

Feasibility analysis of new business models for residential PV installations in Catalonia, Spain

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Abstract—This paper contributes a strategic assessment of the possibilities and perspectives that the Spanish PV engineering and installation company, SUD Renovables, has in the residential market. In this regard, the study develops a complete business model that allows creating value to the customers and for the company itself. Such an analysis allows determining the suitable target market and positioning strategy as well as the modifications in the current logistics and operations, which helps in the current company's growth path.

Keywords— *solar photovoltaics, residential market, business model, strategy, SUD.*

I. INTRODUCTION

The current period of human evolution coincides with a period of environmental instability, mainly caused by a massive use of hydrocarbons that have allowed the prevailing demographic and economic growth. Hence, unlike what has happened along the human history -when humans had to adapt to climatic changes to survive- now are the human beings the ones that produce environmental transformations. In parallel to that, nearly 1.1 billion people worldwide don't have access to electricity [1], with their associated economic and social consequences.

To mitigate both problems, a faster deployment of renewable technologies is needed, since they are clean, safe and inexhaustible. And, some of them, already cheaper than conventional energy sources

[2]. The technology that has undergone the fastest increase during the last years is solar photovoltaics (PV). This power source is currently driving the transition from a centralized energy model to a decentralized one, allowing the creation of a new energy actor, the prosumer, who participates in the production of consumption of its own electricity [3].

In order to continue this grid modernization, new ways of attracting people to the PV business are required. And especially in a country like Spain, with one of the best irradiation levels in Europe, but with a current PV installed capacity way lower than UK or German [4].

Therefore, the aim of the current work is to analyze how the company can create value inside the residential PV market in its main area of work: Catalonia (Spain). Such main goal should be accomplished after a deep study of the elements that may influence its success, like the technology, the regulation or the competitors, among others.

II. CASE STUDY: RESIDENTIAL SOLAR PV MARKET FOR SUD RENOVABLES

A. The Company

SUD Energies Renovables is the engineering company of the SUD group, formed also by Instalsud, in charge of the installation, control and maintenance. Since 2006, they have together developed more than 150 installations of renewable

energy, with a total capacity installed higher than 15 MW. Its core business is the industrial PV market.

However, due to the extremely volatile Spanish regulation, the company has needed to adapt and diversify throughout the years, undertaking activities in other regions -South America- and using other technologies -solar thermal, biomass and wind power-.

Despite the difficulties, the company is living its best times in 2018. Two of the most important activities in which the company is currently involved are the followings:

- Development of the biggest PV installation for self-consumption in Catalonia: more than 2MWp in Gurb (Barcelona).
- The *Impuls Solar Vallès* project, in which the company is performing 100 residential PV installations in a joint purchase way.

This last concept is especially significant for the business model that is the object of study, since SUD is positioning itself as a reference company in such a sector. However, the cost of each installation is quite low (1,65€/Wp, excl. VAT), which leads to lower margins if a battery is not included in the system.

B. The technology

Nowadays, still two-thirds of the electricity that is produced worldwide comes from a fossil fuel [5]. Furthermore, among all renewable sources, solar PV has still a mostly insignificant weight in the electricity mix. In fact, in 2017, this figure was close to 3% in a worldwide average. Honduras (13,3%), Germany (7,5%), Greece (7,3%) and Italy (7,1%) were at the front, while in Spain (3,1%), the percentage of the PV source in the mix lagged the European average [6]. In Catalonia, this value was even lower: 1%.

Thus, there still an important room for improvement in the sector, despite the extraordinary modules price reductions during the last years: 83% of drop from 2010 to 2017, according to IRENA [7]. Such significant figures were mainly caused by (i) the economies of scale and (ii) the increase in the production efficiency associated with newer cell designs [7].

Furthermore, after some years of slower reductions, the PV prices are expected to collapse again at the end of 2018 and the beginnings of 2019. The European Commission has decided to eliminate in September 2018 the import controls of Chinese PV modules in Europe. Hence, such products would be able to enter in the European market at very low prices and the European manufacturers would be forced to adjust their prices to not lose competitiveness [8].

In addition to such a sudden price drop, the sector regulation is expected to take a turn, leaving the so-called “Sun tax” behind. The tedious bureaucracy is going to be reduced and the self-consumption is going to be potentiated, specially with the incorporation of storage systems.

The real possibility to combine (or not) the simple PV modules installation with batteries would mark the prospects of small-scale solar energy in the coming years. In fact, Lazard calculated that large-scale crystalline silicon PV now has an LCOE range of 46 to 53\$/MWh of generation. However, by adding a battery and bi-directional inverters to the PV system to deliver 10 hours of storage with a capacity factor of 52%, it raises the cost to 82\$/MWh [9].

Lazard assessed also the perspectives of different storage technologies. It founded out that lithium-ion is the one with the best prospects, with a forecasted 36% of a price drop in the next 5 years [10].

Therefore, until now, they are a minority the number of PV installations that are being undertaken

with batteries, which significantly reduces the percentage of self-consumption. Hence, this is one of the main challenges of the PV technology: the intermittency issues.

Other challenges that the world needs to face are the followings:

- The low power density of solar PV in comparison with conventional sources, which induces the imperious need of developing a power transition (and not only an energy transition).
- The end-of-life management of the modules. According to IRENA and IEA, the world would need to manage around 78 million tonnes of PV modules waste by 2050 [11].

III. BUSINESS MODEL: RESEARCH & DEVELOPMENT

As it has been proved in the previous section, the company is facing an appealing window of opportunity in the coming times, especially due to the changes in the regulation. This, apart from erasing the most important obstacles, would serve more as the impact that would generate to the public, who will be captivated again by this business.

To attract them to this business, the company needs to provide a clear value. And to do so, the first import element to consider is a proper marketing analysis, defining the reference market and developing a strategic analysis (SWOT).

The reference market relies on a three-dimensional design developed by Derek Abell [12], and helps to orient a company inside a business:

- WHO (the customers to deliver the solution): Individuals in Catalonia.
- WHAT (the need we are satisfying): Domestic PV systems to provide economic, environmental and social gains.
- HOW (the solution itself): Undertaking the engineering, installation and legalisation in turnkey-mode projects.

After that, and in order to define the proper strategy to compete in such a complex and changing sector, it is developed a SWOT analysis (*Figure 1*).



Figure 1. SWOT matrix of SUD in the case-study market

The easiest way to catch the opportunities that are presented is using the classical marketing concepts: segmentation, targeting and positioning.

The segmentation study is undertaken to define groups of customers according to their interests or needs in relation to our service. From all the segments that the company can provide value, it is chosen the best one to begin the activity, which represents the first target market and the one to develop the business model around:

Catalan adults from 50 to 65 years. High acquisition power and high education studies. They live in a single-family house in a quiet residential area. They do not intend to use our service for the economic savings, but for environmental issues and for reducing its dependency from big utilities.

Nowadays, SUD, with the *Impuls Solar Vallès* project, has positioned itself into the medium-low price side of the residential PV market. However, if the company desires to increase the chances to succeed, it should undertake the most suitable repositioning path: the bottom-up approach.

The company is one of the most experienced in the market and should take advantage of that to offer a high-quality service, in order to be seen as a premium brand. In addition, is important to distinguish itself from the retailer companies, that are entering this business by lowering the price (*Figure 2*).

The company cannot compete with them since they are feasible also with reduced margins, as they have another source of income that SUD doesn't: the obtention of a new customer to whom to sell the electricity. Moreover, they can offer adapted electricity tariffs, manage their surpluses of energy, etc.

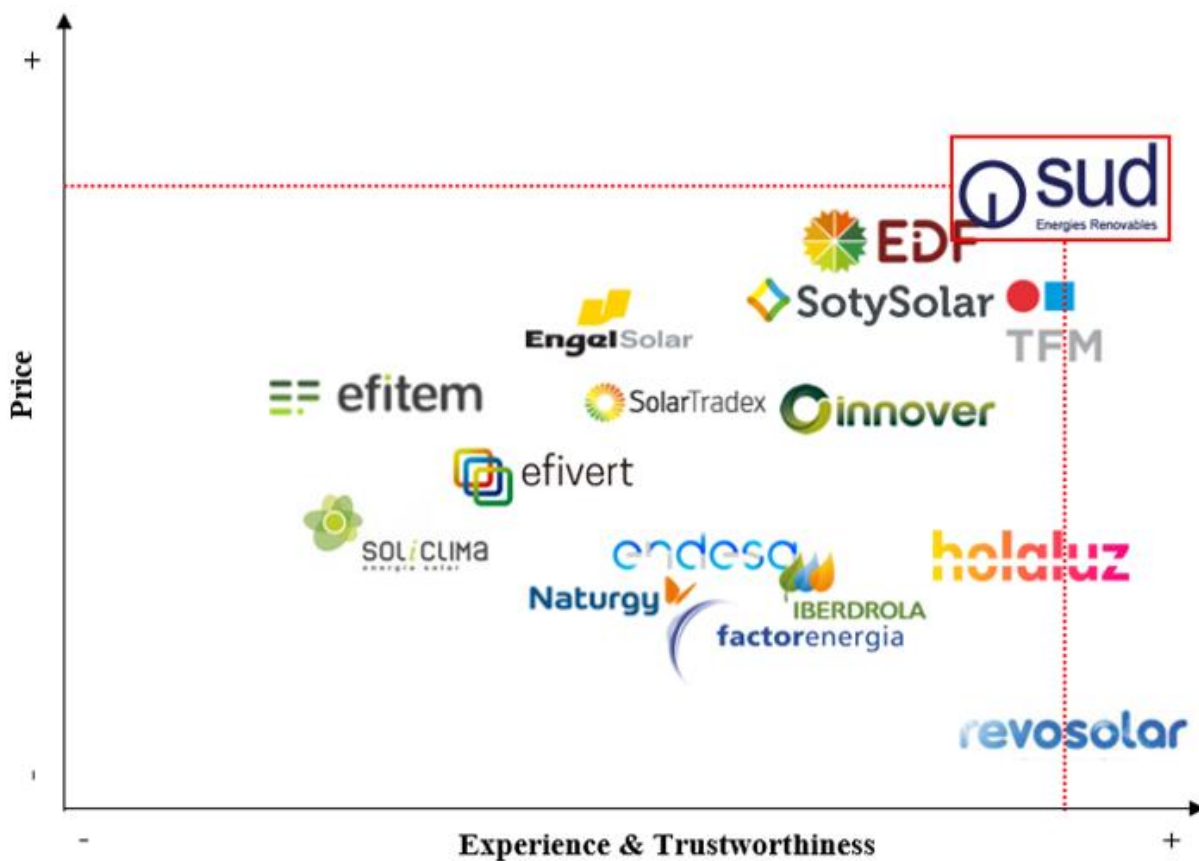


Figure 2. Positioning map applied to SUD in the case-study market

Therefore, SUD should be more focused on differentiating itself from the other specialized PV engineering companies, which, coming from the rest of Spain, they are starting to perform residential installations also in Catalonia (such as EDFSolar and SotySolar).

To have a unique selling proposition, the company needs two main elements. Firstly, a clear definition of the value that is proposed, to whom, how, etc. Secondly, it is needed a differentiation analysis against the competition, in the sense of studying in which points our offer provides a better value than the rest and in which others the company should improve.

Regarding the first one, one of the best tools to describe and analyze a company's business model is the Business Model Canvas. It was proposed by Alexander Osterwalder in 2010 and it divides the business model into nine building blocks that cover four main areas: customers, offering, infrastructure and finances [13].

The customer segment to whom SUD is delivering the solution is the energy conscious private homeowners, with the characteristics previously described. Concerning the value proposition, the company provides several functional and emotional values to the customers:

- Free technical and economic feasibility study.
- Design, development, execution and installation of the PV system.
- Legalization, maintenance and real-time monitoring of the installation.
- Money savings.
- Favoring a decarbonized and decentralized energy model.
- Empowering the customer in one of the basic goods.

When it comes to the infrastructure, the company must enhance its digital strategy to reach and maintain the customer. In addition, it should strengthen the bonds with the key partners, not only the component's suppliers but also the regional and national governments and PV associations.

Finally, the main revenue stream is the sales of the solar PV integral service, while the cost structure is driven by (i) the payments to suppliers, (ii) the representative costs and (iii) the cost of the employees and facilities.

On the other hand, regarding the differentiation strategy, the two main values that the company should potentiate are (i) the own installation company and (ii) its high reputation in the Catalan market. In fact, SUD is the representative of UNEF (the main Spanish PV association) in Catalonia and it has become a reference company within the sector.

IV. BUSINESS MODEL: IMPLEMENTATION

The business model presented introduces new elements to work out well for the company to approach the case-study market.

The two most important of them are (i) the unification of the most important activities in a single location and the (ii) modification of the current organizational chart, introducing a new department.

A residential solar PV project is made up of five main phases:

1. On-site visit, design of the system and development of the executive project.
2. Administrative procedures to obtain the permits and legalize the installation.
3. Order and reception of the material.
4. Installation.
5. Maintenance.

Currently, these steps are done in separate locations, which lowers the efficiency of the operations management.

At SUD headquarters it is completely carried out the steps 1 and 2; as well as the step 3 and 5 together with Instalsud (installation company), who also performs the stage 4. Concerning the step 3, SUD is considering several suppliers for the PV modules, inverters and batteries. However, regarding the PV structures supplier, all the projects have a common denominator: CSolar, which becomes a key supplier.

For that reason, it is proposed to include CSolar inside the company’s organigram and, in addition, join the three activities in the same industrial unit, in order to have more efficient processes (Figure 3).

The fact that all the activities are concentrated in the same place enables a much better cooperation among them.

This improvement is especially significant in the final steps of a project development, execution and maintenance, since it is fundamental to maintain a good communication to keep solving the problems that appear as well as to have a suitable planning for the upcoming works.

This fact is especially important for the residential market, where almost every roof has different characteristics and the cooperation between the structure’s supplier, the project engineer and the work head becomes critical. In addition, the new organization proposes to:

- Increase the power of the head of engineering, in charge of the coordination and management of the three activities.
- Incorporate a human resource technician and another administrative for process processing. In addition, it suggests joining the rest of administrative staff (from the three activities) in a single department.
- Create a new team, in charge of the communication strategy. In this sense, three job positions are created: (i) a SEO, SEM & Website Analytics expertise, (ii) a social media strategist and (iii) a Public Relations. The main objective of such a new team is to create an online brand, to improve the current web positioning and to establish and maintain new relations with the people of the company’s field of interest.

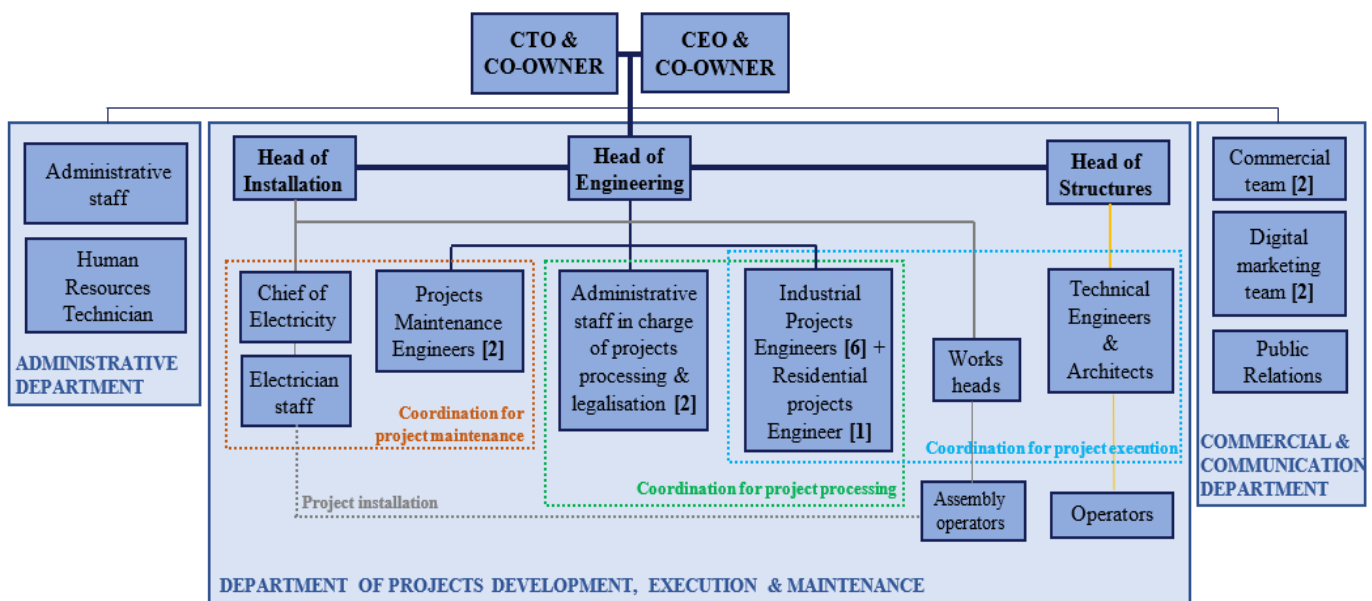


Figure 3. New organigram suggested with the implementation of the business model

Apart from joining the activities in a single industrial unit, it is also important to ensure a suitable process tracking and an efficient internal communication between the parts involved.

The main objective -now that the company is growing and the number of new projects is evolving exponentially- is to reduce the physical communications between the engineers and the head of engineering and the CTO, except when important technical doubts appear.

In the case of the residential market, it is especially important the job that is done for the new communications department. Once the PV system is installed and legalized, it is key to spread the work through the website and social media. And the public would receive this kind of information with a more positive perspective than in the case of industrial installations, since they would think that such installation and economic savings could be done on their own house. Therefore, by spreading awareness of the projects, it would be easy to attract new customers.

And this is a job that has been carried out by the CTO until now. Hence, most of the modifications that are proposed have the intention to free the co-owners and the department heads from all kind of work that should be considered “extra” to what their main functions should be.

V. OTHER BUSINESS OPPORTUNITIES

Apart from the presented business model for the residential PV market, the company may consider other good investment opportunities.

Due to the high knowledge and experience of SUD in the solar market in Catalonia, it is easier for the company to enter in new windows of opportunities.

The two that have been standing out in the present work are the followings:

- Utility-scale market

The utility-scale market is in a clear stage of growth in Spain: the auction of 2017 awarded 3.909 MW to solar PV projects, which are going to be developed in the coming years [4].

However, none of them is going to be in Catalonia, despite the levels of irradiation of this zone are not that poor.

If the company decides to undertake big ground-mounted PV projects, the most important issues to consider are (i) the suppliers of the components and (ii) the source of investment.

Regarding the first one, it may look for new strategic partnerships. In that sense, using the bifacial heterojunction PV panel developed by the Swiss company Meyer Burger may represent an inflexion point for the company. It is a technology that combines the advantages of crystalline silicon with the great absorption and passivation properties of amorphous silicon. And, according to recent experiments, the modules show an average efficiency of around to 24% [14].

Concerning the financing ways, the company may adopt the collective participation of citizens. This strategy, which is being promoted by the Catalan Government, would also contribute to enhance the power of SUD within the Catalan solar market.

- Shared self-consumption market

This new market is expected to increase its significance in the coming years. SUD, together with Holaluz, developed the first shared-self consumption in Spain last year. Thus, the company has been a pioneer in such a market and should take advantage of this to find a new source of profits.

One of the ways to improve the current working of a shared self-consumption installation is to eliminate the individual energy meters and treat the

whole system of different homes like a single installation.

By locating a general energy meter for all the community block, the energy surpluses are practically eliminated, since if a house doesn't consume their correspondent amount of energy, these kWh will directly go to another house that need it. Hence, the objective is to really share the energy and not only share the installation.

VI. CONCLUSIONS

The present work has developed a business model for the company SUD Energies Renovables to face the residential solar PV market in its area of work: Catalonia.

In the analysis of the elements that may influence this business model, it has been proved that the coming months are going to be the first time ever when the technology and regulation are aligned in the same direction in Spain. Thus, the company faces an important window of opportunity.

And it has already the knowledge, the experience in the sector and the trustworthiness to the customer, which position itself as a reference company in Catalonia. Hence, it should take advantage of that to offer a high quality (and at a high-price) service to differentiate itself from the direct competitors, which are entering into the market by lowering the price.

In sum, this study has demonstrated the need for SUD to introduce some modifications in the current positioning strategy and operations management if the company wants to increase the odds to succeed in the residential market.

REFERENCES

- [1] Outlook, E. A. (2017). From Poverty to Prosperity. IEA: Paris, France, 144.
- [2] Karneyeva, Y., & Wüstenhagen, R. (2017). Solar feed-in tariffs in a post-grid parity world: The role of risk, investor diversity and business models. *Energy Policy*, 106, 445-456.
- [3] Leal-Arcas, R., Lesniewska, F., & Proedrou, F. (2018). Prosumers: New actors in EU energy security. In *Netherlands Yearbook of International Law 2017* (pp. 139-172). TMC Asser Press, The Hague.
- [4] UNEF (Unión Española Fotovoltaica) (2018). *2017: el inicio de una nueva era para el sector fotovoltaico*. Informe Anual 2018.
- [5] International Energy Agency (2017). *Key world energy statistics* (p. 30). Paris: International Energy Agency.
- [6] International Energy Agency (2018). *Snapshot of Global Photovoltaic Markets*. Report IEA PVPS T1-33:2018.
- [7] IRENA (2018). *Renewable Power Generation Costs in 2017*. International Renewable Energy Agency, Abu Dhabi.
- [8] reuters.com (2018). *EU set to end Chinese solar panel import controls in September*. Available at: <https://www.reuters.com/article/us-eu-china-solar/eu-set-to-end-chinese-solar-panel-import-controls-in-september-idUSKCN1L90RF>
- [9] Lazard (2017). *Lazard's Levelized Cost of Energy Analysis—Version 11.0*.
- [10] Lazard (2016). *Lazard's Levelized Cost of Storage—Version 2.0*.
- [11] Weckend, S., Wade, A., & Heath, G. (2016). *End-of-life management: solar photovoltaic panels* (No. NREL/BK-6A20-66178). National Renewable Energy Lab.(NREL), Golden, CO (United States).
- [12] Abell, D. F. (1980). *Defining the business: The starting point of strategic planning* (pp. 3-26). Englewood Cliffs, NJ: Prentice-Hall.
- [13] Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons
- [14] Vetter, E., Zhao, J., Schmidt, C. (2018) *>24% Efficient Silicon Heterojunction Solar Cells Applying Meyer Burger's Mass Production Tools and 335W SWCT Module*. Meyer Burger, 2018-05-28