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SONNET – Social Innovation in Energy Transitions

Co-creating a rich understanding of the diversity, processes, contributions, success and future potentials of social innovation in the energy sector

Report on SONNET's initial conceptual framework

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Work Package: 1

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SOCIAL INNOVATION IN ENERGY TRANSITIONS

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2	Dutch Research Institute for Transitions	DRIFT	NL	
3	University of Sussex, with its Science Policy Research Unit (SPRU)	UoS	UK	
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7	ICLEI European Secretariat	ICLEI	DE	
8	City of Mannheim	MANN	GER	
9	City of Antwerp	ANTW	BE	
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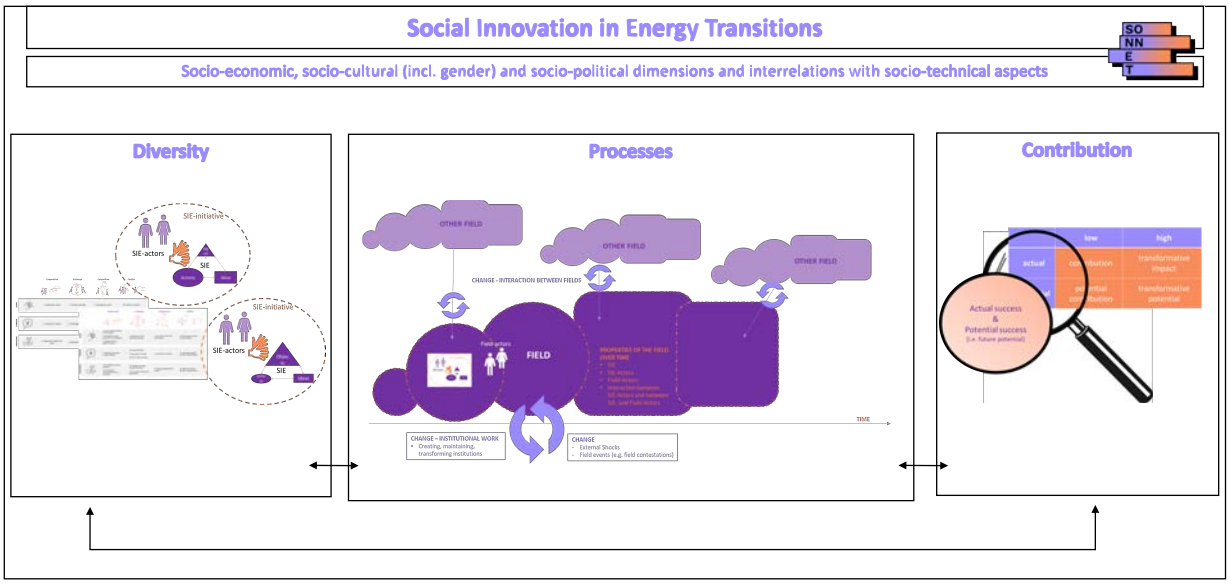
Executive Summary

While there are many insights on social innovation on the one hand, and energy systems and their social processes on the other – to date these insights have hardly been brought together. In this report, we build on literature that examines processes of social innovation and their institutionalisation and relate it to insights from sustainability transitions and energy research in social sciences to build a **draft conceptual framework** for the study of diversity, processes and contributions of social innovation in energy (SIE).

Focusing on 'processes of social innovation' allows investigating the dynamic interactions between social innovation initiatives and broader institutional dynamics including those towards transformative change. Combining this with a focus on 'contributions of social innovation' allows understanding current and future contributions of social innovations to energy systems. To this end, and in line with work on the transformative potentials of social innovation (Avelino et al., 2019; Haxeltine et al., 2017a), we adopt the following definition of social innovation:

> *Social innovations in the energy sector (SIE) are (combinations of) ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy.*

Our work included in this report testifies to the diversity of SIE – having identified 12 SIE-types and the related 18 empirical clusters. This typology serves to inform our sampling for the empirical work – in each of the empirical work packages, the focus will be on one or several of the identified SIE-clusters. It will allow to interrogate, question, or substantiate our understanding of these SIE clusters and types. A second focus of SONNET is on the processes of SIE and specifically the emergence and development of SIE within SIE-fields. The proposed conceptual framework allows us to investigate this unfolding process paying attention to how actors create, maintain and/or transform institutions and how they are enabled or impeded in doing so. Finally, we aim to understand the contributions of SIE – actual and potential and differing degrees. Here our empirical focus will be mainly on understanding the success of SIE-initiatives against a set of goals, and the future potential of SIEs in terms of their potential for scaling and diffusion. The figure below summarizes our draft conceptual framework as basis for our future empirical work.



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1 INTRODUCTION

Transforming European energy systems into more secure, sustainable and affordable configurations by the middle of the 21st century has become a priority in the European Union (European Commission, 2019, 2015). The commitments to lowering greenhouse gas emissions as well as increasing concerns over energy security have triggered changes to current energy systems. Three main trends support these energy transitions: decarbonisation, decentralisation and digitalisation (Di Silvestre et al., 2018). Global decarbonisation commitments have supported the deployment of renewable energies and helped to substantially cut the costs of renewable energy technology – mainly Photovoltaic (PV) and wind turbines – and might achieve similar cost reductions for battery storage systems. Although current developments signpost changes in energy systems, policymakers, academics and civil society actors agree that these changes need to further accelerate to meet the Paris Agreement (Geels et al., 2017). Academics and civil society actors have drawn attention not only to technological advancements but also to the widely neglected social dimensions of sustainable energy transitions (Hirsh and Jones, 2014; Miller et al., 2013). All actors – from corporate energy suppliers to private citizens – may have to undergo fundamental changes concerning not only their role but also their routine practices and attitudes towards how to produce, transport, store, trade and consume energy.

In this regard, social innovation in the energy sector (SIE) has attracted increased interests both as a source of enabling sustainable energy transitions and as a relevant field of experience and learning (Fressoli et al., 2014; Hewitt et al., 2019; Hiteva and Sovacool, 2017; Hoppe and de Vries, 2018; Ooms et al., 2017). The diversity of such social innovations within different energy sectors is widely recognised (Hewitt et al., 2019; Seyfang and Haxeltine, 2012; Smith et al., 2016). However, the diversity, processes and contributions of SIE are not self-evident nor predetermined (e.g. automatically contributing to energy transitions). What is needed is a better understanding of which SIE contribute in what ways and through which processes to sustainable energy systems. This has become the main research objective of SONNET:

> *"SONNET's overall aim is to generate novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy systems." Grant Agreement, page 140*

Building on insights from sustainability transitions, energy research in social science and social innovation literatures, SONNET WP1 sets out to sketch a conceptual framework that can be used to investigate how, to what extent and under which enabling conditions diverse types of SIE may result in new breakthroughs to overcome transition barriers, such as limited citizen engagement or slow adoption of new technologies.

While there are many insights on social innovation on the one hand, and energy systems and their social processes on the other – to date these insights have hardly been brought together. Especially the insights on social innovations have hardly been applied in the context of energy. While a social innovation perspective is alluded to in many domains, such as health care, work integration or migration, what sets these apart from the energy domain is the explicit entanglement of social and technological aspects in the latter. Also, studying social innovations from a sustainability transitions perspective has drawn attention to the need to conceptualise and empirically investigate social innovation in relation to broader social changes (e.g. Koop et al.,

2016; Mischkowski and Späth, 2019; Ooms et al., 2017). Recent SI research has thus started to develop theories of transformative social innovation (Avelino et al., 2019; Haxeltine et al., 2018, 2017a) (also see research brief #1). In SONNET we build on this literature that examines processes of social innovation and their transformative potential and develop it further by relating it to insights from sustainability transitions and energy research in social sciences.

Focusing on 'processes of social innovation' allows investigating the dynamic interactions between social innovation initiatives and broader institutional dynamics including those towards transformative change. Combining this with a focus on 'contributions of social innovation' allows understanding current and future contributions of social innovations to sustainable energy systems. To this end, and in line with work on the transformative potentials of social innovation (Avelino et al., 2019; Haxeltine et al., 2017a), we adopt the following definition of social innovation:

> *Social innovations in the energy sector (SIE) are (combinations of) ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy.*

As per the SONNET Grant Agreement, this deliverable presents an **early draft conceptual framework** for studying diversity, processes and contributions of SIE that will inform the work in the different empirical work packages. As such, it is work in progress and will be updated at the end of the project (see Figure 1).

Figure 1: Commitments as part of the SONNET Grant Agreement

Within SONNET, the work on the conceptual framework is situated in WP1, as task 1.3. "The overall aim of WP1 is to provide a comprehensive knowledge base and conceptual framework for the overall project activities at the beginning of the project, an intra-project platform for inter- and transdisciplinary dialogue throughout the project and an overall knowledge synthesis towards the end." (Grant Agreement, p. 93/94). It contributes towards achieving SONNET objectives 1-4.

Task 1.3 'Development of conceptual framework' starts in M3 and ends in M10 through providing D1.1., which "outlines an initial version of SONNET's conceptual framework including a number of testable working hypothesis regarding the diversity, processes, contributions, success and future potential of SIE-initiatives. This initial framework serves as reference point and starting point for SONNET's empirical analysis" (Grant Agreement, p. 96).

"This task develops a novel conceptual framework and a number of testable working propositions by integrating insights generated from the literature review (T1.1) related to the diversity, processes, contributions, success, and future potential of SIE-initiatives. The framework is to serve as a reference point for the inter- and transdisciplinary SONNET team and together with the working propositions forms the starting point for the empirical analysis within SONNET. The framework contributes to understanding how SIE emerge and develop over time and space; which enabling and impeding conditions SIE faces; and what kind of contributions it makes to sustainable energy transitions specifically paying attention to the understudied socio-economic, socio-cultural and socio-political issues. The conceptual framework and the propositions are developed by DRIFT, UoS and Fraunhofer ISI building on the preliminary framework outlined in the excellence section of this proposal (M.2). The input by all other project partners is incorporated through a dedicated feedback process, which includes a full day partner workshop (M.17), thereby laying the foundation for the successful application of the conceptual framework and its accompanying propositions in the empirical WPs 2-6. Both, the conceptual framework and the working propositions are consolidated, substantiated, unpacked and interrogated through the empirical work and be revisited in T1.6." (Grant Agreement, p. 94).

The framework as it is presented here has been developed based on research briefs developed by members of the project team and additional literature reviews on specific aspects, as well as through iterations with the project team and the Inter- and transdisciplinary Advisory Board (including MS3). Firstly, to build on existing work, we have developed a Mendeley-based SONNET literature database. We have taken this database as our general starting point for several research briefings that have been completed by different SONNET writing teams. These briefings dive into specific aspects of social innovation in energy within three fields of literature (social innovation, sustainability transitions and energy social sciences). Mainly based on reviewing the abstracts of articles tagged with related keywords, these briefs provide an overview of the main insights, outline gaps in the literature, point to questions that arise for SONNET and to further reading. An overview of the briefs can be found in Figure 2. Secondly, we also reviewed literature outside the database to develop specific aspects, such as literature on the role of power, the role of social innovation in transformation and specifically the new institutionalism literature.

Figure 2: Overview of SONNET research briefs

Research Brief #1: Avelino, F. (2020) **A transformative social innovation perspective on the diversity, contributions and processes of social innovation**. SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #2a: Hielscher, S. (2019) **New institutionalism: Examining the processes of social innovation initiatives.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #2b: Hielscher, S. (2020) **Possible ways to explore the processes and contributions of SIE-initiatives.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #3: Fraaije, M., Wittmayer, J.M. & T. de Geus (2020) **The empirical diversity of social innovation in energy.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #4: Winzer, C., Schmid, B., Dzukowski, T. & D. Wemyss (2019) **Defining the success of social innovation in energy.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #5: M.-C. Guetlein, J. Schleich (2019) **Insights on the future potentials of social innovations in energy.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #6: Wittmayer, J.M., Dütschke, E., & M. Fraaije (2020) **A *socio-cultural* focus on social innovation in energy: drivers, barriers and contributions.** Draft. SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498

Research Brief #7: Stadler, M., Avelino, F., Brugger, H., Strumińska-Kutra, M. and K. Rogge (2020) ***A socio-political* focus on social innovation in energy: drivers, barriers and contributions.** SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

Research Brief #8: Wemyss, D., Hielscher, S., Vernay, Ranville, Struminska, M. & A. Dembek (2019) ***Research brief on socio-economic* issues of social innovation in energy**. SONNET Research Brief. SONNET: EU H2020 Grant Agreement 837498.

This document is a draft. As part of the SONNET project workflow it will be updated and shared regularly as input for our inter- and transdisciplinary dialogue (Task 1.4). There is also the intention to develop publications based on this work throughout the duration of the SONNET project. In the inter- and transdisciplinary dialogue, the framework will act as a boundary object facilitating the collection and synthesis of insights from different streams of work (i.e. work packages) - especially in relation to our cross-cutting themes of socio-cultural, socio-political and socio-economic insights and their relations with socio-technical developments.

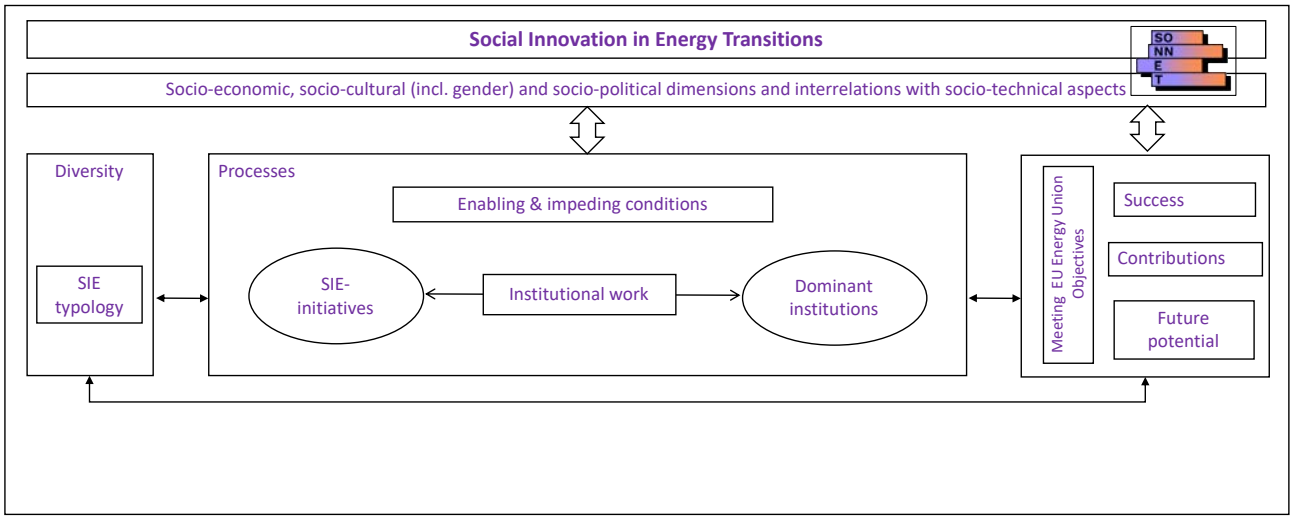
This report is structured as follows. Section 2 provides a bird's eye view on the different conceptual building blocks and their relations, while the ensuing sections provide a more in-depth outline of each of these: diversity of SIE (section 3), processes of SIE (section 4) and contributions of SIE (section 5). Before moving on the report elaborates its socio-political focus on governance arrangements, policy networks, power and policy dynamics (intermezzo). The report closes with an overview of working propositions that are to be answered through empirical work (section 6) as well as a with a concluding section that also sketches the way forward (section 7).

2 UNPACKING SOCIAL INNOVATION IN ENERGY TRANSITIONS: FROM BUILDING BLOCKS TOWARDS A CONCEPTUAL FRAMEWORK

The overall aim of SONNET is to establish "*novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy systems*" (SONNET Grant Agreement 2019: 140). From this aim, we deduct three main foci (see Figure 3):

- understanding the **diversity** of SIE,
- understanding **processes of emergence and development of SIE** and the sequence of interactions and relations between (SIE-)actors and a broader institutional context. This includes insights on dynamics influencing these processes as well as the activities and 'strategies' that SIE-initiatives employ in trying to reconfigure energy systems,
- understanding the **contributions of SIE at a specific point in time**. This includes disentangling the contributions that SIE make to sustainable energy systems and evaluate these and other aspects of SIE in terms of their success and their future potential.

Figure 3: Cognitive map of conceptual building blocks



Source: Slightly adapted from Grant Agreement

SONNET RESEARCH QUESTIONS

In relation to these foci, we have developed research questions to guide the work in the different work packages of SONNET and to allow synthesising them through our inter- and transdisciplinary dialogues (Task 1.4). We should be able to answer these research questions at the end of SONNET in our deliverable D 1.4: Working paper 'The diversity, processes and contributions of social innovation in the energy sector: revised conceptual framework and SIE typology' which will be based on the current report and integrate the empirical findings of the project.

1. **What types of SIE can be identified?**

2. **How do SIEs emerge and develop over time?**
    a. How does the SIE field emerge and institutionalize over time?
    b. How do SIE-actors and field actors interact with the institutional environment and thereby co-shape the SIE-field over time?
    c. What are the enabling and impeding factors for SIE-actors to conduct institutional work and change the institutional environment?

3. **What do SIEs contribute to energy systems today and in the future?**
    a. According to which (and whose) criteria and how can the contributions of SIE to energy systems be evaluated?
    b. What are actual contributions of SIE-initiatives to [more sustainable] energy systems?
    c. What are potential contributions of SIE to [more sustainable] energy systems?

Next to these questions aimed at increasing our understanding of diversity, processes and contributions of SIE, and due to the transdisciplinary set-up of our consortium, we are interested to understand the specific role of city administrations in the emergence and development of SIE:

4. **What is the role of city administrations in the emergence and development of SIE?**
    a. How are SIE impeded and enabled in cities?
    b. How can city governments support SIE?

3 Diversity of Social Innovation in Energy

The guiding research question for this section is: What types of social innovations in the energy system can be identified?

3.1 Understanding SIE

Answering the question: What are social innovations in energy? What are SIE-actors? What are SIE-initiatives?

Despite the only recent uptake in research and innovation policy, the concept of social innovation has a long history dating back to the early 19th century (e.g. van der Have and Rubalcaba, 2016). This long history adds to the multiplicity of meanings, orientations and uses of social innovation in different public, policy and scientific discourses. What these all share is a focus on the 'social' as object of innovation (Avelino et al., 2019). Being considered as an instrument for social change, and potential source of solutions to contribute to addressing complex societal challenges, social innovation has climbed not only the European innovation policy agenda. It is considered as 'driver for change' and as being able to address societal challenges such as climate change, ageing population, growing inequality, globalization and digitalization (Bureau of European Policy Advisers, 2011; Mulgan et al., 2007; Murray et al., 2010). In 2018, European Commissioner for Research, Science and Innovation, Carlos Moedas, promised that "we are going to put more money into social innovation, not because it's trendy, but because we believe that the future of innovation is about social innovation"[1].

Social innovation is a ubiquitous phenomenon, characterised by a variety and plurality of concepts and understandings that make up social innovation research (e.g. Bureau of European Policy Advisers, 2011; Franz et al., 2012; McGowan et al., 2017). Arguably, the most influential definition for social innovation has been coined by the Bureau of European Policy Advisers in their seminal report of 2011 on "Empowering people, driving change", defining social innovations as "new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. In other words, they are innovations that are not only good for society but also enhance society's capacity to act."

Van der Have and Rubalcaba (2016) suggest that the social innovation research field is grounded in four distinct intellectual communities: 1) community psychology; 2) creativity research; 3) social and societal challenges; 4) local development. Of most interest for SONNET is the third community to which we could also count research on social entrepreneurship (Alvord et al., 2004; Hielscher, 2017; Mair and Martí, 2006), the grassroots innovation literature (Hargreaves et al., 2013), as well as the literature on transition initiatives (Frantzeskaki et al., 2016; Gorissen et al., 2018). The latter two bodies of literature have been using the term 'social innovation' mainly to denote

[1] Horizon: the EU Research & Innovation Magazine, online at: https://horizon-magazine.eu/article/carlos-moedas-eu-will-fund-more-social-innovation-because-it-s-future-innovation.html (accessed January 2020).

innovations that are not technological (Dóci et al., 2015; Seyfang and Smith, 2007) but have not defined nor conceptualised what social innovations in energy constitutes.

Echoing BEPA's understanding of social innovation, Hoppe and de Vries (2018) conceptualised social innovation in energy (SIE) as "*innovations that are social in their means and contribute to low carbon energy transition, civic empowerment and social goals pertaining to the general wellbeing of communities*." (ibid: 4). They formulate key topics relevant to SIE (which could also be read as different types of SIE), including: 1) technological innovation leading to new market models, actor configurations, and institutional settings creating room for social innovation; 2) new governance arrangements; 3) community energy, its impact, implications, and social incentives and policy to empower it; 4) new participative research approaches to test and learn from living labs and best practices; 5) 'green nudges' to stimulate behavioural change; and 6) serious energy games. Another recent contribution is Hewitt et al. (2019), who analyse community energy through the lens of social innovation and present differing SIE organisational types in community energy, namely REScoops, Community Development Trusts, Local Government Projects with citizen participation, public-private partnerships, private companies, and other grassroots initiatives.

SIE can be considered to span both supply and demand in different sectors such as electricity, heat, mobility and ICT, and entails the active contributions from consumers, citizens and organisations that go beyond the purchase and adaptation of low carbon technologies. The diversity of such SIE is widely recognised (Seyfang and Haxeltine, 2012; Smith et al., 2016). However, attempts to classify and define SIE are restricted to clustering of SIE-initiatives, despite an increasing interest in SIE over the last decade (Ooms et al., 2017). Coining the term 'clean energy communities' (CEC), Gui and MacGill (2018) for example present three types of CECs: centralised (e.g. renewable energy generation projects, energy efficiency, demand-side management, community bulk-buying), distributed (e.g. network of households and businesses that generate and distribute their own energy connected through a controlling entity: virtual power plants (VPP) and peer-to-peer trading) and decentralised (e.g. micro-generation and integrated community energy system (ICES)). Their starting point is the potential future energy system that could be created through SIE. Studies such as this provide a good starting point on how the diversity of SIE could be categorized, but they often focus on infrastructure and technology arrangements and less so on the social dimension. Similarly, the EU project SI-DRIVE identified three SIE practice fields for renewable energy initiatives: energy collectives (e.g. collective purchasing, energy cooperative, business collectives, co-housing), local production of energy (local production of biofuels, biogas or heat) and providing examples and inspiration (e.g. renewable energy model regions).

Building on these works and Wittmayer et al. (under review[2]), SONNET starts from a broadened perspective on social innovation in energy that allows to better capture the diversity of SIE. Such a perspective implies the following for our understanding of SIE:

[2] Wittmayer, J. M., de Geus, T., Pel, B., Avelino, F., Hielscher, S., Hoppe, T., Mühlemeier, S., Stasik, A., Oxenaar, S., Rogge, K. S., Visser, V., Marín-González, E., Ooms, M., Buitelaar, S., Foulds, C., Petrick, K., Klarwein, S., Krupnik, S., de Vries, G., Wagner, A.,

- *SIE are changes in social relations*. Social innovations are (combinations of) ideas, objects and/or actions that imply/demonstrate a change in social relations and new ways of doing, thinking and/or organising (Avelino et al., 2019; Haxeltine et al., 2017a). Also, ideas can be socially innovative even if they do not translate into action – this is in opposition to classical innovation studies making the difference between invention and innovation.
- *SIE can be about 'renewed' phenomena*. The word "new" does not necessarily refer to things that are entirely new. It can also refer to "renewed" phenomena in terms of "*re-discovering, re-inventing, re-using, re-vitalizing and translating forgotten, lost or abandoned ways of doing, thinking and organising of the past. Innovation is just as much about new combinations of old things, as it is about integrating new things into existing contexts*" (TSImanifesto, 2017[3]).
- *SIE have a clear link with/primarily focus on energy*. SIE include energy generation, transmission, distribution and consumption, and in SONNET we focus primarily on electricity and heat.
- *SIE are multi-directional*. Rather than confusing social innovations with their desired outcome and thus treating these as 'inherently good', such a perspective raises awareness about the inevitably normativity underlying any social innovation and points towards the multi-layered ethical implications thereof (Avelino et al., 2019; Franz et al., 2012; Haxeltine et al., 2017c).
- *SIE can originate in and involve multiple societal spheres*. Rather than limiting social innovation to grassroots innovation or citizen initiatives, social innovation can originate in any institutional context and from different actors, including civil society, state or market - thus in every sphere of society (Avelino and Wittmayer, 2018, 2016).
- *SIE show the interplay between the social and the material*. Rather than confining social innovation to immaterial aspects only or juxtaposing it to technological innovation, social innovation should be considered an analytical entry point that increases our understanding of the interplay of social and material elements. A focus on social phenomena as objects of innovation should not downplay or ignore the relevance of technological innovation.
- *SIE as transformative governance*. Rather than considering social innovation as implementable through policy plans, a broadened understanding considers how policy can better enable social innovation as innovation that is co-created, involving changes in relations between actors and institutions. This includes policy-driven initiatives that may be considered as social innovation in themselves.

SONNET Take Away

Based on this broadened understanding and the work of Avelino et al. (2019) and Haxeltine et al., (2018, 2017a), SONNET studies SIE as socio-technical configurations of (combinations of) ideas,

Hartwig, A. (December 2019, under review) A means to an end? Broadening the understanding of social innovation in energy. International peer reviewed journal.

[3] TSI Manifesto (2017) available online at https://tsimanifesto.org/ (accessed January 2020.

objects and/or actions. These are 'socially innovative' to the extent that they imply a change in social relations associated with new ways of doing, thinking and organising energy. As such we distinguish SIEs (i.e. socially innovative ideas, objects and/or actions) from the *actors*, that are *working on* SIE – we refer to these as SIE-actors.

Concept	Definition	Examples
SIE	Social innovation in the energy sector (SIE) is a combination of ideas, objects and/or actions that changes social relations and involve new ways of doing, thinking and/or organising energy.	Organising under cooperative principles to generate renewably energy
SIE-actor	SIE-actors are individuals, organisations or other collectives who actively work on SIE and are part of a certain SIE-field. They can be from every sphere of society (community, market, state, third sector).	Cooperatives, citizen initiatives, energy companies, start-ups, local governments, intermediaries, NGOs, ...
SIE-initiative	SIE-initiative is a localised version/manifestation in time and space of a SIE. It includes SIE actors, as those actors working on SIE.	Ecovillage Aardehuizen, Frack Off: Extreme Energy Action Network, Living Lab Walldorf, ...

3.2 Investigating the diversity of SIE

Answering the question: What are SIE types? What are SIE clusters?

As outlined, SONNET sets out to understand the diversity of socio-technical configurations that change social relations and involve new ways of doing, thinking and/or organising energy. This section 3.2 provides an overview of the work that we did with regards to investigating the diversity of SIE to date. In doing so, it heavily leans on our work in D1.1. but also goes beyond this and takes account of the work that took place since then – specifically additional work on the clusters of empirical SIE and a refinement of our understanding of SIE.

Our investigation into the diversity of SIE is done in an abductive way, meaning we went back and forth between conceptual development and empirical work and will do so until the end of the project. Thus between:

- Deductive work: By building on existing literature and refining our understanding of SIE and the different aspects of our definition.
- Inductive work: By mapping and analysing 500 SIE-initiatives across eight countries by country expert teams taking SONNET's definition and understanding of SIE as an orientation.

The abductive process to date resulted in:

a) a more differentiated understanding of SIE (as outlined under section 3.1 and the ensuing section 3.2.1),
b) a mapping of 500+ SIE initiatives across eight European countries (see section 3.2.2),

c) a first draft typology of SIE in *Deliverable 1.1. Report on typology and characterisation of social innovation in the energy sector* (Wittmayer et al., 2020) (see section 3.2.3), and
d) a set of clusters of empirical SIE (see section 3.2.4, Appendix 1).

3.2.1 The different aspects of the definition of SIE[4]

Aspect 1: SIE are (combinations of) ideas, objects and/or actions …

Each social innovation exists in the form of 'combinations of ideas, actions and/or objects' – we refer to this combination as the **'socio-technical configuration'** through which the social innovation can be identified (Pel et al., 2019). See Table 1: Operationalisation of ideas, objects and actionsTable 1 for examples.

Table 1: Operationalisation of ideas, objects and actions

Elements of a socio-technical configuration	Operationalisation	Example: Cooperative heat provision
Ideas	Narratives (incl. beliefs, discourses, framings, …); rules (incl. informal and formal rules, policies, laws and regulations, …); knowledge (incl. information, facts, figures, how-to, …); expectations and visions; …	Heat provision through decentral/ small scale community-owned organisation energy commons, …
Objects	Technologies, infrastructures, natural resources, monetary resources, …	Using residual heat to heat a neighbourhood, physical network, …
Actions	Practices, routines, behaviour, …	Attending to the heat generators, being in contact with clients, and many other tangible activities involved in running a community-owned energy company producing and distributing heat to the neighbourhood

Aspect 2: …. that change social relations …

A common-sense definition of 'social relations' is the relations between actors in society. In transition studies, Avelino and Wittmayer (2016) have proposed to differentiate between actors in

[4] The text in this paragraph is partly taken from (Wittmayer et al., 2020)

different societal spheres, such as state, market, community and third sector, and between actors of different levels of aggregation, i.e. individuals, organisations and sectors. This differentiation then allows to analyse the (changing) power relations between these actors at different levels of aggregation.

Another option is to describe social relations through focusing on social interactions between actors (Brinkerhoff et al., 2008; Simmel, 1971). Sociologists distinguish different types of social interactions, including exchange (incl. reciprocity, transaction), cooperation, competition, conflict, coercion and accommodation. Doing so allows to focus on the relations and their quality, rather than focusing on the constituent entities.

Whether these constitute a change in social relations then becomes an empirical question to be answered within a specific context aimed at understanding whether these propose alternative or new social relations as opposed to the dominant or incumbent social relations. Based on Brinkerhoff et al. (2008), we distinguish between competition, exchange, cooperation and conflict (see Table 2 for the definitions).

Table 2: Types of social interactions

Type of social interaction	**Definition based on** (Brinkerhoff et al., 2008, pp. 98–100)
Exchange	"Exchange is the voluntary interaction from which all parties expect some reward." The mechanism is along the lines of a trade: I give you a tangible or intangible benefit and you give me one back. Such relationships are based on the norm of reciprocity – if you give something you expect a reward.
Cooperation	"Cooperation is interaction that occurs when people work together to achieve shared goals." While exchange is a trade, cooperation is teamwork. Cooperation is more likely when individuals are faced with a common threat, when it serves their economic self-interest, when they share a sense of community identity, or when they value belonging to a community.
Competition	"Competition is a struggle over scarce resources that is regulated by shared rules." If the respective goals of actors are mutually exclusive, and in situations of scarcity of resources, competition (or conflict)-based interactions are likely. In case of competition, the struggle will be regulated by shared rules.
Conflict	"Conflict is a struggle over scarce resources that is not regulated by shared rules, it may include attempts to destroy, injure, or neutralise one's rivals." Conflict includes an aspect of 'anything goes' and if it is inflicted with outsiders, it can enhance in-group solidarity.

Source: Wittmayer et al. 2020, p11

Aspect 3: … and involve new ways of doing, thinking and/or organising energy.

To understand the new ways of doing, thinking and/or organising that come with changing social relations means understanding **the ways in which SIE manifests in the energy sector**. Based on insights from literature and substantiated by an analysis of about 500 mapped SIE-initiatives and the related socio-technical configurations, we arrived at the differentiation of 20 manifestations (see Table 3).

Table 3: Operationalisation of manifestations in the energy system

	Definition	**Operationalisation**
Doing	Practices related to energy technologies and the physical composition of the energy system	Generating electricity/heat (efficiently)
		Supplying electricity/heat
		Using electricity/heat (efficiently)
		Exchange electricity peer-to-peer
		Storing electricity/heat
		Implementing technology-based energy services
		Installing energy technology
		Action against political agendas
Organising	Governance and organisational structures within initiatives and within the energy system (i.e. institutions in terms of forms of social organisation or standard operating procedures that shape behaviour and find expression through rules, practices and narratives)	(Facilitating) Networking
		Providing services
		Offer/facilitate financing
		Constructing a dialogue
		Incubating ideas and solutions
		Facilitating supply/demand exchanges
		Nudging and facilitating behaviour change
Thinking	Forms of knowledge and normative framings including values and perceptions	"Raising awareness" about energy
		Campaigning against political agendas
		Pushing a framing, discourse or narrative
		Providing advice
		Transferring knowledge & skills

Source: Adapted from Wittmayer et al. 2020, p12

3.2.2 Arriving at an empirical database of SIE-initiatives

The SONNET consortium mapped about 500 SIE initiatives in 2-3 rounds, taking SONNET's definition of SIE as a starting point. This mapping was done focusing on capturing the diversity of SIE-initiatives and helped us understand the boundaries of what counts as SIE and what not.

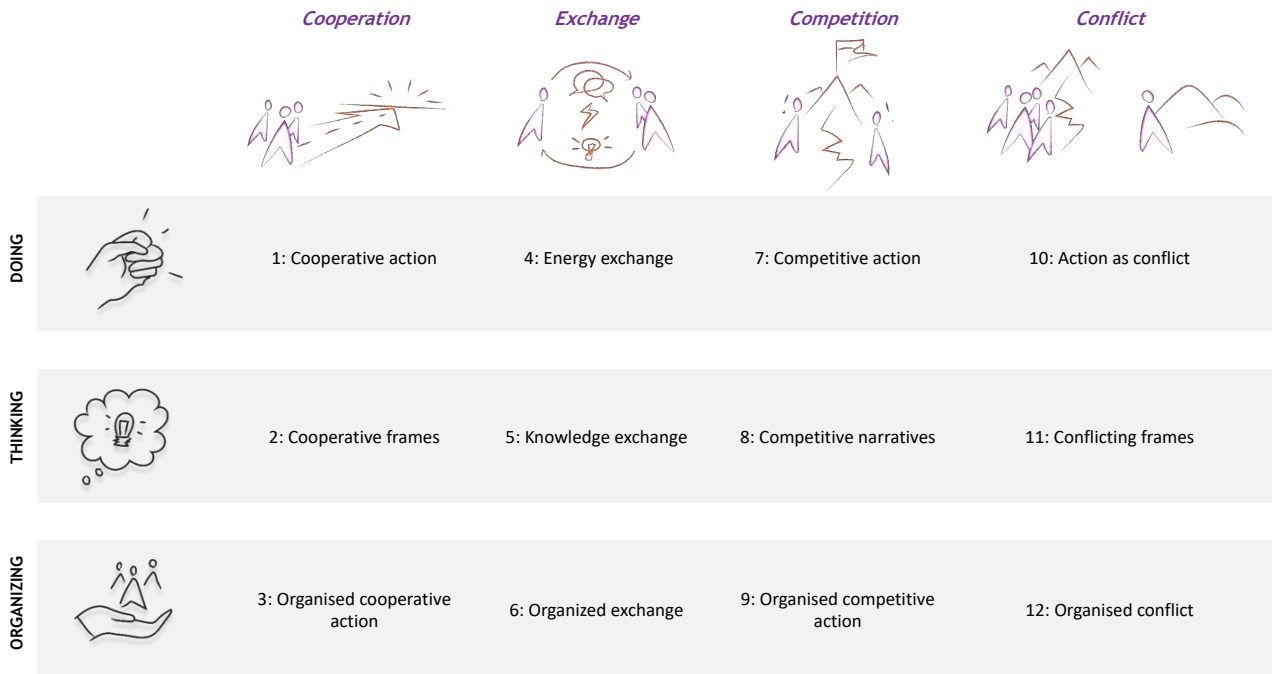
- This resulted in a database of about 500 SIE-initiatives across eight European countries.
- These 500 SIE-initiatives were analysed to deduct their socio-technical configuration, thus the outstanding combination of ideas, objects and/or actions through which the SIE exists. These socio-technical configurations were named and considered as empirical instances of SIE.

This step translated a database of SIE-initiatives into a **database of socio-technical configurations**, with which we continued to work.

3.2.3 Arriving at a typology of SIE

A typology was developed using four 'types of social interaction' and three 'manifestations of doing/thinking/organizing' as variables, resulting in a typology matrix of 12 cells (see **Error! Reference source not found.**). Each of the cell stands for one (ideal) type/abstract category of SIE. Each of these SIE types stands for a set of socio-technical configurations (i.e. a specific (combinations of) ideas, objects and/or actions) that involves a specific kind of social relation (i.e. expressed through different types of social interactions) and a manifestation in the energy system (i.e. focusing on the main manifestation in terms of ways of doing, thinking or organising energy). Whether and the extent to which social relations change as well as the (degree of) novelty of the ways of doing, thinking and organising energy are considered empirical questions to be explored in subsequent empirical work.

Figure 4: Overview of types of Social Innovation in the Energy Sector



Source: Adapted from Wittmayer et al. 2020, p22

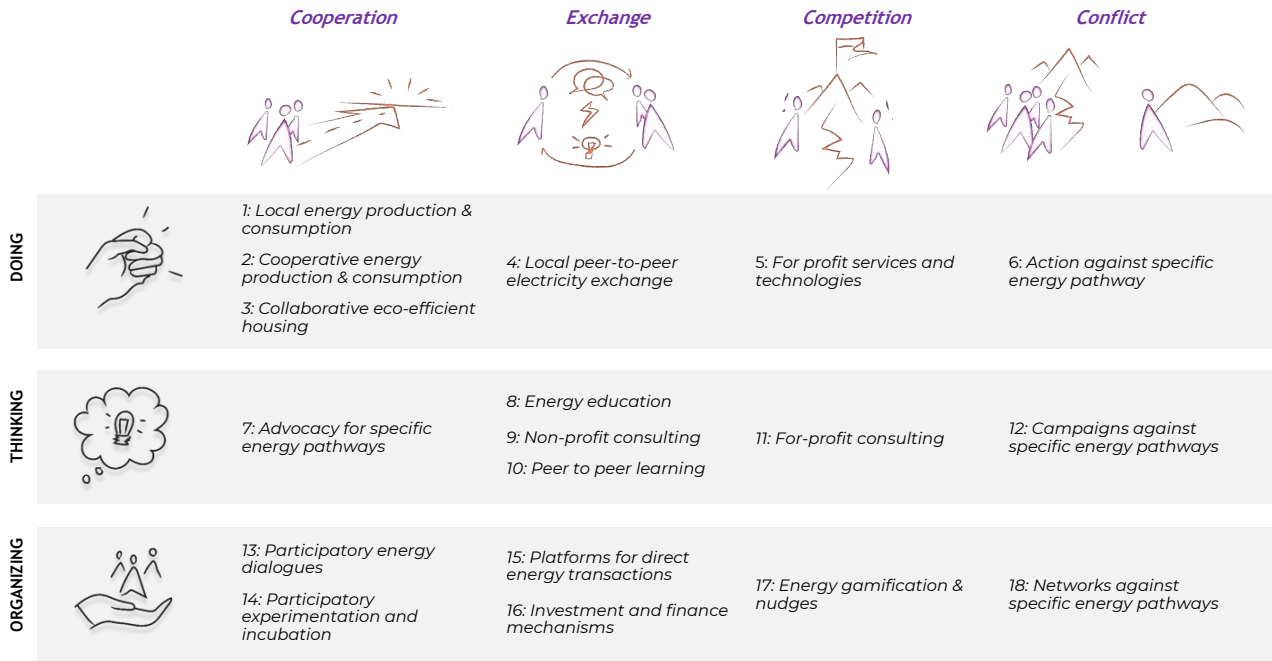
3.2.4 Arriving at clusters of SIE

To understand how these types of SIE are manifesting empirically, we did the following:

- The full set of socio-technical configurations that were deducted from the mapped SIE-initiatives were categorised along the 12 types. Since the types are ideal types, the empirical instances of SIE fitted to a higher or lower degree.
- Within each of the types, the socio-technical configurations were then clustered again into empirical SIE clusters according to their differences and similarities. This step was necessary to arrive at empirically recognizable and distinct forms of SIE.

The following Figure 5 provides an overview of the SIE-clusters that can be empirically investigated. A more detailed description of the different clusters can be found in Appendix 1.

Figure 5: Overview of empirical clusters of SIE



SONNET Take Away

Concept	Definition	Examples
SIE-type	Types of SIE are conceptually informed categories along two dimensions: social interactions and manifestations.	Cooperative action, energy exchange, conflicting frames,...
SIE-cluster	Clusters of SIE are empirically based categories formed along differences and similarities of SIE within one SIE-type.	Advocacy for specific energy pathways, platforms for direct energy transactions, investment and finance mechanisms, cooperative energy production & consumption, collaborative eco-efficient housing, ...

3.3 Synthesis on SONNET's approach to diversity of SIE

To recap, from a 'diversity perspective', SONNET aims to answer the following research question:

1. What types of SIE can be identified?

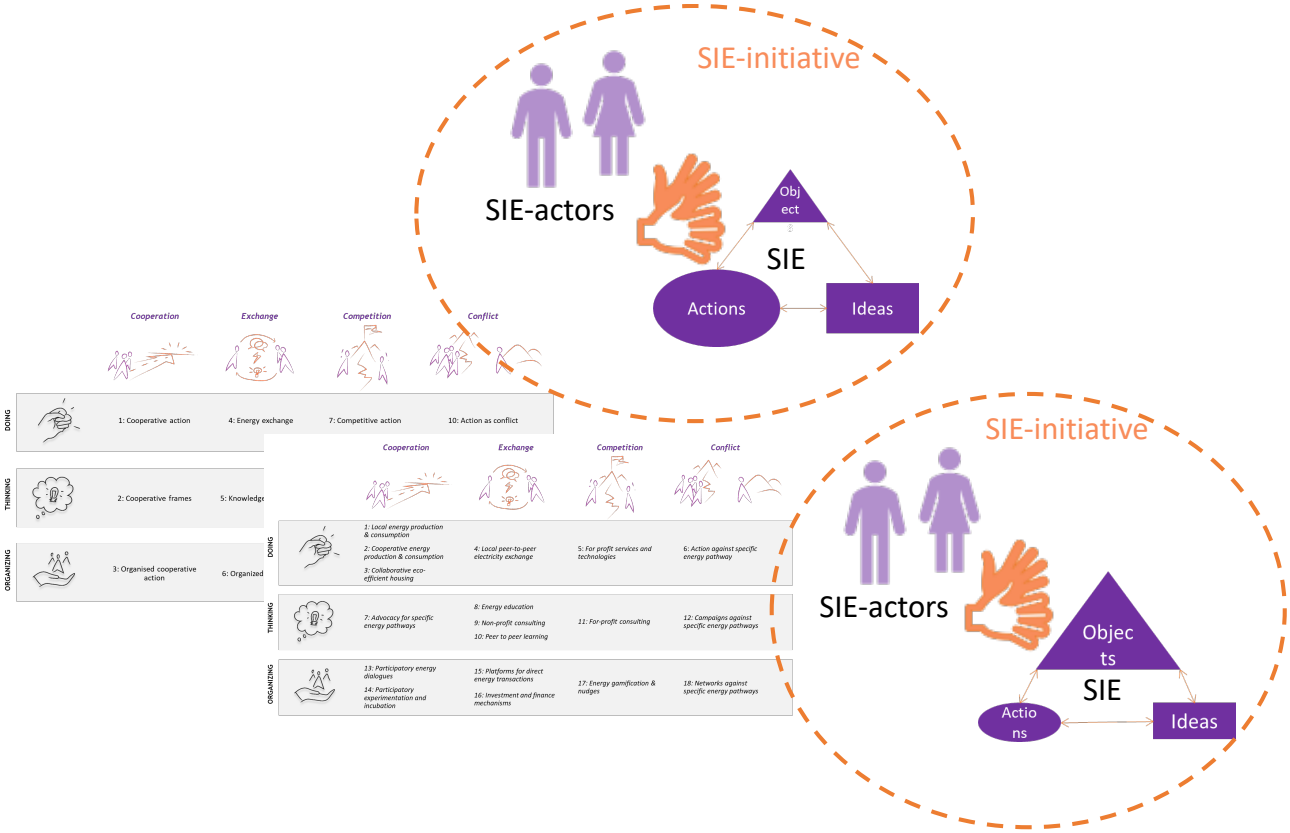
To this end, SONNET takes on board five main concepts that will support the further interrogations, unpacking and/or substantiating the types of SIE suggested to date (see Table 4).

Table 4: SONNET's concepts for thinking about contributions of SIE

Concept	Definition	Examples
SIE	SIE is a combination of ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy.	Organising under cooperative principles to generate renewably energy, ...
SIE-actor	SIE-actors are individuals, organisations or other collectives who actively work on SIE and are part of a certain SIE-field. They can be from every sphere of society (community, market, state, third sector).	Cooperatives, citizen initiatives, energy companies, start-ups, local governments, intermediaries, NGOs, ...
SIE-initiative	SIE-initiative is a localised version/manifestation in time and space of a SIE. It includes SIE actors, as those actors working on SIE.	Ecovillage Aardehuizen, Frack Off: Extreme Energy Action Network, Living Lab Walldorf, ...
SIE-type	Types of SIE are conceptually informed categories along two dimensions: social interactions and manifestations.	Cooperative action, energy exchange, conflicting frames,...
SIE-cluster	Clusters of SIE are empirically based categories formed along differences and similarities of SIE within one SIE-type.	Advocacy for specific energy pathways, platforms for direct energy transactions, Investment and finance mechanisms, cooperative energy production & consumption, collaborative eco-efficient housing, ...

The relationship between these concepts for thinking about the diversity of SIE is visualized in Figure 6. Different SIE are visualised through different combinations of ideas, objects and or ideas on which SIE actors are working. Taken together and located in a specific time and place, this combination manifests as SIE-initiative.

Figure 6: Relationship between concepts for thinking about the diversity of SIE



4 Processes of Social Innovation in Energy

The important role of institutions in energy system transformation is ingrained in the transitions literature through its grounding in institutional theory (Geels ,2004), however, this focus has been underrepresented initially (Moss and Gailing, 2016). Yet, several scholars have emphasized the relevance of institutional change for the development of sustainable energy systems (e.g. Kern 2010; Fuenfschilling and Truffer 2014; Markard and Erlinghagen ,2017) and have called for bringing institutional theory further into the discussion on low-carbon energy transitions (e.g. Nilsson et. al 2011; Andrew-Speed 2016). Consequently, institutional theories have started to receive heightened attention to conceptualise socio-technical dynamics in energy transitions (Jehling et al.. 2019) and there is now a growing body of literature applying institutional theory to the rise of sustainable energy systems (e.g. Andrews Speed 2016). Since energy systems do not only consist of techno-economic features but also diverse layers of socio-cultural processes and organisations, all actors – from energy suppliers to households – have to undergo fundamental changes concerning not only their role but also their routine practices and beliefs of how to produce, transport, store and consume energy. They are part of on-going transformations within the energy system, altering their current positions and dealing with conflicting interests (Schmid et al. 2016).

SONNET's focus on institutions rests on new institutionalism and its influence on the sustainability transitions and the social innovation literatures. The former uses the notion of long-term transformative change which captures the idea that fundamental changes to current dominant institutional arrangements within the energy systems are needed to prevent threats such as climate change and resource deprivation (Weber and Rohracher, 2012). Within the latter, institutional dynamics, among others, are argued to be key in explaining social innovation processes (Cajaiba- Santana, 2014 and van der Have & Rubalcaba, 2016). This section provides background reading on institutional literature[5] that helps us to understand the processes of emergence and development of SIE, more specifically on the one hand the enabling and impeding conditions for SIE processes, and, on the other hand, processes through which actors create, maintain and transform institutions.

The transition of a highly institutionalised energy system into a more sustainable system thus involves changing existing institutions, whether these are rules and regulations, norms and beliefs or shared conceptions about, for instance, energy security (see Section 4.1). SIEs have a dialectic relation with institutions, while they have the potential to create and transform institutions, they will also always maintain parts of existing institutions (Pel and Bauler, 2014). SONNET is interested in specifically understanding this relation. To analyse this, it is not enough to analyse and understand the development of specific SIE-initiatives, such as a specific energy cooperative, as is often done in social innovation research. Rather, the focus is on understanding how SIE evolves, which contestations are present, which actors are involved and how these relate to one another and engage in shared activities (e.g. Mischkowski and Späth, 2019). To this end, we employ a 'field' approach which provides the opportunity to focus on a meso-level social order

[5] For a more detailed outline of gaps in the literature see: Scott (2010) Reflections: The Past and Future of Research on Institutions and Institutional Change, Journal of Change Management, 10:1, 5-21.

(see Section 4.2). This allows us on the one hand to understand processes of institutionalisation as processes of becoming 'taken for granted' and legitimate (see Section 4.3), and on the other to understand how change is possible, specifically through the institutional work of actors (see Section 0).

4.1 Institutions: Regulative, normative and cultural-cognitive pillar

Answering the question: What are institutions?

There have been many suggestions on how to define and conceptualise institutions, originating in different institutional literatures (e.g. DiMaggio Powell, 1983; Campell, 2004). SONNET mainly draws on 'new institutionalism', which is a body of literature within sociological institutionalism[6]. More specifically, we draw on Scott's (2001) conceptualisation of institutions. He distinguishes three pillars of institutions that have reached a high degree of resilience. Each of the pillars has their own basis of legitimacy and logic of compliance (Scott, 2001, Raven et al. ,2017). To sum up,

> "*Institutions comprise regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life... Institutions are multifaceted, durable social structures, made up of symbolic elements, social activities, and material resources.*" (Scott 2014:56-57)

The **regulative pillar** describes the explicit regulative aspects of institutions. Rules, laws, policies, standards, control and sanctions are the key elements and mechanisms of compliance that give meaning to these institutions. Regulative institutions guide "action and perspectives by coercion or threat of legal sanction" (Hoffman 1999). Actors comply with them because they prefer not to suffer the consequences (e.g. penalties). Regulative institutions have been argued to be more visible, which has meant they have been in focus within empirical investigations. Existing studies have often examined values, norms, binding expectations, common beliefs, habits, and routines on the side, rather making them the focus of an investigation (Arenas 2017). Scholars have also argued that a focus on regulative institutions need to be supported by normative and cultural-cognitive ones (i.e. norms and cultural beliefs) so that they cannot be easily manipulated (Roland 2004).

The **normative pillar** takes the 'form of rules-of-thumb, standard operating procedures, occupational standards and, educational curricula' (Hoffman 1999). This pillar is connected to values, social norms, duties, and role expectations, i.e. what is considered appropriate behaviour and can be directed at all actors of a particular field (Scott 2001). "*Actors are not viewed primarily as rational calculators but as social persons who care deeply about their relations to others and adherence to the guidelines provided by their own identity.*" (Scott 2010:6). Actions and beliefs are therefore guided forms of social obligation and professionalization (e.g. trade associations).

[6] For a more detailed overview of institutionalism, please see SONNET Research Brief #2a, Hielscher, 2019.

For example, which normative goals (such as the increased access to solar energy for those without adequate funding) have more legitimacy than others is highly debated between actors within the energy sector.

The **cultural-cognitive pillar** relates to the shared conceptions of reality, binding expectations and common beliefs with which the world is interpreted or meaning is given, such as symbols, discourses and cultural categories. Such elements are usually implicit, as they frequently become routine ways of understanding the world and create 'cognitive logics' for action. 'Cultural' stands for socially constructed symbolic representation (i.e. discourses and frames) and "cognitive in that they provide vital templates for framing individual perceptions and decisions" (Scott 2010:7). They sometimes become more present when actors attempt to make sense of their routine behaviours. The cultural-cognitive pillar of institutions can entail, for example, an analysis of how actors frame and define energy transitions in relation to contemporary energy challenges.

Figure 7: Three pillars of institutions

	Regulative	*Normative*	*Cultural-Cognitive*
Basis of compliance	Expedience	Social obligation	Taken-for-grantedness Shared understanding
Basis of order	Regulative rules	Binding expectations	Constitutive schema
Mechanisms	Coercive	Normative	Mimetic
Logic	Instrumentality	Appropriateness	Orthodoxy
Indicators	Rules Laws Sanctions	Certification Accreditation	Common beliefs Shared logics of action Isomorphism
Affect	Fear Guilt/Innocence	Shame/Honour	Confusion/Certainty
Basis of legitimacy	Legally sanctioned	Morally governed	Comprehensible Recognizable Culturally supported

Source: Scott 2014: 60

Scott (2010) has argued that although it is possible to identify the different pillars and their effect on social order (i.e. one being more dominant than another), it is often the combinations between the elements that make up/ shape existing social arrangements. The pillars co-evolve over time, where "one pillar may be dominant at any given time, the three levels co-exists and are inter-connected" (Hoffman 1999:4, drawing on Hirsch 1997). The pillars overlap, so if one changes it will influence the other two. Conflicts, tensions and dilemmas can arise if the configurations between the pillars start to differ; this opens possibility for change. Moreover, institutions should be analysed in association with social actions, considering that these activities sustain, reproduce and change them. It is thus through constraining or enabling activities that institutions can be analysed.

SONNET Take Away

Concept	Definition	Examples
Institutions	Institutions are made up of regulative, normative and cultural-cognitive elements. They are tacitly or explicitly agreed upon rules constraining or enabling activities of actors that provide stability and meaning to social life. (based on Scott, 2014, Lowndes and Roberts ,2013)	- Regulative institutions: laws, rules, standards, policies - Normative institutions: norms and value systems - Cultural-cognitive institutions: shared conceptions of reality, binding expectations, common beliefs

4.2 Fields: Meso-level social orders

Answering the question: What are SIE-fields?

> *"A field approach seeks the benefits of 'mesolevel theorizing', which recognizes the importance of the differences between varying circumscribed and specialized realms of social order. The concept of field incorporates field-level structures, participating organizations, and the actors working within and between these organizations, encouraging multi-level analysis. The field concept also fulfils a vital role in connecting organization studies to wider, macro-structures – sectoral, societal, and transnational. Organizations exist and operate within specialized institutional environments and these fields are themselves nested within and interdependent with larger encompassing systems."* (Scott, 2010:8)

There are **different field approaches** with their own conceptual backgrounds, e.g. strategic action field (Fligstein, 2001), organizational field (DiMaggio and Powell, 1983) or Bourdieu's field theory (Bourdieu 2006)[7]. Fligstein and McAdam (2011:2) have drawn attention to some of the similarities of these approaches:

1) actors are located in a social space, i.e. field, where they take each other's actions into account,
2) this space is socially constructed and describes 'meso-level social order',
3) actors interact with each other or orient towards one another because of common issues, markets, technologies, goals, etc
4) they recognize (but not necessarily follow) shared norms, beliefs and rules.

[7] For a more detailed outline of Bourdieu, Fligstein and McAdam and DiMaggio and Powell's varying interpretations of a field, see Kluttz and Fligstein, 2016.

Whilst there are similarities between the field approaches, they also differ in the way they conceptualise the role of actors, consensus, field dynamics and power.

The **organizational field**[8] has been conceptualized as a group of organizations that "in the aggregate constitute a recognised area of institutional life: key supplier, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products" (DiMaggio and Powell, 1991:64). Other definitions have put more emphasis on actors who have shared meanings and norms, defining the organisational field as "a community of organizations that partakes of a common meaning system and whose participants interact more frequently and fatefully with one another than with actors outside the field" (Scot, 1995:56). Some shared meanings and norms can be recognised through informal and formal rules, values, assumptions about the world, and all forms of knowledge that are of importance for the actors in the organizational field. Conceptual developments of this field approach have drawn from sources such as structuration theory (Giddens, 1979) and phenomenology (Berger and Luckmann, 1967) amongst others. Existing definitions of an organizational field have been critiqued for "promoting high degrees of structural similarity and isomorphism among organisations that interact with each other frequently" (Suddaby and Viale, 2011:425) because they consider actors to be embedded in their institutional environment. The conceptualisation does allow the development of explanations surrounding institutional changes (Battalina, 2006). Some definitions have therefore been extended to include a "zone of institutional war" (Hoffman, 1999: 352, citing White, 1992) and/ or arenas of conflict (Zietsma and Lawrence, 2010).

To be able to study contestations, Fligstein and McAdam's (2012: 9) draw on the work of Bourdieu, next to Mead's (1934) symbolic interactionism, to define a **strategic action field** as,

> "*a constructed meso-level social order in which actors (who can be individual or collective) are attuned to and interact with one another on the basis of a shared (which is not to say consensual) understandings about the purposes of the field, relationships to others in the field (including who has power and why), and the rules governing legitimate action in the field.*"

They conceptualized the membership of a field along incumbent and challenger dynamics. These actors have varying resources and power and "their interests and views tend to be disproportionately reflected in the rules and organization of the field" (Kluttz and Fligstein, 2016:8).

The **boundaries of a field** are often explored through the membership of the field and members' subjective understanding of the field (Fligstein and McAdam, 2012). Most scholars have argued that "fields and their boundaries may only be understood through empirical investigation" (Townley 2014:53), considering that they are "socially constructed" and boundaries can shift over time (Fligstein and McAdam, 2012:12-13). Scott and Davis (2007) stress that although field boundaries must be empirically defined,

> *"Social systems comprise many ingredients, analysts must choose from among a variety of indicators. These include a focus on actors (e.g., membership boundaries), on*

[8] For a more detailed description see DiMaggio and Powell 1983.

> *activities (e.g., identifying common repertoires), on relations (e.g., interaction networks), or on cultural markers (e.g., shared normative frameworks, cultural beliefs, contentions issues).”* (Scott 2014:232, drawing on Scott and Davies 2007)

Fields (and their structure and boundaries) can be analytically detected through increasing interactions between actors including the formation of coalitions and networks. Although actors might claim they are not part of the field, the determining factor of “their membership is defined through social interaction patterns” (Hoffman 1999:5). DiMaggio and Powell (1983:148) seem to go one step further by arguing that fields constitute “those organizations that in the aggregate constitute a recognised area of institutional life”, i.e. members of a field are aware of each other.

Kluttz and Fligstein (2016:8) provide some indication on how to define the boundaries of the field by describing four shared understandings that members of a field develop over time,

> “*First, actors share a sense of what is at stake in the field (a shared sense of what actors are vying for or the central issue around which the field revolves). Second, actors have a shared sense of the positions of others in the SAF (a recognition of which actors in the field have more or less power and who occupies which roles). Third, they have a shared understanding of the “rules” that guide what is considered legitimate action in the field. Finally, actors in certain positions within the field share interpretative frames (these frames vary within the field but are shared by actors in similar locations).”*

Scott (2014) has also suggested establishing the spatial (i.e. geographical dimension) and temporal (i.e. time frame of studying fields favouring longitudinal ones) boundaries of the field. In general, field theories reviewed to date do not have to say much about the material aspects (such as the role of technology, natural resources and the like) involved in fields.

Fields can be ‘nested’ within other fields and being ‘embedded in complex, multi-dimensional web of dependence with other fields’ (Kluttz and Fligstein 2016:9).

> “*First, like a Russian doll, fields can be nested hierarchically within broader fields, meaning that the nested field is highly dependent on the broader field. Second, fields can also be linked via interdependencies, meaning that the fields are roughly equally dependent. Third, fields can be tied to any number of other fields. Of course, a field need not be connected to another field at all.*” (Kluttz and Fligstein 2016:9)

SONNET Take Away

Within SONNET, we follow Kluttz and Fligstein's (2016:18) suggestion to **bring these different approaches to field theory in conversation with one another**. They have argued that differences within field approaches should be empirically explored to better understand "which way of thinking about fields makes more sense in certain kinds of situations". We mainly draw on Fligstein and McAdam's (2012) definition of a strategic action field to define a SIE-field.

Concept	**Definition**	**Examples**
SIE-field	A SIE-field is an arena/space that includes a specific SIE as well as SIE-actors working on it and field actors enabling and/or impeding it. In this space these actors take one another and their actions into account and have a shared (but not necessarily consensual) understanding of a SIE and of their relationship to other actors. They recognise (but not necessarily follow) shared norms, beliefs and rules.	SIE-initiatives including SIE-actors (such as Brighton Energy Co-op, Cooperative UK, Community Energy England, UK Government, City of Brighton, ...) have a shared understanding of an SIE, which exists as 'organising under cooperative principles to generate renewably energy'.
Field-actors	Field-actors are individuals, organisations or other collectives who are part of a certain SIE-field – these can enable or impede SIE. They can be from every sphere of society (community, market, state, third sector).	Local governments, national governments, professional organisations, industry actors, citizens, ...
Inter-field relations	Relations and interactions between SIE-fields (can be nested, overlapping).	Cooperative energy is nested within community energy in the UK.
Field contestations	Contestations among SIE-initiatives and other field-actors over field structures and processes (Fligstein 1997).	Contestations over regulatory and industrial policy linked to energy infrastructure developments.
Institutional environment	Formal and informal institutions constitute the institutional environment (Scott 2007). The field itself constitutes an environment (= field institutional environment) but also is nested with larger encompassing institutional environment (= outside institutional environment).	N/A

SONNET will define (and also empirically investigate) the **boundaries of a field** through focusing on:

- Actors' increased interactions with one another linked to the SIE over time
- Different types of relations that they create (e.g. membership boundaries, coalitions and/ or interaction networks) over time
- Actors' shared (but not necessarily consensual) understanding of SIE (e.g. common activities, ideas and objects) over time
- Actors' recognised (but not necessarily followed) shared norms, beliefs and rules (e.g. laws, cultural beliefs and contentions issues) over time

Moreover, the SONNET researchers can take into account that...

- Actors develop a socially constructed understanding of the field where boundaries of this field can change over time.
- Actors can take several roles in the field (e.g. work on, enable and / or impede SIE developments).
- Fields should be studied over a 5-10 year history and are bounded within the national context.

4.3 Emergence and stability of fields

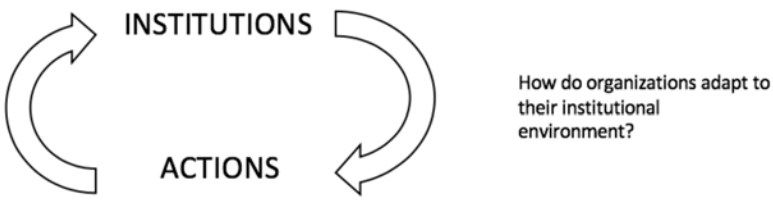
Answering the question: What is institutionalisation?

New institutional theories conceptualize the emergence, stability and transformation of fields (e.g. DiMaggio and Powell 1983). This process is referred to as 'institutionalisation' and is characterized through the creation of institutions where 'rules move from abstractions to being constitutive of repeated patterns of interaction in fields' (Fligstein, 2008:230, drawing on Jepperson, 1991). "Institutionalization was defined in terms of the processes by which such patterns achieve normative and cognitive fixity, and become taken for granted" (Powell, 2007: 1; drawing on Meyer, Boli and Thomas, 1987). In the investigation of institutionalisation processes, two concepts are prominent: 'legitimacy' and 'isomorphic'. Repeated patterns of interaction in fields become more legitimate and stable over time, "eliciting shared meanings and providing cultural models for organizing and acting" and taking "on an increasingly rule-like or taken-for-granted status" (Kluttz and Fligstein, 2016:7).

- **Legitimacy** is "a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995:574). Repeated patterns of interactions that have become legitimate. Organisations and their actions within a field become isomorphic ,i.e. they become similar (DiMaggio and Powell, 1983).
- Mechanisms of **isomorphism** have been conceptualised as being a "coercive force from authorities or resource dependencies, normative sanctioning from experts or professional associations, and mimetic pressure to copy what others are doing, particularly during times of uncertainty" (Kluttz and Fligstein, 2016:7, drawing on DiMaggio and Powell, 1983; Scott 2013).

Several scholars have drawn on Giddens' (1979) notion of structuration to investigate the relational aspects between actors and institutions. Social structure is conceptualized dualist in two sense: first, it is made up of both symbolic and material elements, whether activities or resources; and second, structure provides both the context for present ongoing actions and is the product of these actions (Giddens 1979). Kluttz and Fligstein (2016) have argued that the majority of neo-institutional research focused on studying isomorphism after the field has emerged, i.e. dynamics associated with the stability within fields. For instance, working on questions such as how do organizations adapt to their institutional environment and how is social order maintained within the field (see Figure 8, focus has been on right arrow). The emergence and changes within fields have lacked systematic conceptualisation.

Figure 8: Relation institutions – actions



Organisations involved in current energy systems and their transformations are subject to broader social pressures from their institutional environment. In order to receive support and legitimacy, organizations have to conform to overarching rules and requirements (such as energy regulations). Taken into account current developments, it becomes apparent that these rules and requirements are part of major changes that require organizations to undergo several adaptation processes, which could potentially hugely influence their current day-to-day operations, collaborations with actors and business models (e.g. Moss and Gailing, 2016).

SONNET Take Away

Concept	Definition	Examples
Institutionalisation	Institutionalisation is a process by which a pattern of activities comes to be held in place, and practically taken for granted within a field. The degree of institutionalisation is linked to the emergence and stability of a field	N/A

4.4 Change and agency in fields

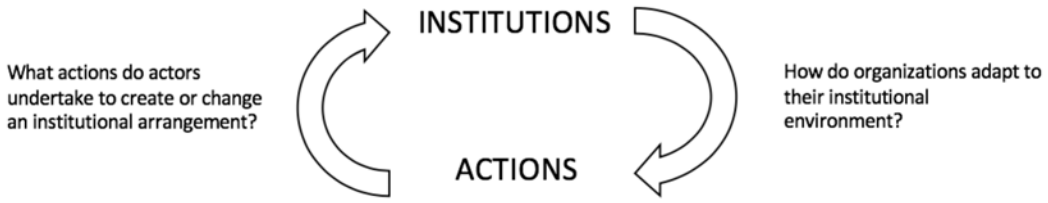
Answering the questions: What is institutional change? What is institutional work?

4.4.1 Institutional change and embedded agency

Scott (2001:187) has argued that "in highly institutionalized systems, endogenous change seems almost to contradict the meaning of institution". Institutions constrain actors' behaviour and possibilities for changes. Looking towards Giddens (1979), actors can also be considered as knowledgeable agents, who are able to influence and change institutions (Leblebici et al., 1991). Thus, the question of institutional change has always dealt with the "paradox of embedded agency" (Holm, 1995; Battilana, 2006; Garud et al., 2007). How is it possible that actors shape institutions whilst at the same time being embedded in institutions that are regulative, normative and cultural-cognitively supported? (Möllering, 2011). Researchers interested in explaining changes in institutional environments have increasingly recognized the importance of agency, questioning how embedded agency is possible (Zietsma and Lawrence, 2010).

Zietsma and Lawrence (2010) have identified two perspectives, either concentrating on exogenous shocks or position of actors within the field. The former focus on **exogenous or external shocks** looks at, for instance, political events and other potentially disruptive events, technological changes, catastrophes (e.g. nuclear accidents, global pandemics), discontinuities, and legal and administrative happenings (e.g. Fligstein, 2001). The latter focuses on institutional entrepreneurs. **Institutional entrepreneurs**, such as new entrance actors and members that cross multiple fields, are conceptualised as actors with the agency to enable institutional change (see Figure 9, left arrow). "*DiMaggio suggests institutional entrepreneurship occurs when someone (or some group) comes along and figures out how to do something new and is able to convince others to go along with them*" (Klutts and Fligstein, 2016:10).

Figure 9: Relation actions – institutions



Critiques have started to emerge, arguing that scholars have either overemphasised the dominant impact of institutions on fields and organisations or the overly heroic, powerful entrepreneur who has sufficient resources (Lawrence et al. 2009), i.e. stressing either structure or agency. Kluttz and Fligstein (2016:22) have highlighted that these conceptualisations are not able to consider questions such as the "*alternative paths fields might take and what field building*

projects are likely to win or loose". Most interesting for SONNET is the concept of institutional work that was developed to overcome these shortcomings[9].

SONNET Take Away

Concept	Definition	Examples
Institutional change	Institutional change is any change in form, quality or state in an institution or arrangement of institutional elements (Hargrave and Van de Ven 2006).	The EU Clean Energy Package includes the right for citizens to generate, self-consume, store and sell renewable energy, and to participate in energy communities and represents a change in regulative institutions and to a certain extent also in normative and cultural cognitive institutions.
Field events	Field events are events which 'unsettle' the existing institutional environment (but not necessarily change it).	Consultations on certain energy policies; demonstrations against climate change
External shocks	External shocks to the field	Economic crises, weather disasters, pandemics, etc.

4.4.2 Institutional work

Explanations of change within organizational fields need to be able to conceptualize on the one hand that institutions constrain actors behaviour, and on the other hand that actors can be knowledgeable agents, who are able to influence and change institutions (Leblebici et al. ,1991).

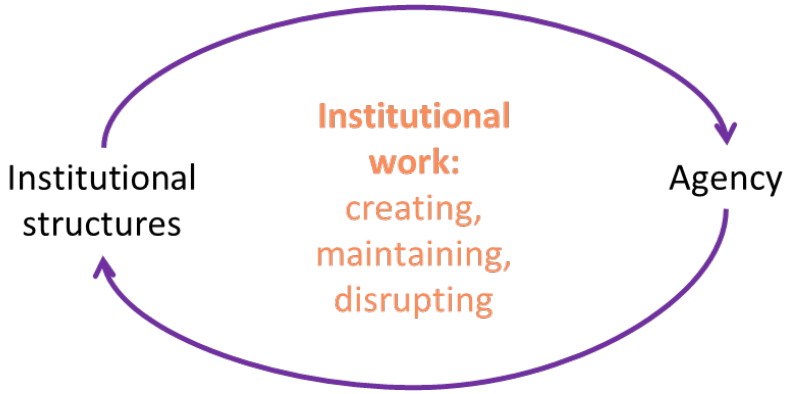
> "*We see two key tensions with respect to the issue of agency, one concerned with the degree of agency attributed to organizational actors, and one concerned with the degree to which a practice approach can adequately describe the relationship between agency and institutions. We introduced the notion of institutional work in an effort to help overcome these tensions.*" (Lawrence et al., 2009:6)

Drawing on Lawrence and Suddabys' (2006) concept of institutional work and the conceptual ideas derived from Möllering (2011), it is possible to consider neither the notion of 'agency' nor 'embeddedness' as dominant within the conceptualization of institutions. They have referred to practices as the connecting element between actions and institutions (Möllering, 2011, Lawrence & Suddaby, 2006). Studies on institutional work are often oriented around three key elements (Lawrence & Suddaby, 2006:219,220): 1) "highlight the awareness, skill and reflexivity of individual and collective actors"; 2) "an understanding of institutions as constituted in the more and less

[9] Another approach is the notions of social skill and challenger and incumbent (Fligstein and McAdam, 2011).

conscious action of individual and collective actors" and 3) "cannot step outside of action as practice - even action which is aimed at changing the institutional order of an organizational field occurs within sets of institutionalized rules". The institutionalisation process is considered to be continuous and does not suddenly stop at some point in time.

Figure 10: Institutional work



Institutional changes do not primarily occur through external shocks but also derive from within the field. Lawrence and Suddaby (2006) have defined institutional work as activities of individuals and/or organizations that aim to create, maintain and transform institutions. The more an alternative practice appears to be a legitimate through an institutionalisation process, the more the legitimacy of the previously institutionalised practice is eroded (Leblebici et al. 1991).

Conducting a literature review, Lawrence and Suddaby (2006:211) have identified several forms of institutional work linked to creating institutions, for instance "overtly political work in which actors reconstruct rules, property rights and boundaries that define access to material resources"; "actions in which actors' belief systems are reconfigured"; and "actions designed to alter abstract categorizations in which the boundaries of meaning systems are altered". The review showed that relatively little work has been done on maintaining institutions, and on transforming/ disrupting institutions. Empirical examples for maintaining institutions have been identified to "primarily address the maintenance of institutions through ensuring adherence to rules systems" and "focus efforts to maintain institutions on reproducing existing norms and belief systems" (Lawrence and Suddaby, 2006:230), whereas for transforming institutions the following has been considered: "work in which state and non-state actors worked through state apparatus to disconnect rewards and sanctions from some sets of practices, technologies or rules", "disassociating the practice, rule or technology from its moral foundation" and "undermining core assumptions and beliefs" that have stabilized institutions (Lawrence and Suddaby, 2006:235-237).

> "*Thus, adopting a practice perspective on institutions points research and theory towards understanding the knowledgeable, creative and practical work of individual and collective actors aimed at creating, maintaining and disrupting institutions*" (Lawrence and Suddaby ,2006:12).

Phillips and Lawrence (2012:223) describe this as a "turn to work", and enumerate work in organizations to entail emotion work, identity work, boundary work, strategy work, practice work and values work. Zietsma and Lawrence (2010), for example, have explored in-depth boundary work as part of institutional work.

This perspective provides a distinct view on institutional change processes that are emergent from within fields and can enrich current discussions about the on-going social change processes related to the development of sustainable energy systems[10].

> "*The aspiration of the concept of institutional work is that, through detailed analyses of these complex motivations, interests, and efforts, institutional research will be able to better understand the broad patterns of intent and capacity to create, maintain, and alter institutions.*" (Lawrence et al., 2009:6)

Lawrence et al. (2009) have pointed out that **two distinctions** can be made when studying institutional work: 'creating, maintaining and disrupting institutions' and the 'creation, maintenance and disruption of institutions'. The latter describes a set of accomplishments, i.e. what has been achieved, whereas the former focusses on the work conducted towards varying activities, i.e. practices of institutional work. Both foci lead to different types of empirical investigations.

> "*Why, how, when, and where actors work at creating institutions, for instance, describes a distinctly different (and we would suggest broader) arena of inquiry than does asking those questions about the creation of institutions.*" (Lawrence et al., 2009:10)

Lawrence et al (2009:10) have outlined several neglected research enquires that a focus on work and practices (rather than a linear process of accomplishments) tries to overcome:

- Which actors are more likely to engage in institutional work?
- What factors might support or hinder that work (independent of its success or failure)? (e.g. see Moellering's (2018) work on uncertainty and institutional work)
- Why certain actors engage in institutional work while others in similar contexts do not?
- What practices constitute the range of ways in which actors work to create institutions?
- Which forms of institutional work and the supporting factors that are likely to lead to successfully creating new institutions?

Drawing attention to **practices rather than accomplishments** also allows for not only investigating intentional activities and intended effects but also unintended consequences.

> "*Because it points to the study of activities rather than accomplishment, success as well as failure, acts of resistance and of transformation, the concept of institutional work may contribute to a move away from a concentrated, heroic, and successful conception of institutional agency.*" (Lawrence et al, 2009:11)

[10] For more information see, for instance, Phillips and Lawrence's (2012) special issue on institutional work.

SONNET Take Away

Concept	Definition	Examples
Institutional work	Institutional work refers to activities of field-actors, including SIE-initiatives, that aim to create, maintain and transform institutions. (based on Lawrence and Suddaby 2006).	- Attempts to influence policy makers and the general public through direct lobbying, research reports, positioning papers, advertising, and the setting of technical standards. - Attempts to influence informal institutions, such as values, norms, binding expectations, common beliefs, habits, and routines, among the wider public (Arenas 2017).

4.5 Synthesis on SONNET's approach to processes of SIE

To recap, from a 'process perspective', SONNET aims to answer the following research questions:

2. How do SIEs emerge and develop over time?
    a. How does the SIE-field emerge and institutionalise over time?
    b. How do SIE-actors and field actors interact with the institutional environment and thereby co-shape the SIE-field over time?
    c. What are the enabling and impeding factors for SIE-actors to conduct institutional work and change the institutional environment?

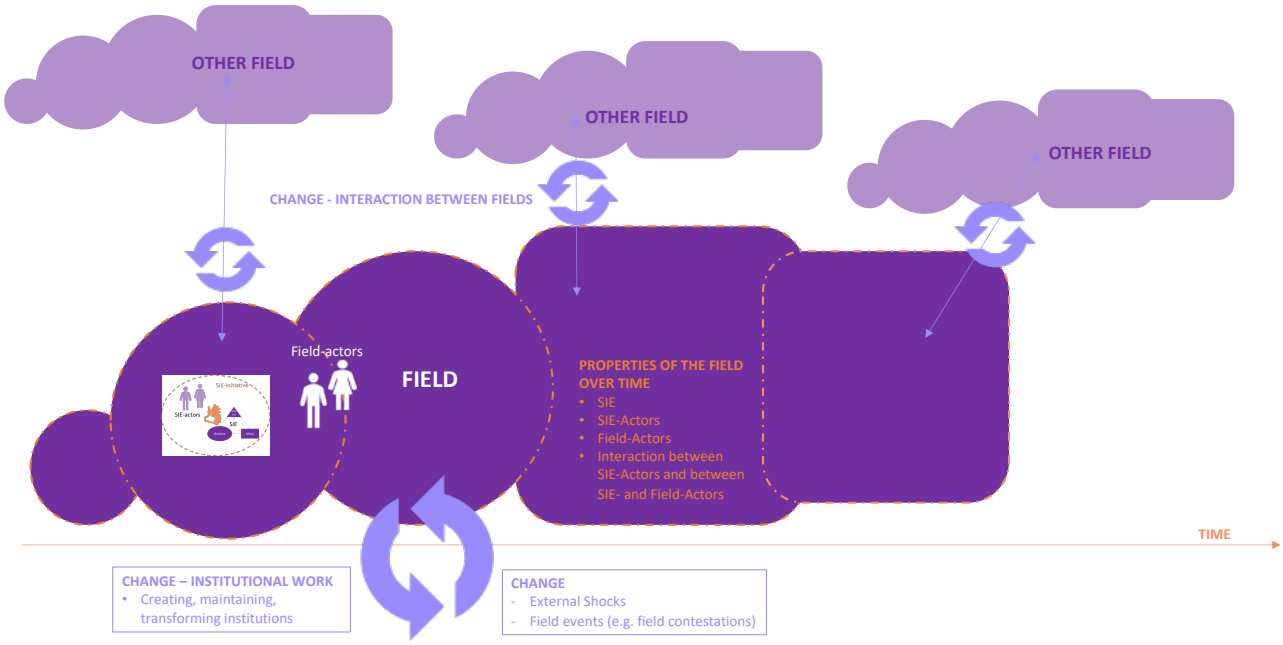
In its 'process perspective' SONNET is focusing on the guiding research question: How do SIE emerge and develop over time? Based on new institutionalism and its uptake in social innovation and sustainability transitions literature – a review we have started in this section which will continue in the time to come – we propose to investigate this question through focusing on the emergence and institutionalisation of SIE-fields, which allows to scrutinize the enabling and impeding conditions for SIE development as well as the activities of SIE-actors in relation to the institutional environment. Figure 11 aims to synthesize this perspective by highlighting the main concepts and their relations – it should provide guidance to SONNET empirical work in WP3.

Table 5: SONNET's concepts for thinking about processes of SIE

Concept	Definition	Examples
Institutions	Institutions are made up of regulative, normative and cultural-cognitive elements. They are tacitly or explicitly agreed upon rules constraining or enabling activities of actors that provide stability and meaning to social life. (based on Scott, 2014, Lowndes and Roberts ,2013)	- Regulative institutions: laws, rules, standards, policies - Normative institutions: norms and value systems - Cultural-cognitive institutions: shared conceptions of reality, binding expectations, common beliefs
SIE-field	A SIE-field is an arena/space that includes a specific SIE as well as SIE-actors working on it and field actors enabling and/or impeding it. In this space these actors take one another and their actions into account and have a shared (but not necessarily consensual) understanding of a SIE and of their relationship to other actors. They recognise (but not necessarily follow) shared norms, beliefs and rules.	SIE-initiatives including SIE-actors (such as Brighton Energy Co-op, Cooperative UK, Community Energy England, UK Government, City of Brighton, ...) have a shared understanding of an SIE, which exists as 'organising under cooperative principles to generate renewably energy'.
Field actors	Field-actors are individuals, organisations or other collectives who are part of a certain SIE-field – these can enable or impede SIE. They can be from every sphere of society (community, market, state, third sector).	Local governments, national governments, professional organi-sations, industry actors, citizens, ...
Inter-field relations	Relations and interactions between SIE-fields (can be nested, overlapping).	Cooperative energy is nested within community energy in the UK.
Field contestations	Contestations among SIE-initiatives and other field-actors over field structures and processes (Fligstein, 1997).	Contestations over regulatory and industrial policy linked to energy infrastructure developments.
Institutional environment	Formal and informal institutions constitute the institutional environment (Scott 2007). The field itself constitutes an environment (= field institutional environment) but also is nested with larger encompassing institutional environment (= outside institutional environment).	N/A
Institutionalisation	Institutionalisation is a process by which a pattern of activities comes to be held in place, and practically taken for granted within a field. The degree of institutionalisation is linked to the emergence and stability of a field.	N/A

Concept	Definition	Examples
Institutional change	Institutional change is any change in form, quality or state in an institution or arrangement of institutional elements (Hargrave and Van de Ven, 2006).	N/A
Field events	Field events are events which 'unsettle' the existing institutional environment (but not necessarily change it).	Consultations on certain energy policies; demonstrations against climate change
External shocks	External shocks to the field	Economic crises, weather disasters, pandemics, etc.
Institutional work	Institutional work refers to activities of field-actors, including SIE-initiatives, that aim to create, maintain and transform institutions (based on Lawrence and Suddaby, 2006).	Attempts to influence policy makers and the general public through direct lobbying, research reports, positioning papers, advertising, and the setting of technical standards. Attempts to influence informal institutions, such as values, norms, binding expectations, common beliefs, habits, and routines, among the wider public (Arenas 2017).

Figure 11: Relationship between concepts for thinking about processes of SIE



5 Contributions of Social Innovation in the Energy Sector

The guiding research question is: What do SIEs contribute to energy systems today and in the future?

While the 'process perspective' outlined under Section 4 focuses on processes of emergence and development of SIE – this 'contributions perspective' focuses on understanding the contribution of SIE to energy systems at a specific point in time. This includes disentangling the degree of changes that SIE make to energy systems today and in the future as well as evaluating these and other aspects of SIE in terms of their desirability for certain parties (i.e. success).

This section is more operational, focusing on clarifying the concepts we will use within SONNET to analyse and discuss the contributions of social innovation in the energy sector (SIE). The section still lacks the step of critically discussing the concepts considering different perspectives or properly embedding them in appropriate literature. We intend to take this up in future consortium-internal iterations as well as in the final deliverable on the conceptual work D1.4. This section should pave the way for this further work.

In this section, we start off discussing the directionalities of energy system transformation to problematize that there is by no means only one direction possible, intended or even desirable (see section 5.1) to which SIEs are to be contributing. We then clarify our understanding of contributions (see section 5.2), and our use of associated concepts, such as success (see section 5.3) and future potential (see section 5.4) within SONNET.

5.1 Directionalities of energy system transformation

Once one starts thinking about the contributions of SIE – let alone associated concepts such as impacts or success, questions arise such as 'contributions to what', 'success according to whom and to which criteria'. The need to acknowledge conflicting visions, norms and expectations of different stakeholders becomes apparent (Schlaile et al., 2017). Such an acknowledgement prompts questions about the multitude and different directions energy transitions can take and the need to address the plurality of understandings related to what for example sustainability energy systems look like (Stirling, 2011). It thus stimulates the explication of the underlying evaluative frameworks that are being used and the normative yardsticks that are being handled by the evaluator.

For SONNET, this means that our work needs to acknowledge the different directionalities and multiple normativities involved in evaluating SIE. Let us recap SONNET's aim which is to establish "*novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and* ***critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy system****s" [GA, emphasis added].* What might be easily overlooked in this aim is that there is not one 'transition of energy systems' out there – there are many 'transitions'. Similarly, there is not only one understanding of sustainable energy systems.

Conceptually, it is thus important to clarify what SIE are contributing to: to sustainable energy systems, to institutional change processes, to sustainability transitions? Any of these relate to an uncertain and plural future. To date, within the SONNET project different normative stances are taken within the different work packages. We therefore have attempted to formulate WP1 contributions in a way that allows for multiple directionalities and normativities to be accounted for – explicitly not arguing that one can conceptualise in a normative void, but rather to do so reflexively.

Therefore, important next steps in this regard are the following:

- Deliberating about the extent to which we want to explicitly clarify one SONNET stance in relation to what SIE should be? And what SIE should contribute to? Or whether we opt for having different normative yardsticks in different work packages; e.g. WP6 (Success of SIE) focuses on the EU goals and SIE-initiatives own goals, and WP4 (City Labs) has a city-specific vision on what they aim to achieve and how this relates to SIE.
- Facilitating SONNET consortium partners in formulating their own normative stances in relation to SIE, energy systems and energy transitions and in having a dialogue.

5.2 Contributions

Answering the question: What are contributions of SIE?

Considering that within the SONNET consortium there is a broad array of directionalities co-existing, our understanding of contributions is not tied to any one of these, but rather allows investigating multiple directionalities. This also aligns with our understanding of SIE as being multi-directional (see Section 3.1). Doing so allows us to investigate what SIE contribute, the different normative ends that SIE contribute to, the desirability of these ends from different societal perspectives and to unravel intended and unintended consequences of SIE.

We use the term 'contributions' to refer to the **actual intended and unintended effects of concrete SIE-initiatives in relation to energy systems**. For thinking about these effects, we suggest differentiating two dimensions.

- ***Time:*** When thinking about the effects of SIE or SIE initiatives over time, we can consider short-term, medium-term and long-term effects; but also evaluate current actual effects and future potential effects.
- ***Degree of impact on energy system transformation***: When thinking about the relation between SIE and energy transitions, and thus transformative change, it is important to also differentiate between the extent to which such SIE contributions impact energy systems and their transformation. When SIE-initiatives transform systems they can be considered to have transformative impact (Haxeltine et al., 2017b).

Taking these two dimensions into account leaves us with differentiating between actual and potential contributions as well as between transformative impact and transformative potential (see Table 6: Different types of contributions of SIETable 6).

Table 6: Different types of contributions of SIE

	low	high
actual	contribution	transformative impact
potential	potential contribution	transformative potential

Contributions in general could be investigated using an institutional perspective as outlined under section 4: that would mean focusing on effects in terms of the accomplishments in terms of institutional change that are forged (see section 4.4.2). Also, the writings on TSI-theory take an institutional perspective on transformative impact of social innovation, namely as being empirically assessable by identifying the degrees of institutionalisation of its core elements. However, there are also other ways to inquire into the contributions and transformative potentials and impacts of SIE – two of these are discussed in what follows.

SONNET Take Away

Concept	**Definition**	**Examples**
Contribution of SIE	Contributions of SIE are the intended and unintended effects of SIE-initiatives in relation to energy systems.	CO_2 reductions, enhanced social ties, …
Potential contribution of SIE	Potential contributions of SIE are the intended and unintended future effects of SIE-initiatives in relation to energy systems.	Potential CO_2 reductions, enhanced social ties, …
Transformative impact of SIE	Transformative impact of SIE is when a SIE or SIE-initiative shows evidence of having achieved a transformative change (Haxeltine et al., 2017b).	N/A
Transformative potential of SIE	Transformative potential of SIE is when a SIE or SIE-initiative shows the potential to achieve transformative change (Haxeltine et al., 2017b).	N/A

5.3 Success and future potential of social innovation in energy

Answering the question: What is success? What is future potential?

Evaluating whether SIE are successful means deciding which normative yardsticks and evaluative frames to choose (see section 5.1). When discussing the contributions of SIE-initiatives to energy systems, we are interested to understand whether SIE-initiatives have been successful in achieving certain normative goals or whether they will be in the future. And which types of SIE are more successful in achieving certain goals than others. Also here, we take the temporal dimension into account and differentiate between actual success and potential success (i.e. future potential).

Goals can be formulated from diverse normative standpoints and by a diversity of actors – concretely we suggest differentiating between the goals held by SIE-initiatives; and collectively formulated or otherwise arrived at goals (e.g. policy objectives, economic goals). In both cases, when considering the success of SIE what is being evaluated is the extent to which SIE-initiatives achieve certain normative goals in relation to energy systems. When considering potential success (i.e. future potential) of SIE, what is being evaluated is the extent to which SIE-initiatives have the qualities to achieve certain normative goals in relation to energy systems in the future.

Review of existing literature[11] as compiled in the SONNET Mendeley literature database regarding evaluation schemes of SI(E) showed that most studies are based on an ex-post analysis analysing the conditions that led to success, but do not provide a conceptual framework. Such ex-post analysis includes technology, social, economic, and/or policy assessments or assess perceived success. Only few papers address achievement of local and EU energy goals. The SONNET Research Brief provides an overview of 69 goals including goals by SIE-initiatives, motivations by members/ cities and suggestions of the reviewed papers. These goals relate to infrastructure, technology, policy, social, environmental, economic, and perceived success.

Importantly, what such a focus on success does not accomplish is to gain insights into the **unintended consequences of SIE** – it turns a blind eye to possible negative consequences.

SONNET Take Away

Concept	Definition	Examples
Success of SIE	Success of SIE is the extent to which SIE-initiatives meet their goals and/or otherwise formulated system goals.	A SIE-initiative can be considered successful to the extent that it achieves its own goal to reduce CO_2 emission or to increase social ties in the community.

[11] This paragraph is based on the SONNET Research Brief #4 by Winzer et al, 2019.

Concept	Definition	Examples
Potential success of SIE (i.e. its future potential)	Potential success of SIE is the extent to which SIE-initiatives meet their goals and/or otherwise formulated system goals in the future.	A SIE-initiative has the potential to meet its own goal to reduce CO_2 emission or to increase social ties in the community in the future.

5.4 SONNET's evaluation focus

Especially in its evaluation work, SONNET chooses specific directionalities and normative yardsticks over others. This section brings together our discussion on directionalities with our evaluation work by outlining the directionalities we have chosen to follow in the evaluation work of WP5 and WP6.

5.4.1 SONNET's focus on success

For its evaluation of the success of SIE (WP6), SONNET focuses on eliciting the contributions of SIE in relation to a) SIE-initiatives own goals and b) the goals formulated by the EU Energy Union. In this way, we can evaluate the extent to which such initiatives are meeting their own goals, and what their contributions are in relation to broader policy objectives.

5.4.2 SONNET's focus on potential success (i.e. future potential)

For its evaluation of potential success of SIE (WP5), SONNET focusses on the potential scope and diffusion of SIE and thus understands diffusion as being a goal against which to evaluate potential contributions of SIE. This focus is currently being operationalised as estimated market shares (i.e. potential) of services or products and analysed through inquiring into the individual perception and acceptance of citizens regarding certain SIE. The extent to which such work can take account of changes in governance and organisation is to be discussed.

SONNET's WP5 work is based on stated preferences discrete choice experiments (SPDCE). A review of existing work[12] showed that there is a large body of literature on SPDCE that also includes the evaluation of future potential of diverse services and products but that applications to SIE are rare (exceptions are Azarova et al., 2019; Knoefel et al., 2018; Salm et al., 2016). There is no study that directly focuses on estimating the market share of SIE as a projector of future potential. To guide the development of the SPDCE, the review identified numerous drivers and barriers for SIE and the effects of households and individuals' characteristics on acceptance of and participation in SIE-initiatives.

[12] This paragraph is based on the SONNET Research Brief #5 by Guetlein and Schleich, 2019.

5.5 Synthesis on SONNET's approach to contributions of SIE

To recap, from a 'contribution perspective', SONNET aims to answer the following research questions:

3. What do SIEs contribute to energy systems today and in the future?
    a. According to which (and whose) criteria and how can the contributions of SIE to energy systems be evaluated?
    b. What are actual contributions of SIE-initiatives to [more sustainable] energy systems?
    c. What are potential contributions of SIE to [more sustainable] energy systems?

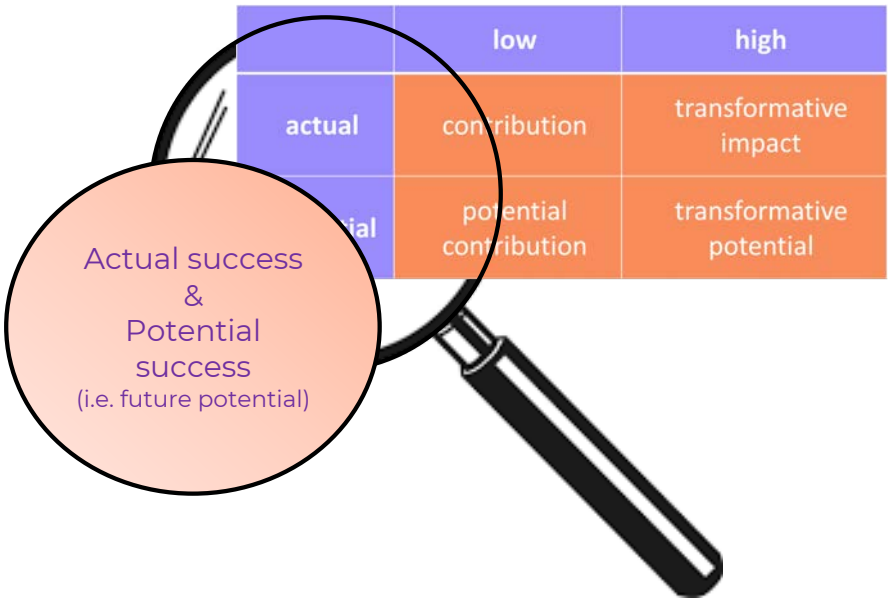
To this end, SONNET takes on board six main concepts that will support the analysis of current and future contributions from different angles. These can be differentiated along two axes: their temporal focus (actual/potential) and their relation to system transformation (low/high). We then take a specific normative lense to evaluate the extent to which such contributions meet certain goals. For an overview of SONNET concepts for thinking about contributions of SIE see Table 7, and for their relation see Figure 12.

Table 7: SONNET's concepts for thinking about contributions of SIE

Concept	Definition	Examples
Contribution of SIE	Contributions of SIE are the intended and unintended effects of SIE-initiatives in relation to energy systems.	CO_2 Reductions, enhanced social ties, ...
Potential contribution of SIE	Potential contributions of SIE are the intended and unintended future effects of SIE-initiatives in relation to energy systems.	Potential CO_2 Reductions, enhanced social ties, ...
Transformative impact of SIE	Transformative impact of SIE is when a SIE-initiative shows evidence of having achieved a transformative change (Haxeltine et al., 2017b).	N/A
Transformative potential of SIE	Transformative potential of SIE is when an SIE or SI-actor displays inherent and/or intended qualities to transform dominant institutions in a specific context (Haxeltine et al., 2017b).	When a SIE-initiative combines a social good orientation with a for-profit orientation, it is challenging the dominant organisational models in the energy sector and possibly in the national context (e.g. in the Netherlands, there is no legal entity for a social enterprise).

Concept	Definition	Examples
Success of SIE	Success of SIE is the extent to which SIE-initiatives meet their goals and/or otherwise formulated system goals.	A SIE-initiative can be considered successful to the extent that it achieves its own goal to reduce CO2 emission or to increase social ties in the community.
Potential success of SIE (i.e. future potential)	Potential success of SIE is the extent to which SIE-initiatives meet their goals and/or otherwise formulated system goals in the future.	A SIE-initiative has the potential to meet its own goal to reduce CO_2 emission or to increase social ties in the community in the future.

Figure 12: Relationship between concepts for thinking about the contributions of SIE



INTERMEZZO: SONNET'S SOCIO-POLITICAL FOCUS

In the inter- and transdisciplinary dialogue, SONNET's conceptual framework will act as a boundary object facilitating the collection and synthesis of insights from different streams of work (i.e. work packages) – especially in relation to our cross-cutting themes of socio-cultural, socio-political and socio-economic insights and their relations with socio-technical developments. In this intermezzo, we take a closer look at one of these three cross-cutting themes – the socio-political issues associated with social innovation in the energy sector (SIE).[13]

Socio-political issues play an important role in SONNET's research and its underlying research objectives. For example, the diverse types of SIE can include socio-political innovation (O1). In addition, understanding the directionalities and future potentials of SIE (O3 and O4) is also a socio-political issue, including attention to unintended consequences of SIE in socio-political terms. However, SONNET's focus on socio-political issues is particularly evident by their explicit inclusion in research objectives O2 and O5.

- O2 Identify and analyse enabling and impeding conditions for SIE processes, with a focus on socio-economic, socio-cultural (incl. gender) and **socio-political issues** and their interrelations with socio-technical aspects.
- O5 Encourage successful SIE through co-creating **socio-political strategies** to enhance governance arrangements and policy networks as well as SIE-related power and policy dynamics.

While the former research objective (O2) calls for a holistic analysis of socio-economic, socio-cultural and socio-political issues as enabling and impeding conditions for SIE processes (see section 4), the latter objective (O5) is mainly addressed in this section: SONNET's dedicated focus on co-creating socio-political strategies to encourage successful SIE. These socio-political strategies focus on four key areas: governance arrangements, policy networks, as well as power and policy dynamics. The SONNET project team will conduct in-depth investigations to generate insights into these areas, with the aim of providing a solid empirical basis for co-creating strategies to encourage successful SIE.

In the following sections, we will lay out the relevant literatures that conceptually underpin our socio-political analysis (for a summary of our key concepts and their definitions see Table 8).

[13] This section draws on Research Brief #7 by Stadler, M., Avelino, F., Brugger, H., Strumińska-Kutra, M. and K. Rogge, 2020.

SONNET Take Away

Table 8: Overview of key socio-political concepts in SONNET

Concept	Definition	Examples
Governance for SIE	Governance for SIE is understood as a complex process through which a plurality of public, non public and private actors interact in order to formulate, promote and realize social innovation in the energy sector (SIE).	- City labs - Participatory budgeting - Task committees in which politicians, citizens and local stakeholders work together to reframe the problems at hand and find new and bold solutions
(SIE) policy networks	A *policy network* is understood as a non-hierarchical set of different types of actors, who are connected by interdependent and relatively stable relations (either cooperative or conflicting) and who (could potentially) directly or indirectly shape policy outcomes in a certain policy field. To analyse the *policy networks in which SIE-initiatives are embedded*, we study the broader set of actors who (could potentially) shape enabling or impeding conditions for SIE-initiatives within a specific city and its surroundings	- Example for national policy network: German energy transition network, which includes national policy makers, administrative organisation as well as interest groups, major energy provider and companies and researchers. - Policy networks of relevance for SIE initiatives consists of initiatives, local policy makers and administrative actors, local companies, (local) energy providers, further civil society organisations (those supporting transitions as well as those mobilizing against e.g. wind parks) and might also include higher level actors, when actively engaged in local process.
Power (relations) related to SIE	*Power* is broadly understood as the relational and structural (in)capacity of actors to mobilise resources and institutions to achieve a goal. SIEs can refer to the resources being mobilised and/or the goals being aspired. *Power relations in SIE* refer to (a) actors having different kinds/levels of power to mobilise SIE-related resources and/or to achieve SIE-related goals (incl. (in)equality and in/exclusion) and/or (b) actors having power over others in SIE-related processes (including dependency , oppression & exploitation), and (c) actors having power with other actors to achieve collective (SIE-related) goals.	- Extractive and exploitative hegemony of decentralised fossil fuel industry - Collective power of international energy cooperative associations to adapt institutional frameworks and mobilise resources for decentralised energy - Decentralisation of resources through community energy - Selective inclusion of people in community energy movement > exclusion of certain people - Energy poverty
Policy mixes of relevance for SIE	Policy mixes of relevance for SIE encompass policy strategies and instrument mixes at different governance levels and policy fields which enable or impede the development of SIE, and have developed incrementally over many years through policy processes.	- Example for policy strategy: UK community energy strategy - Example of enabling instruments: German renewable energy resources law with its feed-in tariffs, priority access, etc. - Ex. of impeding instruments: fossil fuel subsidies, ban on peer-to-peer trading

Governance arrangements

In SONNET, governance is understood as an approach to public management and policy making that

a) adopts hybrid practices, combining administrative systems with market mechanisms and non-profit organizations,
b) is multijurisdictional by combining people and institutions across different policy sectors and different levels of government and
c) encompasses multiple stakeholders linked together in networks (Bevir, 2011, p. 2-3).

This definition is broad enough to capture concepts like New Public Governance (Sørensen and Torfing, 2015), collaborative governance (Ansell and Gash, 2008), participatory governance (Shin and Lee, 2017), public governance (Kordasiewicz and Sadura, 2017; Sørensen and Torfing, 2015) and to capture interactive nature of governance (Sørensen and Torfing, 2018). In short, governance is understood as complex processes through which a plurality of public and private actors interact in order to formulate, promote and realize common objectives (Sørensen and Torfing 2018). In SONNET, we adopt this definition for the context of SIE, thereby defining **governance for SIE as a complex process through which a plurality of public, non public and private actors interact in order to formulate, promote and realize social innovation in the energy sector (SIE).**

Despite of some critical discussions highlighting the tension between effectiveness and democratization, there is a relatively broad consensus that collaboration between relevant and affected social and political actors introduced by governance arrangements tends to improve the definition of problems, generate a greater richness of ideas, stimulate mutual learning, build joint ownership, facilitate coordinated implementation, and diffuse innovative solutions to new contexts (Hartley, Sørensen and Torfing, 2013).

From the perspective of SONNET the most interesting approaches to governance are those directly referring to governance as an arrangement facilitating (collaborative) innovation (Ansell and Gash, 2012; Bommert, 2010; Borins, 2014; Torfing and Triantafillou, 2016) and evolutionary learning for public goals, where diverse stakeholders "learn how to refine and improve their values, knowledge, and practice in a continuous fashion" (Ansell, 2011, p. 9).

This implies that the main research question we intend to answer is **how (novel) governance arrangements can encourage the development of SIE?** We further specify this research question on governance arrangements with the following sub-question: **What kind of institutional and organizational infrastructure is needed to enact governance and learning for SIE?** We plan to investigate the role of diverse institutional and organizational context for introducing dialogue based, collaborative approaches to governance. We intend to also analyse how to build institutional and organizational reflexivity (i.e. the ability to critically reflect on action and its assumptions as well as ability to correct them).

Policy networks

We know from the literature that actor constellations play a crucial role for SIE and for local transitions. In case studies, often the importance of (a group of) single actors who pushed the transition (or certain aspects of it) is emphasized (Große et al., 2016; Radtke, 2016). Whether these actors are able to accelerate the transition in their region seems to highly depend on their ability to mobilize others within the region (Bouwhuis, 2016; Blanchet, 2014; Feldhoff, 2016; Hess 2019) - for which preexisting social (trust) networks might be crucial (Catney et. al. 2013; deLeeuw and Groenleer, 2018). As well as to network with higher-level actors, that support their aims and other cities that follow a similar path (Kern and Bulkeley, 2009).

Policy network analysis lends itself to study these actor constellations and relationships in a structured way. Policy networks are hereby understood as a non-hierarchical set of different types of actors (political, administrative, civil society, researchers, etc.) (Börzel, 1998, 254), who are connected by interdependent and relatively stable relations. Policy networks evolve around a particular policy problem (Kickert, 1997, 6) and consist of those actors that (could potentially) shape policy outcomes therein directly or indirectly (Weible, 2005; Henry, 2011; Ingold, 2011). Members of the network can have opposing views and interests and thus their relations can be of cooperative as well as of conflicting nature (Thatcher, 1998). Furthermore, the policy networks have a geographical boundary (e.g. a city's policy network on the energy transition or a nation's climate change policy network).

Policy network analysis allows for a structured and comparative analysis of beneficial and conflicting relations in which the SIE-initiatives are embedded in, including the relations to various policy relevant actors (Bomberg and McEwen, 2012). This approach identifies structures in actor relations, such as the importance of actors, the density of relations, and the presence of supporting or conflicting relationships (Wasserman and Faust, 1994; Scott, 2000; Henry and Vollan, 2014). It is therefore the prime choice for analysing how certain actor constellations can enhance (or inhibit) the development of SIE-initiatives.

The importance of networks has been emphasized and studied in many research fields, which are of direct relevance to the SONNET project, including the diffusion of (social) innovation (Murray et al., 2010), sustainable development (Henry and Vollan, 2014).

To understand how policy networks can be enhanced for encouraging successful SIEs (O5) it is crucial to understand **(1) which network structures are favorable for the development of SIE-initiatives and (2) how these structures can be realized (through self-organization or institutional arrangements).** Following Henry and Vollan (2014) SONNET therefore addresses three main questions which are crucial for the understanding of policy networks.

First, **how do network structures influence the outcomes of SIE-initiatives at the local level?** This contains the following elements:

a) Which structures are observed in the policy networks surrounding SIE-initiatives (e.g. importance of actors, density of relations, and presence of supporting or conflicting relationships)? *(Descriptive network analysis)*

b) How can certain actor constellations enhance or inhibit the development of SIE-initiatives? *(Comparative, quantitative network analysis)*
c) Are patterns identifiable between certain structures and certain outcomes (e.g. are initiatives more successful in diffusing their outreach, when supporting relationships of municipal actors are intense?)

Second, **how do networks around SIE-initiatives at the local level self-organize?** This particularly relates to generating an improved understanding of the rationale behind the creation of relations in the context of SIEs on the local level: Why do people interact with the people they do? Why do they not interact with other actors with whom relations are theoretical possible? *(Quantitative network analysis and qualitative analysis of interview questions).*

Third, **how do institutions shape networks surrounding SIE-initiatives?** Here, we focus on shedding more light on how beneficial network structures can be created (e.g. do successful formats exist in some cities, which allow to close structural gaps by bringing relevant people together?) *(Qualitative analysis of interview questions).*

Power dynamics

Power is one of the most contested concepts in social and political theory. There have been several critical interrogations on the role of power and politics in both fields of social innovation and sustainability transitions (e.g. Shove and Walker, 2007; Moulaert et al, 2007; Hendriks, 2009; Meadowcroft, 200; Voß et al, 2009; Smith and Stirling, 2010; Kern 2011; Hess 2013; Scoones et al., 2015; Brandsen et al, 2016; Ayob et al, 2016). These are often accompanied/ followed by attempts to review literature on power and to synthesize conceptualizations of power in relation to innovation and transformative change (e.g. Grin, 201; Hoffman, 2013; Geels, 2014; Partzsch, 2017; Ahlborg, 2017; Avelino, 2017; Brisbois, 2019; Sovacool and Brisbois, 2019). Several of these studies have focused on the energy sector.

Interestingly, both the concepts of 'transitions' and 'social innovation' have been defined – either implicitly or explicitly – in terms of shifting (power) relations. This makes the understanding of power relations – and how they change – a necessary condition for understanding processes of (transformative) social innovation.

In the broadest sense of the word, we can understand power dialectically as **the relational and structural (in)capacity of actors to mobilise resources and institutions to achieve a goal** (Avelino 2017). SIEs can refer to the resources being mobilised and/or the goals being aspired. As one of the most contested concepts in social and political theory, power definitions range from actor- specific resources used in the pursuit of self-interests (Weber, 1946) to the capacity of social systems to mobilize resources for collective goals (Parsons, 1967). Despite of the many disagreements, most power theorists agree that power is relational.

We can roughly distinguish between the following **types of power relations** (Partzsch, 2017; Avelino 2017):

1. Actors having power *to*
    - more/less power (incl. (in)equality & in/exclusion)
    - different kinds of power (e.g. economic vs. political power, or innovative vs. reinforcive power)
2. Actors having power *over* others (incl. e.g. force, dependency, oppression, exploitation, (in)justice)
3. Actors having power *with* others to achieve collective goals (incl. empowerment)

While there is increasing attention to notions and theories of power in the fields of transition research and energy studies, and – to a lesser extent – in social innovation research, there has not yet been research that explicitly links social innovation in energy transitions in explicit power terms. We would argue this is particularly problematic because much research about innovation and transformative change in the energy sector tends to *implicitly revolve around issues of power*.

This leads us to specify our question for the empirical analysis guiding T2.3 on power dynamics between SIE and dominant institutions to: **How are which power relations impeding and/or enabling SIE, and vice versa?** Power relations in SIE refer to (a) actors having different kinds/levels of power to mobilise SIE-related resources and/or to achieve SIE-related goals (incl. (in)equality and in/exclusion) and/or (b) actors having power over others in SIE-related processes (including dependency, oppression & exploitation), and (c) actors having power with other actors to achieve collective (SIE-related) goals.

This overarching power-related question can be broken down into four aspects. First, which current power relations / structures (of inequality, exclusion, oppression and extractivism) are considered problematic, how, why and to what extent? How and to what extent are these power relations transformed and/or reproduced by SIEs? Second, how are (or have been) existing power relations in the context/ energy system being transformed (challenged, altered, replaced) and/or reproduced by/through/in this SIE? This can also be looked at by asking what were critical turning points in shifting power relations in the journey of this SIE? And what were critical encounters/ critical moments in which an SIE was confronted with/ encountering which dominant institutions? Third, we can further look into how specific power relations are being transformed/reproduced between: a) SIE and 'incumbent' energy actors; b) gender, class, ethnicity, race, age, sexuality...; c) different institutional logics (state, market, community, non-profit); and d) different governance levels (local, regional, national, European). Fourth, a final aspect can be to ask what are and/ or may be the unintended consequences of SIE (specifically in terms of power relations, or drivers of injustice/ exclusion more generally).

Policy mixes and policy dynamics

Over the past decade increasing attention has been given to the role that policy mixes – also referred to as policy packages or policy portfolios - play for sustainable low-carbon transitions in various sectors, such as in energy (Rogge et al., 2017), transport (Givoni et al., 2013), industry (Scordato et al., 2018), agri-food (Kalfagianni and Kuik, 2017) or forestry (Scullion et al., 2016). However, there is no dedicated policy mix study specifically addressing social innovation nor social innovation in energy, as a search in Web of Science, utilizing the search criteria elaborated within SONNET for the construction of the Mendeley database revealed.

However, within SONNET it is assumed that the policy mix literature might be relevant for understanding and analysing socio-political issues in the context of social innovation in energy transitions. This literature acknowledges the complexity of real world climate and energy policy mixes, and its relevance for (system) innovation (Bouma et al., 2019; Rogge and Reichardt, 2016). Correspondingly, such new policy mix thinking in the context of sustainability transitions combines insights from various disciplines (Kern et al., 2019; Quitzow, 2015a), in particular economics (Sorrell and Sijm, 2003), innovation studies (Flanagan et al., 2011) and policy studies (Howlett et al., 2015). It thereby complements the predominant analysis of instrument interactions (Viguie and Hallegatte, 2012) with other important aspects of climate and energy policy mixes.

In the most recent literature broad policy mixes are typically defined as "complex arrangements of multiple goals and means which, in many cases, have developed incrementally over many years." (Kern and Howlett 2009, p. 395) and "as a combination of the three building blocks elements, processes and characteristics [..] Elements comprise the (i) policy strategy with its objectives and principal plans for achieving them and (ii) the instrument mix with its interacting policy instruments. The content of these elements is an outcome of policy processes. Both elements and processes can be described by their characteristics, including the consistency of elements, the coherence of processes, as well as the credibility and comprehensiveness of a policy mix. Finally, the policy mix can be delineated by several dimensions, including policy field, governance level, geography and time." (Rogge and Reichardt 2016, p. 1622f). In SONNET, we adopt the following definition: **Policy mixes of relevance for SIE encompass policy strategies and instrument mixes at different governance levels and policy fields which enable or impede the development of SIE, and have developed incrementally over many years through policy processes.** These policy processes capture the "political problem-solving process among constrained social actors in the search for solutions to societal problems – with the government as primary agent taking conscious, deliberate, authoritative and often interrelated decisions" (Rogge and Reichardt, 2016, 1625).

In SONNET, we engage with the identified lack of a link of the policy mix and the social innovation literature in two main ways.

On the one hand we harness the broad policy mix terminology to support the analysis of SIE developments, with particular attention to the co-evolution between policy mixes and SIE within the energy system. By co-evolution we refer not only to the effect that policy has on SIE, but also on the effect that SIE has on policy (or policy mixes), e.g. through lobbying of empowered SIE actors, equipped with new resources from supportive policy instruments, or through changes in

the socio-technical system leading to new feedback effects. We thereby aim to answer the question of which role policy mixes play in SIE processes, i.e. how the co-evolution between policy mixes and social innovation can help explain SIE dynamics? (see process section).

On the other hand, we focus on the multi-level nature of policy mixes and the role of SIE in policy making: **What is the role of SIE in EU, national, regional and local policy making and how could it be enhanced?** We thereby aim to identify how SIE-initiatives and SIE intermediaries can better connect with and harness policy dynamics at different governance levels (EU, national, regional and local energy policy making.) The underlying hypothesis here is that the voice of SIE in policy making is not as strong as it might need to be for harnessing the future potential of SIE.

For both of these perspectives clear guidance for mapping the policy mix of relevance for SIE is important. For this, we suggest to mainly follow the bottom up approach developed by Ossenbrink et al 2020, taking the selected SIE fields as the impact domain and thus starting point for our policy mix mapping. In addition, for our city-focused analysis we recommend to apply the top down approach to understand which urban policy strategies and instrument mixes have been implemented by our SONNET cities to address SIE. Based on this initial mapping we can investigate the role of SIE in policy making processes and how it could be enhanced.

Summary

In summary, socio-political issues play an important cross-cutting role in SONNET's work. We have therefore formulated the following research questions:

I. How can (novel) governance arrangements encourage the development of SIE?
II. Which policy network structures are favorable for the development of SIE-initiatives and how can these structures be realized through self-organization or institutional arrangements?
III. How are which power relations impeding and/or enabling SIE, and vice versa?
IV. What is the role of SIE in EU, national, regional and local policy making and how could it be enhanced?

6 WORKING PROPOSITIONS ABOUT SIE

Up to here, this report has introduced concepts to be used in researching the diversity, processes and contributions of SIE. In a next step, working propositions are to be formulated. Working propositions should be tentative and preliminary statements about different aspects of SIE diversity, processes and contributions. As such they should form possible answers to specific questions and can relate the concepts to one another. In doing so, they can chart out fields of inquiry to be taken up in SONNET's empirical work.

This section does not yet propose working propositions for SIE, rather it first provides an overview of working propositions that have been developed by scholars working on Transformative Social Innovation. Second, it proposes a process to arrive at a set of relevant working propositions about SIE. This approach was chosen to ensure that these working propositions draw upon the knowledge and expertise of the complete SONNET consortium, and testify to the inter- and transdisciplinary nature of the project.

The working propositions that we suggest to build on are part of the work on Transformative Social Innovation Theory (Avelino et al., 2019; Haxeltine et al., 2017c, 2017a) (see Table 9). TSI-scholars propose a relational framework accompanied by a number of propositions, which "were used to articulate tentative explanations of TSI" (Haxeltine et al., 2017a, p. 5), i.e. explanations of the interrelations and sub-processes of TSI.

Table 9: Working propositions about transformative social innovation

Proposition 1	Social innovation (SI) initiatives provide spaces in which new or alternative values can be promoted and aligned with new knowledge and practices—in a process of reflexive experimentation that supports both members´ motivations and moves towards collective 'success' and 'impact'.
Proposition 2	Manifesting new/alternative interpersonal relations is one pivotal way in which SI actors are able to create the right conditions to challenge, alter, or replace dominant institutions.
Proposition 3	People are empowered to persist in their efforts towards institutional change, to the extent that basic needs for relatedness, autonomy, and competence are satisfied, while at the same time experiencing an increased sense of impact, meaning, and resilience.
Proposition 4	The transformative impacts of SI initiatives depend greatly on the changing tensions within and stability of the action field(s) that they operate in.
Proposition 5	Transnational networks are crucially empowering local SI initiatives.
Proposition 6	Discourse formation and its mediation through communication infrastructures crucially enhances the reach of SI network formation
Proposition 7	SI initiatives need to find an institutional home in order to access vital resources; this often entails a balancing against the desire for independence from (critiqued) dominant institutions.

Proposition 8	SI initiatives employ a diverse range of strategies for bringing about institutional change; they must proactively adapt these strategies in response to changing circumstances, while navigating contestations with dominant institutions, and maintaining their original vision.
Proposition 9	One way in which SI initiatives engage with dominant institutions is by reconsidering the broader institutional logics in which those institutions are embedded; they do this by 'travelling' across different institutional logics, and by reinventing, recombining and transposing specific elements.
Proposition 10	The rise of SI initiatives and the particular transformative ambitions conveyed by them are strongly shaped by the historical development of the wider socio-material context.
Proposition 11	SI initiatives are only innovative against the background of an evolving socio-material context. Activities of innovating and invention present but one historical appearance of TSI, next to other less conspicuously innovative activities of re-invention, advocacy, and contextual adoption.
Proposition 12	Diversity is an integral element of TSI processes, reflecting the historical diversity of the people involved in them, who strive for diverse institutional forms that fit with their differing values, future visions, and present circumstances.

Source: Haxeltine et al. 20017a

In a next step, these are to be discussed and adapted by the consortium in a dedicated session during our next project meeting. Specifically, we will together develop working propositions that relate to each of the building blocks of the draft conceptual framework (diversity, processes and contributions), the different socio-economic, socio-cultural (incl. gender) and socio-political dimensions and their interrelation with socio-technical aspects as well as propositions relating to the role of cities in SIE. In their agreed upon form, these working proposition and the concepts outlined above will serve to guide the ensuing SONNET empirical work. The empirical work will serve to consolidate, substantiate, unpack or interrogate the resulting working propositions and we return to these in the SONNET synthesis deliverable D1.4 at the end of the project.

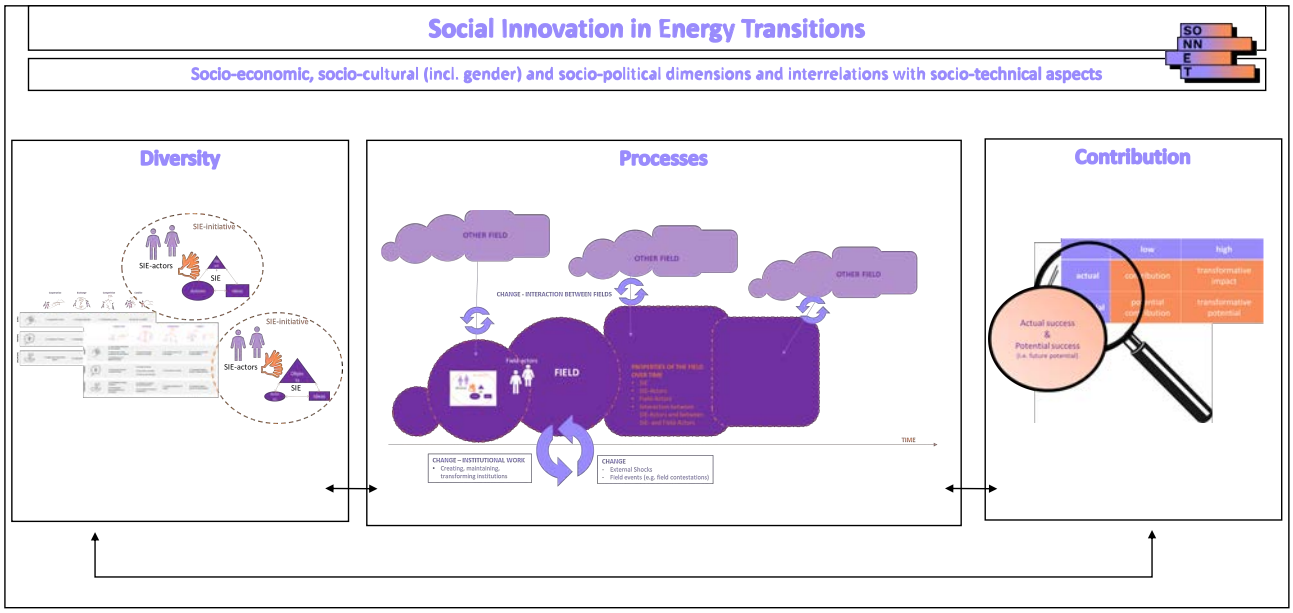
7 CONCLUDING REMARKS AND WAY FORWARD

The concepts introduced in this report are witness to SONNET's focus on the diversity, processes and contributions of social innovation in the energy sector (SIE). Our work up to now testifies to the diversity of SIE – having identified 12 SIE-types and the related 18 empirical clusters. It serves to inform our sampling for the empirical work – in each of the empirical work packages, the focus will be on one or several of the identified SIE-clusters. It will allow to interrogate, question, or substantiate our understanding of these SIE-clusters and types.

A second focus of SONNET is on the processes of SIE and specifically the emergence and development of SIE within SIE-fields. The proposed conceptual framework allows us to investigate this unfolding process paying attention to how actors create, maintain and/or transform institutions and how they are enabled or impeded in doing so.

Finally, we aim to understand the contributions of SIE – actual and potential and differing degrees. Here our empirical focus will be mainly on understanding the success of SIE-initiatives against a set of goals and the future potential of SIEs in terms of their potential for scaling and diffusion. Figure 13 provides a draft conceptual framework as a basis for our future empirical work.

Figure 13: Overview of draft SONNET Conceptual framework



As emphasized at several occasions, this conceptual framework is a draft and there is work ahead not only in empirical unpacking and substantiating, thereby informing the revisions due in D1.4. The harvesting of empirical insights regarding working propositions and concepts across SONNET partners and work packages will be done through a dedicated mechanism of 'inter- and transdisciplinary dialogues' that will take place at each consortium meeting. These dialogues will also support the need for further integration between the different perspectives since this is a task that can only be done in concert by all SONNET partners. Finally, we also intend to further embed our conceptual framework in the different literatures of relevance for SONNET; while we have provided some solid basis here, this will be an ongoing task in the time to come.

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Appendix 1: Empirical Clusters of Social Innovation in the Energy Sector

Cluster	*Name*	Type of interaction	Manifes-tation	Description	2-3 iconic examples
1	***Local energy production and consumption***	Cooperation	Doing	This cluster is centred around multi-actor ownership structures and business models for the generation/ supply of electricity from renewable energy sources, initiated by the public and/ or non-profit sector. Shared concepts: - Focus on local and/ or regional environment; - Often utilities co-owned by public parties (municipality, regional authority, national government, etc) and non-profit sector (NGOs, community energy organizations, etc); - Offering electricity and/ or heat. Activities include: - Supplying electricity/ heat from renewable energy sources (i.e. PV, wind). Relation to other clusters: - Cluster 2 refers to community-led initiatives, whereas Cluster 1 is driven by multi-actor partnerships.	*Tegenstroom: Local RE utility with public-private co-ownership (#129, The Netherlands)* *BürgerEnergieGenossenschaft Wolfhagen eG: Local RE utility with public-community co-ownership (#469, Germany)* *Green City AG: RE utility through non-profit ownership (#471, Germany)*
2	***Cooperative energy production & consumption***	Cooperation	Doing	This cluster is centred around cooperative business models around the generation/ supply of electricity from renewable energy sources, initiated by community-led energy cooperatives. It is a sub-cluster of cluster 1, local energy production and consumption (singled out because of its prevalence). Shared concepts: - Non-profit orientation; - Initiated by community-led energy organizations engaged in electricity generation/supply (i.e. cooperatives, community benefit societies, etc); - Often focus on local and/ or regional environment; - Offering electricity and/ or heat. Activities include: - Supplying electricity/ heat from renewable energy sources (i.e. PV, wind). Relation to other clusters: - Cluster 1 is driven by multi-actor partnerships, whereas Cluster 2 refers to community-led initiatives.	*Sandford Hydro: Cooperative management of community energy (#64, United Kingdom)* *NDSM energie: Cooperative management of community energy for businesses (#121, The Netherlands)* *123 soleil: Cooperative management of community energy (#288, France)*
3	***Collaborative eco-efficient housing***	Cooperation	Doing	This cluster is centred around neighbourhoods and communities involved in efficient energy consumption. Shared concepts: - Initiated by developers, associations, communities and/ or municipalities; - Focused on energy savings within housing; - Often formally managed through housing organizations. Activities include: - Consuming energy efficiently by communities (i.e. through insulation of houses); - Developing energy efficient housing complexes (i.e. by developers). Relation to other clusters: - Cluster 2 is mainly focused on generating electricity, whereas Cluster 3 focuses on energy savings in housing. - Cluster 4 are neighbourhoods/ labs engaged in exchanging electricity, whereas Cluster 3 are neighbourhoods/ communities only engaged with efficient consumption (often coupled with electricity generation).	*Vereniging Aardehuis: Eco-efficient housing and energy prosumerism with sociocratic governance (#3, The Netherlands)* *Nieuw Zuid: Development project for eco-efficient housing (#158, Belgium)* *Le village vertical de villeurbanne: Collaborative eco-efficienct housing (#447, France)*

Cluster	Name	Type of interaction	Manifes-tation	Description	2-3 iconic examples
4	***Local peer-to-peer electricity exchange***	Exchange	Doing	This cluster is centred around neighbourhoods and communities involved in exchanging electricity locally. Shared concepts: - Exchange of electricity between different households; - Focused on the local/ regional environment; - Initiated and driven by multi-actor partnerships (community, DSO, municipality, energy utility, etc.); - Often framed as experimental to create space within institutional context (i.e. as city labs, living labs or experiments); - Often using bitcoin and/ or smart technology to allow peer-to-peer exchange. Activities include: - Exchanging electricity; - Often combined with the generation and/ or storage of electricity. Relation to other clusters: - Cluster 14 can also include living labs, but they are focused on a broad range of topics, whereas Cluster 4 is focused on exchanging electricity; - Cluster 3 is focused on saving energy, whereas Cluster 4 is focused on exchanging electricity; - Cluster 2 is focused on generating electricity, whereas Cluster 4 is focused on exchanging electricity.	*Jouliette: Local electricity exchange through locally organized electricity grid (#1 , The Netherlands)* *West Sussex County Council BISEPS project: Local electricity exchange through locally organized electricity grid in city lab (#27 , United Kingdom)* *Living Lab Walldorf: Local electricity exchange through locally organized electricity grid in city lab (#183 , Germany)*
5	***For profit services and technologies***	Competition	Doing	This cluster is centred around novel competitive services and business models to supply/ generate/ install (sustainable) energy, initiated by companies and start-ups. Shared concepts: - For-profit orientation; - Initiated by company or start-up; - Offer technology and/ or service, often around data and automation; - Catering to customers. Activities include: - Installing/ implementing technology for (sustainable) energy (i.e. installing PV panels on community energy roofs); - Delivering technology-based service (e.g. battery as-a-service business model); - Supplying electricity with novel contract (e.g. increased contract flexibility) - Delivering automation and/ or smart solutions (e.g. automation software to optimize electricity consumption). Relation to other clusters: - Cluster 1 and Cluster 2 are also engaged with the generation/ supply of electricity, but they are cooperatively managed and run using other legal forms. - Greater focus on technological innovation used to create services .	*WeKa Daksystemen: For-profit RE technology to insulate roofs for energy savings (#97, The Netherlands)* *Change!Energy: For-profit RE utility with transparency on guarantee of origin (#201, Germany)* *Free Volt: For-profit smart RE installation to democratize the energy market (#33, Poland)* *Sponti-Car: For-profit leasing business model for mobility (#445, Switzerland)* *Plüm energie: For-profit RE utility with insight into guarantees of origin (#451, France)* *Clean Energy Global: For-profit leasing business model for batteries (#461, Germany)*
6	***Action against specific energy pathways***	Conflict	Doing	This cluster is centred around direct action campaigns against specific energy pathways. Shared concepts: - Focused on protesting against a certain energy practice; - Driven by movements, informal groups and grassroots organizations; - Actions have physical ramifications on generation/ supply of energy system (i.e. by blocking/ barricading/ destroying coal plants). Activities include: - Protesting against energy practice (i.e. fossil fuels, nuclear or smart technology). Relation to other clusters: - Cluster 12 is also at conflict with specific energy pathways, but has no physical implications on energy supply/ generation.	*Coal Action Network: Direct action campaign to close coal mines (#33, United Kingdom)* *Frack Off, Extreme Energy Action Network: Direct action campaign to stop fracking (#34, United Kingdom)* *Obóz dla Klimatu: Action against human and environmental exploitation specifically new coal mines (#334, Poland)*

Cluster	Name	Type of interaction	Manifes-tation	Description	2-3 iconic examples
7	***Advocacy for specific energy pathways***	Cooperation	Thinking	This cluster is centred around campaigns promoting certain energy pathways. Shared concepts: - Advocating a certain shared goal; - Driven by communities, multi-actor constellations and coalitions; - Often through campaigns and/ or lobbying; - Topics include fuel poverty, energy savings, diversity and gender issues. Activities include: - Advocating for a certain energy practice (i.e. decentralized electricity generation); - Lobbying for a certain political agenda or societal discourse (i.e. against fuel poverty). Relation to other clusters: - Clusters 8 - Clusters 10 are also involved in conveying and/ or facilitating a certain discussion, but Cluster 7 is more normative in their outset, aiming to advocate a certain pathway.	*Community Energy Coalition: Coalition of community energy initiatives to lobby for government support (#28, United Kingdom)* *Vrouwen in Energie Noord Nederland (VIEN): Social network lobbying for diversity and inclusion (#148, The Netherlands)* *Allianz Atomausstieg: Campaign for nuclear phase-out (#419, Switzerland)*
8	***Energy education***	Exchange	Thinking	This cluster is centred around educating, training, advising and learning about diverse topics around (sustainable) energy. Shared concepts: - free of charge/ externally funded; - The main goal is to train/ educate others, with a clear difference in hierarchy (teacher vs student); - This often includes a social goal (increasing inclusivity or decreasing energy poverty); - Topics include energy savings, emission reductions and renewable energy; - Transferred through workshop, training, education programme, forum or toolkit; - Initiated by diverse actors (i.e. utilities, municipalities, networks, etc); - Aimed at educating students or citizens (to facilitate energy savings and raise awareness), minorities (to train skills and increase power in labour market), or prosumers (installing RE, managing RE, etc) Activities include: - Non-profit education and knowledge transfer (i.e. through an education program on energy poverty). Relation to other clusters: - Cluster 9 and Cluster 10 also aim to transfer knowledge, but Cluster 9 is specifically based on non-profit advisory, not education, and Cluster 10 is engaged with facilitating dialogues and peer-to-peer learning (no hierarchy in knowledge).	*Summerschool Energiearmoede: Municipal-led summer school on energy poverty (#145, The Netherlands)* *3malE: Utility company educating children on energy topics (#194, Germany)* *Workshop - smart grids energy and big data analytics: Free workshop on smart grid and big data (#506, Luxembourg)*
9	***Non-profit consulting***	Exchange	Thinking	This cluster is centred around non-profit consultancy for (sustainable) energy. Shared concepts: - Non-profit orientation; - Offering advisory service on diverse topics, though often around energy savings in housing; - With one party having the power/ knowledge to make recommendations, and the other to take action accordingly; - Driven by community-led organizations, municipalities, NGOs, etc; - Often targeting communities and households; - Service, advisory or information is offered without a paywall (free). Activities include: - Providing advisory (i.e. on energy savings). Relation to other clusters: - Cluster 11 also offers advisory, but it has a for-profit orientation, whereas Cluster 9 is non-profit; - Cluster 8 is also focused on spreading energy literacy, but it specifically focused on education (i.e. through workshops), whereas initiatives underlying Cluster 9 position themselves as consultancy	*Community Energy Scotland: Non-profit advisory and support on representation and knowledge for community energy (#23, United Kingdom)* *Centrales villageoises: Association-led advisory on community energy (#285, France)* *Noé21: Non-profit consultancy on energy transition by civil-society (#493, Switzerland)*

Cluster	Name	Type of interaction	Manifes-tation	Description	2-3 iconic examples
10	***Peer to peer learning***	Exchange	Thinking	This cluster is centred around peer-to-peer learning about diverse topics around (sustainable) energy. Shared concepts: - Non-profit orientation; - The aim is to learn through peer-to-peer relations, rather than expert-lay learning; - Topics include energy savings, emission reductions and general renewable energy; - Transferred through workshop, training, education programme, forum or toolkit; - Initiated by companies, government, non-profits or communities; - Can be informal (i.e. energy coaches, carbon conversations, fora, online platforms, etc); - Can aim to accelerate the energy transition through peer-to-peer conversations. Subgroups that emerge from the data: - A: Offline network or group discussion hosted in the physical space; - B: Online platform or forum where members can exchange experiences and knowledge online. Activities include: - Non-profit peer-to-peer education and knowledge transfer (i.e. through carbon conversations amongst citizens). Relation to other clusters: - Cluster 8 also focuses on knowledge transfer, but Cluster 10 specifically focuses on peer-to-peer exchanges, rather than expert-lay learning.	*Samen-Sneller-Duurzaam: Network for peer-to-peer learning to accelerate energy transition (#116, The Netherlands)* *Forum Synergiewende: Online forum for peer-to-peer learning to accelerate energy transition (#193, Germany)* *Conversations carbone: Facilitated conversations for peer-to-peer learning on reducing emissions (#491, Switzerland)*
11	***For-profit consulting***	Competition	Thinking	This cluster is centred around expert consultancy for (sustainable) energy. Shared concepts: - For-profit orientation; - Offering expert advisory service on diverse topics (i.e. legal support, energy savings advice, smart grid advisory, etc); - Driven by for-profit consultancies and think-tanks; - Service, advisory or information is offered behind paywall (not free). Activities include: - Providing advisory (i.e. on legal/ administrative matters around electricity generation). Relation to other clusters: - Cluster 9 also offers advisory, but it is freely accessible, whereas Cluster 11 is restricted by a 'paywall'.	*Lux Nova Partners: Expert advisory service on legal topics of renewable energy (#26, United Kingdom)* *Instytut Energetyki Odnawialnej (IEO): Expert advisory on renewable energy through think-tank (#427, Poland)* *energie experten: Expert advisory on energy savings through civil-society experts (#464, Germany)*
12	***Campaigns against specific energy pathways***	Conflict	Thinking	This cluster is centred around opposing narratives against specific energy pathways through peaceful opposition, lobbying and/ or campaigns. Shared concepts: - Focused on protesting against a certain energy practice; - Driven by multi-stakeholder collaborations, associations, NGOs and grassroots organisations; - Often through campaigns and/ or peaceful opposition, aiming to push a certain framing or narrative. Activities include: - Protesting against energy practice (i.e. fossil fuels, nuclear or smart technology); - Lobbying for a certain political agenda or societal discourse (i.e. anti-smart meters). Relation to other clusters: - Cluster 6 is also at conflict with the mainstream energy pathways, but has physical implications on energy supply/ generation (e.g. barricading/ destroying coal plants); - Cluster 7 aims to promote certain pathways, whereas Cluster 12 frames themselves as opposing / against a certain pathway and/ or practice.	*POAL (Plateforme opérationelle anti-linky): Platform against smart meters by civil-society (#304, France)*

Cluster	Name	Type of interaction	Manifes-tation	Description	2-3 iconic examples
13	***Participatory energy dialogues***	Cooperation	Organising	This cluster is centred around organising dialogues between actors on (sustainable) energy, initiated by the community or public actors. Shared concepts: - Aim to create a shared understanding; - Organising a space for dialogue and deliberation; - Often initiated by community-led or public actors (i.e. transition towns, municipalities, etc); - Often focus on the local and/ or regional environment; - Topics range from energy savings, general energy topics, urban climate policies, electricity grids, etc. Activities include: - Facilitating a dialogue (i.e. engaging citizens in urban policies through policy deliberation). Relation to other clusters: - Cluster 10 is focused on peer-to-peer learning, whereas Cluster 13 is focused on deliberation and finding a shared discourse.	*Bürgerdialog Stromnetz: Dialogue involving citizens on expansion of electricity grid (#207, Germany)* *Warszawski Panel Klimatyczny: Representative citizen panel for deliberating about urban climate policy (#356, Poland)* *Convention citoyenne pour le climat: Randomized citizen assembly for deliberating about reduction for greenhouse gas emissions (#384, France)*
14	***Participatory experimentation and incubation***	Cooperation	Organising	This cluster is centred around organising experimentation and incubation of ideas and/ or technology through multi-actor constellations. Shared concepts: - Facilitate a space to develop/ ideate an idea and/ or technology; - Driven by multi-actor constellations; - Aiming to test and demonstrate technical or social experiments around (sustainable) energy; - Often aiming to catalyse and/ or accelerate innovation. Activities include: - Facilitating space to test experiments/ ideas (i.e. technology for sustainable energy).	*The green village: Living lab to test and demonstrate technical solutions (#154, The Netherlands)* *Stadslab2050: Living lab addressing societal challenges (#164, Belgium)* *South Poland Cleantech Cluster: Cluster of companies aiming for regional sustainable development (#344, Poland)*
15	***Platforms for direct energy transactions***	Exchange	Organising	This cluster is centred around marketplaces facilitating peer-to-peer electricity exchanges. Shared concepts: - Facilitating peer-to-peer exchanges of sustainable energy (e.g. electricity, biogas, etc); - Through software and online marketplaces (e.g. platform displaying suppliers to customers); - Facilitated by a single actor; - Can use bitcoin and/ or smart technology to allow peer-to-peer exchange. Activities include: - Facilitating exchanging electricity (e.g. through an online platform). Relation to other clusters: - Cluster 4 concerns the physical exchange of electricity (e.g. in a neighbourhood), whereas Cluster 15 concerns the facilitation of these exchanges (e.g. through software).	*Vandebron: Online marketplace to connect consumers and producers of RE (#92, The Netherlands)* *Powerpeers: Online marketplace to connect consumers and producers of RE (#143, The Netherlands)* *ILEK: Online marketplace connecting hydropower/biogas suppliers with households (#275, France)*
16	***Investment and finance mechanisms***	Exchange	Organising	This cluster is centred around facilitating investments in (sustainable) energy. Shared concepts: - Facilitating/ offering financing from private sources (e.g. through crowdfunding); - Driven by companies, public, NGOs or community actors (e.g. foundation, municipality, national government); - To facilitate return on investment to shareholders and/ or investors. Activities include: - Facilitating/ offering financing from private or public sources (e.g. through crowdfunding or a subsidy).	*Postcoderoosregeling: National subsidy to stimulate community energy locally (#167, NL)* *Sunraising: Association facilitating citizen investement in and supply from PV (#233, Switzerland)* *enerfip: Platform facilitating crowdfunding of renewable energy projects (#281, France)*

Cluster	*Name*	Type of interaction	Manifes-tation	Description	2-3 iconic examples
17	***Energy gamification & nudges***	Competition	Organising	This cluster is centred around changing behaviour through play, nudges or gamification. Shared concepts: - Competitive element; - Changing behaviour is often the main goal; - Topics include energy savings, and general sustainable behaviour; - Reward of competition might be financial; - Often embodied in competition-driven app, board game, label or award; - Often initiated by municipalities and non-profits. Activities include: - Organising a competition around behaviour change (e.g. energy savings competition amongst students); - Providing a label for best-performing objects and/ or actors (e.g. label for energy performance of house); - Nudging users to change behaviour (e.g. through app changing energy consumption)	*jeu de l'oie sur les énergies: Board game facilitating energy savings playfully (#300, France)* *Energiestadt Label: Label awarding municipalities with above-average efforts in energy policy (#420, Switzerland)* *Déclics: Playful nudging program for energy savings (#489, France)*
18	***Networks against specific energy pathways***	Conflict	Organising	This cluster is centred around coalitions and networks of actors joining forces against specific energy pathways through peaceful opposition, lobbying and/ or campaigns. Shared concepts: - Focused on protesting against a certain energy practice; - Often aim to strengthen position through joined forces; - Driven by multi-stakeholder collaborations, associations, NGOs and grassroots organisations; - Often through campaigns and/ or peaceful opposition, aiming to push a certain framing or narrative. Activities include: - Facilitating protest against energy practice (e.g. platform against open-cast coal mining). Relation to other clusters: - Cluster 6 is also at conflict with the mainstream energy pathways, but has physical implications on energy supply/ generation (e.g. barricading/ destroying coal plants); - Cluster 12 is advocating an alternative energy pathway from a single organization, whereas Cluster 18 is facilitating other actors to advocate alternative energy pathways together.	*Freie Landschaft Schweiz: Online platform facilitating dialogue on effect of wind turbines on landscape quality (#416, Switzerland)* *Zielona Transformacja Śląska: Coalition of associations facilitating collaborative opposition of open-cast mining (#433, Poland)*

APPENDIX 2: EC SUMMARY REQUIREMENTS

Changes with respect to the DoA

There are no changes in scope and content of the deliverable.

Dissemination and uptake

This deliverable provides the conceptual foundation of the empirical work conducted by all SONNET partners and will be drawn upon for the topic guides. Based on SONNET's empirical findings the conceptual framework will be refined and submitted for publication in a peer-reviewed journal. The SIE typology and clustering that has been further developed from D1.1 is also used in SONNET's dissemination activities, e.g. in webinars and a project video. The underlying database of 500 SIE initiatives will be further refined in the continuing empirical work, and is intended to be openly shared on the platform Zenodo towards the end of the project.

Short Summary of results (<250 words)

This report develops a **draft conceptual framework** for the study of diversity, processes and contributions of social innovation in energy (SIE).

Our work included in this report testifies to the diversity of SIE – having identified 12 SIE-types and the related 18 empirical clusters. This typology serves to inform our sampling for the empirical work – in each of the empirical work packages the focus will be on one or several of the identified SIE-clusters. It will allow to interrogate, question, or substantiate our understanding of these SIE clusters and types.

A second focus of SONNET is on the processes of SIE and specifically the emergence and development of SIE within SIE-fields. The proposed conceptual framework allows us to investigate this unfolding process paying attention to how actors create, maintain and/or transform institutions and how they are enabled or impeded in doing so.

Finally, we aim to understand the contributions of SIE – actual and potential and differing degrees. Here our empirical focus will be mainly on understanding the success of SIE-initiatives against a set of goals and the future potential of SIEs in terms of their potential for scaling and diffusion.

Evidence of accomplishment

This deliverable and associated documents.