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Engineering and colombian “community energies”: a symbiosis towards a just energy transition.

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CONTENTS

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ENGINEERING AND COLOMBIAN “COMMUNITY ENERGIES”: A SYMBIOSIS TOWARDS A JUST ENERGY TRANSITION

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Abstract: In view of the multidimensional crisis that the planet is experiencing, a just energy transition is urgently needed. Such transition requires effective participation of historically marginalized communities. This paper presents the preliminary results of a case study that explores the role that engineering can play in supporting the Colombian experiences known as Community Energies. Through a documentary review, three main results were found: technical alternatives should reclaim violated rights, respect the culture of the communities and stimulate public policies with research. Although further research is needed (including additional methods or empirical research), this paper closes by showing that these experiences demand the training of future engineers with a more comprehensive understanding of the energy issue and skills for working with communities.

Key words: Community energy, design, engaged engineering, engineering education, just energy transition

1. Introduction

Faced with the multidimensional crisis that the planet is experiencing, mostly caused by the burning of hydrocarbons, areas such as engineering maintain a research agenda oriented towards the search for a technological "leap" capable of containing emissions or developing a "clean" energy source on a large scale. This vision overlooks the important role that community and territorial organizations could play in the energy transition. Not only because these organization have been demanding for decades that the way out to the crisis must guarantee environmental and social justice, but they have also implemented a series of initiatives, incorporating technical elements, which they have called "Community Energies". With this in mind the articulation between engineering students, professionals and Community Energies organizations can result in a symbiotic relationship.

For engineering, it may be relevant to investigate dimensions of the problem and proposals that had not been considered so far. On the other hand, territorial organizations have achieved great progress without support; however, they are interested in having technical assistance. In this regard this paper presents the preliminary results of a case study that seeks to identify how engineering can strengthen Community Energies. With this objective in mind, in addition to this brief introduction, the paper contains three more sections: a discussion and delimitation of the concept of Community Energy with which this research works, followed by the results of the research question. Finally, it closes with some final considerations.

2. What are community energies?

The term “community energy” (CE) has a strong presence within activism [1], [2], [3] and European regulation [4], or literature in English language [5]. However, the popularization of the term with the increasing number of initiatives, initially in northern Europe [6], was not accompanied by a clear delineation of its meaning [7], [8], [5]. This has led the term to be confused with other concepts and to be used ambiguously, to the point that, depending on the context, it can be used to position the interests of different, even contradictory, social sectors. Despite this diversity of uses, it is usually associated with energy communities, with collective ownership and decision making on technologies that take advantage of renewable energy, as well as with the distribution of its benefits.

Contrary to what [8] states, many of these experiences also exist in Latin America. Evidence of this is the "mapping of alternative renewable energy generation and/or manufacturing projects on a local scale, carried out during 2018 [by the Rosa Luxemburg Foundation], in nine Latin American countries" [9] that found more than 700 initiatives. Despite this number, the term "community energy" does not yet have the visibility and usage that it has

already achieved on the European continent. Recognizing the importance of these experiences, in the Colombian case, the organizations Censat Agua Viva, Movimiento Ríos Vivos, Colectivo de Reservas Campesinas y Comunitarias de Santander, and Fundaexpresión have been working for years to promote the concept and the multiplication of these types of initiatives.

These organizations have been affected, in different ways, by the extractive and predatory logic that sacrifices ecosystems and communities in the interest of profit, although it is usually justified by a supposed general interest. As this logic is based on an energy model, the main cause of the civilizational crisis that the planet is experiencing, organizations have characterized it (fossil-fuelled, centralized, private, patriarchal, militarized, etc.) to point out the urgency and the foundations of an energy transition that is fair to communities [11]. This vision of transition, in addition to incorporating the reclaiming of rights violated by the prevailing energy model, includes the leadership of the communities themselves. For this reason, these organizations define community energies as:

"The set of knowledge, practices and socio-environmental transformation processes in the production and consumption of energies and food, which favour the creation of dignified living conditions for the most vulnerable communities, which respect all forms of life present on the planet and which contribute in the mitigation of the climate crisis, building peace and in the reconstruction of the social fabric."

Although not explicitly stated in this concept, there are several elements that these organizations use to characterize community energies. Firstly, they promote decentralized generation, the measured and local use of energy, avoiding the waste of materials, energy and food that characterizes the prevailing model [10]. Therefore, the objective is not the generation of profit but rather the satisfaction of local needs, prioritizing self-sufficiency.

The CEs broaden the vision of energy that predominates in the prevailing energy model, where it is usually reduced to electricity or fuels, understood as infinite resources. In contrast, CEs propose that energy is a dimension that permeates and can condition all aspects of life (food, thermal well-being, sanitation, health, work, education, transportation, leisure, etc.). For this reason, although they understand the biophysical limitations of the planet, the CEs advocate the right to access to a minimum of energy that guarantees dignified conditions of permanence in the territories.

On the other hand, CEs "are proposals developed by grassroots organizations, with proven territorial roots" [12] which design implement and operate them, guaranteeing the sustainability of the initiative over time, the relevance of the selected energy generation techniques and uses, and the strengthening of the social fabric based on energy self-management [13]. The existence of such social fabric, along with the construction of decent conditions of permanence in the territory, allows facing the rural exodus of young people towards the marginality of the cities while strengthening local culture and food sovereignty.

Given the concentration of power in the States and large corporations for decision-making on the future of the energy model, the solidarity and the networking that the CE organizations have been developing is crucial. This has allowed knowledge and practices to be shared, stimulating new practices, for example through the farmer-to-farmer methodology [13], as well as the construction of alliances and proposals that are beginning to dispute ground in the field of public policies [12].

3. How to strengthen CE from engineering?

Given the importance of this type of initiatives to materialize an energy transition that guarantees social justice and environmental justice, and considering the centrality that "knowledge, practices and processes" [12] have in the previously presented concept, four axes in which technical areas such as engineering could strengthen CE are presented below. They are described separately to facilitate understanding| but are in fact closely linked.

3.1. Restoration of rights and technical alternatives to address them

Contrary to the benefits promised by the prevailing energy model, it has provoked numerous socio-environmental conflicts in which communities are displaced, access to common goods is monopolized and limited depending on payment capacity, culture and social fabric are destroyed, there is a biodiversity loss, climate patterns are altered, there is proliferation of new diseases, among others. [11] [13] [14] [15]. Despite this, the States still do not recognize their responsibility in the restoration of the rights of the communities affected by the energy model and the climate crisis.

In this regard, there are experiences of CE that have been claiming the restitution of their rights and making visible ways in which engineering could find new applications to address other demands of the affected communities. Two examples that can be highlighted are the construction of a

biodigester that guarantees a sanitation and cooking system for a school of 350 students [16] and the use of solar dehydrators to dry coffee to counteract the change in the microclimate caused by both the Hidroituango dam and the climate crisis.

3.2. Building alternatives in cultural terms

However, the construction of alternatives is not limited to finding new areas of application for engineering as it is known, since it also requires understanding that the just energy transition is influenced by a cultural dimension. The energy waste caused by the production and international circulation of large quantities of goods is based on a consumerist culture that makes the impacts on other communities invisible [17]. For this reason, its transformation requires questioning the type of society in which humanity is accustomed to live (transportation, housing, food, health, urban planning, separation from nature, etc.) [11].

In the case of CE, the construction of alternatives involves recognizing the relationship that communities had (or still have) with water, winds, biodiversity, food or in general with energy [13]. The challenge for engineering is to recognize how the preservation of culture, the improvement of living conditions, and the attention to the climate crisis can be translated into technical criteria. An emblematic case that illustrates this challenge is the process of reconstruction of the island of Providencia after the passage of Hurricane Iota in 2020 [18]. Although concrete and steel construction is usually associated with better quality, these were not necessarily the most suitable materials for the island's saline environment. as widely known by the Raizal community inhabiting the island.

3.3. Transformation of existing public policy

Despite the geographic scope, the longevity in decades of several CEs and the potential to stimulate them as part of a just energy transition [13], previous national governments in Colombia limited themselves to promoting a transition as a diversification of the energy matrix based on large-scale private renewable projects, in many cases with export vocation [11]. There is a diversity of studies that have been identifying the regulatory barriers of the legislation built during those governments, making recommendations [7], [8], [17], [19], [20] and there are even public policy proposals [12].

Although these studies represent a step forward, empirical research still needs to be developed [7]. On the one hand, it is necessary to study the errors of local technology transfer policies that on several occasions have ended up with abandoned artefacts. On the other hand, it is necessary to quantify the impact that CEs have on reducing emissions, increasing biodiversity, mitigating climate change, reducing transmission losses and reducing multidimensional poverty. These types of studies could support a strong inter-ministerial support to the CE, as well as evidence of the risk of increasing the dependence of the Colombian economy on hydrocarbons, leading to a "carbon lock-in" [21].

3.4. Training professionals with a more complex vision

Perhaps the main challenge for engineering to strengthen CE is the training of professionals, researchers and extension workers who do not limit their vision of energy transition to a simple change of technology or energy source [13], nor their practice to working with large enterprises. Although the National University of Colombia has been the only one, so far, to propose a space for debate on the "Contributions from engineering education for a just energy transition" [22] in the country, most of its reflections did not go beyond the call for an "integral" education and for students to take subjects from other areas of knowledge.

However, the CEs show the inability of a centralized energy system to avoid losses, the consequences of assuming that energy is a commodity only accessible to those who have purchasing power, the magnitude of the climate crisis and the differential effects between territories and countries, the difficulty of generating ever-increasing amounts of energy in a world with finite materials, the multiple relationships and dependencies between life (not only human) and energy, etc. [11] [13]. Contrary to the impression that the seminar at the National University of Colombia may have left [22], the "justice" of the transition requires changes both in the contents and premises of training, as well as in the methodologies within the disciplinary classes.

4. Final considerations

The preliminary results of this study show that the relationship between engineering and the Colombian CE experiences is a fertile ground for work. Such an alliance is not only stimulated by the demands of technical knowledge that CEs have, but may allow engineering to transform the dominant paradigm that limits its contribution to the energy transition. As long as engineering reduces its scope of action to working with industry and large enterprises, or simplifies the energy transition to a change of technology or energy source, it will

hardly be able to stimulate the energy model to ensure social and environmental justice.

A deeper analysis of these results is still needed, broadening the frame of reference or research methods. However, it does not seem hasty to affirm the need to develop experiences of articulated work between engineering and CE in order to further explores the potential of this relationship. While graduate work or research projects can be done with CE as the object of study, other alternatives could be: field visits, inviting people who lead CE to present their experience in classes, university extension projects with CE as an ally/beneficiary, and even aiming at the transformation of the engineering curriculum to study how to incorporate social and environmental justice into the work of energy transition.

It will also be essential that this articulated work be accompanied by a diligent exercise of recording, systematization and reflection. The lessons learned from these pilot projects may encourage more engineering schools to start working with CE and make more explicit in their programs how they are contributing to a justice energy transition.

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