
Business Models for the development of local renewable electricity production and electromobility

2019-2020

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The logo for heig-vd, consisting of the text "heig-vd" in white lowercase letters on a red rectangular background.

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The work reported here has been conducted in the framework of the [RegEnergy project](#).

Collaborations



Financements



Introduction

Learning about the possible from studying the existing market

PV is a decentralized, local energy production, currently developing very fast. Self-consumption on site is currently the most interesting way of using it. On the other hand, the electric vehicle is becoming standard. What will happen when all the roofs are covered with photovoltaics and all cars are electric? Electromobility can enhance self-consumption, cars can be charged in a smart way or used as batteries to decrease the impact of PV development on the grid and increase the share of local renewable energy in the local consumption mix. But what business models can be built out of this new opportunity? Who are the actors involved? Can new players on the energy market, and traditional stakeholders cooperate to integrate the new complexity of decentralized microgrids in their products and offers? What are the gains for the end-users?

There are different types of approaches that researchers use to ideate and define which business models are most relevant in the case of a given future business concept. In this case, initial interviews fed the design of a workshop that informed the RegEnergy team on new business model options, and in particular new tariff schemes that could make the microgrid project (based on local renewable energy production and the development of electromobility on an industrial park) economically interesting for all actors involved. The interviews were held with a selected group of existing companies active in Switzerland in the space of EV charging, microgrid management and grid operations. HEIG-VD Cheffe de projet Mary Jean Bürer conducted the interviews starting in June 2019 with relevant stakeholders on the supply side of the market (for example those with a technology offering) as well as those on the demand side (such as building investors). The interview protocol used is available on request. Possible working business models for the V2G integration and management of the microgrid project under the assumptions set by Planair were explored in the analysis conducted by HEIG-VD and presented at several meetings, including the workshop held in January 2020 with key stakeholders. At the workshop three possible tariff structures were defined in the group dealing with the microgrid business model aspects, and in the other group business model aspects relevant to the EV charging and the management of the EVs were explored and further developed. This led to the analysis prepared by Planair based on the combined findings of their modeling work, the insights from the interviews and finally the insights gathered

at the workshop in early 2020 for this part of the work. The survey conducted by HEIG-VD will now be completed and provide further insights relevant to the EV users allowing for the final conclusions to be adapted accordingly. However, the most important questions about what type of pricing would be needed, and how to “divide the pie” were answered until now, to some extent.

« What is smarter? Going for no uncertainty, one contract with the microgrid manager with fixed pricing, and service guaranteed, or optimize gains for all parties ? »

Interviews with Stakeholders

Learning from speaking to market players individually

At the start of the project we were able to interview 11 key players (out of 15 stakeholders identified) in the market – from those offering services related to management of microgrids or control of microgrids to those offering services related to EV charging, and also the demand side of the equation. In this mix, we interviewed 3 local DSOs with knowledge about the new RCP law and their own strategies regarding microgrids and the evolution of this particular market. We also interviewed companies in the EV charging business which were not directly relevant to the project, for comparison sake. It was important to interview also a mix of incumbent firms in the business, as well as a number of start-ups in the space, to obtain different views and perspectives from each type of player. In any case both types of players are needed and very relevant to meeting the project objectives and developing a successful investment.

« The innovative solutions don't come from the incumbents – they come from start-ups and identifying the start-ups that have technology to help »

The possible business models discussed in the interviews are summarized in the table below.

Besides what we pulled out regarding business model options, we learned other things from these interviews that can be interpreted and used when deciding how to proceed on the project and what could be done to support a promising business model avenue

Identified barriers from the providers point of view:

- The current RCP law does not allow the DSO to lower the tariff related to power for better microgrid management, and there is no regulation that allows variable prices for peaks in power. One could consider discussing such issues with the regulators, and finding solutions so that all the most attractive business model options could be enabled with certain policy fixes, or adjustments in regulation.
- There are not enough existing demonstrations of this type in the world and therefore there is a need for more experiments of this type with different technologies made by different makers and among different types of firms.
- More information is needed for potential service providers in order to build better business models and adapt them according to the needs of investors and the process for decision-making in this context.
- Today some technical issues exist around the use of data – to translate data and anonymize data (incompatibility of data coming from different devices including the car). Once these issues are resolved start-ups feel they can then build a lot of new business models.
- There is no shortage of providers for this level of EV charging investment but bidirectional charging infrastructure for microgrid management is not the focus of

most service providers for the moment until this market (and the technology – also on the side of automakers) develops further.

Finally, insights with regard to the demand side (obtained from interviews with the investors and owners related to the project) pointed out a few areas to explore in the future, such as:

- How to deal with multiple owners on the site and their need to agree before investments are made.
- EV customers are still few today although there is a slowly growing interest

| Business Model (over-simplified version) | Value Provided and/or questions about additional value they could provide |
|---|---|
| SME with smart grid technology that is serving the DSO | Allows the grid manager to know his grid will be well managed- win for the DSO and win for the prosumers |
| SME/start-up that wants to sell solutions to clients whether DSOs or microgrid managers of the future | They can deploy the technology to control the microgrid, and manage the self-consumption (meanwhile the value provided is also that the building owner can own the solution developed) |
| Large energy company with SME developed in the e-mobility space. Earns money on the charging and invests in public charging | They have flexible value propositions and can earn money on the chargers, or from energy produced by the chargers, or even from energy consumed by the chargers. |
| SME that provides access to energy spot markets, long term markets and the regulation market. | They are pooling energy, so the client does not have to fulfill the full amount of energy needed (at least 5MW) to participate in these markets. |
| Large DSO with the traditional business model today however considering other options under the RCP model (regulation allowing auto-consumption communities). | For example, the company can rent or sell cables and provide value to the microgrid manager in these two different ways depending on what is more valuable given the microgrid options, tariff prices, etc. |
| Another large DSO with the traditional business model today however considering other options (as above) | They consider to offer assistance to put an RCP in place and then manage the amount of energy that concerns apartments (service model). Another model they are considering is as an investor – they invest in the infrastructure and behind they provide the energy to the consumers of the area (when like 50 apartments). |
| SME in the e-mobility space. Earns money on the charging and invests in fast charging infrastructure | Provides fast charging infrastructure but for V2G it is not relevant (except Evtech) |

| | |
|---|---|
| <p>SME in the e-mobility space with a product (electric vehicle charging product) and a solution – basically the charging station, the software and the management solution to interact with the charging station and connect to other systems.</p> | <p>They are one of the few in their market to have a vehicle to grid offering but they need to still understand the value bidirectional brings to such an installation.</p> |
|---|---|

Table 1: Business Model elements of Key Stakeholders interviewed

Overall, the results of this first part of the study showed that this appears to be a DSO-led innovation ecosystem opportunity, with involvement by various innovative start-ups offering different technologies and service offerings. The DSOs have an advantage in this market because they have the capital required to offer different business models, they have the contacts needed to move forward such a complex project, they have the existing data and information and are ready to make that available only for a price. They sometimes have their own start-ups like MOVE of GroupE that they work with easily.

heig-vo **DSO-led innovation ecosystem**
 If the DSO wishes to conduct contracts with each player



Figure 1: Slide from a presentation of the results during the RegEnergy project explaining the configuration where the DSO leads the innovation ecosystem and the value exchange between different providers of solutions to the microgrid project

everyone agrees that this concept has potential value in the future once technology is further developed, and current barriers are lifted. Regulations also need to be further adapted to allow for easier access to ancillary service markets. Players are interested in this space but they require more information and certainty to develop and invest in the development of such new business models. This project can help to clarify at least the demand-side of the equation, and also to understand the limitations from the user-side of the equation (EV users).

There are enough smart technologies and service providers available to offer different kinds of business and financing models ranging from allowing the building owner to own the infrastructure (while they manage it for the owner) - to renting the infrastructure and providing the service for financial payments, and varieties of business models with different pricing schemes based on smart technologies.

There is a willingness to serve the market by a number of different potential innovation ecosystem players if the demand is there, and once the technology is more advanced. Very few of those players interviewed did not see a business model opportunity in this space. Almost everyone saw a way to serve the space, one way or the other.

The Design Thinking Workshop

Learning and problem-solving first via finding empathy with customers' pains

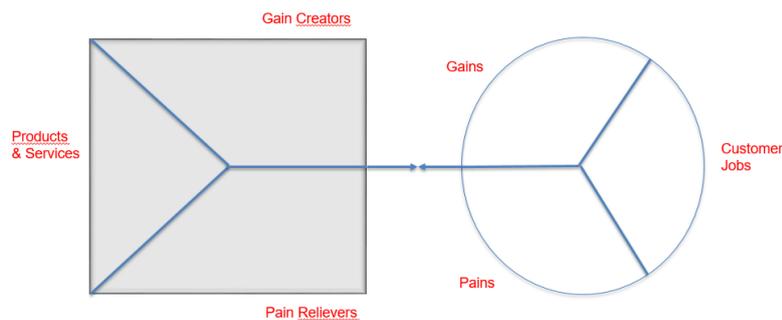
A workshop was held on January 20, 2020 at HEIG-VD where findings of the project were first presented (findings from the interviews and the modeling work by Planair) and then two groups formed based on previously defined participation. They worked with the value proposition canvas initially and used the canvas to brainstorm through different pains and gains of the relevant "clients" in each case before developing the value propositions and the details around these propositions.

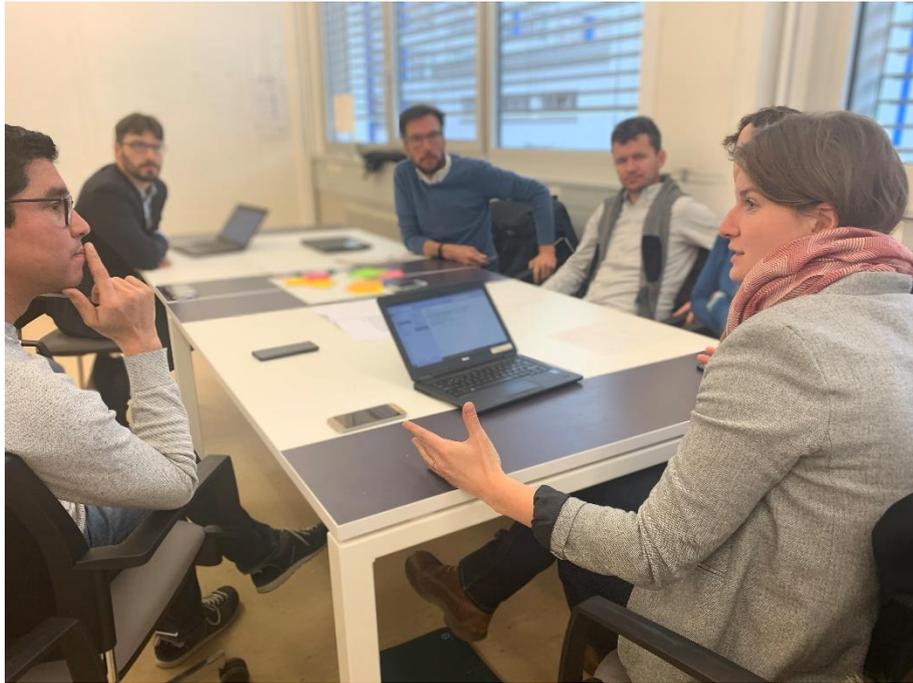
« What is the customer's pain ? What are her biggest frustrations? What obstacles stand between her and what she wants or needs to achieve? »

The group dealing with EV charging solutions was led by Laure Deschaintre of Planair, and the group dealing with microgrid management was led by Lionel Perret of Planair. Both groups were managed and supported by Dr. Bürer who hosted the event at HEIG-VD's STarmac site at the St. Roch campus and provided the value network diagrams and provided an example at the start of the working sessions, to get the groups started.

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Value Network Diagrams for the Workshop





The participants of the workshop were asked to break into two groups and work on two customer centric design tasks:

- 1) Imagine to be in the shoes of the microgrid manager (whether a DSO or other) and develop the basis of a business model around the pains and gains of their key clients (the building owners/managers/tenants); define who are their customers exactly, and develop customer jobs;
- 2) Focus on the pains and gains of EV owners, and providing value to them, as well as services to the microgrid manager (in fact think about the pains and gains of both «clients») and develop the basis of a business model which serves both parties' needs

The group dealing with the microgrid managers' needs focused primarily on the kinds of tariff structures possible, and defined the pros and cons of each tariff arrangements.

The resulting choices identified and the pros and cons of each are the following:

Fixed ROE pricing

- Pros: Simplicity, annual planning and cost anticipation possibilities
- Cons: Valuation of limited flexibility, distribution of gains between players complex to optimize. Potential external flexibility should be valued independently.

Total dynamic pricing type VGT

- Pros: Maximizing the potential revenue for each user beyond the ROI
- Cons: Difficulty in planning costs and gains, need to provide regular information to an external system.

In the discussion, a 3rd model targeting local production was proposed :

Local consumption priority pricing

The tariff for all network consumption is that of the reference situation excluding the RCP.

The pricing for self-consumers can then aim to be done by minimizing the local stamp, thus offering a particularly attractive tariff for self-consumption. Optimizing flexibility is then done primarily for local consumption.

- Pros: maximization of local consumption of local production and local income, planning of possible flexibilities by having forecasts of local production.
- Cons: Difficult to achieve several optimizations independently, external flexibility income will be more complex to achieve.

The 3 tariffs are considered interesting, and it is evaluated that the project (to be designed) could work precisely to compare and analyze the advantages/disadvantages of their effective implementation.

It was also clear that the business models related to the microgrid manager were highly policy-driven. There was no way to speak about business model options without speaking about tariff options, and tariff structures are still regulated in Switzerland. Therefore, the uncertainty around the legal interpretations around the RCP law, as microgrid projects emerge in Switzerland, is a key barrier to entry alone.

The group dealing with EV discussed the possible tariffication models to convince the end-user to be as flexible as possible. These discussion set the base and recommendations for the future survey on Y-PARC aiming to understand which model is the most attractive for the future EV-owners. Main outputs of the discussions are :

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- Each user should be able to choose his tariff (flexible, not flexible) every morning depending on his schedule
 - Users should not feel imprisoned by the system and should be able to leave when they need to, also if there is a change of plan
 - Communication is the key. The system must be easy to understand and use.
 - To retribute flexibility: the tarification could depend on the number of hours connected. For the V2G a price component taking into account the number of kWh fed back to the grid could be added.
 - The impact on the battery of the number and power level of charges is not dealt with on the current EV market (V1G). Addressing it in the context of flexibility and V2G is risky for the image of the end-user.

Conclusions

Learning from our business model research in order to better design the microgrid project and provide insights to the actual demonstration project planned

At this stage, we are not yet finished with the survey of EV users to add to the story regarding what makes sense for the microgrid project in terms of the value proposition that creates the most value for the potential customers, in this case we defined mostly the microgrid manager as the main customer in this innovation ecosystem however the EV users are also customers and to build a functioning complete business model for the two sides of the equation, we still need the results of the survey.

« Pitching to Investors – How will you create value for customers? How will you make money doing so? Tell the story simply before explaining the model in detail. »

So far what we learned in this project with regard to basic business models possible for the microgrid management are:

- The model where the DSO at least appears to be in the center of the ecosystem, could be the most sustainable model when competition is greater and early entrants face new business models emerging from incumbents.
- The second option (where the microgrid manager has the lead) could be possible if building management companies (and owners of buildings) get into the business, and see the potential for other service offers. However, this is not currently the case, as far as we could tell from our interviews.

The more likely case would be that the microgrid manager has a contract with the DSO for the services that allow for the good function of the microgrid, with the electricity sold or bought at a fixed price or variable price depending on the business model.

Three tariff structures were discussed at the workshop (in fact two, accompanied by a new one developed at the workshop).

To conclude, for now this appears to be a DSO-led innovation ecosystem opportunity, with involvement by various innovative start-ups offering different technologies and service offerings.

The choice of service company will have a larger impact on the overall business model and tariff structure choices to be made relevant to the microgrid management. Or rather the choice of business model will have a large impact on the choice of technology providers.

In addition, how regulations evolve will be playing a large role in determining which business models to pursue, and therefore will have a large impact on the choice of technology and service providers that makes sense for this type of investment.

Finally, how to deal with EV users, and understanding their own pains and gains from the theoretical project, will be better understood after the completion of the survey and the analysis of the results.