PROSEU

Prosumers for the Energy Union: mainstreaming active participation of citizens in the energy transition

Review and characterisation of collective renewable energy prosumer initiatives

(Deliverable N°2.1)

Horizon 2020 (H2020-LCE-2017)
Grant Agreement N°764056

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°764056. The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the funding authorities. The funding authorities are not responsible for any use that may be made of the information contained therein.

Lead partner for deliverable	University of Porto /UPORTO
Document type	Report
Due date of deliverable	30.04.2019
Actual submission date	15.05.2019
This version (minor corrections)	28.06.2019
Dissemination level	Public (PU)
Author(s)	Lanka Horstink (UPORTO), Guilherme Luz (FC.ID), Mark Soares (UPORTO) & Kiat Ng (UPORTO)
Reviewer	Swantje Gährs (IÖW)
Contributor(s)	Inês Campos (FC.ID), Esther Marín (FC.ID), Julia Wittmayer (DRIFT), Sem Oxenaar (DRIFT), Marta Toporek (CLIENTEARTH), Kristian Petrick (ECO-UNION); Swantje Gährs (IÖW); Lars Holstenkamp (LEUPHANA); Moritz Ehrtmann (LEUPHANA); Tomislav Novosel (UNIZAG); Tomislav Puksec (UNIZAG); Thijs Scholten (CE DELFT); Donal Brown (ULEEDS); Mireia Reus (ECOUNION); Arthur Hinsch (ICLEI); Silvia Assalini (ICLEI)

Cite as: Horstink, L.; Luz, G.; Soares, M. & Ng, K. (2019). *Review and characterisation of collective renewable energy prosumer initiatives.* PROSEU-Prosumers for the Energy Union: Mainstreaming active participation of citizens in the energy transition (Deliverable N°2.1). Horizon 2020 (H2020-LCE-2017) Grant Agreement N°764056.

Summary of PROSEU

PROSEU aims to enable the widespread adoption of the renewable energy *prosumer* phenomenon in Europe, as a key condition for the Energy Union. Prosumers of renewable energy sources (RES) are active energy users who both consume and produce energy from renewable sources. The growth of RES prosumerism all over Europe challenges current energy market structures and institutions. PROSEU's research focuses on collective forms of RES prosumers and will investigate how these are influencing and interacting with new business models, market regulations, infrastructures, technology scenarios and energy policies across Europe. Besides surveying collective RES prosumer initiatives, the transdisciplinary research team will work together with a selection of them (15 Living Labs), as well as policymakers and other stakeholders from nine countries, following a quasi-experimental approach to learn how RES prosumer initiatives of all types are dealing with the challenges, and to determine what incentive structures will enable the mainstreaming of RES prosumerism, while safeguarding citizen participation, inclusiveness and transparency. Moving beyond a case-by-case and fragmented body of research on RES prosumers, PROSEU will build an integrated knowledge framework for a socio-political, socioeconomic, business as well as financial, technological, socio-technical and socio-cultural understanding of RES prosumerism and coalesce into a comprehensive identification and assessment of incentive structures for its mainstreaming in the context of the energy transition.

Summary of PROSEU's Objectives

Eight key objectives at the foundation of the project's vision and work plan:

- **Objective 1:** Document and analyse the current state of the art with respect to (150-200) RES prosumer initiatives in Europe.
- **Objective 2:** Identify and analyse the regulatory frameworks and policy instruments relevant for RES prosumer initiatives in nine participating Member States.
- **Objective 3:** Identify innovative financing schemes throughout the nine participating Member States and the barriers and opportunities for RES prosumer business models.
- **Objective 4:** Develop scenarios for 2030 and 2050 based on in-depth analysis of technological solutions for RES prosumers under different geographical, climatic and socio-political conditions.
- **Objective 5:** Discuss the research findings with 30 relevant stakeholders in a Participatory Integrated Assessment and produce a roadmap (until 2030 and 2050) for mainstreaming RES prosumerism.
- **Objective 6:** Synthesise the lessons learned through experimentation and co-learning within and across Living Labs.
- **Objective 7:** Develop new methodological tools and draw lessons on how the PROSEU methodology, aimed at co-creation and learning, can itself serve as an experiment with institutional innovation.
- **Objective 8:** Create a RES prosumer Community of Interest.

PROSEU Consortium Partners

Logo	Organisation	Type	Country
	FCIENCIAS.ID	Private non-profit association	Portugal
	UPORTO	University	Portugal
	ICLEI EURO	Small and medium-sized enterprise	Germany
	CLIENTEARTH	Non-governmental organisation	United Kingdom
	UNIVLEEDS	University	United Kingdom
	DRIFT	University	the Netherlands
	UNIZAG FSB	University	Croatia
	LEUPHANA	University	Germany
	ECO-UNION	Non-governmental organisation	Spain
	IÖW	Private non-profit limited company	Germany
	CE Delft	Small and medium-sized enterprise	the Netherlands

Table of contents

List of tables

List of figures

List of abbreviations

- CHP Heat and power co-generation
- DSO Distribution System Operator
- EC European Commission
- EU European Union
- FiT Feed-in Tariff
- GDPR General Data Protection Regulation
- NECP National Energy and Climate Plans
- NRA National Regulatory Authority
- RECom Renewable energy community
- RED II Renewable Energy Directive, recast in 2018
- RES Renewable energy sources
- TSO Transmission System Operator

Glossary

- **Aggregator:** a demand service provider that combines multiple short-duration consumer loads for sale or auction in organised energy markets (Directive 2012/27/EU: European Parliament and Council, 2012). Also defined as "a market participant that combines multiple customer loads or generated electricity for sale, for purchase or auction in any organised energy market" (2017 recast proposal for a new EU Electricity Directive: European Commission, 2017b).
- **Active customer:** a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity (2017 recast proposal for a new EU Electricity Directive).
- **District heating or District cooling**: the distribution of thermal energy in the form of steam, hot water or chilled liquids, from central or decentralised sources of production through a network to multiple buildings or sites, for the use of space or process heating or cooling (RED II Directive: European Parliament and Council, 2018) .
- **Demand response:** the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including time-variable electricity prices or incentive payments, or in response to acceptance of the final customer's bid, alone or through aggregation, to sell demand reduction or increase at a price in organised markets as defined in Commission Implementing Regulation (EU) No 1348/2014.
- **Dynamic electricity price contract:** an electricity supply contract between a supplier and a final customer that reflects the price variation at the spot market, including at day ahead and intraday markets, at intervals at least equal to the market settlement frequency (2017 recast proposal for a new EU Electricity Directive).
- **Electricity Market**: over-the-counter market and electricity exchanges for trading energy, capacity, balancing and ancillary services in all timeframes, including forward, day-ahead and intra-day markets (Recast Electricity Directive).
- **Energy from renewable sources or Renewable energy:** energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas (RED II Directive).
- **ESCo:** Energy Service Company, according to the European Commission this is a new intermediary in the changing energy market, different from the traditional energy consultants, equipment suppliers or energy utilities. They have evolved in response to the growth in renewable energy production, including prosumerism and may mediate between entities interested in prosuming and the financiers, project developers and energy utilities.(Joint Research Centre (EC), 2019)
- **Feed-in-Tariffs**: a policy mechanism designed to accelerate investment in renewable energy technologies. Under a feed-in tariff, eligible renewable electricity generators, including homeowners, business owners, farmers and private investors, are paid a cost-based price for the renewable electricity they supply to the grid. This enables diverse technologies (wind, solar, biogas, etc.) to be developed and provides investors a reasonable return. The tariff (or rate) may differ by technology, location (e.g. rooftop or ground-mounted for solar PV projects), size (residential or commercial scale) and region. The tariffs are typically designed to decline over time to track and encourage technological change. FiTs typically offer a guaranteed purchase agreement for long (15–25 year) periods.[1]
- **Jointly acting renewables self-consumers**: a group of at least two jointly acting renewables self-consumers in accordance with point (14) [of the RED II Directive, defining "renewables self-consumer"] who are located in the same building or multi-apartment block (RED II Directive).
- **License**: an official permit for an energy installation for contracting, operation, access to the grid (will vary according to the national law in place).
- **Net Metering**: allows consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. Monthly net metering allows consumers to use solar power generated during the day at night, or wind from a windy day later in the month. Annual net

1 Wikipedia: https://en.wikipedia.org/wiki/Feed-in_tariff

metering rolls over a net kilowatt credit to the following month, allowing solar power that was generated in July to be used in December, or wind power from March in August.[2]

- **Peer-to-Peer**: "peer-to-peer trading" of renewable energy means the sale of renewable energy between market participants by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction, either directly between market participants or indirectly through a certified third-party market participant, such as an aggregator (RED II Directive).
- **Prosumer (in energy)**: the European Commission generally does not use this term, but it appears to equate the concept with its idea of an active customer and/or renewables self-consumer (see respective definitions in this glossary), as defined in the recast Electricity Directive and the RED II Directive. A 2016 review of prosumer collectives defines an energy prosumer as "a consumer of energy who also produces energy to provide for their needs, and who in the instance of their production exceeding their requirements, will sell, store or trade the surplus energy" (Ford, Stephenson, & Whitaker, 2016). This review alone mentions 20 definitions of prosumers, but doesn't touch upon the different interpretations in different legislations in EU countries.
- **RES Prosumer Initiative**: in the PROSEU study a RES Prosumer Initiative is a collective energy actor that produces energy from renewable sources with the primary objective of providing in its own energy needs and/or those of its members, and in some cases selling excess energy to clients, thereby actively participating in the energy markets. Examples of such a collective energy actor are: cooperatives; informal collectives; not-for-profit organisations (including socio-cultural or sports associations and NGO's); companies in different sectors; public institutions (whether municipalities or schools and retirement homes) and public-private or other forms of partnerships.
- **Renewable energy community (according to the EU)**: This is a legal entity:
    a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
    b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;
    c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits. (RED II Directive)

  In the **REScoop model** (see below), community power or community energy initiatives are judged by higher standards, namely: 1. Voluntary and Open Membership; 2. Democratic Member Control; 3. Economic Participation through Direct Ownership; 4. Autonomy and Independence; 5. Education, Training and Information; 6. Cooperation among Cooperatives; 7. Concern for Community.[3]
- **Renewable Energy cooperatives:** According to the European Renewable Energy Cooperative Federation, REScoop, an energy cooperative "refers to a business model where citizens jointly own and participate in renewable energy or energy efficiency projects." (see previous note)
- **Renewable energy obligation:** a support scheme requiring energy producers to include a given share of energy from renewable sources in their production, requiring energy suppliers to include a given share of energy from renewable sources in their supply, or requiring energy consumers to include a given share of energy from renewable sources in their consumption, including schemes under which such requirements may be fulfilled by using green certificates (RED II Directive).
- **Renewable power purchase agreement**: a contract under which a natural or legal person agrees to purchase renewable electricity directly from an electricity producer (RED II Directive).
- **Renewables self-consumer**: a final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity (RED II Directive).

2 Wikipedia https://en.wikipedia.org/wiki/Net_metering

3 https://www.REScoop.eu/the-REScoop-model

- **Self-consumption:** activities specific for self-consumers (as described in the definition of a renewables self-consumer).
- **SME:** a micro, small or medium-sized enterprise as defined in Article 2 of the Annex to Commission Recommendation 2003/361/EC (RED II Directive).
- **Support scheme**: any instrument, scheme or mechanism applied by a Member State, or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased, including but not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and sliding or fixed premium payments (RED II Directive).
- **Surplus renewable energy**: self-generated renewable energy, which is not self-consumed.

Executive summary

Responding to Objective 1 of the PROSEU project, Deliverable 2.1 (D2.1) establishes a baseline review and characterisation of renewable energy sources (RES) prosumer initiatives across Europe, which other PROSEU work packages (WP) can subsequently build on. Based on highly collaborative work carried out under Task 2.1 and 2.2 of WP2, this report shares interdisciplinary insights on the current state of play for collective forms of prosumer initiatives in Europe using a mix of qualitative and quantitative methods. Guided by grounded theory, the main theories applied in WP2 include sustainability, (energy) transition theories, theories of incentive structures, and theories of social innovation. Building on literature review in related fields (e.g. sustainability, energy systems, (transformative) social innovation, community-based initiatives, energy democracy and -poverty), document analysis of available data, as well as methodologies and findings drawn from past and current European Union (EU)-funded research projects in related fields (e.g. ENABLE.EU, ENERGISE, ENTRUST, TESS, TRANSIT, PATHWAYS, SI DRIVE), this report presents an overview of the unfolding of the RES prosumer phenomenon across nine EU Member States (the United Kingdom (UK), the Netherlands, Germany, Belgium, France, Italy, Croatia, Spain, and Portugal).

General country-scale RES prosumerism background data were synthesised into individual "country fact sheets" for the EU as a whole, as well as for each of the nine Member States, to sketch the different RES environments that encourage or deter the growth of prosumer initiatives, while the disparities and similarities of the characteristics and challenges of collective prosumer initiatives across the nine EU countries were abstracted from a self-administered online survey launched in these countries in eight languages. A RES prosumer initiative in the PROSEU study is defined as "a collective energy actor that produces energy from renewable sources with the primary objective of providing in its own energy needs and/or those of its members, and in some cases selling excess energy to clients, thereby actively participating in the energy markets." To ensure that survey results are representative of the diverse types of collective RES prosumer initiatives within each country, a criteria-based stakeholder database was created and a stratified sample of almost 1,000 RES initiatives were contacted personally by PROSEU partners in each of the countries. With a relatively high overall response rate of 21.8%, corresponding to 198 respondents, the survey task achieved the upper-end goal of obtaining data from 150-200 collective prosumer initiatives. Through iterative collaboration among different work packages and country partners, and with the objective of collecting data to support WP3, 4, 5 & 6, which will respectively explore policy and legal structures, finance and business models, scenarios for RES

technology options, and possible incentive structures for mainstreaming prosumer initiatives, the survey shed light on the following aspects of the collective forms of RES prosumer initiatives across nine EU Member States: general demographics; RES technologies used; governance/organisational structures; forms of financing; motivations/ambitions; and perceived hindering and facilitating factors (technological, regulatory, political, socio-cultural, financial).

RES prosumers, also referred to as "self-consumer" as defined by the European Commission (EC), play a strategic role in the EU's clean (and fair) energy transition, especially considering its ambitious aspiration of not only living up to the Paris agreement but actually leading the global clean energy transition. Recent legislative acts by the EC, such as RED II (recast of the Renewables Directive), the new Governance Regulation of the Energy Union and Climate Action, the new Energy Efficiency Directive as well as the recast of the Electricity Directive (pending adoption), point to increasing recognition of the role of RES prosumers. Three forms of RES prosumerism are defined in the new RED II Directive: the renewables self-consumer, jointly acting renewables self-consumers and the renewable energy community. Focusing on collective forms of prosumer initiatives and aiming to guide the survey sampling task, our preliminary database analysis identified five main (collective) RES prosumer actor types: energy cooperatives; renewable energy communities; organisational prosumers (public, not-for-profit, and business); property sector; and other collective forms that do not belong to any of the above-mentioned actor types and are not necessarily prosumers themselves (e.g. peer-to-peer platforms and aggregators).

Survey data were analysed according to country as well as the legal forms of the initiatives. The proportional number of respondents in each country generally corresponded to the progress of prosumer development in each Member State, e.g. currently leading RES prosumerism countries such as the Netherlands (27.8%), Germany (22.7%), the UK (17.7%), and France (10.1%) make up almost 80% of the total survey respondents. The legal forms of the survey respondents across all countries were distributed according to the following categories: cooperative, for profit company, social enterprise, public institution, private not-for-profit organisation, informal civil-society initiative or collective, public-private partnership, partnership between organisations or collectives, project run by organisation or collective. More than half of the survey respondents were energy cooperatives (60%); likewise, more than half operated at local scale with one quarter operating at regional scale (69% and 24% respectively); and almost half were middle-sized collective initiatives in terms of nº of members. Supported by the survey results, legal forms do not accurately reflect the actual role played by the initiative in the energy transition. For instance, energy communities

or initiatives that indicated having a community focus are often registered under varying legal forms, the preferred one being the cooperative, but, depending on the country context and other socio-political and legal factors, energy communities may also be run by public-private partnerships, partnerships between organisations and/or collectives, informal civil society initiatives, or can be projects run by an organisation or collective, associations and even companies. Drawing on these insights, in-depth collective RES prosumer typologies will be carried out under Task 2.3 due August 2019.

Overall, in the EU, based on the founding dates of the initiatives, RES prosumerism started picking up from 2010 to 2015, slowing down between 2015 and 2017, while a likely new growth spurt started as from 2017. Box 1 shows the top positive as well as top negative drivers reported by respondents for starting their initiative, out of 14 possible motivating reasons rated on a Likert scale (1-strongly disagree to 5-strongly agree).

Box 1: Top positive and negative drivers for collective prosumers

Positive drivers - "Strongly agree"	**Negative drivers - "Strongly disagree"**
• Tackling the climate change problem • Be part of the clean and low carbon transition • Decentralise energy production • Create a sense of community • Take advantage of new RES technologies • Reduce energy costs	• Take advantage of subsidy schemes • Take advantage of policy incentives • Reduce the environmental impact of existing activities of your organisation/collective or community • Improve revenues of your organisation/collective or community

In terms of RES technology, solar photovoltaic was found to be the most popular technology among all the initiatives. About two thirds of the initiatives own their RES equipment, with the top form of financing being contributions from either the founder(s) of the initiative and/or the members of the initiative. Looking at the entire dataset, women in both management and non-management positions represent no more than 30% of the total staff. However, significant variations are found across countries. Interestingly, while our dataset shows an almost equal distribution between paid vs unpaid staff when considering all surveyed initiatives, significant differences are observed across countries as well as across legal forms. Of note, more than 80% of staff in cooperatives and the not-for-profit sector are volunteers, their transient and often amateur nature considered a limit to growth, based on comments provided by several initiatives.

The socio-political factor of "collaborating and networking with others" is perceived to be a success factor, while lack of energy infrastructures is perceived to jeopardise successful development of the initiatives. A key perceived barrier to RES prosumer development, mentioned repeatedly by a majority of respondents, are the existing public policies and legislation for RES initiatives, with varying specificities across the different countries. This is further detailed in PROSEU D3.1 (Toporek & Campos, 2019), which assessed existing EU-wide and Member State-specific regulatory and policy frameworks for RES prosumers. Box 2 juxtaposes the top four facilitating factors and hindering factors, as well as the threats and opportunities, as perceived by the initiatives.

Box 2: Perceived facilitating and hindering factors, threats and opportunities

Perceived facilitating factors (top 4)	**Perceived hindering factors (top 4)**
• Knowledge of RES technologies • Access to finance, subsidies or grants • Collaborating and networking with others • RES technology options available	• Public policies and legislation for RES initiatives • Energy infrastructures (e.g. grid, meter) • Access to finance, subsidies or grants • Knowledge of policies and legislation in RES production
Perceived threats	**Perceived opportunities**
• The current, uncertain legislative setting. • The risk of working as/with volunteers and the urgent need to professionalise operations (one of the Dutch respondents said it best: we need to move from "hobby to lobby"). • The two faces of EU states: on paper promoting prosumerism, but in practice failing to facilitate its implementation. • The continuing lack of awareness of citizens about the dangers of climate change and the need for an energy transition. • The fair distribution of costs and benefits (in particular when exploiting common goods such as wind, water, sun, not to forget available land). • The slow progress in terms of the IT infrastructure sustaining the energy system: smart grids, smart meters, data processing, … • A persisting strong lobby by the conventional energy sector (e.g. in France this lobby is strangling wind energy projects).	• Creating synergies between RES prosumerism and other climate/zero carbon friendly activities (e.g. complementing prosumerism with energy efficiency measures or awareness creation). • Utilising the roofs of buildings in the public sector for solar PV production. • The ability for RES prosumers to also become energy suppliers.

Introduction

This deliverable reports back with findings based on work carried out in PROSEU Work Package 2- Baseline analysis and Characterisation of Renewable Energy Prosumer Initiatives (WP2). Specifically, it integrates the results of Tasks 2.1 (baseline review and stakeholder identification) and 2.2 (survey of RES prosumer initiatives across Europe) to provide a snapshot and characterisation of RES prosumer initiatives across Europe.

WP2 was designed not only to sketch the context for collective forms of RES prosumerism in the European Union (EU), focusing on the (initially) eight countries of the partnership, but also to provide a quantitative and qualitative overview of prosumer initiatives in Europe: where they are, and how much RES energy they produce, what types of technology are used, where possible shed light on the gender, and other socio-cultural features of the participants and beneficiaries of the initiatives, highlight the initiatives' achievements (e.g. in terms of energy production or social innovations), their ambitions, what they perceive to be the main barriers as well as main facilitating factors to their development (whether technological, regulatory, political, socio-cultural or financial), and how they deal with issues of participation, inclusiveness, and transparency.

At the same time, WP2 was intended to help develop the analytical framework that will then guide other work packages (namely WP3, 4, 5, 6, and 7).

WP2 is mainly responding to Objective 1 of PROSEU:

> Document and analyse the current state of the art with respect to (150-200) RES prosumer initiatives in Europe in order to understand what drives these initiatives, their achievements, business models, how they legitimise their actions and ambitions, what they perceive to be the main barriers (technological, regulatory, political, sociocultural, financial), how prosumer initiatives deal with issues of participation, inclusiveness (e.g. gender) and transparency.

WP2's specific objectives are:

> 1. Establish an interdisciplinary baseline of knowledge of RES prosumer initiatives on which subsequent WPs will build, by reviewing socioecological, socio-economic, socio-political, sociocultural and technological factors driving collective energy-responsible behaviour and choices, including findings on how prosumer initiatives deal with issues of participation, inclusiveness, gender, and transparency;

2. Provide input to other WPs on the key factors encouraging or discouraging consumers from becoming prosumers, and advising other WPs on how different types of solutions and incentives should be further studied;
3. Provide a characterisation of the variety of (150-200) RES prosumer initiatives surveyed across eight countries; and
4. Develop a typology matrix that reflects the variety of RES prosumers initiatives in Europe.

The results of Task 2.3, responding to objective 4—developing collective prosumer typologies—will be presented in Deliverable 2.2 in September 2019, drawing upon and further exploring the variables touched upon in the baseline review as well as the survey, such as: location and locality, socio-economic contexts and governance frameworks, types of business and organisational models, new spaces created, data on scale and impact if available (e.g. number of employees, number of beneficiaries, number of jobs created), technologies used, socio-economic, socio-cultural and environmental drivers, barriers and challenges, and types of incentives.

Task 2.1 Baseline review and stakeholder identification

This task involved compiling and reviewing relevant scientific studies, including relevant funded H2020 projects, best practices, and other insights related to legislative/regulatory, social, economic, political and technological aspects of renewable energy prosumerism. It took stock of factors driving individual and collective energy choices and energy-related behaviours, including assimilating available results from funded projects of this call. Building on this "state of the art" review, and on the efforts of each of the partners to identify stakeholders—prosumers as well as other entities with an interest in prosumerism in their respective countries—a database was developed of stakeholders that could be approached under Task 2.2 and potentially in WP3, 4, 6, and 7: among these are collective prosumer initiatives, prosumer facilitators as well as antagonistic stakeholders (e.g. incumbent energy utilities), energy policymakers, and policy experts at the local, national, and EU level. The specific results of the stakeholder data collection are kept anonymous from the general public, and the databases stored on a secure server, in compliance with the General Data Protection Regulation (GDPR), only to be accessed by PROSEU researchers in the interest of data-analysis and/or to invite stakeholders to our events, when they have given their explicit permission to be contacted.

Task 2.2 Survey of prosumer experiences across Europe

For this task a comprehensive questionnaire, covering most, if not all, of the variables we wished to test on the collective RES prosumers identified in Task 2.1 was developed and used in an online survey. Due to ethical considerations under the GDPR, special care was taken to preserve the anonymity of respondents and to safeguard their data (by using a secure online platform). The questionnaire was translated by every partner in each country language (a total of eight languages). Although initially only eight countries were to be surveyed, it was unanimously decided to make the extra effort to add France, in its capacity of important new player in RES prosumerism. France is a major nuclear energy player, and contrary to Germany has not sworn off this source of energy yet, however, public opinion there is fast changing. A French-speaking partner offered to establish the contacts.

A stratified sample of close to 1,000 initiatives, based on the diversity of RES prosumers encountered under Task 2.1, were personally approached by the respective PROSEU partners in nine EU Member States. The survey collected information for a broad characterisation of the profile of collective RES prosumer initiatives in nine countries, including where possible sociocultural features of the people engaged in the initiative. It aimed to find out what drives the initiatives, what their achievements are, their business models, how they legitimise their actions and ambitions, what they perceive to be the main barriers (technological, regulatory, political, socio-cultural, financial) as well as key facilitating factors for their development and how they deal with issues of governance, participation, inclusiveness and transparency. The average response rate to the survey was high (21.8% or 198 respondents), and this task therefore achieved the high end of its goal to collect data on 150-200 collective RES prosumers.

In this report, Chapter 1 introduces the methodology applied in WP2, Chapter 2 presents an overview of the state of the art of prosumerism in renewable energy in the EU, while Chapter 3 shares and discusses the survey results of renewable energy self-consumption initiatives across nine EU Member States.

1. Methodology: PROSEU's transdisciplinary and holistic approach

1.1 Research problem and questions

The countries of the European Union are publicly committed to fulfil the promises of the Paris Climate Agreement and become energy-efficient, low-carbon economies, an intention reiterated at the Marrakech COP. The European Commission's ambition is to have the EU "lead the clean energy transition, not only adapt to it" (European Commission, 2016b). To this end the EC envisions a 40% cut in CO2 emissions (compared to the 1990 baseline) while also modernising the EU's economies through innovative clean energy technologies as well as "smart" "low energy" design and equally "smart" management of energy systems and markets. At the same time, the EC and EU countries are keen on embedding fairness and inclusiveness, as well as job growth, in the envisioned "Energy Union". With such ambitious goals and so little time, EU countries know that they need their citizens on board, as active participants in the clean energy transition. By allowing so-called energy prosumers to participate in what has traditionally been a monopoly or at best oligopoly market, EU countries are hoping that they will help jumpstart the transition. As a result of relaxing the rules for self-consumption of renewable energy sources, thousands of energy cooperatives and energy communities and tens of thousands of smaller and larger prosumers have popped up in most countries of the EU in recent years. The RES prosumer phenomenon is spreading through Europe at an accelerated pace, and is already having an impact on the energy status quo, forcing legislators and policy-makers to react ad hoc, which in turn poses a risk for organisations, public-private partnerships, and citizens' collectives that are investing in clean energy. Additionally, crucial dimensions of prosumerism, such as the development of technology, organisational models and funding are in flux, impossible to pin down and even less control. Energy, in particular clean energy, is a crucial area that the EU countries really want to get right, which is why it is so urgent to take stock of the energy prosumer phenomenon, mapping its characteristics in terms of the social make-up of prosumer initiatives as well as their use of technology, choice of business model and funding, and the democratic quality (inclusiveness, transparency, fairness) of their projects, while discovering the drivers, barriers and opportunities that contribute to or hinder their success, and finally, analysing their outcomes in terms of their contribution to a clean but also fair energy transition.

At the heart of PROSEU's international Consortium's research is the following question:

> "What are the incentive structures that will enable the mainstreaming of RES prosumerism, thereby safeguarding citizen participation, inclusiveness, and transparency?"

WP2, which kicks off PROSEU's research programme, will specifically answer the following research questions:

> **RQ1:** What are the legal, regulatory, financial, technological contexts in each of the EU countries studied and at EU level such as they relate to collective renewable energy prosumerism?
>
> **RQ2:** What are the basic demographics (legal form, size, maturity, scale, and energy focus/needs) of collective forms of RES prosumerism in the EU?
>
> **RQ2:** What are the preferred technologies used or planned for by these collective RES prosumers?
>
> **RQ3:** How are collective RES prosumers financing their initiatives?
>
> **RQ4:** What are the most common governance modes for collective RES prosumer initiatives?
>
> **RQ5:** What are the primary motivations of collective RES prosumers?
>
> **RQ6:** What are the main facilitating and the main hindering factors to successfully start and run a prosumer initiative in the EU as perceived by collective RES prosumers?

1.2 PROSEU's overall working methodology

Given its research problem, PROSEU is an interdisciplinary project, in which social, cultural, political, economic, ecological and technical aspects are closely intertwined. Therefore, the research work is being done, as much as possible, through interdisciplinary collaboration. PROSEU is also a transdisciplinary project, since it allows for the integration of different systems of knowledge (scientific and local knowledge) (Joint Research Centre, 2019). The Consortium itself is a transdisciplinary group including practitioners, civil society stakeholders and academic researchers, from both the public and private sectors. For the PROSEU team, it is vital to understand stakeholder needs and motivations, as well as how these needs can be met by innovative solutions (Campos et al., 2016). Stakeholders will be involved as active, equal partners and domain experts and not as mere subjects of research. Their involvement and influence in all of the processes leading up towards the project's goal are considered essential.

The overall methodological framework of PROSEU is based on a problem structuring approach, which is considered to be the starting point in transition management (Loorbach & Rotmans,

2010b). Problem structuring is defined as the articulation, confrontation, and, where possible, integration of as many sources of information and (contradictory) arguments as possible (Hisschemöller & Hoppe, 1995), and is therefore by its very nature a transdisciplinary approach as well as one that relies on close stakeholder engagement (Campos et al., 2016).

A problem structuring approach avoids the bias of problem solving, by making problem finding the core task, while also recognising how closely intertwined facts and values are, demanding the uncovering of possible dilemmas and conflicting arguments (Dunn, 2015). It is also policy oriented (Sabatier, 1988), bridging the way from research to stakeholder discussion and institutional experimentation.

A focus on problem finding rather than solving, together with a multi-method and iterative approach, where lessons learned are reviewed at each stage of the project, means that PROSEU researchers will be building their theory of incentive structures for the mainstreaming of collective prosumer initiatives in the manner of grounded theory (Strauss & Corbin, 1994).

While the PROSEU project is interdisciplinary from start to finish, it increases in transdisciplinarity the more the stakeholders identified in the first stages of the research are involved in the fact-finding, decision-making and scenario development. WP2 is the first stage in a progressively ever more interactive approach, and is meant to broadly identify the key stakeholders, their diverse contexts and the key characteristics and concerns of our core subjects: collective RES prosumers.

1.3 Methodology for the review and mapping of the RES prosumer phenomenon

The first step in preparing a review of the state of the art of RES prosumerism in the EU was to gain a good understanding of the literature in this field. This meant getting a feel for the theories that frame or may potentially frame the phenomenon of energy prosumerism, in particular its collective form. The theories that are most relevant for our take on renewable energy prosumerism are sustainability transition theories—of which the clean energy transition is one form—theories of incentive structures, and theories of social innovation (SI). Neither of these concepts have unique definitions, indicative of how we are still at the dawn of understanding the complex dynamics of system change. Sustainability transition is defined by some as a long-term process leading to a fundamental change in structure, culture, and practices (Loorbach & Rotmans, 2010a), and by others as a shift from one regime to another (Geels, 2011). Likewise, a straightforward definition

of energy transition would be "(…) a change in an energy system, usually to a particular fuel source, technology, or prime mover (a device that converts energy into useful services, such as an automobile or television)" (Sovacool, 2016, p. 3). However, such a reductive interpretation ignores the complex dynamics involved in the transformation of sociotechnical systems, as Sovacool himself attempts to prove in the afore-mentioned article. Finally, one way of conceptualising social innovation is to envision it as "changing social relations, involving new ways of doing, organising, framing and knowing" (Avelino et al., 2017, p. 5). But this leaves out what kind of impact the social innovation may have and whether it is actually tackling societal challenges, prompting the latter authors to devise the more active concept of "transformative social innovation" (Ibid.).

Drawing an accurate picture of energy prosumerism in Europe also meant delving into the grey literature in this field, currently more extensive than the peer-reviewed work. The European Commission as well as numerous research consortia funded by the EC and independent research institutes have published important reports and reviews on sustainability and energy transitions, the state of RES technologies, and the socioeconomic, political, and cultural factors influencing the adoption of RES technologies. The result of the review is presented in Chapter 2.

Conducting the review also included looking more closely at the nine countries of our focus countries (UK, NL, DE, BE, FR, IT, HR, ES, PT). In order to achieve this, it was agreed early on to create RES country fact sheets, based on a tested selection of RES-related indicators. It was deemed the best way to create useful, comparable, shareable, and updateable information on the state of RES development and RES prosumerism in each of the target countries as well as the European Union as a whole. The resulting two-page RES country fact sheets are presented in ANNEX 3. Based on the fact sheets and supporting literature, in particular the reports of similar projects, such as ENTRUST (Gaffney, Lennon, O'Connor, & Dunphy, 2015; Boo et al., 2016) and ENERGISE (Jensen & et al., 2018), a comparison was made between the RES standards in the nine EU countries of our focus, and these were additionally measured up to the prevailing EU standards.

Table 1: Methodology for creating RES country fact sheets

1. Conduct documental research in European Union databases as well as country-specific databases, and examine existing energy and related fact sheets, from the EU and H2020 funded projects.
2. Contact experts within and outside of the Consortium to get their opinion on, and preference for certain indicators.

3. Test and discuss the first batch of country fact sheet indicators with the PROSEU partners. Indicators could only be selected if they satisfied the following criteria:
   a) Applicable to all countries;
   b) Comparable for all countries (i.e. measured in the same way).
4. Make a final selection of country fact sheet indicators (It was collaboratively decided to not go beyond 20 indicators).
5. Create a first draft RES Country Fact Sheet for two countries and test those with the partners responsible for those countries.
6. Incorporate the feedback from these project partners into the final format for the RES Country Fact Sheet.
7. Complete the RES country fact sheets for all nine countries as well as the EU as a whole.
8. Send the RES country fact sheets to the project partners responsible for each country to verify country-specific information. The Fact Sheets were also presented and discussed at PROSEU's 2nd General Assembly.
9. Incorporate the last changes and feedback from partners.
10. Format, reference, and complete the RES country fact sheets, making sure to have a flexible format that can be incorporated in the D2.1 deliverable but will also result in stand-alone RES country fact sheets that may be sent to collective RES prosumers from our developing Prosumer Community of Interest and other stakeholders.

1.4 Methodology of the European survey of collective RES prosumers

1.4.1 Self-administered online questionnaire

The PROSEU survey is one of the pillars of the project, because it allows for a broad overview of collective forms of RES prosumerism in countries with very different legislative and political contexts. Due to the fact that the data we wished to collect were considerable, the fact that not all partners were equipped or would have enough time to conduct interviews, and adding to this the language barriers, the methodology chosen was that of a self-administered online questionnaire to be sent out to previously contacted potential respondents in nine countries (UK, NL, DE, BE, FR, IT, HR, ES, PT) and in eight languages. In addition, a general link to the survey was disseminated among partners' contacts in the field of RES prosumerism, allowing for a snowball approach to complement the personal approach. The survey form was built especially for PROSEU by a web developer using open source code, avoiding Survey Monkey, Google Forms, and other freeware, to ensure the security of the data as well as allow us to create more complex answer categories. No personal data was collected through the questionnaire, there was no exchange of personal

data between countries, the survey was invisible to online search engines (i.e. only people with the links were able to reply), and only the survey team (WP2) as well as other PROSEU teams that needed to build on the early survey results were able to access the data, and only for analytical and report writing purposes. All personal data and data identifying the initiative that was collected in the process of sending out the forms (e.g. email address, name of initiative) will be destroyed at the closing of the project. For this survey, quality and depth were valued over quantity and statistical significance, allowing for a more comprehensive questionnaire, but limiting the number of initiatives we could reach, due to the need for a personal approach. Our goal was therefore to collect between 150 to 200 completed questionnaires from collective RES prosumer initiatives in the nine countries of our focus.

1.4.2 Survey objectives and strategy

The survey was intended to help us characterise the field of RES prosumerism in Europe, in particular collective forms of prosumerism, focusing on nine countries (UK, NL, DE, BE, FR, IT, HR, ES, PT), although allowing for additional snow-ball responses from countries where either of these languages is widely spoken.

The survey was to be key in answering five of WP2's six research questions, namely research questions RQ2 to RQ6.

RQ2: What are the basic demographics (legal form, size, maturity, scale and energy focus/needs) of collective forms of RES prosumerism in the EU?

RQ2: What are the preferred technologies used or planned for by these collective RES prosumers?

RQ3: How are collective RES prosumers financing their initiatives?

RQ4: What are the most common governance modes for collective RES prosumer initiatives?

RQ5: What are the primary motivations of collective RES prosumers?

RQ6: What are the main facilitating and the main hindering factors to successfully start and run a prosumer initiative in the EU as perceived by collective RES prosumers?

Due to the ambitious nature of the research questions, the survey had to be set up as a multiple case-study. We were conscious of the fact that we would find large discrepancies between countries that have a longer tradition of energy prosumerism (in particular the UK, Germany and the Netherlands), countries where prosumerism is evolving rapidly (France, Belgium, Italy) and

countries that have only recently relaxed the rules for energy self-consumption (Portugal, Spain, and Croatia).

A combination of a personalised approach with a snowball technique would therefore ensure we would meet our agreed quota (between 150 and 200 valid responses), as explained below. The final survey form was developed bearing in mind the following criteria and inputs:

- Our comprehensive information needs (see the research questions above), which challenged us in the sense that we would have to balance between these needs and the demands that they would place on our respondents.
- The structure of previous, similar surveys, or surveys with similar respondents.
- A collaborative process (the questionnaire was developed with active input from most partners and their designated experts, using an iterative method).
- Ergonomics (making it easy and pleasant for respondents to answer the survey).
- The specificities of collective RES prosumers (very often set up as cooperatives, communities, or other collective projects and quite unlike individual prosumers).

The result was a combination of a user-friendly survey form with approximately 30 questions, taking about 30 minutes to answer, available in the respondent's own language, and a soft-push approach in two or three steps (telephone call to leaders of the initiatives, an explanatory email with a link to the survey, and a follow-up email or phone call, as needed.

1.4.3 Survey development process

Faced with dozens of definitions of prosumers, not always mentioned under this name, and with a lack of research in the field of collective forms of RES prosumerism (i.e. broader than the RES cooperative form, yet different from the individual prosumer), the WP2 team coordinated an exploratory research based on the early results of database building in the nine countries, followed by a Consortium-wide discussion in view of establishing a working definition of the term "collective RES prosumer initiative".

Early database analysis results led us to adopt the following working definition, which may/should be adjusted as PROSEU moves through the different stages of its research.

A **RES prosumer initiative in the PROSEU study** is a collective energy actor that produces energy from renewable sources with the primary objective of providing in its own energy needs and/or those of its members, and in some cases selling excess energy to clients, thereby actively participating in the energy markets.

Examples of such a collective energy actor, as illustrated by the initiatives collected in our databases are: energy cooperatives; renewable energy communities—either set up as formal or as

informal collectives/partnerships; not-for-profit organisations (including socio-cultural or sports associations and NGO's); companies in different sectors; public institutions (whether municipalities or schools and retirement homes); public-private partnerships; other partnerships; and (in extremis) small utility companies producing (almost) exclusively from RES for a community.

To distinguish between those actors actually prosuming (i.e. producing and consuming energy from renewable energy sources, as an entity or through its members) and the many actors influencing RES prosumerism in some way or other (i.e. facilitating, promoting, financing, supporting, benefiting from, or even hindering), the working definition for all the other RES prosumer stakeholders adopted was the following:

RES prosumer stakeholders are organisations, institutions, or collectives—or their representatives—that influence, facilitate, benefit from, and/or may hinder the development and evolution of RES prosumer initiatives, in particular its collective form.

Our aim was to collect as diverse a set of respondents possible, which is why the databases were tested in two different moments while they were being built, so as to help form a good picture of the types / typologies of collective RES prosumers in each of the countries that were part of the survey.

The actor types that we discovered in this early exploratory analysis, to be confirmed (or not) in Task 2.3 (collective RES prosumer typologies), and which guided our sampling efforts, were:

1. Energy cooperatives: these come in many shapes and forms, they may spring from a community or region—set up by locals or local associations and/or authorities—they may have been formed by a group of companies aiming to prosume, or they may have stemmed from an active consumer initiative. There are also cooperatives *of* cooperatives and/or utilities. This is therefore in itself a broad category and should be further studied. We were mainly interested in those cooperatives that are prosuming: producing RES themselves or through their members, and consuming RES directly or through their members. Some energy cooperatives will behave more as energy utilities (in some cases because they are obliged to do so by law), while some business projects with an exclusive profit objective may opt for the cooperative form to circumvent certain legal or policy hurdles. A clear collective purpose and ambition will have to be evident for any of these to continue to qualify as prosumers.

2. Renewable energy communities (REcoms): these have a clear local perspective, following the EC definition (now more restrictive under the latest version of the RED II Directive), which demands that these (now necessarily legal entities) are effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity. They may be run by a cooperative, an association, a municipality, other public authorities, or through partnerships between different entities, including companies. Their motivations are primarily to "provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits" (RED II Directive).

2A. Renewable energy communities that do not fulfil the latest EC demand that the community be a legal entity. These may be informal collectives or partnerships with a clear local perspective and similar ambitions as mentioned above.

3. Organisational prosumers: This type of collective prosumer is in fact a borderline case, since in many instances they may behave as big households, bringing them closer to the objectives of individual prosumers. They were nevertheless included in our survey, because their motivations can be quite varied and not always exclusively "selfish".

3A. Public sector prosumers: Among these we can find schools, universities, retirement homes, hospitals, buildings of public authorities, etc. The most important criterium here is that they are prosuming for the benefit of their institution, and that they have a public purpose (even though some may actually be private), maybe looking to decrease their dependence on "dirty" energy, maybe aiming to set an example in prosumerism.

3B. Not-for-profit sector prosumers: Among these we find foundations, NGO's, and associations (e.g. sports or cultural associations). Similar to the previous actor, these prosumers are acting for the benefit of their organisation, maybe looking to decrease their dependence on "dirty" energy, maybe aiming to set an example in prosumerism. In some cases, however, they may have been the legal form opted for by a renewable energy community, in which case they should be reclassified to **2** or **2A.**

3C. Business sector prosumers: Here we will find companies in industry, services or agriculture, examples of which are a paper company, a farm and a factory. They are prosuming for the benefit of their organisation, aiming to improve their renewable energy uptake. When sampling

for them, a certain level of ambition is expected, to avoid over-including for example small companies with two solar panels. We aimed to find companies that wish to prosume >50% of their energy needs.

4. Property sector: These may be social real estate projects, home owner associations, or municipal real estate energy schemes. Although technically this is a sub-sector of the previous category **3**, organisational prosumers, this is a special case where business or public sector interests meet community interests.

5. Other collective RES prosumer initiatives: There are cases that fall outside of the previous types of actors. Examples are municipal, regional, or NGO campaigns to achieve CO2 neutrality, energy efficiency, green mobility, greener housing, or more generally "sustainability" in their territory. They may be prosumer facilitators, but are often not prosumers themselves. Another example of unclear prosumer initiatives are the P2P energy trading platforms and other energy aggregators, which technically cannot be considered prosumer initiatives, but are important stakeholders in prosumerism.

It is therefore important, as already mentioned under energy cooperatives, to distinguish the legal form of the collective RES prosumer initiative from their role as an energy actor. How they behave as an energy actor ultimately says more about their prosumerist intent than their legal form.

Besides carefully identifying and pre-analysing the potential respondents, the questionnaire used in the survey was developed in a fully collaborative and iterative process. Each PROSEU team was given the opportunity at the kick-off meeting to pitch questions and variables that they were hoping WP2 could collect. Using a personalised online project management platform, this work was then continued over the next months, with a smaller team, made up of researchers from UPORTO, DRIFT and FC.ID, that coordinated the question development. Based on previous, similar surveys or surveys with similar respondents, in particular the surveys used in the European-funded projects SI Drive (Schröder et al., 2014), TESS (Tikkanen & Haara, 2014), and ENABLE.EU (Galev & Gerganov, 2018), as well as the methodologies used in the projects TRANSIT (Wittmayer, Avelino, Dorland, Pel, & Jørgensen, 2015) and PATHWAYS (Carrilho da Graça & Gomes, 2016), a long list of potential questions was drawn up and subsequently refined as well as shortened at each iteration. Each new questionnaire version was shared with partners, either for their expert opinion or for their agreement on including the question. The final questionnaire was tested on six respondents in three different countries, leading to some final adjustments before the official launch on October

16, 2018. The questionnaire was translated, with help of the partners, from the original English to seven other languages. The complete, final questionnaire in the English version can be found in ANNEX 1.

1.4.4 The sampling strategy

In order to ensure a diverse sample and help us pin down the many faces of collective RES prosumer initiatives in the European Union, a dynamic stratified sampling approach was chosen. Using the actor types identified among the collective RES prosumers collected during the database-building phases between May and September, partners were asked to select more or less proportionately from each type of actors, if available in their countries (energy cooperatives, energy communities both formal and informal, organisational prosumers from the for-profit, not-for-profit and public sectors, municipal utilities when acting as community energy providers, and property sector prosumers). Additional selection criteria were:

- The scale of the initiative;
- its stage of development (from the planning stage to projects starting out to more mature initiatives);
- organisational forms (bearing in mind that they do not always coincide with the type of actor)
- a balance of public vs private;
- types of energy needs.

The sampling was dynamic in the sense that results from the survey would be monitored so that partners could adjust their level of stratification as well as their contact efforts according to their response rate.

A survey protocol was drawn up to ensure the same approach and thus homogeneous results in the nine countries. The selected respondents were personally contacted by the partners, and after having acceded to participate in the survey, would receive an introductory email to the survey and a personalised link, allowing them to pause filling in the form as often as they wished. Partners were asked to contact approximately three to four times the number of respondents that we were expecting to reply (in countries with more prosumers). External surveys such as the one we were running, often have very low response rates (10 to 15%), but we were counting on having an advantage by contacting each respondent personally. In smaller countries the task was more challenging, because the total population was quite small (Croatia only managed to list 15 prosumers, it is the country that is most new to prosumerism, followed by Portugal, that managed to list 42 collective prosumers, albeit many of them organisational prosumers). As a complement

to the personalised contact, a snow-ball approach was also used, with a general link that could easily be shared between initiatives. ANNEX 2 presents the survey protocol in detail.

To ensure a higher response rate, we promised respondents that they would receive an early executive report where they could compare their initiative to other (similar) participants according to a number of variables. Additionally, respondents could choose to be placed on our collective RES prosumer map—should they so desire. They also optionally could have access to our growing Community of Interest (and thus respective updates on the research), as well as to the workshops and assessment exercises that we are planning during the project.

In the end, we had to let the survey run for three and a half months, because the challenges of programming a personalised survey form as well as the fact that we added an extra country to our targets, meant that we were not able to launch the survey until half October. Contacting close to 1,000 initiatives was a slow and demanding process, which excluded December and early January when people are harder to contact as a rule. We therefore decided to prolong the survey until the end of January, to encourage "laggards" to participate, or to complete their initiated questionnaire. The WP2 team was able to closely monitor results as they came in through a back-office set up at the private server. This way they were able to give precise information to the partners in each of the countries about their response rates and which respondents could/should be contacted again. The back-office also allowed for narrow error and bug control.

Partners were asked to use the following rules of thumb when deciding which respondents to add to their sample:

Table 2: Sampling rules of thumb

1. Is this a collective RES prosumer initiative according to our definition?
2. Is the initiative producing or planning to produce its own renewable energy, either directly or through its members / partners?
3. Is the initiative self-consuming the renewable energy it is producing or planning to produce, either for the organisation / collective and/or for its members? If it additionally produces for clients, that's not a problem, but their own organisation / community and/ or members should be the focus.
4. *(mainly for organisational prosumers)* Is the initiative ambitious in its aims to produce RES, i.e. aiming at providing in its energy needs with >50% RES that it is producing/will produce?
5. A final check, if doubts still persist, is to estimate whether the initiatives are mainly value-driven rather than profit-driven.

6. Since it is not always possible to obtain the previous information, the final rule of thumb is: When in doubt, add them, and whether they manage to answer our survey will be the final triage.

These rules of thumb will show that we are looking at collective RES prosumerism as a continuum and not as an absolute category. One way to operationalise this idea of continuum could be the variable of "ambition", which, being an inherently vague term, will have to be derived from a compound of variables studied in PROSEU. This debate will be continued and solved in Deliverable 2.2.

1.4.5 Ethical considerations

This survey did not collect any personal data (the respondents' e-mail addresses were only used to generate personalised survey links and were not shared between partners). The only identification asked for was the organisational email address (when organisations agreed to be contacted again) and the name of the initiative. Any personal data collected—when respondents used their personal email address—or data that identifies the initiative, were only to be accessed by the WP2 team and a few other PROSEU teams that needed to build on the survey data, and used exclusively for analytical purposes and report writing. This type of data will be destroyed at the conclusion of the PROSEU project. Initiatives were also asked to give their explicit consent at the start of the questionnaire:

Table 3: Declaration of consent

☐ I declare that my decision to participate in this study is entirely of my own free will.
☐ The Renewable Energy Initiative participating in this survey agrees to share information with the PROSEU Consortium for purposes of analysing, comparing, and mapping RES prosumers in Europe.

The initiatives that participated will only be contacted again if they agreed to be part of the Community of Interest, to be placed on our online prosumer map, or to participate in any of our workshops or events.

Because the GDPR rules were very new when we were preparing our survey, and because our information needs were extensive, we decided against a mass-mailing. Instead, in each of the countries, partners personally contacted the collective RES prosumer initiatives registered in the databases that all the teams had been building since the start of the project.

The survey form and the survey protocol can be found respectively in ANNEX 1 and ANNEX 2.

1.4.6 Summary of the methodologies used in WP2

WP2 of the PROSEU project uses a reflexive, interdisciplinary mixed-methodology approach to attain its objectives, and satisfactorily answer the research questions for its two tasks. The methodologies that have been discussed in the previous sections are summarised below.

Table 4: Overview of methodologies used in WP2

Output	Step 1	Step 2	Step 3	Step 4
Theoretical framework for collective RES prosumerism (on-going)	Literature review on sustainability transition, energy transition, (transformative) social innovation, community-based initiatives, energy democracy/justice/poverty	Draw on the methodologies and results from previously EC funded research projects in related fields (e.g. TRANSIT, SI DRIVE, TESS and PATHWAYS)	Grounded theory approach aiming to develop an incentive structure theory for prosumerism and similar sociotechnical innovations	Collaborative, trans-disciplinary, reflexive and iterative analysis of data, results and exploratory theories
Baseline review of RES prosumerism in the EU (completed)	Literature review, including grey literature, establish RES prosumer state of the art for EU	Interdisciplinary documental research with contributions from all partners/target countries to support state of the art	Indicator-based comparative analysis for nine countries and EU as a whole	Produce stand-alone RES country fact sheets
Characterisation of collective RES prosumers in the EU (completed)	Exhaustive review of criteria and indicators for collective RES prosumers	RES prosumer and stakeholder database building and exploratory database analysis	Self-administered online survey for collective RES prosumers in 9 EU countries	Data analytics, using MATLAB and content analysis, resulting in the identification of trends for each group of characteristics

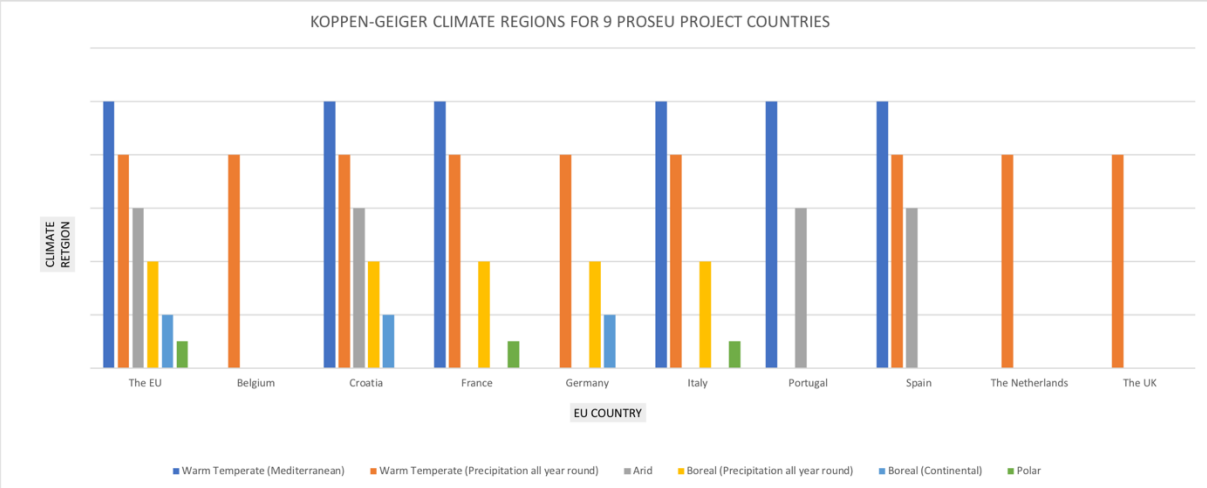
2. An overview of the state of the art of prosumerism in renewable energy in the EU

2.1 Setting the scene for RES prosumerism in the EU

The nine EU countries studied in the PROSEU project are sufficiently diverse to constitute a cross-section of how the development of RES and RES prosumerism is proceeding in the EU. We included RES prosumerism frontrunners such as Germany, the United Kingdom (UK) and the Netherlands; two countries with a long history of self-consumption either at industry or at regional level but where new prosumer initiatives encounter significant challenges, Belgium and Italy; and four countries where RES prosumerism has only just been legalised: two small countries, Croatia and Portugal, and two large, France and Spain. The particular energy landscape of each country is dependent on a number of factors, be they geographical, environmental, political, social, cultural, economic, or technical. These interact and together create the unique conditions that either promote or hinder the upscaling of the prosumerism phenomenon within a particular country. Before reviewing the state of the art of RES prosumerism in the EU, a brief comparison of our target countries and how they fare on key groups of factors may be helpful to set the scene. A full list of indicators (20) and how each country scores on these, can be found in the RES country fact sheets appended in ANNEX 3.

In terms of geography and population, the nine countries have differing characteristics that create different energy demands. Climate regions in the EU reach from Polar to Warm Temperate and from Boreal to Arid, and all of them are present in the nine PROSEU countries, to varying degrees: some countries have only one climate zone (NL and UK), several have three or more and Croatia has all five zones (Figure 1). Colder temperatures will require more energy for heating buildings, whereas countries with very warm summers will require considerable energy for cooling.

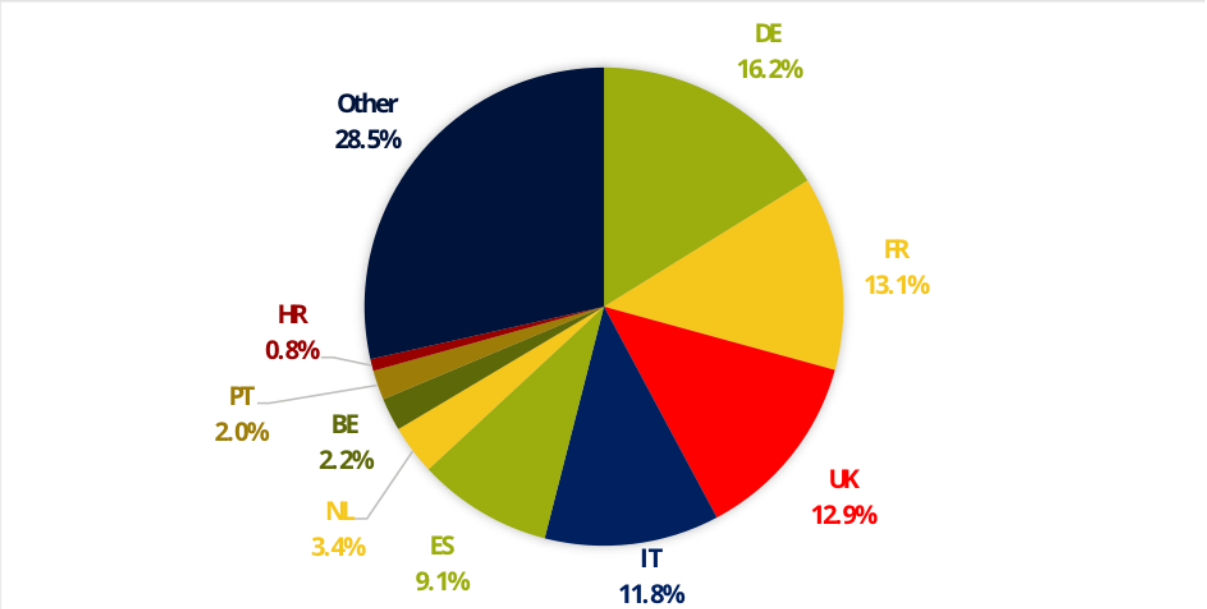
Figure 1: Koppen-Geiger climate regions in the PROSEU countries



(Based on the classification provided by Kottek, Grieser, Beck, Rudolf, & Rubel, 2006)

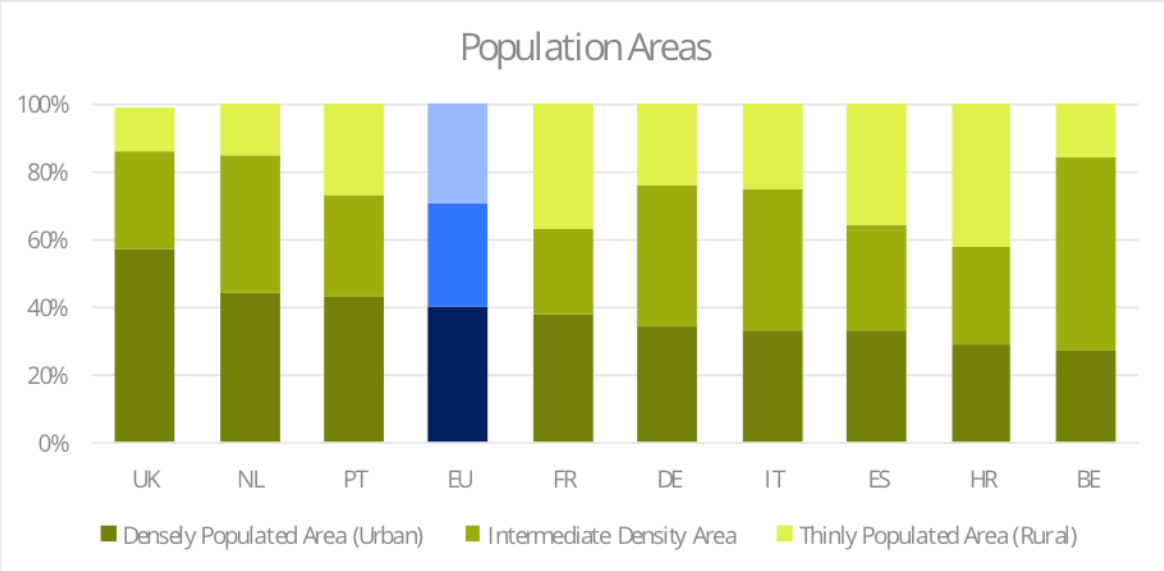
Population size, as well as population density creates differing energy demands in the nine countries, as can be gleaned from Figures 2 and 3. Densely populated areas may create a high but very localised demand, whereas rural areas may have trouble sourcing energy or connecting to the electricity grid, even though demand may be lower. Finally, whether the countries' citizens own their houses or are renting, will have a direct influence on their interest to self-consume. The data for home ownership are shown in Figure 4.

Figure 2: Percentage of total EU population for PROSEU countries as Jan 1, 2018



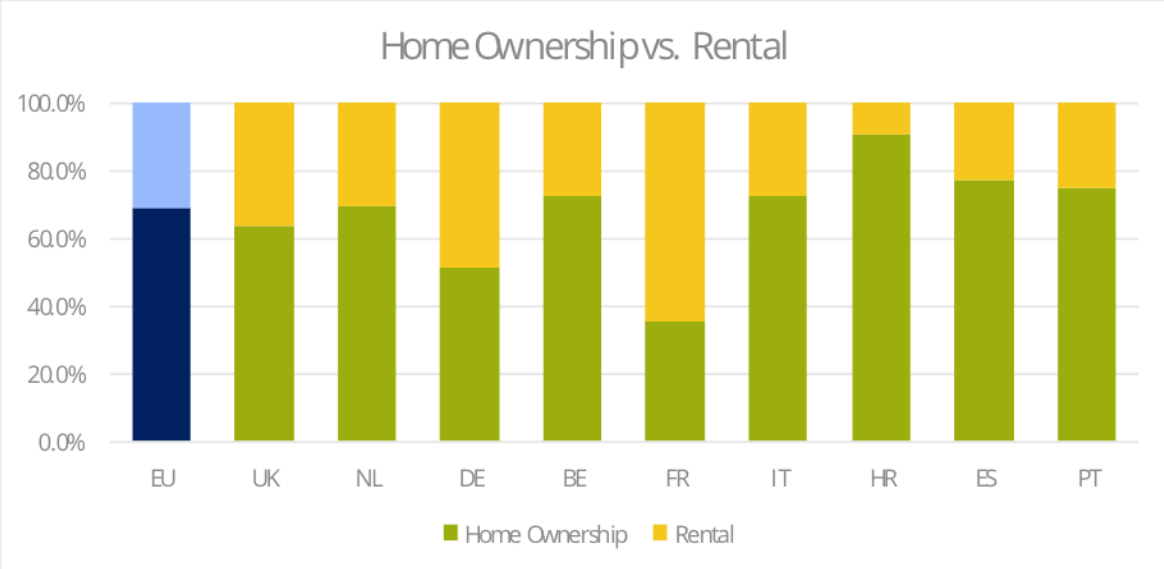
(Source: Statistical Office of the European Union, 2018)

Figure 3: Distribution of population areas in PROSEU countries



(Source: Dijkstra & Poelman, 2014)

Figure 4: Level of home ownership in PROSEU countries (2016)

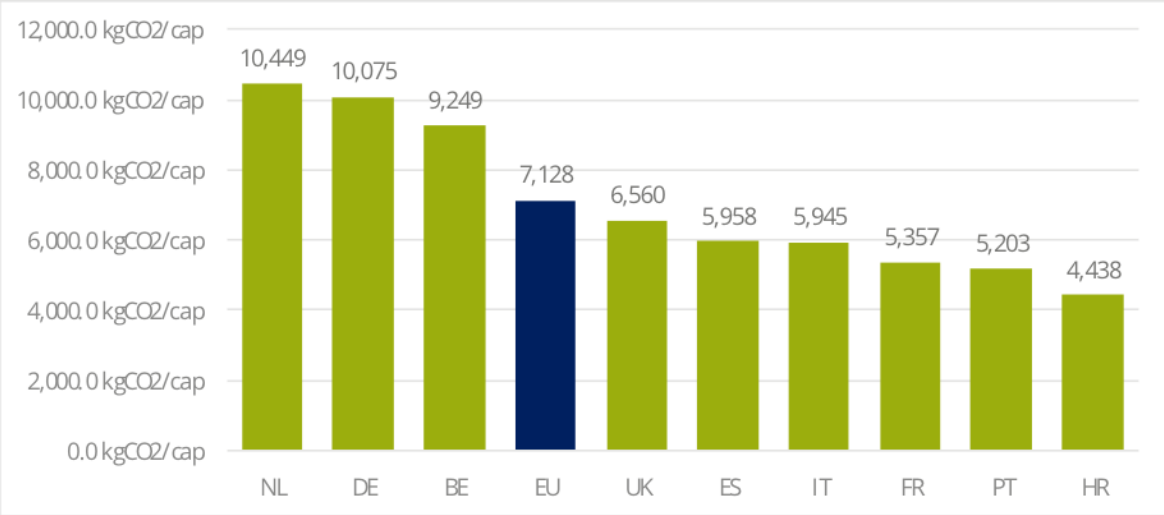


(Source: Statistical Office of the European Union, 2018)

In terms of the ecological impact of energy consumption, three of the PROSEU countries are among EU countries with the highest emissions of CO2 per capita (NL, DE, BE), whereas countries such as Portugal and Croatia have emissions per capita considerably below the EU average (Figure 5). Looking at their energy use per capita (Figure 6), the trend is maintained, except in the case of France, which is among the countries with lower emissions per capita, but is also one of the larger countries in terms of energy needs. One reason for this is that France produces 40% of its electricity

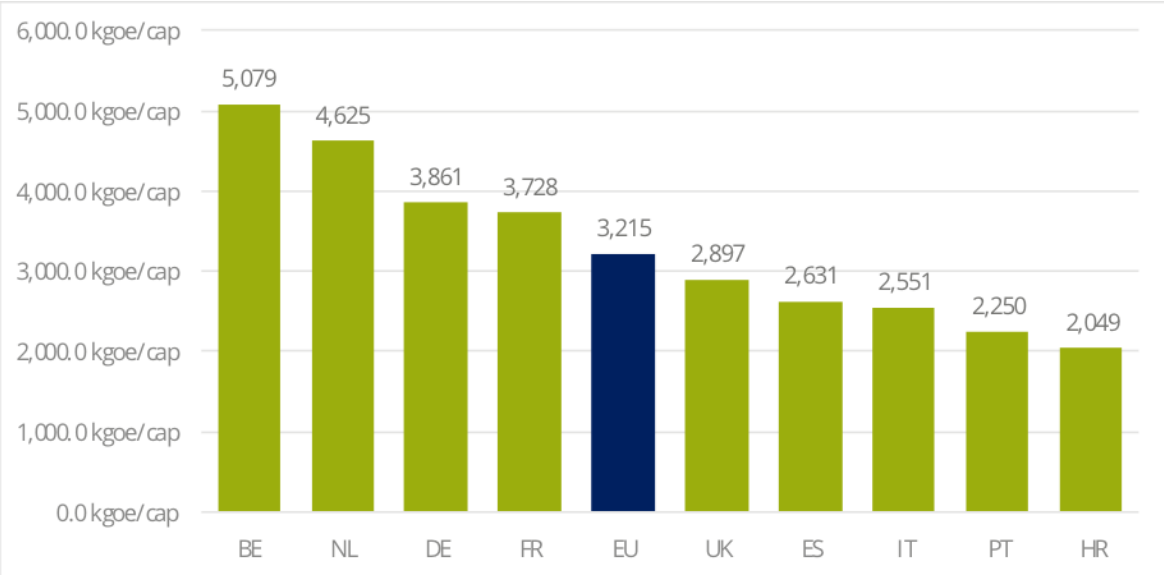
using nuclear energy (not a renewable energy source, but responsible for considerably less emissions of CO2). In general, the more Northern European countries tend to have a larger industrial capacity and their citizens have higher average incomes and greater purchasing power than the countries in the South, which may partly explain their higher energy consumption. Nevertheless, there are subtleties that shouldn't be overlooked, such as the quality of housing (e.g. isolation), which tends to be superior in the more Northern countries, representing higher energy efficiency.

Figure 5: CO2 emissions per capita for PROSEU countries (2016)



(Source: Statistical Office of the European Union, 2018)

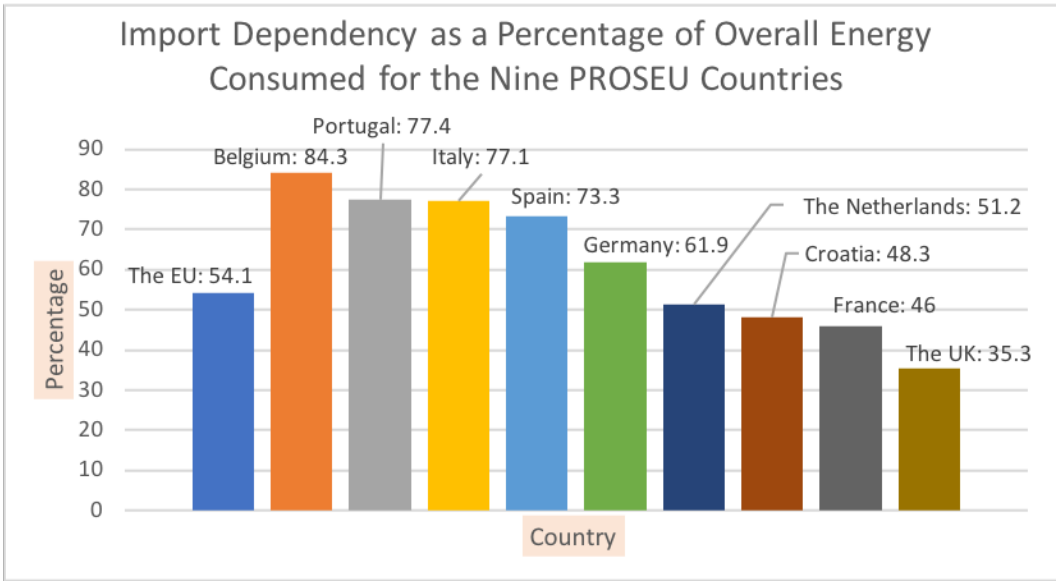
Figure 6: Energy use per capita for PROSEU countries (2016)



(Source: Statistical Office of the European Union, 2018)

The EU as a whole is a net importer of energy, importing 54.1% of its energy needs in 2015 (European Commission, 2017a). Thus, the EU is threatened by a high level of energy insecurity and dependence on foreign energy. Five of the countries under study (Figure 7) are among the most import-dependent countries in Europe (BE, PT, IT, ES and DE). The Netherlands scores close to the EU average and the UK is an outlier within our sample, importing 35.3% of its energy needs.

Figure 7: Energy import dependency for PROSEU countries (2015)

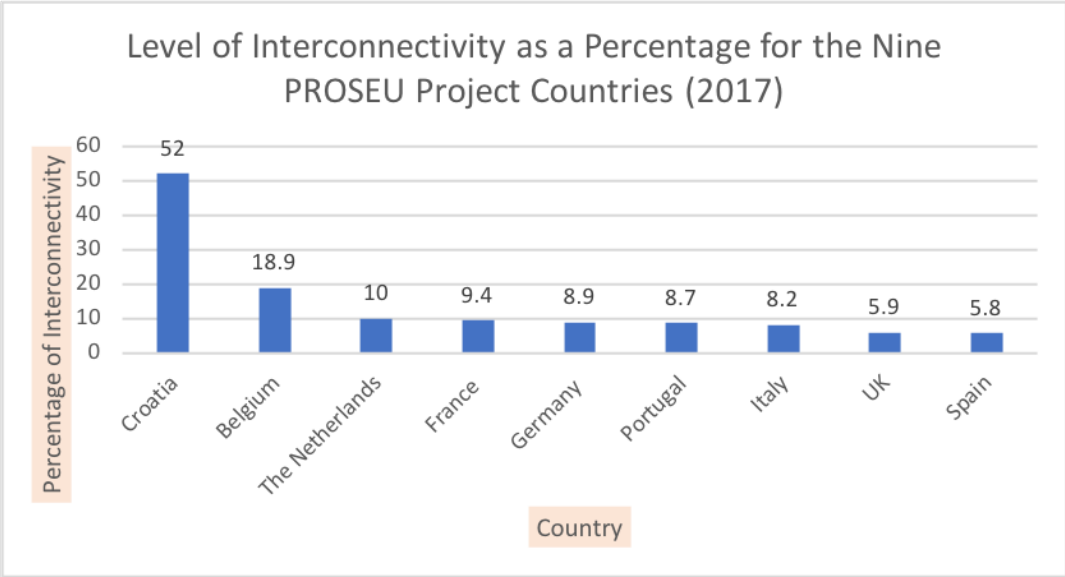


(Source: European Commission, 2017a)

Countries that are energy insecure can overcome this by interconnecting their energy networks with those of neighbouring countries. That is why the EU is promoting an increase in the level of interconnection between EU countries, with a target of 10% interconnection by 2020 for each of the Member States (European Commission, 2017c). Figure 8 below shows how our sample countries are faring on that goal. While four of our more Northern countries have either achieved the goal, or are close—followed closely by two Southern countries, Portugal and Italy—two of the remaining countries, the UK and Spain, are still far from that goal. This is less troublesome for the UK, which as we saw above, is much less energy insecure. It is a problem for Spain, one of the so-called large net importers of energy. Finally, Croatia is a huge outlier in the positive sense, with an interconnectivity level of 52% for 2017.

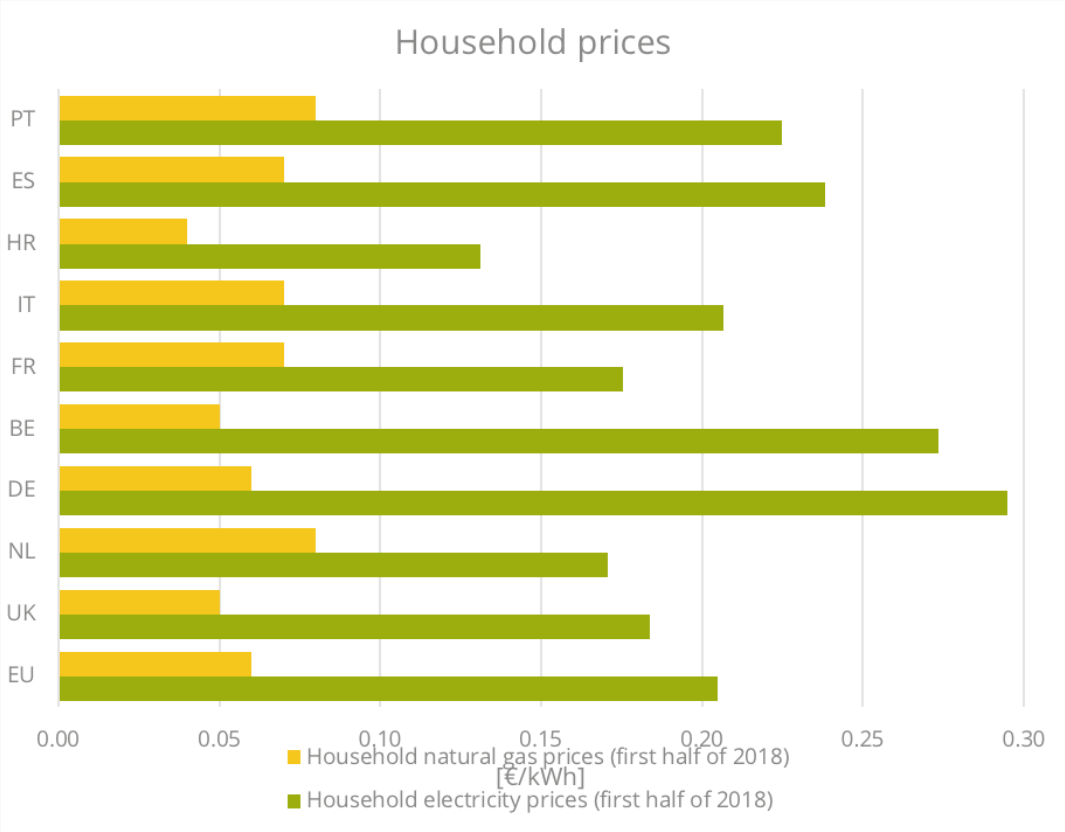
In Figure 9, also below, we present a comparison of household prices for energy (€/kWh). On average, Europeans are subject to high prices for electricity, while natural gas is considerably cheaper.

Figure 8: Level of energy interconnectivity for PROSEU countries



(Source: European Commission, 2017a)

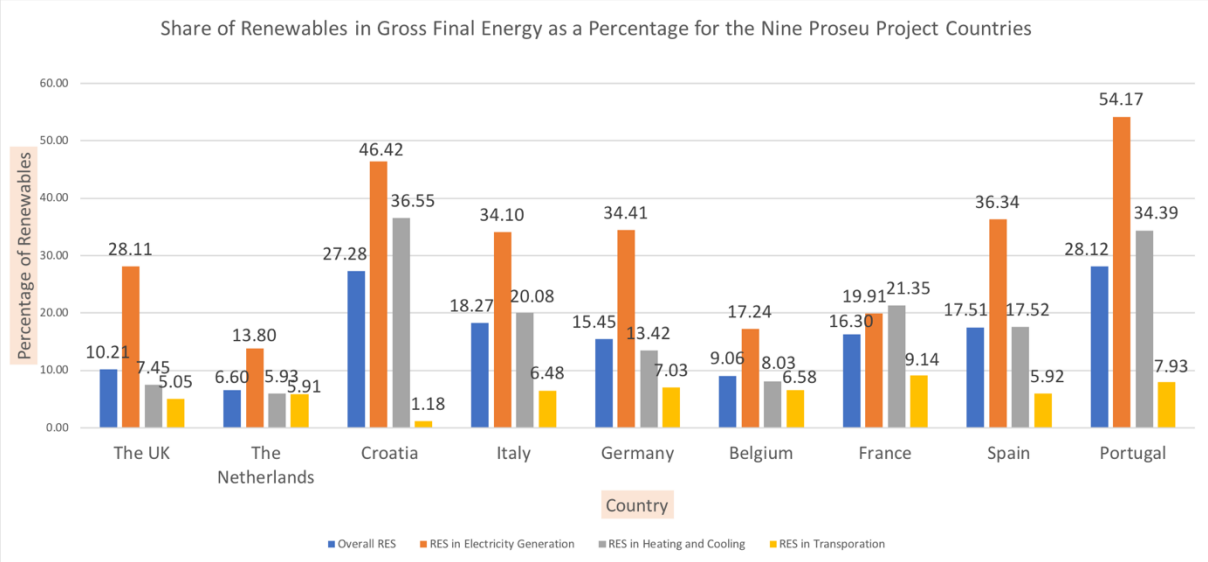
Figure 9: Household prices for energy in PROSEU countries



(Source: Statistical Office of the European Union, 2019a)

Two of the wealthiest countries in our sample have the highest prices for electricity (DE and BE), while the three remaining wealthier countries (FR, NL and UK) have prices that are at or below the EU average. The countries in the South, except for Croatia (which has a very large share of hydro-powered electricity), all have prices that are above the EU average, with the difference that both Spain and Portugal saw an increase in prices of around 50% over the past ten years, whereas Italy actually saw a slight decrease (-4%) (Strom-Report Blog, 2018). Of the wealthier countries, Germany, Belgium, and France saw large increases in price over the past decade, whereas the UK had a smaller increase (10%) and the Netherlands saw a decrease (-13%) (Ibid.). Note that the latter two are natural gas producers and use natural gas for heating. Just as the current energy mix for each country may drive them to different path-dependent energy production solutions (e.g. the Netherlands deciding whether to start heating with electricity rather than gas, which will be a lot costlier), their choice of renewable energy sources may be driving the price of electricity up, as could be the case in Germany. Figure 10 presents the share of renewables as of 2017 for the nine PROSEU countries. For the same year, the EU average share of renewables in gross final energy consumption was 17.53%.

Figure 10: Share of Renewables in gross final energy consumption in PROSEU countries (2017)



(Source: Statistical Office of the European Union, 2019b)

How well some countries are faring in terms of renewable energy sources in electricity (e.g. Croatia and Portugal have a very high renewables share in electricity consumption) does not necessarily reflect their investment in RES technology or the energy sources they have in more abundance. Thus, both Croatia and Portugal have a very high share of hydro-produced electricity (Statistical

Office of the European Union, 2019b), and among their installations they count a number of very large hydro dams, while solar powered electricity is still very residual in these countries. Spain, which has applied what has been called a "sun tax" for the past decade, also has a relatively small installed capacity of solar photovoltaic technology vs a large installed capacity of wind technology. In contrast, Germany, a Northern country with below-average sun days, has invested considerably in solar powered energy solutions (Ibid.). In all of the nine countries under study, however, either hydro power or wind energy is still the leading renewable energy source (Ibid.). Either or both of these energy sources have catapulted Portugal, Spain, Croatia, Germany and Italy to leading positions in the share of renewables in electricity consumption.

In the next sections, we will review in some detail how the differing renewable energy contexts and impacting factors translate to the conditions under which RES prosumerism is developing in the EU.

2.2 Slow but certain recognition of the prosumer as an energy actor

Up until recently, the role of the "prosumer", "self-consumer" or "active customer" had not been consecrated by EU legislation, leaving those wishing to be active agents in the energy sector, in particular the renewable energy sector, without a legal definition, special rights, support, or even clear obligations, thus exposing them to considerable investment risk and uncertainties (Toporek & Campos, 2019, p. 16).

Despite this, prosumers, or to use the European Commission's term of "self-consumer", are attributed an important role in the process of the desired—as much as necessary—clean energy transition, if the EU is to live up to the Paris agreement and its own, even more ambitious promises. The EC aspires, as it revealed during the 2016 launch of the so-called "Clean Energy Package", to have the EU "lead the clean energy transition, not only adapt to it" (European Commission, 2016a). The EU officially committed itself to a 40% cut in CO2 emissions by 2030, employing a three-pronged strategy:

- Putting energy efficiency first.
- Achieving global leadership in renewable energies.
- Providing a fair deal for consumers.

A year earlier, in its communication "Delivering a New Deal for Energy Consumers" (European Commission, 2015), the EC had already made it known that it wishes to place citizens at the core

of the "Energy Union" (European Commission, 2019). In 2016, the Commission went a step further and recognised that "consumers are active and central players on the energy markets of the future" and that they will have "the possibility to produce and sell their own electricity" (Ibid.). Active customers are seen as strategic in the transition towards an Energy Union that besides innovative and climate neutral, is expected to be fair and inclusive, as well as promote job growth.

A little over two years later, the EC has completed negotiations on most of the legislative proposals embedded in the Clean Energy Package, with the RED II (recast of the Renewables Directive), the new Governance Regulation of the Energy Union and Climate Action, as well as the new Energy Efficiency Directive already approved and published, while the recast of the Electricity Directive has achieved political agreement but is still awaiting adoption.

By allowing prosumers or self-consumers to participate, individually or in association with others, in what has traditionally been a monopoly or at best an oligopoly market, the EC is hoping they will help jumpstart the clean energy transition. Having amped up the renewable energy sources consumption share goal from 20 to 32% by 2030, which includes a sub-target for transport requiring 14% of the energy consumed in road and rail transport to come from renewable sources, the EU countries know that they need their citizens on board, as active participants. And indeed, in those countries where rules for self-consumption of renewable energy sources have meanwhile been relaxed and/or incentives provided, several thousands of energy cooperatives and energy communities and tens of thousands of smaller and larger prosumers have popped up. The European federation of renewable energy cooperatives, REScoop, albeit only six years "young", already counts 1,500 members, representing approximately one million citizens.

2.3 The prosumer as facilitator of the clean energy transition

The literature on prosumers in energy tends to attribute a key role to fully empowered prosumers in the clean and fair energy transition. Koirala et al. (2016) predict that a transition from fossil-fuel-based centralised energy systems to renewables-based decentralised energy systems will entail:

- Increased electrification.
- Distributed energy resources.
- A fully carbon-neutral energy mix: adapting the infrastructures to renewables.
- Changing utility business models: control at consumer- and community-level.
- Increasing ambition at the local and regional (community) level to integrate electricity, heating, cooling and transportation. (Koirala, Koliou, Friege, Hakvoort, & Herder, 2016)

The relocation of control over such crucial resources, such as energy, by emerging new actors, such as prosumers and prosuming energy communities, is seen as both a driver as well as a result of the energy transition (Lavrijssen & Carrillo Parra, 2017). It is true that new energy actors are popping up and challenging the status quo, but this might never have happened if RES technologies had not become more affordable and accessible. Which, in turn, has been influenced by many other factors, among them the successive commitments celebrated at the Climate Summits, however timid at first, but now ever more urgent and unavoidable as governments face ultimatums from their peers, from scientists, and from their citizens.

Although motivations to start or join a collective energy initiative may vary significantly, as Bauwens' study of two energy cooperatives in Flanders (Bauwens, 2016) illustrates, the founders of these initiatives are almost invariably motivated to be independent energy actors, in control of the (clean) energy choices of their community (Bauwens, Gotchev, & Holstenkamp, 2016). Community energy projects are intended to benefit the community, whether these benefits be financial gains, self-sufficiency, or a contribution to a low or zero-carbon society (Brummer, 2018). Brummer himself concludes that two main aspects characterise most community energy initiatives:

- An energy system that is more sustainable in its technological aspects.
- An energy system that allows more participation and democratic control. (Ibid., p. 194)

Prosumers, by whichever term they may be called, are also considered instrumental to realising energy justice. Lacey-Barnacle and Bird, in an 18-month study in Bristol, UK, while using the broader concept of "civic energy actor", found local low-carbon energy initiatives to clearly benefit deprived communities (Lacey-Barnacle & Bird, 2018). Taking a more critical view, energy scholars Jenkins, Sovacool, and McCauley believe that sociotechnical transitions can produce justice as much as injustice, unless "justice is embedded as a core notion during both policy analysis and policy process" (Jenkins, Sovacool, & McCauley, 2018, p. 71). The scholars of sustainability transition are likewise placing their bets on the power of grassroots-led innovation in energy niches to lead the transformation of the whole energy system (see for example Seyfang & Haxeltine, 2012; Seyfang, Hielscher, Hargreaves, Martiskainen, & Smith, 2014). Although research is still in its early stages, the underlying hypothesis appears to be that less institutionalised, local, citizen-led sociotechnical projects (also called niches) allow for more experimentation and consequent innovation, in particular in social practices.

The challenge is how to balance the process of niche-based social innovation, in particular what TRANSIT researchers have called "transformative social innovation" or TSI—defined by them as "the process of challenging, altering, or replacing the dominance of existing institutions in a specific social and material context" (Haxeltine et al., 2017, p. 3), with the need to scale up sustainability transitions, in particular the clean energy transition. Equally challenging is figuring out how to properly support sociotechnical niches such as RES prosumer initiatives. Schot and Geels warned us even before community-based sustainability initiatives really took off, that, although niches are critical for regime changes, they depend on internal as well as external factors for their success (Schot & Geels, 2008). Previously mentioned European Union-funded projects such as TRANSIT, Enable.EU, TESS and SI Drive have looked at some of these factors, delving into the intricacies of individual and collective new social practices: what are the motivations of the different actors, what are their roles and how do they interact and organise themselves, what is the role of information, how does technology either facilitate or hinder the social innovation, what are the critical success and failure factors, and, a question PROSEU is also asking, how do we move from niche-level initiatives to the mainstreaming of a social innovation, without losing the democratic, inclusive, and collaborative spirit that inspired people to launch these projects in the first place?

The SI Drive project, which mapped and analysed cases of social innovation in seven key policy fields, including energy, concluded the following about the drivers of social change:

> The need to respond to a specific societal challenge or a local social demand are by far the main motivation and trigger for starting, initiating and running a social innovation. More than 60% of the initiatives started from this perspective. These objectives are more relevant than having an inspiring new idea (28%), a policy incentive like a policy programme or strategy (18%) or a social movement focusing on specific issues (15%). The possibility of taking advantage of new technologies for tackling social problems is a first motivation or trigger for 23% of the cases (Howaldt, Schröder, Kaletka, Rehfeld, & Terstriep, 2016, p. 41).

2.4 Debates on prosumerism

If it is true that societal and community needs are the kindling that start the fires of social innovation, other factors, among them geographic, political, and socioeconomic, but also institutional will determine how successful such initiatives are. When studying the case of the emergence and constitution of biogas cooperatives in South Tyrol, Italy, Wirth found that the farmers involved in the projects shared strong institutional features of community, such as a culturally established tradition of cooperatives and a strong sense of responsibility for the local environment as well as the local population (Wirth, 2014). These institutional features will vary from

country to country, region to region. A recent comparative study of Germany and Spain in terms of ownership of renewable energy installations finds a stark contrast between the two: in Germany 22% of the installed renewable electricity capacity is in the hands of energy communities, whereas in Spain collective ownership of RES installations is rare (Romero-Rubio & de Andrés Díaz, 2015).

The definition and role of these energy community initiatives is in itself a hot topic in the RES self-consumption debate. Few countries (Germany being a clear exception) are recognising energy communities as entities or even energy actors, yet their growth has been explosive and their strategies to survive creative. In light of these rapid developments, the new RED II Directive recognises three forms of renewable energy prosumerism, of which we present the final versions below. Since the term prosumer has not caught on in EC lexicon yet, the term "renewables self-consumer" is instead used while two collective forms of RES prosumers are officially recognised:

Table 5: RED II Directive prosumer definitions

- **Renewables self-consumer**: a final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity.
- **Jointly acting renewables self-consumers**: a group of at least two jointly acting renewables self-consumers in accordance with point (14) [of the RED II Directive, defining "renewables self-consumer"] who are located in the same building or multi-apartment block.
- **Renewable energy community (RECom):** a legal entity
  a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
  b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;
  c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.

Under RED II, Renewables self-consumers will be able to "generate renewable energy, including for their own consumption, store and sell their excess production of renewable electricity, including through renewables power purchase agreements, electricity suppliers and peer-to- peer trading arrangements" (Article 21 of RED II). REComs will be able to do the same and also "share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community, subject to the other requirements laid down in this Article and to maintaining the rights and obligations of the renewable energy community members as customers" (Article 22 of RED II). The currently agreed text for the new Electricity Directive will

further reinforce the rights of energy communities to engage as energy actors in a number of production, distribution, and supply activities, as well as additional services, whether producing renewable energy or not (yet). The only catch, but which may also be a way to safeguard the locality and community focus of these energy initiatives, is that their primary objective must be to provide environmental, economic, or social community benefits rather than financial profits.

One of the commitments under the new Governance of the Energy Union and Climate Action Directive, is for each EU country to submit their final National Energy and Climate Plans (NECPS) until the end of 2019 (draft plans had to be delivered by 31 December 2018). These plans have to cover the five dimensions of the Energy Union: energy security; a fully integrated energy market; energy efficiency; decarbonisation of the economy; research, innovation and competitiveness (European Commission, 2019) for the period of 2021 to 2030 and countries will have to report on the progress they are making in implementing their plans on a biennial basis. Together with the RED II Directive, the Energy Efficiency Directive, and the upcoming new Electricity Directive, this means the legal pillars are finally in place to support individual and collective prosumerism.

2.5 What is holding prosumerism back?

While the debate on RES prosumerism was on-going over the past decade, its development has been very uneven across Europe, and even now, until all EU countries have adopted the new directives and adjusted their NECPs, insecurities remain. In PROSEU's previous deliverable D3.1 (Toporek & Campos, 2019), the authors point out considerable disparities both in legislative and policy support for RES prosumerism in different EU countries, as well as several speeds of prosumer development, often as a consequence of the countries' legal and policy context. Countries such as Austria, Denmark, Finland, Latvia, and Sweden, are examples where RES represent over 30% of gross final energy consumption, whereas in Belgium, Luxembourg, Malta, the Netherlands, and the UK they remain under 9% (EEA, 2017, p. 5). The EU-28 average meanwhile was 17.53% in 2017. Of the countries studied by PROSEU, only Portugal and Croatia approach the mark of a 30% share in gross final consumption of energy, while France, Spain, and Germany score in the middle, and the UK, Italy, the Netherlands, and Belgium score closer to the 9% mark (Statistical Office of the European Union, 2019b). It must be noted that these numbers do not reflect how well some of the lower-scoring countries may be doing in terms of RES shares in specific sectors, such as electricity (IT: 34.10%; UK: 28.11%; BE: 17.24%; NL: 13.80% and EU-28: 30.75% in 2017). They also don't reflect the sometimes-disproportionate share of hydro in the RES mix, a decision that may be debateable depending on what size of hydro is "accepted" as a renewable

energy source (this is the case of Croatia, where 80% of RES electricity is produced by hydro dams). The reasons for the disparities are not purely technological, financial, or even cultural. Spain, as will be discussed further on, is a case in point, having politically blocked self-consumption in RES for a long time while it is now suddenly changing gears drastically to promote RES prosumerism.

These disparities and threats to the collective production and consumption of RES, as well as the potential benefits of removing them and bet on local RES energy initiatives have been well-documented by a number of reputable recent reports. REScoop's 20-20-20 project, co-funded by the Intelligent Energy Europe Programme of the EU, reviews both the opportunities and the barriers to collective prosumerism. Among the opportunities are the rapidly falling costs of solar photovoltaic (PV) installations and batteries for storage, as well as an incentive to self-consume rather than sell to the grid, since feed-in-tariff rates (FiTs) are dropping or even being abolished (Vansintjan, 2015, p. 34). Among the advantages of collective forms of prosumerism mentioned in the report is the possibility to ensure a local supply of clean energy, which is effectively under control of citizens and/or local groups and collectives, thereby enabling the shaping of an energy future that truly "suits the needs of their members and the ideals of their organisation" (Ibid., p.46). Among the biggest hurdles that the REScoop report identifies are bureaucracy and regulations, the density of which varies per EU country (Germany, again, being one of the most supportive countries).

After a period of growth of RES initiatives, when EU negotiations started around 2014 on the form that the energy transition should take, the legal framework became uncertain again and the number of new collective prosumers, in particular energy cooperatives, started dropping. One reason for this, according to the REScoop report, is that investments in RES installations can be considerable: In Germany the average amount of seed capital for energy cooperatives lies a little under 686.000 € (Ibid., p. 50). New initiatives face considerable financial risk if they start while the legal framework for collective/community prosumerism is still so unstable.

In another report that came out of the 20-20-20 project (REScoop, 2017), the partners involved conclude, based on a review of studies of RES financing, and interviews with experts, that financing factors are not the main hurdle in financing REScoop projects. For example, European citizens have not entirely lost their aptitude for saving, so there is a huge potential to pool small investments. Instead, barriers to financing tend to be cultural and political in nature, related to a lack of knowledge of RES (in some cases even misinformation) and to a lack of legitimacy attributed to the cooperative model, but also to the inexperience of the citizens running the energy cooperative

projects. Finally, few countries have public support schemes for collective RES projects that may help to legitimise them and guarantee their investment.

Examples of uncertainties holding back the growth of collective prosumer initiatives pointed out in the REScoop 20-20-20 report (specific to Germany, the country farthest ahead in collective energy self-consumption) are:

Table 6: Legal uncertainties for RES prosumers

- Whether or not general expansion targets for renewable energy should be capped to a maximum.
- Whether Direct Marketing should be mandatory for REScoops.
- Whether new RES projects should generally be awarded through public tendering procedures.
- Whether the cooperative members' private use of energy should be exempted from EEG (Energy injection legislation) apportionment.
- Whether civic involvement should be mandatory in all future renewable energy projects.

Source: (REScoop, 2017, p. 52)

The REScoop 20-20-20 report identifies some of the main threats to democratic and localised initiatives in clean energy and hence, to a clean and fair energy transition:

Table 7: Main threats to collective RES initiatives

- The spreading of myths on the unviability of a RES future by opponents of the energy transition.
- The growing number of purely commercial initiatives by project developers and increasingly also the larger energy companies. They often set up organisations that are legally indistinguishable from the collaborative forms, in particular cooperatives, but do not adhere to the cooperative principles and are not in citizens' hands.
- Rigorous lobbying by large energy companies to make sure that community/ individual RES projects stay small.

Source: (REScoop, 2017, pp. 54–57)

REScoop, as a stakeholder representing at least one million EU citizens, recommends in their report that natural resources officially remain a common good. Any costs and benefits of their exploration should be equitably distributed. When local residents are involved in the coordination of the use of these resources, values that are preached by the EC itself, such as democratic decision-making, inclusiveness, transparency, and a fair deal for all, are better guaranteed than when purely commercial organisations are put in charge. This involvement is also a way to reinvest revenue in the community. Finally, REScoop proposes that not just local production, but also the transmission and distribution networks be kept in the hands of citizens, a sensitive issue that has been much under-discussed. REScoop warns strongly against giving transmission and distribution networks out into private hands. This goes against the liberalisation trend in the energy markets, however, REScoop is not only sceptical of increasing concentration in the RES sector, but also of governments

taking control of commercial energy production. In their words: “public producers also have every reason to sell their electricity on the market at the highest possible prices, while environmental objectives and good service to citizens and businesses should be the government's focus” (Ibid., p.66).

Another recent and extremely comprehensive report on the state of Europe’s energy transition is the Energy Atlas 2018 (Heinrich Böll Foundation, FOEE, EREF, Green European Foundation, 2018). The authors note that the EU not only *must*, but *can* be extremely ambitious in their RES goals. They argue, based on the current state of storage and demand-response technologies, that a 100% renewable energy system in Europe is technically possible (Ibid., p. 8). They see a system change from centralised and monopolistic energy utilities to decentralised, community-inspired and innovative business models as potentially driven by citizens, municipalities and energy cooperatives. However, they warn that policies and strategies will have to be in place to ensure that a fair, inclusive, democratic, and efficient energy transition is championed by citizens and communities.

This, in their view, is not happening yet, despite the fact that the potential for citizen-owned energy production is enormous. A 2016 report by the research institute CE Delft (2016) estimates that 264 million “energy citizens” could generate 45% of the EU’s electricity needs by 2050. According to their calculations, collective projects and energy cooperatives alone could represent 37% of the energy produced by these citizens.

One other barrier to community-owned renewable projects is that of the overcapacity in the energy market, a result of a lot of fossil fuel and nuclear energy still being subsidised in the name of “energy security” (Heinrich Böll Foundation et al., 2018, p. 17). This persists, despite the fact that the growth in the use of renewable energy sources since 2005 has been exponential. The updated report from the European Environmental Agency on renewable energy in Europe for 2017 states that:

> (…) the rapid development of some renewable energy technologies and consequent cost reductions have already led to RES technologies achieving high market shares. Today, for solar photovoltaic electricity, as well as biogas electricity and solid biomass use for heating and cooling, these shares are at, or close to the levels anticipated to be reached by 2020 in the National Renewable Energy Action Plans drafted by countries in 2010. In 2016, renewable energy accounted for the overwhelming majority (86%) of new EU electricity-generating capacity for the ninth consecutive year. (EEA, 2017, p. 5)

The EU can hardly keep up with the growth: it is currently decommissioning more capacity from conventional sources than is being installed (Ibid.), with renewable heating and cooling remaining the dominant RES market sector, and renewable electricity being a close second, driven by growth in wind power, solar PV generation, but also an increase in solid biomass combustion (Ibid., p. 6).

This takes us to another barrier to the decentralisation of energy: the lack of flexibility of conventional power plants, which are not prepared to be turned on and off quickly to adjust for the fluctuation of renewable energy sources (Heinrich Böll Foundation et al., 2018, p. 22). The careful management of electricity grids will be crucial to make the new energy mix work.

2.6 The way forward for RES prosumerism

The latest report by the High-Level Panel of the European Decarbonisation Pathways Initiative echoes the warning to urgently make the electricity system more flexible and better integrated in the wider energy system, all the while not making the mistake of continuing to support carbon-intensive energy sources (Schellnhuber et al., 2018). Nothing less than a holistic, systemic, digitalised and highly innovative approach is needed, while making sure not to leave behind the 54 million European citizens who were unable to adequately heat their homes in 2012 (Pye et al, 2015, in Schellnhuber et al., 2018, p. 46). The High-Level Panel attributes an important role to changing energy governance structures, claiming that "(b)road citizen engagement is key to successful zero-carbon transition in cities" (Ibid., p. 115), and warns that the new business models in the energy sector, including the emergence of platform economics and prosumers, must be supported by an appropriate regulatory environment (ibid., p. 38).

The previously mentioned Energy Atlas offers a number of solutions for dealing with the problem of variable generation from renewable sources, for decarbonising transport, and for tackling the heating and cooling sector—representing almost 50% of the EU's final energy demand (Heinrich Böll Foundation, FOEE, EREF, Green European Foundation, 2018, pp. 24–28). The authors also point out that energy efficiency measures alone, as foreseen in new EU legislation, can save up to 326 million tonnes of oil per year by 2020 (Ibid., p. 30). But as regards the desired decentralisation and democratisation of the energy system, the Atlas leaves us with a major caveat: the lack of digitalisation of the energy infrastructure, and the fact that the digital systems that exist—such as digital trading and billing—are still in the hands of large energy companies, may effectively place a stranglehold on the transition towards renewable energy. Energy monopolies are actively slowing down the marketisation of new digital technologies for energy production and distribution. The

digitalisation of the energy sector is not only beneficial for the development of community-owned energy, but in fact crucial for the stability of an energy system with a high input of renewables, as the case of the solar eclipse in May 2015 so poignantly demonstrated: German grid operators had to manage switching large fossil-fuelled power plants on and off in a matter of hours to avoid a massive power surge or blackout (Ibid., p. 32).

Finding the right pathway for an energy transition that incorporates the values the EC and many of the EU countries have openly supported—e.g. a transformation of the energy system that is not only technically innovative and socioeconomically viable, but also democratic, inclusive and institutionally transforming—is one of the biggest challenges facing EU institutions and Member States at the moment. In a collaboratively generated synthesis, Fazey and 47 fellow researchers recently drew up what they considered to be the "essentials for guiding action-oriented transformation and energy research" (Fazey et al., 2018). These guidelines aptly wrap up our review of the prosumerism phenomenon and its role in a meaningful energy transition in Europe:

Table 8: Ten essentials for guiding action-oriented transformation and energy research

1. Focus on transformations to low-carbon, resilient living;
2. Focus on solution processes;
3. Focus on 'how to' practical knowledge;
4. Approach research as occurring from within the system being intervened;
5. Work with normative aspects;
6. Seek to transcend current thinking;
7. Take a multi-faceted approach to understand and shape change;
8. Acknowledge the value of alternative roles of researchers;
9. Encourage second-order experimentation; and
10. Be reflexive.

Source: (Fazey et al., 2018, p. 57)

3. Results of the survey in nine European countries: "New Energy for Europe: Renewable Energy self-consumption initiatives."

3.1 Methodological analysis of the survey results

Research on the characteristics of collective forms of RES prosumers is scarce and scattered, which is why the PROSEU project included a Europe-wide survey. We wished to obtain a good overall picture of these RES prosumer initiatives: who and where they are, their diversity, how they organise themselves, their choices of technology, how they finance themselves and what their business model is, what drives them, how they legitimise their actions and ambitions, what they perceive to be the barriers as well as the key facilitating factors for their successful development, and how they deal with issues of participation, inclusiveness, gender, and transparency.

In PROSEU's initial proposal, the method chosen for the survey was the semi-structured interview format. When the project started, mass-mailing and interviews as well as a combination of both were put back on the table. But because of the very recent GDPR rules, we decided against doing a mass-mailing. In any case, the level of ambition of our inquiry did not lend itself to a mass survey, but on the other hand the method of interviews would require all partners to have interview skills and/or would encounter language barriers. We therefore decided to conduct a large multiple-case study by using an online survey, especially developed for us using open source code and placed on a secure server. Our sampling strategy and GDPR rules implied that each partner collect data on collective forms of RES prosumers in their respective countries. After several iterations of database analysis to refine the profile of our collective RES prosumer (see Chapter 1 for details on the stratification), we had collected close to 1,000 contactable initiatives representing our different exploratory categories of RES prosumer initiatives in nine countries. As an example, Germany, one of the countries in our survey that is leading in RES prosumerism (followed by the Netherlands, UK, and France) achieved the following proportion of different collective RES prosumers for their sample:

Table 9: German sample stratification

German sample distribution	Number	Percentage
Energy cooperatives	241	64.4%
Community-owned initiative	22	5.9%

Public-private partnership	23	6.1%
Municipality or local government	27	7.2%
Other public institution	14	3.7%
SME	13	3.5%
Large business	10	2.7%
Small RES utility company	1	0.3%
Not-for-profit (NGO, association)	12	3.2%
Unknown	11	3.0%
TOTAL	**374**	**100%**

We were aware that not all of the countries would have this RES prosumer profile. In particular, Croatia, Spain, and Portugal, countries that are new to the prosumer phenomenon (or have actively put the brakes on prosumerism, such as Spain until recently), might find it more difficult to diversify their sample. Likewise, Italy, despite having the business and financing schemes in place for promoting prosumerism, still has a low number of prosumer initiatives. Belgium, besides being a small country, has seen a drop in prosumer growth due to changing legislation and the creation of a "Prosumer Tariff" in Flanders, and was therefore expected to contribute with a lower sample. On the other hand, countries such as France and the UK have very specific legal forms that organisations can choose from, more diverse than in the other countries. The partners in those countries had to try and reclassify their potential respondents to obtain a representative sample.

The final distribution of contacted respondents across the countries and the corresponding response rates were the following:

Table 10: Sample distribution across countries and response rates

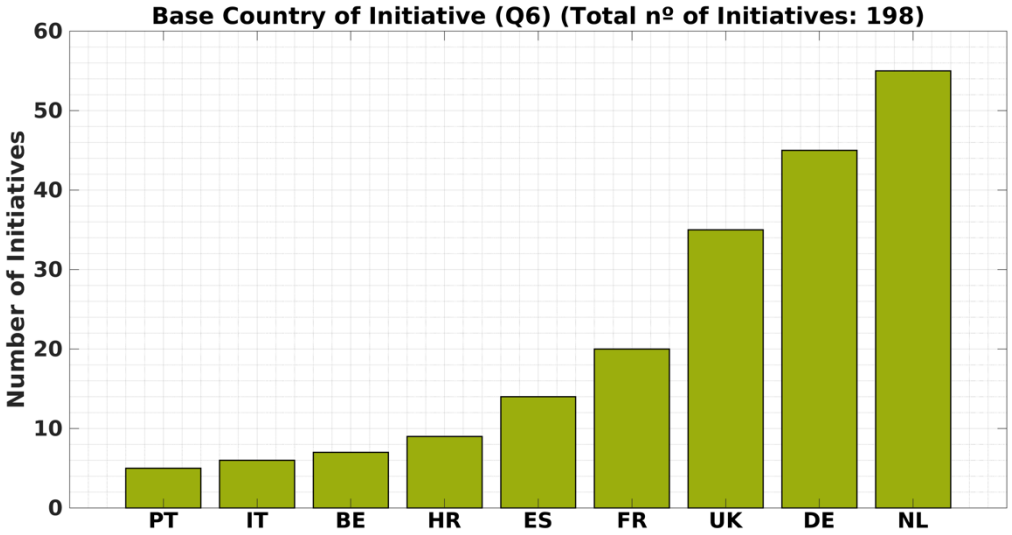
Target Country	Sample size -	Response rate	Response rate
United Kingdom	209	35	16.7%
The Netherlands	163	55	33.7%
Germany	259	45	17.4%

Belgium	36	7	19.4%
France	70	20	28.5%
Italy	41	6	14.6%
Croatia	15	9	60.0%
Spain	70	14	20.0%
Portugal	42	5	11.9%
Other	5	2	40.0%
TOTAL	910	198	21.8%

In addition, two initiatives, respectively from Denmark and Finland, both cooperatives, members of REScoop, responded to the survey and were included in the final dataset. These initiatives are included in the total mentioned above (198 initiatives). The average response rate corresponded to our best expectations (we wanted to reach a minimum of between 150 and 200 initiatives, and achieved the high end of this objective). The country distribution also mostly followed the trend of prosumer development in each of the target countries, with the exception of Portugal and Italy, of which the response rate was quite a bit below our average, and of Croatia, which, despite a very high response rate, had not managed to create a large enough sample size (15) for the results to be representative. In contrast, while Spain has not had a favourable climate for prosumerism, and France is quite new to it, nevertheless, because of the size of these countries in terms of population and energy needs, their proportional sample sizes ended up to be larger, with very good response rates. Finally, RES prosumerism leaders Germany, the Netherlands, and the UK had varying response rates (just below average to way above average), with the differences between them partially explained by "survey fatigue" in Germany and in the UK, which have had more years of "prosumer enthusiasm", and partially by how many times the country's survey team was able to follow up on laggards. These caveats have to be kept in mind when analysing the survey data.

The distribution of the respondents across the nine target countries is represented in Figure 11 below.

Figure 11: Respondent distribution across countries



Based on the legal forms encountered during the database building process (see Section 1.4.3 and the German sample presented in this chapter), we reclassified the responses to the legal form question by our respondents. We added the category of "social enterprise", since it is quite distinct from the straight-forward for-profit company. The category public institution holds any entity from the public sector, including municipalities or schools. There is of yet no legal form for "energy community", nor can we directly equate the legal form of the initiative with its role as an energy actor, so this category could not be added. We will elaborate on this in the section on demographics. We found that energy communities often, but not always, choose the legal figure of the cooperative to organise their initiative. Besides these, we found three types of initiatives that come close to an overt form of energy community: public-private partnerships, partnerships between organisations and/or collectives and informal civil society initiatives or collectives. Finally, we found RES prosumer initiatives that were run as projects by organisations or collectives.

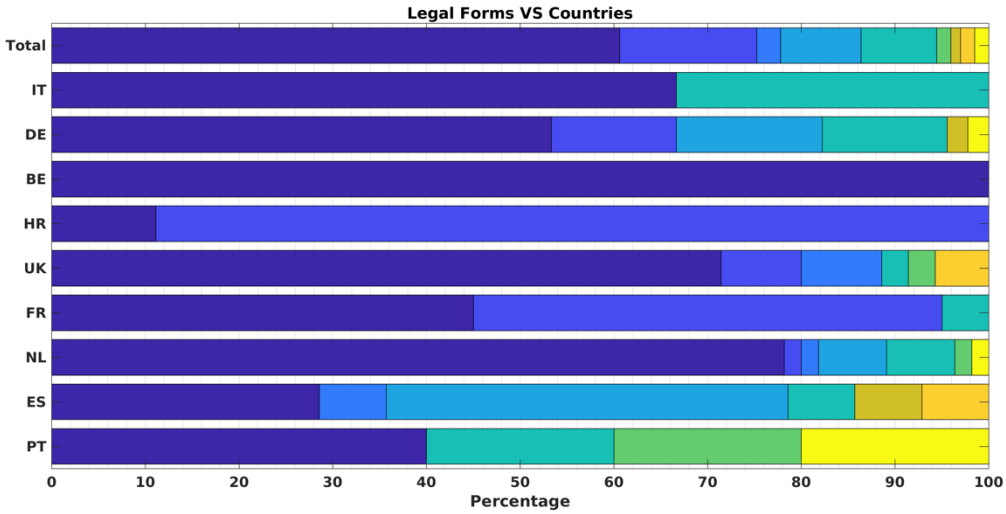
In consultation with the partners in the respective countries, the legal forms given by respondents were thus reclassified according to the following table, deemed to be most representative of the types of organisational forms we were encountering.

Table 11: Reclassification of legal forms

Legal / organisational forms given by respondents (in original language)	Reclassification for data analysis
SAS cooperative, SAS d'interêt collectif, Community Benefit Society, Societé cooperative à resp. limitée, eingetragene Genossenschaft (eG), CVBA, Community Development Trust, Cooperativa, Industrial Provident Society	Cooperative
Societé à resp. limitée, Privatno firma, Malo poduzece, S.A., ESCo, Kommanditgesellschaft (KG), Gesellschaft mit beschränkter Haftung (Gmbh), Aktiengesellschaft (AG), Besloten Vennootschap (BV), Limited (Ltd), project	Company (for-profit)
Publieke organisatie, Staatliche Behörde, Kommune, Overheids orgaan, Körperschaft des öffentlichen Rechts, Gemeente, Municipalidade, Gebietskörperschaft, Escola publica	Public Institution (incl. local authorities)
Association (ex: of homeowners, sports, ...), Stichting, associação, Gesellschaft bürgerlichen Rechts (GbR), associazione privativa	Private not-for-profit organisations (e.g. NGO, association, foundation,...)
Social purpose business, Empresa de no lucro, Community Interest Company	Social Enterprise
Private project	Project run by an organisation or collective
Partnership between family farms and a town community, partnership between cooperatives, partnership between companies and community interest companies	Partnership between organisations and/or collectives
Unincorporated community group, informal association	Informal collective or community
Partnership between a Gmbh & Co.KG, partnership between municipality and other organisations	Public-Private-Partnership
Other	Other

The distribution of legal forms across the dataset and for each target country is presented in Figure 12.

Figure 12: Distribution of legal forms in each target country



Legend for Figure 12

Overall, and as expected, energy cooperatives make up the bulk of respondents (60%), just as they do of collective RES prosumers in general. In fact, considering the federation REScoop's estimates of RES energy cooperatives in Europe—In 2014, REScoop reported approximately 3,000 energy cooperatives (Huybrechts & Mertens, 2014), considering their own growth of 20% since then, an educated guess would place the current total close to 3,600—our response rate for cooperatives is statistically significant, albeit with a high margin of error (9%). We will therefore not assume that our results are necessarily statistically significant, but, especially in the case of cooperatives, we can be confident that we have found clear trends for a number of indicators surveyed by us.

In our results, companies were slightly over-represented compared to the German distribution example, partly due to the fact that the Croatian prosumers were almost exclusively companies, while almost half of French respondents were companies. Finally, informal collectives might have been under-represented due to their fear of legal consequences (in those cases where they may not be meeting legal requirements such as registration or other bureaucratic demands). Some of

the personally contacted informal collectives refused to collaborate, despite guarantees of anonymity. But for most of the countries, the distribution of legal forms corresponds with the trend in the country (e.g. Belgium, the Netherlands, Germany, Italy, and France have high numbers of cooperatives, it is a preferred form of collective prosumerism there, whereas in Croatia cooperatives are mostly shunned, since they are still associated with communist times).

The survey form, developed collaboratively over a number of months, was tested on six respondents in the Netherlands and Germany (not included in the final sample), and final corrections were made before officially launching the survey on October 16, 2018. Among the corrections made was the elimination or simplification of some of the questions in order not to go over a 30-minute timeline for responding to the survey, since long surveys are a strong deterrent to reply. Most questions were created as multiple-choice options to allow for a more user-friendly experience, although, as a compromise, most of the questions also gave respondents the opportunity to comment by choosing "other". Question Q32 was left completely open and the fact that, despite this being the last question in a relatively long survey, 71 initiatives (36% of our dataset) took the time to answer it, is a good indicator of how motivated our respondents were to answer the survey.

The final survey form can be found in ANNEX 1 and consists of 32 questions, divided into seven categories:

Table 12: Survey categories of questions

Control questions Q1 (name of initiative) Q2 (consume RES yes/no) Q4 (job title of respondent) Q32 (additional information the initiative might want to give) >> this question is also compared to other sets of questions, in particular those on Motivation and Hindering/ Facilitating factors
General demographics of collective RES prosumers Q3 (legal form) Q5 (starting date) Q6 (location) Q7 (scale) Q8 (energy needs addressed) Q20 (nº of members) Q21 (nº of direct clients)
Use of technology by collective RES prosumers Q9a (which technologies are used or planned) Q9b (installed capacity of these technologies) Q10 (is the initiative connected to the grid)

Q11 (when did they start producing/plan producing)
Q12 (energy produced in 2017 for each technology)

Governance/organisation of collective RES prosumers
Q15-19 (staff characteristics: total number, women/men proportion, volunteer/paid staff proportion)
Q26 (decision-making style in executive organs)
Q27 (involvement/participation of staff/non-management teams in decision-making)
Q28 (networking, openness to others)
Q29 (inclusiveness)

Financing of the initiative
Q22 (who owns the RES equipment)
Q23 (how are initiative activities financed)
Q24 (how much capital was borrowed, if any)
Q25 (what are the 4 largest income generators)

Motivation/ambition of the initiative
Q13 (whom is energy produced for?)
Q14 (any additional services that are offered)
Q30 (Likert scale (1-5) of reasons to start the initiative)
Complementary: Answers to "Would you like to be a part of the RES Prosumer Community that PROSEU is building? (shows ambition)

Hindering and facilitating factors as perceived by collective RES prosumers
Q31 (which 3 factors have most slowed down and which 3 factors have most facilitated the development of the initiative)

At the end of the survey, respondents were asked if they wished to be part of PROSEU's RES Prosumer Community of Interest (by allowing their project to be added to the upcoming online interactive map of renewable energy initiatives in Europe), receive PROSEU's newsletter and/or the final report of the survey, participate in PROSEU's workshops and/or in the multi-stakeholder assessment group to mainstream energy prosumers across Europe, or, on the contrary, if they did not wish to be contacted again.

Data from the survey were analysed using the application MATLAB, a high-performance language for technical computing. In a first step, the dataset, exported as a csv from the SQL database was cleaned by:

1. Eliminating incomplete survey forms;
2. Eliminating survey forms from initiatives that could not be identified;
3. Eliminating survey forms from individual rather than collective prosumers or from stakeholders that are not prosuming, according to our definition;
4. Correcting names of initiatives by cross-checking with the organisational email provided and/or the website;

5. Correcting answers about the legal form when they were incomplete but could be found on the initiative's website.

Seven survey forms, where the initiatives answered validly to over 70% of the questions, were considered significant and useful enough to include in the dataset. Each survey form was manually checked to make sure it came from a valid initiative and was correctly answered. This manual check was necessary, as mentioned before, because of the need to reclassify the legal form given by respondents, but also because many of our questions had an open "other" option.

Once the dataset was established, each question was plotted out in several ways (looking at absolute totals, percentages, averages, modes and medians, as well as cross-tabulating results) to check for additional bugs, inconsistencies, or interpretation problems (on the side of respondents), and decide on the format that best suited the representation of results. This step revealed a few errors in a few questions (such as double scores where there should only be one, possibly the result of exportation incompatibilities). These were corrected by carefully verifying the original SQL database, and registering the correct answer.

Two questions had to be invalidated because the answers were not consistent across respondents. These were questions 13 (whom is the energy produced for) and 25 (what are the four largest income generators of the initiative). The categories to which these questions belonged were backed up by other questions that could provide similar answers. Q25, for example, was backed up by Q23 (how are initiative activities financed) and to a certain degree Q14 (additional services offered). Q13 could be addressed indirectly by looking at Q20 (nº of members) and Q21 (nº of direct clients) and at the comments left by respondents.

There were only two questions that both resulted in too many inconsistencies and at the same time had no back up questions to support them. Unfortunately, these two questions related to the same issue: Q9b (what is the installed capacity of the RES installation(s)) and Q12 (how much energy was produced with these RES installations in 2017). The fact that not all technologies can be measured by the same units in terms of their capacity (e.g. solar PV is measured differently from biogas, or battery storage capacity), compounded by the fact that production, again, is measured by different units, meant that our drop-down menu to choose capacity and production units was too complex and may have confounded some of our respondents. Others, perhaps even a majority, may have responded correctly, but this would require checking each and every answer either personally with the initiative and/or via their website. We decided to invalidate these

questions for now, hoping that in the next iteration (the typology work for D2.2) it might be possible to recover some of this information.

Comments (mostly from "other" options) and open questions were first subjected to a keyword search and then in a second, sometimes third iteration, classified into answer categories. Some of these answer categories were added to the existing answer categories (for example, small hydro was added as an additional technology option because 12 respondents indicated their main or important additional RES technology was hydroelectric), others were left out (when they represented isolated comments) and still others were reclassified into existing answer categories, when the respondent was saying the same in different words as that answer category. To offer three examples, one respondent replied under "other" in Q22 that their initiative owned the equipment and the initiative in turn was owned by several organisations. This was reclassified as answer category 22_1 "Our initiative owns it". Several respondents complained of excessive bureaucracy on the part of local, regional, or national administration in Q31. Their answers were reclassified under "Policies and Legislation for RES initiatives", which could either be a hindering or a facilitating factor, but was overwhelmingly classified as a hindering factor. Finally, in Q30, a number of respondents stated under "other" that they wished to benefit the local economy, however an answer category called "Improve revenue of your organisation and/or collective and/or community" already existed. If we consider community in a broad sense (a town, a city, a region), the local economy refers to this community. Reclassifications were overall not major, but resulted in extra categories for the following questions, thus helping to better reflect the answer trends:

- Q9 (RES technologies) : An extra category was created for hydro.
- Q14 (Additional services): Three extra service categories were created.
- Q22 (Ownership of equipment): An extra category was created for "each of the members owns it".
- Q23 (Financing of initiative): The answer category "participation fees from members" was renamed "Contributions from members" to more accurately reflect the answer trend and be able to reclassify answers from the "other" category.
- Q27 (Level of involvement of staff): A category had to be created for those that have no staff.
- Q29 (Criteria for joining): Three categories of criteria for joining the initiative were created based on the open answers.
- Q30 (Motivation for starting initiative): The answer category "Achieve energy self-sufficiency" was renamed "Contribute to energy self-sufficiency/independence", so as to incorporate answers from the "other" category that referred to energy self-sufficiency.

3.2 General demographics of collective RES prosumers

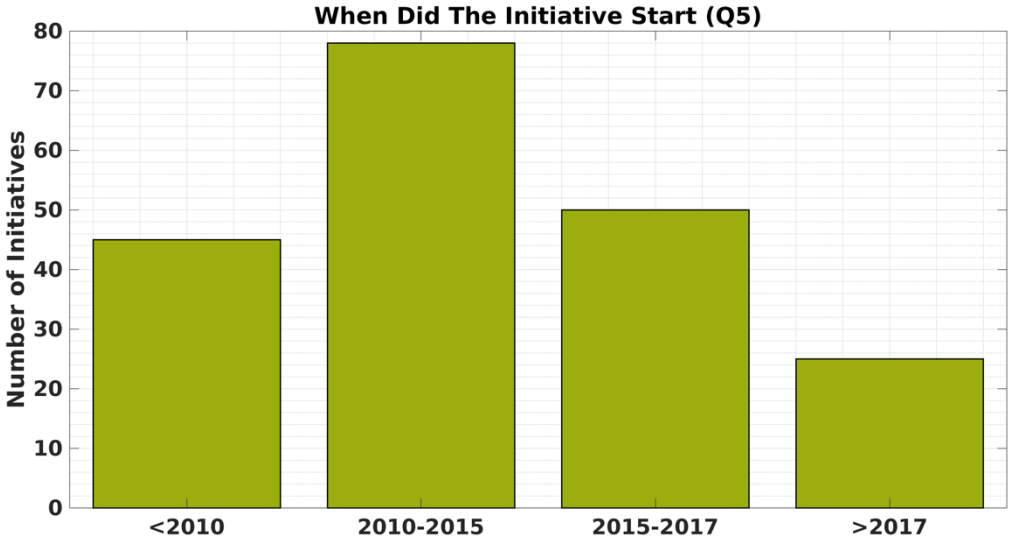
The cluster of questions in this category provided us with the distribution of legal forms among RES prosumer initiatives, as discussed in the previous section, as well as the starting date of the initiative, the country where they were based, the scale at which they operated, the energy needs they were addressing, and how many members and/or direct clients, if applicable, they had.

The distribution across the legal form categories created by us was presented in Figure 2 in the previous section. There we discussed the predominance of certain legal forms (60% of our respondents are cooperatives, currently the most common form for energy communities) and how the distribution changes according to country. In addition, the following observations could be made:

- Many of the initiatives have a community focus, which cannot be gleaned from their legal form, but is often present in the name or in their comments (e.g. "we are a community interest association and not-for-profit"). It seemed important for respondents to stress whether their initiative had a community purpose, in the absence of an official legal form for energy communities. This might be the reason why many of the answers to the Legal Form question had less than straightforward answers: a lot of answers were more a description of the type of energy actor that the initiative considered itself to be than the official legal form (e.g. we are a municipality working with local organisations; we are a company /association but run as a cooperative; we are a citizens' cooperative, …).
- A number of larger cooperatives but also municipalities in the Netherlands, the UK and Belgium are opting to create energy companies (not overtly called either ESCos or utilities but appearing similar in function, in that they will mediate for the cooperative/municipality with the energy market to set up the prosumer installation or supply members/constituents).
- A closer glance at the respondents reveals a few interesting outliers, such as an association that represents firms located on the same grounds that wish to prosume together; farmers cooperatives that also wish to be prosumers; energy suppliers that enable individuals and organisations to prosume and sell them the excess energy; or companies simply taking advantage of pro-renewable energy legislation to set up for-profit RES initiatives with a prosuming component (an example is Croatia, where biogas is obtained from farmers by companies and then resold).

In the following figures and text, the additional demographics of our collective prosumer respondents are presented.

Figure 13: Starting date of initiative



In order to visualise the distribution of the founding dates of the initiatives (Figure 13), we created four intervals based on the trend we found in the dataset: a slow growth until 2010, a more rapid growth in the five years hence, a slowing down of the growth in the years 2015-2017 and the possible start of a new growth spurt since 2017 (See Figure A in ANNEX 4 for more details). This trend was also described in the review chapter, where we showed that in many of the frontrunning countries prosumerism grew rapidly from 2010 until 2014, 2015, and then started slowing down partly because the EC and EU countries started discussing the form the clean energy transition should take, creating new uncertainties, partly because countries such as Belgium and the UK started considering cancelling support schemes for RES initiatives. In other countries, namely Italy, Spain, and Portugal, prosumerism is taking off with governments now more supportive of the phenomenon—Spain having abolished the so-called "Sun tax" (Toporek & Campos, 2019). Croatia is still a wild card: so far, it appears that mostly new energy companies are taking advantages of the support schemes, which are only available for production capacities higher than 1 MW (Ibid.).

Figure 14: Scale at which initiatives operate

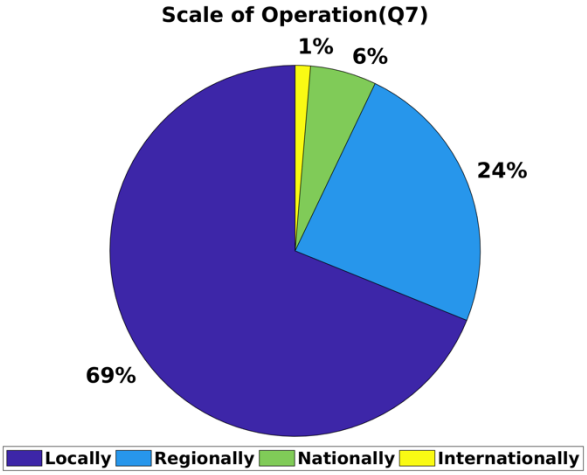
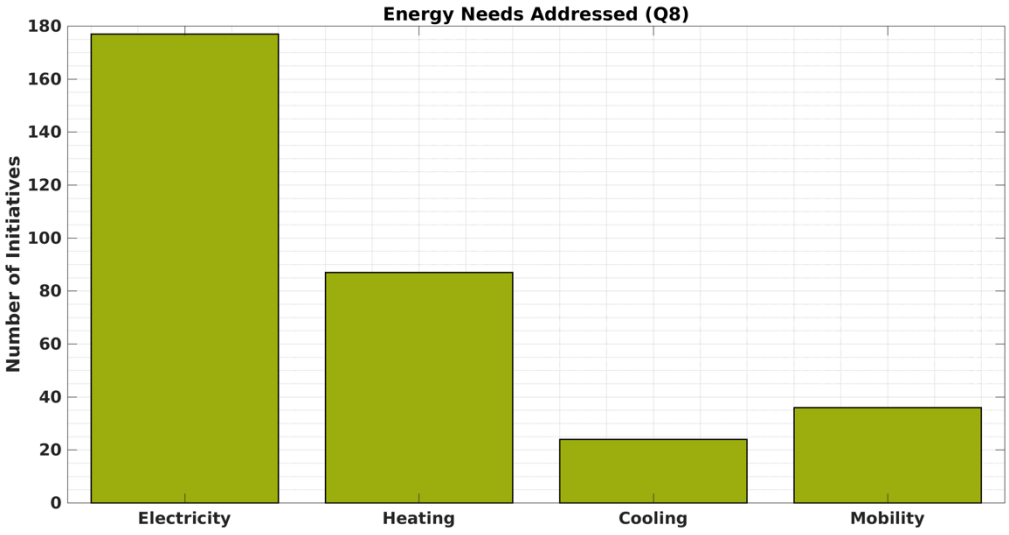


Figure 14 reflects the distribution of the scale at which initiatives operate, taking into consideration those initiatives that said that they operated at several scales (i.e. the percentage is calculated according to the total number of answers, not the total number of respondents). The overwhelming majority of initiatives surveyed operate either locally or regionally, correlating with, but also surpassing the number of cooperatives (60% of the dataset).

Figure 15: Energy needs addressed by the initiatives



Among the energy needs that are addressed by the RES prosumer initiatives as shown in Figure 15, when looking at the total dataset as well as when correlating with legal forms (Figure B in ANNEX 4), RES powered electricity strongly takes the lead, followed by heating, mobility, with cooling in last place. The only exception are public institutions, where cooling appears to represent a slightly

larger energy need than mobility. When we correlate energy needs with base country, one country sticks out (Figure C in ANNEX 4): While the initiatives from the Netherlands, the UK, and France still have electricity in the lead, with heating trailing behind (possibly related to their path-dependence on gas and nuclear energy, respectively), those from Germany are in a category of their own, increasingly managing to heat their buildings with renewable energy, with heating and electricity practically sharing first place. The initiatives from the other countries besides the top four, most of them newer to prosumerism, follow the trend of the overall dataset.

Figure 16: Nº of members

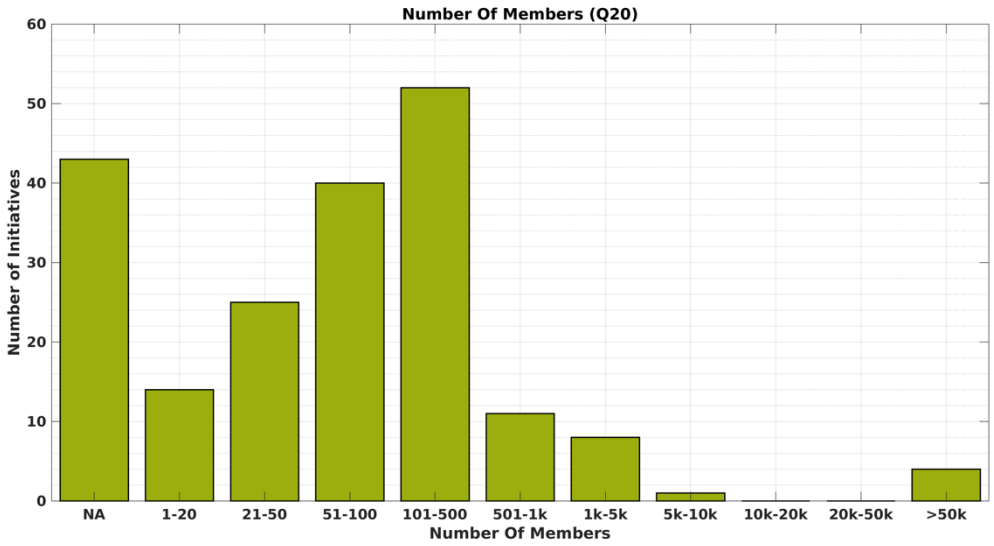
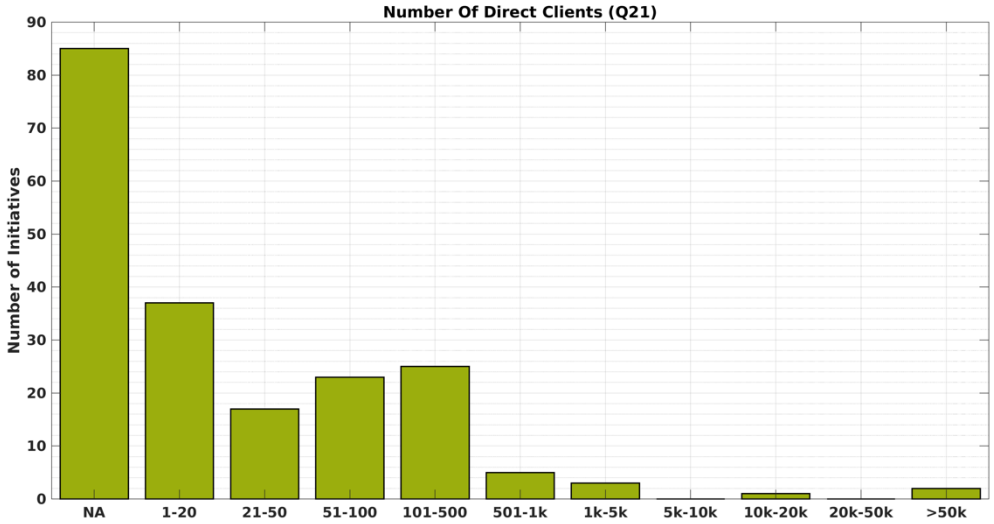


Figure 16 above depicts the answers to the question of how many members each initiative had. Our dataset had a predominance of middle-sized collective initiatives (with more than half of those that reported members counting between 51 and 500 members). Cooperatives, true to their legal form, almost always reported members (in a few cases the cooperatives were constituted by organisations and not by natural persons) and most of these belonged to the middle-sized group. Likewise, the majority of initiatives in the not-for-profit sector, composed of associations, NGO's and informal collectives, reported having members, except for the foundations, which are known to have a very different governance model. The for-profit sector, i.e. companies, not surprisingly, rarely had members in their initiative. The public sector also reported mostly having no members. The latter initiatives are mostly run by paid, professional staff, a reality that is very different from that of most cooperatives and associations in RES prosumerism.

Figure 17: Nº of direct clients

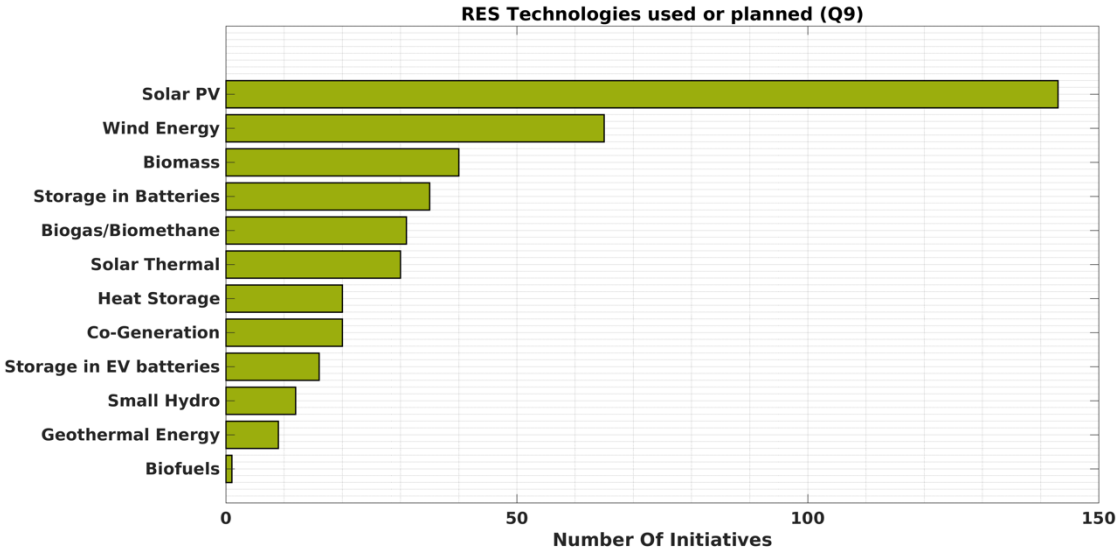


A little less than half of all initiatives reported (Figure 17) not having clients (most of these had members instead). At least 30 initiatives have both members and clients. The overwhelming majority of public institutions in our dataset have no clients. Cooperatives and the not-for-profit sector were more divided between not having clients (about a third) and having clients, with those cooperatives that reported clients equally spread between three intervals, whereas the not-for-profit sector was made up of smaller initiatives in the 1-20 nº of clients interval. A surprisingly high number of companies reported not having direct clients, which on the one hand may be explained by France's over-representation of companies that are actually citizens' initiatives, on the other hand by our use of the term "direct client". Some of the larger companies in our dataset do actually have clients, according to their websites, but perhaps did not consider them to be "direct" (this was the case for five of the Croatian companies, that operate as aggregators for prosumers, namely farmers producing biomass).

3.3 Use of technology by collective RES prosumers

Despite the fact that we unfortunately did not manage to obtain valid answers for the amount of production capacity in RES installed by the respondents and their respective production figures for 2017, we were able to get good details on the distribution of RES technologies in our dataset, as well as across the legal forms and the target countries.

Figure 18: Use of RES technologies



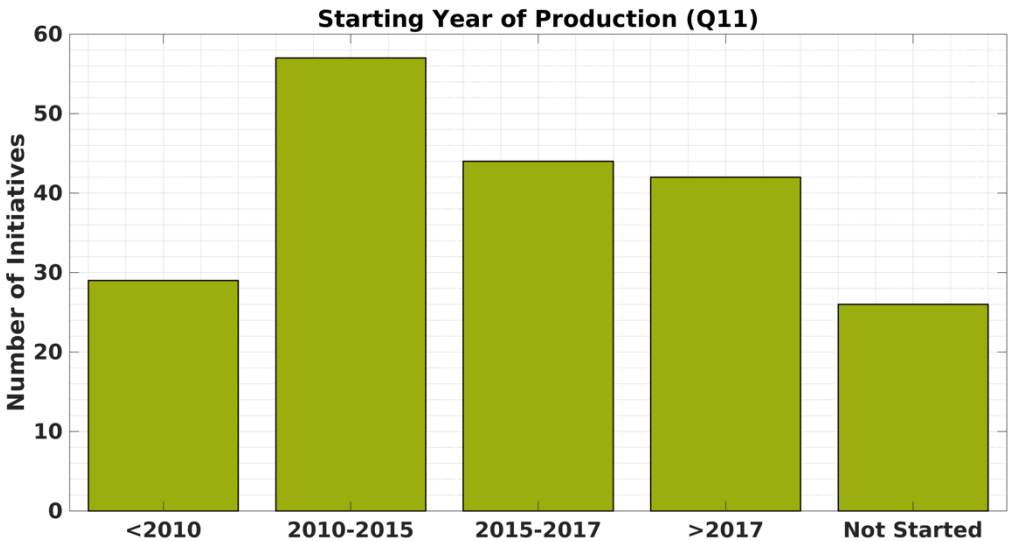
Contrary to the official numbers of RES technology shares in the countries under analysis (Statistical Office of the European Union, 2019b), which for 2017 still show wind energy as a leading new RES technology and hydro as a leading "older" technology, solar PV was the strong favourite among the initiatives in our dataset (Figure 18). This is despite solar PV overall only ranking second or third in our target countries (about half of which have hydro in the lead followed by wind, and the other half wind, followed by solar). The prominence of solar PV in Res prosumer initiatives is not a surprise when we consider the extent to which solar PV is taking off, as discussed in the review chapter. It is generally expected to take the lead over wind energy in the next years. This trend is already very visible in our dataset. Over 70% of initiatives and an equal percentage of cooperatives report having installed, or planning to install, solar PV (see Figure D in ANNEX 4). Wind energy technology is reported by a little over 30% of the total sample. It is followed by biomass and biogas, storage in batteries, and then solar thermal. The distribution is very similar for all legal forms, except for solar thermal, which ranks higher than energy storage in cooperatives, and wind energy, which is less common than biomass and biogas for public institutions.

The profiles according to country are quite different, even when considering that for half of the countries, samples were small (see Figure E in ANNEX 4). The initiatives from Belgium, well known for its wind cooperatives, indeed report wind energy as their leading technology. The initiatives from Croatia, on the contrary, have a clear focus on biogas, biomass, and co-generation. The Italian initiatives appear to be experimenting with many different technologies, each reporting on average five to six technologies, with solar technologies leading, but including less frequently observed

technologies drawing on geothermal energy, and storage in vehicle batteries. The Spanish initiatives almost exclusively focus on solar PV, with a couple of larger initiatives also reporting hydro (one of these was the only one from Spain to also include geothermal energy, wind energy, and biogas). Among the "big four" countries from our sample, the respondents report solar PV as their (current) number one technology. However, the German sample deviates from the trend by listing biomass as their second most important RES technology, followed by storage in batteries, and co-generation. Curiously, for this sample, wind energy is only in 6th place. In the UK sample, storage in batteries ranks 3d, also deviating from the trend, whereas in the French one, energy storage is still very residual. Using renewables for transport was reported by few initiatives, although a number mentioned it as being "in the planning" for the coming years.

In terms of grid connection, the majority of initiatives reported that they are connected to the grid. Only 22 respondents (11%), that were either informal collectives, had not started producing yet, were aggregating prosumers rather than prosuming themselves, as well as an island in a lake, reported not being connected. These initiatives were mostly from Germany, the Netherlands and the UK, with a few from Spain.

Figure 19: Starting year of production



The year in which the initiatives from our dataset started producing is displayed (Figure 19) with the same intervals as the founding date of the initiatives in Figure 13. A new category, however, had to be added, because over 12% of the sample had not initiated production yet, with quite a few complaining of excessive and complex bureaucracy and/or strict urban planning regulations,

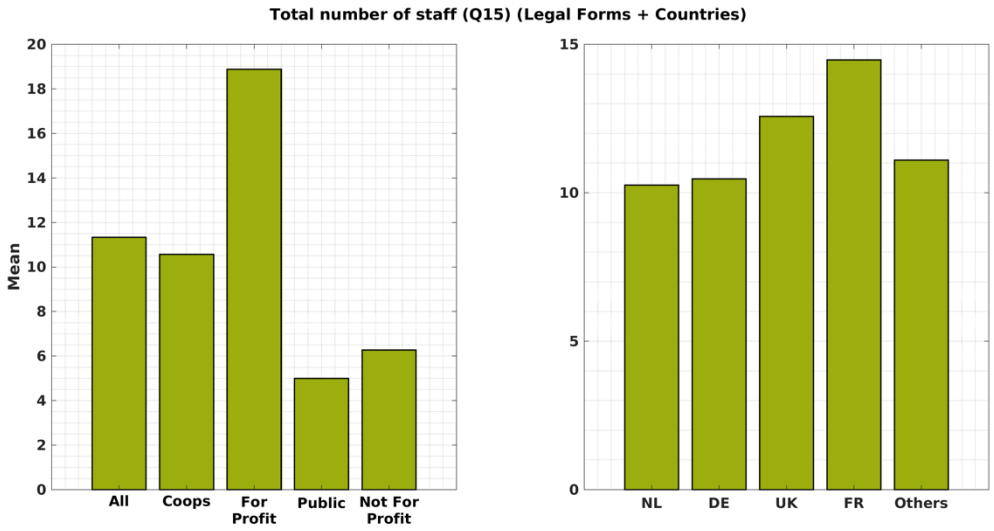
and some explaining under the open question Q32, that they had given up on production due to above-mentioned barriers compounded with high investment requirements for some of the RES technologies (in particular wind energy). These initiatives are now focusing on energy advice services and promoting energy efficiency, while one (in the UK) is considering developing its own housing, where RES production would already be incorporated.

3.4 Governance/organisation of collective RES prosumers

In the PROSEU study, by governance we mean the structures and methods that initiatives have put in place for the purpose of coordinating and managing their activities. We first set the stage by looking at the number and composition of people working in these initiatives.

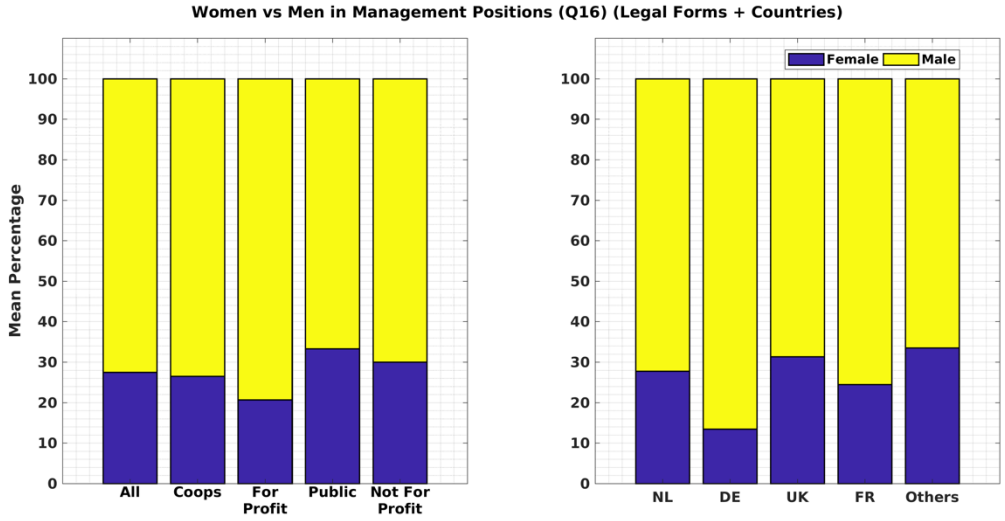
Figure 20 below displays the average number of staff for the full dataset and for the four most common legal forms, as well as averages for the four countries with larger samples. While on average initiatives report having approximately 11 staff members, there are large differences between companies, cooperatives, and the not-for-profit sector. Unsurprisingly perhaps, considering their for-profit nature, companies have the highest average number of staff, while cooperatives on average have a little over half that many staff members. The not-for-profit sector, consisting of associations, NGOs and foundations, as well as informal collectives, report a very low number of total staff, but it must be considered that these are often also smaller initiatives, whereas many of the cooperatives from our sample are middle-sized to large (between 51 and 500 coop members). The public sector reports the smallest number of total staff, but even though this might correspond to reality, when we consider the chronic under-funding of local and regional authorities in most countries in the EU, the sample size was too small to make a definitive observation.

Figure 20: Total nº of staff in initiatives



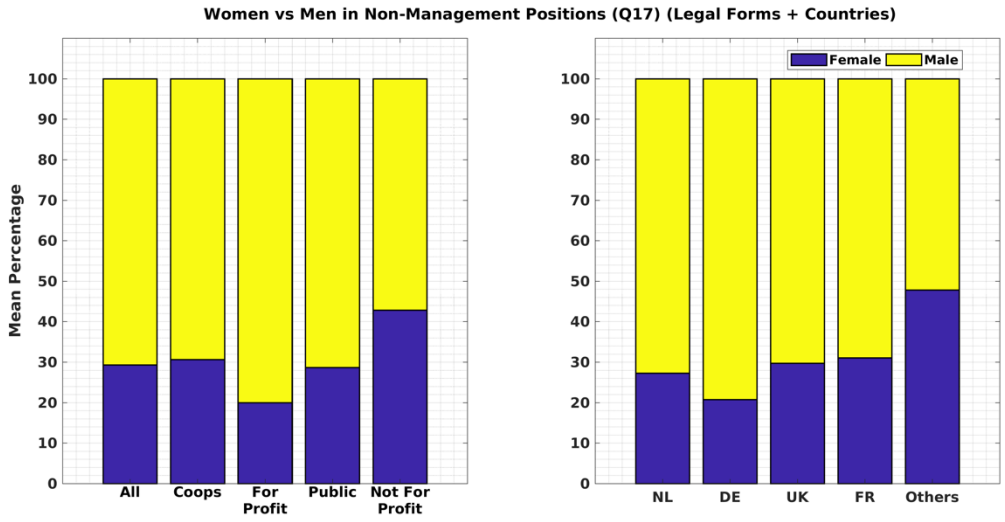
In Figure 21, we present the reported nº of respectively women and men in management/leading positions in the initiatives from our dataset. Overall, as well as across legal forms and countries, the proportion of women in leading positions in RES initiatives is low, on average around 28%. Looking at each of the countries (Figure F in ANNEX 4), in particular the larger samples, we find that German initiatives represent an outlier, with an average of only 12% women in management positions. Croatian initiatives report zero women in management. Initiatives from Portugal and Spain are outliers in the opposite direction, reporting on average 40% women managing their initiatives. Finally, UK initiatives do slightly better than average. Across legal forms, the differences are not significant: even though the public sector fares better, it represents a very small sample.

Figure 21: Proportion of women vs men in management positions



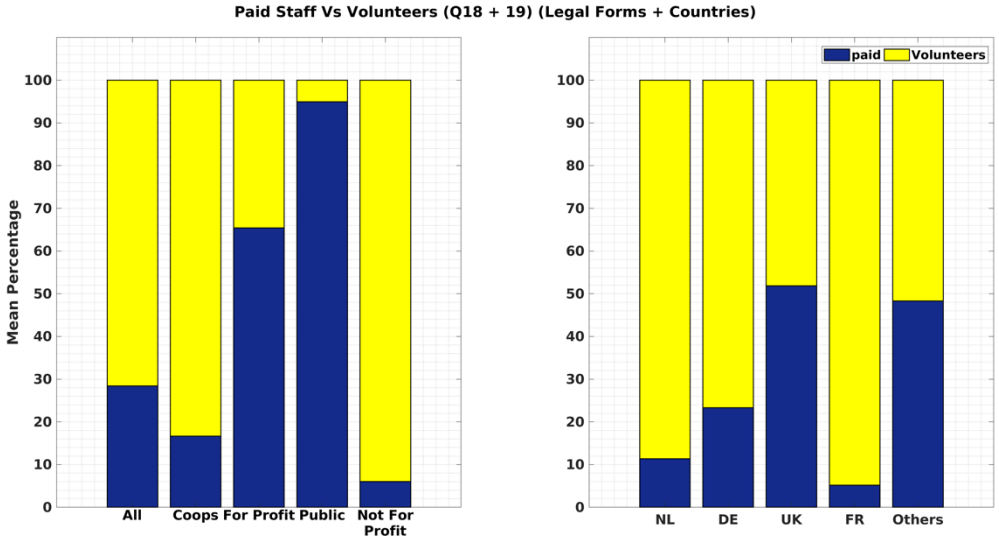
Looking at the proportion of women in non-management positions (Figure 22), the average does not improve much, although moving a bit closer to 30%. Across legal forms, the not-for-profit sector constitutes an outlier with more than 42% women. German initiatives maintain the second lowest average percentage of women, after the Croatian companies (Figure G in ANNEX 4). Portuguese and Spanish initiatives again represent a significant outlier with close to 60%—constituting a majority—of women in all non-management positions/non-core teams. Even though the Portuguese sample was too small for definitive observations, the Spanish sample was the 5th largest sample.

Figure 22: Proportion of women vs men in non-management positions



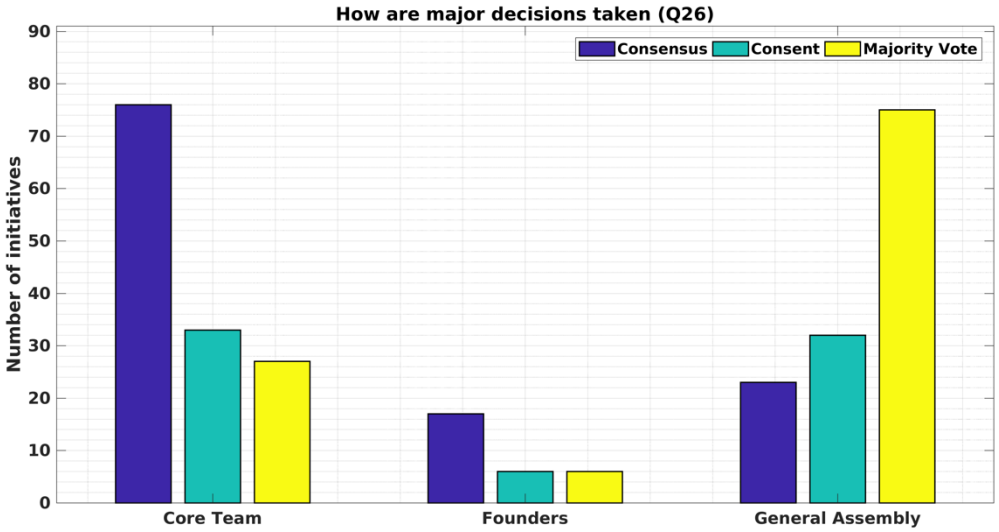
In Figure 23 below, we present the proportion of paid vs unpaid (i.e. volunteer) staff in the initiatives in our dataset. The average proportion leans strongly towards volunteer staff (72% of all staff, including management as well as non-management positions, works without pay), with significant differences across legal forms and countries. The public sector, unsurprisingly, reports close to 100% paid staff. However, among the companies, not all staff was paid, contrary to the for-profit nature of this legal form. In fact, over 30% of staff was reportedly unpaid. In our view, and as discussed previously, this is related to the difficulties in some countries to set up a more cooperative legal form, prompting some energy communities to choose the Limited company form, which is in most countries a structure that can be legalised very quickly and with little bureaucracy.

Figure 23: Proportion of volunteers vs paid staff



The cooperatives and the not-for-profit sector report an overwhelming majority of volunteers in their organisations (84% for coops, 94% for not-for-profits). This feature of collective RES prosumers with a community focus is widely commented upon by our respondents. Many of these complain of excessive workloads, difficulty in finding and keeping volunteers, and the risk of not being able to keep up with the growth of the initiative due to lack of professionalisation. Across the larger country samples, we also find significant differences. Whereas in the German, Dutch, and particularly in the French samples, initiatives are predominantly run by volunteers, to the order of respectively 76%, close to 90 and >95%, the initiatives from the UK tend towards an equal distribution of volunteers vs paid staff. Dutch initiatives were the ones that complained most about their volunteer structures, hinting perhaps at a cultural factor at work (the German initiatives in our sample have more experience with energy communities than the Dutch and the French), but it could also be a result of specific bureaucratic circumstances. Of the initiatives from the smaller samples, those from Belgium (all cooperatives) also depended almost exclusively on volunteer work (>90%). Portugal, Italy and Croatia were far removed from the dataset average, with a minority of volunteers. Whereas in Portugal and Italy, we find the rare case of cooperatives that are remunerating most of its personnel, in the case of the Croatian sample, there is a clear difference between the for-profit companies, that report that they remunerate 100% of their staff, with the only cooperative reporting exactly the opposite.

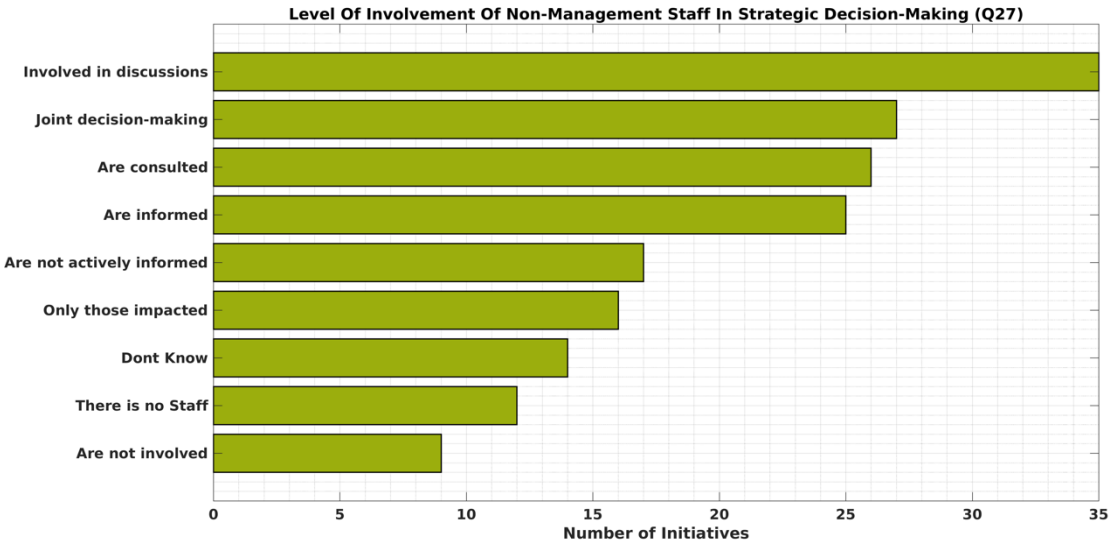
Figure 24: Decision-making style



A good indicator for governance models (in particular whether these are more participative and transparent) is how major (strategic) decisions are taken by organisations. We distinguished between three levels of decision-making: at the founders' level (when applicable, for example in the case of cooperatives founded by organisations or a project run by an organisation), at the level of the core team/management team, and at the level of the general assembly (where applicable). We offered three forms of decision-making: majority vote, consensus, and consent—we define consensus as a decision on which everyone, without exception, agrees, whereas consent is a decision that not everyone may agree with but that they can all live with. Cooperatives are the dominant legal form in our dataset, and these, as well as the not-for-profit sector, usually hold general assemblies at least once a year. Figure 24 shows the results for question Q26. About half of the cooperatives and not-for-profits reported that they decide by majority vote at the level of the general assembly. About a quarter of them use the consent form of decision-making, consensus coming in last place. In contrast, the picture is inverted when it comes to taking important decisions at the level of the management team/core team and/or the founders. The favoured form here is decision-making by consensus (reported by 76 initiatives at the level of management), followed by consent, and then majority vote, with little difference between the number of initiatives that decide by consent vs those that decide by majority vote at these levels. There are some outliers: French initiatives on average report that they do not use consensus in decision-making at assembly level, whereas, in contrast, proportionally more of them opted for consent-based decision-making in the core team than the overall average. Other outliers were the initiatives from the UK, that tended to take major decisions primarily at the core team level, by

consensus, and those from the Netherlands, where the use of consensus in assemblies is higher than that of consent (but still lower than the majority vote), compared to the overall average,

Figure 25: Level of staff involvement in decision-making

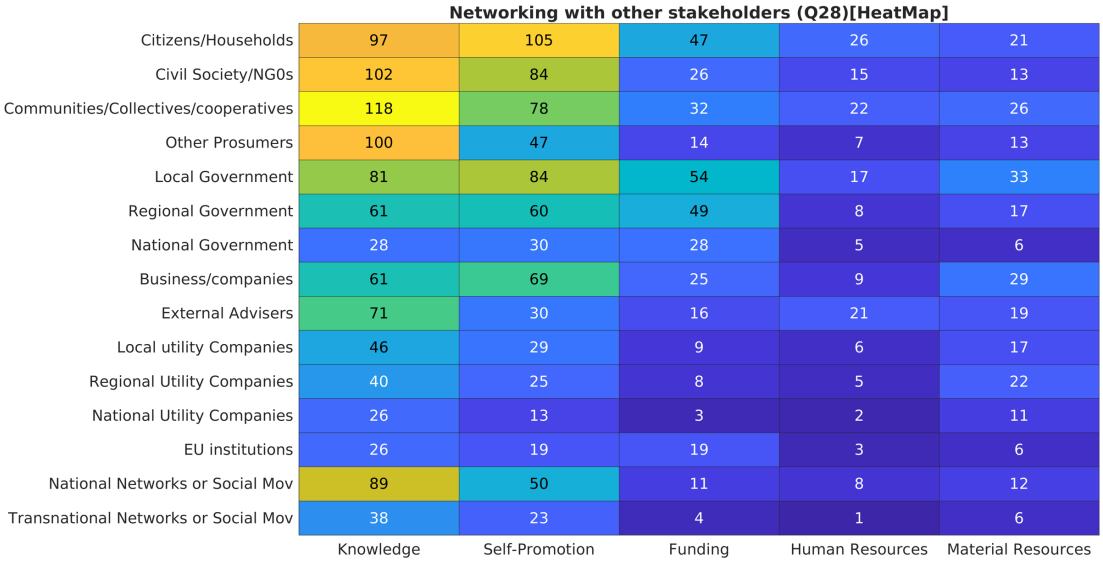


About 13% of respondents either didn't know whether staff was involved in strategic decision-making (Figure 25) or had no staff, 8% did not involve staff at all, and 16% did not actively involve staff, or only involved those that would be impacted by decisions. The remaining initiatives, constituting the majority (57%) are rather evenly spread across the four remaining, more inclusive forms of decision-making. The most participative forms of decision-making that we proposed, which meaningfully impact decision-making, in decreasing order were respectively joint decision-making, consulting, and involving in discussions. These were opted for by half of the respondents, most of these cooperatives. Initiatives from the UK tended to converge on slightly less participatory forms (active consultation was the most participatory form, the others were: informing without impact on decision-making, and consulting only those impacted). The public sector, albeit constituting a small sample, were quite clear in their answers: they either didn't know if staff were involved, or stated they were not informed. Finally, 25 respondents stated they actively inform their staff and ask for their input, but that this not necessarily influences final decisions.

In Figure 26 below, we present a so-called "heatmap" of the networking relationships, and respective type of relationship, that were reported by our respondents. A heatmap counts the number of "votes" for each relationship with a particular entity correlated with the type of relationship reported. It then attributes a corresponding colour that varies from "cooler" colours (blue to green) to "warm" colours (orange to yellow), according to the number of votes in that

category. Respondents could indicate several types of relationships for each entity, which is why the totals per row are higher than the total number of initiatives in our dataset (198). The types of relationships respondents could choose from were “knowledge sharing”, “self-promotion”, “access to funding”, “access to human resources”, and “access to material resources”.

Figure 26: Heatmap of the networking relationships of initiatives (from “cool” to “warm”)



For the full dataset, only one category scored “hot” or yellow, which was the category of “knowledge sharing with communities, collectives and/or cooperatives”. In total, 118 initiatives claimed to collaborate with communities/collectives and/or cooperatives for the purpose of knowledge sharing. This was followed by their engagement with citizens for purposes of self-promotion, and then knowledge-sharing again, but with civil society and other prosumers. This general result also held true for cooperatives, the largest subset in our dataset, but not for the other three major legal form categories. The for-profit sector reported engaging almost equally with citizens, civil society, communities/collectives and local government for both knowledge sharing and self-promotion purposes. The not-for-profit sector claimed to engage slightly more with citizens as well as companies, also for the purposes of knowledge sharing, followed closely by engagement with communities/collectives and other prosumers, for the same purpose. The public sector reported engaging with regional government, external advisers, local government, companies, and the utility companies, also mainly for the purposes of knowledge sharing. They also reported engaging with companies for the purpose of self-promotion.

The top categories chosen by the initiatives from the top four countries in our dataset were:

- Dutch initiatives: Communities/collectives/cooperatives for the purpose of knowledge sharing (41 votes). This was followed by engagement with citizens for the purposes of self-promotion as well as knowledge-sharing (respectively 36 and 33 votes).
- German initiatives: Other prosumers (which may include cooperatives) for the purpose of knowledge sharing (24 votes). Engagement with communities, etc., and civil society also received high votes (respectively 20 and 19).
- UK initiatives: Communities/collectives/cooperatives for the purpose of knowledge sharing (24 votes). This was closely followed by engagement with civil society for the same purpose (21 votes).
- French initiatives: Their choice of engagement was more divided, with an approximate equal number of votes going to engaging with citizens, civil society, and communities for the purpose of knowledge sharing (resp. 19, 20 and 21 votes), as well as with communities for the purpose of self-promotion (20 votes).

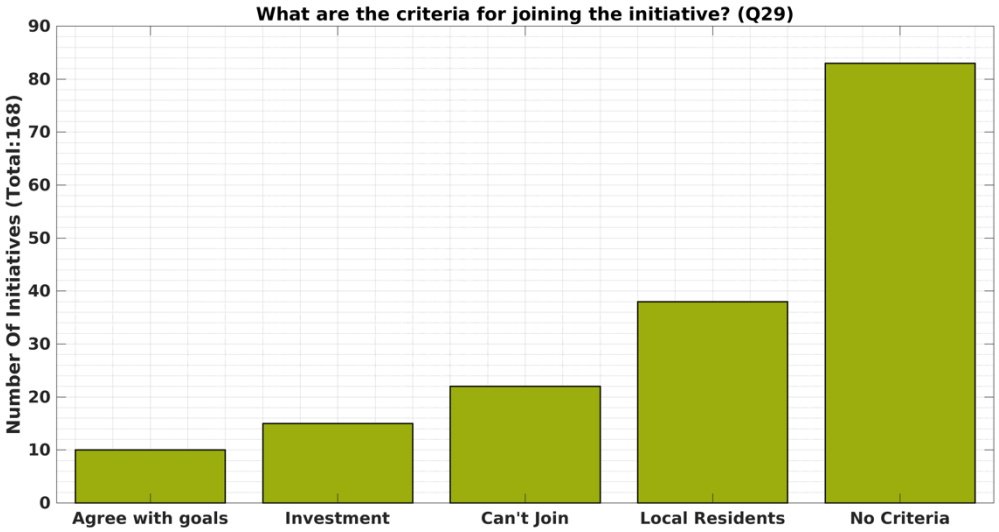
All initiatives reported considerable engagement with national networks or social movements for the purpose of knowledge sharing, with the French initiatives proportionally leading in this category of networking, considering that its sample was the smallest of the four countries (NL: 30 votes; DE: 17; UK: 15; FR: 20, i.e. the full French sample).

Finally, in this section we also looked at the level of inclusiveness of the initiatives under study. The results are presented in Figure 27. As explained in the first section of this chapter, the open answers to the question about whether the initiatives had any criteria for joining were reclassified after content analysis (168 initiatives responded to this question). This resulted in five categories of criteria:

- "no criteria" (half of the initiatives that responded to this question);
- "not possible to join" (most applicable in the case of companies or the public sector, in total 22 initiatives chose this option);
- "need to be a local resident" (most applicable in the case of initiatives that are energy communities, 38 initiatives fall in this category);
- "mandatory minimum investment" (this was the case for 15 initiatives);
- "need to agree with the goals and objectives of the initiative" (10 initiatives reported this obligation for those wishing to join).

Here again, there were some outliers in the responses. In the UK, investment was the second most chosen category (after "no criteria"), the public and the for-profit sector stated as their top criteria categories either "no criteria" or "can't join". All others followed the trend presented in Figure 27.

Figure 27: Inclusiveness of the initiative

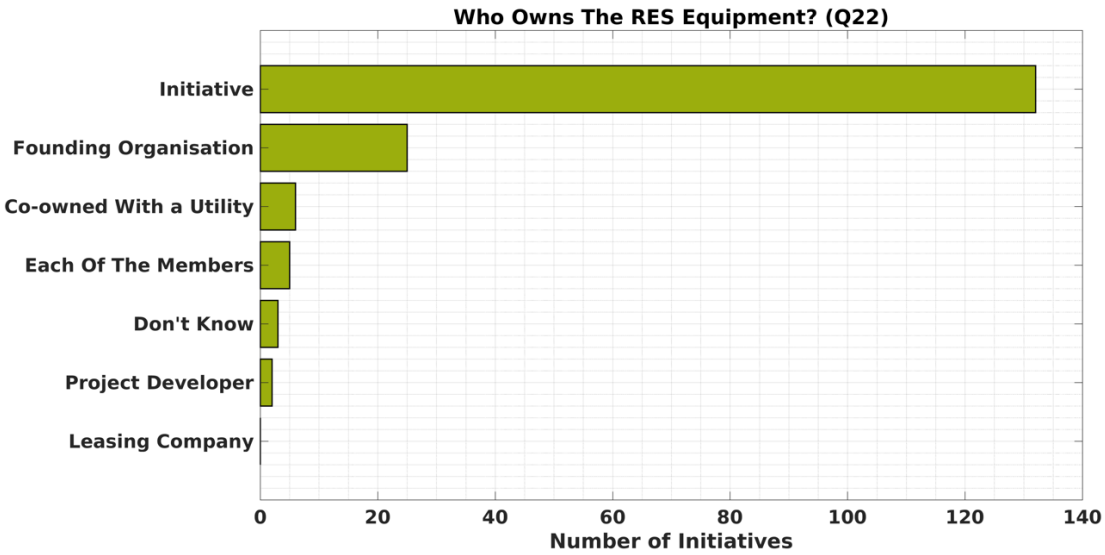


3.5 Financing of RES prosumer initiatives

In order to get an idea of the financing models that are preferred by RES prosumer initiatives to get their operation off the ground, we asked four questions, of which one had to be invalidated due to inconsistent answers (Q25 “what are the four largest income generators”). The remaining three still allowed us to draw some exploratory conclusions.

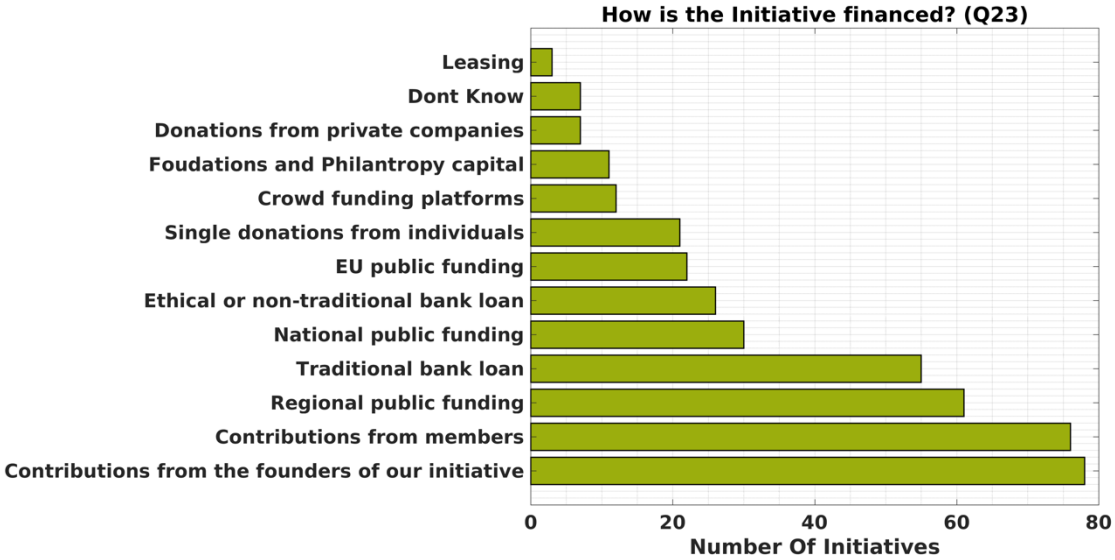
As depicted by Figure 28 below, two thirds of initiatives stated that their organisation owns the RES installations of the initiative. In 25 cases, it is the organisation that founded or that is supporting the prosumer initiative that owns the installation. Looking closer at the dataset, this is the case of initiatives that were founded by another cooperative or by an NGO, or that vary their partnerships according to each project (letting the partner own the equipment). The other options were “co-owned with a utility”, “each of the members of the initiative own their own equipment”, “the project developer owns the equipment” and “a leasing company owns the initiative. These options were very residual, while a few of the respondents confessed to not knowing who owned the installation.

Figure 28: Ownership of RES equipment



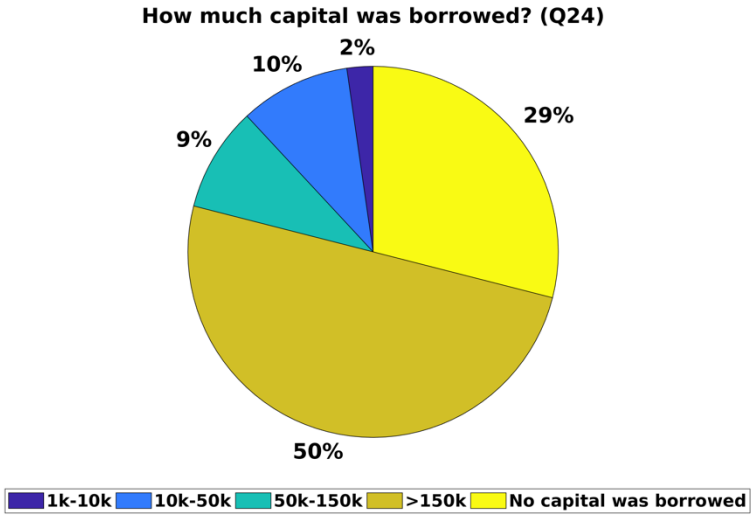
The strategies of RES prosumer initiatives in our dataset to finance their operations (Figure 29) tend to be quite varied (the majority indicated more than one form of financing). The top form of financing, reflecting the top legal form in our dataset—cooperatives—was through contributions from either the founder of the initiative and/or the members of the initiative. This was followed by the choice of a traditional bank loan, in the case of approximately 55 initiatives (especially those that indicated wind energy in their RES mix), and by several forms of public funding (by order of popularity: regional, national, and EU funding). The option of collecting single donations from individual citizens is worth mentioning, whereas crowd-funding or other, similar alternative forms of financing, were not a popular choice for our dataset.

Figure 29: Financing of initiatives



Finally, we asked how much capital the initiatives had borrowed, if any, offering four intervals for the amount of capital borrowed (Figure 30). Half of the initiatives indicated the category with the largest amount of capital (>150.000 € equivalent). In contrast, and with some significance, almost one third stated they did not borrow any capital. The majority of the "larger" investors were cooperatives, including all of the wind cooperatives, with a few homeowners' associations and other initiatives that invested in a heating system, and half of the Croatian companies. Among those that did not borrow any capital were the majority of the public institutions in our dataset, a number of local cooperatives as well as associations with a local focus (32 initiatives) and all the informal collectives.

Figure 30: Amount of capital borrowed



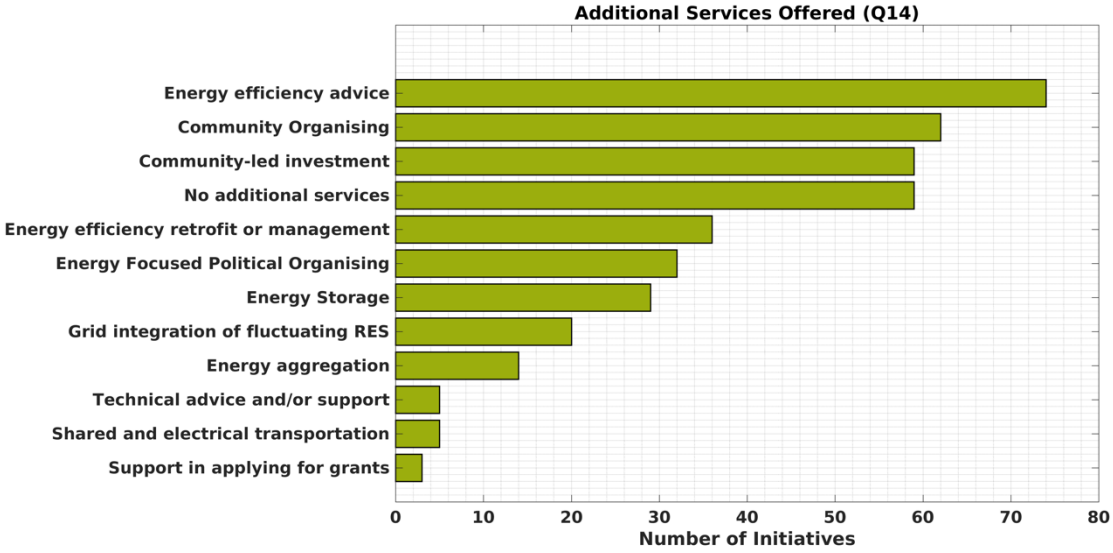
3.6 Motivations of RES prosumer initiatives

In the survey form, three questions were aiming at gauging the motivation behind the creation of collective RES prosumer initiatives. Additionally, respondents had the opportunity to comment or complete information in most of the other questions. Through content analysis, first looking for keywords, then creating new answer categories, we were able to obtain a good overall picture of what drives the collective form of RES prosumerism.

In Figure 31, we present the additional services, if any, that initiatives reported that they offered their members and/or clients and/or constituents. Out of our 198 initiatives, 30% stated that they offered no other services besides self-production and self-consumption. About half of these are cooperatives, the other half is made up mostly of public institutions, some smaller associations, and two of the Croatian aggregator companies.

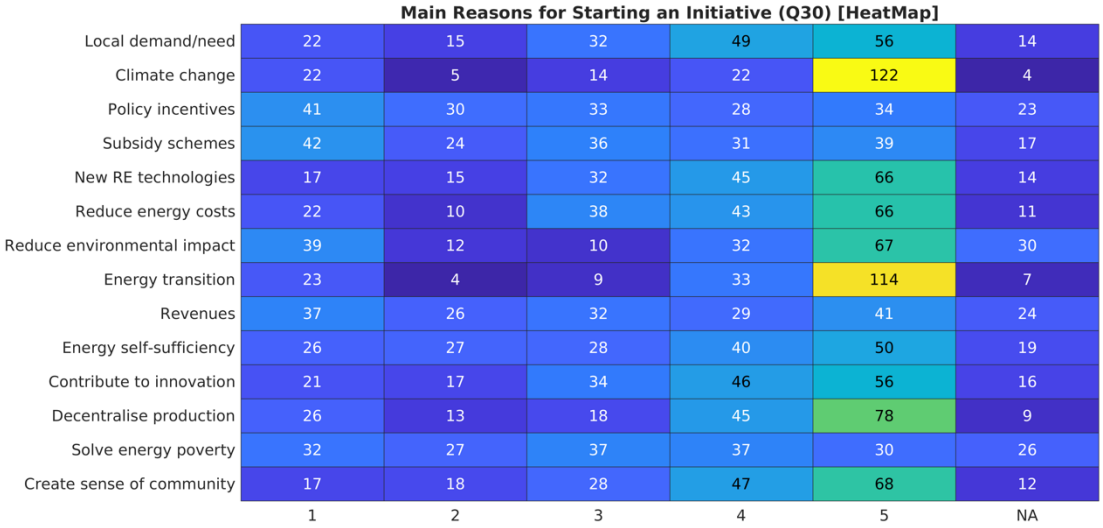
Of those that do offer additional services, energy efficiency advice looms large in first place, followed by community organising, and advising on community-led investment. As mentioned before, some of the respondents have given up on prosuming for the moment, due to financial and legal factors, and are focusing instead on improving energy efficiency in their communities. In a complementary category, energy efficiency retrofit or management was mentioned by 18% of respondents. And finally, in a complementary category to community organising, energy focussed political organising was selected by 16% of respondents. Energy storage appears to be an upcoming activity, it was selected by about 15% of respondents, but also mentioned under other questions (choice of RES technology, for instance). Not all the countries under review here authorise or make it easy to store energy, just as not all of them authorise the aggregation of energy (Toporek & Campos, 2019). This may explain why these activities, that are becoming increasingly popular, are not yet part of the top services offered by our respondents.

Figure 31: What other services are offered



A key question in our survey was about the reasons for starting the initiative. Respondents were given 14 possible reasons, and asked to grade these on a Likert scale (1-strongly disagree to 5-strongly agree). We plotted out the results in a heatmap, presented in Figure 32.

Figure 32: Heatmap of motivations for starting the initiative (Likert scale)



The results were quite unequivocal. Out of 198 initiatives, 122 "voted" that "tackling the climate change problem" was their main driver. In second place, most initiatives wished to "be part of the clean and low carbon transition". In a more remote third place, but nevertheless significant, 78 initiatives strongly agreed with the driver of "decentralising production". In fourth place, 68 initiatives voted strongly in favour of "creating a sense of community". These two reasons also had a significant number of votes under "agree" (4 on the Likert scale). Looking exclusively at the two highest categories of the Likert scale, 4 and 5, by order of number of votes, the following drivers stand out, in order of importance:

- Tackling the climate change problem.
- Be part of the clean and low carbon transition.
- Decentralise energy production.
- Create a sense of community.
- Take advantage of new RES technologies.
- Reduce energy costs.

On the opposite end of the scale, the drivers that received the most votes for "strongly disagree" were:

- Take advantage of subsidy schemes.
- Take advantage of policy incentives.
- Reduce the environmental impact of existing activities of your organisation/collective or community.
- Improve revenues of your organisation/collective or community.

While on the one hand, it became quite clear that socio-ecological rather than financial motivations were the main drivers for the majority of initiatives, it was surprising to find that over one fifth of respondents had a very negative reaction to the idea of taking advantage of subsidy schemes

and/or policy incentives. This finding is nevertheless corroborated by the fact that in the countries under study, legislation is either still changing, is complex, or has become unfavourable to collective energy initiatives (see Chapter 2).

When looking at the top four legal forms in our dataset, we see that cooperatives have set the answer trend. They are closely followed by the not-for-profit and public sectors. The for-profit sector also gave largely the same votes for the same drivers, with the exception of the driver "respond to local demand/needs", which for the full dataset only comes in 8th place of the votes for "strongly agree", but which the for-profit sector classifies in second place. It is natural for companies to have different drivers than community initiatives, and a number of them might be seeing an opportunity for business in responding to what they view as local demand. But in general, companies in our dataset actually responded more as if they were community initiatives or at minimum socio-ecologically inspired initiatives. Our next deliverable will look deeper into the drivers behind RES prosumerism initiatives.

When looking at the main reasons for starting the initiative according to countries, the four largest samples (NL, DE, UK, FR) closely follow the general trend, revealing the same drivers, although initiatives from Germany and the UK tended to moderate their enthusiasm somewhat (classifying the same drivers, but with 4 "agree" rather than 5 "strongly agree"). Of the smaller samples, the Croatian initiatives are worth mentioning, since they are the only ones to vote strongly in favour of taking advantage of policy incentives as well as subsidy schemes, while, besides reducing energy costs, improving revenues of their organisation (or possibly community in the case of the cooperative), also received high votes. In contrast, some of the Belgian initiatives made a point of what almost seems like a protest vote to "strongly disagree" with taking advantage of incentives and/or subsidies.

3.7 Main hindering and facilitating factors as perceived by RES prosumer initiatives

Aside from discovering the drivers behind collective RES prosumerism initiatives, it was also crucial for the PROSEU study to uncover the main success factors and the main barriers to the development of these initiatives. The following figures, nº 33 and nº 34, present the results of question Q31, where we asked respondents to tick up to three factors that they felt slowed down the development of their initiative as well as up to three factors that they felt facilitated the

development of their initiative. The figures present the number of times a particular factor was selected as a facilitating vs hindering factor, in decreasing order of relative popularity.

Figure 33: Perception of main facilitating factors

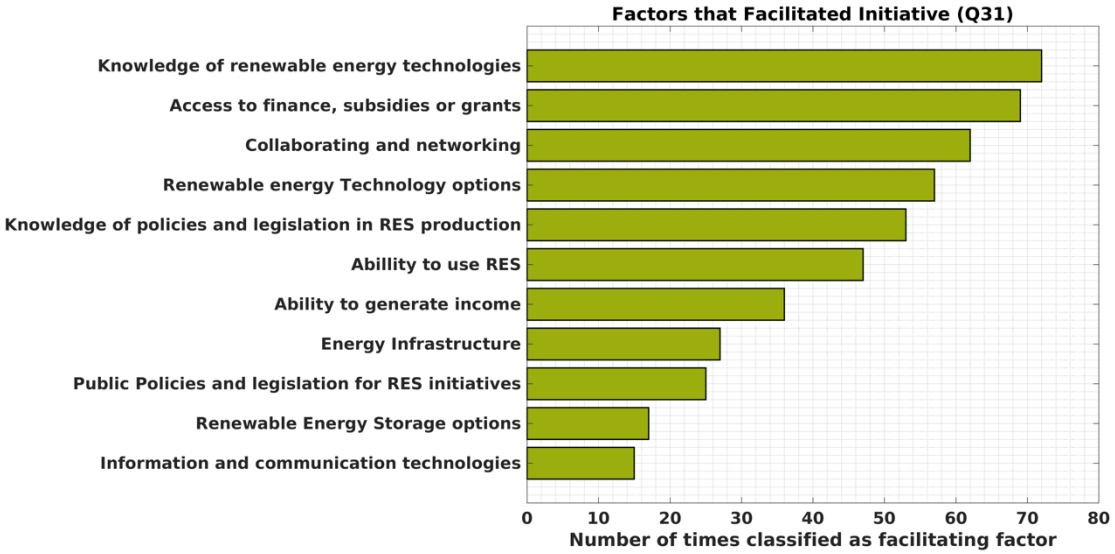
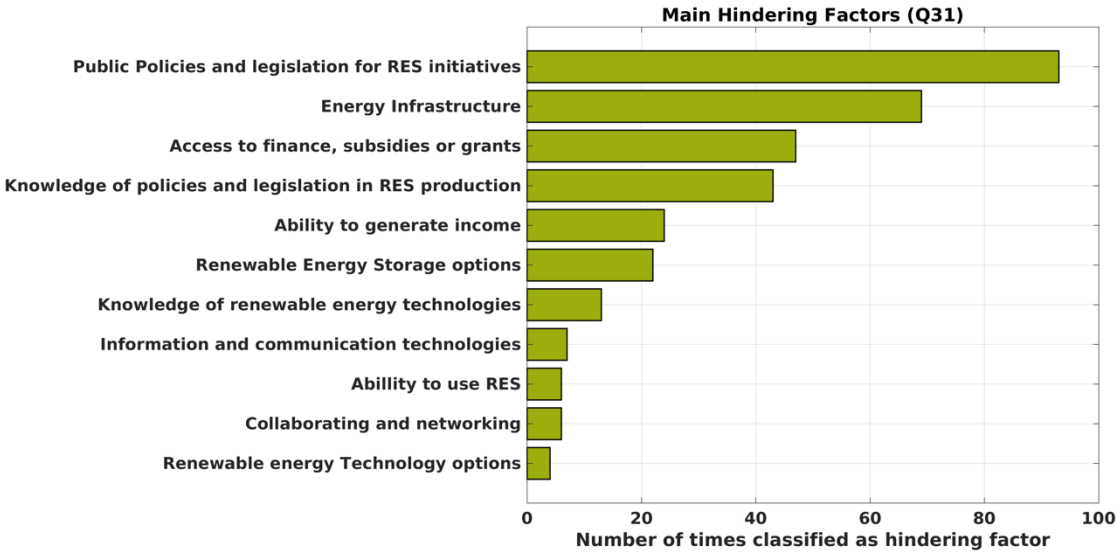


Figure 34: Perception of main hindering factors



The top four factors perceived as most facilitating by our respondents were:

- Knowledge of renewable energy technologies.
- Access to finance, subsidies or grants.
- Collaborating and networking with others.
- Renewable energy technology options available.

These factors were mostly consistent across the countries as well as the legal forms, except for initiatives in France and other countries more recent to RES prosumerism (such as Portugal and Spain). These tended to swap the factor of "Renewable energy technology options available" with the factor "Ability to use RES technology".

In contrast, the top four factors perceived as most hindering by our respondents were:

- Public policies and legislation for renewable energy initiatives.
- Energy infrastructures (e.g. grid, meter,).
- Access to finance, subsidies or grants.
- Knowledge of policies and legislation in RES production.

These factors were very consistent across the countries as well as the legal forms. Two factors are repeated as top-rated factors in both categories, meaning that, depending on whether the initiative can harness the factor in question, it will be either a facilitating factor or a barrier to the initiative's development. Such is the case for "access to finance, subsidies or grants", which is considered critical to the initiative's success but also mentioned as one of the main factors for potential failure (i.e. when an initiative cannot tap into one or other form of financing). It is also the case for "knowledge of policies and legislation in RES production", considered important for the initiative's success (rated in 5th place) while it is one of the top barriers in the perception of our respondents, when this knowledge is absent.

The socio-political factor of "collaborating and networking with others" is deemed as important for success as the technical factor of the availability of RES technology options. On the other hand, if the energy infrastructures do not exist, even with good RES technology options, initiatives feel this will threaten their successful development. Finally, in a strong first place, existing public policies and legislation for RES initiatives are perceived as a key barrier to the development of RES prosumer initiatives. This is not surprising, considering that legislation in all of the nine countries is currently either being revised, or likely to be revised after the new EU directives come into effect. It is, however, noteworthy how negative most respondents are about existing or changing legislation. For half of the respondents, this is considered a key barrier. Many of those also specified why, under question Q32 (additional information). In particular, the German, Dutch, and Belgian initiatives complain about complex bureaucracies that considerably slow down the implementation of a RES initiative, besides inconsistent laws and rules, and conflicting attitudes of the authorities at different levels (regional vs national). French initiatives complain that they are not allowed to consume what they produce, while UK initiatives are terrified of the end of FiT (the

survey ended two months before the Feed-in tariff was abolished). In effect, because of differing legislation, true prosumers are hard to find. In some countries, such as France, energy may be produced and sold but not self-consumed. In other countries (Croatia, Germany), it is easy to self-consume, but very hard to sell (you need a license). The nine countries under study, as explained in detail in our previous deliverable (Toporek & Campos, 2019), vary tremendously as to whether they recognise energy communities, allow neighbours in the same building to self-consume collectively, allow energy communities to share electricity among their members, or whether a supplier license is needed, to name but a few legislative features.

Additionally, according to the answers under question Q32, in some countries, in particular smaller countries such as The Netherlands and Belgium, lack of space is a barrier and urban planning regulations stifle RES prosumer development.

Besides barriers to initiative development, our respondents also shared (under Q32) what they perceived as the main threats to the growth of RES prosumerism. Sometimes these threats mirror the barriers (in the case of legislation). Below we list all of the key threats indicated by our respondents:

- The current, uncertain legislative setting.
- The risk of working as/with volunteers and the urgent need to professionalise operations (one of the Dutch respondents said it best: we need to move from "hobby to lobby").
- The two faces of EU states: on paper promoting prosumerism, but in practice failing to facilitate its implementation.
- The continuing lack of awareness of citizens about the dangers of climate change and the need for an energy transition.
- The fair distribution of costs and benefits (in particular when exploiting common goods such as wind, water, sun, not to forget available land).
- The slow progress in terms of the IT infrastructure sustaining the energy system: smart grids, smart meters, data processing, …
- A persisting strong lobby by the conventional energy sector (e.g. in France this lobby is strangling wind energy projects).

Respondents also indicated opportunities that they consider under-explored at the moment:

- Creating synergies between RES prosumerism and other climate/zero carbon friendly activities (e.g. complementing prosumerism with energy efficiency measures or awareness creation).
- Utilising the roofs of buildings in the public sector for solar PV production.
- The ability for RES prosumers to also become energy suppliers.

4. Conclusions

The research of WP2 of the PROSEU project was designed to provide a broad review of the state of the art of RES prosumerism in the EU, focusing in particular on its collective forms, and zooming in on nine EU countries with very different socio-political, legislative, and cultural contexts in regard to renewable energy self-consumption. The review relied on compiling and analysing the results from scientific studies and analyses, relevant EU-funded projects, EC reports, reports from other European research institutes, as well as a document analysis of EU and country-specific energy data, in order to establish an interdisciplinary baseline of the currently existing conditions in which RES prosumerism is developing in the EU. A comprehensive survey carried out among close to 200 collective RES prosumer initiatives in the nine Member States under study provided us with a cross-section of the diverse demographic, organisational, operational, and motivational make-up of RES prosumer initiatives in Europe, including the main drivers behind their activities and what they perceive to be the key success and hindering factors for RES prosumer development.

In our study, we took stock of a broad number of variables that impact on the potential spread and maturation of RES prosumer initiatives. At the geographic level, our nine target countries have very different climate and population profiles. This is reflected in the overall energies that they consume, i.e. countries with good hydric conditions have high production of hydro-electricity, countries that produce their own gas (such as the Netherlands and the UK), have gas-driven heating systems, France is still dependent on its nuclear energy production, etc. But at the RES level, only hydro continues as a leading energy technology, whereas wind energy comes either in first or in second place in terms of production. Solar powered electricity, meanwhile, is growing fast in most countries, including the more Northern countries, and was the top RES technology that the initiatives in our survey were investing in.

At the level of policy-making and legislation, we found that all the countries, despite their differences in terms of geographic and populational size, climate and culture, are at a crossroads: the ones that have had longer experience with energy self-consumption are currently either facing the consequences of the increasing complexification of their legislation, such as Germany and the Netherlands, or are putting the brakes on their incentives for self-consumption, as is happening in the UK. In those countries where energy self-consumption has only recently been legislated, such as France, Spain, Portugal, and Croatia, initiatives are taking off under uncertain and uneven conditions, as the governments of these countries are still fine-tuning their regulations. Both Belgium and Italy have historic examples of collective self-consumption, but Italy lacks the

incentives and proper regulations to facilitate new prosumer initiatives, whereas energy cooperatives in Belgium face urban planning and technical barriers. Most of our target countries either do not recognise energy communities, have no regulations in place to protect and empower them, or are actively limiting their expansion by not authorising the creation of virtual communities and/or the possibility for neighbours to share electricity.

The new European directives that define and protect individual as well as collective RES self-consumption are expected to constitute a catalyser, as well as provide the legal clarity for RES prosumerism to proliferate in member countries. But there are no guarantees that bureaucracies, such as the obligation to register to self-consume or to obtain a license as an energy supplier when self-consuming as a collective, or the rules for tenders, will be simplified, and these were considered a major barrier by the initiatives that responded to our survey. Also, the new EU directives may constitute a step back for those countries that have been more permissive about energy self-consumption in the past (Germany, the Netherlands, Italy) or have recently loosened regulations (France and Spain), because the new definitions of collective self-consumers may end up to be more restrictive than the reality of these countries.

Despite the legal and political barriers, RES initiatives have grown considerably in number. We have but to look at the numbers provided by the federation for RES cooperatives, which is only six years old but already has 1,500 members across Europe. There appear to be two movements driving RES prosumerism from opposite directions: the EU and EC's ambition to lead the clean energy transition, which is now bearing its legal fruit, so to speak, and the ambition of local and regional self-consumption initiatives to be recognised and supported as energy communities.

From the PROSEU survey, we obtained key information about this second movement, driving the RES prosumerism phenomenon bottom-up. First, we learned that collective RES prosumer initiatives may choose a variety of legal forms, which not always mirror their role as energy actor, in particular when their intention is to be an energy community. Instead, the variety we found indicates that there is a lack of choice of appropriate legal forms for REScoms. There were quite a few cooperatives and partnerships between organisations or collectives that felt the need to found a company or forge a relationship with an existing energy supplier, in order to be able to supply their members/constituents. There appears to be a need for a new lexicon in energy production and consumption, and for the legal and political support of the new energy initiatives that result from this debate.

We also found that the main drivers behind collective forms of prosumerism are related to socially and environmentally inspired motivations, such as being part of the energy transition, tackling climate change, creating a sense of community, and decentralisation of energy production. The exception are companies, and some commercial cooperatives, that have simply taken advantage of policy incentives and/or subsidy schemes. Interestingly, the community focus of an initiative could almost be measured by how much it shunned current policy incentives, subsidy schemes, and bureaucracies for the production and self-consumption of renewable energy. The real energy communities, often run almost exclusively by volunteers, are struggling to finance and legalise their activities, whereas new energy suppliers, focusing on selling RES either from their own production or (in many cases) as an aggregator of individual producers of RES (such as farmers in the case of biomass production) appear to be flourishing.

The increasing liberalisation of energy markets and lack of protection of the EU's commons (wind, sun, water, land, and forests) may be facilitating commercial energy actors rather than the millions of self-consumers and thousands of RES communities that the EU had in mind when it launched its Clean Energy Package. This tendency should be a red flag for EU Member States to adjust their legislation as well as policies, to avoid the high-jacking of RES prosumerism by energy companies, which might drive up the price and lack the incentive to plug revenues back into the community.

Additionally, if energy companies take the lead, the crucial forging of synergies with other clean energy and sustainability activities (such as energy efficiency and the creation of circular economies) to which a number of the respondents in our survey called attention, may be lost.

Even if energy communities become the norm, other threats persist. One of them is at the governance level. We learned from the additional information shared with us by the initiatives in our survey, that most of these local collective initiatives are chronically understaffed and run by volunteers, who may lack the experience or time to accompany the growth of the initiatives' activities. The continuity of local initiatives is not guaranteed, especially if bureaucracies thicken, as they have in a number of EU countries. As one respondent remarked: we need to move from "hobby to effective lobby" and we need to move from "an organisation of volunteers to professionalisation". The collective initiatives might also benefit from attracting more women to their organisations, since currently the average presence of women, whether in management or non-management positions, is below 30%. Finally, the energy communities in our survey worry about the conventional energy lobby, which is still very strong, the persisting lack of awareness of citizens of the severity of climate change impacts, and the slow progress in democratisation of

energy infrastructures, in particular IT infrastructures, seen as key to unlocking energy decentralisation.

The RES initiatives also indicated what they perceive to be the key success factors for RES prosumer development: access to knowledge of renewable energy technologies as well as to knowledge of public policies and legislation for self-consumption of energy, the availability of good RES technology options, access to the necessary financing (subsidies, grants, or other), and finally, the power of collaboration and networking. Two of these key factors, in our respondents' view, constitute major barriers to the thriving of RES prosumerism when they can't be harnessed: access to financing and the knowledge to navigate the potential minefields of public policies and legislation for self-consumption of energy.

Our research succeeded in establishing a comprehensive baseline as well as a broad cross-section of the diverse profiles of the RES prosumer energy actors, raising several red flags but also pointing out new pathways. Next, the PROSEU project will look at new business models and forms of financing that are emerging and could help get more RES prosumer initiatives off the ground. Additionally, several technology scenarios and their respective implications will be modelled, while work continues to refine the typologies of RES prosumer initiatives in the EU, in order to propose the corresponding incentive structures that will leverage the further development of these initiatives. Meanwhile, project partners in each country will be working closely with a diverse selection of initiatives to learn from them as well as for them in several iterations that will also involve a broader group of stakeholders in RES prosumerism.

5. References

Avelino, F., Wittmayer, J. M., Pel, B., Weaver, P., Dumitru, A., Haxeltine, A., … O'Riordan, T. (2017). Transformative social innovation and (dis)empowerment. *Technological Forecasting and Social Change*, S0040162517305802. https://doi.org/10.1016/j.techfore.2017.05.002

Bauwens, T. (2016). Explaining the diversity of motivations behind community renewable energy. *Energy Policy*, *93*, 278–290. https://doi.org/10.1016/j.enpol.2016.03.017

Bauwens, T., Gotchev, B., & Holstenkamp, L. (2016). What drives the development of community energy in Europe? The case of wind power cooperatives. *Energy Research & Social Science*, *13*, 136–147. https://doi.org/10.1016/j.erss.2015.12.016

Bertram, R., & Primova, R. (Series Ed.). (2018). *ENERGY ATLAS 2018: Facts and Figures about renewables in Europe*. Heinrich Böll Foundation, FOEE, EREF, Green European Foundation.

Boo, E., Pasqualini, T., Dallamaggiore, E., Dunphy, N., Lennon, B., Meade, K., … Otal, J. (2016). *ENTRUST. report on policy and regulation landscape*. 231.

Brummer, V. (2018). Community energy – benefits and barriers: A comparative literature review of Community Energy in the UK, Germany and the USA, the benefits it provides for society and the barriers it faces. *Renewable and Sustainable Energy Reviews*, *94*, 187–196. https://doi.org/10.1016/j.rser.2018.06.013

Campos, I. S., Alves, F. M., Dinis, J., Truninger, M., Vizinho, A., & Penha-Lopes, G. (2016). Climate adaptation, transitions, and socially innovative action-research approaches. *Ecology and Society*, *21*(1). https://doi.org/10.5751/ES-08059-210113

Carrilho da Graça, G., & Gomes, S. (2016). *Analysis of case studies according to the different approaches of analysis - Case study report on Sustainable Cooperative COOPÉRNICO.* (PATHWAYS Project: Exploring Transition Pathways to Sustainable, Low Carbon Societies - Grant Agreement Number 603942 No. D3.3).

CE DELFT. (2016). *The potential of energy citizens in the European Union*. Delft, The Netherlands.

Dijkstra, L., & Poelman, H. (2014). *A harmonised definition of cities and rural areas: the new degree of urbanisation* (Regional Working Paper 2014 No. WP 01/2014; p. 28). Retrieved from

European Commission website: https://ec.europa.eu/regional_policy/sources/docgener/work/2014_01_new_urban.pdf

Dunn, W. N. (2015). *Public Policy Analysis*. Routledge.

EEA. (2017). *Renewable energy in Europe – 2017 Update: Recent growth and knock-on effects.* (No. 23/2017). Copenhagen, Denmark: European Environment Agency (EEA).

European Commission. (2015). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Delivering a New Deal for Energy Consumers*. Retrieved from https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52015DC0339

European Commission. (2016a, November 30). Clean Energy for All Europeans – unlocking Europe's growth potential. Retrieved from EC Press releases database website: http://europa.eu/rapid/press-release_IP-16-4009_en.htm

European Commission. (2016b, November 30). Commission proposes new rules for consumer centred clean energy transition. Retrieved from EC Energy News website: https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition

European Commission. (2017a). *Third Report on the State of the Energy Union* (Communication No. COM(2017) 688 final). Retrieved from https://ec.europa.eu/commission/publications/third-report-state-energy-union_en

European Commission. (2017b, February 23). *Proposal 2016/380 (COD) for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules for the internal market in electricity*. Retrieved from https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-864-F2-EN-MAIN-PART-1.PDF

European Commission. (2017c, November 23). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS: Communication on strengthening Europe's energy networks*. Retrieved from

https://ec.europa.eu/energy/sites/ener/files/documents/communication_on_infrastructure_17.pdf

European Commission. (2019). Energy union and climate: Making energy more secure, affordable and sustainable. Retrieved from EC Priorities website: https://ec.europa.eu/commission/priorities/energy-union-and-climate_en

European Parliament and Council. (2012, October 25). Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency. Retrieved from EUR-Lex website: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX%3A32012L0027

European Parliament and Council. (2018, November 12). DIRECTIVE (EU) 2018/ 2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources. Retrieved from EUR-Lex website: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.328.01.0082.01.ENG&toc=OJ%3AL%3A2018%3A328%3ATOC

Fazey, I., Schäpke, N., Caniglia, G., Patterson, J., Hultman, J., van Mierlo, B., … Wyborn, C. (2018). Ten essentials for action-oriented and second order energy transitions, transformations and climate change research. *Energy Research & Social Science*, *40*, 54–70. https://doi.org/10.1016/j.erss.2017.11.026

Ford, R., Stephenson, J., & Whitaker, J. (2016). *Prosumer Collectives A review 2016*. Smart Grid Forum.

Gaffney, C., Lennon, B., O'Connor, P., & Dunphy, N. (2015). *ENTRUST Survey of Socio-demographic data on energy practices*. 86.

Galev, T., & Gerganov, A. (2018). *Final report on comparative sociological analysis of the household survey results* (ENABLE.EU: Enabling the Energy Union No. D4.1).

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, *1*(1), 24–40. https://doi.org/10.1016/j.eist.2011.02.002

Haxeltine, A., Pel, B., Dumitro, A., Avelino, F., Kemp, R., Bauler, T., … Jørgensen, M. S. (2017). *Towards a TSI theory : a relational framework and 12 propositions*. TRANSIT working paper.

Hisschemöller, M., & Hoppe, R. (1995). Coping with intractable controversies: The case for problem structuring in policy design and analysis. *Knowledge and Policy*, *8*(4), 40–60. https://doi.org/10.1007/BF02832229

Howaldt, J., Schröder, A., Kaletka, C., Rehfeld, D., & Terstriep, J. (2016). *Mapping the World of Social Innovation: A Global Comparative Analysis across Sectors and World Regions* (SI-DRIVE Social Innovation: Driving Force of Social Change No. D1.4). Retrieved from https://www.si-drive.eu/wp-content/uploads/2016/07/SI-DRIVE-D1-4-Comparative-Analysis-2016-08-15-final.pdf

Huybrechts, B., & Mertens, S. (2014). THE RELEVANCE OF THE COOPERATIVE MODEL IN THE FIELD OF RENEWABLE ENERGY: THE RELEVANCE OF THE COOPERATIVE MODEL. *Annals of Public and Cooperative Economics*, *85*(2), 193–212. https://doi.org/10.1111/apce.12038

Jenkins, K., Sovacool, B. K., & McCauley, D. (2018). Humanizing sociotechnical transitions through energy justice: An ethical framework for global transformative change. *Energy Policy*, *117*, 66–74. https://doi.org/10.1016/j.enpol.2018.02.036

Jensen, C., & et al. (2018). *30 national summary briefs of national energy supply and demand.* (ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, Grant Agreement No. 727642 No. D2.5). Retrieved from http://energise-project.eu/sites/default/files/content/ENERGISE_D2.5_310518_Final.pdf

Joint Research Centre (EC). (2019). Energy Service Companies (ESCos). Retrieved from European Energy Efficiency Platform (E3P) website: https://e3p.jrc.ec.europa.eu/communities/energy-service-companies

Koirala, B. P., Koliou, E., Friege, J., Hakvoort, R. A., & Herder, P. M. (2016). Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems. *Renewable and Sustainable Energy Reviews*, *56*(2016), 722–744. http://dx.doi.org/10.1016/j.rser.2015.11.080

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World Map of the Köppen-Geiger climate classification updated. *Meteorologische Zeitschrift*, *15*(3), 259–263. https://doi.org/10.1127/0941-2948/2006/0130

Lacey-Barnacle, M., & Bird, C. M. (2018). Intermediating energy justice? The role of intermediaries in the civic energy sector in a time of austerity. *Applied Energy*, *226*, 71–81. https://doi.org/10.1016/j.apenergy.2018.05.088

Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., … Thomas, C. J. (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science*, *7*(1), 25–43. https://doi.org/10.1007/s11625-011-0149-x

Lavrijssen, S., & Carrillo Parra, A. (2017). Radical Prosumer Innovations in the Electricity Sector and the Impact on Prosumer Regulation. *Sustainability*, *9*(7), 1207. https://doi.org/10.3390/su9071207

Loorbach, D., & Rotmans, J. (2010a). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, *42*(3), 237–246. https://doi.org/10.1016/j.futures.2009.11.009

Loorbach, D., & Rotmans, J. (2010b). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance: An International Journal of Policy, Administration, and Institutions*, *23*(1), 161–183.

REScoop. (2017). *RES202020-Report on financial barriers and existing solutions [Deliverable 4.1].pdf* [Intelligent Energy Europe Programme of the European Union].

Romero-Rubio, C., & de Andrés Díaz, J. R. (2015). Sustainable energy communities: a study contrasting Spain and Germany. *Energy Policy*, *85*, 397–409. https://doi.org/10.1016/j.enpol.2015.06.012

Sabatier, P. A. (1988). An advocacy coalition framework of policy change and the role of policy-oriented learning therein. *Policy Sciences*, *21*(2), 129–168. https://doi.org/10.1007/BF00136406

Schellnhuber, H.-J., van der Hoeven, M., Bastioli, C., Ekins, P., Jaczewska, B., Kux, B., … Trutnevyte, E. (2018). *Final report of the High-Level Panel of the European Decarbonisation Pathways Initiative*. Retrieved from https://archive-ouverte.unige.ch/unige:111523

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management*, *20*(5), 537–554. https://doi.org/10.1080/09537320802292651

Schröder, A., Weerakkody, V., El-Haddadeh, R., Kapoor, K., Butzin, A., Boelman, V., … Oeij, P. (2014). *METHODOLOGY REVIEW: Research Propositions, Data Collection and Analysis Framework* (SI DRIVE: Social Innovation Driving Force of Change No. D2.1). Retrieved from https://www.si-drive.eu/wp-content/uploads/2018/03/D2-1-Research-Framework-final-2014-12-small.pdf

Seyfang, G., & Haxeltine, A. (2012). Growing Grassroots Innovations: Exploring the Role of Community-Based Initiatives in Governing Sustainable Energy Transitions. *Environment and Planning C: Government and Policy*, *30*(3), 381–400. https://doi.org/10.1068/c10222

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions*, *13*, 21–44. https://doi.org/10.1016/j.eist.2014.04.004

Statistical Office of the European Union. (2018). European statistics. Retrieved from Eurostat website: https://ec.europa.eu/eurostat/web/main/home

Statistical Office of the European Union. (2019a). European statistics. Retrieved from Eurostat website: https://ec.europa.eu/eurostat/web/main/home

Statistical Office of the European Union. (2019b). *EUROSTAT: SHARES 2017 - Short Assessment of Renewable Energy Sources*. Retrieved from https://ec.europa.eu/eurostat/web/energy/data/shares

Strauss, A., & Corbin, J. (1994). Grounded theory methodology: An Overview. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (pp. 273–285). USA: Sage Publications.

Strom-Report Blog. (2018). Electricity Prices in Europe – Who Pays the Most? Retrieved from Strom-Report Blog website: https://1-stromvergleich.com/electricity-prices-europe/

Tikkanen, J., & Haara, A. (2014). *WP 1: Inventory of community-based initiatives and selection for in-depth analysis - Case study selection method and criteria, including a checklist to evaluate the community-based initiatives* (TESS PROJECT No. D1.1). Retrieved from http://www.tess-transition.eu/wp-content/uploads/2015/02/TESS_Deliverable_1.1-_FINAL.pdf

Toporek, M., & Campos, I. S. (2019). *Assessment of existing EU-wide and Member State-specific regulatory and policy frameworks of RES Prosumers (Deliverable N°3.1)* (PROSEU-Prosumers for the Energy Union No. D3.1; p. 128).

Vansintjan, D. (2015). *The energy transition to energy democracy. Power to the people.* (p. 76). Belgium: REScoop 20-20-20 Intelligent Energy Europe project.

Wirth, S. (2014). Communities matter: Institutional preconditions for community renewable energy. *Energy Policy*, *70*, 236–246. https://doi.org/10.1016/j.enpol.2014.03.021

Wittmayer, J., Avelino, F., Dorland, F., Pel, B., & Jørgensen, M. S. (2015). *Methodological guidelines Batch 2. TRANSIT Deliverable 4.3.* (TRANSIT: Transformative Social Innovation Theory - Grant Agreement No 613169 No. D4.3).

5.1 Sources for RES country fact sheets by indicator

GEOGRAPHY AND POPULATION:
1) Climate Region:
i) Koppen-Geiger Climate Classification = Main Climate + Precipitation + Temperature:
http://koeppen-geiger.vu-wien.ac.at/applications.htm

2) Demographics:
i) Total Population: (as of Jan. 1, 2018)
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Demographic_balance,_2017_(thousands).png
ii) Densely Populated Area (Urban) vs. Thinly Populated Area (Rural)(%):
[1 - Densely populated area (cities). At least 50% living in high-density clusters (urban centre);
2 - Intermediate density area (towns + suburbs) Less than 50 % of the population living in rural grid cells or in a high-density cluster;
3 - Thinly populated area (alternative name: rural area). More than 50% of the population living in rural grid cells.
http://ec.europa.eu/regional_policy/sources/docgener/work/2014_01_new_urban.pdf]
iii) Home Ownership vs. Rental (%) (2017):
Distribution of population by tenure status, type of household and income group - EU-SILC survey.
http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

ECOLOGICAL IMPACT:
3) Emissions and Consumption:
i) Emissions Per Capita (Kg of CO_2):
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
ii) Energy use Per Capita (Kgoe/cap):
EU COUNTRY DATA SHEETS JUNE 2018, Eurostat.
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
iii) Europe 2020 greenhouse gas target:
https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=t2020_30&tableSelection=1
iv) EU 2030 greenhouse gas target:
http://www.europarl.europa.eu/news/en/headlines/society/20180208STO97442/cutting-eu-greenhouse-gas-emissions-national-targets-for-2030

LEGAL/POLICY:
4) Prosumers:
i) Legal definition of prosumers:
ii) Specific legal framework on collective prosumer Initiatives:
iii) Permit collective power generation:
iv) Permit collective ownership of installation(s):
v) Maximum generation capacity (Power Capacity cap reference):
vi) Permitted to connect to grid:
vii) Are compensated for feeding electricity into the grid:
EUROPEAN COMMISSION (2017). *Study on "Residential Prosumers in the European Energy Union"* JUST/2015/CONS/FW/C006/0127. Framework Contract EAHC/2013/CP/04. Prepared by: GfK Belgium consortium.

EUROPEAN PARLIAMENT AND COUNCIL (2016). Proposal *for a DIRECTIVE on common rules for the internal market in electricity (recast) (Text with EEA relevance)*. (Report No. COM(2016) 864 final/2 2016/0380(COD)). Press release by the European Commission on the political agreement. Retrieved from the European Commission website https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v7_864.pdf

European Parliament (2018). *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast).* (Text with EEA relevance.) (Report No. EU OJ L 328, 21.12.2018, p. 82). Retrieved from the European Parliament website https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001

5) Energy Sector Transparency, Perception and Participation:
i) Level of transparency:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf
ii) Perception of the energy sector:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf
iii) Participation:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf

ECONOMICS:
6) Environmental Economy Jobs:
i) # of jobs in the production of RES:
ii) # of jobs in Heat & Energy saving:
iii) Total # of Env. Economy jobs:
Employment related to market output of environmental economy, 2015. (1000 full-time equivalents). Eurostat (online data code: env_ac_egss1) https://ec.europa.eu/eurostat/statistics-explained/images/c/c7/Employment_2.png

7) Main Energy System Actors:
i) Actors directly involved in the Energy system:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf

8) Energy Sector Structure:
i) Monopoly, Oligopoly, or Other:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf
ii) Centralized or Decentralized:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf
iii) Public-private sector ties:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf

9) Prices:
i) Household electricity prices (€/kWh) (First Half of 2018):
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics
ii) Household natural gas prices (€/kWh) (First Half of 2018):
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Natural_gas_price_statistics
iii) Share of taxes/levies (%) (2018):
Share of taxes and levies paid by household for electricity, first half 2018 (%):
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics
iv) How price is established in the energy market:
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf

10) Energy affordability:
i) Cost of energy:
https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-3c.html
ii) % of population in arrears on utility bill (2016):
https://www.energypoverty.eu/indicator?primaryId=1467
iii) Energy expenses (2015): Income quantiles 1 – 4 (% of population):
(The first quintile group represents 20% of the population with the lowest income (an income smaller or equal to the first cut-off value), and the fifth quintile group represents the 20% of population with the highest income (an income greater than the fourth cut-off value)). Source:
https://www.energypoverty.eu/indicator?primaryId=1467

11) Energy poverty: (% of population):
i) People at risk of poverty (% of population) (2016):
https://www.energypoverty.eu/indicator?primaryId=1467
ii) Excess winter mortality/deaths:
https://www.energypoverty.eu/indicator?primaryId=1467
iii) Presence of leak, damp, rot:
https://www.energypoverty.eu/indicator?primaryId=1467
iv) Equipped with heating:
https://www.energypoverty.eu/indicator?primaryId=1467
v) Equipped with air conditioning:
https://www.energypoverty.eu/indicator?primaryId=1467

12) Business models:
i) RES Prosumer business models:
REPORT ON PVP4GRID CONCEPTS AND BARRIERS English Summary D2.4. Public Deliverable. Author: European Renewable Energies Federation (EREF): Pierre Bancourt with the collaboration of the "PVP4Grid" consortium Brussels, July 2018.

13) Financing Schemes:
i) Forms of support
REPORT ON PVP4GRID CONCEPTS AND BARRIERS English Summary D2.4. Public Deliverable. Author: European Renewable Energies Federation (EREF): Pierre Bancourt with the collaboration of the "PVP4Grid" consortium Brussels, July 2018.
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf
(p.64 table)

TECHNOLOGY (RES technologies):
14) Electricity Capacity:
i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016):
EU COUNTRY DATA SHEETS JUNE 2018, Eurostat.
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A

15) Electricity Production:
i) Gross Electricity Generation by Fuel Type (TWh) & (%):
EU COUNTRY DATA SHEETS JUNE 2018, Eurostat.
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A

16) Electricity Consumption:
i) Final Electricity in kWh per Capita:
EU COUNTRY DATA SHEETS JUNE 2018, Eurostat.
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A

17) Energy Capacity: (2016)
i) Power system capacity
http://www.entrust-h2020.eu/wp-content/uploads/2017/01/D2.1_Energy-System-Charact_-release-v2.pdf

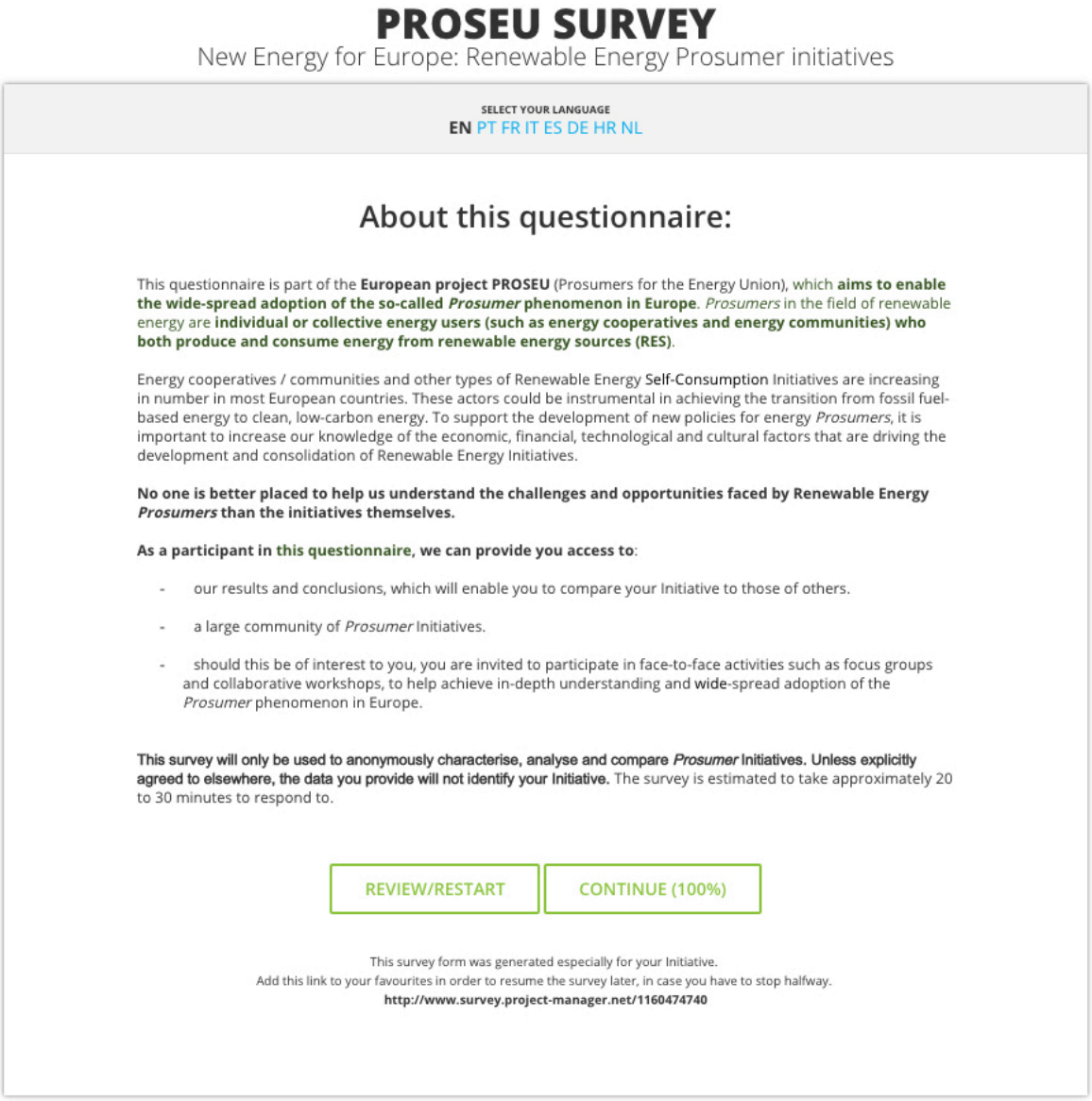
18) Energy Production:
i) Primary Production by Fuel Type (Mtoe & %) (2016) (Production includes primary indigenous production, primary products receipt, recovered and recycled products):
EU COUNTRY DATA SHEETS JUNE 2018, Eurostat.
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A

19) Energy Consumption: (2016)

i) Fuels going through Final consumption – All Products (2016):
https://ec.europa.eu/eurostat/cache/sankey/sankey.html?geos=EU28&year=2016&unit=KTOE&fuels=0000&highlight=&nodeDisagg=0101000000&flowDisagg=false&translateX=0&translateY=0&scale=1&language=EN
EU
ii) Gross Inland Consumption by product (%):
EU COUNTRY DATA SHEETS JUNE 2018; Eurostat
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
iii) Share of Renewables in Gross Final Consumption of Energy (%):
EU COUNTRY DATA SHEETS JUNE 2018; Eurostat
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
iv) Final Energy Consumption by sector (%):
EU COUNTRY DATA SHEETS JUNE 2018; Eurostat
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A

20) Energy Dependency: (2016)
i) Energy Import Dependency (%) (is the ration between net imports and the sum of gross inland consumption and international maritime bunkers. Values above 100% indicate that stocks are accumulated):
EU COUNTRY DATA SHEETS JUNE 2018; Eurostat
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
ii) Imports by fuel type (%):
EU COUNTRY DATA SHEETS JUNE 2018; Eurostat
https://ec.europa.eu/eurostat/web/products-datasets/-/NRG_100A
iii) Energy connectivity (with other countries) (%) (2017):
https://ec.europa.eu/commission/publications/energy-union-factsheets-eu-countries_en &
http://europa.eu/rapid/press-release_MEMO-15-4486_en.htm

ANNEX 1 ONLINE SURVEY FORM



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

SELECT YOUR LANGUAGE
EN PT FR IT ES DE HR NL

About this questionnaire:

This questionnaire is part of the **European project PROSEU** (Prosumers for the Energy Union), which **aims to enable the wide-spread adoption of the so-called *Prosumer* phenomenon in Europe**. *Prosumers* in the field of renewable energy are **individual or collective energy users (such as energy cooperatives and energy communities) who both produce and consume energy from renewable energy sources (RES)**.

Energy cooperatives / communities and other types of Renewable Energy Self-Consumption Initiatives are increasing in number in most European countries. These actors could be instrumental in achieving the transition from fossil fuel-based energy to clean, low-carbon energy. To support the development of new policies for energy *Prosumers*, it is important to increase our knowledge of the economic, financial, technological and cultural factors that are driving the development and consolidation of Renewable Energy Initiatives.

No one is better placed to help us understand the challenges and opportunities faced by Renewable Energy *Prosumers* than the initiatives themselves.

As a participant in this questionnaire, we can provide you access to:

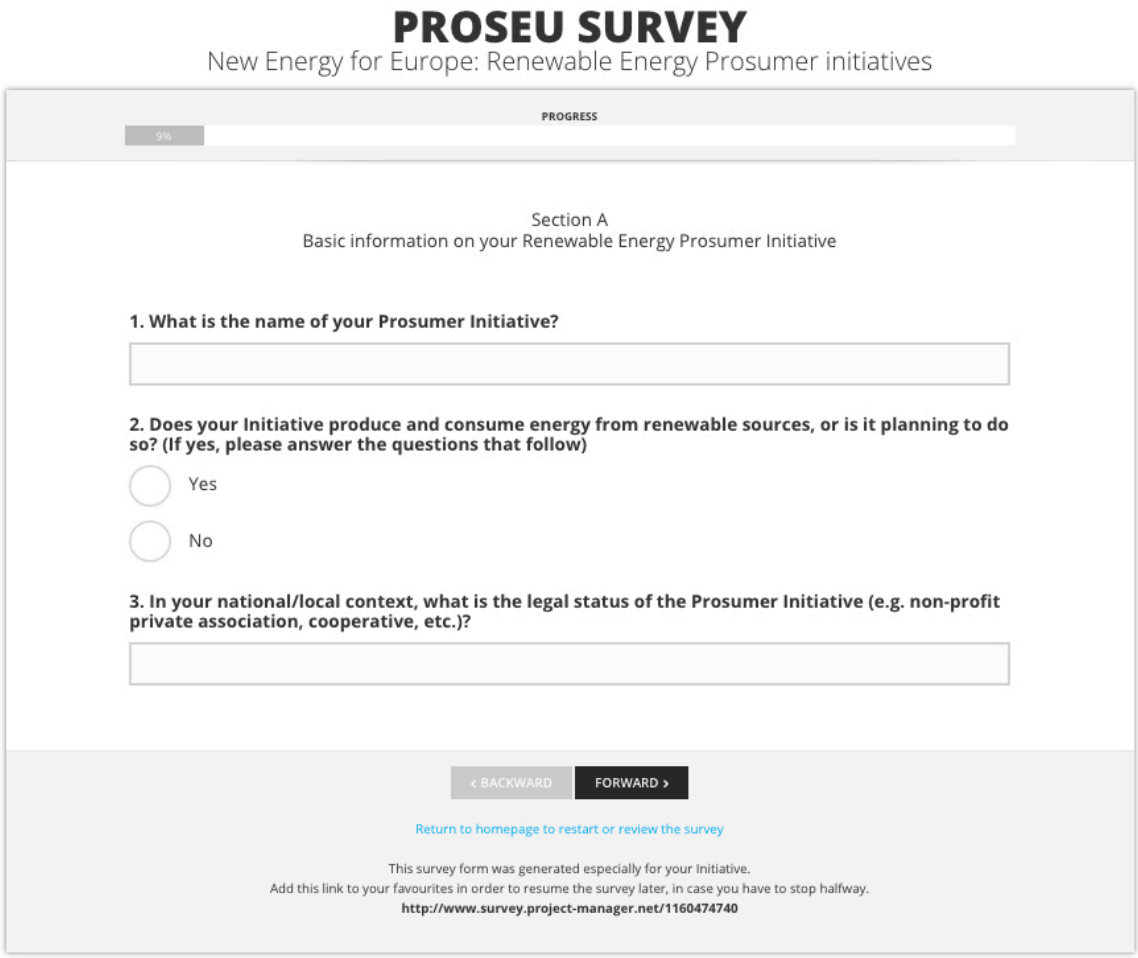
- our results and conclusions, which will enable you to compare your Initiative to those of others.
- a large community of *Prosumer* Initiatives.
- should this be of interest to you, you are invited to participate in face-to-face activities such as focus groups and collaborative workshops, to help achieve in-depth understanding and wide-spread adoption of the *Prosumer* phenomenon in Europe.

This survey will only be used to anonymously characterise, analyse and compare *Prosumer* Initiatives. Unless explicitly agreed to elsewhere, the data you provide will not identify your Initiative. The survey is estimated to take approximately 20 to 30 minutes to respond to.

REVIEW/RESTART CONTINUE (100%)

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

9%

Section A
Basic information on your Renewable Energy Prosumer Initiative

1. What is the name of your Prosumer Initiative?

2. Does your Initiative produce and consume energy from renewable sources, or is it planning to do so? (If yes, please answer the questions that follow)

Yes

No

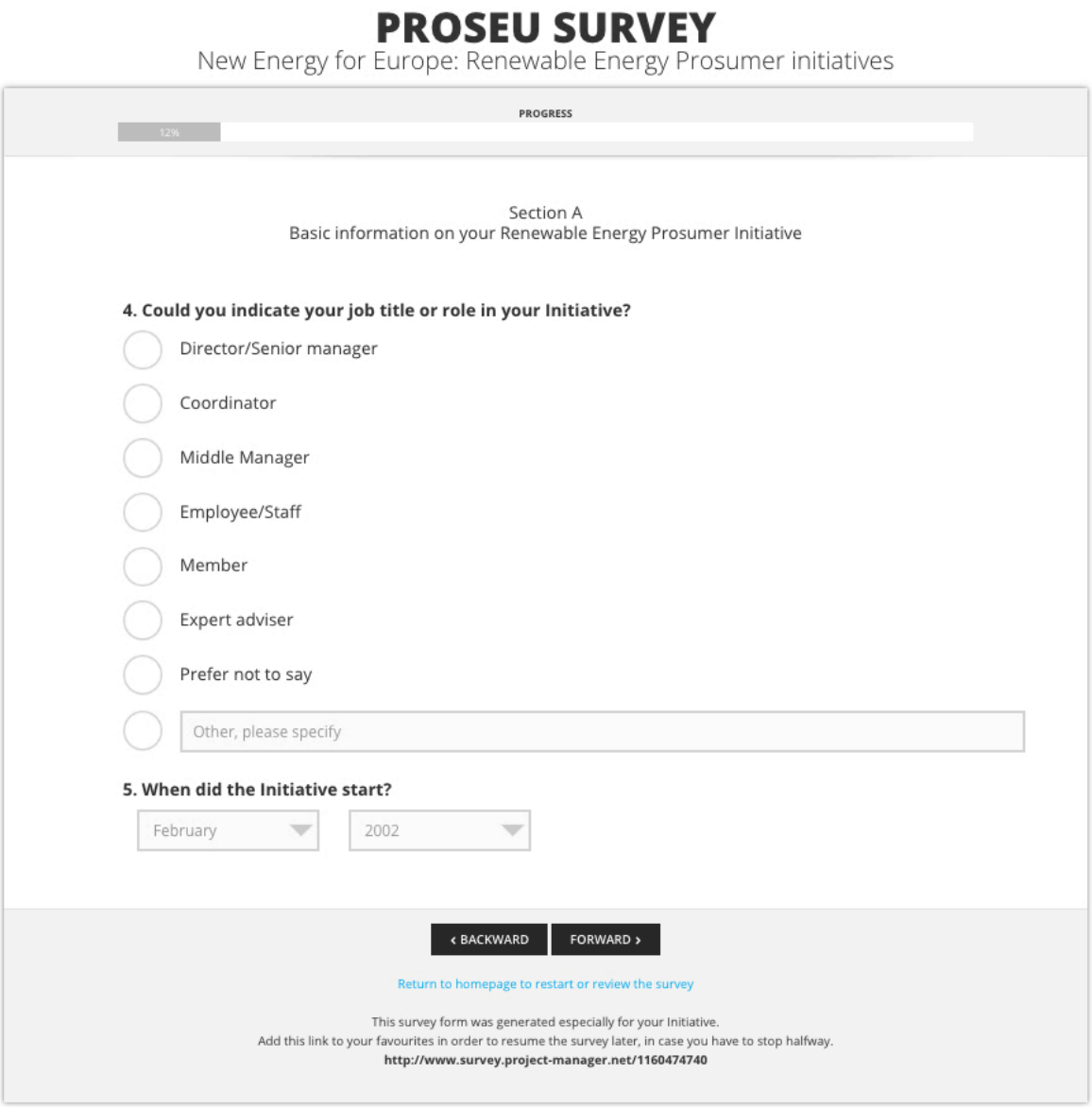
3. In your national/local context, what is the legal status of the Prosumer Initiative (e.g. non-profit private association, cooperative, etc.)?

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

12%

Section A
Basic information on your Renewable Energy Prosumer Initiative

4. Could you indicate your job title or role in your Initiative?

- Director/Senior manager
- Coordinator
- Middle Manager
- Employee/Staff
- Member
- Expert adviser
- Prefer not to say
- Other, please specify

5. When did the Initiative start?

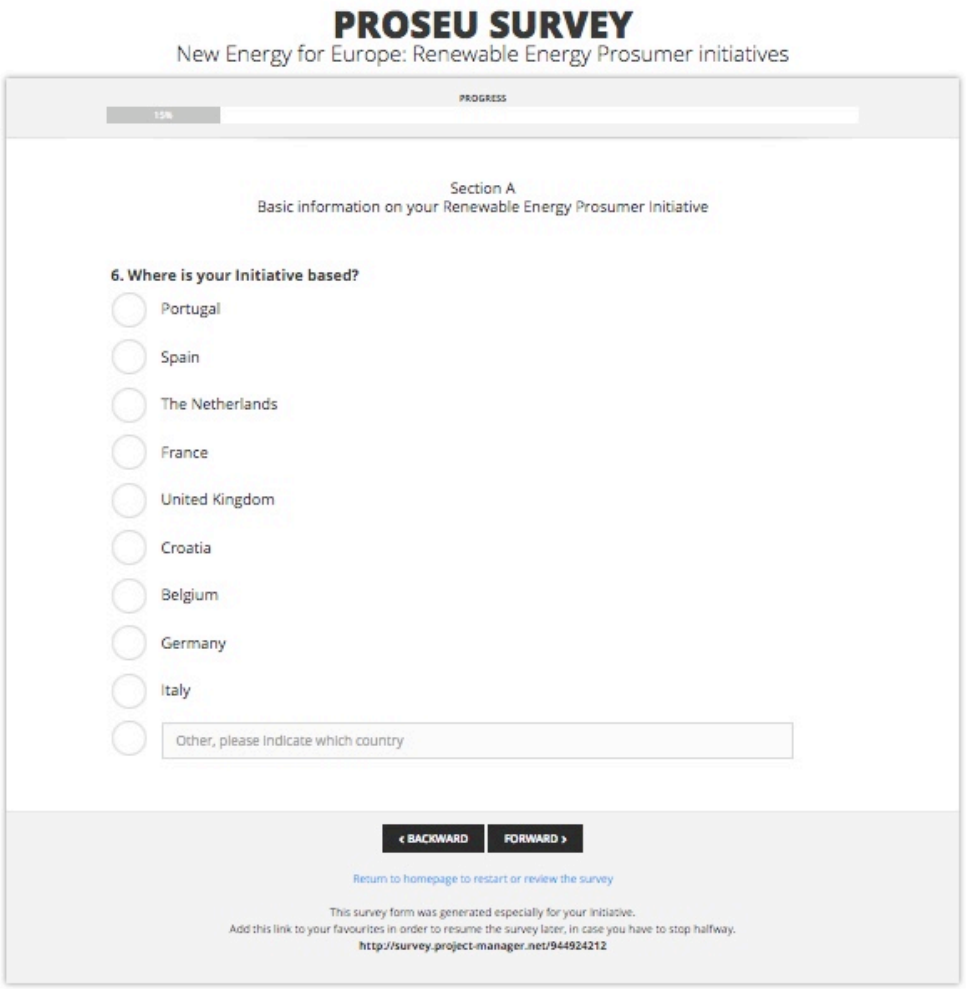
February 2002

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

15%

Section A
Basic information on your Renewable Energy Prosumer Initiative

6. Where is your Initiative based?

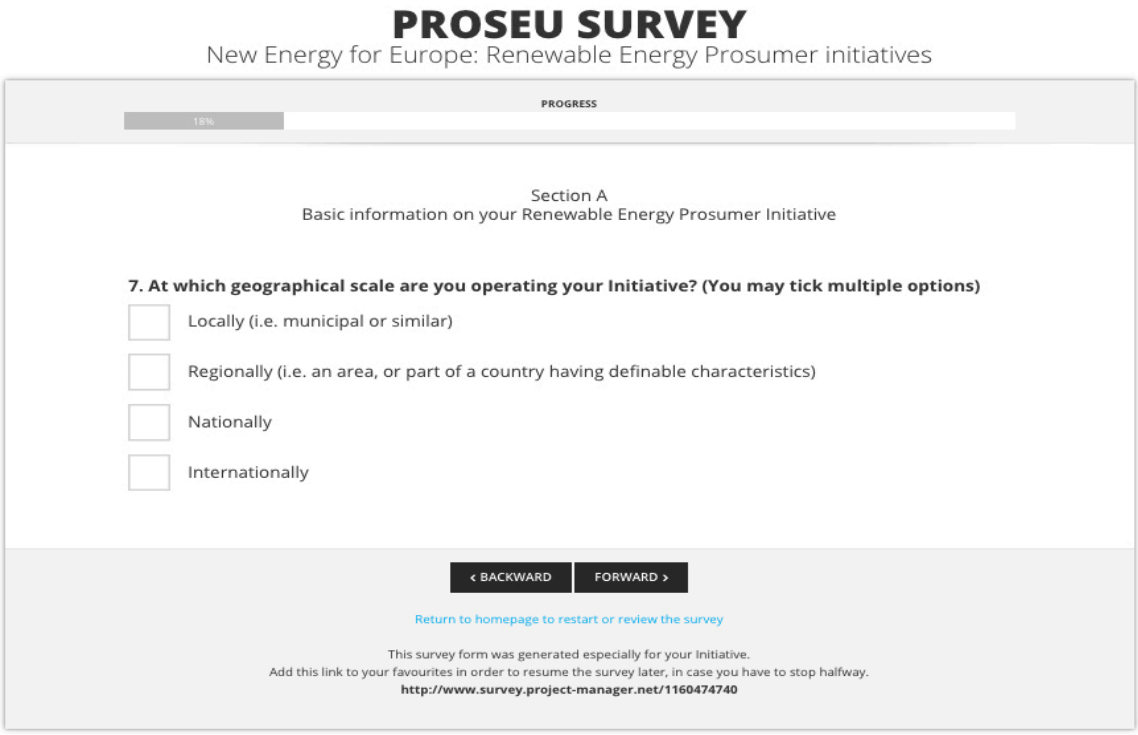
- Portugal
- Spain
- The Netherlands
- France
- United Kingdom
- Croatia
- Belgium
- Germany
- Italy
- Other, please indicate which country

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://survey.project-manager.net/944924212

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

18%

Section A
Basic information on your Renewable Energy Prosumer Initiative

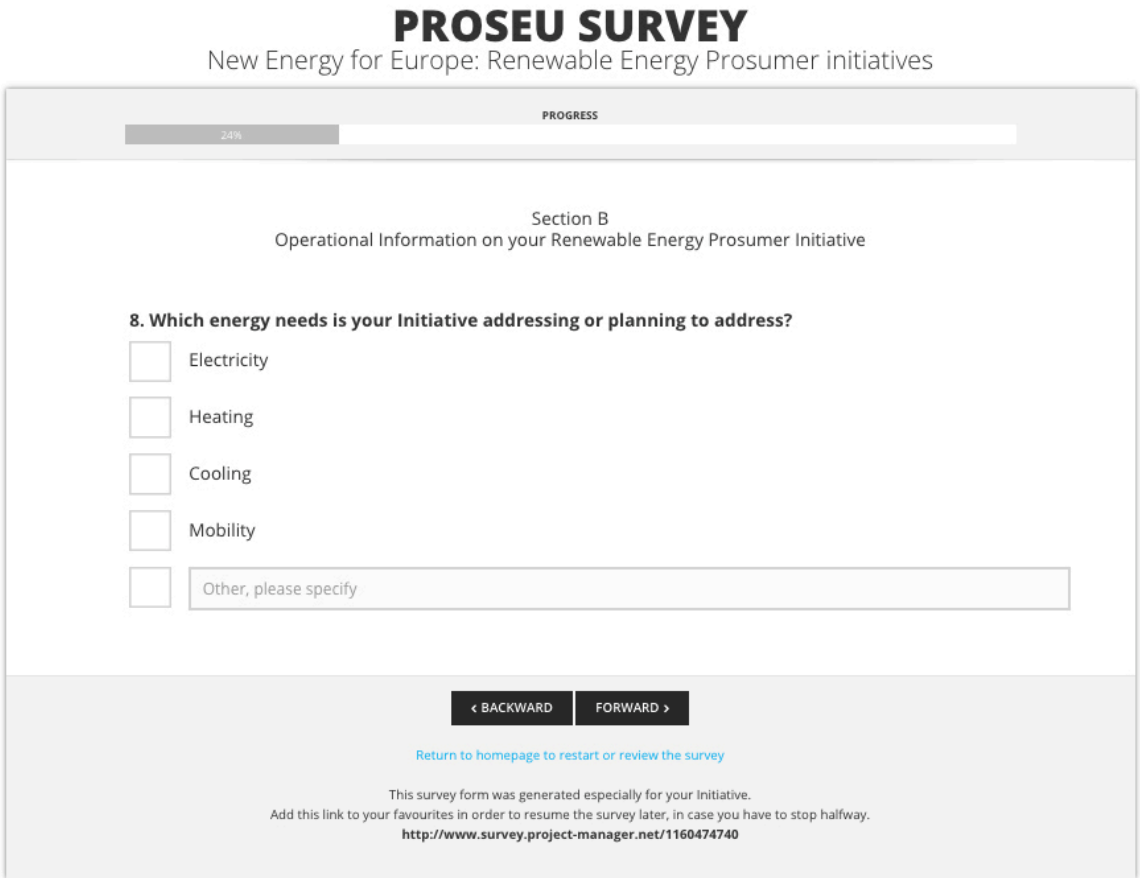
7. At which geographical scale are you operating your Initiative? (You may tick multiple options)

- ☐ Locally (i.e. municipal or similar)
- ☐ Regionally (i.e. an area, or part of a country having definable characteristics)
- ☐ Nationally
- ☐ Internationally

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

24%

Section B
Operational Information on your Renewable Energy Prosumer Initiative

8. Which energy needs is your Initiative addressing or planning to address?

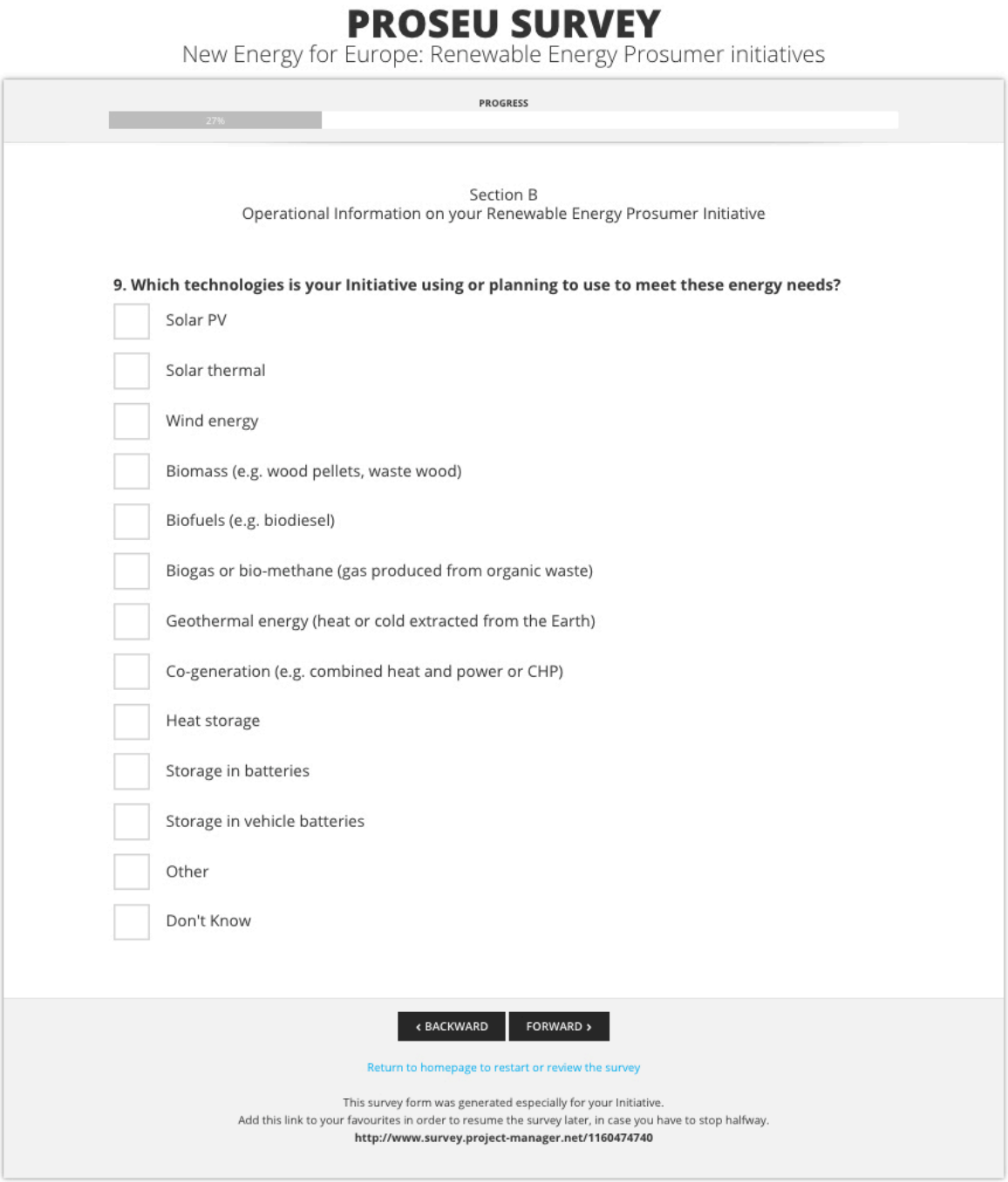
- ☐ Electricity
- ☐ Heating
- ☐ Cooling
- ☐ Mobility
- ☐ Other, please specify

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

27%

Section B
Operational Information on your Renewable Energy Prosumer Initiative

9. Which technologies is your Initiative using or planning to use to meet these energy needs?

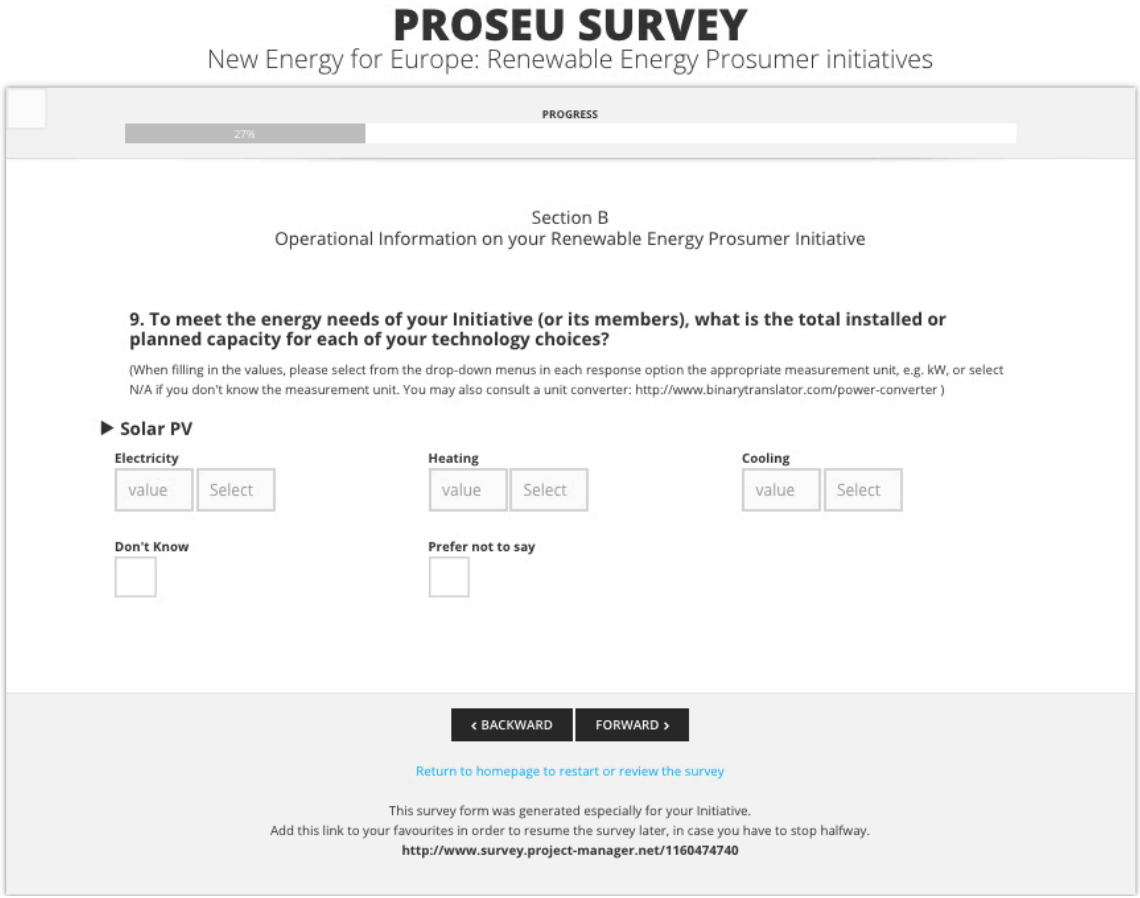
- [ ] Solar PV
- [ ] Solar thermal
- [ ] Wind energy
- [ ] Biomass (e.g. wood pellets, waste wood)
- [ ] Biofuels (e.g. biodiesel)
- [ ] Biogas or bio-methane (gas produced from organic waste)
- [ ] Geothermal energy (heat or cold extracted from the Earth)
- [ ] Co-generation (e.g. combined heat and power or CHP)
- [ ] Heat storage
- [ ] Storage in batteries
- [ ] Storage in vehicle batteries
- [ ] Other
- [ ] Don't Know

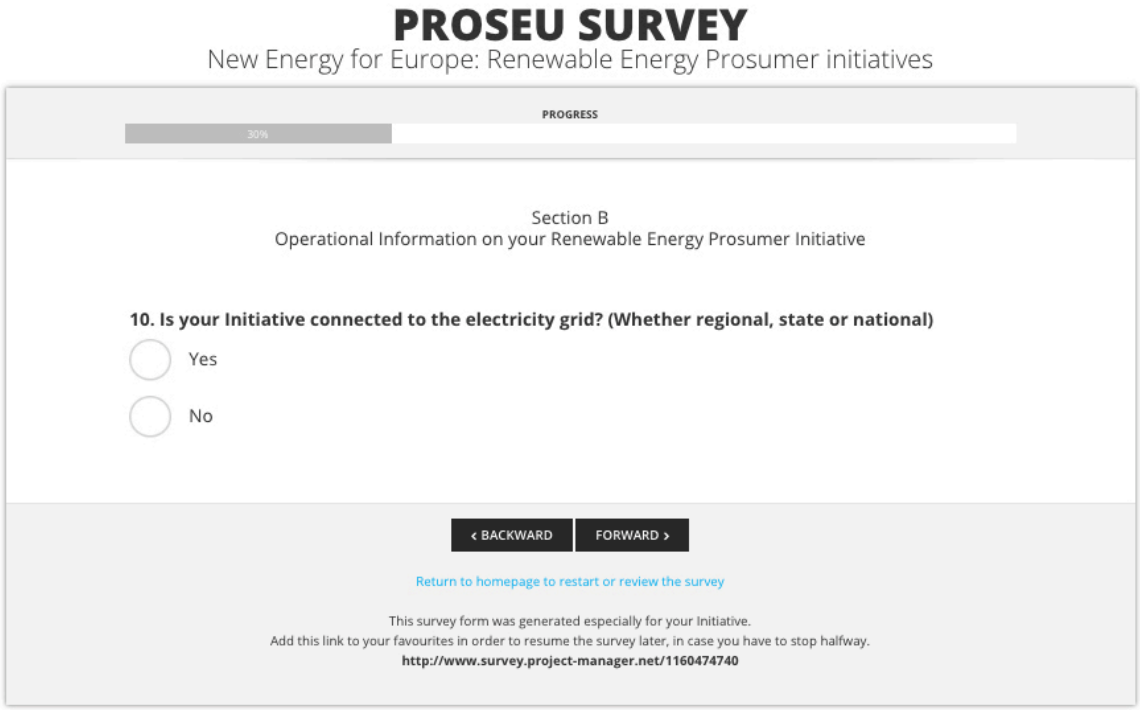
‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

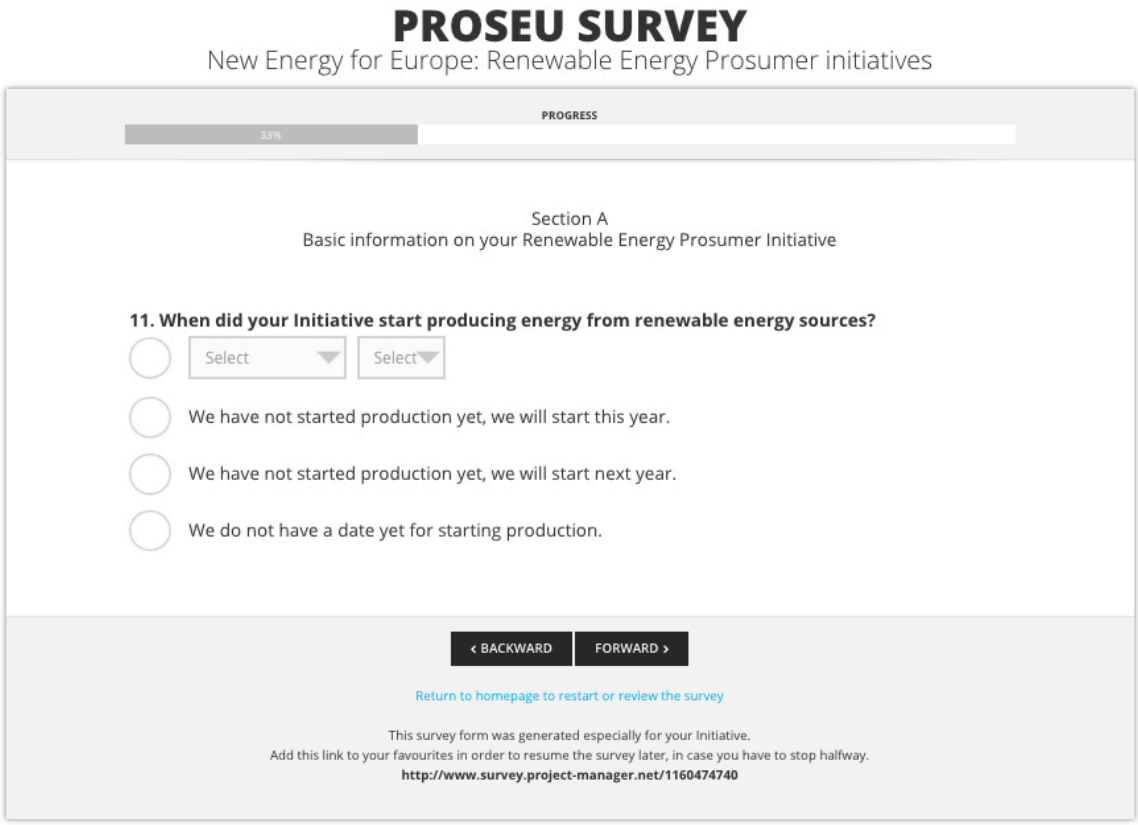
This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)


PROSEU SURVEY
New Energy for Europe: Renewable Energy Prosumer initiatives
PROGRESS
27%
Section B
Operational Information on your Renewable Energy Prosumer Initiative
9. To meet the energy needs of your Initiative (or its members), what is the total installed or planned capacity for each of your technology choices?
(When filling in the values, please select from the drop-down menus in each response option the appropriate measurement unit, e.g. kW, or select N/A if you don't know the measurement unit. You may also consult a unit converter: http://www.binarytranslator.com/power-converter)
▶ Solar PV
Electricity
value
Select
Heating
value
Select
Cooling
value
Select
Don't Know
Prefer not to say
‹ BACKWARD
FORWARD ›
Return to homepage to restart or review the survey
This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740


PROSEU SURVEY
New Energy for Europe: Renewable Energy Prosumer initiatives
PROGRESS
30%
Section B
Operational Information on your Renewable Energy Prosumer Initiative
10. Is your Initiative connected to the electricity grid? (Whether regional, state or national)
Yes
No
‹ BACKWARD
FORWARD ›
Return to homepage to restart or review the survey
This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

33%

Section A
Basic information on your Renewable Energy Prosumer Initiative

11. When did your Initiative start producing energy from renewable energy sources?

Select Select

We have not started production yet, we will start this year.

We have not started production yet, we will start next year.

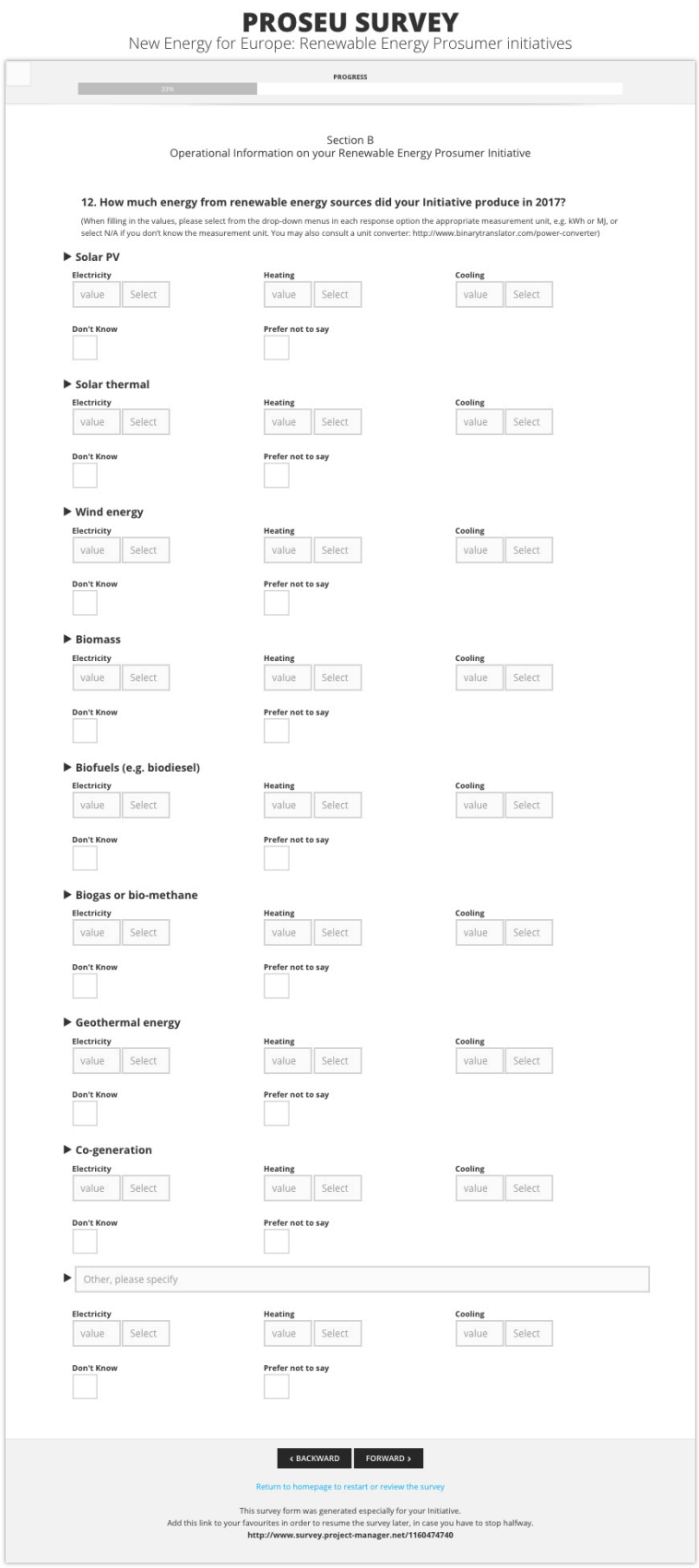
We do not have a date yet for starting production.

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

33%

Section B
Operational Information on your Renewable Energy Prosumer Initiative

12. How much energy from renewable energy sources did your Initiative produce in 2017?

(When filling in the values, please select from the drop-down menus in each response option the appropriate measurement unit, e.g. kWh or MJ, or select N/A if you don't know the measurement unit. You may also consult a unit converter: http://www.binarytranslator.com/power-converter)

▶ **Solar PV**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Solar thermal**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Wind energy**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Biomass**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Biofuels (e.g. biodiesel)**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Biogas or bio-methane**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Geothermal energy**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ **Co-generation**

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

▶ Other, please specify

Electricity: value | Select — Heating: value | Select — Cooling: value | Select

Don't Know — Prefer not to say

‹ BACKWARD FORWARD ›

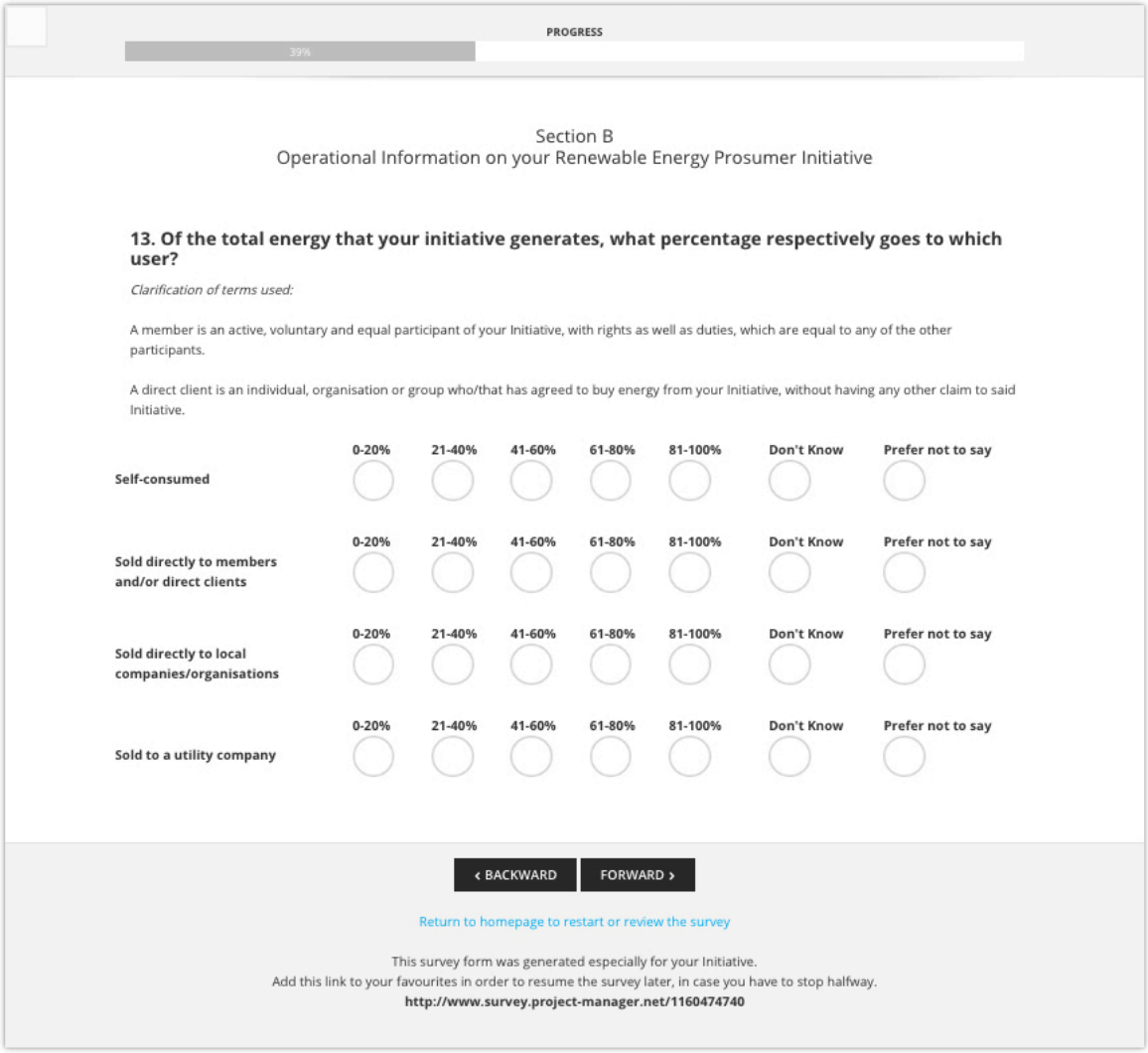
Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives



PROGRESS

39%

Section B
Operational Information on your Renewable Energy Prosumer Initiative

13. Of the total energy that your initiative generates, what percentage respectively goes to which user?

Clarification of terms used:

A member is an active, voluntary and equal participant of your Initiative, with rights as well as duties, which are equal to any of the other participants.

A direct client is an individual, organisation or group who/that has agreed to buy energy from your Initiative, without having any other claim to said Initiative.

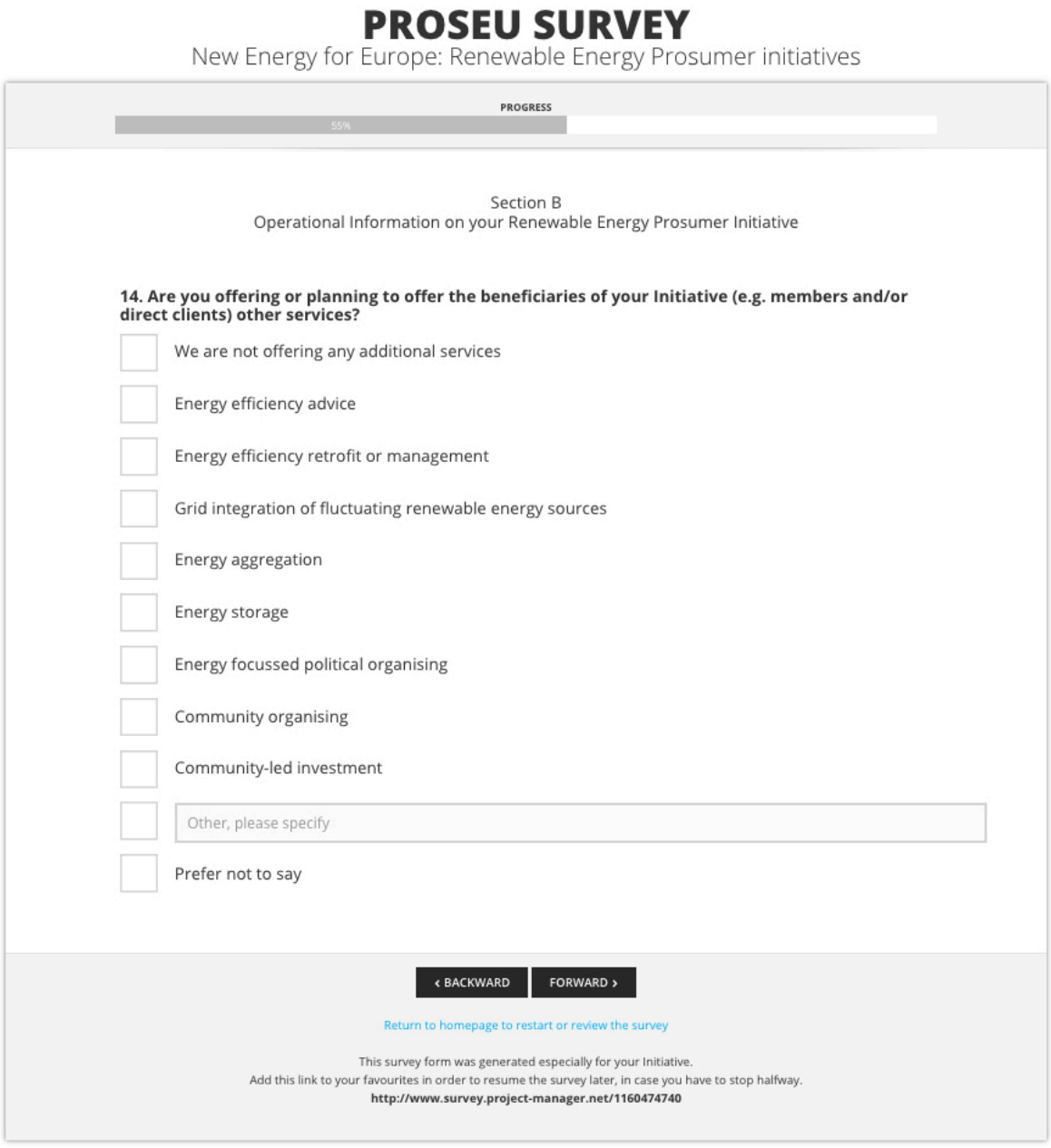
	0-20%	21-40%	41-60%	61-80%	81-100%	Don't Know	Prefer not to say
Self-consumed	○	○	○	○	○	○	○
Sold directly to members and/or direct clients	○	○	○	○	○	○	○
Sold directly to local companies/organisations	○	○	○	○	○	○	○
Sold to a utility company	○	○	○	○	○	○	○

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

55%

Section B
Operational Information on your Renewable Energy Prosumer Initiative

14. Are you offering or planning to offer the beneficiaries of your Initiative (e.g. members and/or direct clients) other services?

- [ ] We are not offering any additional services
- [ ] Energy efficiency advice
- [ ] Energy efficiency retrofit or management
- [ ] Grid integration of fluctuating renewable energy sources
- [ ] Energy aggregation
- [ ] Energy storage
- [ ] Energy focussed political organising
- [ ] Community organising
- [ ] Community-led investment
- [ ] Other, please specify
- [ ] Prefer not to say

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

55%

Section C
Organisational capacity and resources

Please enter the number of persons directly involved in the activities of your Initiative for each of the following options.
(Tick "not applicable" (N/A) when the question does not apply to your Initiative)

15. What is the total number of staff/employees (incl. management staff or core team, other staff, whether paid or unpaid)?

N/A

16. What is the number of women vs. the number of men in the management staff/core team, e.g. 2 F, 2 M?

F: M:

N/A

17. What is the number of women vs. the number of men in the non-management staff/other teams?

F: M:

N/A

18. What is the number of staff/employees who are paid?

N/A

19. What is the number of staff/employees who are volunteers?

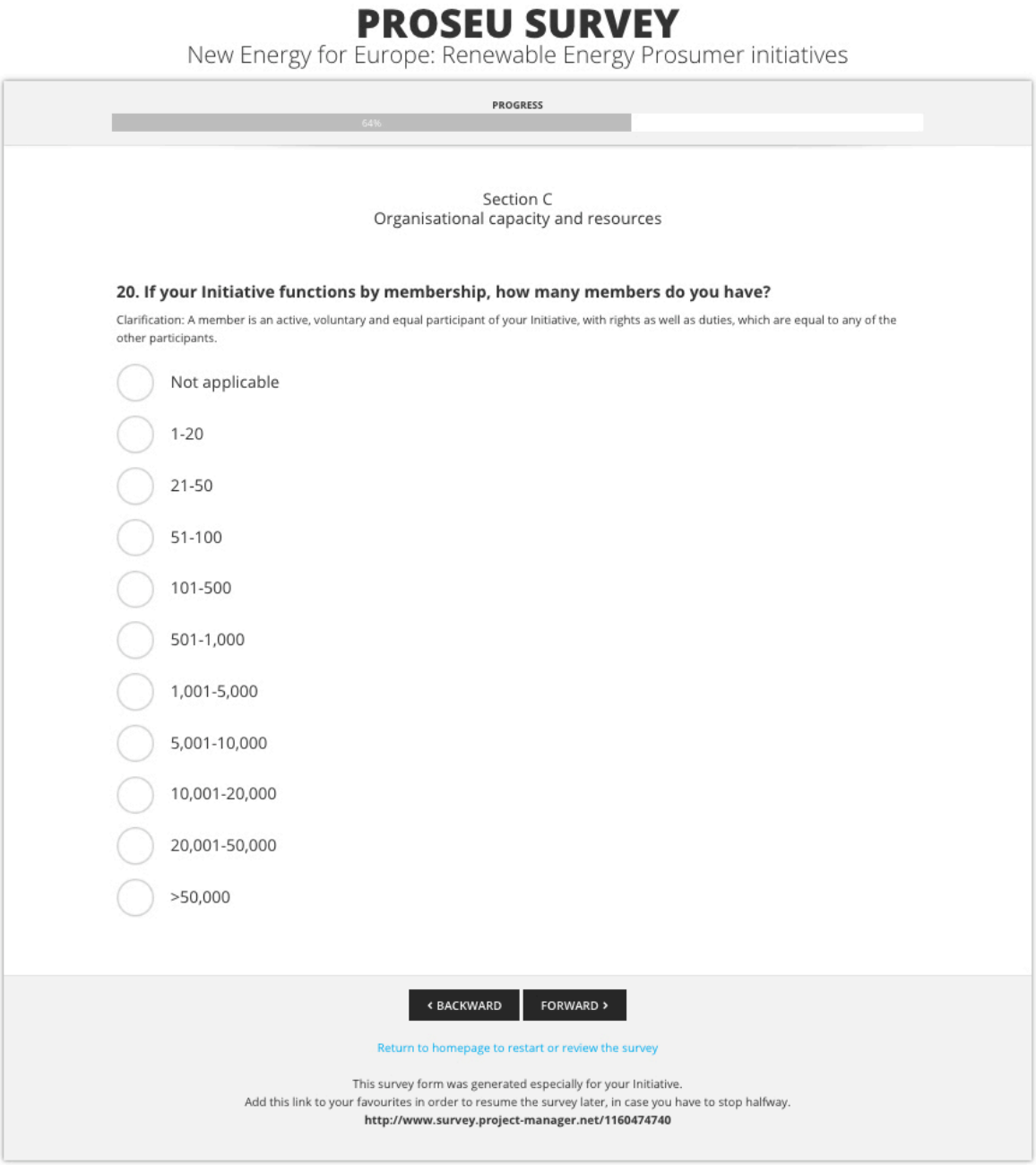
N/A

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

64%

Section C
Organisational capacity and resources

20. If your Initiative functions by membership, how many members do you have?

Clarification: A member is an active, voluntary and equal participant of your Initiative, with rights as well as duties, which are equal to any of the other participants.

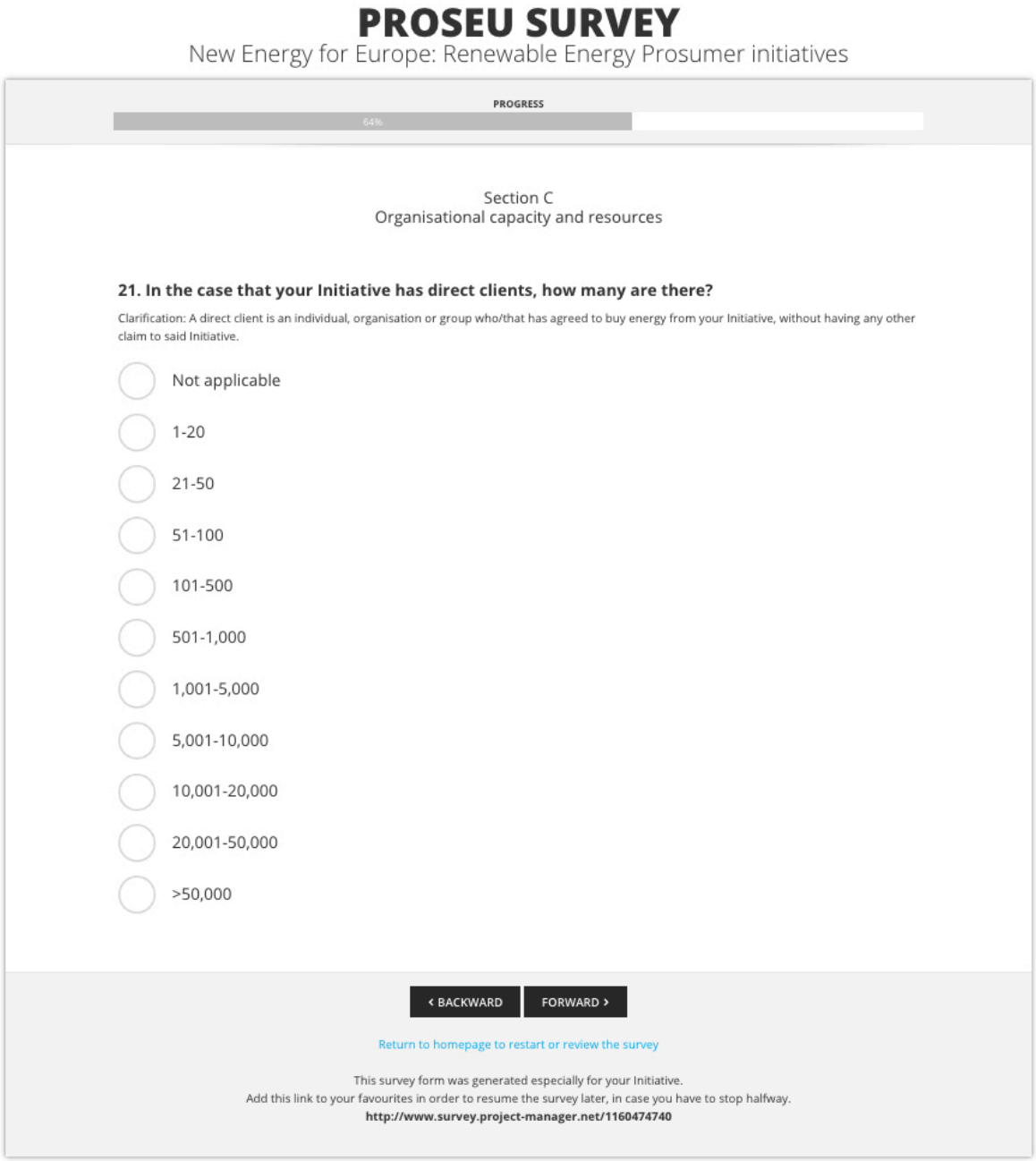
- Not applicable
- 1-20
- 21-50
- 51-100
- 101-500
- 501-1,000
- 1,001-5,000
- 5,001-10,000
- 10,001-20,000
- 20,001-50,000
- >50,000

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

64%

Section C
Organisational capacity and resources

21. In the case that your Initiative has direct clients, how many are there?

Clarification: A direct client is an individual, organisation or group who/that has agreed to buy energy from your Initiative, without having any other claim to said Initiative.

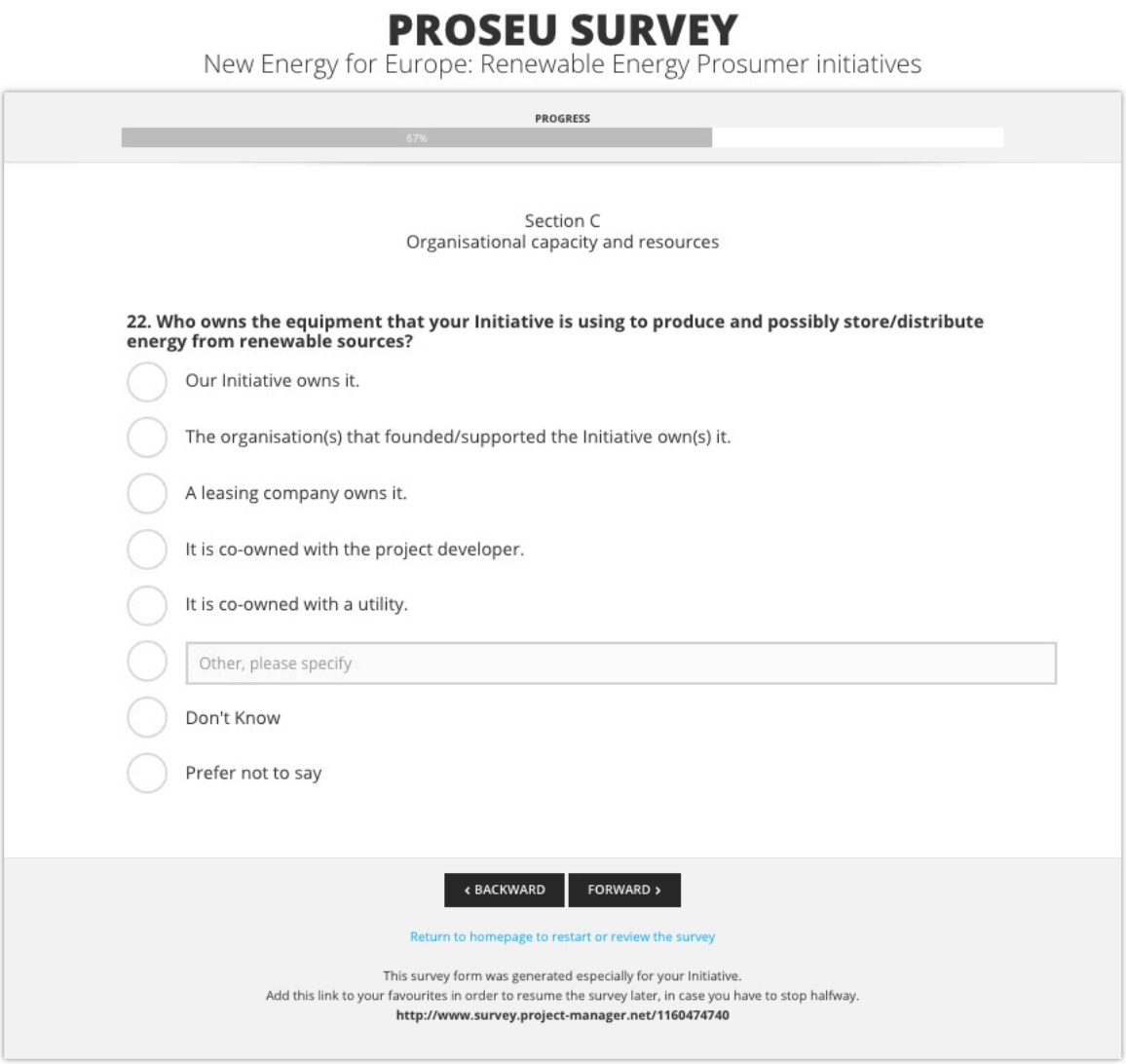
- Not applicable
- 1-20
- 21-50
- 51-100
- 101-500
- 501-1,000
- 1,001-5,000
- 5,001-10,000
- 10,001-20,000
- 20,001-50,000
- >50,000

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

67%

Section C
Organisational capacity and resources

22. Who owns the equipment that your Initiative is using to produce and possibly store/distribute energy from renewable sources?

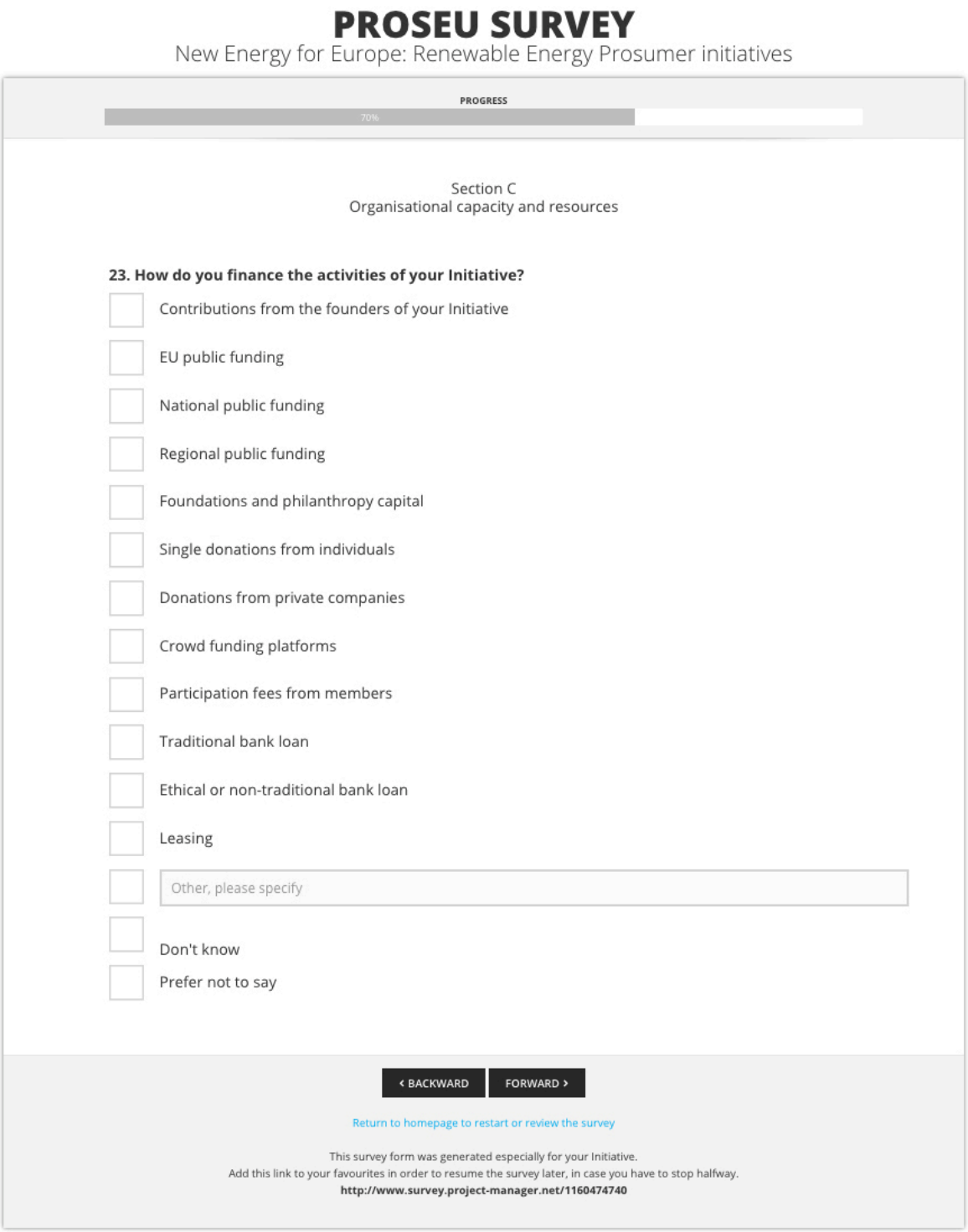
- Our Initiative owns it.
- The organisation(s) that founded/supported the Initiative own(s) it.
- A leasing company owns it.
- It is co-owned with the project developer.
- It is co-owned with a utility.
- Other, please specify
- Don't Know
- Prefer not to say

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

70%

Section C
Organisational capacity and resources

23. How do you finance the activities of your Initiative?

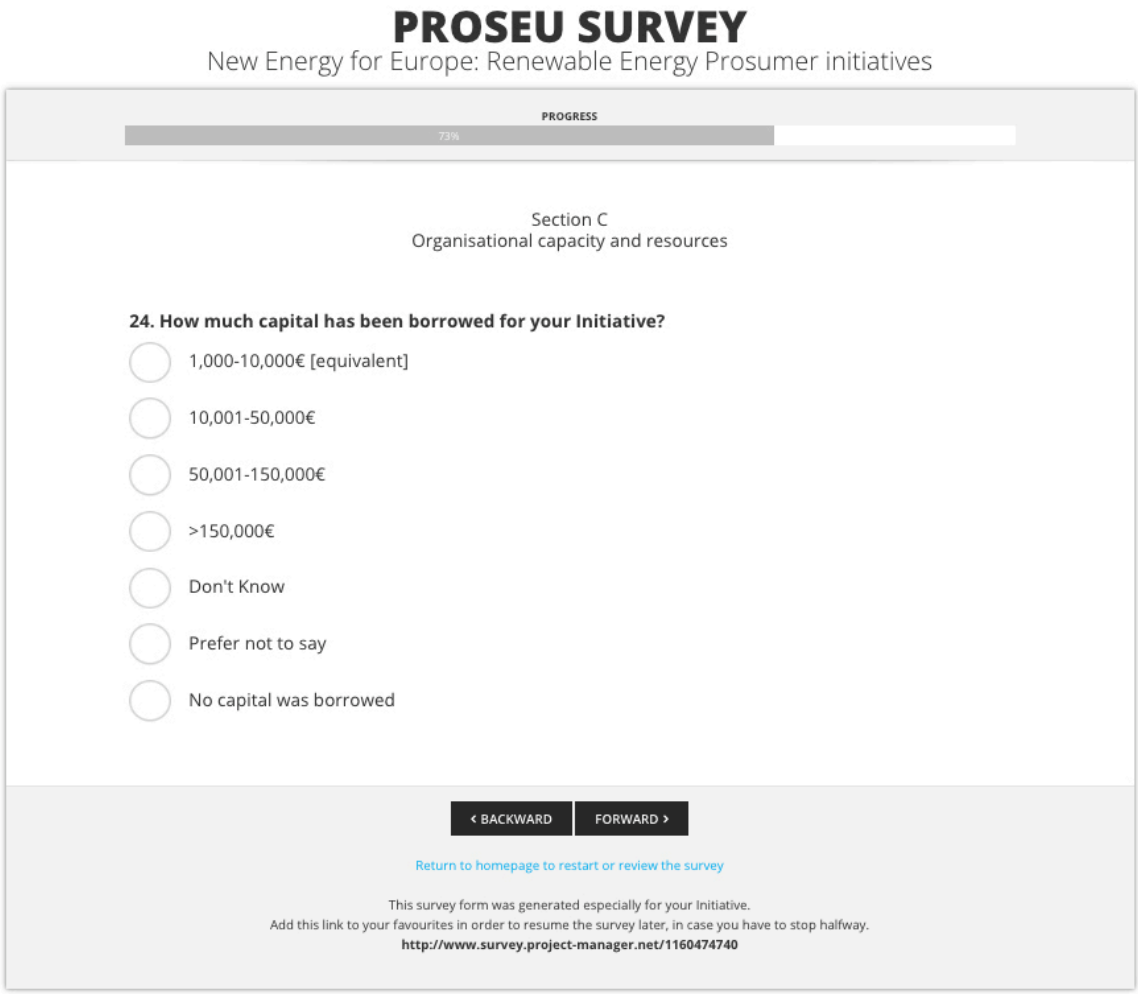
- [ ] Contributions from the founders of your Initiative
- [ ] EU public funding
- [ ] National public funding
- [ ] Regional public funding
- [ ] Foundations and philanthropy capital
- [ ] Single donations from individuals
- [ ] Donations from private companies
- [ ] Crowd funding platforms
- [ ] Participation fees from members
- [ ] Traditional bank loan
- [ ] Ethical or non-traditional bank loan
- [ ] Leasing
- [ ] Other, please specify
- [ ] Don't know
- [ ] Prefer not to say

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

73%

Section C
Organisational capacity and resources

24. How much capital has been borrowed for your Initiative?

- 1,000-10,000€ [equivalent]
- 10,001-50,000€
- 50,001-150,000€
- >150,000€
- Don't Know
- Prefer not to say
- No capital was borrowed

< BACKWARD FORWARD >

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

73%

Section C
Organisational capacity and resources

25. Please identify and rank your four biggest income generators, from 1 (first largest income generator) to 4 (fourth largest income generator).

Type of revenue:

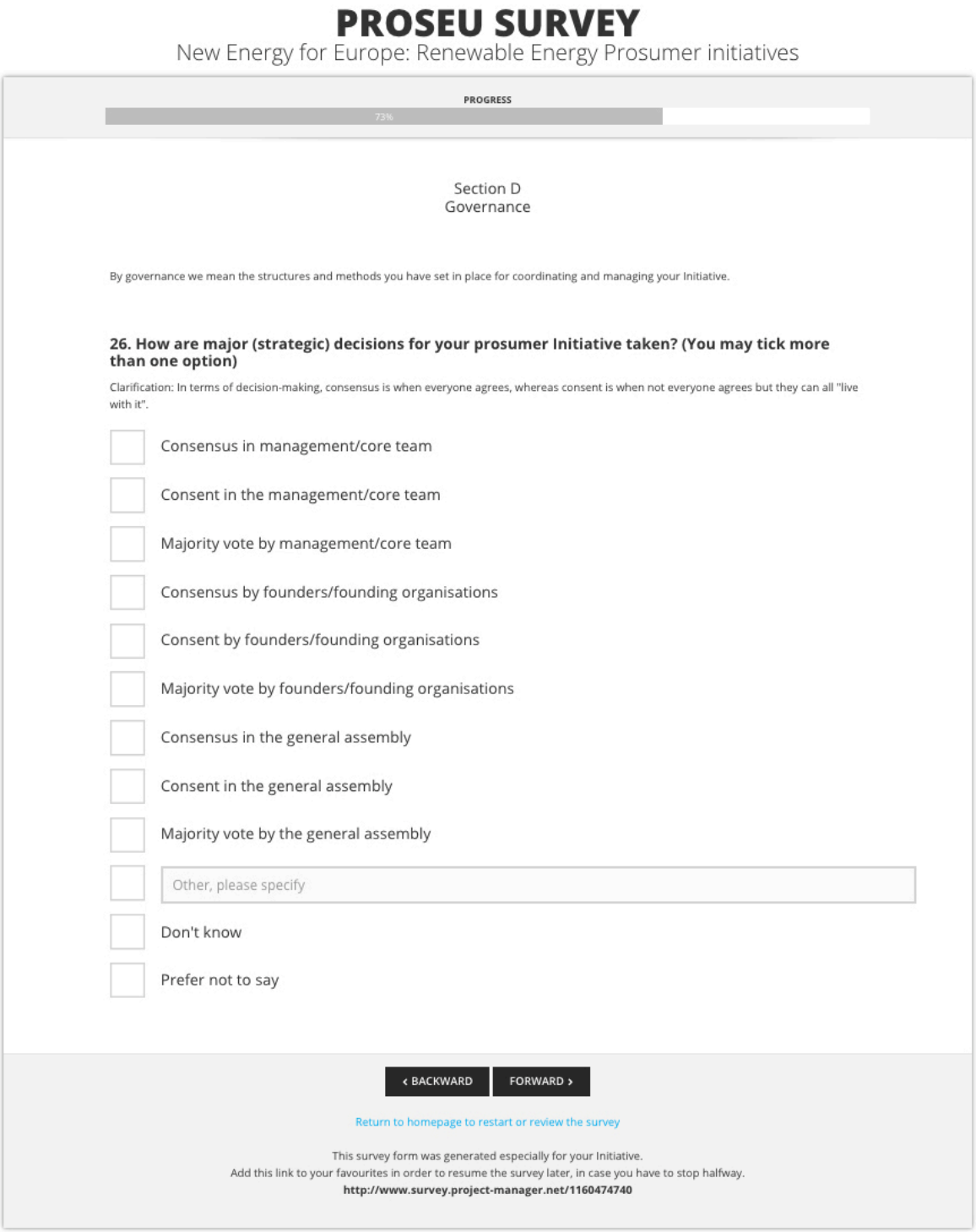
	1	2	3	4
Self-consumption (savings in energy costs and/or rebate on energy bill)	○	○	○	○
Energy sales to members and/or direct clients	○	○	○	○
Energy sales to market	○	○	○	○
Public subsidies (i.e. feed-in tariffs)	○	○	○	○
Other services (please specify)	○	○	○	○
Other services (please specify)	○	○	○	○
Don't Know	○			
Prefer not to say	✓			

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

73%

Section D
Governance

By governance we mean the structures and methods you have set in place for coordinating and managing your Initiative.

26. How are major (strategic) decisions for your prosumer Initiative taken? (You may tick more than one option)

Clarification: In terms of decision-making, consensus is when everyone agrees, whereas consent is when not everyone agrees but they can all "live with it".

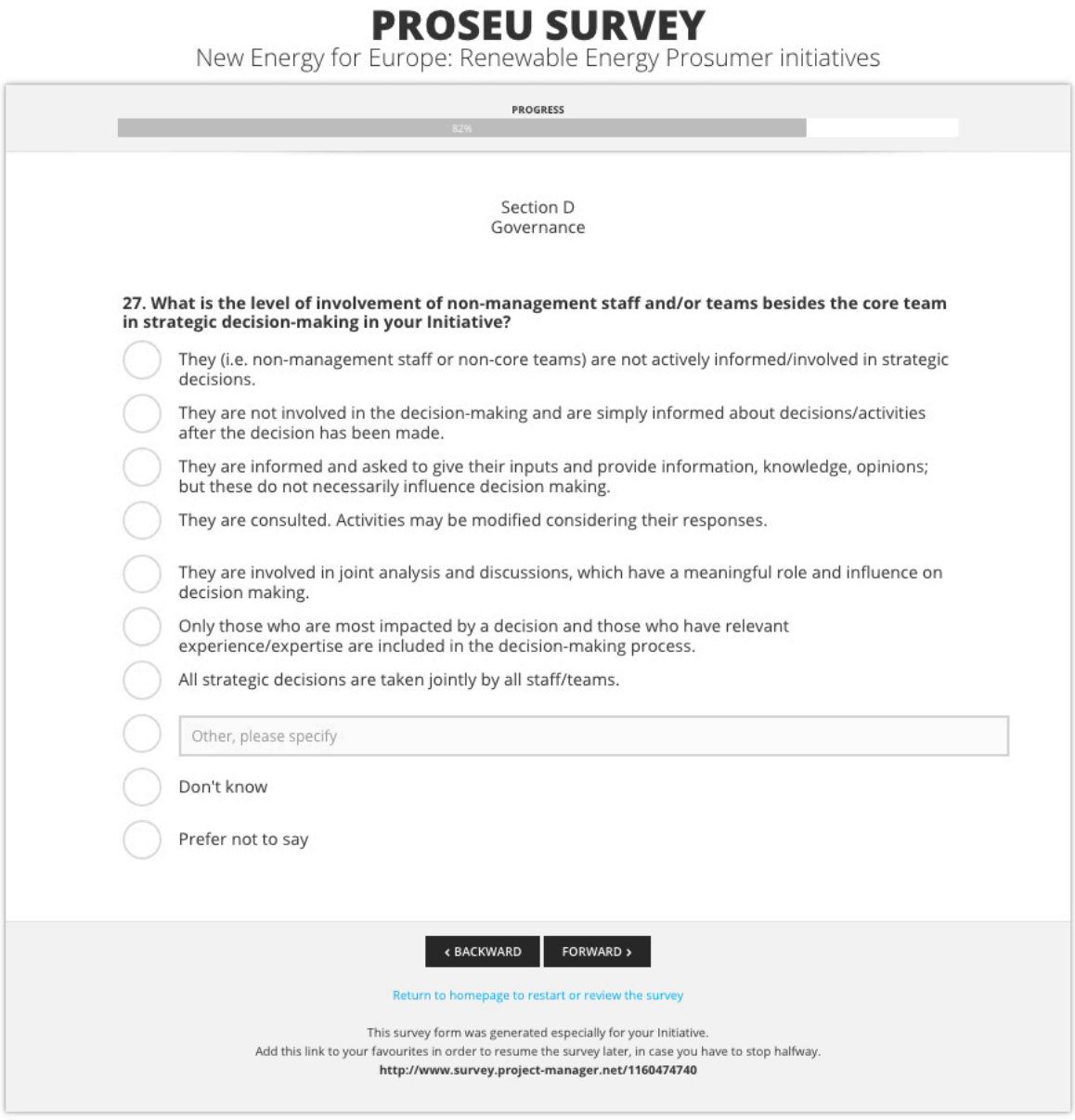
- [ ] Consensus in management/core team
- [ ] Consent in the management/core team
- [ ] Majority vote by management/core team
- [ ] Consensus by founders/founding organisations
- [ ] Consent by founders/founding organisations
- [ ] Majority vote by founders/founding organisations
- [ ] Consensus in the general assembly
- [ ] Consent in the general assembly
- [ ] Majority vote by the general assembly
- [ ] Other, please specify
- [ ] Don't know
- [ ] Prefer not to say

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

82%

Section D
Governance

27. What is the level of involvement of non-management staff and/or teams besides the core team in strategic decision-making in your Initiative?

- They (i.e. non-management staff or non-core teams) are not actively informed/involved in strategic decisions.
- They are not involved in the decision-making and are simply informed about decisions/activities after the decision has been made.
- They are informed and asked to give their inputs and provide information, knowledge, opinions; but these do not necessarily influence decision making.
- They are consulted. Activities may be modified considering their responses.
- They are involved in joint analysis and discussions, which have a meaningful role and influence on decision making.
- Only those who are most impacted by a decision and those who have relevant experience/expertise are included in the decision-making process.
- All strategic decisions are taken jointly by all staff/teams.
- Other, please specify
- Don't know
- Prefer not to say

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

85%

Section D
Governance

28. What other people or organisations does your initiative collaborate with on a regular basis? (Please indicate for each of your external relationships what the main objective or goal of the relationship is.)

	Knowledge sharing	Promoting the initiative	Get access to funding	Get access to human resources	Get access to material resources[1]
Citizens/Households	☐	☐	☐	☐	☐
Civil Society Organisations/NGOs	☐	☐	☐	☐	☐
Communities/collectives/cooperatives	☐	☐	☐	☐	☐
Other prosumer initiatives	☐	☐	☐	☐	☐
Local government and/or administration	☐	☐	☐	☐	☐
Regional government and/or administration	☐	☐	☐	☐	☐
National government and/or administration	☐	☐	☐	☐	☐
Business/companies	☐	☐	☐	☐	☐
External advisers and experts	☐	☐	☐	☐	☐
Local utility companies	☐	☐	☐	☐	☐
Regional utility companies	☐	☐	☐	☐	☐
National utility companies	☐	☐	☐	☐	☐
EU institutions	☐	☐	☐	☐	☐
National network(s), interest organisations or social movements	☐	☐	☐	☐	☐
Transnational network(s), interest organisations or social movements	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

Don't know ☐

Prefer not to say ☐

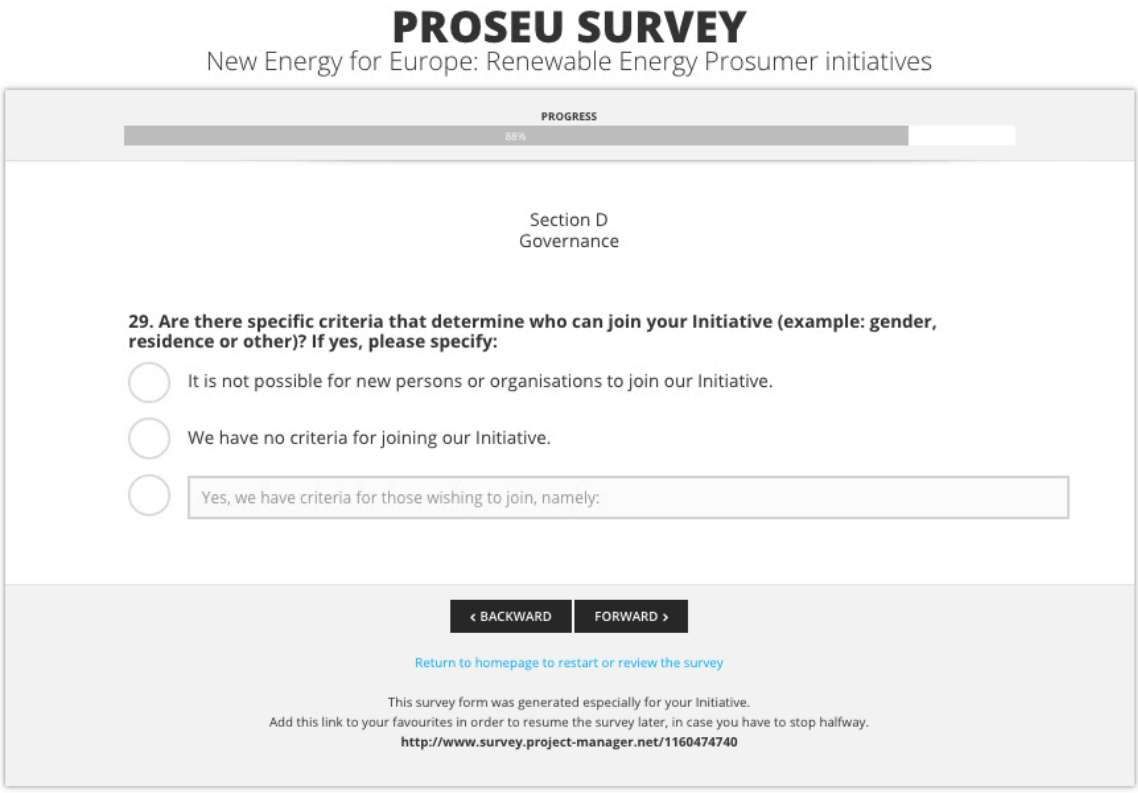
[1] products, infrastructure, technology, etc.

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey-project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

88%

Section D
Governance

29. Are there specific criteria that determine who can join your Initiative (example: gender, residence or other)? If yes, please specify:

- It is not possible for new persons or organisations to join our Initiative.
- We have no criteria for joining our Initiative.
- Yes, we have criteria for those wishing to join, namely:

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS
91%

Section E
Motivation

30. What were the reasons for starting your Initiative? Please indicate whether you strongly disagree (1) or strongly agree (5) with the reasons suggested.

	1	2	3	4	5	N/A	Prefer not to say
Respond to local demand / needs	○	○	○	○	○	○	○
Tackle the climate change problem	○	○	○	○	○	○	○
Take advantage of policy incentives	○	○	○	○	○	○	○
Take advantage of subsidy schemes	○	○	○	○	○	○	○
Take advantage of new renewable energy technologies	○	○	○	○	○	○	○
Reduce energy costs	○	○	○	○	○	○	○
Reduce the environmental impact of existing activities of your organisation/ collective/community	○	○	○	○	○	○	○
Be part of the clean and low carbon energy transition	○	○	○	○	○	○	○
Improve revenue of your organisation/collective/community	○	○	○	○	○	○	○
Achieve energy self-sufficiency	○	○	○	○	○	○	○
Contribute to innovation in energy production	○	○	○	○	○	○	○
Decentralise energy production	○	○	○	○	○	○	○
Help tackle energy poverty	○	○	○	○	○	○	○
Create a sense of community	○	○	○	○	○	○	○
sdfsdf	○	○	○	○	○	○	○
sdfsdf	○	○	○	○	○	○	○

‹ BACKWARD FORWARD ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)

PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS
94%

Section E
Motivation

31. Which factors do you feel have most slowed down and which have most facilitated the development of your initiative?

(Tick up to 3 factors that have slowed down and up to 3 factors that facilitated the development. For example: you may have either been able or not to access finance, depending on the public policies in your country these may have been an obstacle or on the contrary very helpful, or the available energy infrastructures may have been a either a positive or a negative factor.)

Factors:

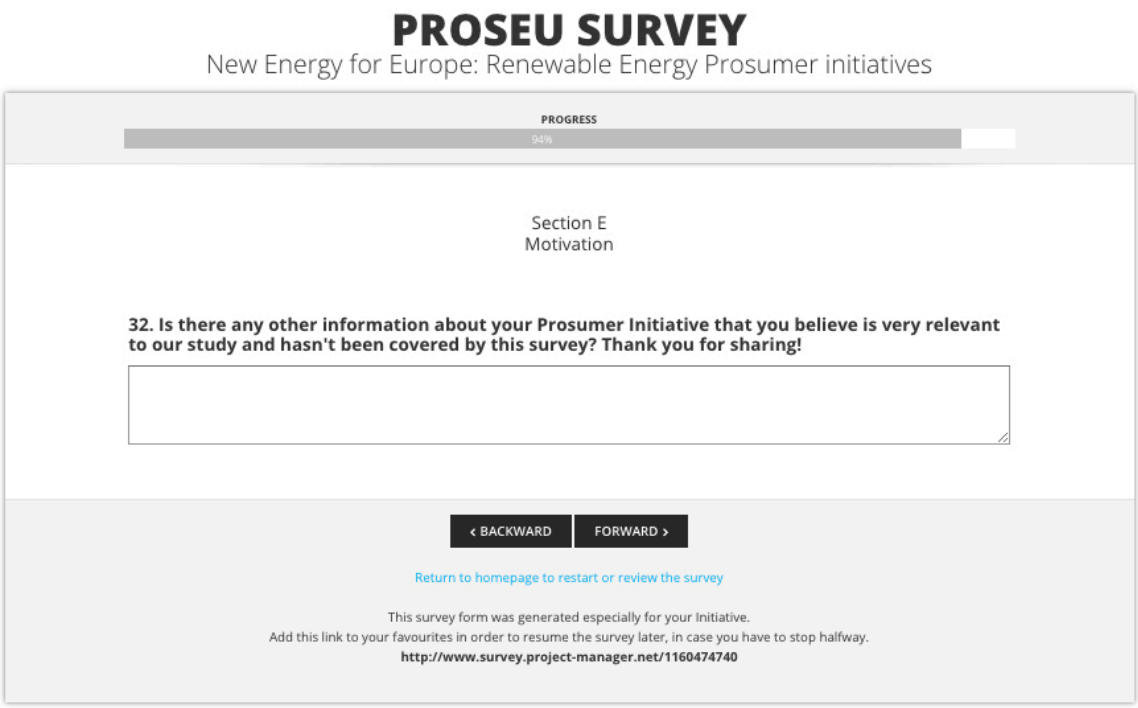
	Slowed down the development of initiative	Facilitated the development of initiative
Renewable energy storage options	☐	☐
Energy infrastructures (e.g. grid, meters)	☐	☐
Renewable energy technology options	☐	☐
Knowledge of Renewable Energy technologies	☐	☐
Knowledge of policies and legislation in Renewable Energy production	☐	☐
Access to finance, subsidies or grants	☐	☐
Public policies and Legislation for Renewable Energy Initiatives	☐	☐
Information and Communication Technologies applied to energy production	☐	☐
Ability of your Initiative to generate income	☐	☐
Collaboration and networking with others	☐	☐
Ability to use Renewable energy technologies	☐	☐
Other, please specify	☐	☐
Don't know	☐	
Prefer not to say	☐	

‹ BACKWARD FORWARD ›

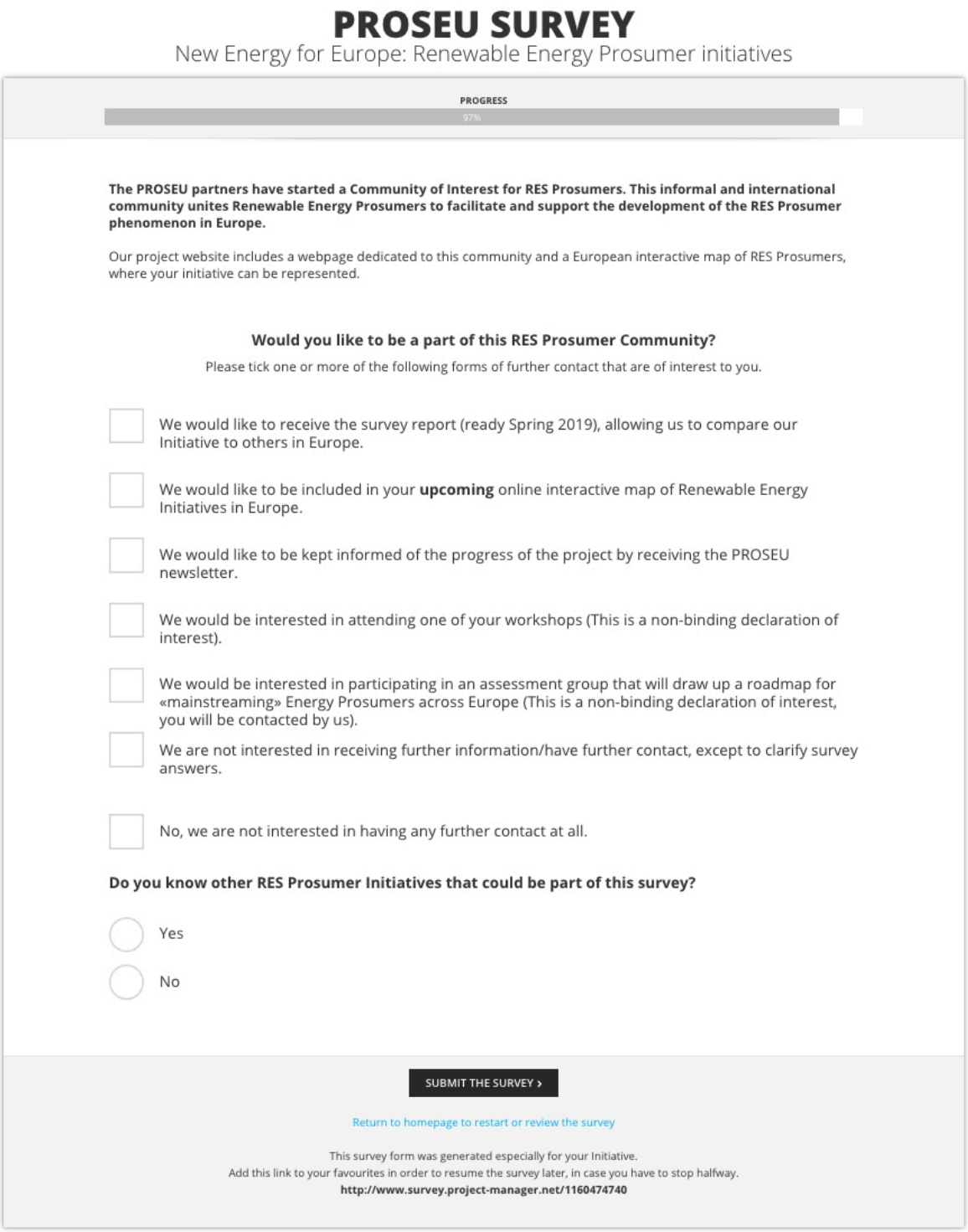
Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)


PROSEU SURVEY
New Energy for Europe: Renewable Energy Prosumer initiatives
PROGRESS
94%
Section E
Motivation
32. Is there any other information about your Prosumer Initiative that you believe is very relevant to our study and hasn't been covered by this survey? Thank you for sharing!
‹ BACKWARD
FORWARD ›
Return to homepage to restart or review the survey
This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)



PROSEU SURVEY

New Energy for Europe: Renewable Energy Prosumer initiatives

PROGRESS

97%

The PROSEU partners have started a Community of Interest for RES Prosumers. This informal and international community unites Renewable Energy Prosumers to facilitate and support the development of the RES Prosumer phenomenon in Europe.

Our project website includes a webpage dedicated to this community and a European interactive map of RES Prosumers, where your initiative can be represented.

Would you like to be a part of this RES Prosumer Community?

Please tick one or more of the following forms of further contact that are of interest to you.

- [ ] We would like to receive the survey report (ready Spring 2019), allowing us to compare our Initiative to others in Europe.
- [ ] We would like to be included in your **upcoming** online interactive map of Renewable Energy Initiatives in Europe.
- [ ] We would like to be kept informed of the progress of the project by receiving the PROSEU newsletter.
- [ ] We would be interested in attending one of your workshops (This is a non-binding declaration of interest).
- [ ] We would be interested in participating in an assessment group that will draw up a roadmap for «mainstreaming» Energy Prosumers across Europe (This is a non-binding declaration of interest, you will be contacted by us).
- [ ] We are not interested in receiving further information/have further contact, except to clarify survey answers.
- [ ] No, we are not interested in having any further contact at all.

Do you know other RES Prosumer Initiatives that could be part of this survey?

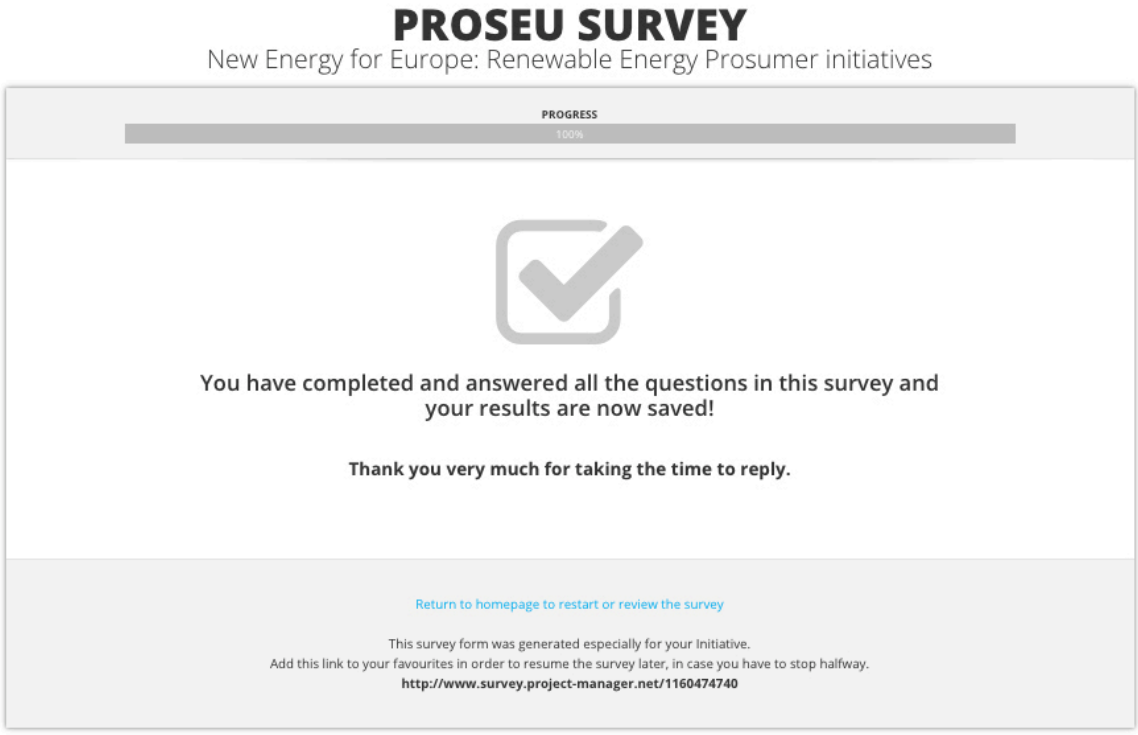
- ( ) Yes
- ( ) No

SUBMIT THE SURVEY ›

Return to homepage to restart or review the survey

This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

Annex 1 (cont.)


PROSEU SURVEY
New Energy for Europe: Renewable Energy Prosumer initiatives
PROGRESS
100%
You have completed and answered all the questions in this survey and your results are now saved!
Thank you very much for taking the time to reply.
Return to homepage to restart or review the survey
This survey form was generated especially for your Initiative.
Add this link to your favourites in order to resume the survey later, in case you have to stop halfway.
http://www.survey.project-manager.net/1160474740

ANNEX 2 SURVEY PROTOCOL

(Note: this protocol was created to assist each of the partners active in collecting data for the survey in their respective countries and thus ensure a homogeneous method of data collection).

The survey form that will collect responses from collective RES Prosumers to our 32 questions in five areas (basic information, operational information, information on organisational capacity and resources, governance and motivation) in 8 languages is available in two versions:

- A personalised link generated by you on our secure server—this link is to be used with the Initiatives you have previously collected in your RES Prosumer database. You simply enter the email address for the Initiative that you have previously called and that has agreed to participate. A link will be generated that you can paste into the e-mail template we have prepared. The e-mail address will not be stored on the server, so we will not collect personal data in any way.
- A general link that can be used to capture respondents beyond our pre-defined sample (i.e. the RES Prosumers you have collected in your database). This link is also made available to the respondents that you have personally contacted, so that they may send it on to Initiatives they believe fit the survey profile as explained in our introduction.

After the official launch of the survey, you are expected to start contacting the collective RES Prosumers in your database, making sure you will have a nicely stratified sample (to review the types of prosumer actors and organisational forms we are expecting, please refer to the survey methodology). Due to our previously selected and highly stratified samples, and the personal touch, it would be reasonable to expect at minimum the average survey response rate of 33% and ideally closer to 50% for the countries with small samples. This means each country should aim to contact about 3 to 4 times the amount of potential respondents it expects to collect.

Countries with large databases (Netherlands, Germany and UK) might not be able to personally call each of the Initiatives, and might find it hard to follow up with all of them. Countries with smaller databases, can expect to contact all of the Initiatives in their databases about three times.

The survey will run for three months, but we know the best months to ensure cooperation are October and November (until half December). So please take advantage of this time window. In agreement with the ethics clearance we have received, it is important you know that all data will remain anonymous to anyone except for the WP2 research team and any of the PROSEU teams that need to do further analysis on the characteristics of RES Prosumer Initiatives in Europe (i.e. possibly WP4). All the personal data or data that identifies the initiative will be destroyed at the

closing of the PROSEU project. An ID generated for each Initiative participating in the survey will ensure data analytics may be run without identifying the Initiatives.

An exception to this anonymity is where Initiatives have freely supplied their organisational contacts in order to receive our newsletter, be part of our interactive Prosumer map and Community of Interest and/or participate in our workshops. This database is managed by WP8, the communication team of PROSEU.

Please feel free to use your contacts in the field to facilitate reaching out to RES Prosumer Initiatives. These contacts may also help you to disseminate the general link for the survey (in the appropriate language), so that we can snowball additional Initiatives and go beyond the number of Initiatives planned for each country, and even add Initiatives from other countries. In the end, we are confident that we will have a good-sized and varied sample. To ensure cooperation and quality results, potential respondents should be contacted personally, by phone or in person, and asked to participate after a brief explanation of the project and the survey. When they accept to participate, you will generate a personalised link for their e-mail address and paste this in the e-mail template (which you may adapt) to be sent to the respondent. It is important to have an offer to make it interesting for Initiatives to participate. Besides offering them the possibility to join the Community of Interest, have their Initiative placed on the online collective RES prosumer map and to attend one or more of our workshops, we can offer to send an early executive report to participants and include a personalised comparison sheet, where their Initiative is compared with similar others in their country and the 9+ countries where we are surveying. We would also urge you to maybe think of your own offer, for your own country. For example, the Netherlands is planning to organise a network event for RES Prosumers after the final WP2 report is published (April 2019).

We (WP2 team) will monitor responses in order to adjust the sampling strategy if necessary, or to do follow-ups of respondents who said they would participate. If we see any anomaly in responses or feel response rates are low, we will get in touch with you. You may find the two documents (Excel with all the questions and a Word with the homepage text) needed for translation of the online questionnaire in the respective folder on our project website. Please beware that the Excel file is code-sensitive (i.e. each line corresponds to a place on the online survey form), you should not change, copy or delete lines! A pdf with screenshots from the online survey form has been created, so that you may visualise what the form looks and feels like, without having to fill in the actual online form. This pdf contains the English version, but it's easy to create versions for each language.

Below you will find the telephone and e-mail protocols for approaching respondents, which should also be translated. Feel free to adapt them according to your particular circumstances and/or the type of respondent you are dealing with. For any questions, don't hesitate to contact the WP2 team.

---Special note, suggested by partner DRIFT: if you are contacting large companies that have started to self-consume, and that might feel that some of our survey questions are not making sense to them (most notably the part about the staff/volunteers and decision-making), you can warn these beforehand, for instance by saying "In case RES prosumption/self-consumption is a secondary goal or project in your organisation, please answer the questions about "amount of staff/volunteers" and about decision-making within the Initiative from the perspective of your department/people working on energy prosumption-related activities within your organisation. ---

(Telephone protocol)

>>You can find the document with the telephone protocol on our project website.

Good morning/afternoon [name of your contact], my name is [researcher name], and I am calling from [organisation] in the context of the H2020 project called PROSEU, Prosumers for the Energy Union. We are looking at organisations and Initiatives that produce and self-consume energy from Renewable Energy Sources, a phenomenon that has also been called prosumerism. Our aim is to enable the wide-spread adoption of the Prosumer phenomenon in Europe. I am calling you because [give a reason why this Initiative is interesting or why they fit the profile]. Not enough is known about prosumers and the challenges they are facing, which is why we have launched a Europe-wide survey, the results of which we hope to feed into new policies for renewable energy prosumers. [confirm you are speaking to the right person to ask for permission to include them in the survey, in case you don't have a name yet]. The survey is anonymous, takes about 30 minutes to complete, and we want to give those participating an early summarised report sketching the characteristics of prosumer Initiatives across Europe, together with a personalised comparison sheet that shows how your Initiative compares to similar others in your country and in Europe. [pause for questions, if they ask what type of questions: basic information (such as where are they based), operational information related to their energy activities, information on organisational capacity and resources, governance style and motivation for starting to self-consume] For those Initiatives that are interested, as well as broader stakeholders, we are also starting a Community of Interest and mutual support, and an online map showing the diversity of projects out there. Throughout the project, we will additionally organise workshops with the aim of exchanging

knowledge among energy prosumers and other renewable energy stakeholders. If you agree to participate, I will send instructions and a personalised link to our online survey form to an e-mail address of your choosing. Thank you so much for agreeing to join in the survey. I will send you the e-mail today. Let me know if you have any further questions. Goodbye.

(Template of the e-mail to be sent after the phone call)

>> You can find the word document of both e-mail templates on our project website.

Subject: PROSEU survey. New Energy for Europe: RES Prosumer Initiatives

Body text: Dear representative/member of [name of the Initiative] OR Dear Ms/Mr …. [if applicable enter a sentence indicating why we think they are interesting: e.g. Your Initiative caught our attention, since it focuses on …]

I am writing to invite you to participate in an online questionnaire about the way your Initiative [*OR* organisation/association/institution/…] produces and self-consumes energy from Renewable Energy Sources (RES). [Organisation name] conducts this survey as part of the European-funded research project PROSEU [insert link: http://proseu.eu/].

Your participation is crucial to learn more about RES prosumer Initiatives (i.e. collectives such as yours that produce and self-consume from RES), and to be able to support your and other Initiatives interested in contributing to a transition to clean, low carbon energy in Europe.

The questionnaire should take you approximately 30 minutes to respond to (you can stop and re-start at any time). You may click the 'link' below to access the questionnaire or you can copy and paste the link directly into your Internet browser. This is a personal link generated only for your Initiative: [paste here the link that has been generated for the email]

Data provided will be stored by PROSEU and accessed only by its researchers for the exclusive purpose of characterising RES prosumer Initiatives and analysing their legal, financial, technological and cultural drivers and barriers. The original survey data will not be shared with any external parties, will be stored on a secure online server in Europe and all personal data and that which identifies your initiative will be erased after the project ends in February 2021.

At the end of the survey you will be asked if you wish to join the RES Prosumer Community of Interest we are building, or if you would like to see your Initiative placed on our online prosumer Initiative map, and if you are interested in attending any of our workshops or other events.

All survey participants will receive an early executive report on the European survey results with a personalised comparison sheet that shows how your Initiative compares to similar others in your country and in Europe. If you think that other collectives of producers/self-consumers (i.e. prosumers) could or should be a part of this survey, please feel free to share with them the general link [insert general link] (The links can be saved as a favourite to be able to stop and re-start the questionnaire at any point).

Please do not hesitate to contact me for additional information.

Thank you very much for your time and cooperation. Your response is essential for conducting our research.

Sincerely,

[Full name/affiliation/address/contact phone or email] PROSEU project researcher

www.proseu.eu

For your convenience, I repeat your personalised survey link here: [paste here the link that has been generated for the email address]

(Alternative Email for those sending the 'general link')

Subject: PROSEU survey. New Energy for Europe: RES Prosumer Initiatives

Body text: Dear representative/member of …. [name of the Initiative] // Dear Ms/Mr …. I am writing to invite you to participate in an online questionnaire about the way your Initiative produces and self-consumes energy from Renewable Energy Sources (RES). We call collectives such as yours RES Prosumer Initiatives.

Your participation in this survey is crucial so that we can learn more about RES prosumers and be able to support your Initiative, along with others, that are interested in mainstreaming renewable self-consumption and energy communities in Europe. By participating, you will be contributing to a transition to clean, low carbon energy.

The questionnaire is estimated to take approximately 30 minutes to respond to (you can stop and re-start at any time).

Click the 'link' below to access the questionnaire or copy and paste the link into your Internet browser. Make sure you save the link to your favourites to be able to stop and re-start or review your replies at any time.

This survey is being conducted by the European Project 'PROSEU'[insert link: http://proseu.eu/]. At the end of the survey you will be asked if you wish to join the RES Prosumer Community of Interest we are building, or if you would like to see your Initiative placed on our online prosumer Initiative map, and if you are interested in attending any of our workshops or other events.

All survey participants will receive an early executive report on the European survey results with a personalised comparison sheet that shows how your Initiative compares to similar others in your country and in Europe. No personal data will be collected.

Data provided will be stored by PROSEU and accessed only by the researchers for the exclusive purposes of analysis and report writing. This data will not be shared with any external parties and will be stored on a secure online server.

Please do not hesitate to contact me for additional information.

Thank you very much for your time and cooperation. Your response is essential for conducting our research.

Sincerely, [Full name/affiliation/address/contact phone or email] PROSEU project researcher www.proseu.eu

For your convenience, I am repeating the survey link here [paste the general link]

ANNEX 3 RES COUNTRY FACT SHEETS

EU Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

THE EUROPEAN UNION (EU)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	i) Warm Temperate (Mediterranean; Precipitation all year round), Arid, Boreal (precipitation all year round, Continental), Polar.
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	 i) 512,711,000 (2018) ii) Densely Populated Area (Urban): 40% vs. Intermediate Density Area: 31% vs. Thinly Populated Area (Rural): 29% iii) Homeowner: 69.2% vs. Renter/Tenant: 30.8%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 7,128.0 KgCO2/capita (2016) ii) 3,215.1 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 77.64 (Ahead of schedule) iv) EU parliament´s proposed target = -40% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) Yes. Renewables self-consumer in the recast RES Directive and active customer in the recast Electricity Directive (both newly agreed and/or adopted; transposition deadline for the RES Directive: 30.06.2021; transposition deadline for the Electricity Directive: to be included in the final published text – expected to be 31.12.2020) ii) Yes. In the recast of the RES Directive and the recast of the Electricity Directive. To be implemented by each EU Member State. iii) Yes (as in ii) iv) Varies by EU member State. v) Varies by EU member State. vi) Varies by EU member State. vii) Required now by EU law. To be implemented by each EU Member State.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Varies by EU member country. ii) Varies by EU member country. iii) Varies by EU member country. Includes public consultations and public participation as per the Governance Regulation and government requirements (e.g., access to information, the Aarhus Convention).
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) Information not available (Data for EU-28 are not yet available) ii) Information not available (Data for EU-28 are not yet available) iii) Information not available (Data for EU-28 are not yet available)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Energy Producers, Transporters, Distributors, Retailers, Prosumers, SME RES producers, Media, Associations, Government, Legal & Legislative, Universities, Research Centres, Public Agencies, Banks & Insurance, Market Operator, ICT companies, NGOs, The Market, so on.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	i) Varies by EU member country. The EU is pushing for a decentralised free-market liberalized capitalist structure. ii) Top down centralized energy system in most member states. iii) Varies by EU member country. Many ties exist.

EU (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2049 €/kWh (first Half of 2018) ii) 0.06 €/kWh (first Half of 2018) iii) 36.7% (first half of 2018) iv) Varies by EU Country. Market prices fluctuate based on commodity, e.g. Uranium, Crude Oil, Gas, etc.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) Varies greatly by EU Country. ii) 20.5% iii) Information not available.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 23.5% (2016) ii) Information not available (2014) iii) 15.0% (2016) iv) 93.6% (2012) v) 10.1% (2007)
12) Business Models: i) RES Prosumer business models	i) Various. Varies by EU member country. For example, Self-consumption, collective consumption, and so on.
13) Financing Schemes: i) Forms of support	i) Various. Varies by EU member country. For example, Feed-in tariffs, Tax Benefits, Financing, Subsidies, Refunds.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 990,918 MW (100%): Renewables = 412,465 MW (41.6%) - Wind = 154,325 MW (15.6%), Hydro = 153,969 MW (15.5%), Solar PV= 100,812 (10.2%), Solar Thermal = 2,302 MW (0.23%), Tide, Wave and Ocean = 233 MW (0.02%); Geothermal = 824 MW (0.08%); Other Sources = 819 MW (0.08%); Nuclear = 122,051 MW (12.3%); Combustibles = 455,583 MW (45.97%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 3,255.1 TWh: Renewables = 981.5 TWh (30.2%) – Wind = 302.9 TWh (9.3%), Hydro = 380.2TWh (11.7%), Solar = 110.8 TWh (3.4%), Biomass and Renewable Wastes = 180.5 TWh (5.5%), Geothermal = 6.6 TWh (0.2%), Tide, Wave and Ocean = 0.5 (0.02%); Wastes (non-RES) = 25.9 TWh (0.8%); Other = 5.0 TWh (0.15%); Nuclear = 839.7 TWh (25.8%); Combustibles = 1,403.1 TWh (43.1%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 5,456.4 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., excess plants.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 770.4 Mtoe (100%): Renewables = 210.7 Mtoe (%), Nuclear = 216.7 Mtoe (%), Combustibles = 343 Mtoe (%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 1,205,592 Ktoe ii) Renewables 13.2%, Nuclear 13.2%, Waste (Non-Res) 0.9%, Combustibles = 72.6% - Solid Fuels = 14.7%, Petroleum and Products = 34.6%, Gases = 23.3%. iii) Overall RES (with Aviation Cap) = 17.0%, RES in Transport = 7.1%, RES in Heating and Cooling = 19.1%, RES in Electricity Generation = 29.6%. iv) Transport = 33.2%, Industry = 25.0%, Services = 13.5%, Households = 25.7%, Agri.& Fishing = 2.3%, Other = 0.3%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 54% (of all the energy it consumes) ii) Crude Oil – 90%, NG - 69%, Solid fuels -42%, Nuclear fuels – 42%. iii) 11 Member States below the 2020 target of 10%-2017.

UK Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

United Kingdom (UK)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Precipitation all year round).
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 66,238,000 (2018) (EU28 Rank = 3rd; 12.91% of EU 28 total population) ii) Densely Populated Area (Urban): 57% vs. Intermediate Density Area: 29% vs. Thinly Populated Area (Rural): 13% iii) Homeowner: 63.4% vs. Renter/Tenant: 36.6%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 6,560.2 KgCO2/capita (2016) ii) 2,897.4 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 63.64 (Ahead of schedule) iv) EU parliament´s proposed national target = -37% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) No. No specific legislation defining RES Self-Consumers or Prosumers. ii) No. No specific legal framework on collective prosumer initiatives, but the lack of one does not appear to be hindering the creation of initiatives. iii) Yes. iv) Yes. v) If < = 10 MW installation - anyone has a right to operate generation without a license. Beyond this, need license to generate, distribute or supply electricity. Can also be 50 MW if certain other conditions apply. vi) Yes. Legally permitted to connect to the grid. vii) Yes. A remuneration system (i.e., FiT scheme) by which micro and small installations producing electricity from RES are payed according to fixed tariffs. This FiT scheme ended in March, 2019. There is currently no policy support in the form of subsidies or cheap access to capital.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Lacking – Satisfactory. Varies based on type of energy source used. ii) Mixed. Distrust in new technologies such as shale gas fracking. Public confidence relatively high in nuclear, renewables and oil & gas. iii) High. Numerous community energy projects have emerged, e.g., there exists many energy coops and community power schemes.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) 12,000 full time jobs (2015) ii) 24,000 full time jobs (2015) iii) 242,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Governments, Legal & Legislative Powers, Energy Lobby (Coal, Oil, Gas, Nuclear, Wind), Analysts, Community Energy Projects, Traders, Market Operator, Large Energy Users, The Media, Associations, Banks, Insurance, Universities, Research Centres, Agencies, Opinion Leaders.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Information not available ii) Information not available iii) Information not available
9) Prices: i) Household electricity prices (€/kWh)	 i) 0.1839 €/kWh

UK (cont.)

ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	ii) 0.05 €/kWh iii) 23.1% (first half of 2018) iv) Information not available
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) Medium. 12th highest household electricity prices in the EU. ii) 4.9% iii) Information not available
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 22.2% (2016) ii) 10.4% (2014) iii) 14.2% (2016) iv) 99.5% (2012) v) 1.6% (2007)
12) Business Models: i) RES Prosumer business models	 i) Individual and Collective self-consumption is permitted.
13) Financing Schemes: i) Forms of support	 i) Up until now have included: Tax Benefits (e.g. VAT reduction), Financing, Subsidies, Refunds, Fixed charges, Revenue Sharing, P2P trading, and Performance Contracts.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 97,640 MW (100%): Renewables = 32,708 MW (33.5%) – Wind = 16,217 MW (16.6%), Hydro = 4,579 MW (4.7%), Solar PV = 11,899 MW (12.2%), Tide, Wave and Ocean = 13 (0.01%); Nuclear = 9,497 MW (9.7%); Combustibles = 55,435 MW (56.8%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 339.4 TWh (100%): Renewables = 86.2 TWh (25.4%) – Wind = 37.4 TWh (11.0%), Hydro = 8.4 TWh (2.5%), Solar = 10.4 TWh (3.1%), Biomass and Renewable Wastes = 30.0 TWh (8.8%); Wastes (non-RES) = 4.8 TWh (1.4%); Nuclear = 71.7 TWh (21.1%); Combustibles = 176.6 TWh (52.0%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 4,648.1 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Under-capacity. Oil & gas reserves are ending. Import nearly 50% of E. Need more plants, connectivity and new sources, such as shale gas.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 119.8 Mtoe (100%): Renewables = 12.4 Mtoe (10.4%), Wastes (non-RES) = 1.3 Mtoe (1.1%), Nuclear = 18.5 Mtoe (15.4%), Combustibles = 87.5 Mtoe (73.0%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 141,470 Ktoe; (EU rank = 3rd; 11.7% of EU total = 1,205,592 Ktoe) ii) Renewables 8.1%, Nuclear 9.8%, Waste (Non-Res) 0.7%, Combustibles = 80.6% - Solid Fuels = 6.2%, Petroleum and Products = 37.7%, Gases = 36.7%. iii) Overall RES (with Aviation Cap) = 9.3%, RES in Heating and Cooling = 7.0%, RES in Electricity Generation = 24.6%, RES in Transport = 4.9%. iv) Transport = 39.3%, Industry = 18.1%, Households = 28.5%, Services = 12.4%, Agriculture and Fishing = 0.9%, Other = 0.8%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 35.3% = Net Importer ii) Petrol = 33.9%, Crude + NGL = 16.2%, NG = 46.5%, Solid Fuels=50.8% iii) 5.9%. Energy Island - lack of interconnection with other countries.

The Netherlands Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

THE NETHERLANDS (NL)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Precipitation all year round).
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 17,181,100 (2018) (EU28 Rank = 8th; 3.35% of EU 28 total population) ii) Densely Populated Area (Urban): 44% vs. Intermediate Density Area: 41% vs. Thinly Populated Area (Rural): 15% iii) Homeowner: 69.4% vs. Renter/Tenant: 30.6%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	 i) 10,448.7 $KgCO_2$/capita (2016) ii) 4,625.0 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 91.63 (Behind schedule) iv) EU parliament´s proposed national target = -36% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	 i) No legal definition. However, self-consumption is permitted. ii) Yes. Specific 'postcode area' system and special rules (exceptions) to the Electricity Act for selected projects. iii) Yes. iv) Yes. v) Yes. Restrictions are related to particular schemes and advantages. Maximum self-consumption limit of 5,000 kWh/year for prosumers in the net-metering system. vi) Yes. Allowed to feed self-produced electricity into the grid. vii) Yes. Mainly through net metering scheme. Case may be that they only pay for and are taxed on the energy they consume.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	 i) Information not available. ii) Information not available. iii) Information not available.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) 28,000 full time jobs (2015) ii) 19,000 full time jobs (2015) iii) 132,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	 i) Energy Producers, Transporters, Distributors, Traders & Consumers, The Market, SME RES producers, New Energy Retailers, System Operators, Governments, Hydrogen and Gas Companies, Prosumers.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Information not available. ii) Information not available. iii) Information not available.

The Netherlands (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.1706 €/kWh ii) 0.08 €/kWh iii) 30.4% (first half of 2018) iv) Information not available
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) Medium. 18th highest household electricity prices in the EU. ii) 1.5% iii) Income Quintile 1: 5.8%, Income Quintile 2: 5.0%, Income Quintile 3: 4.7%, Income Quintile 4: 4.4%, Income Quintile 5: 3.8%.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 16.7% (2016) ii) 6.6% (2014) iii) 14.6% (2016) iv) 99.8% (2012) v) 6.4% (2007)
12) Business Models: i) RES Prosumer business models	i) Net-metering - price of retail E = price received from utility for E fed to the grid. Seven-year economic payback time is guaranteed.
13) Financing Schemes: i) Forms of support	i) Feed-in Tariffs (e.g. SDE+), Net-metering, Tax Benefits on energy consumed, VAT Tax refund, Subsidies, and Postcode roos projecten.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 34,176 MW (100%): Renewables = 6,343 MW (18.4%) – Wind = 4,257 MW (12.5%), Hydro = 37 MW (0.1%), Solar PV = 2,049 MW (6%); Other Sources = 37 (0.1%); Nuclear = 485 MW (1.4%); Combustibles = 27,311MW (79.9%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 115.2 TWh (100%): Renewables = 14.7 TWh (12.7%) – Wind = 8.2 TWh (7.1%), Hydro = 0.1 TWh (0.08%), Solar = 1.6 TWh (1.4%), Biomass and Renewable Wastes = 4.9 TWh (4.3%)); Wastes (non-RES) = 1.7 (1.5%); Other = 0.2 (0.17%); Nuclear = 4.0 TWh (3.5%); Combustibles = 94.6 TWh (82.1%)
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 6,221.1 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) At capacity, i.e. overcapacity has been reduced due to coal fired plant closures and the pausing of plans to use gas fired plants.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 50.9 Mtoe (100%): Renewables = 4.7 Mtoe (9.2%), Wastes (non-RES) = 0.7 Mtoe (1.4%), Nuclear = 1.0 Mtoe (2.0%), Combustibles = 44.5 Mtoe (87.4%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 63,200 Ktoe; (EU rank = 8th; 5.2% of EU total = 1,205,592 Ktoe) ii) Renewables 4.7%, Nuclear 1.3%, Waste (Non-Res) 1.1%, Combustibles = 92.4% - Solid Fuels = 13.0%, Petroleum and Products = 41.0%, Gases = 38.4%. iii) Overall RES (with Aviation Cap) = 6.0%, RES in Heating and Cooling = 5.5%, RES in Electricity Generation = 12.5%, RES in Transport = 4.6%. iv) Transport = 28.9%, Industry = 29.6%, Households = 19.9%, Services = 13.7%, Agriculture and Fishing = 7.8%, Other = 0.1%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 45.8% = Net Importer ii) Petrol = 95.6%, Crude + NGL = 98.9%, NG = -32.7%, Solid Fuels = 91% iii) 18.1%. Above EU 2020 target of 10% interconnection.

Germany Country Fact sheet

Renewable Energy Country Fact Sheet

GERMANY (DE)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Precipitation all year round); Boreal
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 82,850,000 (2018) (EU28 Rank = 1st; 16.15% of EU 28 total population) ii) Densely Populated Area (Urban): 34% vs. Intermediate density area: 42% vs. Thinly Populated Area (Rural): 24% iii) Homeowner: 51.4% vs. Renter/Tenant: 48.6%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 10,075.0 KgCO_2/capita (2016) ii) 3,860.9 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 74.05 (Ahead of schedule) iv) EU parliament´s proposed national target = -38% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) No. None in legislation, but there are definitions of self-supply and self-producer. Collective entities tend to not fall under self-supply definition. ii) No. No general legal framework for collective initiatives exists. However, there are specific regulations for so-called "tenants' electricity". iii) Yes. iv) Yes. v) No limit for the amount of electricity produced or size of the system. However, grid operators can regulate the amount of electricity put into the grid to guarantee stability. Also, financial incentives limit it in practice. vi) Yes. Allowed to feed electricity into the grid. vii) Yes. Grid Operators must take all energy from & must remunerate prosumers via a market premium, a FiT, a tenant electricity supplement, or direct selling. Amount depends on plant size, type & GO`s grid position
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Medium - High. A large percentage of the public lack education on how the market functions, e.g. how return-on-investment works. ii) Mixed. General perception is positive - a high level of support for RE. Some controversy over costs & local disputes (e.g. wind installations). iii) High. Citizens greatly influence the government's actions – e.g. citizen opposition to nuclear energy has led to a government phase out.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) 71,000 full time jobs (2015) ii) 72,000 full time jobs (2015) iii) 475,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Governments, Traders, Market Operators & Regulators, Energy Producers, Media, Academia, Research Centres, Industry, Civil Society, Insurance, Banks, Consumers, NGOs, RES actors, & Service Companies.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Information not available. ii) Information not available. iii) Information not available.

Germany (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2950 €/kWh ii) 0.06 €/kWh iii) 53.3% (first half of 2018) iv) Information not available.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) High. 2nd highest household electricity prices in the EU. ii) 2.5% iii) Income Quintile 1: 8.2%, Income Quintile 2: 7.0%, Income Quintile 3: 6.7%, Income Quintile 4: 6.1%, Income Quintile 5: 4.9%.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 19.7% (2016) ii) 6.9% (2014) iii) Information not available (2016) iv) 99.7% (2012) v) 1.5% (2007)
12) Business Models: i) RES Prosumer business models	 i) Individual self-consumption is permitted. Mieterstrom model – PV electricity of plant operator connected to consumer via a direct wire.
13) Financing Schemes: i) Forms of support	 i) Feed-in Remuneration (i.e., Feed-in Tariffs), Premiums, Tax Benefits, Subsidised loans, Reduction/Exemption from fees and surcharges.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 208,500 MW (100%): Renewables = 101,608 MW (48.7%) – Wind = 49,592 MW (23.8%), Hydro = 11,300 MW (5.4%), Solar PV = 40,714 MW (19.5%) (Thermal = 2 MW (0.0%)), Geothermal = 29 (0.01%); Other Sources = 348 (0.2%); Nuclear = 10,799 MW (5.2%); Combustibles = 95,716 MW (45.9%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 649.1 TWh (100%): Renewables = 193.9 TWh (29.9%) – Wind = 78.6 TWh (12.1%), Hydro = 26.1 TWh (4.0%), Solar = 38.1 TWh(5.9%), Biomass & Renewable Wastes = 50.9 TWh (7.8%), Geothermal = 0.2 TWh (0.03%); Wastes (non-RES) = 7.3 TWh (1.1%); Other = 1.9 TWh (0.3%); Nuclear = 84.6 TWh (13.0%); Combustibles = 361.2 TWh (55.6%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 6,296.0 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., excess plants – are phasing out nuclear.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 119.5 Mtoe (100%): Renewables = 39.5 Mtoe (33.1%), Wastes (non-RES) = 4.5 Mtoe (3.8%), Nuclear = 21.8 Mtoe (18.2%), Combustibles = 53.7 Mtoe (44.9%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 237,880 Ktoe; (EU rank = 1st; 19.7% of EU total = 1,205,592 Ktoe) ii) Renewables 12.3%, Nuclear 6.9%, Waste (Non-Res) 1.4%, Combustibles = 80.8% - Solid Fuels = 24.3%, Petroleum and Products = 34.3%, Gases = 22.2%. iii) Overall RES (with Aviation Cap) = 14.8%, RES in Heating and Cooling = 13.0%, RES in Electricity Generation = 32.2%, RES in Transport = 6.9%. iv) Transport = 30.1%, Industry = 28.2%, Households = 25.9%, Services = 15.7%, Agriculture and Fishing = 0.0%, Other = 0.0%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 63.5% = Net Importer ii) Petrol = 96.4%, Crude + NGL = 96.7%, NG = 88.6%, Solid Fuels = 49.6% iii) 8.9%. Insufficiently connected with the EU Energy market.

Belgium Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

BELGIUM (BE) (Regions of Flanders and Wallonia)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Precipitation all year round).
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 11,413,100 (2018) (EU28 Rank = 9th; 2.2% of EU 28 total population) ii) Densely Populated Area (Urban): 27% vs. Intermediate Density Area: 57% vs. Thinly Populated Area (Rural): 17% iii) Homeowner: 72.7% vs. Renter/Tenant: 27.3%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	 i) 9,249.0 $KgCO_2$/capita (2016) ii) 5,079.2 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 81.53 (Behind - on schedule) iv) EU parliament´s proposed national target = -35% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	 i) No (Flemish Region). Not in legislation. No legal definition but the term is used. Self-generation and self-consumption are allowed. No (Wallonia Region). In legislation is the term `Self-producer`. Is the physical or legal person producing electricity mainly for their own use. ii) No. Are not defined or regulated under any specific legislation. iii) Yes. It is possible to do it / it is allowed. iv) Yes. v) Limits are not imposed by regulations. Limits are determined by the system`s technical specifications/limitations. E.g. A < = 10 kW cap (2017). vi) Yes. Allowed to feed electricity into the grid. vii) Yes. Mainly net-metering system (Flanders).
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	 i) Medium – High. ii) Information not available. iii) Medium – High. Citizens have succeeded in pressuring the government to agree to phase out nuclear energy sector.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) 4,000 full time jobs (2015) ii) 6,000 full time jobs (2015) iii) 82,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	 i) Energy Producers, Gas companies, Transporters, Distributors, Traders & Consumers, The Market, SME RES producers, New Energy Retailers, Prosumers, System Operators, Governments, Protest Movements.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Information not available. ii) Information not available. iii) Information not available.

Belgium (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2733 €/kWh ii) 0.05 €/kWh iii) 30.6% (first half of 2018) iv) Information not available.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) High. 3rd highest household electricity prices in the EU. ii) 4.5% iii) Income Quintile 1: 7.4%, Income Quintile 2: 6.3%, Income Quintile 3: 5.6%, Income Quintile 4: 4.7%, Income Quintile 5: 4.1%
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 20.7% (2016) ii) 10.6% (2014) iii) 18.9% (2016) iv) 98.8% (2012) v) 2.9% (2007)
12) Business Models: i) RES Prosumer business models	 i) Collective self-consumption is not allowed. No regulatory framework makes collective and virtual self-consumption impossible.
13) Financing Schemes: i) Forms of support	i) Net-metering (for households): Flanders (10kWp), Wallonia (<5kWp). Self-consumption (Industry), Premiums & Tax Benefits on E consumed.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 21,554 MW (100%): Renewables = 7,095 MW (32.9%) – Wind = 2,370 MW (11%), Hydro = 1,425 MW (6.6%), Solar PV = 3,300 MW (15.3%); Other Sources = 4 MW (0.018%); Nuclear = 5,913 MW (27.4%); Combustibles = 8,542 MW (39.6%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 85.5 TWh: Renewables = 15.3 TWh (17.89%) – Wind = 5.4 TWh (6.3%), Hydro = 1.5 TWh (1.8%), Solar = 3.1 TWh (3.6%), Biomass and Renewable Wastes = 5.3 TWh (6.2%); Wastes (non-RES) = 1.3 TWh (1.5%), Other = 0.5 TWh (0.6%), Nuclear = 43.5 TWh (50.9%); Combustibles = 25 TWh (29.2%)
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 7,236.1 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., excess plants – are phasing out nuclear.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 16.2 Mtoe (100%): Renewables = 3.1 Mtoe (19.1%), Nuclear = 11.2 Mtoe (69.1%), Wastes (non-RES) = 0.7 (4.3%), Combustibles = 1.3 Mtoe (8.0%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 44,791 Ktoe; (EU rank = 10th; 3.7% of EU total = 1,205,592 Ktoe) ii) Renewables 6.8%, Nuclear 19.5%, Waste (Non-Res) 1.2%, Combustibles = 71.5% - Solid Fuels = 5.1%, Petroleum Products = 41.5%, Gases = 24.9%. iii) Overall RES (with Aviation Cap) = 8.7%, RES in Heating and Cooling = 8.1%, RES in Electricity Generation = 15.8%, RES in Transport = 5.9%. iv) Transport = 28.9%, Industry = 33.6%, Households = 22.4%, Services = 12.8%, Agriculture and Fishing = 2.1%, Other = 0.1%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 76.0% = Net Importer ii) Petrol = 98.8%, Crude + NGL = 99.7%, NG = 100.6%, Solid Fuels=94.9% iii) 18.9%. Above EU 2020 target of 10% interconnection.

France Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

FRANCE (FR)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	i) Warm Temperate (Mediterranean; Precipitation all year round); Boreal (Precipitation all year round); Polar.
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 67,221,900 (2018) (EU28 Rank = 2nd; 13.1% of EU 28 total population) ii) Densely Populated Area (Urban): 38% vs. Intermediate Density Area: 25% vs. Thinly Populated Area (Rural): 38% iii) Homeowner: 35.6% vs. Renter/Tenant: 64.4%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 5,357.2 KgCO2/capita (2016) ii) 3,727.6 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 85.64 (Behind schedule) iv) EU parliament´s proposed national target = -37% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) No, term prosumer not used, however there is a definition of an individual self-consumption operation. ii) Yes. Collective self-consumption operation (although not corresponding fully to a definition of energy community in terms of membership and activities). iii) Yes. iv) Yes. v) None. There are no legal restrictions on the size of the load. vi) Yes. Allowed to feed electricity into the grid. vii) Yes. Exist Feed-in Tariffs, Dynamic electricity price contracts (with some suppliers), and flexible contracts (e.g. time-of-use contracts and day – night tariffs). Projects < 3 kW can donate Energy for free to the grid.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Lacking. Independent public bodies and NGOs are fighting for there to be a greater degree of transparency from the nuclear energy sector. ii) Poor. Distrust exists over lack of government transparency on nuclear energy. Most people have an ambiguous position of the energy sector. iii) Low-Medium. Most feel there is no room for debates or direction setting. Citizen initiatives exist, but many are misinformed/lack direction. Government support via public funds (e.g. EnerciT; a premium in €/MWh).
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	i) 54,000 full time jobs (2015) ii) 23,000 full time jobs (2015) iii) 311,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Government, Political Actors, Civil Society Organisations, New Government Working Groups, Energy companies (RES, Gas, Hydrogen), ICT & energy services, SME´s, Start-Ups, NGOs, & protest movements.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	i) Monopoly. Big players dominate. New actors due to EU liberalisation. ii) Centralised - Vertically integrated. Big energy destabilises small actors. iii) State owns shares in big energy companies (e.g. in EDF & GDF-36%)

France (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.1754 €/kWh ii) 0.07 €/kWh iii) 35.3% (first half of 2018) iv) Wholesale market: providers buy E from producers at hourly price; Usual energy market: between providers and users with prices fixed.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) Medium. 13th highest household electricity prices in the EU. ii) 5.2% iii) Information not available.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 18.2% (2016) ii) 11.0% (2014) iii) 12.7% (2016) iv) 99.5% (2012) v) 5.3% (2007)
12) Business Models: i) RES Prosumer business models	 i) Individual and collective self-consumption are allowed, e.g., coop, association, company. PV storage systems allowed - certain conditions.
13) Financing Schemes: i) Forms of support	 i) Feed-in Tariffs, Feed-in Premiums (premium payments), Tax credits & reduction (e.g. VAT), Capital Subsidies, & Loan and Investment support.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 130,794MW (100%): Renewables = 44,526 MW (34.0%) – Wind = 11,467 MW (8.8%), Hydro = 25,517 MW (19.5%), Solar PV = 7,320 MW (5.6%), Tide, Wave and Ocean = 220 MW (0.17%); Geothermal = 2 MW (0.0015%); Nuclear = 63,130 MW (48.3%); Combustibles = 23,138 MW (17.7%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 556.2 TWh (100%): Renewables = 102.1 TWh (18.4%) – Wind = 21.4 TWh (3.8%), Hydro = 64.9 TWh (11.7%), Solar = 8.2 TWh (1.5%), Biomass and Renewable Wastes = 7.1 TWh (1.3%), Tide/Wave/Ocean = 0.5 TWh (0.09%); Wastes (non-RES) = 2.4 (0.4%); Other = 0.6 (0.1%); Nuclear = 403.2 TWh (72.5%); Combustibles = 47.9 TWh (8.6%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 6,629.2 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., overproduce with nuclear and sell abroad.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 131.4 Mtoe (100%): Renewables = 23.9 Mtoe (18.2%), Nuclear = 104.0 Mtoe (79.1%), Wastes (non-RES) = 1.7 Mtoe (1.3%), Combustibles = 1.8 Mtoe (1.4%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 160,509 Ktoe; (EU rank = 2nd; 13.3% of EU total = 1,205,592 Ktoe) ii) Renewables 9.9%, Nuclear 41.8%, Waste (Non-Res) 0.7%, Combustibles = 49% - Solid Fuels = 3.4%, Petroleum and Products = 30.2%, Gases = 15.4%. iii) Overall RES (with Aviation Cap) = 16.0%, RES in Heating and Cooling = 21.1%, RES in Electricity Generation = 19.2%, RES in Transport = 8.9%. iv) Transport = 33.7%, Industry = 20.0%, Households = 27.1%, Services = 15.8%, Agriculture and Fishing = 3.1%, Other = 0.4%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 47.1% = Net Importer. ii) Petrol = 97.5%, Crude + NGL = 97%, NG = 98.9%, Solid Fuels = 93.5% iii) 9.4%. Insufficiently connected with the EU Energy market.

Italy Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

ITALY (IT)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	i) Warm Temperate (Mediterranean; Precipitation all year round); Boreal (Precipitation all year round); Polar.
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 60,484,000 (2018) (EU28 Rank = 4th; 11.79% of EU 28 total population) ii) Densely Populated Area (Urban): 33% vs. Intermediate density area: 42% vs. Thinly Populated Area (Rural): 25% iii) Homeowner: 72.4% vs. Renter/Tenant: 27.6%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 5,944.5 KgCO2/capita (2016) ii) 2,550.8 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 83.85 (Behind - on schedule) iv) EU parliament´s proposed national target = -33% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) No, term prosumer not used, however there is a definition of an individual self-consumption operation. ii) Yes. Collective self-consumption operation (although not corresponding fully to a definition of energy community in terms of membership and activities). iii) Yes. iv) Yes. v) No limits on the size of renewable energy systems for self-generation or on the amount of electricity that can be fed into the grid. vi) Yes. Allowed to feed electricity into the grid. vii) Yes. Self-consumers can sell electricity using different arrangements: a bilateral energy purchase contract, the market (to directly sell electricity), simplified purchase and resale arrangements, and net metering (20 kW - 200 kW plants post 2007).
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Lacking. Majority cannot understand their energy bill. Distrust exists due to safety, materials, profiteering, corruption, and pollution issues. ii) Poor. Negative attitude of government and companies due to high electricity prices, taxes, millions in fuel poverty, & political corruption. iii) Medium. Many are interested in self-production via RES.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) Information not available ii) Information not available iii) Information not available
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Government, Market Operator & regulator, Traders, Opinion Leaders, Energy Users, Legal & Legislative, NGOs, Retailer, Energy Producers, Regulators, SME RES, Catholic Church, and Online Media.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Information not available ii) Centralized power management ordered by Government Ministries. iii) Government defines strategy, 2 private actors regulate, 1 supplies E.

Italy (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2067 €/kWh ii) 0.07 €/kWh iii) 37.8% (first half of 2018) iv) Information not available
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) High. 7th highest household electricity prices in the EU. ii) Information not available iii) Information not available
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 30.0% (2016) ii) 14.0% (2014) iii) Information not available (2016) iv) 95.2% (2012) v) 21.3% (2007)
12) Business Models: i) RES Prosumer business models	 i) Net Metering (20 kW - 500 kW). Ritiro Dedicato system – simplified purchase and resale arrangement. Sell E to S.O. at a guaranteed price.
13) Financing Schemes: i) Forms of support	i) Feed-in & Compensation (e.g. net-metering), Feed-in & Selling or Remuneration, Tax Benefits (e.g. VAT reduction), and Subsidies.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 114,162 MW (100%): Renewables = 51732 MW (45.3%) – Wind = 9,384 MW (8.2%), Hydro = 22,298 MW (19.5%), Solar PV = 19,283 MW (16.9%) Geothermal = 767 MW (0.67%); Other Sources = 334 MW (0.3%); Combustibles = 62,096 MW (54.4%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 289.8 TWh: Renewables = 109.8 TWh (38%) – Wind = 17.7 TWh (6.1%), Hydro = 44.3 TWh (15.3%), Solar = 22.1 TWh (7.6%), Geothermal = 6.3 TWh (2.2%), Biomass and Renewable Wastes = 19.5 TWh (6.7%); Wastes (non-RES) = 2.5 TWh (0.9%); Other = 0.7 TWh (0.2%); Combustibles = 176.6 TWh (60.9%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 4,714.8 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., enough-excess plants, some want nuclear.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 33.8 Mtoe (100%): Renewables = 23.8 Mtoe (70.4%), Wastes (non-RES) = 1.2 Mtoe (3.6%) Nuclear = 0 Mtoe (0%), Combustibles = 8.8 Mtoe (26.0%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 122,237 Ktoe; (EU rank = 4th; 10.1% of EU total = 1,205,592 Ktoe) ii) Renewables 16.8%, Nuclear 0%, Waste (Non-Res) 0.8%, Combustibles = 80.3% - Solid Fuels = 7.1%, Petroleum and Products = 35.7%, Gases = 37.5%. iii) Overall RES (with Aviation Cap) = 17.4%, RES in Heating and Cooling = 18.9%, RES in Electricity Generation = 34.0%, RES in Transport = 7.2%. iv) Transport = 33.7%, Industry = 22.6%, Households = 27.8%, Services = 13.3%, Agriculture and Fishing = 2.5%, Other = 0.1%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 77.5% = Net Importer ii) Petrol = 91%, Crude + NGL = 93.3%, NG = 91.8%, Solid Fuels = 97.5% iii) 8.2%. Insufficiently connected with the EU E market.

Croatia Country Fact sheet

Renewable Energy Country Fact Sheet

CROATIA (HR)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	i) Warm Temperate (Mediterranean; Precipitation all year round), Arid, Boreal (precipitation all year round; Warm humid continental).
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 4,105,500 (2018) (EU28 Rank = 21st; 0.8% of EU 28 total population) ii) Densely Populated Area (Urban): 29% vs. Intermediate Density Area: 29% vs. Thinly Populated Area (Rural): 42% iii) Homeowner: 90.5% vs. Renter/Tenant: 9.5%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 4,437.6 KgCO2/capita (2016) ii) 2,048.6 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 76.19 (Ahead of schedule) iv) EU parliament´s proposed national target = -7% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) Yes. In legislation. Two kinds of actors are recognised by law: 1. User of Self-Supplying Facility (i.e., a self-supplying consumer), and 2. End-Buyer with Own Production (i.e., a prosumer). ii) No. Define citizens' energy from RES in draft policy only. iii) Yes. iv) Yes. v) 500kW. May not exceed this if want to ensure suppliers' obligation to take the surplus of the RES electricity that is produced. vi) Yes. Allowed to feed electricity into the grid. vii) Yes. A formula and rules set by law are used to calculate the minimum remuneration a supplier must pay the prosumer for surplus electricity into grid. They may agree on a higher remuneration than the minimum.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Information not available ii) Information not available iii) Information not available
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	i) 1,000 full time jobs (2015) ii) 1,000 full time jobs (2015) iii) 37,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Energy Producers, Transporters, Suppliers, DNOs, Grid Operator, Construction Permit Issuing Authorities, Small Scale RES Producers, Priority Electricity Producers, Energy Market Operator, Fund for Environmental Protection and Energy Efficiency, Bank, Governments.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	i) Market based monopoly ii) Centralized iii) Information not available

Croatia (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.1311 €/kWh ii) 0.04 €/kWh iii) 22.2% (first half of 2018) iv) State intervention
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) Low. 24th highest (4th Lowest) household electricity prices in the EU. ii) 21.5% iii) Income Quintile 1: 12.3%, Income Quintile 2: 10.1%, Income Quintile 3: 9.0%, Income Quintile 4: 8.1%, Income Quintile 5: 7.1%.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 27.9% (2016) ii) 9.0% (2014) iii) 13.6% (2016) iv) 89.1% (2012) v) Information not available (2007)
12) Business Models: i) RES Prosumer business models	 i) Direct contract with the power supplier. Price is defined by a methodology presented in the Renewable energy law
13) Financing Schemes: i) Forms of support	 i) Feed-in & Remuneration or Selling (e.g. Premiums), and Subsidies.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 4,878 MW (100%): Renewables = 2,744 MW (56.3%) – Wind = 483 MW (9.9%), Hydro = 2,205 MW (45.2%), Solar PV = 56 MW (1.1%); Combustibles = 2,134 MW (43.7%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 12.8 TWh (100%): Renewables = 8.6 TWh (67.2%) – Wind = 1.0 TWh (7.8%), Hydro = 7.1 TWh (55.5%), Solar = 0.1 TWh (0.8%), Biomass and Renewable Wastes = 0.4 TWh (3.1%); Combustibles = 4.3 TWh (33.6%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 3,651 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Overcapacity in installed power. Under-capacity in production (i.e. net-importer (point 20)) due to high cost of thermal power plant operation.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 4.5 Mtoe (100%): Renewables = 2.3 Mtoe (51.1%), Wastes (non-RES) = 0 Mtoe (0%) Nuclear = 0 Mtoe (0%), Combustibles = 2.2 Mtoe (48.9%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 7,156 Ktoe; (EU rank = 25th; 0.6% of EU total = 1,205,592 Ktoe) ii) Renewables 23.3%, Nuclear 0%, Waste (Non-Res) 0.1%, Combustibles = 71% - Solid Fuels = 7.6%, Petroleum and Products = 38.1%, Gases = 25.3%. iii) Overall RES (with Aviation Cap) = 28.3%, RES in Heating and Cooling = 37.6%, RES in Electricity Generation = 46.7%, RES in Transport = 1.3%. iv) Transport = 32.6%, Industry = 16.4%, Households = 36%, Services = 11.5%, Agriculture and Fishing = 3.5%, Other = 0.0%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 47.8% = Net Importer ii) Petrol = 76.9%, Crude + NGL = 76.4%, NG = 33.5%, Solid Fuels =102% iii) 52%. Well above EU 2020 target of 10% interconnection.

Spain Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

SPAIN (ES)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Mediterranean; Precipitation all year round); Arid.
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 46,659,300 (2018) (EU Rank = 5th; 9.1% of EU 28 total population) ii) Densely Populated Area (Urban): 33% vs. Intermediate Density Area: 31% vs. Thinly Populated Area (Rural): 36% iii) Homeowner: 77.1% vs. Renter/Tenant: 22.9%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 5,958.0 $KgCO_2$/capita (2016) ii) 2,630.8 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 116.43 (Behind schedule) iv) EU parliament´s proposed national target = -26% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) Yes. In legislation. Self-consumption. Prosumers relate to small scale generation of electricity for self-consumption, where the electricity generated is located close to them. ii) Yes. 2 types: 1) Non-entrepreneurial consumers; and 2) Entrepreneurial consumers. (2017) iii) Yes. iv) Yes. v) < = 100 kW (Low power installations) (2017). No restriction on system size. < 100 kW no need to register as electricity generation installations. vi) Yes. Allowed to feed electricity into the grid. vii) Yes. Type 1 get nothing for electricity fed into the grid. Type 2 receive electricity market price at the time it is discharged to the grid (2017). Rate of renumeration & structure to be redefined in future legislation (2019).
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Lacking. ii) Poor. (2nd lowest score on trust in providers, 3rd lowest on overall consumer satisfaction, and 2nd highest number of problems in the EU). iii) Low. Citizens are reluctant to participate in the energy sector. Are a growing number of consumer groups and NGOs in the energy sector.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) Information not available. ii) Information not available. iii) Information not available.
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Energy Producers, Transporters, Distributors, Retailers, Prosumers, SME RES producers, Media, Associations, Government, Legal & Legislative, Universities, Research Centres, Public Agencies, Banks & Insurance, Market Operator, ICT companies, NGOs, and The Market.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Oligopoly. Five big energy companies and four big oil companies. ii) Top down centralized energy system. Multilevel (Many components). iii) Energy companies – Government "revolving door" phenomenon.

Spain (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2383 €/kWh ii) 0.07 €/kWh iii) 21.4% (first half of 2018) iv) Established by energy company monopoly players & government. Liberalisation = new energy market retailers - have small market share.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) High. 5th highest household electricity prices in the EU. ii) 6.2% iii) Income Quintile 1: 5.3%, Income Quintile 2: 4.6%, Income Quintile 3: 4.2%, Income Quintile 4: 3.9%, Income Quintile 5: 3.5%.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 27.9% (2016) ii) 20.1% (2014) iii) 14.8% (2016) iv) 75.8% (2012) v) 30.4% (2007)
12) Business Models: i) RES Prosumer business models	 i) 1. Self-consumption with no remuneration; 2. Self-consumption with remuneration for excess electricity sent into the grid (market price).
13) Financing Schemes: i) Forms of support	i) Renumeration rate and structure yet to be defined in future legislation. Type 1 got a tax benefit as a financial incentive (no feed-in tariff). Type 2: Feed-in remuneration for excess energy (market price) + subsidies (2017).
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 106,185 MW (100%): Renewables = 50,332 MW (47.4%) - Wind = 23,003 MW (21.7%), Hydro = 20,056 MW (18.9%), Solar = 7,273 MW (6.8%) (PV= 4,973); Nuclear = 7,399 MW (7.0 %); Combustibles = 48,454 MW (45.6%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 274.8 TWh: Renewables = 108.1 TWh (39.3%) - Wind = 48.9 TWh (17.8%), Hydro = 39.9 TWh (14.5%), Solar = 13.6 TWh (4.9%), Biomass and Renewable Wastes = 5.7 TWh (2.1%)); Wastes (non-RES) = 0.7 TWh (0.25%); Other = 0.1 TWh (0.03%); Nuclear = 58.6 TWh (21.3%); Combustibles = 107.1 TWh (39.0%).
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 5,006.8 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., excess plants.
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 34.1 Mtoe (100%): Renewables = 17.7 Mtoe (51.01%), Nuclear = 15.1 Mtoe (44.28%), Combustibles = 1.2 Mtoe (3.51%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 87,438 Ktoe; (EU rank = 6th; 7.3% of EU total = 1,205,592 Ktoe) ii) Renewables 14.3%, Nuclear 12.4%, Waste (Non-Res) 0.2%, Combustibles = 72.6% - Solid Fuels = 8.3%, Petroleum and Products = 43.8%, Gases = 20.5%. iii) Overall RES (with Aviation Cap) = 17.3%, RES in Heating and Cooling = 16.8%, RES in Electricity Generation = 36.6%, RES in Transport = 5.3%. iv) Transport = 42.4%, Industry = 23.0%, Households = 18.3%, Services = 12.9%, Agriculture and Fishing = 3.2%, Other = 0.3%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 71.9% = Net Importer ii) Petrol = 99.2%, Crude + NGL = 98.7%, NG = 98.7%, Solid Fuels = 76% iii) 5.8%. Energy Island - lack of interconnection with other countries.

Portugal Country Fact sheet

PROSEU

Renewable Energy Country Fact Sheet

PORTUGAL (PT)	
Country Fact Sheet Variable	*Value*
GEOGRAPHY and POPULATION	
1) Climate Region: i) Koppen-Geiger Classification	 i) Warm Temperate (Mediterranean); Arid.
2) Demographics: i) Total Population (# of people) ii) Densely Populated Area (Urban) vs. Intermediate Density Area vs. Thinly Populated Area (Rural) (%) iii) Home Ownership vs. Rental (%)	i) 10,291,000 (2018) (EU28 Rank = 12th; 2.0% of EU 28 total population) ii) Densely Populated Area (Urban): 43% vs. Intermediate density area: 30% vs. Thinly Populated Area (Rural) 27% iii) Homeowner: 74.7% vs. Renter/Tenant: 25.3%
ECOLOGICAL IMPACT	
3) Emissions, energy use & targets: i) Emissions Per Capita (Kg of CO2) ii) Energy use Per Capita (kgoe/cap) iii) EU 2020 greenhouse gas target (units of CO2 equivalents) iv) EU 2030 greenhouse gas target	i) 5,203.1 KgCO2/capita (2016) ii) 2,249.6 kgoe/cap (kilogram of oil equivalent per capita) iii) 80 (20% decrease from 1990 level of 100); 2016 level = 115.77 (Behind schedule) iv) EU parliament´s proposed national target = -17% (2030 target is compared to 2005 level and is not yet legally binding/mandatory)
LEGAL/POLICY	
4) Prosumers: i) Legal definition of prosumers ii) Specific legal framework on collective prosumer initiatives iii) Permit collective power generation iv) Permit collective ownership of installation(s) v) Maximum generation capacity (Power Capacity cap reference) vi) Permitted to connect to grid vii) Are compensated for feeding electricity into the grid	i) Yes. 3 terms in legislation related to self-consumption/prosumerism: 1. Producer for self-consumption (not defined), 2. Production Units for self-consumption (production from any mix, production + consumption in same location, surplus injected into grid), 3. Small Production Units (RES production entirely sold to the grid). ii) No. However, a framework for small production units and for self-consumption could be used for collective prosumer initiatives. iii) No. iv) Yes. v) < = 1 MW (small production units for self-consumption); < = 250 KW (small production units not for self-consumption). vii) Yes. Are remunerated for the electricity fed into the grid. Based on a contract with the DSO for energy provided in kWh per month. Remuneration is usually approximately 90% of the market price.
5) Energy Sector Transparency, Perception and Participation: i) Level of transparency ii) Perception of the energy sector iii) Citizen Participation	i) Lacking. Lack education on the energy sector and the players within it. A large number of people are unable to understand energy bills. ii) Poor. Negative as high energy prices exist and continue to increase. iii) Low. Citizens are reluctant to participate in the energy sector. Are a small number of community groups, coops, NGOs in the energy sector.
ECONOMICS	
6) Environmental Economy Jobs: i) # of jobs in the production of RE ii) # of jobs in Heat & Energy saving iii) Total # of Env. Economy jobs	 i) 18,000 full time jobs (2015) ii) 5,000 full time jobs (2015) iii) 85,000 full time jobs (2015)
7) Main Energy System Actors: i) Actors directly involved in the Energy system	i) Energy Producers, Transporters, Distributors, Traders, Consumers, The Market, Small and Medium RES producers, New Energy Retailers, SME´s, Prosumers, System Operators, and Governments.
8) Energy Sector Structure i) Monopoly, Oligopoly, or Other ii) Centralized or Decentralized iii) Public-private sector ties	 i) Oligopoly. One major energy company and a few big oil companies. ii) Top down centralized energy system. Multilevel (Many components) iii) Government owns minority share in major energy company EDP.

Portugal (cont.)

9) Prices: i) Household electricity prices (€/kWh) ii) Household natural gas prices (€/kWh) iii) Share of taxes/levies (%) (2018) iv) How price is established in the energy market	 i) 0.2246 €/kWh (First Half of 2018) ii) 0.08 €/kWh (First Half of 2018) iii) 55.2% (first half of 2018) iv) Information not available.
10) Energy Affordability: i) Cost of energy (1st Half of 2017) ii) % of population in arrears on utility bill iii) Expenditure for electricity, gas, fuels as a share of income (2015)	 i) High. 6th highest household electricity prices in the EU. ii) 6.3% (2016) iii) Information not available.
11) Energy Poverty: i) People at risk of poverty ii) Excess winter mortality/deaths iii) Presence of leak, damp, rot iv) Equipped with heating v) Equipped with air conditioning	% of population: i) 25.1% (2016) ii) 24.9% (2014) iii) 31.1% (2016) iv) 43.7% (2012) v) 6.9% (2007)
12) Business Models: i) RES Prosumer business models	 i) Individual self-consumption. E not self-consumed is injected into grid. Systems <1.5 kW do not receive remuneration. DSO based contracts.
13) Financing Schemes: i) Forms of support	 i) Benchmark tariff - Prosumers are remunerated for electricity fed into the grid through a bidding system based on a government set tariff.
TECHNOLOGY/RES TECHNOLOGIES	
14) Electricity Capacity: i) Installed Electricity Capacity by Fuel Type (MW) & (%) (2016)	 i) Total = 20,561 MW (100%): Renewables = 12,571 MW (61.1%) - Wind = 5,124 MW (24.9%), Hydro = 6,960 MW (33.9%), Solar PV = 462 MW (2.2%), Geothermal = 25 MW (0.12%); Combustibles = 7,990 MW (38.9%).
15) Electricity Production: i) Gross Electricity Generation by Fuel Type (TWh) & (%) (2016)	 i) Total = 60.3 TWh: Renewables = 33.4 TWh (55.4%) – Wind = 12.5 TWh (20.7%), Hydro = 16.9 TWh (28.0%), Solar = 0.8 TWh (1.3%), Geothermal = 0.2 TWh (0.3%), Biomass and Renewable Wastes = 3.1 TWh (5.1%); Wastes (non-RES) = 0.3 TWh (0.5%); Combustibles = 26.5 TWh (43.9%)
16) Electricity Consumption: i) Final Electricity in kWh per Capita	 i) 4,482.3 kWh/cap (2016)
17) Energy Capacity: (2016) i) Power system production capacity	 i) Power Overcapacity, i.e., excess plants (Thermoelectric plants cover for when there is a lack of rainfall for hydro or wind for RE production).
18) Primary Energy Production: i) Primary Production by Fuel Type (Mtoe & %) (2016)	 i) Total = 6.2 Mtoe (100%): Renewables = 5.8 Mtoe (93.5%), Wastes (non-RES) = 0.2 (3.2%), Combustibles (Petrol) = 0.2 Mtoe (3.2%).
19) Energy Consumption: (2016) i) Fuels going through Final consumption – All products (Ktoe) ii) Gross Inland Consumption by product (%) iii) Share of Renewables in Gross Final Consumption of Energy (%) iv) Final Energy Consumption by sector (%)	 i) 17,264 Ktoe (EU rank = 19th; 1.4% of EU total = 1,205,592 Ktoe) ii) Renewables 24.2%, Nuclear 0%, Waste (Non-Res) 0.9%, Combustibles = 76.8% - Solid Fuels = 12.2%, Petroleum Products = 46.1%, Gases = 18.5%. iii) Overall RES (with Aviation Cap) = 28.5%, RES in Heating and Cooling = 35.1%, RES in Electricity Generation = 54.1%, RES in Transport = 7.5%. iv) Transport = 42.0%, Industry = 26.9%, Households = 16.3%, Services = 12.0%, Agriculture and Fishing = 2.6%, Other = 0.2%.
20) Energy Dependency: (2016) i) Energy Import Dependency (%) ii) Imports by fuel type (%) iii) Energy connectivity (%) (2017)	 i) 73.5% = Net Importer ii) Petrol = 96.9%, Crude + NGL = 98.7%, NG = 99.1%, Solid Fuels =102% iii) 8.7%. Insufficiently connected with the EU Energy market.

ANNEX 4 ADDITIONAL GRAPHS (SURVEY)

Figure A: Original distribution of starting dates

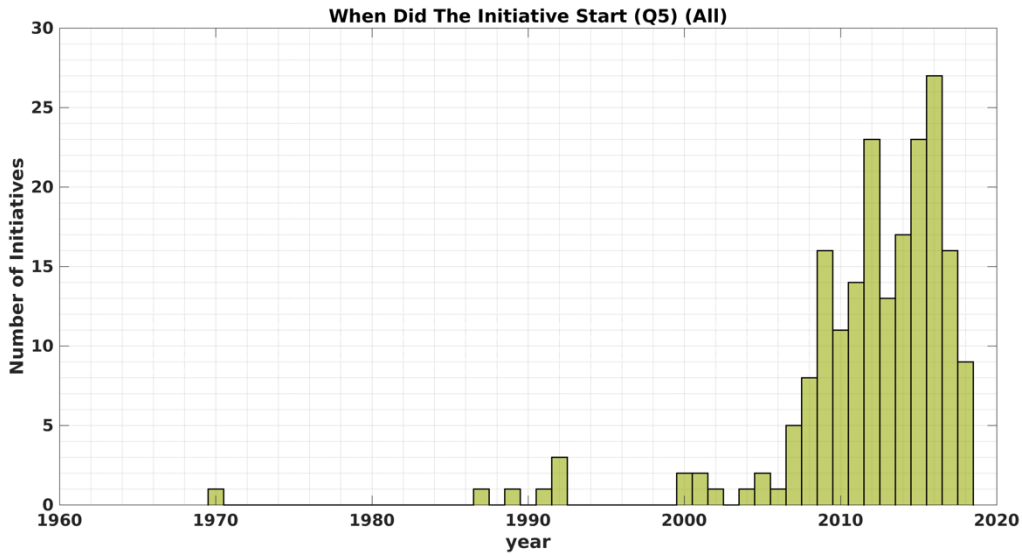


Figure B: Energy needs addressed according to legal form

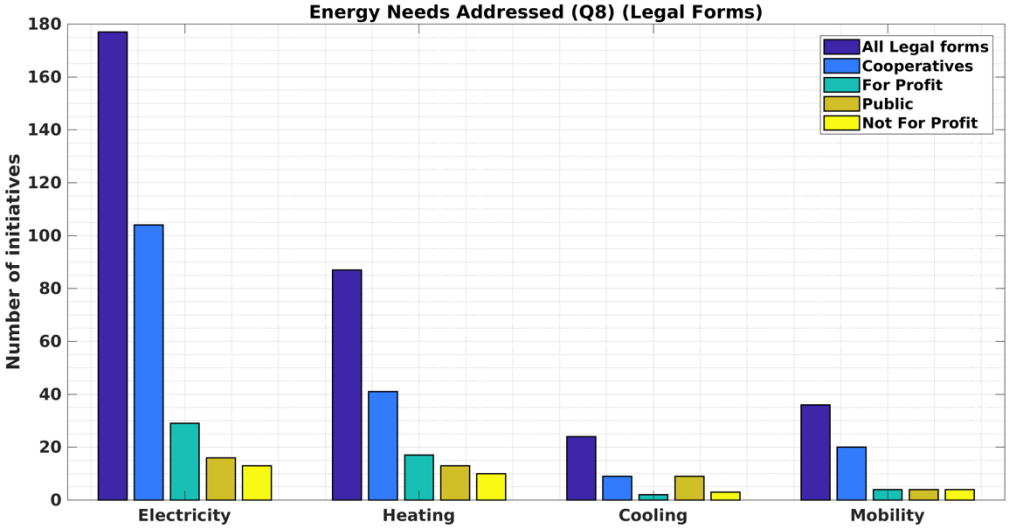


Figure C: Energy needs addressed according to country

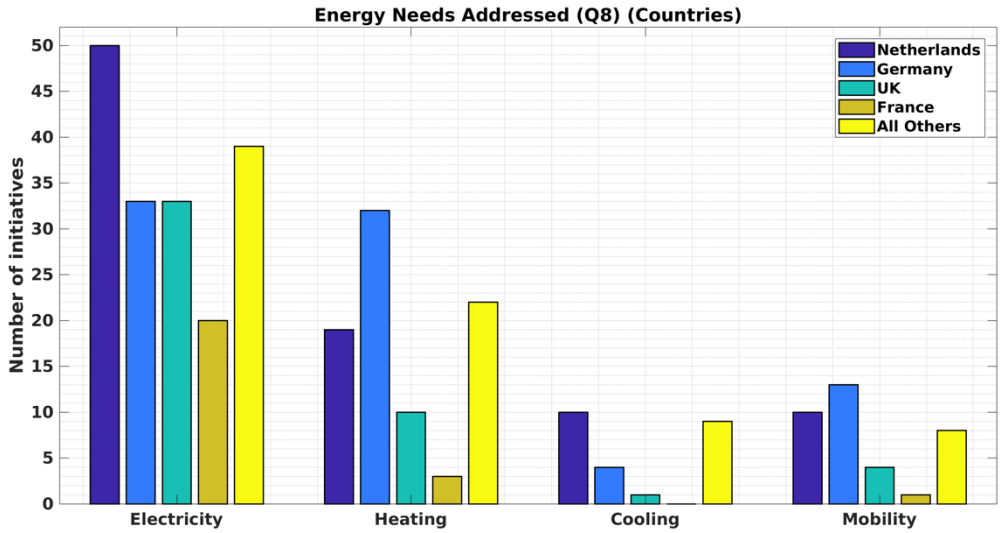


Figure D: RES technologies used or planned according to legal form

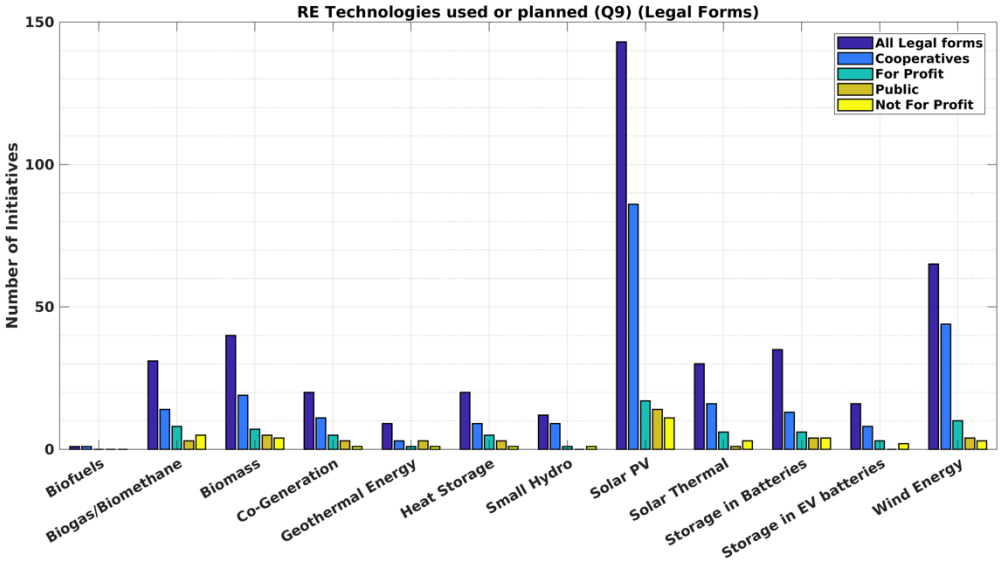


Figure E: RES technologies used or planned according to country

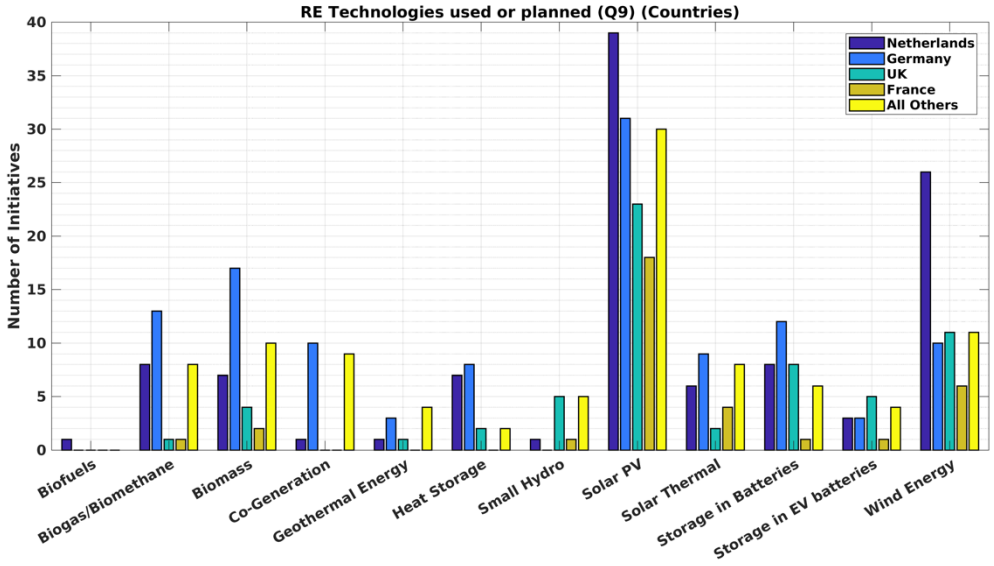


Figure F: Proportion of women vs men in management position according to country

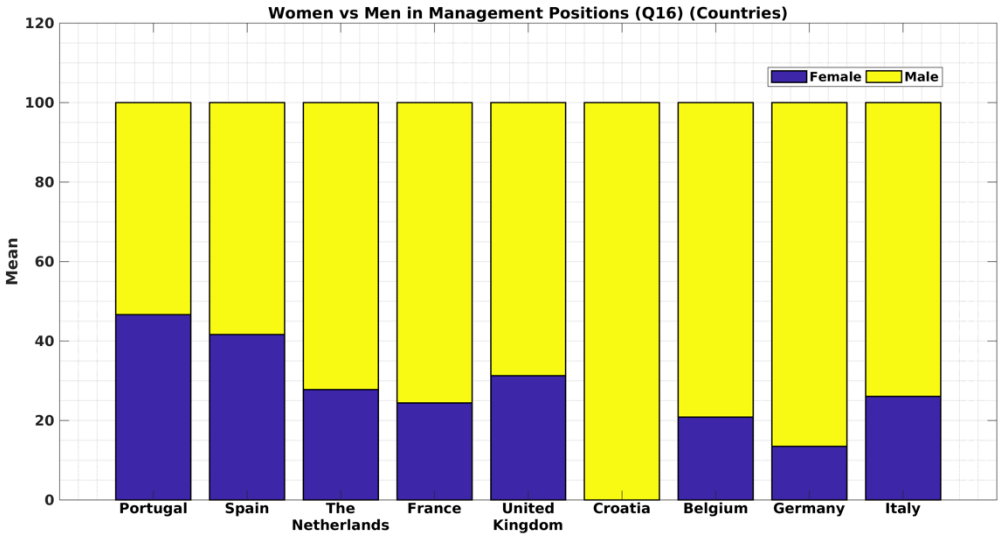
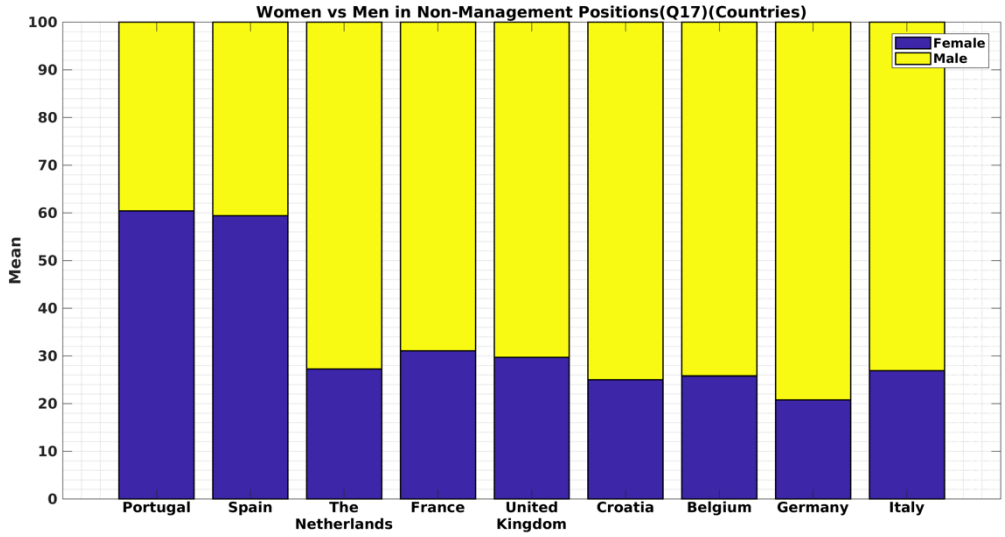


Figure G: Proportion of women vs men in non-management position according to country



PROSEU

info@proseu.eu