

## Participate in a collective self-consumption operation: Who's the winner? – Evidence from France

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### Introduction

According to RTE, achieving carbon neutrality in 2021 would require a significant increase in renewable energy production capacity (RTE, 2021) and a major overhaul of energy systems in France and Europe. To support this transition, the European RED II and RED III directives defined four fundamental strategic objectives: increasing renewable production capacity, mobilizing private capital, increasing consumer participation, and bringing flexibility to the electricity system (Vernay et al., 2023).

In France, the rollout of collective self-consumption (CSC) is directly in line with this dynamic, although it only partially meets these ambitions. While ACC is intended to increase installed capacity, particularly through solar photovoltaics, and to mobilize private savings or local investment, its impact on active citizen participation remains modest and largely dependent on third-party facilitators. Furthermore, research highlights that CCS currently has no tangible effect on the flexibility of the French electricity system (Vernay et al., 2023).

Economically speaking, the ACC is emerging as an alternative market mechanism capable of ensuring the profitability of investments while easing the burden on the public purse. Unlike traditional support mechanisms such as the purchase obligation (EDF OA), whose costs are passed on to the public purse, the ACC allows for the direct valuation of energy between local producers and consumers.

Finally, the relevance of managing the energy transition at a sub-national level is increasingly being affirmed by regulatory authorities (CRE, 2026). This local approach, which is at the heart of the ACC model, brings production and consumption closer together, potentially reducing network losses and requiring the emergence of local governance in line with the characteristics of the transactions carried out.

Collective self-consumption (CSC) refers in French law to the supply of electricity organized between one or more producers and one or more end consumers, who must be linked within a legal entity (often referred to as the organizing legal entity, OLE). This legal framework anchors ACC in a “regulated” local sharing system (rather than a liberalized peer-to-peer market), where collective organization, internal rules, and information exchanges with the network operator become structuring factors for member participation (Law No. 2025-391 of April 30, 2025). The Energy Code distinguishes between “patrimonial” operations, where the producer, consumer, and PMO are a single entity and the electricity is shared between several buildings, and “extended” operations, where several entities exchange electricity within a framework constrained by criteria of geographical proximity and power. These criteria are defined by ministerial decree after consultation with the

Energy Regulatory Commission. The regular evolution of these criteria reflects an institutional framework that is still being adjusted, which directly influences the potential size of communities and their organizational costs.

## Literature review

At the European level, the ACC is part of a broader trend toward shared energy and energy communities, formalized in particular by work on the transposition of collective self-consumption and energy community frameworks in Member States. Frieden et al. (2021) highlight the diversity of national choices (scope, rights, sharing arrangements, roles of third parties), as well as the legal and organizational frictions caused by these transpositions.

In the French case, Dieme (2020) identifies two main ACC models: (i) a “prosumer” model where the community (or its members) owns the production assets (often PV), and (ii) a “third party” model where an external investor (developer, utility, etc.) owns the asset and sells the electricity to the community.

Recent economic literature finally formalizes ACC as an arrangement where the value created depends not only on physical electricity flows, but also on internal governance instruments (sharing rules, internal pricing schemes, membership fees, etc.). Balegamire & Gautier (2025) model a community that buys surplus from prosumers and resells it to members, showing that the sharing rule (e.g., per capita vs. pro-rata consumption) and internal prices are key levers for defining “viable” operations and distributing surplus between prosumers and consumers.

### The profitability of collective self-consumption, the primacy of the self-consumption rate, and the role of heterogeneity

The literature indicates that the profitability of a collective self-consumption operation is strongly correlated with the rate of self-consumed or collectively consumed energy, measured by the “self-consumption rate.” This is because the economic value comes largely from the difference between locally consumed electricity (which avoids purchase at retail price) and surplus electricity (often less valuable) (D'Adamo et al., 2022; Abada et al., 2020). This dependence on the self-consumption rate raises the issue of the heterogeneity of consumption profiles within the community. Research on sharing schemes shows that the ability to match production and consumption (diversity of uses, timeframes, flexibility) automatically increases the volume of self-consumption and can improve economic profitability (D'Adamo et al., 2022; Abada et al., 2020).

In the French case, however, Dieme (2020) offers a more pessimistic conclusion: given the current national framework, the PV ACC projects studied appear to be unprofitable, with taxes and tariff components playing a central role. The author then discusses the minimum policies needed to restore profitability: a subsidy of around 40% of the investment for the “prosumer” model, or the abolition of the CSPE for the “third party” model (in its fiscal and tariff framework).

Viability, stability and value sharing: rentability-equity/acceptability dilemma

Beyond aggregate profitability, the literature emphasizes the viability of communities: a collective can create value but fail to stabilize if sub-coalitions have an interest in leaving or if the sharing rule is deemed unacceptable. Here too, heterogeneity plays a central role. Abada et al. (2020) draw on cooperative game theory and show that, despite potential gains (including aggregation gains related to network costs), there is no guarantee that a community will be stable; stability depends in particular on coordination costs and the sharing rule. Thus, the heterogeneity of profiles within a coalition seems to play an ambiguous role: it can improve stability by increasing profitability, but it can also increase divergent interests (antagonistic interests between prosumers and simple consumers) and make the coalition unstable (Gautier et al., 2025). Furthermore, Bowens (2016) highlights the fact that the members of an energy cooperative do not form a homogeneous group. Two categories of member motivations emerge: “egocentric” (material, financial interest) and social or moral norms (environmental concern, interpersonal trust, identification with the group). Long-standing members tend to be more norm-oriented and have a higher level of commitment in terms of finance and governance (Bauwens, 2016).

Recent work on sharing rules highlights a dilemma between profitability and fairness/acceptability: for Abada et al. (2020), pro-rata and static rules fail to stabilize the coalition because they do not sufficiently reward members whose consumption profile is most beneficial to the group. Jacqmin et al. (2026) analyze the French case in detail: the default rule is a dynamic distribution proportional to consumption, and the authors emphasize that adherence to the default is reinforced by behavioral biases and community governance. They discuss several limitations: the risk of inequity when profiles/flexibilities differ, price signals that may encourage counterproductive behavior (e.g., rebound), and tension between a top-down approach and the logic of commons governance.

Pro rata consumption keys tend to maximize self-consumption (and therefore total value), but can result in distributions that are unfavorable to small consumers or less synchronous profiles, thereby reducing heterogeneity and long-term profitability (Balegamire and Gautier, 2025; Villalorga Palou, 2023; Camblong, 2023). Similarly, the per capita rule is considered simpler, more transparent, and fairer, but it undermines the profitability of the operation (Balegamire and Gautier, 2025; Villalorga Palou, 2023). However, internal sharing rules influence the performance and acceptability of operations (Camblong, 2023). It is therefore necessary to question the long-term viability of these operations within the framework of the sharing rules defined above.

Finally, recent literature emphasizes the plurality of definitions of fairness and the metrics that can be used (equality, distributive justice, protection of the most vulnerable, etc.). Work on equity indicators in local electricity markets shows that there is no single consensus and that the choice of indicators shapes normative conclusions and design recommendations (Couraud et al., 2025).

### Investment, network and incentives: aligning private interests and social costs

The link between ACC operations is twofold: the impact of investment in renewable electricity generation units on the grid (operation/grid interaction) and on sharing within the operation (inter-grid interaction).

On the grid, Gautier, Jacqmin & Poudou (2025) show that a community can contribute positively to well-being if appropriate Coasian-type grid pricing can align the community's interests with the maximization of well-being, while limiting negative effects on non-members. The interest of operations is to increase production capacity. In the event of overinvestment, this can lead to an increase in network costs and thus be passed on to non-members.

Within the operation, some contributions show that savings can be maximized when allocation coefficients reflect actual consumption rather than initial investment, which can disconnect capital contribution from access to energy benefits. Llera Sastresa et al. (2023) document this point by comparing allocation criteria (consumption vs. investment participation/subscribed power) and showing the impact on savings.

### Barriers and transaction costs

The obstacles to ACC deployment are widely documented but often grouped under the general category of “barriers.” These include access to funding (Frieden et al., 2021; Roberts, 2019), access to real-time data, administrative barriers (Frieden et al., 2021), and governance or physical barriers (space requirements, roof strength, etc.) (Roberts, 2019) are all obstacles to the emergence of CCS operations.

These findings resonate with the framework of transaction cost economics: since Coase (1937), the explanation for the use of organizational forms rather than the market has been based on the cost of “transacting.” Williamson then formalized the key attributes of transactions (uncertainty, frequency, specific investments) that guide the choice of governance structures.

Brousseau and Nicita also point out that institutional frameworks determine a significant portion of the costs incurred by agents to exchange, define, and enforce rights and rules.

Recent studies explicitly apply this framework to similar mechanisms (local flexibility markets), showing that, in “proof of concept” phases, transaction costs can exceed contractual revenues and that standardization, regulation, aggregation, and automation are major levers for reducing these costs (Nolden et al., 2025).

Even if the ACC is not identical to a local flexibility market, the analogy is useful for thinking of the ACC as a chain of transactions (member entry/exit, data collection, sharing rules, billing, control, dispute resolution), where size, profile heterogeneity, and the degree of sophistication of the rules can increase coordination, information, and governance costs. This can potentially be to the detriment of smaller participants.

The literature shows that the trade-off between profitability and fairness/acceptability via several mechanisms, particularly the default sharing rule, seems to favor large producers and large consumers, with alternatives to the default rule making operations more costly and complex to administer. This implies significant transaction costs. To our knowledge, no article has studied self-consumption operations in France from a transaction cost economics perspective in order to determine the participation and organizational costs borne by producers and consumers within an ACC operation and how these costs interact with the size, heterogeneity, and sharing rules of these operations. The aim will therefore be to define the potential for inclusiveness in terms of broad participation and viability in terms of the stability of the coalition of these communities.

Motivations:

- Study of the French case in the literature on LEMs
- Definition of the conditions for emergence and broad participation in local energy markets
- Study of regulatory incentives to adapt tools to the profile, while taking into account the total cost of regulation

## Bibliography