Tariff Design and Pricing in Energy Communities

María Victoria Gasca*, Remy Rigo-Mariani*, Vincent Debusschere*, Yousra Sidqi†
*Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France
†Lucerne University of Applied Sciences and Arts
Email: victoria.gasca@grenoble-inp.fr

***Abstract*—Energy tariffs and incentives for renewable energy generation are key to encouraging residential users to engage in local energy production and form renewable energy communities (RECs). However, tariffs highly influence decisions and the benefits obtained by stakeholders. Typically, the retail tariff consists of fixed, time of use, inclined blocks, and/or dynamic fares; nevertheless, the more complex the tariff is, the less understandable it is for end-users and not necessarily the best tariff for all stakeholders. Therefore, this research analyzes the sensitivity of RECs' internal prices while implementing three grid purchasing tariffs (fix, time-of-use, and dynamic). The impact on both stakeholders (aggregator and retailer) is analyzed, as well as their interactions and the benefits for the end-users. Results indicate that, regardless of the internal pricing values, the community manager and the REC members receive optimal benefits when those internal tariffs are equal (e.g., purchasing equal to feeding in price).**

***Index Terms*—Aggregator, community manager, energy communities, prosumers, tariffs.**

I. INTRODUCTION

Renewable Energy Communities (RECs) consist of the aggregation of serval electricity end-users that can share renewable energy, primarily from solar, wind, or biomass sources. RECs promote energy independence, sustainability, and resilience by empowering local stakeholders with their energy consumption. Beyond environmental benefits, they offer a democratized energy system, where participants have a say in energy-related decisions and share economic rewards, such as reduced utility costs at both the users' and the community's levels. In typical REC organizations, an aggregator entity acts as a "community manager," facilitating interactions between end-users and retailers. Each user has a vested interest in RECs, primarily driven by economic incentives that depend on the potential savings compared to a baseline in which energy is traded with a retailer and cannot be shared with neighbors.

RECs' tariff structures are essential for internal energy exchanges. Since ECs produce and distribute their power, their internal pricing schemes shall encourage participation, reward energy-sharing behaviors, and ensure fair cost distribution. Traditional tariffs encompass flat-rate, dynamic, time-of-use (TOU), and inclined block tariffs. Any other arrangement, such as post-delivery allocation, is possible as transactions between members are not necessarily subject to regulation. However, any surplus/deficit of energy traded with retailers follows conventional rates (e.g., TOU).

Numerous tariffs are currently in place across countries, regions, and jurisdictions [1]. These tariffs are designed to align with regulations, reflect the generation prices specific to each country, and cater to the typical demand behavior of a given grid. However, this conventional approach has shifted with the emergence of structures like RECs.

Consequently, it is crucial to understand and evaluate the impact of different tariff structures and values within the community on both individual and collective costs. Significant research has already been conducted on dynamic rates; for instance, in [2], the authors compare the use of various assets when having different grid tariff designs, including taxes. Several asset compositions providing flexibility to the grid impact such tariff designs. Likewise, an analysis of the impact of grid tariffs and tariff structure for RECs is proposed in [3]. Similar approaches have been implemented for RECs comprising storage devices, such as heat pumps and thermal energy storage [4], [5]. Other analyses proposed to design tariffs in the framework of a two-level optimization problem [6].

However, such works are focused on local energy markets, which position the aggregator solely as an intermediary non-profit entity. This assumption is sometimes far from reality. Additionally, no interactions between retailers and aggregators are considered. Lastly, the implications of internal prices within the REC should be part of the discussion in such analyses.

This work proposes to implement a sensitivity analysis to grid tariffs and analyzes the impact on both actors (aggregators and retailers), their interactions, and the benefits for end-users. Moreover, the importance of reducing mathematical complexities is highlighted while proposing comprehensible tariffs for end-users. Various factors simultaneously influence the interests of the stakeholders and end-users' incentives. Retail pricing is primarily driven by retailers' goals to maximize revenue, which can influence consumer behavior and market dynamics. Understanding these interactions is crucial for analyzing the overall performance of RECs and the evolution of energy tariffs. In this context, two contributions are proposed in this paper.

1) A sensitivity analysis over internal tariffs in a REC while testing three grid purchasing tariffs.
2) A comparison of aggregator vs individuals' perspective on the economic benefits.

The remainder of the paper is organized as follows: Section II describes the optimization model of centralized and decentralized energy management. The grid tariff considerations are described in Section III as well as the assessment method. Section IV draws the main results of the sensitivity analysis. Finally, Section V discloses the conclusions.

This work is supported by the French National Research Agency in the framework of the "Investissements d'avenir" program (ANR-15-IDEX-02) and by SWEET LANTERN (Swiss Federal Office of Energy, Project No. SI/502544)

979-8-3315-1278-1/25/$31.00© 2025 European Union

II. SYSTEM MODEL

This work deals with a residential REC of N members, all motivated to leverage solar energy for enhanced efficiency and sustainability. Through individual investment in solar technology and storage, these consumers can significantly lower their energy expenditures while actively participating in the transition toward renewable energy sources. The power consumption of each member n and the PV generation profile are modeled using the variables ($P^{l}_{t,n}$) and ($P^{pv}_{t,n}$) respectively. The energy storage system can charge ($P^{b-}_{t,n}$) and discharge ($P^{b+}_{t,n}$) based on the implemented management strategy which ultimately impacts the power exchanges ($P^{r+}_{t,n}$ and $P^{r-}_{t,n}$) with the main grid for given load/generation profiles. Equation 6 also accounts for its total energy capacity E^{b}_{max} and efficiency η. Equations (1) to (8) model the energy flows within the community with specific operating constraints for the storage, i.e., to avoid simultaneous charge/discharge with the binary variables ($u^{b}_{t,n}$), and state of charge (SOC) update.

$$P^{r-}_{t,n} + P^{pv}_{t,n} + P^{b+}_{t,n} = P^{r+}_{t,n} + P^{b-}_{t,n} + P^{l}_{t,n} \forall \{t,n\} \epsilon \{T,N\} \tag{1}$$

$$P^{r+}_{t,n} \leq u^{r}_{t,n} \cdot P^{r}_{max} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{2}$$

$$P^{r-}_{t,n} \leq (1 - u^{r}_{t,n}) \cdot P^{r}_{max} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{3}$$

$$P^{b+}_{t,n} \leq u^{b}_{t,n} \cdot P^{b}_{max} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{4}$$

$$P^{b-}_{t,n} \leq (1 - u^{b}_{t,n}) \cdot P^{b}_{max} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{5}$$

$$SOC_{t+1,n} = SOC_{t,n} + \left(\eta \cdot P^{g-}_{t,n} - \frac{P^{b+}_{t,n}}{\eta} \right) \times \frac{dt}{E^{b}_{max,n}} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{6}$$

$$\underline{SOC} \leq SOC_{t,n} \leq \overline{SOC} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{7}$$

$$\begin{aligned} SOC_{t=0,n} &= SOC^{ini}_{n} \\ SOC_{t=T,n} &= SOC_{t=0,n} \end{aligned} \quad \forall \, n \, \epsilon \, N \tag{8}$$

A. Decentralized energy management system

In a decentralized energy management framework, users perform on their own the energy management of their assets and each trades electricity with the retailer solely, as shown in Fig. 1.

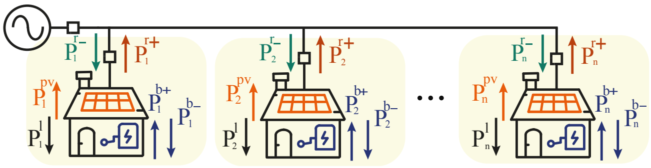

Fig. 1. Conventional power management for individuals.

Electricity purchase is charged at the retail price π^{r-}_{t}, and the feed-in tariff corresponds to π^{r+}_{t} (i.e., the tariff for selling the surplus of electricity). Both prices are determined by the retailer considering different factors, policies, and regulations [1]. In this work, these prices vary depending on the analyzed case, the first one considers flat tariffs for both purchase and selling prices, the second one a TOU tariff, and the third one a dynamic tariff. Furthermore, it is assumed that individuals prioritize their profit. Their main objective is to reduce energy imports based on purchase prices while gaining additional revenue by exporting or selling their surplus to the grid.

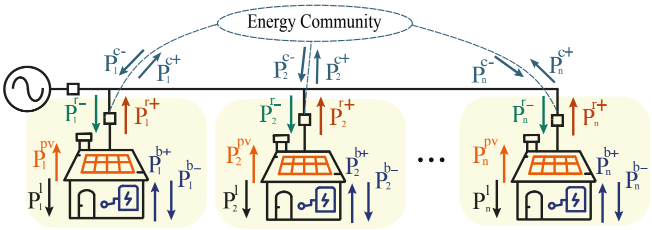

Fig. 2. Renewable energy community scheme (the dashed lines show the aggregated power).

To allocate resources optimally and achieve desired outcomes, such as lowering operational costs, an optimization model is expressed as follows.

$$\min B^{I}_{n} = \sum_{t} (\pi^{r-}_{t} \times P^{r-}_{t,n} - \pi^{r+}_{t} \times P^{r+}_{t,n}) \times dt \tag{9}$$

$$\text{s.t.} \quad (1) - (8)$$

B. Centralized energy management system

In a REC, the users interact with their supplier, purchasing ($P^{r-}_{t,n}$) and selling the surplus ($P^{r+}_{t,n}$). Internally, there are energy exchanges between users, purchasing power ($P^{c-}_{t,n}$) at an internal community price π^{c-} and selling their surplus ($P^{c+}_{t,n}$) at π^{c+}. These prices influence the overall community exchanges with the main grid. Fig. 2 depicts a scheme of a REC with an energy management system (EMS).

The overall optimization problem aiming at minimizing the net community energy bill is described as follows, where Equation (1) is modified to include the internal exchanges of the EC as in Equation (11). Note that Equation 12 ensures the balance in internal trading.

$$\min \sum_{n} B^{C}_{n} = \sum_{n} \sum_{t} (\pi^{c-} \times P^{c-}_{t,n} + \pi^{r-} \times P^{r-}_{t,n} \tag{10}$$

$$- \pi^{c+} \times P^{c+}_{t,n} - \pi^{r+} \times P^{r+}_{t,n}) \times dt$$

s.t.

$$P^{r-}_{t,n} + P^{c-}_{t,n} + P^{pv}_{t,n} + P^{b+}_{t,n} = \tag{11}$$

$$P^{l}_{t,n} + P^{b-}_{t,n} + P^{r+}_{t,n} + P^{c+}_{t,n} \quad \forall \{t,n\} \epsilon \{T,N\}$$

$$\sum_{n} P^{c+}_{t,n} = \sum_{n} P^{c-}_{t,n} \quad \forall \quad t \, \epsilon \, T \tag{12}$$

$$P^{r+}_{t,n} + P^{c+}_{t,n} \leq \overline{P} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{13}$$

$$P^{r-}_{t,n} + P^{c-}_{t,n} \leq \overline{P} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{14}$$

$$P^{c+}_{t,n} \leq \mu^{c}_{t,n} \times \overline{P} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{15}$$

$$P^{c-}_{t,n} \leq (1 - \mu^{c}_{t,n}) \times \overline{P} \quad \forall \{t,n\} \epsilon \{T,N\} \tag{16}$$

$$(2) - (8)$$

III. GRID TARIFFS AND ASSESSMENT

Several tariffs are applied to both energy management frameworks (i.e., centralized and decentralized EMS). It is assumed that the retailer can appoint three tariffs. The first one includes a fixed price throughout the analyzed period (e.g., one year). The second tariff attempts to motivate users to modify their consumption pattern by lowering prices at historically low consumption measurements and increasing the price when there is a conjunction of a heavy grid burden and high consumption; this is the TOU tariff. The third tariff uses the dynamic prices of the electricity market.

The economic performance of the REC is evaluated by calculating the collective bill savings relative to a baseline scenario. The baseline scenario entails users individually selling their energy production and adhering to conventional consumption practices.

A. *Collective bill savings*

In the baseline scenario, users operate independently and interact solely with the grid, utilizing a decentralized EMS. The financial implications are assessed by calculating the final bill post-central EMS of the REC, as outlined in Section II. Consequently, bill savings are determined by the difference between the initial bill under the decentralized model and the final bill achieved through collective energy management, as specified in Equation (17).

$$BS^C = \frac{\sum_n B_n^I - B^C}{\sum_n B_n^I} \tag{17}$$

B. *Individual bill savings*

To calculate the individual bill savings, a key of repartition or cost allocation strategy is needed [7]. The allocation of costs within RECs is a highly debated topic, particularly regarding its fairness [8]. To analyze the implications of varying tariffs on one distribution methodology, this paper focuses on a straightforward approach for bill distribution as outlined in [8] and [9].

The individual savings, expressed in Equation (18), correspond to the comparison between the initial billing (B_n^I) and the final one after the formation of the REC, utilizing a bill repartition methodology (b_n). The equal allocation of non-separable costs (EANSV) method is used for the distribution of the bill to effectively assign individual expense values [8], [9].

$$BS_n^I = \frac{B_n^I - b_n}{B_n^I} \tag{18}$$

Separable costs refer to the individual expenses incurred before joining a REC, while non-separable costs represent the discrepancy between the community bill and the sum of the individual costs [10]. Among various methods for allocating non-separable costs, EANSV assigns to each end-user their respective separable costs and then distributes the non-separable costs equally. As shown by Equation (19), this methodology streamlines the calculations and distributes the costs considering the end-users' initial net bill to allocate the new costs effectively.

$$b_n = B_n^I + \frac{(B^C - \sum_n B_n^I)}{N} \tag{19}$$

IV. RESULTS

The findings presented herein are derived from the dataset provided by [11], which encompasses power consumption profiles $P_{t,n}^l$ over one year. To streamline the analysis, clustering techniques were employed to select two representative days from each month. This methodology ensures that the energy representation across the 24 selected days is consistent with that of the entire year. Consequently, the simulation is conducted over 24 days, effectively representing a full year's data.

The evaluated REC comprises a diverse mix of users, acknowledging that some users do not invest in energy storage, while others may utilize larger battery systems. The PV power profiles $P_{t,n}^{pv}$ are sourced from [12] and are replicated for 10 users. The installed capacities are listed in Table I.

TABLE I
EC'S USERS INSTALLED CAPACITY.

User	P_{max}^l **[kW]**	P_{max}^{pv} **[kW]**	P_{max}^b **[kW/h]**
1	1.51	6.2	0
2	3.26	13.1	0
3	2.04	4.73	0
4	6.50	13.03	3.38
5	3.28	2.13	1.11
6	6.85	0	0
7	4.77	16.24	1.92
8	4.35	5.97	0.93
9	3.24	3.01	0
10	3.74	4.84	0.83

The retail prices correspond to the description in Section III, and are depicted in Fig. 3 for a representative day. The considered grid prices are fixed, Time-of-Use (TOU), and dynamic tariffs for purchasing electricity from the grid. The fixed and TOU prices are based on [13], and the dynamic prices are taken from [14]. Moreover, Fig. 3 also displays the feed-in/export tariff (which is fixed for all tested cases) [13]. It is important to note that in this analysis the established internal purchase price consistently exceeds the selling price across all tested scenarios.

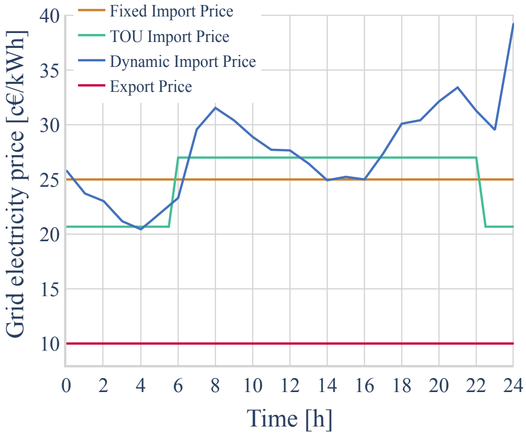

Fig. 3. Grid prices inputs for a typical day.

A. *Aggregator's and retailer's perspective:*

From the energy community's perspective, a global supervision is taken from the aggregator (or community manager), who handles the internal prices of the EC to achieve larger benefits on his behalf.

In this work, different internal energy prices were tested. The prices range from the feed-in tariff to the fixed retailer purchase price, i.e., $[\pi^{r+} — \pi^{r-}] = [10 — 25]c€$ [13]. The purchase price is always larger for every combination of prices than the feed-in price $\pi^{r+} \leq \pi^{r-}$.

The results show that internal prices should not significantly differ in order to maximize bill savings. The REC manager should aim to counteract these prices, prioritizing higher internal purchasing prices. As demonstrated in Fig. 4, maximum collective bill savings occur when internal prices align (i.e., $\pi^{r+} = \pi^{r-}$), leading to a consensus (i.e., $K = 0$). This indicates that having a diverse range of internal prices, as seen in peer-to-peer pricing models, may not yield the most advantageous outcomes for the collective interest.

Interestingly, regardless of the internal prices, the bill savings are similar when the difference in the internal prices is the same, i.e., if the values of $\pi^{r+} - \pi^{r-} = K$, where K can take values from 0 to 15. A zoomed section is highlighted in Fig. 4, which displays the outcomes when having a $K = 1$. As observed from the zoomed section, variations in bill savings remain relatively unaffected by whether the REC internal prices are high or low as long as K remains the same (e.g., for a $K = 1$, the prices could vary as $\pi^{r+} = 24\,\text{c€}$, $\pi^{r-} = 25\,\text{c€}$ or $\pi^{r+} = 11\,\text{c€}$, $\pi^{r-} = 12)\,\text{c€}$. This phenomenon is similarly observed across the grid purchase price structures, including fixed, TOU, and dynamic pricing models. The findings imply that the absolute values of internal prices are less critical; instead, the difference between these prices plays a more substantial role in impacting outcomes.

Moreover, there is an inverse relation between the internal price difference K and the bill savings. The larger the difference in the internal prices (i.e., a large K), the lower the savings on the bill. Hence, when the internal prices are equal to the retail prices as in the fixed tariff, i.e., $\pi^{r+} = 10\,\text{c€}$ and $\pi^{r-} = 25\,\text{c€}$, the bill does not considerably change with respect to the baseline, given that there is no economic incentive to trade within the REC (if the consideration relies only on economic preferences). This result is similar for the three types of grid purchase tariffs, as observed in Fig. 4 for a $K = 15$, in which the collective savings reach less than 10% for the dynamic and TOU grid purchasing prices.

From an aggregator's standpoint, opting for a TOU grid tariff can significantly enhance overall benefits. The TOU tariff can yield up to 21 % in additional savings compared to dynamic pricing and 17.7 % against a fixed tariff. However, this advantage diminishes when the internal price difference is at a threshold of ($K \geq 11$), where dynamic pricing takes precedence.

Conversely, from the retailer's perspective, the highest earnings are achieved in opposition to the aggregator's interests. The largest bill is achieved at high prices during periods of consumption, such as the case of dynamic prices. There is a consensus when $K = 8$ between the fixed and dynamic price and at $K = 12$ for the TOU and dynamic prices, which indicates that the retailer and the community manager agree on achieving equality in the benefits at these prices. After surpassing a difference in the internal prices ($K \geq 8$) the fixed tariff is predominantly better than the dynamic or the TOU tariff from the retailer's perspective.

B. Individual's perspective

The relationship between collective and individual bill savings is proportional, even if some users get more benefits than others, depending on their initial assets investment. Fig. 5 shows this relationship, which leads to the conclusion that the users are in line with the community manager. In general, the TOU tariff is more beneficial for members of the REC. Fig. 6 shows the bill savings of Users 4 and 7 when applying three grid tariffs; it is visible that the individual behavior resembles the community manager's perspective of the obtained benefits as shown in Fig. 4.

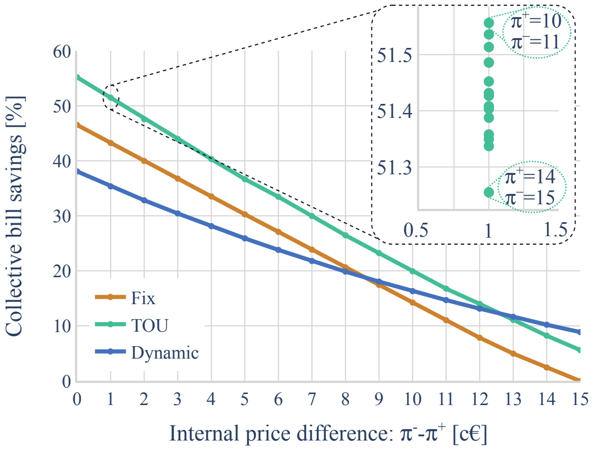

Fig. 4. Comparison of purchase tariffs, considering the difference in internal prices ($P^{c-} - P^{c+}$).

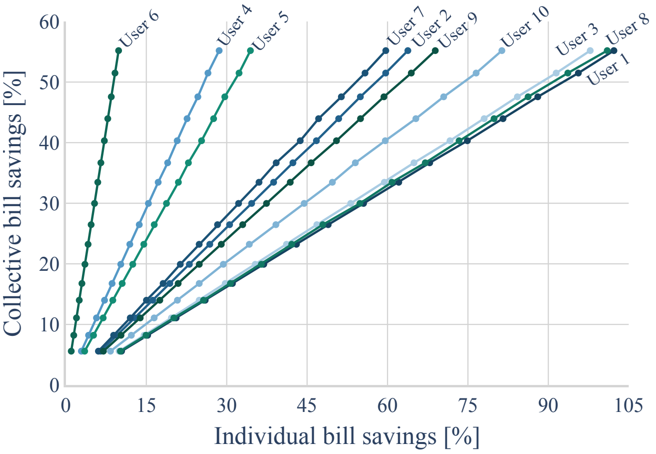

Fig. 5. Comparison of collective and individual bill savings for a TOU purchasing price, using the EANSV bill repartition.

Leveraging reduced purchase prices during periods of peak demand enhances the advantages for both the aggregator and end users, benefiting most stakeholders within the energy community. The internal purchase price has also been strategically established below the market grid purchasing price to encourage consumer engagement in the energy community. Importantly, conducting internal transactions at a uniform pricing model increases bill savings, positively impacting the community manager and individual participants.

Despite the prevailing consensus, not all stakeholders share this viewpoint. As previously noted, retailers hold a contrasting perspective, but this perception extends to other users likewise. Dynamic pricing renders enhanced advantages for certain individuals, such as Users 3 and 8, who stand to benefit more significantly from this pricing strat-

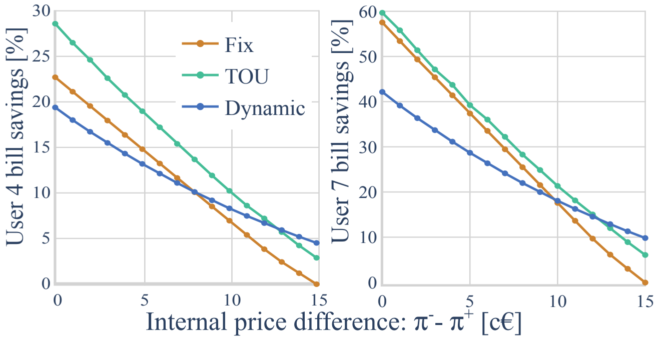

Fig. 6. Individual bill savings of Users 4 and 7, for three purchasing prices, using the EANSV bill repartition.

egy. Notably, User 8 exhibits a significant self-consumption rate, given that her/his initial electricity bill is nearly zero. Consequently, when applying alternative pricing models like dynamic pricing, User 8's bill could decrease by as much as -114.06 € per year. This translates to a considerable percentage of savings, as illustrated in Fig. 7. Likewise, User 3 finds the dynamic tariff reasonably competitive against the TOU rates. Moreover, among the assessed user profiles, User 8 experiences a marked advantage from adopting dynamic pricing, realizing monthly savings of around 10 €. However, this marginal price benefit raises concerns about its overall effectiveness, particularly given that User 8 constitutes the maximum recipient of these benefits.

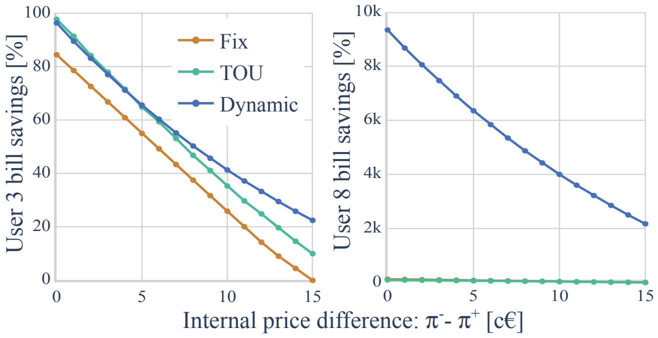

Fig. 7. Individual bill savings of Users 3 and 8, for different purchasing prices, using the EANSV bill repartition.

V. CONCLUSIONS

This paper proposes a sensitivity analysis of the internal energy community tariffs while considering three grid purchasing prices: fixed, time-of-use, and dynamic tariffs. It includes collective and individual perspectives. The collective perspective considers two stakeholders' viewpoints: the community manager and the energy provider. From the individuals' perspective, the equal allocation of non-separable costs allocation method is applied to analyze the impact of the grid purchase tariffs on the individuals' bill savings.

The outcomes of this analysis highlight a phenomenon concerning the equality of internal pricing within the energy community, which yields advantages for all stakeholders involved. This evaluation indicates that the optimal internal price is one at which both purchasing and selling parties reach a consensus. Consequently, the bidding process can be streamlined, eliminating unnecessary complexity.

This study uses a well-established cost allocation method validated in prior research, demonstrating its fairness and ease of implementation and comprehension. However, it is important to recognize that altering the cost distribution method will inevitably lead to varied outcomes for individuals. Therefore, generalizations from the individual perspective are not feasible. It is also significant to highlight that the time-of-use tariff structure is advantageous for most stakeholders involved in forming renewable energy communities, making it appealing to both energy managers and end-users alike.

Future work will focus on the systemic implications of designing optimal tariffs for all stakeholders involved in renewable energy communities.

REFERENCES

[1] "Economies of energy communities: Review of electricity tariffs and business models," 2021. [Online]. Available: https://energy.ec.europa.eu/system/files/2021-06/bridge_tf_energy_communities_report_2020-2021_0.pdf

[2] R. M. Johannsen, P. Sorknæs, K. Sperling, and P. A. Østergaard, "Energy communities' flexibility in different tax and tariff structures," *Energy Conversion and Management*, vol. 288, 7 2023.

[3] L. Sadoine, Z. D. Grève, and T. Brihaye, "Impact of retail electricity prices and grid tariff structure on the operation of resources scheduling in renewable energy communities," in *2023 IEEE PES Innovative Smart Grid Technologies Europe (ISGT EUROPE)*, 2023, pp. 1–5.

[4] B. Velkovski, V. Z. Gjorgievski, D. Kothona, A. S. Bouhouras, S. Cundeva, and N. Markovska, "Impact of tariff structures on energy community and grid operational parameters," *Sustainable Energy, Grids and Networks*, vol. 38, 6 2024.

[5] R. Sudhoff, Y. Bouraoui, S. Schreck, S. Thiem, and S. Niessen, "Implications of electricity tariff design on the operation of renewable energy communities," in *2023 IEEE PES Innovative Smart Grid Technologies Europe (ISGT EUROPE)*, 2023, pp. 1–5.

[6] A. Tlenshiyeva, M. Tostado-Véliz, H. M. Hasanien, N. Khosravi, and F. Jurado, "A data-driven methodology to design user-friendly tariffs in energy communities," *Electric Power Systems Research*, vol. 228, 3 2024.

[7] N. Li, R. A. Hakvoort, and Z. Lukszo, "Cost allocation in integrated community energy systems - a review," *Renewable and Sustainable Energy Reviews*, vol. 144, p. 111001, 2021. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1364032121002914

[8] M. V. Gasca, R. Rigo-Mariani, V. Debusschere, and Y. Sidqi, "Fairness in energy communities: Centralized and decentralized frameworks," *Renewable and Sustainable Energy Reviews*, vol. 208, 2 2025.

[9] M. V. Gasca, R. Rigo-Mariani, V. Debusschere, Y. Sidqi, and C. Clastres, "Costs allocation in energy communities: An insight on users' preferences," in *2023 IEEE PES Innovative Smart Grid Technologies Europe (ISGT EUROPE)*, 2023, pp. 1–5.

[10] H. Moulin, "The separability axiom and equal-sharing methods," *Journal of Economic Theory*, vol. 36, no. 1, pp. 120–148, 1985. [Online]. Available: https://www.sciencedirect.com/science/article/pii/0022053185900821

[11] S. Quoilin, K. Kavvadias, A. Mercier, I. Pappone, and A. Zucker, "Quantifying Self-consumption Linked to Solar Home Battery Systems: Statistical Analysis and Economic Assessment," *Applied Energy*, 2016.

[12] A. D. Mustika, R. Rigo-Mariani, V. Debusschere, and A. Pachurka, "A two-stage management strategy for the optimal operation and billing in an energy community with collective self-consumption," *Applied Energy*, vol. 310, p. 118484, 2022. [Online]. Available: https://doi.org/10.1016/j.apenergy.2021.118484

[13] "Grille de prix de l'offre de fourniture d'electricite - tarif bleu," 2024. [Online]. Available: https://particulier.edf.fr/content/dam/2-Actifs/Documents/Offres/Grille_prix_Tarif_Bleu.pdf

[14] "Entso-e. transparency platform," 2023. [Online]. Available: https://transparency.entsoe.eu