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SEZIONE FUORI LUOGO

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Participatory practices in energy transition in Italy. For a co-productive, situated and relational analysis[2]

1. Notes on the 'great transformation' of energy transition

The aim of this paper is to analyze public experiences of participation in energy transition processes using a co-production, situated and relational approach (Chilvers & Kearnes, 2016; Chilvers *et al.*, 2021). Interest in this area of research is part of a general phenomenon brought about by the recent acceleration in both national and European energy policies, that favour the diffusion of decentralised systems for the production and consumption of clean energy. These policies are also aimed at regenerating vulnerable or marginal areas (cf. Italian PNRR) and at promoting the community-based participation of citizens in energy governance. In Italy, some of the most relevant innovations in recent years undoubtedly include the introduction of legislation to support energy communities and collective self-consumption schemes (Law No 8/2020 and Legislative Decree 199/2021). All this has prompted an increasingly rich debate in the scientific community, transversally involving different fields of study and research. However, the processes of change in the energy sector, with all the implications related to the involvement of citizens, as well as the processes of urban regeneration and, more generally, of attention to territorial fragilities and areas at risk of depopulation, have been underway for some time.

In particular, as far as the energy sector is concerned, over the last two decades, the global energy system has undergone a significant process of transformation. First of all, this involves the effects of a widespread policy of liberalisation of the energy market, which has allowed for a wider range of services to be offered in correspondence with the plurality of market players. This situation has, in turn, increased competition in the sector. On the other hand, the profound transformations that have swept through the energy sector are also due to a series of technological innovations, first and foremost those linked to the spread of energy produced from renewable sources (solar thermal and photovoltaic, wind, but also bio-mass, geo-thermal, hydrogen, etc.), which have made it possible to rethink and potentially restructure the system on different levels:

(a) in relation to production (with the affirmation and increasing possibility of access to widespread production systems from renewable sources);

b) in relation to consumption (with the implementation of increasingly safe, reliable, durable and affordable renewable energies, which have triggered the trend towards total electrification);

c) in relation to energy supply (which has enabled the diversification of players within the market, including providers exclusively linked to clean sources);

d) in relation to the possibility of storage (with the development of lithium batteries, despite their high cost).

Along with these transformations there has been a growing awareness and scientific interest in the problematisation of ecological issues and climate change (Latour, 2015), which have been accompanied by increasing pressure in favour of green transition-oriented policies. This has led to an increase in the number of studies on renewable energy sources and more generally on issues related to energy transition (Monaco, 2021; Arrobbio, Sciullo, 2020), which is becoming increasingly important, and is contributing to experimentation and technological advances.

In the field of social sciences, one of the most debated and studied issues in relation to these rapid changes in the technical and scientific field of energy is related to the emergence of forms of participation, energy democracy (Feldpaush-Parker *et al.*, 2021; Osti, 2017) and energy citizenship (Campos, Marín-González, 2020; Lennon *et al.*, 2019a, 2019b; Ryghaug *et al.*, 2018). More

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specifically, then, three main macro-phenomena, that are strongly transformative in character have emerged (Barnes, 2021). These trends are still influencing the energy system quite strongly, both in terms of physical and infrastructural change and, especially in terms of governance, in close relation to the increasing adoption of energy plants using renewable sources for energy production. As Barnes points out (*ibid*.):

1 The first trend is related to the process of Decarbonisation, which has been adopted and supported by global and national policies. The main response from institutions has been to deploy renewable energy policies, which have been accompanied by processes and campaigns to raise awareness and consciousness in the public sphere at the citizen/consumer level, and a set of economic incentives. In addition, stricter climate limiting regulations aimed at companies have been implemented.

2 A second megatrend relates to Digitisation (the so-called 'ICT revolution' that started in the 1970s). In general, digitisation has created new ways and opportunities for citizens to connect to the energy system and market, and thus also new opportunities and tools to multiply forms of participation in this sector through, for example, the daily use of smart meters, smart technologies and energy demand response systems, the introduction of distributed clean energy generation systems (Chilvers *et al.*, 2021: 250), 'material participation' (Marres, 2015), which implements citizen participation in energy management as well as in the public decision-making sphere through the mediation of technological devices, the use of digital platforms (as in the case of the creation and global spread of social movements, including the 'gilets jaunes' or 'Fridays for Future'), and so on.

3 The third major trend is Decentralisation, which concerns how energy is produced and where, and consumption and supply systems, which stand in stark contrast to the traditional centralisation of the energy system in the hands of nation states. In fact, this process has also produced new forms of more widespread and decentralised involvement, precisely in terms of the management and control of energy production and consumption, as well as its distribution (e.g., energy cooperatives, but also the ownership and management of energy plants by municipalities or the more recent energy communities, van der Waal, 2021; van der Waal *et al.*, 2018; van der Schoor *et al.* 2016; van der Schoor & Scholtens, 2015). In Italy, this process is clearly associated with the liberalisation of the energy market that was implemented in the late 1990s, but only fully achieved in 2007.

In light of these large-scale processes, that are further called into question by the current energy crisis caused by the war in Ukraine, the focus of the analysis proposed here concerns participation processes in the emerging energy transition in Italy, and in particular the recent phenomenon of community energy. The analysis is carried out according to the relational STS approach, which envisions participatory practices in the field of science and technology as situated, relational and co-produced processes with regard to the normative and social contexts and power relations prevailing in the sector of reference. The research questions we address, therefore, are: what are the emerging forms of participation in the energy sector in Italy (what), which actors (public, who) mainly drive these forms of participation, which procedures or practices (how) are adopted to develop them (Chilvers & Kearnes, 2016: 33; Chilvers & Longhurst, op. cit., p. 586)? The paper, therefore, presents in paragraph 2, a critical analysis of the theoretical-methodological approach used, and the relational STS, in paragraph 3, an analysis of the emerging forms of community energy in Italy, according to the main research questions, and finally, section 4 presents a case study based in Southern Italy (in Messina), of community energy processes within a broader project based on the socio-territorial regeneration of a peripheral urban area. The Conclusions (section 5) focus on future expectations for Southern Italy.

2. A theoretical framework of participation models in energy transition

The theoretical framework adopted to carry out our analysis is the relational STS, proposed by the 3S (Science, Society & Sustainability) research group at the School of Environmental Sciences, at the University of East Anglia. In general, this approach addresses the study of forms of participation concerning issues and sectors related to science, technology, environment and society. In particular, the authors who are more interested in energy studies have focused their analysis precisely on participation forms and practices in this field.

More generally, this interpretative and analytical approach arises from a fundamental assumption, which states that forms of participation (also) in the energy field are to be considered and conceived as a phenomenon co-constructed by the local, cultural, social, economic and political-regulatory context. It is therefore a situated, relational, constructivist and performative approach. This differentiates it from other main theoretical-methodological approaches, for example the more critical ones, which consider forms of citizen participation and engagement in the fields of science, technology and environment, in a 'discrete' form, i.e. as single events or in any case not as part of a process. According to these visions, the technical procedures of citizen engagement are pre-established externally by technical or institutional actors, who link and connect them directly to success in terms of consensus to the proposals and issues presented. In essence, participatory forms are analyzed and evaluated as alternative forms of control over issues regarding technological and scientific innovation, according to a vision that separates the actors involved in participatory processes and the participatory processes and procedures themselves, as well as these latter and their contexts. In other words, the very collectives of people involved in these forms of participation are conceived as actors who are external to participation (Brown, 2009), and not in fact as collective actors but rather as groups of individuals (Proctor, 1998) and according to pre-determined ideas of participation (Rowe, Frewer 2000), without a processual vision (Chilvers, Kearnes, 2016: 10-12). In a certain sense, critical strands represent a power centre that directs and controls so many mini-publics by means of inclusion/exclusion procedures, participation modes and even pre-established outcomes. Conversely, the relational STS approach considers the organisational forms of participation, including the publics involved, as the constantly changing outcome of a process of mutual influence, which they define in terms of co-production between science, technology and society. All elements and actors involved in participatory processes in these fields are constantly transformed and, in turn, transform the other components. On the other hand, this dynamic of co-production affects the very forms of participation, which are also in continual transformation:

> The realities of participation, the public and public knowledge-commitments do not pre-exist, but are instead the outcome of collective participatory practices. In this view, rather than simply being composed of discrete formations of mini-publics, with linear relations with centres of power and calculation, multiple situated sites and forms of participation are continually being made, unmade and remade (Chilvers, Kearnes, 2016, p. 13).

We should further highlight that the actors participating in these processes are not only human actors but also non-human actors, according to the Actor-network Theory (Callon, 1986a, 1986b; Latour 2005a, 1999, 1996, 1991; Latour, Callon, 1992; Latour, Woolgar,1979), which underlies relational STS. Thus, in the co-production of publics and practices of participation, it is necessary to take into account that the publics themselves are heterogeneous, because they are composed of individuals, organised entities, institutions, etc., but also of devices, technologies, scientific knowledge, expertise, political and social theories, normative objects and devices, etc. This makes process being studied even more complex, wide-ranging, heterogeneous and situated and, consequently, it is even more urgent to analyze it in its making. In this perspective, moreover, every form of participation is recognised and observed as partial, subject to uncertain-

ties, and producing mechanisms of exclusion. However, the researcher should not analyze these processes with a pre-established ideal or model of participation in mind, because this does not allow them to observe the participatory dynamics in their making and transformation, except in relation to that ideal, to which they will evidently never correspond.

In order to operationalise the relational STS perspective, therefore, it is necessary to separate three main assumptions, corresponding to the three dimensions that are always present in every form of participation:

1 the subjects (participants/publics: "who");
2 the objects (the issues: 'what');
3 the participation models or procedures (or political philosophies: "how") (Chilvers, Long-hurst, 2016, p. 590).

These elements or dimensions are co-produced through the enactment of forms of participation: "The who (publics), what (issues), and how (procedural formats) of participation do not externally exist in a natural state but are actively constructed through the performance of collective participatory practices" (Chilvers, Longhurst, op. cit., p. 586). In particular, then, our authors explored two central aspects in relation to participatory processes linked to energy transition, taking up two central concepts and phases of the ANT translation process (Callon, 1986a): "enrolment" and "mediation". The former relates to the way in which enrolment is organised: 'Enrolment refers to the way in which different (human and non-human) actors are drawn into a particular form of participatory collective practice and definition of the issue at stake' (Chilvers, Longhurst, 2016, p. 591). Mediation refers to the forms or technologies that mediate relationships between actors: "Mediation refers to the way in which a participatory collective is held together by different devices, processes, skills, or technologies of participation'" (Chilvers, Longhurst, op. cit., p. 591).

These regulating principles have been applied to various fields in which the relations between society, science, technology and the environment are relevant, both with reference to more specific cases, although still connected to general networks and contexts (Chilvers, Kearnes, 2016, pp. 31-260), and to sectoral participatory phenomena from a national perspective. With regard to these latter studies, analyses of forms of participation have been elaborated through the use of different tools, such as certain mapping methods: multi-criteria mapping (MCM) and deliberative mapping (DM) (Chilvers, Kearnes, 2016, p. 296; Chilvers *et al.*, 2021), which have allowed for an 'ecology of participation'. In fact, the latest evolution of this approach has reached a more systemic perspective by arriving at the so-called "Ecologies of participation", first and foremost in the energy sector and in the U.K. (Chilvers *et al.*, 2021, 2018), with the intention of providing a systemic and plural mapping of the participation models in place, even beyond previous categorisations or the more canonical and pre-established ones. Alongside the aims of a scientific nature, these studies are also intended to achieve more pragmatic and political objectives, which consist mainly of identifying conditions of inequality and imbalance in the involvement of citizens in relation to the different social strata to which they belong, but also in indicating those participatory experiences which, for various reasons, are not considered by institutional actors.

3. Emerging forms of participation in energy transition in Italy. Energy communities.

Here, we are not concerned with elaborating an ecology of participation in the energy sector in Italy, but rather with undertaking an initial analysis of a particular form of citizen involvement and participation in the energy sector, namely community energy. The analysis will be guided by the regulatory principles and methodological steps of relational STS, as outlined above.

The materials and research tools used for the general analysis of RECs in Italy are mainly qualitative and consist of: the main regulatory documents on the subject introduced at a European and national level (EMDII, REDII and Clean Energy Package; Law n.8 /2020 and legislative decree 199/2021); observations resulting from participation in workshops, seminars and public meetings on RECs over the last two years; the collection (not yet completed) of semi-structured interviews (24 up to the time of writing) with community energy promoters and RECs in Italy (mainly in Sicily and Trentino-Alto Adige), accompanied by the drafting of an ethnographic diary.

In general terms, community energy consists of renewable energy communities (RECs), collective self-consumption schemes (AUCs), and energy cooperatives. In the literature, we find a certain plurality of definitions of these forms of participation in energy transition (Barroco Fontes Cunha *et al.*, 2021; Devine-Wright, 2019), which emphasise certain dimensions that are considered as priorities for an understanding of the phenomenon: community renewable energy (Walker & Devine-Wright, 2008), community-based grassroots innovations (Seyfang & Haxeltine, 2012, Seyfang & Smith, 2007), grassroots initiatives (Magnani & Osti. 2016), community energy (Seyfang *et al.*, 2014 Hargreaves *et al.* 2013). Here, we will elaborate in more detail on RECs, understood as socio-technical configurations that share the production and/or consumption of energy from renewable sources and may consist of individual citizens, small and medium-sized enterprises, and public entities. The EU has introduced two definitions of energy communities. In the first they are referred to as Citizen Energy Communities (CECs), in the Internal Market for Electricity Directive (EMDII), and in the second they are referred to as Renewable Energy Communities (RECs), in the Renewables Directive (REDII), later merged into the CEP - Clean Energy Package of 2020. The two definitions of energy communities emphasise two different aspects: the definition of CECs emphasises the central role of citizens in the objective of transforming and reconfiguring the electricity market towards its systemic decentralisation, while that of RECs identifies the use of renewable energy sources as one of the central aspects for achieving objectives related to fighting the climate crisis. In both cases, however, the European Union intends to place the active and direct role of citizens and local communities at the centre of the processes of ecological transition to massively increase the use of energy from renewable sources and decentralise its related governance.

The CEP itself indicates the main objectives to be achieved by 2030 and 2050 as the three paradigms of electrification, decarbonisation and digitisation of the electricity system at a European level, which can be achieved through the progressive but rapid decentralisation of the energy production system. Energy communities are considered one of the preferred configurations for accelerating these transformation processes. For this reason, the EU is strongly supporting the dissemination of CEP within member countries, while soliciting all scientific research sectors to further investigate their strengths and weaknesses and, above all, to facilitate the deployment of their potential (Blasch *et al.*, 2021). Consequently, member states' policies have also accelerated their support for these participatory forms of energy transition, implementing regulations and economic incentives that favour their diffusion. Thus, these two institutional actors (who) have problematised the question (issue) of citizen participation in energy transition, also defining the details (how) at a general level. For its part, Italy has, in fact, introduced two laws to transpose European provisions (law no. 8/2020 and legislative decree 199/2021), the last of which has still not been implemented at the time of writing. In addition, the National Recovery and Resilience Plan (PNRR) has also allocated over €2 billion to forms of self-production and collective self-consumption, confirming the high degree of attention, also in terms of financing, that is planned for these configurations. In this framework, it is extremely interesting to understand how participatory practices are developing in Italy, taking into account the high expectations, the funding, the expected objectives and the very positive narratives accompanying the development of these configurations. With law no. 8/2020, which partially transposes European directives, the Italian legislator has imposed on RECs and self-consumption schemes, the principle that profit must not be a motivation, since their objective is to achieve economic,

social and environmental sustainability both for the benefit of their members and of the local community (Art. 42, c.3 b).

This first regulation also allows individual citizens, SMEs and local authorities to be members of RECs. Basically, therefore, these are community-based aggregations that should arise from a bottom-up initiative and restore greater decision-making power to citizens/consumers and local communities in terms of governing the electricity system, helping to restructure it in an increasingly decentralised, distributed and democratic key. It is important to remember two technical criteria imposed by this first law: one is the technical constraint of the secondary transformation substation (i.e. the substation for transforming energy from medium to low voltage) which has been indicated by many stakeholders as too restrictive, because it greatly limits the perimeter within which each REC can be set up; the second refers to the maximum power of 20 KW that can be used by each REC in the energy plant only if the plant is new, which is also considered too limiting. The second regulation (legislative decree 199/2021), in fact, in fully transposing European directives, not only extended these two parameters, but extended them to such an extent as to make a potential leap in scale for the RECs: indeed, both the extension to the primary transformer substation and the increase in the maximum power to 1MW have projected the size of each REC to, potentially thousands of PODs - and, therefore, thousands of members. However, they are awaiting the implementation of the law in order to make it fully operational, so at the time of writing there are still no RECs established in accordance with this second law, but only projects in the pipeline. Nevertheless, these two regulatory devices have an important weight in the general configuration of these forms of participation, especially with regard to the technical parameters imposed, which influence the forms of construction, emergence and the very creation of RECs in Italy. For this reason, they will be given due consideration in our analysis as non-human actors.

From the perspective of relational STS and Actor-network Theory (ANT), from which the first derives, energy communities are a network of human and non-human actors which form the participatory practices and procedures that take shape there, but which are also formed and transformed by them. In more detail, we can primarily consider the contexts in which these participatory configurations are activated. As we have pointed out above, RECs in Italy are co-constructed in terms of participation. together with and in relation to the non-human actors that contribute to defining these contexts, such as normative devices (European and national), political cultures, infrastructure, expertise, etc.

3.1 Non-human actants

Of course, the introduction of regulatory devices that permit the formation of RECs in Italy play a central role in the enrolment and, therefore, in the definition of the actors (human and non-human) that make up the network. This phase is highly significant to the translation process (Callon, 1984), since it defines the specific role attributed to and played by each actant, especially the non-human ones. Indeed, the two Italian laws already referred to introduce technical constraints which allow for the enrolment of specific non-human actors, which are, as we have already pointed out, different according to the two laws.

A) Indeed, Act No. 8 of 2020 introduces the constraint of the secondary substation and a maximum power of 20kW per installation. These constitute two non-human actors that co-construct the network and the methods of participation (enrolment and mediation) within the network. In fact, they impose smaller dimensions on the RECs that were set up in response to this first regulation, and also limit the human actors that can take part as they must be present within the area that is delimited by the non-human actant, the secondary substation itself. This has an effect not only in quantitative terms, but also in qualitative terms, because the various human actors, (for

example, ordinary citizens or organised groups or companies that would potentially have joined and supported the establishment of an REC, motivated by interests of a social, cultural or economic nature, but are not present within the perimeter of the secondary substation) cannot be part of that specific alliance. Due to the action of this specific non-human actant, this condition has, in other respects, generated in the promoters and members of these RECs, an expectation regarding the possibility of building a renewed sense of trust and belonging to the local community around this network, by virtue of the necessarily reduced spatial dimensions that such configurations assume. This vision is clearly expressed by a member of an REC in Riccomassimo, a hamlet in the mountain municipality of Storo (province of Trento, North of Italy):

> The strong point of this initiative was the relationship of trust (with CEDIS[3]) and also the desire to prevent the depopulation of the village. Certainly, our first objective was to stop depopulation in the village, and I believe this is very important (...). In my opinion, especially in this post-Covid period, having a love and passion for your community is very important.

Moreover, as far as management of the energy plant is concerned, the necessary delimitation of both the area and power of the plant makes it more sensible to call on the expertise of those already present and operating in the area, from the network promoters' previous acquaintances and partners, as is the case in some already operational RECs (see also Magnani & Cittati, 2022). In other words, the non-human actors enlisted on a national level by the 2020 legislation favour those local experiences that can count on the proximity or connection with various expert subjects (technical, managerial, organisational, legal) and on a broad social capital. Possible examples include the RECs in Ferla (province of Catania, Southern Italy), Fondo Saccà, in Messina, and Naples EST, but also in Riccomassimo in Storo (Trento) and again in Magliano Alpi (province of Cuneo, Northern Italy). In all these cases, they are networks promoted and set up by human actors with the power, albeit dimensionally limited to the local community, to involve citizens or organised actors. In many cases, they are institutional actors (local authorities) with strong roots in marginal or inland areas, often revolving around a personal relationship of trust (in some cases the mayor), which makes it possible to define a small network where there is also sufficient technical expertise for the managerial implementation of these kinds of configuration. In the case of Riccomassimo, the entire technical and management part of the REC is managed by the CEDIS Electricity Consortium, which has the legal status of a historical energy cooperative, with more than a hundred years' experience in the sector. In Naples EST, on the other hand, a specialised company was involved to manage all aspects, while in Messina, as will be discussed in more detail later, a social ESCO (Solidarity & Energy) is in operation. The latter coordinates the research and management activities of the REC with other research centres, first and foremost a highly specialised institute in the renewable energy sector of the National Research Council - CNR (Advanced Energy Technologies Institute - ITAE) located in the city; in Magliano Alpi, the network was promoted in a collaboration between the mayor and the Turin Polytechnic Energy Centre.
B) Law 199 of 2021, on the other hand, allows potential REC membership to be extended to all those who are connected to the same primary transformer substation, as well as increasing the maximum plant power of each REC to 1MW. These two new non-human actants enlisted by the most recent regulatory device have pushed (but only in power, since the publication of the implementation decrees is still pending) forms of participation, for example RECs, to another level. In fact, the primary substation actant makes it possible to enroll potentially thousands of PODs and, in correspondence also human actants (the users corresponding to each POD), generating, as a dimensional effect, much vaster networks that can extend to significant parts of even medium-large cities or municipalities. This condition, in turn, necessitates enlisting human actors (organisations, experts, specialised agencies, etc.) who are more capable of managing broader

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3   CEDIS is an energy consortium with the legal status of a historical energy cooperative, established in 1904 in Storo (province of Trento).

socio-technical configurations, both from the point of view of the material structures needed to satisfy the demand for energy generated in this way, and also more directly related to the expertise and management of such large networks. In other words, the networks most likely to emerge in correspondence to the enrolment criteria and procedures stimulated by the new regulatory framework are alliances characterised by the centrality of medium- and large-sized expert organisations, which can count on much larger material, technical and managerial infrastructures than those put in place by the first networks that arose thanks to the 2020 regulatory framework and which, therefore, appear almost as a sort of initial small-scale experiment. However, the possible scalability of RECs is also referred to by one of the promoters of an REC set up under the latest legislation, and which is planned for the city of Brixen (South Tyrol, Northern Italy), using a cooperative-type organisational model. In the following extract, we find the reasoning behind the management design for this initiative:

> In Brixen, if I am informed correctly, we have 15 thousand PODs, so in theory, I can imagine that if we start, we will have an immediate one to two thousand applications (to enter the REC) which we will no longer be able to manage as we do now, with an Excel file! So, I think we have to prepare for automated membership management and we are also considering the best way to log in, with a SPID perhaps, etc.

3.2 Political and participatory cultures

The two main ways of setting up the RECs analyzed thus far are mediated not only by the action of the human and non-human actors that have already been considered (local authorities, locally organised actors, regulatory devices, primary and secondary substations, maximum power of facilities, local or more extensive expertise, etc.), but also by the action of the so-called 'political cultures' which contribute to making their situated, co-produced and relational character even more evident. We should emphasise that, within the scope of the issues addressed by STS studies, the mechanisms of legitimation, production and participation in knowledge processes and decision-making vary in relation to national contexts, corresponding to their sedimented cultural and political features (Chilvers, Kearnes, 2016, p. 52). Jasanoff (2005) has shown these differences in his comparative study between European states and the USA, noting how some forms of participation are more likely and others less so, with reference to the institutional contexts and political cultures prevailing in each state, including the relationship between science, technology and society. However, as far as the Italian case is concerned, although the national context is undoubtedly relevant, the regional or local level of political cultures emerges just as strongly, and is perhaps predominant. In fact, in our analysis of the organisational structures and participation procedures in the RECs, local political culture asserts itself as an actant directly involved in the co-construction of the modes of participation and internal governance for each initiative. Indeed, if it is true that for the RECs set up in response to the first national legislation, the associative structure was the most commonly chosen, for reasons dictated by their small size and the non-commercial nature imposed by the regulatory device, it is equally true that the organisational modalities of participation in associative form were influenced by the political cultures sedimented at a local level. This emerges most clearly in those areas characterised by widespread and sedimented cooperative practices in various sectors of activities and services, such as some areas in north-eastern Italy, and in particular Trentino and South Tyrol, where the cooperative form has historically played a central role in the provision of energy services in the absence of both state and market actors. In these areas, the construction of methods of participation and the decision-making for RECs has followed a trajectory corresponding to the participatory and political practices mentioned above and has found in the existing historical cooperatives an indisputable actant to enlist, insofar as they are already strongly legitimised at a local level for the re-investments they make in the local community. This same political culture

of participation is also co-constructing, even more directly, the idea for the organisational structure to be given to a number of RECs being developed in South Tyrol on the basis of the second regulation of 2021. In particular, there are two projects: one is a historical cooperative in Val di Fleres and the other a recent community cooperative (b*coop) based and operating in Brixen (a small city of about 22.700 inhabitants). For both, the promoters intend to recruit their members by proposing a co-operative structure for each of the two RECs in order to guarantee continuity with the participative and political practices characterising the history of this area.

> Part of the revenue (deriving from the distribution of economic incentives) goes to a community like ours and is used exclusively for community projects, as defined by the general assembly of members (b*coop representative, REC promoter from Brixen).

> Many are proud and happy to be members and they also see the value of the cooperative for the valley and this definitely creates a sense of community (...). During the last assembly, some members stood up and asked why we shouldn't have an REC here too. X told me that a cooperative similar to ours, CEDIS, has already done this in Trentino (cooperative representative Fleres, Val di Fleres, South Tyrol).

Therefore, in Italy, there is a plurality of participatory forms and structures that diversify and can diversify further in relation to the different laws, but even more so on the basis of the technical, social and economic infrastructure within each territory, and the network within which the actors promoting the REC are included, the availability of expertise in the area, the dimensions chosen for this socio-technical configuration, and the political and participatory cultures and practices sedimented in each region. These are the main human and non-human actors that co-construct the different forms of participation in the REC in different areas of the country. In the next section, again from the theoretical-methodological perspective of relational STS, we analyze a very particular case study, which identifies itself as an experimental model of an energy community, understood as a form of participation in a broader sense for the promotion of the local community and the most vulnerable segments of the population.

4. Socio-technical participation and regeneration in Southern Italy. The case of a marginal area of Messina

This particular case study presents some interesting elements regarding different forms of participation in the energy field:

1 the enrolment process for the establishment of an REC existed prior to the implementation of the first law of 2020, to which it was subsequently adapted, and was partly co-constructed, albeit with the intention of adopting a larger scale later on;

2 it integrates the type of participation promoted by civil society actors with a planned and integrated project and strong internal leadership;

3 it places the REC within a broader concept and participatory process, both in terms of the activities carried out within the territory and in terms of time span and overall objectives.

The complexity of this participatory experience will be analyzed by applying the main categories of the relational STS theoretical framework.

This case study concerns the process of social and urban regeneration in a highly marginalized area of the city of Messina (in Sicily, southern Italy) and is one of those interventions that intend to integrate the experimentation of solidarity-based energy communities in order to promote energy transition processes and the empowerment of vulnerable populations (Sen, 2010, 2000) in a shared and participatory form. More precisely, it regards an area of slums dating back to the

post-earthquake period, which re-formed after the Second World-War[4]. The Fondo Saccà slums are located near the city centre, close to many basic services (hospitals, transport, schools, etc.), and until recently, housed 70 families, who have now either acquired a house (49) or have been assigned a rented flat by the municipality. The current condition is the result of a wide-ranging intervention conducted over the last eight years, consisting of two separate but interconnected operations: the first is an experimental pilot project for social and ecological cohousing that is still being completed on two plots that were cleared in 2015; while the second operation, 'Capacity', is a much broader and more articulated urban regeneration project, adapted from the pilot scheme, and which is, in essence, a development of this on a larger-scale. The Messina Community Foundation has been partly responsible for the conception and implementation of these two projects, building up and coordinating a dense network of cooperation with various public and private actors.

The social and ecological cohousing project consists of six completed flats with two more still under construction. The adjective "social" indicates the primary purpose of this housing, which has been designed to accommodate vulnerable people with social and/or psychological difficulties. They are to be housed in four of the flats, while the other two are already occupied by the Civic and Educational Centre (CeCE), with the aim of building social cohesion in the area through educational activities for children. This experiment is highly innovative, both on a socio-technological and energy level, and these two aspects have been integrated in order to help regenerate the area. The socio-technical dimension includes different types of technology: the use of bio-architectural materials for the construction of the flats (wood for the load-bearing structure, straw and mortar for thermal insulation), home automation systems, a mechanism for recovering and recycling grey water for irrigating gardens and urban vegetable gardens, areas in which to set up neighbourhood workshops for children, and energy production and consumption systems from latest-generation photovoltaic systems, to which a storage system has been added. It is, above all, the socio-technical configuration linked to energy that acquires particular relevance, because it is associated with a predefined mechanism, known as the 'social algorithm', which makes it possible to redistribute the energy produced and the costs of its consumption not only in relation to the amount of energy used by each individual, but also on the basis of the characteristics and social-health needs of each member, which may, for example, involve the constant use of energy-intensive machinery for health care. The regulating principles of this algorithm are to be defined by an internal agreement between the inhabitants of the social cohousing, with the help of the FdC operators, all of which will contribute to outlining the participatory profile of a true energy community (Bawens, Devine-Wright, 2018; Magnani, Osti, 2016) based on solidarity, and which is already registered with the GSE[5]. Thus, we already find a very specific form of enrolment and mediation: non-human actors (technologies) are enlisted with the aim of reducing the gap in terms of access to energy (affordability) and relative comfort, which have so far characterised the histories of the human actors/beneficiaries involved in this intervention. The realisation of this experiment has actually helped to physically redesign this former slum, but it also represents a model that needs to be scaled up. Overall, the current form of the intervention is the result of the reprogramming of the initial idea, through a process of population involvement set up between 2014 and 2016, which operationalised the enrolment phase through a social survey of the local inhabitants. It is possible to consider this citizen involvement practice as an expression of the deliberative participation model. In fact, the survey method was the one normally used and patented by the FdC in Messina: the TSR® or Socially Responsible Territories research, whose objective is to map the principles/desires of the population inhabiting the area of interest in order to understand what their social and material priorities are (Giunta *et al*. 2006) and how they would like the territory to be modified (Musolino, 2017). The subject here, about and with whom

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4   For more on the long history and spatial segregation dynamics of this marginal area, see Farinella, Saitta 2013; Ginatempo 1976; Musolino, 2021; Musolino, Tarsia, 2019; Zampieri, 2018.
5   GSE is the energy services operator in Italy.

the TSR® research is conducted, is the "community of inhabitants", and the intervention or policy is addressed to them. The social research undertaken in the Maregrosso neighbourhood initially carried out a socio-demographic analysis of the chosen area, based on 2011 ISTAT census data. A survey of principles/desires was then carried out on a sample of inhabitants (437 - 110 of whom were between 8 and 14 years old and 326 between 15 and 85 years old - out of a total population of about 8,000 residents) using an action-research perspective, which intended to return the data, expressed in terms of the population's priorities regarding the reprogramming of the interventions, to the FdC (Lewin, 1980; Dolci, 1987)[6] In accordance with the methodological approach and the aims of the TSR®, a variety of survey techniques was used, depending on age, gender, living conditions, level of education, etc. The following survey tools were used: semi-structured interviews, cognitive maps (Lynch, 2010), workshop-type interventions in schools and the neighbourhood parish, socio-ethnographic observation, and QGis mapping of spatial perception. It is evident that, from this point of view, mediation consists of a set of interview/collection techniques, which show an exclusion/inclusion polarity. In fact, on the one hand, mediation includes only some of the total number of inhabitants, even though a reputational sampling method by areas was adopted, which has its own degree of representativeness; on the other hand, it has an inclusive capacity in terms of social variety and diversity. In reality, the type of (public) citizen co-constructed by this form of participation is clearly a 'deliberative citizen', with consciously broad and diverse characteristics, people who inhabit the local neighbourhood or area, both in the residential sense of the term and in relation to their constant presence, whether it be daily or habitual (either for work, use of public spaces, services, etc.). In addition, if the classic definition and characterisation of the deliberative citizen is someone who implements their participatory actions through predominantly discursive skills, then the mediation tools of the participatory form are much broader, as seen above, allowing further targets from the population to be included in the process. The reason (issue) for proposing this type of citizen for the project is thus well-defined by the process: the redevelopment of a marginal area and adjoining territory, with a view to ecological and energy transition. The resulting vision (vision) oscillates between two poles: one is linked to the socio-economic and cultural factors that characterise the area, and the other is represented by the strong centrality attributed to technological and management factors. These two poles reference each other, since the socio-political dimension of the vision is conceived and used in the practice of participation as a constraint that must necessarily be taken into account due to the fact that the intervention must be included in this reality, but it is also seen as the independent variable that indicates the general direction that should be taken in order for the inhabitants themselves to intervene effectively and comprehensibly. For its part, the technological innovation dimension has an educational role for the population or - to put it in terms of the approach adopted by the FdC – from an empowerment perspective: the vision requires the promotion of knowledge about new technologies involved in ecological and energy transition, as well as their more conscious and active practical use by citizens.

Thus, a circular movement emerges between the social/population and the technological and innovative dimensions. This allows us to add another characteristic to the profile of the deliberative citizen: that is, a citizen who must act in order to become more informed and aware (Chilvers, Longhurst, op. cit., p. 594), but also more autonomous in the practical use of technological innovations and of consumption behaviour, and this has an impact on the ecological dimension. Actually, in this respect, the participation process entrusts the citizen with the role of consumer, causing his/her deliberative profile to hybridise with that of citizen/consumer, but more considerations and more effective observations can be made on the ground once the energy community is fully operational. As things stand, however, what can be noted is that the design of this specific technology is intended for a temporary specific and limited target: a small number of individuals and families who present difficult conditions from a socio-economic and psycho-

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6   For a more in-depth look at the approach and methodological tools used, see Musolino, 2021.

logical point of view and who will therefore need the support of professionals with specific skills (educators, social workers) in order to understand and use the technology more consciously. In the analysis perspective adopted here, it will certainly be very interesting to verify whether and how the participation relationship mediated by the technological devices (Marres, op. cit.) used by the residents will change over time and be achieved in terms of greater awareness and autonomy, taking into account that support for these people will be maintained and adjusted according to their situations and receptiveness. This dimension is of great interest because normally, the most advanced technologies in the energy field are accessible only to medium-high population groups (Ryghaug *et al.*, op. cit., p. 297), as they usually have higher economic and cultural capital, and often a keen ecological and environmental sensitivity, and more easily invest money in the purchase of renewable energy technologies, while also spending time increasing their own knowledge and training on these issues. Conversely, the experimental project in Messina aims specifically to reduce the gap between the social strata as far as knowledge and access to both material systems and socio-technical configurations from renewable energy sources and the promotion of energy transition are concerned.

The participation set up with the cohousing project was adopted on a larger scale in the 'Capacity' project, firstly, with the intention of completely clearing Fondo Saccà and secondly, the housing emancipation of its inhabitants. For the sake of space, suffice it to say that the intervention actually led to the elimination of dilapidated housing in the area and the relocation of families according to capability and participatory modalities (for an in-depth study, cf. Leone, Giunta, 2019, p. 50 *et seq.*), adopting the deliberative modality so as to involve in the decision-making process precisely the type of citizen who is normally excluded from policy-making processes. This increase in the scale of urban regeneration was also accompanied by the idea of making a corresponding leap in scale in the level of participation in energy transition processes, through the possibility generated by the second legislation and the new non-human actors introduced by it (primary substation, etc.), which make it possible to enlist other actors (and PODs) from a wider area. In the case of Messina and the specific form of participation selected, the extension to the primary transformation substation would make it possible to enroll larger numbers of REC members, by following particular principles for their enrollment. These criteria are currently being elaborated, but they tend towards the inclusion of the most fragile families in the neighbourhood; more specifically, those families benefiting from the Capacity project are those who have decided to remain in the neighbourhood, while on the other hand, the criterion of exclusion concerns families belonging to the wealthiest segments of the population. The rationale behind this form of participation is once again related to the involvement of citizens, in this case the more vulnerable ones, who are included in a capacitation process in order to extend the network of ecological and energy transition processes according to "energy justice" (Hanke *et al.*, 2021) and "just transition" criteria (Wang, Lo, 2021), from the broader perspective of the regeneration of territories and the empowerment of vulnerable populations.

Conclusions

The main objectives of this contribution are to stimulate reflection and also to analyze the multiple forms of citizen involvement and participation in energy transition processes, paying particular attention to emerging energy communities. The relational STS theoretical-methodological approach adopted to analyze the creation process for these participatory practices in the energy sphere in Italy, indicates a plurality of forms located and co-produced at a local level, but also a series of human and non-human actors acting transversally at a national level, co-constructing enrolment procedures and the inclusion/exclusion mechanisms related to this. Some initial evidence has emerged concerning the definition of organisational forms influenced by institutional settings and political cultures sedimented at a local level, which co-construct

partially different forms of participation, albeit within similar or the same regulations. Indeed, in some areas of the country, which are more directly the subject of our ongoing research, such as Trentino and South Tyrol, the inspiration and support or clear choice for defining participation procedures in RECs corresponds to a cooperative type, with some differences, connected mainly to the urban and rural location of the socio-technical configurations. These initial results clearly suggest that in some contexts, the general and historical conditions are more favourable to the reception and development of these participation practices regarding energy transition, both for infrastructural reasons and for historical reasons linked to the sedimentation of the local community's culture of self-organization, in a more cooperative key.

On the other hand, the case study of the REC in Messina is clearly an experience co-constructed in relation to a type of local community with specific infrastructural characteristics and a political culture that is very different from those mentioned above, and also presents different meanings and objectives associated with the REC due to the difference in the local context. In fact, this form of participation integrates the socio-technical dimension in the energy field with that of social and urban regeneration, representing a possible direction to focus on in the coming years. In particular, we are referring to a series of interventions emerging in southern Italy, linked to the spread of energy communities, which are part of much broader processes of resistance and regeneration within vulnerable areas. The central element of these (currently few) cases is the experimentation of community energies as a function of a socio-economic and territorial rebalancing among the inhabitants of the South, and of a fairer interpretation of energy transition. Therefore, one of the trends that seems to be emerging, although not yet supported by consistent numbers, is related to the creation of community-based configurations aimed at redistributing the costs and opportunities of green transition in favour of the most fragile groups, and improving physical, structural, infrastructural and service aspects in marginal areas in southern Italy. This interpretation of energy transition and territorial transformation places the local area at the centre, in the sense that its participation is autonomous and the energy system decentralised, laying the foundations for a future redefinition of the map of local territories in a more polycentric key.

A number of initiatives that have already been set in motion in the South of Italy support this hypothesis (De Vidovich *et al.*, 2021). One of the best-known cases is certainly that of the 'Energetic and Solidarity Community of East Naples' in the S. Giovanni a Teduccio district, that was set up thanks to a private partnership between Legambiente Campania, Fondazione Famiglia di Maria, which has been working in the district for several years, and Fondazione con il Sud, which has granted funding. In this case too, the REC stands as a tool for contrasting energy poverty and achieving a fairer ecological transition, in the wake of a commitment to social regeneration and to combat poverty, in a neighbourhood with very specific features. In addition, two other energy communities with social goals are planned for Messina, one of which ('REC Lelat') will be located in one of the city's most problematic neighbourhoods, and the other ('synoikeo Messina') aims to integrate an REC into a collaborative living experience (*ibid.*).

As far as rural locations are concerned, on the other hand, the 'National Recovery and Resilience Plan' has committed substantial funding (2.20Bn €, 'Investment 1.2 - PNRR', p. 127) to support the diffusion of renewable energies through support for creating energy communities and collective self-consumption, in order to consolidate widespread and decentralised energy systems. This measure is targeted in particular at municipalities in inland areas with a population below 5,000 inhabitants. Again, this is a broad perspective intervention - at least, on paper -, which aims to use community energies to counter depopulation, isolation and the growing social and economic fragility of our country's small inland centres, promoting the conditions for local development and the digitization of economies, starting more precisely from the energy sector. The community matrix for these interventions should also produce greater social cohesion through forms of participation and direct involvement in the definition of these local initiatives and their internal regulations. Social cohesion is, in fact, another of the major objectives of PNRR policies

(*ibidem*, p. 129) to help fragile and rural areas. It is clear, therefore, that the socio-technical configurations of energy also have a dual function in the intentions of the political decision-maker. On the one hand, there is certainly a strong aspiration towards the expansion of renewable energy infrastructures in terms of the multiplication of decentralised systems, but this incentive is also aimed at social and territorial reinforcement, in terms of energy self-sufficiency (or rather, maximising self-consumption) from renewable sources and, thus the rediscovery of a local and community-based economy. However, these expected goals involve very different local contexts which - as is amply highlighted in this paper - co-construct forms of participation, even in the field of energy transition, projecting towards different REC 'models' or practices, both in terms of physical and geographical characteristics and internal governance structures. Therefore, by adopting the pragmatic perspective of relational STS, on which our analysis is based, it would be appropriate also for the more central institutional levels to take into account this plurality of possible and existing formations in order to formulate more appropriate and effective public policies.

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