Business model approaches based on suitable pricing for EV charging infrastructure providers in the context of energy communities

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Abstract— **The steadily increasing number of electric vehicles (EVs) combined with the unbroken interest in energy communities (ECs) opens a new field of business for charging infrastructure providers (CIPs). Therefore, in a first step, this work analyzes three different use cases of how a CIP could engage with ECs: (i) as active EC member operating charging points, (ii) as contractor (no active EC participation) for charging points, or (iii) as active EC member operating charging points in combination with battery storage. In a second step, based on these use cases, the backbones of every business model (BM) are elaborated in detail, namely pricing structures and resulting revenue streams. To get a complete picture of a CIP's BM, the business model canvas (BMC) is used and applied to the first use case. Results suggest that CIPs could generate sufficient revenue streams for economically viable BMs. However, the economic strength of such BMs depends significantly – among other things -- on the pricing structure within an EC. This implies that CIPs' revenue streams would differ for each EC, and can also change over time, leading to a certain degree of uncertainty. However, it is still expected that innovative CIPs will set foot in the field of ECs, not least for reasons of exploiting first-mover market benefits, marketing advantages and the chance to initiate novel cooperations.**

Keywords: business models, charging infrastructure providers, energy community, pricing structures, revenue streams

I. INTRODUCTION

As a part of the *Clean Energy for All Europeans Package* of 2019 [1], Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs) have been introduced in the *Recast of the Renewable Energy Directive* [2] and the *Electricity Market Directive* [3], respectively. Based on these EU-wide regulations, all member states were obliged to transpose these guidelines into national legislation within 1-2 years. Since then, the adoption of energy communities (ECs) – concepts that enable the sharing of energy between members on a virtual (not physical) basis -- has flourished in some countries, such as Austria. With increasing numbers of ECs operating, novel opportunities for different stakeholders arise. At the same time, almost all EU member states account increasing numbers of electric vehicles (EVs) [4] and charging points [5]. In Austria, for example, an increase of EVs from 44,507 (end of 2020) [6] to more than 1.3 million [7] is expected. Considering that a significant number of people live in rent, and/or in multi-apartment buildings with limited possibilities to install individual charging points, novel solutions to address future needs are required. In this respect, ECs could be one solution. If ECs would implement their own EV charging infrastructure, or would have the possibility to co-use charging points of conventional infrastructure providers, EC members could increase their economic benefits by also charging their EVs with cheaper energy from the EC. However, ECs and their participants (mostly private households) might be reluctant to invest in costly EV charging infrastructure (apart from private home charging points) and act as charging infrastructure providers themselves. This opens an opportunity for professional charging infrastructure providers (CIPs), willing to enter a new field of business. In this respect it is of crucial importance to develop suitable business models (BMs) for CIPs and so evaluate the economic potential of engaging with ECs.

Therefore, this work analyzes three different use cases of how a CIP could engage with ECs: (i) as active EC member, (ii) as contractor, or (iii) as active EC member operating charging points in combination with battery storage. Based on the use cases, the backbones of every BM -- namely pricing structures and resulting revenue streams -- are elaborated in detail to derive conclusions regarding a BM|s economic viability. Also, a complete business model canvas (BMC) is developed for the first use case. Use cases are assumed for ECs as they would be operated in Austria. A limitation of this work is that pricing structures remain purely theoretical. However, a basis is provided for optimization models to determine the optimal price setting for both, ECs as well as CIPs.

II. STATE-OF-THE-ART

Integrating EVs in ECs has the potential to boost renewable self-consumption [8]. However, in this respect, not only

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development opportunities exist for EVs in the context of ECs, but also challenges [9]. Focusing on the positive side, integrating EVs in ECs could increase their flexibility potential, which can have, among others, positive effects on the overall energy system. Thus, Backe et al. [10] investigate sector coupling between the central power system and ECs with a specific focus on EVs. Srithapon et al. [11] propose an energy management strategy to enhance the flexibility of ECs, including the scheduling of EVs for charging and discharging. Similarly, optimal energy scheduling for ECs considering high EV penetration is investigated in [12], while [13] studies the optimal management of an EC hosting a fleet of EVs. Using game theory, Ref. [14] introduces a service-quality based pricing approach for charging EVs in smart ECs, finding that users' charging costs can be reduced by 16.39%. In Ref. [15], advantages of integrating external EV owners into an existing EC by using EC members' private home charging points during their absence are evaluated.

In the recent past, a number of studies have researched business models (BMs) in context of ECs. Kubli et al. [16] identified 25 emerging BM design options for ECs and derived a typology for tailored BM configuration. A comprehensive overview of BMs for ECs is provided in [17], focusing on the value proposition offered by these initiatives. Therefrom, eight BM archetypes are identified based on EC drivers. Iazzolino et al. [18] identify key elements effecting a BM for energy sharing specifically for residential end-users, while Ref. [19] focuses on BMs based on households' beliefs and preferences. However, not only BMs for ECs themselves are of importance, which is why authors of Ref. [20] propose BM approaches for a number of different EC stakeholders, while a BM specifically for EC aggregators is developed by [21]. Also, BM archetypes for different types of local energy market actors have been investigated by [22].

The literature review shows that certain aspects of electric mobility and EVs have been investigated in the EC context, as have BMs for ECs and certain stakeholders. However, there is a gap in research regarding BMs for EV charging infrastructure providers operating in the field of ECs.

III. METHODOLOGY

An often-used method for BM development is the business model canvas (BMC), which is shortly explained in Section III.A. Section III.B analyses three possible use cases for CIPs' engagement with ECs.

A. The cornerstones of business model development

The BMC [23] is a tool to develop detailed BMs and proposes nine segments of investigation: Key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure and revenue streams. In this work, the main focus lies on the core economic part of any BM, namely *revenue streams*. Therefore, a detailed analysis of three use cases for CIPs' engagement with ECs is conducted in Section IIIB, which provides the basis to understand detailed relations and derive suitable pricing structures in the following Section IV. These pricing structures are then the backbone for all revenue streams.

B. Use cases for CIP engagement in ECs

1) CIP as EC participant

In this use case it is assumed that the CIP is an actual member of the EC and brings in one or more charging points. From the viewpoint of the EC, the charging points would be a seen as "consumers". Depending on a charging point's load at different points in time (in combination with other EC participants' demand), the available generation within the EC is allocated accordingly[1]. Once energy has been allocated, two situations can occur: Either a charging point's load (and thus the demand for charging an EV at a certain time-step) can be covered, or there is a residual demand. The latter case requires the CIP to supply the charging EVs with energy purchased from a conventional energy supply company (ESCO), or directly from the energy market. (If a CIP is a comparably "big player", it can be expected that they have direct market access and do not need to use an ESCO as a "middle man" for energy purchase). Moreover, it needs to be considered that a CIP might be reluctant to limit the usage of their charging points to EC members but would rather also allow for non-EC members to charge their EVs. This leads to the situation that the CIP would need to introduce different pricing modalities, differentiating between EC members and others. With regard to pricing, a two-stage situation emerges: Since the CIP is the owner of the charging points, and also a member of the EC, the CIP is billed for the amounts of energy obtained from the EC (allocated based on static or dynamic distribution key). The amounts of energy purchased from the EC are then 'passed on' to the charging EVs. In case an EC member charges their EV, the EC energy price is charged with a certain profit offset for the CIP. In case an external party charges their EV, the conventional tariff (depending on the charging card that is used) is charged. This situation is most favorable for the CIP, since energy is bought comparably cheap from the EC, and sold at a conventional tariff to an external party, resulting in a higher profit margin for the CIP.

2) CIP as contractor for ECs

In this second use case – and in contrast to the first one -- the CIPs themselves are not members of the EC. This brings the advantage of reduced obligations towards the EC (e.g. such as purchasing energy from the EC before further selling it to charging infrastructure users, as described in Section 1)). The charging points would be 'owned' by a member of the EC who contracts the CIP for installation and operation. Also, the 'owner' of the charging points can decide whether access is

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[1] In Austria, energy allocation is performed by the DSOs. There is the choice between a static or dynamic allocation key. In case of dynamic allocation, the total amount of generated energy within the EC is allocated based on individual participant's load shares on the total EC load (per 15-min time-step). In the case of static allocation, each participant receives a fixed share of the available generation at each point in time. Due to its higher efficiency, dynamic allocation is mostly used.

restricted to other EC members, or whether charging points can be used by any EC-external entity as well. Anyways, the charging point ‘owner’ would act as a consumer from the viewpoint of the EC and would need to purchase energy from the EC (if available) if EVs are charged, and then bill arising costs to the charging entities. In case that EC members charge their EVs (and EC generation is available), it would be assumed that the ‘owner’ of the charging point (who is also an EC member) passes on the cheap EC energy price, only with a slight monetary offset due to additional expenditures towards the CIP (e.g. contracting rates). In case that external entities are also allowed to use the charging points, conventional charging tariffs (depending on the charging card used) apply, leading to a higher profit margin for the charging point ‘owner’ as well as the CIPs if cheaper energy from the EC is used for charging.

3) CIP addionally operating a battery storage

This option builds upon the first use case (CIP as a member of the EC); thus, all descriptions provided in Section III 1) are also valid. However, in this case, the operation of a battery storage is considered in addition: Since charging points are often locations of high demand peaks, CIPs might need to implement certain mechanisms to reduce such peaks in the future. This future need could be combined with the currently intensified discussions that ECs need to behave grid friendly to some extent. Implementing a battery storage as a backup to supply charging points during times of low EC generation has the potential to enhance an EC’s self-consumption rates and reduce charging demand peaks simultaneously. The battery would be seen as an additional metering point, acting as a ‘consumer’ during times of charging and as a ‘generator’ during times of discharging. In this respect, it is imperative to ensure that the battery is only charged after the direct demands of all other EC participants (including the charging points) have been covered, since direct self-consumption is always the most economic option. So, if all direct demands of the EC have been covered, and there is still surplus generation available, then the battery is charged. Similarly for discharging: The battery is only discharged, if the directly (at a certain time-step) available EC energy is already used up.

IV. RESULTS

The different use cases described in Section III B provide the basis for deriving the economic cornerstones of BMs for CIPs. Resulting pricing structures only focus on the energy component of the electricity price and disregard grid charges, taxes, and levies.

A. Pricing structure and possible revenue streams for a CIP as EC participants

The situation elaborated in Section III B1) (Figure 1) results in the following pricing logic for the participating entities: The EC participants need to agree upon a price for selling and purchasing energy within the EC (between peers) (p_{EC}). From the viewpoint of an EC member who generates energy (e.g. PV system installed), the EC energy price needs to be higher compared to feed-in-tariffs (p_{FIT}) offered by ESCOs. For a consumer, the EC energy price needs to be cheaper compared to conventional ESCOs supply offers (p_{ESCO}), see Eq. (1).

$$p_{FIT} < p_{EC} < p_{ESCO} \qquad (1)$$

However, as soon as a CIP is included, a couple of additional pricing constraints need to be considered: Since charging points are also viewed as ‘consumers’, the EC energy price should be cheaper compared to other sources of energy purchase for the CIP, e.g. purchasing from energy markets (p_{Market}), see Eq. (2).

$$p_{EC} < p_{Market} \qquad (2)$$

However, it can be expected that at certain points in time, market prices will be cheaper than EC energy. Nevertheless, an economically solid BM can still be achieved by CIPs since EC energy prices are passed on (plus profit margin) to the charging entities anyways. Simultaneously, it needs to be ensured that EC members charge their EVs at a cheaper rate ($p_{ch_{EC}}$) compared to conventional charging offers ($p_{ch_{conv}}$) – at least as long as energy from the EC is available for charging. This implies that the sum of (i) the pure EC energy price (p_{EC}) and (ii) the monetary offset ($p_{offset_{CIP}}$) that is charged by the CIP for their services within the EC – in total $p_{ch_{EC}}$ -- needs to be cheaper than conventional charging offers, see Eq. (3)-(4).

$$p_{ch_{EC}} < p_{ch_{conv}} \qquad (3)$$

$$p_{ch_{EC}} = p_{EC} + p_{offset_{CIP}} \qquad (4)$$

Thus, it can be concluded that the BM of CIPs in this first use case builds upon the following two pillars:

- With regard to EC participants: Difference between p_{EC} and $p_{ch_{EC}}$.
- With regard to externals: Difference between p_{EC} and $p_{ch_{EXT}}$ (conventional charging tariff).

The higher the price differences, the bigger the revenue stream for the CIP, and the easier to recover costs for charging infrastructure implementation, operation, maintenance; purchasing energy from the EC and billing; further software development to distinguish between EC participants and externals, as well as corresponding personnel costs.

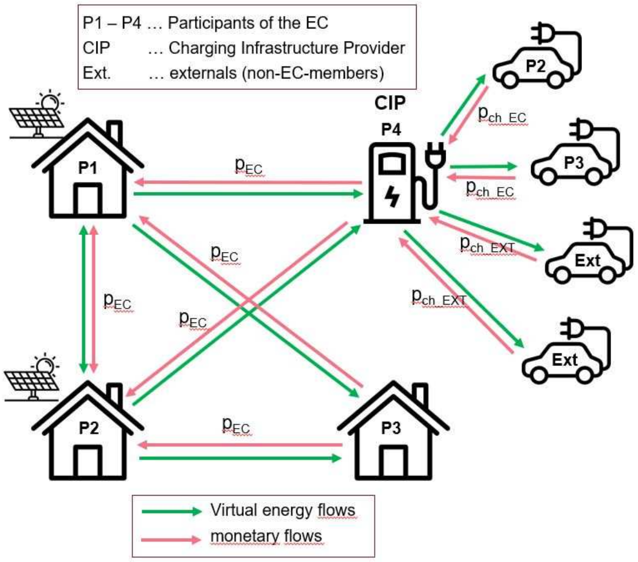


Figure 1: Exemplary situation for a CIP as EC participant; showing relations, virtual energy and monetary flows.

B. *Pricing structure and possible revenue streams for a CIP as contractor for ECs*

Despite not being an actual member of the EC in this second use case, a CIP's BM still strongly depends on the pricing situation of the EC and the charging point 'owner', who contracts the CIP. The general pricing logic within the EC is equal to the description in Section IV A.

Since the charging point 'owner' is an EC member, energy from the EC (if available) can be purchased paying the EC energy price. However, this EC energy price cannot be passed on 1:1 to EC members charging their EVs, since the charging point 'owner' also needs to pay a contracting rate to the CIP. This contracting rate $p_{contrRate}$ can be included directly in the EV charging rates for EC members, Eq. (5):

$$p_{chEC} = p_{EC} + p_{contrRate} \qquad (5)$$

(The similarity of Eq (5) to Eq. (4) is obvious. However, the difference would lie in the height of the second pricing term, since in the second use case the CIP is neither a member of the EC, nor the 'owner' of the charging points.)

Simultaneously, it must be ensured that EC members who charge their EVs at EC related charging points, pay a cheaper rate (as long as EC energy is available) compared to a conventional tariff ($p_{ch_{conv}}$) – Eq. (6):

$$p_{ch_{EC}} < p_{ch_{conv}} \qquad (6)$$

For external users of the charging points, and also for EC members in case no EC energy is available, conventional charging tariffs (depending on the charging cards used) apply. However, in case external users charge their EVs at points in time where the charging point 'owner' is able to purchase energy from the EC, the profit margin increases (since the external users are still billed with conventional tariffs). In that case, a part of this larger profit margin would be passed on the CIP, enhancing revenue streams. The costs that need to be covered by a CIP in this business case are similar to the ones described in Section IVA, with the exception that now the CIP is not responsible for purchasing energy from the EC (since this is done by the 'owner' of the charging points, who is also a member of the EC). The revenue streams of a CIP as contractor arise as follows:

- From the contracting rate: The contracting rate can be realized e.g. as a fixed fee per month, or, as suggested in this case, dependent on the kilowatt-hours sold.
- From the price difference if externals use the charging points paying conventional charging tariffs, while cheap EC energy is available (additional revenues passed on by the charging point 'owner' to the CIP).

C. *Pricing structure and possible revenue streams for a CIP addionally operating a battery storage*

Including a battery storage as additional EC asset – in this case exclusively used as backup supply for the charging points – increases the level of complexity with regard to an economically viable BM. In the case of CIPs who additionally operate a battery storage (see Figure 2), it is assumed that they also participate in the EC. Since the pricing logic of ECs, including a participating CIP, has been explained before, this section focuses solely on the pricing parts concerning the battery storage acting as backup supply for charging points. In case the battery is charged with energy from the EC, the CIP would pay the EC energy price (Eq. (7)):

$$p_{in_{stor}} = p_{EC} \qquad (7)$$

During times of none or insufficient EC generation, the storage would be discharged to supply the charging points. The total costs for EV charging for EC members ($p_{ch_{EC,stor}}$), Eq. (8) – in case energy from the storage is used -- would include (i) the EC energy price p_{EC} (the rate at which the CIP purchased the EC energy to charge the battery), (ii) a fee to account for the monetary and non-monetary expenses of operating the battery $p_{op_{stor}}$, as well as (iii) some monetary compensation to account for charging, stand-by and discharging losses ($p_{loss_{stor}}$), and, most naturally, (iv) some additional profit margin ($p_{offset_{CIP}}$).

$$p_{ch_{EC,stor}} = p_{EC} + p_{op_{stor}} + p_{loss_{stor}} + p_{offset_{CIP}} \qquad (8)$$

However, for EC members costs for EV charging – also when energy comes from the battery storage -- would still need to be lower compared to conventional charging tariffs (depending on the charging card used), see Eq. (9).

$$p_{ch_{EC}} < p_{ch_{EC,stor}} < p_{ch_{conv}} \qquad (9)$$

Letting also EC externals use the charging points makes the business case of operating a battery storage easier for CIPs: Externals are not subject to cheaper EC prices, but pay a conventional tariff $p_{ch_{EXT}}$ (depending on the charging card used) also for amounts of energy that the CIP purchased from the EC and stored in the battery storage. In total, the BM of CIPs in this third use case builds upon four pillars:

- With regard to EC participants:
    - Difference between p_{EC} and $p_{ch_{EC}}$.
    - Difference between $p_{in_{stor}}$ and $p_{ch_{EC},stor}$.
- With regard to externals:
    - Difference between p_{EC} and $p_{ch_{EXT}}$.
    - Difference between $p_{in_{stor}}$ and $p_{ch_{EXT}}$.

The revenue streams derived from these price differences need to cover all expenses related to charging infrastructure and battery storage implementation, operation and maintenance.

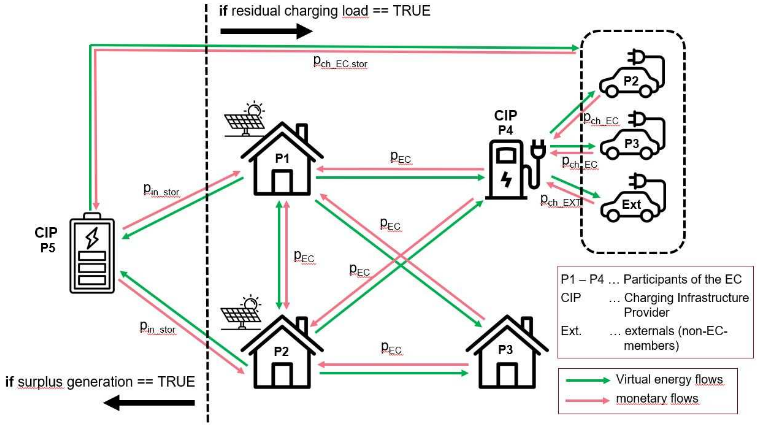
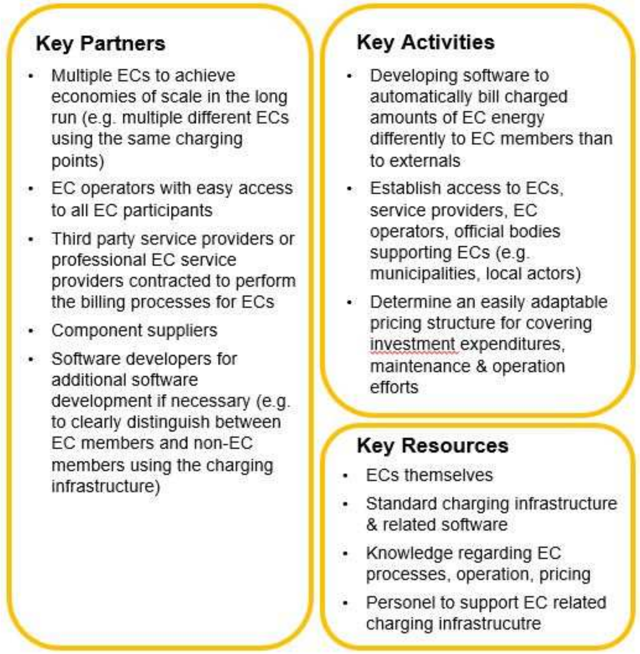


Figure 2: Exemplary situation for a CIP as EC participant, additionally operating a battery storage; showing relations, virtual energy and monetary flows.

D. *Complete business model for the exemplary use case of a CIP as EC participant*

Figure 3 presents the BMCs' segments key partners, key activities and key resources, Figure 4 includes customer relationships, customer segments and channels and Figure 5 completes the BMC with value proposition, cost structure and revenue streams. Contents have been validated with actual Austrian CIPs, wo are co-authoring this work.



Key Partners

- Multiple ECs to achieve economies of scale in the long run (e.g. multiple different ECs using the same charging points)
- EC operators with easy access to all EC participants
- Third party service providers or professional EC service providers contracted to perform the billing processes for ECs
- Component suppliers
- Software developers for additional software development if necessary (e.g. to clearly distinguish between EC members and non-EC members using the charging infrastructure)

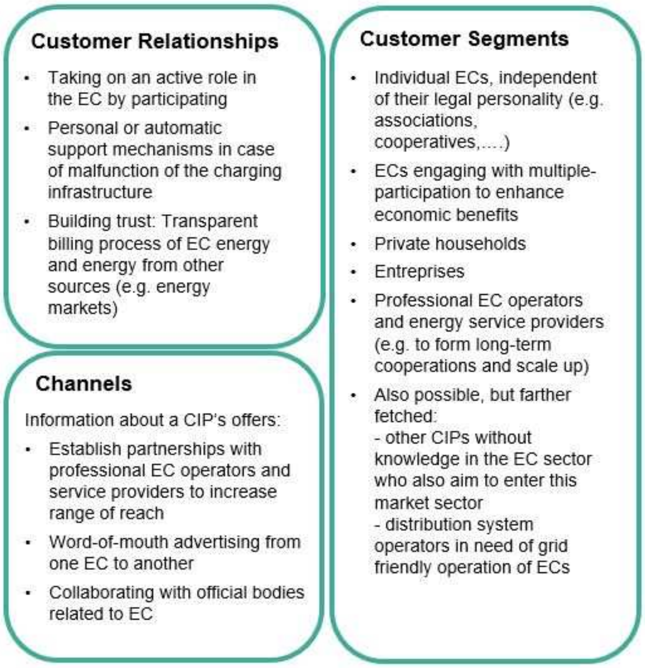
Key Activities

- Developing software to automatically bill charged amounts of EC energy differently to EC members than to externals
- Establish access to ECs, service providers, EC operators, official bodies supporting ECs (e.g. municipalities, local actors)
- Determine an easily adaptable pricing structure for covering investment expenditures, maintenance & operation efforts

Key Resources

- ECs themselves
- Standard charging infrastructure & related software
- Knowledge regarding EC processes, operation, pricing
- Personel to support EC related charging infrastrucutre

Figure 3: Part 1 of the BMC for the exemplary use case of a CIP being an active member of an EC



Customer Relationships

- Taking on an active role in the EC by participating
- Personal or automatic support mechanisms in case of malfunction of the charging infrastructure
- Building trust: Transparent billing process of EC energy and energy from other sources (e.g. energy markets)

Channels

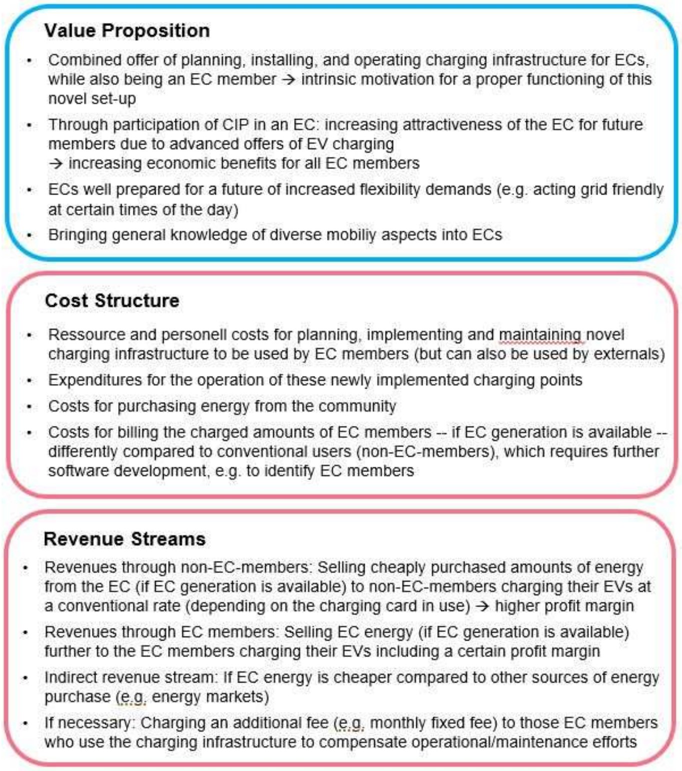
Information about a CIP's offers:

- Establish partnerships with professional EC operators and service providers to increase range of reach
- Word-of-mouth advertising from one EC to another
- Collaborating with official bodies related to EC

Customer Segments

- Individual ECs, independent of their legal personality (e.g. associations, cooperatives,….)
- ECs engaging with multiple-participation to enhance economic benefits
- Private households
- Entreprises
- Professional EC operators and energy service providers (e.g. to form long-term cooperations and scale up)
- Also possible, but farther fetched:
  - other CIPs without knowledge in the EC sector who also aim to enter this market sector
  - distribution system operators in need of grid friendly operation of ECs

Figure 4: Part 2 of the BMC for the exemplary use case of a CIP being an active member of an EC



Value Proposition

- Combined offer of planning, installing, and operating charging infrastructure for ECs, while also being an EC member → intrinsic motivation for a proper functioning of this novel set-up
- Through participation of CIP in an EC: increasing attractiveness of the EC for future members due to advanced offers of EV charging → increasing economic benefits for all EC members
- ECs well prepared for a future of increased flexibility demands (e.g. acting grid friendly at certain times of the day)
- Bringing general knowledge of diverse mobiliy aspects into ECs

Cost Structure

- Ressource and personell costs for planning, implementing and maintaining novel charging infrastructure to be used by EC members (but can also be used by externals)
- Expenditures for the operation of these newly implemented charging points
- Costs for purchasing energy from the community
- Costs for billing the charged amounts of EC members -- if EC generation is available -- differently compared to conventional users (non-EC-members), which requires further software development, e.g. to identify EC members

Revenue Streams

- Revenues through non-EC-members: Selling cheaply purchased amounts of energy from the EC (if EC generation is available) to non-EC-members charging their EVs at a conventional rate (depending on the charging card in use) → higher profit margin
- Revenues through EC members: Selling EC energy (if EC generation is available) further to the EC members charging their EVs including a certain profit margin
- Indirect revenue stream: If EC energy is cheaper compared to other sources of energy purchase (e.g. energy markets)
- If necessary: Charging an additional fee (e.g. monthly fixed fee) to those EC members who use the charging infrastructure to compensate operational/maintenance efforts

Figure 5: Part 3 of the BMC for the exemplary use case of a CIP being an active member of an EC

V. CONCLUSIONS

This paper presents three different ways of CIP engagement in ECs: (i) as active EC participant who operates charging infrastructure, (ii) as contractor for charging infrastructure (not participating in the EC), (iii) as active EC participant operating charging infrastructure in combination with a battery storage. Based on these use cases, the backbones of every BM are elaborated in detail, namely pricing structures and resulting revenue streams. To get a complete picture of a CIP's BM, a complete BMC is provided for the first use case.

The analysis in this paper showed that ECs could open an economically viable field of business for CIPs, specifically with regard to the progressing electrification in general, and the probable future need of ECs to offer flexibility e.g. to behave grid friendly to some extent. However, it also becomes evident that a CIP's BM, and specifically the necessary revenue streams do strongly depend on the pricing structure of the related ECs, conventional tariffs and, thus related, market prices. Especially the pricing structures within the individual ECs can differ significantly (since ECs can decide their internal energy selling/purchasing price themselves) and might also change over time, which is why CIPs cannot expect fixed revenues of a certain height for each EC they engage with. Thus, this situation is bound to comparably high uncertainties for CIPs. However, still, it is expected that innovative CIPs engage with ECs, not least due to a significant marketing potential, which might open further novel possibilities.

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REFERENCES

[1] European Commission, Clean energy for all Europeans package (2019).URL https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

[2] EUR-Lex, Directive (EU) 2018/2001 of the European Parliament and of the council of 11 December 2018 on the promotion of the use of energy from renewable sources (2018).

[3] EUR-Lex, Directive (EU) 2019/944 of the European Parliament and of the Council of 5 june 2019 on common rules for the internal market for electricity and amending Directive 2012/27/eu (2019).

[4] eurostat Statistics Explained, Electric vehicles and energy generation statistics, eurostat. URL https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electric_vehicles_and_energy_generation_statistics

[5] IEA International Energy Agency, Global EV outlook 2023, IEA. URL https://www.iea.org/reports/global-ev-outlook-2023/trends-in-charging-infrastructure

[6] Statistik Austria, Kraftfahrzeuge - bestand, Statistik Austria. 2021.

[7] Oesterreichs Energie, Netzberechnungen Österreich – Einfluss der Entwicklungen von Elektromobilität und Photovoltaik auf das Österreichische Stromnetz. 2020

[8] G. Lombardi, L. Cioccolanti, L. Del Zotto, S. Tomassetti, P. E. Campana, The role of electric vehicles in hybrid solar-based small energy communities, Energy Conversion and Management 321 (2024) 119074. doi:10.1016/j.enconman.2024.119074.

[9] J. Menyhart, Overview of sustainable mobility: The role of electric vehicles in energy communities, World Electric Vehicle Journal 15 (6) (2024) 275. doi:10.3390/wevj15060275

[10] S. Backe, M. Korpas, A. Tomasgard, Heat and electric vehicle flexibility in the european power system: A case study of norwegian energy communities, International Journal of Electrical Power and Energy Systems 125 (2021) 106479. doi:10.1016/j.ijepes.2020.106479

[11] C. Srithapon, D. Mansson, Predictive control and coordination for energy community flexibility with electric vehicles, heat pumps and thermal energy storage, Applied Energy 347 (2023) 121500. doi:10.1016/j.apenergy.2023.121500.

[12] R. Faia, B. Ribeiro, C. Goncalves, L. Gomes, Z. Vale, Multi-agent based energy community cost optimization considering high electric vehicles penetration, Sustainable Energy Technologies and Assessments 59 (2023) 103402. doi:10.1016/j.seta.2023.103402

[13] G. G. Zanvettor, M. Casini, A. Giannitrapani, S. Paoletti, A. Vicino, Optimal management of energy communities hosting a fleet of electric vehicles, Energies 15 (22) (2022) 8697. doi:10.3390/en15228697

[14] Y. Wang, Y. Xiang, H. Hu, K. W. Lao, J. Tong, Y. Jiang, Service quality based pricing approach for charging electric vehicles in smart energy communities, Journal of Cleaner Production 420 (2023) 138416. doi:10.1016/j.jclepro.2023.138416

[15] B. Velkovski, V. Z. Gjorgievski, B. Markovski, S. Cundeva, N. Markovska, A framework for shared ev charging in residential renewable energy communities, Renewable Energy 231 (2024) 120897. doi:10.1016/j.renene.2024.120897.

[16] M. Kubli, S. Puranik, A typology of business models for energy communities: Current and emerging design options, Renewable and Sustainable Energy Reviews 176 (2023) 113165. doi:10.1016/j.rser.2023.113165

[17] I. F.G. Reis, I. Gon¸calves, M. A.R. Lopes, C. Henggeler Antunes, Business models for energy communities: A review of key issues and trends, Renewable and Sustainable Energy Reviews 144 (2021) 111013. doi: 10.1016/j.rser.2021.111013

[18] G. Iazzolino, N. Sorrentino, D. Menniti, A. Pinnarelli, M. De Carolis, L. Mendicino, Energy communities and key features emerged from business models review, Energy Policy 165 (2022) 112929. doi:10.1016/j.enpol.2022.112929

[19] M. Karami, R. Madlener, Business models for peer-to-peer energy trading in Germany based on households' beliefs and preferences, Applied Energy 306 (2022) 118053. doi:10.1016/j.apenergy.2021.118053

[20] B. Fina, C. Monsberger, Measures and business model approaches to facilitate the diffusion and integration of energy communities—a special focus on the austrian case, Energy Strategy Reviews 49 (2023) 101161. doi:10.1016/j.esr.2023.101161

[21] D. Fioriti, A. Frangioni, D. Poli, Optimal sizing of energy communities with fair revenue sharing and exit clauses: Value, role and business model of aggregators and users, Applied Energy 299 (2021) 117328. doi:10.1016/j.apenergy.2021.117328

[22] J. Schwidtal, P. Piccini, M. Troncia, R. Chitchyan, M. Montakhabi, C. Francis, A. Gorbatcheva, T. Capper, M. Mustafa, M. Andoni, V. Robu, M. Bahloul, I. Scott, T. Mbavarira, J. Espa˜na, L. Kiesling, Emerging business models in local energy markets: A systematic review of peer-to-peer, community self-consumption, and transactive energy models, Renewable and Sustainable Energy Reviews 179 (2023) 113273. doi:10.1016/j.rser.2023.113273

[23] A. Osterwalder, Y. Pigneur, Business model generation: Ein Handbuch für Visionäre, Spielveränderer und Herausforderer, 2011.