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Unveiling the social transformative potential of Collective Action in Energy Transition: from energy communities towards a communalism of energy

Dario Padovan, Osman Arrobbio, Alessandro Sciullo, Davide Grasso, Andrea Taffuri, Jacopo Bindi, Francesco Bartolomei, Luca Mastrosimone¹

Abstract

Historically, significant energy transitions have coincided with turning points in human history, such as shifts from human to animal energy, from animal and biomass to fossil and nuclear energy, and more recently, from fossil to renewable energy due to the climate and ecological crisis. These transitions have led in the past to profound societal transformations, from hunter-gatherer societies to agrarian, manufacturing, and industrial societies, influencing the establishment of capitalist regimes and modern liberal democracies. The current energy transition however seems not so socially disrupting as one can expect. However, to underline the social change potential embodied in energy transition we develop a theoretical model of collective action linked to energy field. The article suggests that, based on the idea that energy communities can become social activators of a communalism of energy, we can envision a strategy for the reappropriation of energy as a common good and for a radical change of societal organization of energy, more horizontal, inclusive, equal and capable of reproducing new forms of energy citizenship.

Keywords: Community, energy, collective, action, transition, conflict, communalism

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Riassunto

Storicamente, transizioni energetiche significative hanno coinciso con punti di svolta nella storia dell'umanità, come il passaggio dall'energia umana a quella animale, da quella animale e da biomassa a quella fossile e nucleare e, più recentemente, da quella fossile a quella rinnovabile a causa della crisi climatica ed ecologica. Queste transizioni hanno portato in passato a profonde trasformazioni della società, da società di cacciatori-raccoglitori a società agricole, manifatturiere e industriali, influenzando l'istituzione di regimi capitalistici e delle moderne democrazie liberali. L'attuale transizione energetica, tuttavia, non sembra così sconvolgente dal punto di vista sociale come ci si potrebbe aspettare. Tuttavia, per sottolineare il potenziale di cambiamento sociale insito nella transizione energetica, sviluppiamo un modello teorico di azione collettiva legato al settore energetico. L'articolo suggerisce che, basandosi sull'idea che le comunità energetiche possono diventare attivatori sociali di un comunitarismo dell'energia, possiamo immaginare una strategia per la riappropriazione dell'energia come bene comune e per un cambiamento radicale dell'organizzazione sociale dell'energia, più orizzontale, inclusiva, equa e capace di riprodurre nuove forme di cittadinanza energetica.

Parole chiave: Comunità, energia, azione collettiva, transizione, conflitto, comunitarismo

■ 1. Introduction

The close relationship between energy systems and societal organisation is widely acknowledged and supported by substantial empirical evidence (Sorman and Giampietro, 2013; Smil, 2016). Energy production, distribution, and consumption practices influence daily behaviour, product design, labour organisation, and power distribution within societies (Burke, 2019). Conversely, societal needs, market dynamics, institutional arrangements, and political power structures contribute to maintaining the existing energy system and resisting change (Fisher-Kowalski et al 2019; Geels et al 2017; Smil 2017; Pirani, 2018; Padovan, 2018). Historically, significant energy transitions have coincided with turning points in human history, such as shifts from human to animal energy, from animal and biomass to fossil and nuclear energy, and more recently, from fossil to renewable energy due to the climate and ecological crisis. These transitions have led in the past to profound societal transformations, from hunter-gatherer societies to agrarian, manufacturing, and industrial societies, influencing the establishment of capitalist regimes and modern liberal democracies. The current energy transition however seems not so socially disrupting as one can expect. On the contrary, the current development, implementation, and governance of renewable energy technologies, seem potentially reinforcing existing power dynamics and inequalities. Signi-

ficant attention has been devoted to proposing solutions based on technical innovation and efficiency – from electrification both in the transport and domestic sectors to energy efficiency in buildings, from everyday energy savings to wind, geothermal and solar sources, not to speak of hydrogen and nuclear but the social dynamics and drivers that motivate groups of citizens to act collectively within the energy system – and the conditions under which their actions become transformative—have been largely overlooked. In this paper we contend that collective action in the energy sector is gaining some potentiality to drive a bottom-up energy change process. We see at collective action in the field of energy as a social process able to engender commoning action and to empower existing communities to shift away from prevailing socio-technical horizon to move toward energy equity, social inclusion and new energy communalism (Gregg et al., 2020; Lupi et al., 2021). Given this historical context, it is crucial to explore how the ongoing transition to renewable energy to produce electricity might also challenge the current capitalist and liberal system. Thus, this paper aims to investigate the potential for social transformation embodied into the proliferation of energy communities aimed to self-produce and self-consume electricity coming from solar energy even though we can find communities producing and consuming thermal energy from biomass as well as communities which manage energy storage for example managing electric cars. However, the kind of energy produced and consumed is irrelevant for the reflections that we want to provide addressing the following three key research questions.

- To what extent collective action for energy change could challenge the current model based on the fossil energy system?
- Which alternative social models could emerge, from the interaction of the likely crisis and conflicts triggered by the transition process and what might be the dynamics between individual and collective interests, and between incumbents and collective action?
- Closely related to the previous, which role might play collective action and its most diffused instance (energy communities) foster a radical social change and through which dynamics they could trigger this change?

To answer these questions the paper provides a theoretical reflection – not empirical – embracing a perspective based on collective action. We propose this model because it is the very useful to understand ambivalences, dualisms, contradictions which mark the energy change process. The paper will be organised as follow. In section 2, collective action will be framed and defined from a theoretical point of view, while in section 3 will propose a detailed analysis of how collective action forms in the energy field are configured. On the 4th section, the mobilization model from Tilly (1975) will be presented as the analytical framework to thoroughly explores how people collaborate in pursuit of shared interests in the energy market. Specifically, applying the model to energy communities highlighted that these communities could evolve through various trends and evolutionary dynamics. After having identified the main component of collective action in the energy transition, section 5 explores the

social revolution potential of the energy transition. Here we will try to identify components and dynamics of collective action, outlining some dynamics to wider scenarios in which this mobilisation can solidify and consequently produce concrete transitional dimensions. By analyzing potential different scenarios, we can envision a strategy for the reappropriation of energy as a common good, a potential radical form of societal organization of the energy for the future that we can call communalism of energy, more horizontal, inclusive, equal and capable of reproducing new forms of energy citizenship (Venturini, 2021; Wahlund and Palm, 2022).

■ 2. Framing Collective Action

Collective action is a perennial problem for social and philosophical sciences. In a broad sense, we can say that collective action is the solution that humans embrace to cope with problems that are individually unsolvable (Rosenthal, 1998). This leads to the centrality of collective action for the social realm. It is one of the core constituent elements of social life, implying for this a social ontology (Schatzki, 2003). It is also contended if collective action can go beyond the line that theorists have traditionally relied on in demarcating the social between society and materiality (Schatzki, 2010). Below, we provide a few theoretical hints that might help in framing collective action in the wider landscape of societal transformation.

First, it must be highlighted that action is not done under the full control of consciousness. Action should rather be seen as a node, a knot, and a conglomerate of many surprising sets of agencies that have to be slowly disentangled (Latour, 2005). It is a continuous source of uncertainty that has to be explained, if we will be able to do it. In a few words, we are trying to investigate what makes all of us do the same thing at the same time, in the same space for the same goal. Agencies and actors are not the point of departure to explain collective action in the energy transition, but rather what has to be explained. An ‘actor’ is not the source of an action, but the moving target of a vast array of entities swarming toward it.

Second, a more trivial dilemma concerns whether individuals acting collectively get or gain more than they would by acting individually. In the case of energy, the dilemma to be solved is whether people acting together can simultaneously satisfy their own individual energy needs or preferences and contribute to solving a common problem like climate change. Often, these cases of collective action dilemma are not win-win situations, thus people must choose so people have to decide whether to act selfishly or for the collective good.

Third, collective action is often seen as the mere sum of individual acts or the chaotic bundle of individualised practices. For example, when competing for ‘positional goods’. Generally, this race for goods is accompanied by a distributional struggle that exacerbates the social tensions rather than heightens social integration, creating a new beggar-my-neighbour (Hirsch, 1977).

In many cases, people act collectively also because they are disappointed by the behaviour of their provider and decide to take a new path leaving it and taking

in their own hands their faith. This latter, showed by Albert Hirschman (1970), is a pure case of exit, whereas people decide to experience new practices and strategies of goods provision. In short, through collective action, we might mean the choice by all or most individuals of the course of action that, when chosen by all or most individuals, leads to the collective best outcome. This course of action can be also referred to as cooperative behaviour (Elster, 1985).

A final remark refers to how collective action can manage a material component such as energy without delegating it to complex, large and bureaucratic organisations operating in the field of the energy market. Corporate activity implies the erasing of intermediate and collective bodies able to mediate between individuals and large organisations. While the “small” is not necessarily better than the “giant”, the former implies less delegation and greater collective involvement in organising its own activities or practices. In this sense, collective action entails a radical social innovation in the field of the management of natural resources, such as energy. This passage brings us directly to the core of this paper which focuses on collective action not only as the basic feature of the social realm, but also on a peculiar object of its action, namely the production, distribution and use of energy, usually of exclusive domain of bureaucratic intermediaries.

■ 3. Collective Action in the Energy Transition

3.1. The role of collective action in energy transition

Recently we are witnessing a growing amount of research and investigations devoted to the social aspects of energy transition. All these studies have extended merits for casting new lights about the social limits and potentialities of energy transition, but they lack the consideration of a proper collective perspective in addressing societal dynamics.

The transition from the traditional model of energy supply, characterised by centralised and big-size energy production plants, towards a more decentralised, small scale and renewable energy system seems to represent a valuable alternative. It therefore seems crucial to extend the analysis of a possible and necessary transition towards a more sustainable energy system open to the contribution of civil society in developing grassroots forms of social innovation (Sciullo et al, 2022). This perspective highlights the social and political features that the energy transition should carry on (Patrucco, 2023). It brings with it not only the mere substitution of impactful, unsustainable and exhaustible inputs with more efficient, less polluting and renewable ones, but presupposes new systemic approaches and new paradigms around energy (Magnani et al., 2023). In this context, new forms of collective action around energy are emerging in Europe (Sciullo et al., 2022; Wierling, 2023), promoting the re-territorialisation and disintermediation of energy systems. These forms of collective action are mainly represented by energy communities who promote a new model of service management, in which con-

sumers are no longer just passive market customers, but can become prosumers, active subjects who produce value and energy for self-consumption and sharing (Caramizaru and Uilhein, 2020). The production of energy from renewable sources, decentralised and distributed across the territory, seems to be the new frontier of ‘energy democracy’: it shortens supply chains and makes them controllable, reduces emissions and can distribute the ownership of plants hitherto concentrated in the hands of a few subjects (Patrucco, 2023). Rather than participating as mere and passive energy consumers, members of a collective can assume several different roles within the energy system but the idea of collective action in energy transition is subject to different interpretations within the literature. The form that collective action takes in its uprising in the field of energy has been usually called community energies or energy communities², and could refer to a variety of organisational forms such as cooperatives, purchasing groups or virtual communities. Some authors defined energy communities as any sustainable energy initiative led by nonprofit organisations, not commercially driven or government led (Walker and Devine-Wright, 2008, Hall et al., 2016); some others stress the grassroots innovation nature of community energy, as driven by civil society activists and by social and/or environmental needs, rather than rent seeking (Seyfang et al., 2014). For all, they have the potential and often are able to influence the ways and the extent to which energy is produced, distributed, consumed and dissipated. Along with these new roles new possibilities to engage and participate have developed (van der Schoor and Scholtens, 2015; Stern, 2014; Bomberg and McEwen, 2012). All these contributions underline the importance of civil society involvement. The role of energy communities varies on the basis of their relation or link with the energy system. We can here distinguish between approaches that analyse communities or cooperatives as alternatives to the large energy system or others that see them as complementary (Bauwens et al., 2022). Visions aimed to integrate communities into the energy system are Micro-grids, Integrated Energy Systems, Virtual Power Plants, Energy Hubs and Prosumer Community Groups. These approaches are designed to adapt to an already existing centralised energy system without taking in consideration real alternatives to energy incumbents (Koirala, et al., 2016). Some authors have criticized these conceptualizations of ECs, claiming that their top-down transformative nature is overly idealized and simplistic. (Bauwens et al. 2022). Additionally, Hanke et al. (2021) have demonstrated through empirical studies in various European contexts that ECs do not inherently result in greater energy justice. As a result, academic research should shift its focus on the social practices associated with them. This includes exploring what enables, enhances, inspires, includes, excludes, obscures, or hinders these practices in specific situations. More relevant to answer our research questions is the role of energy communities as engines of reorganisations of the local energy

² In the scientific and policy debate, community energy usually refers to grassroots initiatives with a wider ambition of societal transformation, whereas energy community refers to collaborative forms of energy production integrated in the market (e.g., within the framework of the REDII). In the following we adopt energy communities to refer to any collective action initiatives

systems through the engagement of local communities and fostering a bottom-up model able to capture the benefits of distributed energy resources and increase the people's global well-being. In this vision, local energy communities not only ensure self-provision of energy but also provide other crucial social benefits, such as inclusion, proactivity, and community empowerment. In these terms, collective action can easily go beyond the conventional boundaries of the energy system, embracing many other fields of social reproduction and organisation. In short, we can say that current reorganization of energy system based on energy community is highly disputed and controversial because it bears both features that can be well adapted to the incumbent energy regime or challenging it moving forward. For instance, the current legislation is not so favorable to the self-production but it supports self-consumption because it is able to balance the grid.

3.2 Theoretical models for investigating collective action

Not all the scholars who investigate the energy transition acknowledge the potentiality of collective action to challenge the current energy system. Someone sees collective action only as a more efficient and perhaps rational way to manage energy but does not fully recognise its power. The collective is social energy and energy communities are also energetic communities in the sense that the collective action that gives rise to them is social power (De Angelis, 2017), even if it is exerted through the control of devices and apparatuses aimed to capture and convert energy, a control that has consequences for the collective action itself³. From our point of view, it deserves to address our attention towards the raising and dynamics of collective action within social groups. Energy communities are inherently tied to collective action, as they harness social power to control devices and apparatuses for energy capture and conversion. From our perspective, there are several key theoretical models to consider developed along the time. Here we underline those of Mancur Olson, Elinor Ostrom, and Fred Hirsch.

Mancur Olson's (1965) free rider model suggests that individuals tend to act as free riders, prioritising their own benefit over group participation, as long as their private gains exceed personal costs. This can lead to inefficiencies and free-riding behaviour within collective efforts. A second theoretical perspective was pro-

³ At the turn of the twentieth century theorists in the humanities and social sciences were engaging with energetics and thermodynamic theory in their work. Following the radical developments of nineteenth-century physics, philosophers, sociologists, and literary authors reconceived 'non-material' phenomena (mind, society, culture) as part of the natural world through related concepts of energy, force, vibration, and rhythm. An energetic materialism emerged in which theorists reimagined matter as energy and contended with the dynamic relationships this ontology implied. While dynamic and developmental accounts of nature are often associated with evolutionary theory in the nineteenth century, we can say that the science of energy contributed equally to a metaphysics of transformation. The Henri Bergson's theory of mind and matter, Emile Durkheim's theory of society, Henry Adams's theory of history can be seen as important developments in twentieth century thought aimed to revise the notions of matter and interaction by elaborating them in a new discourse of energetic materialism (Badia, 2014).

posed by Elinor Ostrom, which includes many structural variables that make collective action possible, such as the importance of the number of participants involved, whether benefits are subtractive or fully shared (i.e., public goods vs common-pool resources) as well as the heterogeneity of participants. The likelihood of cooperation depends on how other structural variables are affected by the size of a group (see Ostrom, E., 2001). In the case of subtractiveness of goods, she criticises Olson by referring to common-pool resources as subtractable in nature. She also includes the problems of overexploitation and overcrowding, present for example among important types of collective pool resources such as forests, water systems, and pastures. Public goods and common-pool resources are both non-excludable, but the key distinction is their rivalry property. Public goods can be consumed without depleting resources for others, while common-pool resources require social group management through negotiated rules. Renewable energy fits both definitions (provide literature here). Collective action, as proposed by Fred Hirsch (1977), serves as a remedy for societal issues arising from economic growth, such as congestion, pollution, and scarcity. It counters individualistic behaviour by encouraging coordinated efforts to address common problems.

Olson, Ostrom and Hirsch, arguments raised the issue of collective goods that might emerge from collective action. What is peculiar when we refer to energy as a good, it's its original nature of public good that, through the mediation of the socio-technical regimes governing the production-distribution-consumption patterns, it's transformed into a common and even private good. In summary, energy is a hybrid that combines features of both public and collective goods, and it can become a private good when commodified. Collective action, such as energy communities, offers a potential model for managing energy challenges, but it requires specific enabling conditions to maintain its effectiveness, on which we will focus on the next section.

■ 4. The components of collective action as energy communities enablers

To investigate collective action applied to energy transition we embrace a mobilisation model built on Tilly's proposal (Tilly, 1978) to grasp the dynamics of 'inconspicuous' attempts to escape the incumbent hegemony of energy providers, while simultaneously coping with global environmental risks such as climate change. The model consists of five main characteristics of collective action initiatives (or contenders) in the energy market, which can be assessed in relation to the boundaries of the initiatives themselves: interest and motivation, that pertain to the internal perspective; organisation, that is a strong internal component which includes the way in which people take decisions; opportunities (and threats), that pertain to the external perspective; resources, that might refer to both the internal and external dimensions and the mobilization; power and social control, both the assumption and the outcome of collective action, that we could define as the agents capacity to mobilize

and control resources, institutions, and socio-political conditions in order to pursue a desired transformative goal (Foucault, 1980). Using Bertrand Russell's metaphor: "power is to politics what electricity is to physics". Power essentially concerns energy, the one that humans use to get things done (Russell, 1938). These dimensions, and their interactions, are visualised in the figure below and shortly described in the following paragraphs.

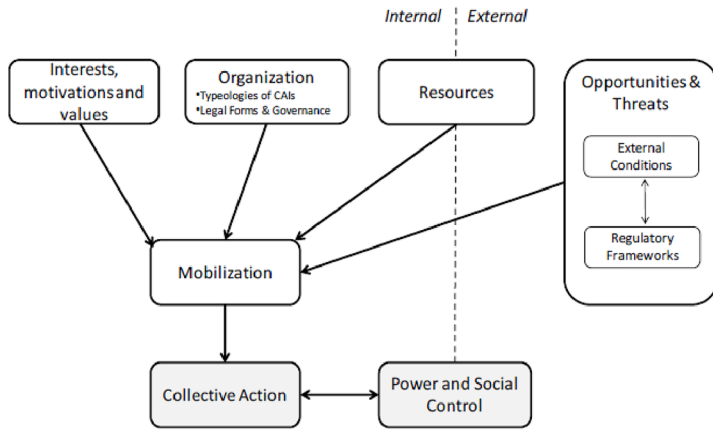


Figure 1. The Mobilization Model, inspired by Tilly (Gregg et. al., 2020).

4.1 Interests and solidarity

Interests are the consequences, both positive and negative, that emerge from the interactions of a group with other groups. The collective's overall advantages or disadvantages are largely shaped by the various ways it interacts with other collectives. When studying collective action, many analyses assume that groups and their interests are fixed, but the reality is more nuanced. Not all groups successfully mobilize, and not all mobilized groups act collectively. Furthermore, some collective actors fail to achieve their objectives, and many individuals come and go within these collectives. The ebb and flow of collective action are driven by shifts in social distinctions and the associated dynamics of class and roles, rather than changes in individual attitudes. Some theories extend beyond individual perspectives and underscore the importance of anticipating the actions of groups that have embraced new belief systems to drive social change (Stern and Dietz, 1994), as it has been the case of many energy communities founded by antinuclear activists around Europe. Shared beliefs play a critical role in defining interests and motivating actions directed toward those interests. While a common interest is a crucial factor in mobilisation, it becomes especially potent when it transcends the aspirations of a specific class or group, aiming to overcome current particular interests.

Using interest as a lens to predict collective action presents several challenges. One such challenge is determining the correct method for identifying a collective's interest. To address this issue, two alternative approaches can be employed:

- Deriving interest from the collective's own statements and actions (utilitarian approach).
- Analysing the broader relationship between interest and social position (social-structural approach).

Regarding how collective interests come into being, the transformation of energy into a common good necessitates the emergence of a diverse group of citizens who claim ownership of the energy system. From this standpoint, an energy collective is defined by its interest in liberating a local energy system, particularly electricity, from its status as a private good, thereby transforming it into a collective good.

Various motivating forces drive individuals to act, interact, and organize together, yet a consensus on their nature remains elusive. Nevertheless, we propose that when individuals come to collective energy action, it's fueled by expectations of both individual and collective interests, which can either align or conflict. For example, individual pursuits like financial gain and personal security may clash with aspects such as cooperation, trust, social approval, deliberative decision-making and the common ownership or use of resources, including distributing surplus energy to vulnerable populations.

This extensive array of reasons for collective action straddles two distinct ontological frameworks or two major systems of action: solidarity systems and interest systems (Pizzorno, 1966). These systems of action are both antagonist and cooperating. This is a distinction we can draw using the long history of 'fundamental dichotomies' known to sociological thought: civil society and state, community and society, organic solidarity and mechanical solidarity, acting in view of value and acting in view of interest, sacred societies and profane societies. When a system of solidarity operates on the structure and values of a system of interests, a process follows that we might call the formation of areas of equality. In fact, those who participate in a community of solidarity, as energy community, place themselves as equals regarding the values of a given system of interests.

Community is formed to the extent that the participants know that there is some equal rule for all of them. In other words, since the system of interests is a system of inequalities, a system of solidarity can be formed that acts on it to the extent that, in even the smallest area of action, inequalities are denied. The importance of community for studying collective action is increasing. We suggest that social bonds which predate specific "triggers" and "events" are of critical importance in providing social strength for long-term, risky, and concerted collective action. Community has the considerable advantage of offering social foundation for concerted collective action without requiring formal organization and the creation of a new set of statuses with new interests.

4.2 Organisation

The organisation is that aspect of a group's structure which most directly affects its capacity to act on its interests and corresponds to the extent of common action and unifying structure among the individuals in the population. Organisation is not static; it is but a process whose dynamism depends on the principal dilemma that organisation has to solve: the potential conflict between individuals and group interests. Often conflicts lead to fractures inside the collective and these fractures among members may crack the collective action. Conflicts can cross all the range of interests that enter the collective action process. The way in which these tensions can be held under control depends on the organisation.

The potential for collective action often arises from a diverse distribution of individual values and beliefs. The shift towards sustainable environmental practices is not merely a matter of policy but also a call to engage in collective efforts. To understand the challenges of collective action, we need to consider two contrasting perspectives: individual ontology and collective ontology, as previously discussed in the context of interests. These perspectives support different theories – individual ontology leans towards collective choice theories in situations with limited and well-defined alternatives, while collective ontology is more relevant for situations where available choices are inadequate. The growing interest in new forms of energy organisation highlights the limitations of the existing global energy system. However, the strategies to address these limitations can vary significantly, depending on whether the focus is on individually making choices or collectively taking action. Our concept of organisation emphasises inclusivity within a group and how it becomes an integral part of members' lives. We can assess inclusivity using indicators such as the time and energy members devote to collective action and the proportion of their social interactions within the group compared to their total interactions. Defining the boundaries of collective action is a complex task, as actions are inherently collective and involve various agents. These agents can range from individual behaviour contributing to collective action to systemic emergent properties of collective action. Our focus is primarily on the dynamic and often disorderly nature of collective action that leads to sudden and unpredictable changes and innovations. This distinction is useful for our purpose, as it helps us categorize collective agents as grassroots movements, communities, or cooperatives that make decisions collectively through a horizontal and bottom-up decision-making process, rather than following a top-down model typical of corporate actors. However, understanding the course of collective action we must also understand the way in which it can be solidified in some organization or institution. Here we face with the fact that any organized collective must take in consideration in its horizon of practices to move from the pre-established institutions that rule the field to new forms of organization and institution as modifiable by virtue of collective action itself. The problem here is if it is possible to escape the current institutional rules modifying them not only at the representational level but also affirming energy commons as a new institutional power structure (Dardot and Laval, 2019). In other words, collective action is both a matter of

internal organization of the mobilized collectives – inclusiveness or the amount of time, energy and social interaction devoted to the group membership; efficiency; effectiveness; differentiation; centrality and stratification (Tilly, 1978) – and a matter for anticipating institutions that deeply shape the social life, assembling the human and non-human interactions and structuring social activity in terms of overt or implicit social rules. New institutions emerging from collective action and the social dialectic among groups, classes, genders can balance interests and promote solidarity, channel social action, and shape the actors themselves in both the economic and social spheres, but they are different from bureaucratic and managerial organisations such as armies, companies, ministers (Donolo, 2018). The sphere in which human beings associate to satisfy material needs, to reproduce as well as to produce, to ‘bond’ with each other as individuals and as family groups, to socialise in a wide range of personal associations and levels of intimacy is that of institutions, and they are the potential that lay in the collective action as an anticipatory organizational form.

4.3 Mobilisation and resources’ control

Tilly’s mobilisation model places emphasis on the general idea that the more resources a group has access to, the better the chances are for mobilising collective action. In Tilly’s words, “mobilisation refers to the acquisition of collective control over resources” and “contending for power means employing mobilised resources to influence other groups” (1978, p. 78). This concept draws from Amitai Etzioni (1968), who views mobilisation as the rapid gain of control over previously uncontrolled resources, which can be economic, military, political, or psychological. Resource Mobilization Theory, inspired by this perspective, shifted the focus from individual participation and grievances in social movements to the rationality of movement actors. It emphasises the development of strategies and the coordination of resources to impact political processes. Resources in this context encompass various elements like labour, knowledge, goods, votes, norms, and trust. Mobilisation analysis explores how organisations gather and make these resources accessible for collective action. The level of collective control over resources significantly influences the outcomes of collective action. Mobilisation views the extent of resources that are under the collective control of the contender as a process. Recent investigations into local communities or other collectives that deliberated change in the control of resources like food, land, energy, water, mobility, and so forth have used the mobilisation approach (Markantoni, 2016; Gregg et al., 2020; Sciullo et al. 2020; Sciullo et al., 2021; Gregg et al., 2023). The common characteristic of all these processes is that they entail a transformation of the social unit involved. As mobilisation advances, as the unit commands more resources, and as more of the available total resources are used jointly rather than individually, the unit increases its ability to act collectively. Capacity to utilise resources, not legal ownership or title to benefits, is what really matters (Etzioni, 1968). Etzioni categorises resources as technical (e.g., energy plants), utilitarian

(e.g., energy services), and normative (e.g., loyalties and trust) (*Ibidem*). In the context of energy control, these classifications are relevant as they highlight the shift from factors of production to collective or common energy goods. In our case, we focus on a set of resources that vary from the factor of production nominally under collective control to an outcome that can be thought of as a collective or common good, the energy itself used in different places by different members. Mobilisation can also result from sudden changes that disrupt established practices and behaviours.

“Catalytic innovators” may play a pivotal role in initiating change. They drive social change by addressing underserved needs, offering simpler and cost-effective alternatives, and bringing in resources through unconventional means. However, they may be ignored or can face resistance from existing organisations that do not initially recognize the viability of their solutions (Moulaert et al., 2017). The approach based on catalytic innovators provides insights into social innovation but has limitations. It tends to favor a top-down perspective, where leaders or innovators drive mobilisation. This approach is akin to Weber’s concept of individual ‘charisma,’ blending rational and irrational elements, which may overestimate its ability to attract interests and resources. Collective action dynamics involve changing priorities of exit, voice, and loyalty. Professionals focus on resource accumulation without competing claims, rationalists adapt programs to group interests, and moralists emphasise building an inclusive group.

Collectives can mobilise through various methods: preparatory, alternative, and defensive mobilisation (Tilly, 1978). External threats prompt defensive mobilisation to protect members. Top-down alternative mobilisation is common, where groups gather resources to pursue distinct interests. Preparatory mobilisation, on the other hand, is the most top-down approach, where organisations accumulate resources in anticipation of potential opportunities and risks in the future. This aligns with early cooperative experiences where financial reserves were built to safeguard against future challenges such as unemployment, income losses, or shortages of essential resources like energy. Such preparation significantly enhances the group’s ability to act collectively, enabling them to make collective demands, solve common problems, and develop alternative solutions for the future. In many cases, it is challenging to differentiate between alternative and preparatory strategies, with the fundamental distinction lying between defensive and alternative mobilisation, each with different conservative and alternative implications.

4.4 Opportunity and threats

These concepts pertain to the relationship between a collective group and its external environment, which can either pose new chances or threats to the group’s interests. Analysing opportunities can be challenging since it’s difficult to determine which opportunities are realistically available at a given time. Numerous external factors influence collective mobilisation and development, and they heavily depend on the specific context and path. In the context of the energy field,

various factors can lead to the formation of collectives, including fluctuating energy prices, growing environmental awareness, inconsistent energy policies, dissatisfaction with national governments' environmental efforts, the desire to reduce energy dependence on foreign countries, and the evolving energy markets towards liberalisation and the transition to renewable energy generation and decentralised energy systems (Boon and Dieperink 2014; Sciuillo et al. 2021). These factors have created opportunities for local authorities and citizens to play an active role in energy production and ownership, fostering new participatory paradigms in the energy sector.

There are three key layers of potential factors that can influence and accelerate the energy transition: the energy and electrical power system, energy policies and regulatory frameworks, and socio-cultural attitudes towards the environment and cooperative models (Caramizaru and Uihlein, 2020). Finally, we can take in consideration the apparatus or device, referring to an assemblage of technical and social elements that, in each moment, has the strategic function to respond to an urgency or to plan strategies of reproduction of the system itself. In the case of energy, it indicates fundamental changes in the different operations of the energy regime.

In summary, the extent to which collective action could emerge depends on: (1) the identification of objective common interests - which refer to "that which is common" - amongst all particular interests and which therefore form the social bond and wide areas of equality; (2) the capacity of its organisation to convey action toward clear goals, encouraging useful alliances, and coordinating members for different activities; (3) its mobilisation (the amount of resources under its collective control); and (4) the capacity to understand the opportunity structure as crucial determinant of a group's collective action. Collective participants strive to create goods that hold value aligned with their interests, investing valuable resources in the process.

■ 5. Exploring the social revolution potential of Energy Transition

5.1 Challenging energy sovereignty towards energy communalism

The mobilisation model allowed us to identify components and dynamics of collective action in the field of energy transition. These components, beyond their analytical distinction, act together to delineate new relations of power at social levels, which depend on the various elements before delineated. We can add that the power of a collective action depends on the solidarity and equality shared by collective members, and on its capacity to mobilize the collective resources control, that implies the problem of control – not only the ownership - of both 'internal' (e.g., skills of collective members) or 'external' resources (e.g., money). Originally, time and money have been seen as cru-

cial resources, but resources must be understood more broadly as “any social, political, economic asset or capacity that can contribute to collective action” (Jenkins, 2001). The crucial resources needed to mobilize for achieving energy commons are socio-organizational resources (e.g., networks, organization, political intelligence), knowledge resources (e.g., skills, know-how, and technological expertise), symbolic resources (e.g., collective understanding, quest for autonomy, visible and meaningful actions), or structural and infrastructural resources (e.g., local grid management, subsidies or incentives) (Bomberg and McEwan, 2012; see also Gregg et al., 2020). Other resources that could play a role include, for instance, the extent of communication skills and public awareness, the availability of free technical information and competences, variations in community feeling, and time availability for volunteer-based work. The mobilization and control of these resources implies a bottom-up model both for managing these baseline resources as well as the self-produced and self-consumed energy by the community. This kind of self-government is already claimed in other sectors of commons such as food, water, land. For instance, seed commons or the collective management of seeds and associated knowledge is a major aim of food sovereignty to challenge the industrialized agriculture. To reclaim the commons there is a need to enable community control over growing, trading and consuming food. That will demand mutually supportive transformations in agriculture, economies, rights and political systems towards agroecology, the economics of solidarity, collective notions of property and direct democracy (Pimbert, 2022).

To reclaim the commons in the energy sector, we too must enable community control over producing, distributing and consuming energy. Starting from this idea, in this section we propose to look at the potential effects of these collective action dynamics to a wider dimension and try to identify scenarios in which this mobilisation can solidify and consequently produce concrete transitional dimensions toward energy commons. A transitional dimension means that in a certain situation – such as the energy global transition – power is contended by two or more large groups of agents, taking on a political significance relevant to a variety of interacting agents. Autonomy comes into play when one’s basic needs are met, and life’s possibilities become limitless. It’s about enjoying opportunities that go beyond utility, which serves the end of productive activity. Self-government, in essence, signifies the freedom of collectives to utilise their produced resources according to their own preferences, without being bound by utility’s principles.

The problem of power inherent to energy transition entails a twofold process. On one side, it involves a situation of dualism or multiplicity of agents competing for resource utilisation. On the other hand, it leads to a resolution of this competition, where someone ultimately prevails. The coexistence of multiple modes of production and consumption - in this case of energy - is typical of periods of transition. It highlights two perspectives in mutual tension: on the one hand, it implies a transition as a process in which, within the social formation dominated by capital relations, elements begin to emerge

that prefigure a new mode of production, e.g., ecological, thus sharpening the contradictions of the system itself and releasing new opportunities. On the other hand, we can consider a perspective by virtue of which the problem of the epistemic and political laceration necessary to begin the transition is eliminated, and instead configures a gradual, evolutionary transition, in any case not marked by precise breaking points. Dualism can thus be both coexistence and rupture. The transition to energy communalism is hardly conceivable as the coexistence of two ways of socially organizing energy that are structurally incompatible with each other. The emergence of energy communalism in the context of this dualist view immediately coincides with the transformation of the energy system on the global level. And since this transformation is conditioned by a number of local and global elements, the end of this dualism can only coincide with the phasing out of both the fossil regime and its primary form of technical-organizational and economic centralization.

The dualism or pluralism of power evident in various fields of action like energy, food, water, and health, can result in different transitional scenarios, culminating in irreconcilable forms of communalism or capitalism. When we mention ‘transitional horizons,’ we are referring to potential (though not necessarily probable) future scenarios emerging through various transition pathways in different contextual conditions. This transitional horizon represents a reversal of the dynamics that have guided human evolution to date. From this perspective, every individual can perceive their own humanity, making all equal to all others, maintaining their individually founded distinguishing values (Bataille, 1991).

The development and spread of energy communities have the potential to align with various transitional scenarios that are currently considered possible, although none of them can be confidently predicted in terms of likelihood. To shed light on different transitional scenarios for energy communalism based on their mobilisation dynamics, we can draw inspiration from Tilly’s framework (1978, 195-196), which outlines these possibilities:

- “Politics as usual” entails minimal disruption of the current energy order or regime, involving low-cost divisions between alternative political entities.
- “Coups” involve more costly divisions, although they are not necessarily irreversible, and result in relatively limited shift of members from a regime to another one. Coups are often top-down initiatives.
- “Silent revolutions,” if they occur, lead to significant movements of people while not necessarily fostering a revolutionary situation.
- “Great revolutions” are characterised by extensive divisions between alternative political entities and large-scale displacement of members toward the new energetic and ecological order.

By applying the mobilisation model to energy communities before, it was emphasised that these communities can evolve through various trends and evolutionary dynamics. Several factors that could support the emergence of energy communities are already in motion in terms of interest, organisation, mobilisation, resources, and opportunities. These factors include citizen enga-

gement in communities, favorable legislation, shifts in energy culture, and a growing anti-capitalist sentiment in response to ecological challenges. Considering these favorable conditions within the framework of potential transitional scenarios raises the question of whether energy communities have the potential to move beyond the current configuration, often driven by market rules, and shift toward an energy “communism” or “communalism.” In this context, “communism” or communalism revives its original meaning of a cooperative society based on mutual respect, where individuals contribute to the social labor fund according to their abilities and receive the means of life based on their needs. Communism is about recognizing society and the individual as ever-developing, self-generative, and mutually interdependent processes. It means also to conceive commons as the outcome of collective action and not a pre-existing object or condition around which to form the community or the communalist project. Only collective action can make the common, not only agreement or contract or again the recruitment on the energy grid fueled by renewable. It is the collective action in the practice that make community and commons arising, when individuals at any given time and under any given conditions, engages in the same task.

5.2 Energy transition and social unrests

It is intriguing to explore whether a profound shift in the energy regime provoked by the communalization of it can drive radical social changes and vice versa, whether radical social movements can lead to significant energy transitions. This perspective goes beyond the banal and conservative view according to which the energy transition to renewables should take place without the slightest alteration of not only the energy regime but also the social system to which energy provides its imprinting and matrix (see for example Padovan, 2018). “Revolutions” says Marina Fischer-Kowalski, “are not randomly distributed across time and space; instead, they are associated with certain conditions. Historical events like social revolutions follow patterns linked to how societies exploit natural resources. Beyond human inventiveness and technology, the availability of fossil energy carriers plays a pivotal role in industrial transformations. Their superior energy return on investment and abundance enable fundamental societal changes. However, reaping these benefits requires an equally fundamental socio-political transformation” (Fischer-Kowalski et al. 2019). Dramatic changes in socio-ecological metabolism can lead to significant consequences, including disruptive short-term events that may result in what we broadly refer to as “social revolutions.” This term encompasses a wide range of revolutionary events triggered by radical collective action, including true revolutions, uprisings, insurrections, protests, and both overt and clandestine conflicts. In contrast to many other authors, we propose a strong connection between the concept of social revolution and the energy regime and its historical and ongoing transitions.

Many social scientists who have explored “social revolutions” have highlighted the role of unclaimed/enclosed resources and contexts. For instance, Eisenstadt (1978) suggests that revolutions are more likely to occur when resources are not entirely devoted to subsistence. Tilly (1978) emphasises the control over resources by competing groups as a crucial factor in major social conflicts. Skocpol (1979) implicitly places revolutions within the transition from agrarian to industrial societies. Calhoun (1982) suggest that changes in energy resources such as the passage from water energy to steam energy can influence local mobilization promoted by rural communities. A change in energy regime is a matter of social mobilization as in the case of the introduction of the steam power which created a new type of factory system that eliminated an intricate set of controls based on kinship and community ties, which limited the potential anonymity of factory life (Smelser, 1968). The same we can say regarding the enclosure that excluded forest commoners from getting fuel from forests (Neeson, 1993) provoking widespread uprising. In general, we can say that the activity of commoning is conducted through labor with other resources; it does not make a division between “labor” and “natural resources.” On the contrary, it is labor which creates something as a resource, and it is by resources that the collectivity of labor comes to pass. As an action it is thus best understood as a verb rather than as a “common pool resource.” (Linebaugh, 2014) Whereas the resources created by commoning are threatened, social uprisings are likely.

These authors in a more or less consisting way have considered energy as a critical resource whose control is a matter of class struggle. Moreover, it is worth to note that the technical applications of the emerging energy regime in the means of production and reproduction represent a crucial point in the evolution of social conflicts about social and material metabolism. Andreas Malm (2013) suggests that “the transition to steam power coincided with the automation of cotton production” during the structural crisis of 1825-1842. These critical years of the transition to steam power were protected by laws that made intentional damage to coal mines or engines punishable by death. As claimed by Marx, “technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life, and the mental conceptions that flow from those relations” (Marx 1867, p. 493). When examining social revolutions through the energy lens, we identify three key dynamics that serve as determinants for their occurrence, either individually or in combination:

- Changes in social structure driven by profound energy shifts. For example, the transition to fossil fuels led to the urbanisation of a growing workforce, shifting from land-based biomass to fossil fuels. This change disrupted the dominance of landlords and created opportunities for a non-agrarian entrepreneurial class and a new class of urban wage labourers, reflecting the lens of class struggle.

- Vigorous mobilisation of competing authorities in response to energy changes, often resulting in a new property regime or the abolition of commons (e.g., forests for lignite). Fossil fuels immediately became subject to new property rules, while commons were excluded. This process is akin to the outlawing of peasants' wood gathering discussed by Marx in 1842 (Bensaid, 2007).
- Radical political mobilisation related to the practical applications of the energy transition in production methods, such as the case of the steam engine. These transitions can lead to collective mobilisation and uprisings, as exemplified by the Luddite uprising two centuries ago.

These cases illustrate how the pursuit, conversion, distribution, and consumption of greater and different energy carriers contribute to changes in the system's physical size and complexity, resulting in "social revolutions." Increased energy consumption leads to growth, entailing structural changes toward greater size and complexity. Conversely, reduced energy intake results in a decrease in structure. The relationship between energy and the overall system is deeply intertwined.

Given the interplay of these three factors (energetic, organisational, and political), the potential for energy communities to trigger profound social revolution and transition to a form of "energy communism or communalism" depends on the combination of their mobilisation processes. It involves their internal evolutionary paths toward controlling energy resources, as well as the external opportunities to frame this control within a broader societal context, with groups advocating for climate justice and a fossil-free future in the streets.

5.3 The mobilization against the fossil and for energy democracy

The transition from one energy regime to another can significantly influence the potential for radical social change or social revolution. This transformation interacts with changes in the energy budget, which can either increase or decrease. The shift from a biomass-based energy regime to a fossil fuel-based one, as noted by Fischer Kowalski et al. (2019), provided the backdrop for various social upheavals. Some were absorbed by the existing system, while others initiated new forms of governance. These dynamics were closely linked to the growing energy demand. The transitions from wood to coal to gas and oil enabled the economy to advance towards richer fuel sources. The abundance of fossil fuels had four major impacts. First, nearly all forms of fossil fuel supplanted solar and water-based production and communities dependent on them. Second, the extensive extraction and use of fossil fuels allowed for the substitution and control of a greater amount of human labour. Third, it increased the size and productivity of production units, setting the stage for overproduction crisis. Fourth, the thermodynamic power of fossil fuels facilitated the reorganisation of societal lifestyles around denser physical and social structures. Larger manufacturing units necessitated the concentration of more

production inputs in nearby plant spaces. This expansion led to urban growth as rural inhabitants migrated to the cities, where the solar-based societal ideals were incongruent with the fossil fuel-driven society.

In the context of the current energy transition and our research questions, the role of energy communities in harnessing the potential for social change toward a more equitable socio-economic model is significant for three points:

- Regarding the change in social structure and mobilisation of sovereign actors, the ongoing reconfiguration of the social system around the new energy mix is already taking place. This process adds complexity and potential risks to the emerging social order.
- The race beyond the limits set by fossil capital is being eroded by the increasing complexity of its consequences. As society becomes more complex, it involves more sub-groups, social roles, networks, controls, information flow, centralization of information, specialisation, and interdependence of parts. Greater complexity demands more energy for resource production, information processing, administration, and protection. As complexity increases, the society may reach a point where additional investments yield declining marginal returns, making it vulnerable to collapse.
- Regarding political mobilization and conflicts, they are already flaming around the world, not to speak of a couple of wars that are strictly connected with the changes of the energy global system.

The challenge for energy communities (within the wider energy transition trajectories) and for the mobilisation process from which they should emerge is therefore twofold: on the one hand the need to balance the satisfaction of societal energy needs and the contrast to energy demand increase; on the other to avoid the increasing energy poverty and injustice caused by the current fossil capitalistic model building up an alternative vision based on the collaborative governance of sustainable energy as a common good (De Angelis, 2017). That is to trigger a deep social change towards a form of solar communism (Schwartzman, 1996). In this respect, the current institutional, social and economic context within which the energy communities are emerging (mostly shaped by the EU directives REDII) is not promising. At least three major reasons that might negatively affect the mobilisation dynamic can be highlighted:

- As for the opportunities, the institutional framework is slowly being finalised but still uncertain about how much ‘sovereignty’ will be formally conceded to “commoners” (i.e. community members).
- On the side of the interests and organisations, the few established (or in the process of establishment) energy communities are often triggered by economic interests of the participants (i.e. lowering the energy bill) and often directly or indirectly established by the same energy companies, formally not allowed to be member of the communities.
- As for the control on the resources, the EU directive keeps the market as the main mediator of the energy exchange since the members of the communities must be part of the energy market as customers of an energy retailer.

At first glance, the current model for Renewable Energy Communities (RECs), as promoted by the evolving regulatory framework, appears to have limited potential for radical social change. It raises questions about whether the traditional form of energy communities, such as energy cooperatives established before EU directives, might have a more significant impact on steering the energy transition towards more radical change. The option to mobilise and take control of energy resources outside the formal institutional framework and establish a different form of energy community remains open, but it would necessitate an actual social revolution from the outset. In terms of radical political mobilisation, the social dynamics seem to be more favourable for supporting radical social changes. The ongoing energy transition away from fossil fuels to an as-yet-unclear new energy horizon is already provoking social unrest. Examples include strong protests in Europe against rising energy prices and the cost of living. Hossain and Hallock (2022) have identified an unprecedented global wave of over 12,500 protests in 148 countries in 2022, driven by issues related to food, energy, and the cost of living, with many of the largest protests occurring in Western Europe. These protests were triggered by specific governmental failures to protect citizens against the effects of food and energy price increases.

The societal attitude towards radical change in the current energy and socio-economic system appears to be evolving in favour of supporting radical proposals. Energy communities can interact with these mobilisation dynamics from two intertwined perspectives. First, they can leverage these mobilisation dynamics to create a favourable public attitude for alternative and radical changes. A communalism approach could provide an alternative to the current model, giving people control over the necessary resources for a decent life, addressing the grievances expressed in these protests. Second, energy communities could play a crucial role in minimising or possibly avoiding the risk that these mobilizations lead to an evolution from a liberal-democratic system to a fully authoritarian or Leviathan model (Wainwright and Mann, 2018), with a centralised control over resources.

■ 6. Conclusions: from energy communities to a communalism of energy

The renewable energy transition is currently underway, expected to progress more swiftly and under greater governance compared to previous energy transitions. The future scenarios, or transitional horizons, remain open and unclear, with uncertain pathways to achieve them. As social systems attempt to reduce complexity and address emerging challenges, they often do so at the expense of their environment, leading to an ecological crisis. This crisis is driving societies to transition away from fossil fuels towards a new energy foundation, which, in turn, influences social structure and organisation. In light of these considerations, the research questions can be restated as follows:

- What kind of society will emerge as a result of alternative energy systems?
- If the chosen system fails, what alternative options are available?
- What role do collective action and energy communities play in enabling these alternative pathways?

As a provisional response, we can identify two distinct and irreconcilable options for the future. The more likely option involves greater investments in problem-solving, increasing overall complexity, and a higher reliance on energy. This path is driven by the pursuit of material comforts, vested interests, a lack of viable alternatives, and explicit support from certain components of global capital. If the trajectory of problem-solving that capital has followed for centuries continues, this path is likely to be taken in the near future. It will be characterized by green capitalism, eco-modernism, geo-engineering, and other related approaches, often punctuated by conflicts, wars, and new forms of colonialism and imperialism with unintended consequences. The second path involves stimulating cultural and economic simplicity and sufficiency, aiming for lower energy costs, and fostering a process “beyond growth.” This transition could occur through various frames:

1. The “soft landing” scenario, preferred by many, envisions a voluntary shift to solar energy, green fuels, energy-conserving technologies, and reduced overall consumption.
2. The “irenical dismissing” approach advocates the replacement of giant and vertical capitalism with a cooperative sharing economy.
3. The “eco-social revolution” or the establishment of an eco-socialist or eco-communist society based on open communities and a reevaluation of commons, commoning, and commoners’ collectives. In this scenario, economic growth and consumerism may be removed from the realm of ideology, and a social revolution supporting these changes would be upheld.

This latter frame concerns the evolution of energy communities. As we have seen, energy changes often imply social uprisings. This could be also the case of this still fragile energy transition started a few years ago but hesitantly moving upward with ongoing socio-ecological conflicts. Widespread dynamics of final price increasing of fossil energy have seen immediate and radical reactions from civil society that can be actually considered as crucial components of a mobilisation process within which energy communities can actually play a crucial role. The potential of energy communities to trigger radical social change hinges both on their capacity to influence the re-configuration of the economic and regulatory energy landscape and to support the mobilisation process that is arising against the energy incumbents and their allied governments. Both dynamics are being driven by the environmental crisis and its increasing effects on societal functions and relations, a magmatic situation that makes it more and more urgent to investigate the relationships among the ecological and energy transition and the future societies we will be able to build.

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