains', as would be the case in the 841 archetypical MLP storyline (Turnheim and Sovacool, 2020). Instead, in the present study, one 842 solar firm acted opportunistically given its strong network position – which it partly had 843 achieved with the help of the electric utilities. We, thus, see the opposite of the 'David versus
- Goliath' story which has been observed in the U.S., where utilities tried to hinder solar firms 844

- from penetrating the market (cf. Hess, 2016), or in the earlier mentioned example from
- 846 Sweden where Big Energy shifted to a competitive mode and bypassed Small Solar (Wadin et
- al., 2017). One reason for this might be that the utilities in the earlier studies where often
- 848 multi-national firms in private ownership, while the electric utilities in the present study are
- all municipally owned and, thus, also follow a public sector logic (as described in 6.2).

850 In the present study, Solar South was well aware that it was walking a thin line between

- 851 collaboration and competition. Such tensions have been illustrated in situations when new
- entrants and incumbents engage in co-opetition, where opportunistic behaviour can diminish
- 853 joint value creation (cf. Kangas et al., 2021). In the end, the observed behaviour seems to
- 854 indicate that Solar South prioritized its (international) expansion targets higher than
- 855 continued relationships with its electric utility partners, to which the electric utilities
- 856 responded by searching for exit strategies.

# 857 **7.** Conclusion and implications

- 858 The starting point of this paper was the premise that niche-regime interaction is an integral
- 859 part of sustainability transitions. We also argued that there is a need for new micro-level
- approaches to studying such interaction, focusing on the development of reciprocal,
- 861 collaborative and business-related relationships between incumbents and new entrants. The
- 862 purpose of the research was therefore to advance the understanding of the substance and
- 863 evolution of business relationships between incumbents and new entrants over time.
- 864 Our study of collaborations around the solar turnkey system business model between
- 865 electricity utility incumbents and solar installation firms in Sweden shows how business
- 866 relationships evolved along the three key dimensions of activity links, resources ties, and
- 867 actor bonds. Most notably, the electric utilities took over more of the project operations after
- 868 receiving training from the solar firms, initially valuable resources decreased in importance
- 869 but were replaced by other resource dependencies, goals started to diverge, and
- 870 misunderstandings and conflicts emerged as the solar firms improved their network positions.
- 871 We discussed these changes in terms of creation of mutual benefits, misalignment of logics,
- and shifts of power.
- 873 Through these findings, we contribute to the field of sustainability transitions by addressing 874 some of the weaknesses associated with previous literature on niche-regime interaction. First, 875 regarding the confrontation bias, the studied cases did indeed contain their fair share of conflict, but the logic behind this conflict was reversed as compared with the traditional 876 877 storyline. Indeed, it was the solar firms' private sector logic that clashed with the electric utilities' public sector (sustainability-oriented) logic rather than the other way around. We 878 879 would suggest that this was in large part due to the fact that the incumbents in our cases were 880 municipal energy companies rather than large multi-national utilities. In comparison with 881 Wadin et al. (2017), where "Big Energy" takes the classic incumbent role, exploiting "Small Solar", our cases illustrate that actors grouped under the umbrella terms of "incumbents" or 882 "regime actors" can behave in quite different ways towards niche actors (or new entrants). 883

This supports earlier claims that the field of transition studies should move beyond the incumbent – new entrant dichotomy (Berggren et al., 2015; Geels, 2018; Ruggiero et al., 2021). We, therefore, suggest that future research on niche-regime interaction should focus more on the observed behaviour of different actors based on their values, goals, and strategies and how this behaviour actually influences transitions in different phases.

889 Second, we complement the previous institution-focused literature with a more business-890 oriented approach (as suggested by Geels (2018)). Initially, we observed some traditional 891 institutional niche anchoring strategies (Elzen et al., 2012), such as the brand "piggybacking" 892 legitimation strategy used by solar firms (Raven et al., 2016). At the level of dyadic business 893 relationships, factors such as trust and alignment of logics governed the somewhat messy communication and bonds between individual actors and organizations. For the development 894 895 of a joint business model, resource synergies, business goals and ambitions, and connections 896 within a larger business network came forth as determinants for niche-regime interaction 897 dynamics. This shows that it is highly relevant for transition researchers to complement 898 meso-level studies of niche-regime interactions with more micro-level studies in order to 899 understand and describe changes in regime structures as well as niche-regime linkages (cf.

- 900 Bui et al., 2016).
- 901 Third, by treating the niche and regime actors symmetrically throughout the study, we
- 902 illustrated that the transition process is not sequential (cf. Diaz et al., 2013), but can rather be
- 903 characterized as a process of co-creation, where the interaction between the two actors is
- 904 dynamic and evolving. Although it is still too early to tell which direction the ongoing
- transition will take, this might suggest a new type of change mechanism associated with the
- 906 reconfiguration pathway (cf. Geels et al., 2016; Geels and Schot, 2007). Previously identified
- 907 mechanisms include modular adoption of niche innovations by incumbents (Geels, 2018),
- where niche innovations are developed by new entrants and later incorporated in existing
- 909 systems. Co-creation, in contrast, involves joint value creation drawing on resource synergies 910 that both parties contribute to on more or less equal terms (Ballantyne et al., 2011). Further
- 910 that both parties contribute to on more or less equal terms (Ballantyne et al., 2011). Further 911 research is needed to confirm this mechanism and determine its importance in different
- 912 transition cases, and for this purpose transitions researchers could potentially find some
- 913 inspiration in literature on open and collaborative innovation processes (cf. Ollila and
- 914 Yström, 2016), development of networked business models (Bankvall et al., 2017; Lind and
- 915 Melander, 2021; Palo and Tähtinen, 2013) and value co-creation ((Ballantyne and Varey,
- 916 2006; Lusch and Vargo, 2006).

#### 917 Author contributions

918 To be added after review.

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