Can we build them from scratch? Viability of municipal retail companies in Spain

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ABSTRACT

Over the last years, municipalities have increased their awareness around energy by paying more attention to consumption, origin and cost. Some municipalities started to procure electricity in wholesale markets to eliminate intermediary costs. Others had more ambitious plans and have created municipal electricity retail companies not to only purchase electricity for municipal loads but also to offer this service to residential consumers. In this work we propose a methodology to evaluate the viability of setting up a municipal electricity retail company to purchase electricity for the municipal loads as a prior step to provide service to households. The methodology is applied to the city of Valencia (Spain), where a legal, economic and barriers analysis show potential benefits but also a set of risks. We used a year data of consumption, electricity prices and contracts to compare two scenarios, with and without municipal retail company, to assess the viability of the company. The methodology considers the costs associated with software, human resources and possible energy imbalances to assess the viability of the solution. The application of the methodology results in potential benefits but also important risks that must be taken into account by policy makers prior to the start of a project of this kind.

KEYWORDS

Electricity markets, municipal retail companies, energy transition, Valencia, savings, energy sovereignty.

INTRODUCTION

From some years on, a renewed interest on municipal energy companies has arisen in both Europe and USA [1]. The main objectives of these companies are, among others, the generation revenue for the municipality, the promotion of the local economic development, increasing transparency and offering solutions to energy poverty situations among their citizens. In the framework of increasing electricity prices [2], municipalities present growing electricity bills that need to be addressed both by energy efficiency measures and new forms of purchasing energy resources. Municipal retail electricity companies can help cities not only to reduce their bills but also to obtain new tools to address energy poverty, renewable energy generation and more transparency.

Over the last years, different Spanish cities and municipalities have implemented pilot projects to directly buy their electricity in the wholesale electricity market. Some of them have done by

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becoming qualified consumers or by creating municipal retail companies, which offer the possibility to serve external clients too.
However, establishing these companies has a large set of associated risk. Risks can come from increasing the electricity costs due to bad demand forecasting, difficulties to implement it due to lack of specialized or to the municipal treasure and cash flows.
In this context, even if different studies have projected the creation of municipal retail companies, no clear methodology or key steps exist. The objectives of this work are:

- To establish a novel methodology to evaluate the viability to constitute municipal retail electricity companies.
- To identify the main costs and benefits of this kind of projects.
- To present the main risks and barriers to the constitution and activity of this company.

To prove the feasibility of the proposed method, the methodology will be applied to the municipality of Valencia (Spain), where different electricity consumptions related to the municipal administration will be analysed in detail. The rest of the paper is organised as follows. The proposed methodology is presented in the first section, which is applied to the case study. Finally, some conclusions are drawn.

MATERIALS AND METHODS

The study follows a methodology consisting in five main steps, a benchmark, an economic, a legislative and risks and barriers analysis and finally series of results and conclusions, as it is shown:

1. Benchmark: This step includes the analysis of similar projects and their potential benefits. It is essential to understand these projects, their main barriers to be able to overcome them and the followed steps.

2. Legislative analysis: evaluation of the current regulatory framework for buying and selling electricity as a retailer and understand the duties and possibilities of retail companies, as well as the framework for public companies or organisations. A characterisation of each of the necessary steps to set up the company must be detailed.

3. Economic analysis: evaluation of the economic profits and costs that a municipal retail company would have compared with the business as usual scenario. Both scenarios should include not only energy related costs, but also other necessary costs such as software, human resources…

- Business as usual scenario (S1): analysis of the financial costs to acquire electricity in the current situation. The most common option is a contract with a private retail company with a set of fixed or indexed prices for a fixed period.
- Municipal retail company scenario (S2): acquisition of the electricity from the municipality and possible future customers through a company to the wholesale electricity market. Different markets exist such daily, intraday or future markets.

Moreover, overt the counter contracts may be signed with electricity generators outside the structured channels.

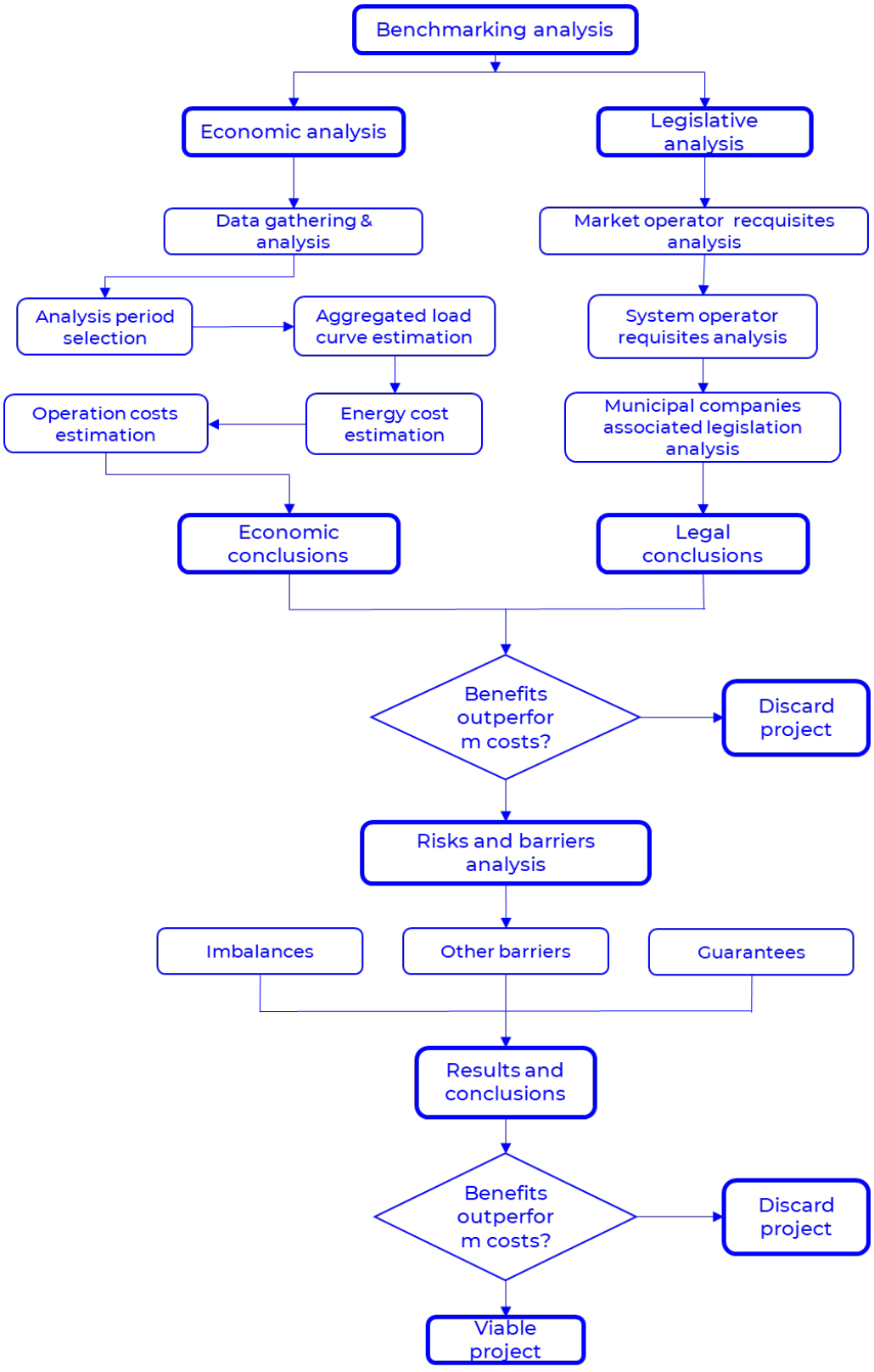

Figure 1. Methodology main steps

With both scenarios, an approximation to the total costs or profits can be estimated. To do so, the steps and the required information that we needed are the following:

a. **Data gathering and analysis:** obtention of real data associated with the municipality (consumption points and characteristics, periods of analysis, type of contract, type of meter…) and working methodologies through personal interviews and meetings with the technicians.
b. **Period analysis selection:** a yearlong period is the minimum required to understand the seasonal consumption and energy needs.
c. **Aggregated load curve estimation:** estimation of load curves if all data is not available.
d. **Energy cost estimation:** classification of the different consumptions by time periods and type of contract and grid access.
e. **Operation costs estimation:** analysis of the non-energy costs such as software, human resources…

4. Risk and barriers analysis: evaluation of the main risks associated with the operation:

- Imbalances: buying electricity in the wholesale market has risks associated due to imbalances between the final electricity consumed and the purchased. Imbalances cost to the buyer when they go against the system and might cost or not when they go in favour of the system. These overcharges can represent an important share of the total cost if the buyer does not predict well its necessities. Therefore, it remains essential to take them into account, in a common basis, retail companies tend to have imbalances between the purchase and consumed electricity from 2 to 10% of the total energy sold [3].
- Guarantees: in order to ensure the correct payment, normally the Market Operator and the System Operator requires to every agent participating in the market to immobilise some ctive to ensure the correct weekly pay. Not fulfilling these criteria can end up in fees to the buyer and even its disqualification from the market.

Moreover, other barriers such as the administrative, bureaucratic, social or political may exists.

5. Results and conclusion: analysis of the previous steps to conclude if a municipal retail company has viability or not.

CASE OF STUDY AND RESULTS

The methodology above presented has been applied to the city of Valencia, an 800,000 inhabitant's city in the east of Spain with Mediterranean climate. In 2018, the city had an energy consumption of about 92 GWh from which 59.4% were public lighting, traffic lights, fountains and parks, 33.4% was dedicated to offices and 7.3% was consumed in schools. It meant a total cost for the municipality equal to 14.5 M€ [4].

Benchmark

As it has been said, some cities and municipalities have started to purchase directly their electricity in the wholesale electricity market by becoming qualified consumers or by creating municipal retail companies, which offer the possibility to serve external clients too.

Among the cities that opted for the first option are Aviles (Asturias) and Rivas Vaciamadrid (Madrid), with 79.000 and 86.000 inhabitants, respectively. The first city started operating in the wholesale market in 2014 and the second did it in 2018. Both started acquiring the electricity for their most predictable consumption to not incur in imbalances and once they had enough experience, they extended it to most of their consumption points. Both cities have reported saving of around 20% a year from their initial bills [5], [6] .

Barcelona and Cadiz have more ambitious projects and they have municipal retail companies. Barcelona, a 1,64 M inhabitants city is the only city in Spain that has created a new retail company "Barcelona Energia" that provides electricity to the municipal consumption and 20,000 customers through a public company, TERSA. The company buys the electricity and does the retail business but also serves as a seller of the municipal generating infrastructure and helps its clients with self-generation. Barcelona does not offer cheaper prices but offers a more transparent service with counselling to their customers.

Cadiz, with 116.000 inhabitants, has a municipal retail company; "Eléctrica de Cádiz" since the mid-20th century that serves the municipal consumption and more than 60,000 customers. Its experience allows the company to provide competitive prices and services, which have recently wined several prices regarding Energy Poverty and PV installations.

Other cities such as Pamplona and Palma de Mallorca have studied the possibility to create this kind companies [3]. However, both projects have not been implemented yet due to political and legal barriers.

Legislative analysis

As a summary, Figure 3 presents the main steps to become a qualified agent in the wholesale market to buy electricity.

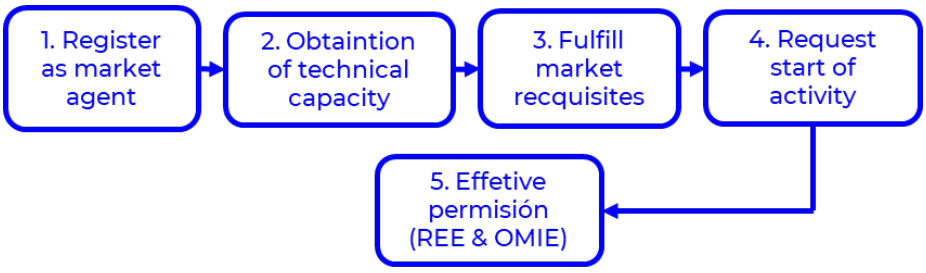

Figure 2. Legal process to start operating in the market

Economic analysis

For the first part of the analysis, consumption from the municipality was treated and analysed. The first step was to select the period of analysis with the maximum amount of real data. In our case this was from September 2017 to September 2018. In order to calculate the aggregated load curve for that period, we did not have the hourly consumptions of all the consumption points because about half of the meters are not smart. Therefore an estimation process to model the total aggregated consumption by time period and type of contract was necessary to obtain a total load curve of the municipal consumptions [7].

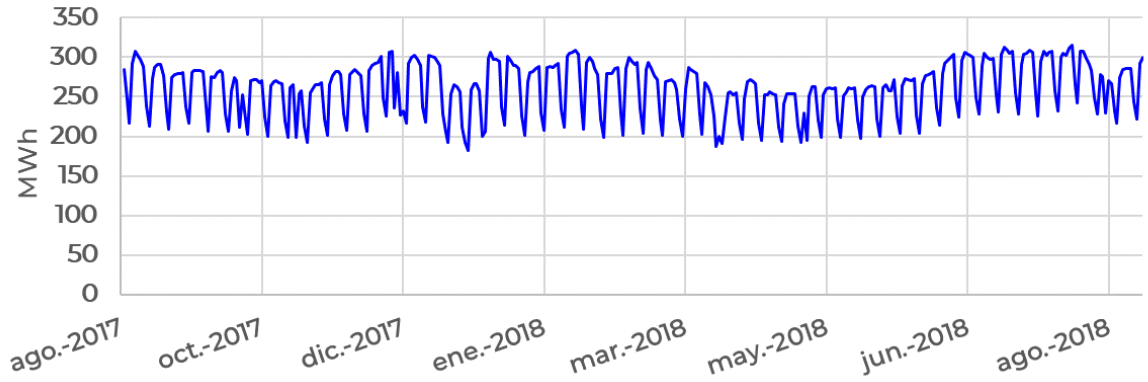

Figure 3. Daily consumption of the municipality during the period of analysis.

The estimated total consumption in the studied period is 95.280 GWh, which differs on 2% from the total consumption of 2018 [4], proving valid theses estimations.
Once the aggregated load curve is calculated, we classified the different consumptions by time periods, type of contract and grid access so that we could make the energy costs analysis under the two scenarios. Costs in scenario 1 represent the real costs from the contract the municipality currently has, while scenario 2 is obtained with the day-ahead wholesale electricity market prices and the regulated fees to the grid and operators [8]. The fees depend on the type of connection to the grid, the time periods and power contracted.
Furthermore, to develop this first phase, a public retail company would require some operation costs such as software, human resources, etc. Based on a similar analysis, we have estimated that in this first phase this costs will ascent to 106.600€ [3], which will be part of the scenario 2.
After the economic analysis, a legal one to fulfil all the requirements of the Spanish law has been performed.

Risk and barriers analysis

Finally, a risk analysis and a barrier analysis have been performed. A robust method to analyse the imbalances is taken, where the assumption is that the municipality will always deviate against the systems. Thus, we model the worst case of different percentages of deviation from the real consumption. Deviation prices are obtained from REE [8]. The guarantees needed for the municipal consumptions are also estimated with the current legislation. Finally, a barrier analysis is performed through a literature review and the interviews.
The economic analysis show potential savings of over a 1M€ without taking into account the risks and operation costs. However, the deviation cost overrun under different percentages of unbalances might put in danger the expected benefits.

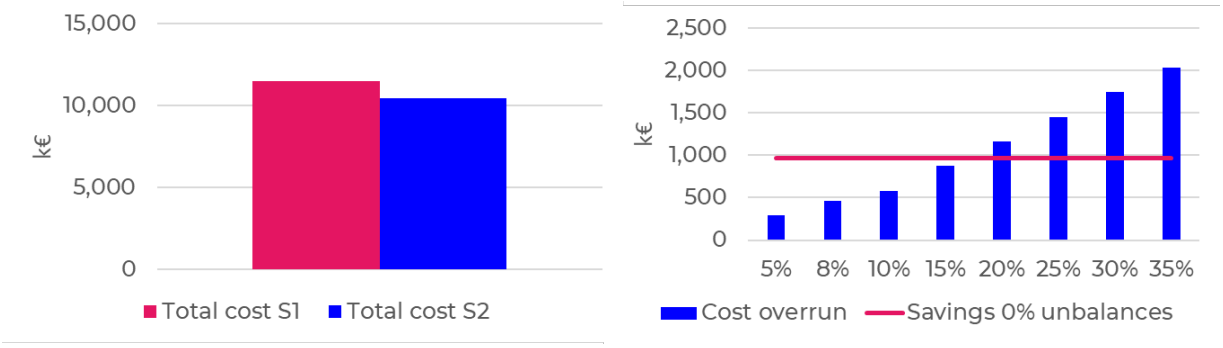

Figure 4. Costs by scenario (left) and cost overrun by percentage of imbalances (right)

Retail companies tend to have imbalances of around 2 to 10 per time step [3]. Thus, we assume 5% of imbalances every hour (time step of the Spanish system) against the system as a robust scenario to analyse. Probably in some hours the imbalance might be higher but also in several hours the imbalance would be in favour to the system, which causes no extra costs. Table 1 presents a summary of the costs and savings respect the initial scenario under different percentages of electricity imbalances.

Table 1 Results summary

Situation	Overall Cost	Savings respect S1	
	k€	k€	%
S2	10,558	962	8.35
S2 + 5% imbalances	10,849	671	5.83
S2 + 10% imbalances	11,139	381	3.30

As it can be see, event in the worst case scenario of having 10% of hourly imbalances during the whole year, buying electricity with a retail company would be profitable for the municipality. However, other possible risks exist. According to the current market characteristics, the guarantees are needed for eleven days and might represent at its maximum a total of 755 k€. This might represent a liquidity problem, which in case of not being fulfilled might end up in fees and sanctions. Changes to more complex ways of handling energy bills might generate issues among the current staff. To overcome this risk is important to take into account and hire specialised staff as mentioned in the operation costs.

CONCLUSION

The methodology here presented to create a municipal retail company for municipal loads is viable to any municipality in Spain. This option has a special interest to bigger cities, which can reduce their energy costs by directly going to the wholesale market without incurring in operation costs that are subject to economies of scale and have available cash flows. The city of Valencia is one of these cases with an electricity consumption of 92 GWh/year.

The case present large saving potentials arriving to 9% of the current electricity costs billed by a private retails company. It is important to highlight that this savings are lower than the ones reported by other municipalities due to the fact that energy efficiency and contractual

changes have already been made in the city. This contrast with municipalities that start this kind of project without previous work on their energy bills, which obtain larger savings from worse initial scenarios.

On the one hand, the creation of a municipal retailer provides a valuable tool to start deploying municipally owned generation, providing a platform to assess and manage them. The company can also become a retailer for households offering advices over distributed energy resources, self-generation, energy poverty and other energy related issues.

On the other hand, some barriers and risk such as complex bureaucratic procedures, economic guarantees, costs overruns or bad demand predictions. These issues can be a major burden to the constitution of a municipal retail company. However, they can be correctly faced by contracting specialized human resources, software and with a convenient planning of cash. In contrast, by managing all these risks, the city will obtain a better understanding and control of their energy loads and consumption.

Future work will adapt this methodology to asses the viability of including residential consumers to the retail company. Studying the feasibility of programs to reduce energy poverty and represent consumers with self-generation units and distributed energy resources.

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