D2.2: Business Models and early stage financial support

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Final Version

Please note this version has not yet been approved by the European Commission

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[1] **R** = Document, Report; **Dem** = Demonstrator, pilot, prototype; **DEC** = website, patent filings, videos, etc; **OTHER** = other

[2] **PU** = Public, **SE** = Sensitive

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INTRODUCTION

Energy communities, which empower local actors to participate actively in the generation, consumption, and sharing of renewable energy, play a crucial role in driving the transition to a sustainable energy system from the bottom up. This report, *D2.2: Business Models*, explores the potential of energy communities to transform the traditional energy market by focusing on collective self-consumption models and their associated business structures.

Building on the work in WP2 on mapping the value exchanges between the different actors involved in the TANDEMS pilots in Bulgaria, Flanders and the Netherlands, this Deliverable examines in more operational detail the economic and organizational dimensions of energy sharing, comparing traditional energy market models with emerging approaches that prioritize community-driven energy management. By employing the a Business Model framework and analysing case studies, the report provides a comprehensive perspective on how these models can be designed, implemented, and scaled. Key considerations include the cost structures, equity requirements, and the integration of innovative pricing mechanisms to ensure fair and sustainable operations.

Through this analysis, the report aims to provide actionable insights for EU policymakers, energy community leaders, and stakeholders seeking to implement effective energy-sharing models. This document represents an important step in understanding the business dynamics of energy communities and their potential to address the dual imperatives of climate action and social equity.

AIM

In this report, we will try to unravel and quantify the key elements that make up the business model of community energy. Every energy community is different, but the key elements that make up the business model are more or less the same. So by understanding these key elements and quantifying them, it becomes easier to design a new model or to analyse and adapt an existing one.

Energy communities want to contribute to the energy transition and often start by developing production assets, which is a great start. In many cases however, the energy community wants to be more active in the energy market by also sharing this energy with its members as end-users. Here, Energy Communities are often confronted with a lack of knowledge about the energy sector and/or a dependency from market actors. This report aims to cover part of this knowledge gap by showing what happens within the entire energy supply chain and how this effects the business model of energy sharing.

APPROACH

First, we will look at a basic concept of energy sharing from a theoretical standpoint and how it differs from a more traditional market model. Then we will map out the structure for analysing a business model for energy sharing and define the key quantifiable values throughout the entire supply chain. We will aim to quantify and understand these values and what their order of magnitude is. This will give us a final (theoretical) business case and proposition for energy sharing.

In the third chapter we will use this same structure to analyse the business models of three very different Pilot Projects from the Tandems Portfolio of Pilot Sites and compare the similarities and differences.

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1. ENERGY SHARING MODEL EXPLAINED

Energy Sharing has many different interpretations and operational applications. Also, there are many different terms that can mean similar things, like the cost price model, self-supply model, collective self-consumption and Peer2peer trading.

We will not go into the vast amount of operational models or different legal definitions of energy sharing, rather, we will look at the basic concept of an energy community of end-users that collectively owns its own assets and wants to supply this electricity directly back to the end-user.

Please note that energy sharing processes described are administrative and financial and are part of the regular processes used by energy suppliers and balance responsible parties (BRP's). We are not talking about sharing actual electrons through direct cables.

1.1. TRADITIONAL MARKET MODEL

To understand energy sharing as a concept, and in particular how it can fit into the existing energy sector as a whole, it is useful to understand the current traditional market model (Figure 2: Traditional energy community model).

All producers have a contract with a supplier. These contracts are often referred to as PPA's (Power Purchase Agreements). Generally, the price of these contracts refer to the market price (ENDEX for long term contracts and EPEX for day ahead prices in the Netherlands). Sustainable production assets like Solar and Wind farms sell their production on the EPEX day ahead market because the subsidy they receive from the government is based on the development on this market (see chapter 2.11).

On the other side, end-users also have a contract with a supplier. The price per kWh in this contract is also based on the energy market, regardless if it is a dynamic (EPEX) price or a 1, 2, or 3 year fixed price (ENDEX).

So production and consumption are not directly related[3], prices are determined by the market. Producers generally want the highest price for their production, and consumers want to pay the lowest price. Producers and consumers therefore have opposing interests. The price in the energy market is determined by the marginal cost for the most expensive dispatchable plant which is

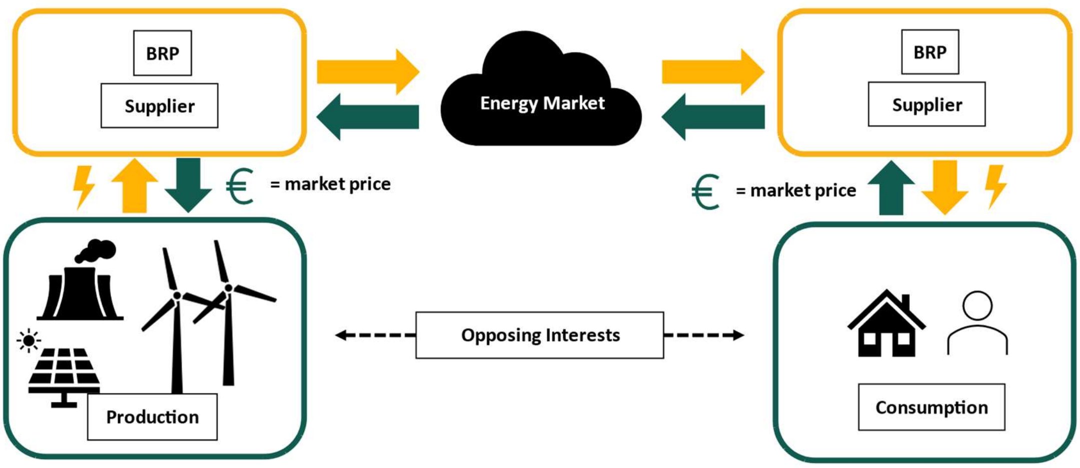

Figure 1: Traditional market model

[3] In some cases industrial end users do have a direct relationship with producers

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producing electricity[4]. The electricity market price is therefore strongly influenced by an event like the availability and price of oil, coal or gas.

1.2. TRADITIONAL ENERGY COMMUNITY MODEL

Also within traditional energy communities (Figure 2: Traditional energy community model) the traditional market model is used. Consumers invest in production and receive a financial return. In the Netherlands we jokingly call these investment communities.

The opposing interest is removed although there is no relationship between the energy bill of the consumer and the production of the producer. During the energy price crisis of 2022 this meant a very high income on the production side of the community (with potential high returns for the investors) and (still) very high bills on the consumption side.

Almost all energy communities in the Netherlands are organised this way and although it is a great way to organise ownership of assets within communities of end-users, this model could not be characterized as energy sharing.

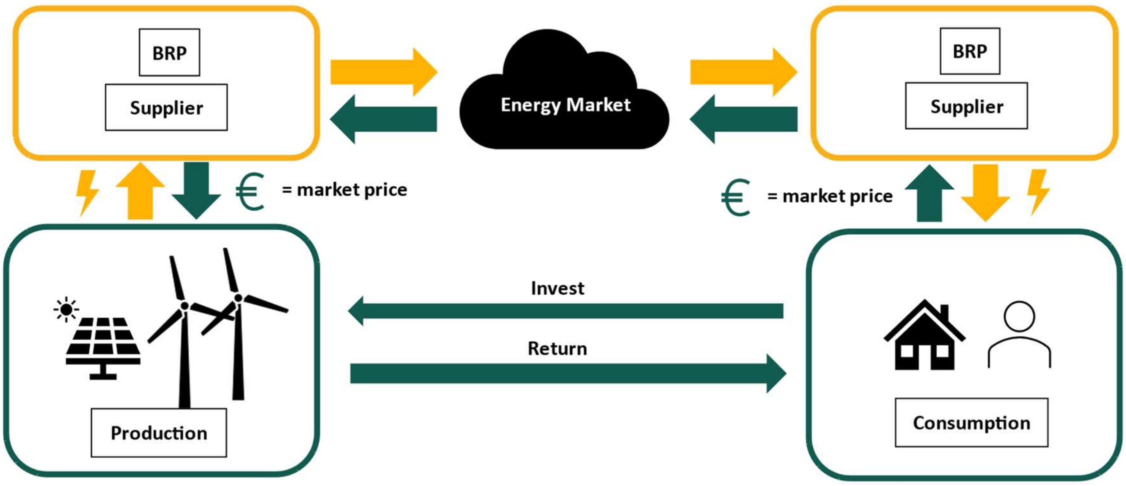

Figure 2: Traditional energy community model

[4] Merit Order | Energy Transition Model

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1.3. ENERGY SHARING MODEL

When production and consumption of electricity within an energy community is simultaneous (occurring at the same time within the timeframe of an hour), the production can be supplied to (or shared with) the consumers directly, without interacting with the energy market (Figure 3: Energy sharing model).

Of course, this is not possible in 100% of the time. Therefore, market interaction will always be necessary. The energy community will have to sell electricity when production is higher than demand and buy electricity when production is lower than demand. Typically, the market of choice would be the day ahead market, but in theory, this could also be another community.

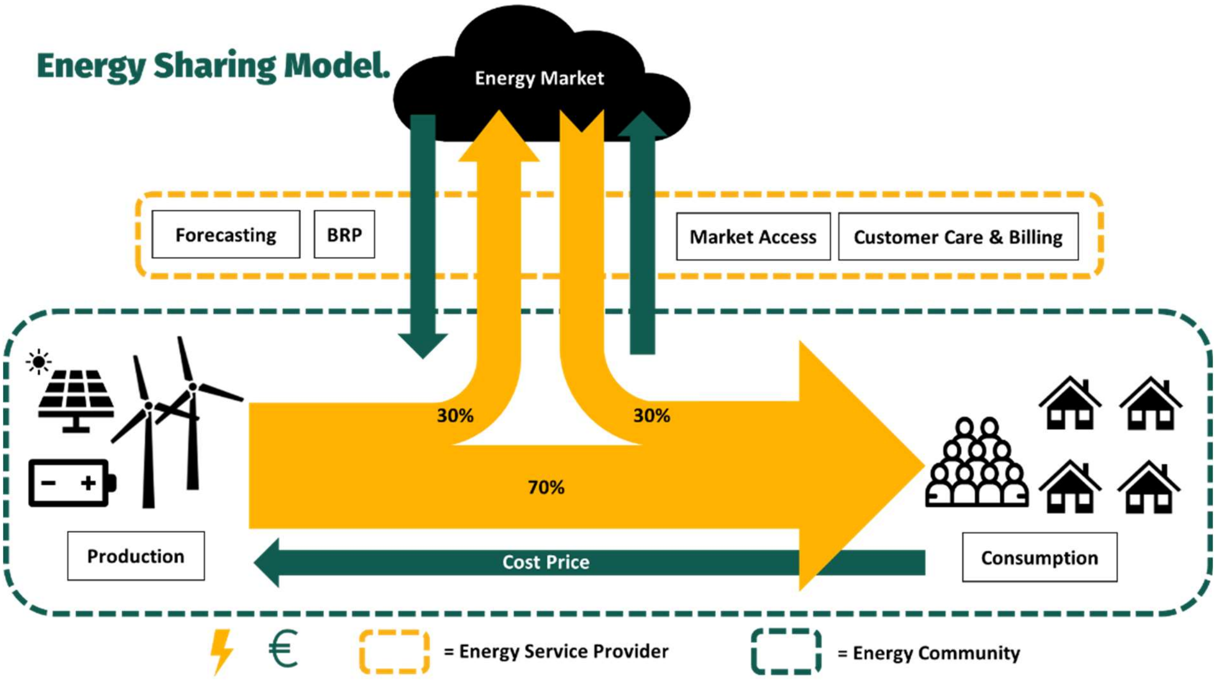

Figure 3: Energy sharing model

1.4. A FAIR COST PRICE

What is the price you pay for your own electricity? In the energy sharing model, the price paid for the produced electricity is the cost price: the price that has to be paid to cover all costs. Paying less will mean the Energy Community will go bankrupt and paying more will mean a surplus or profit for the Energy Community, which is being paid for by their own members. Both don't make much sense, so the cost price is the most reasonable middle ground. Of course it is wise to include certain financial buffers within the cost price.

The business model of energy sharing is therefore also very simple. The energy bill of the consumers has to cover all the costs within the energy community. This includes the cost price of production, the costs that come with buying and selling on the market and other handling cost. In chapter 2 we will go further into detail on the different cost elements involved.

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1.5. ENERGY SERVICE PROVIDER

In the energy sharing model, there is still an organisation that plays the role of the energy supplier and BRP. We prefer to call this party the Energy Service Provider (ESP) because it facilitates the energy sharing activities for the energy community. These services include:

- Forecasting
- Energy Sharing (internal matching within the community)
- Balancing (BRP)
- Market access and trading
- Customer care & Billing

Traditional energy suppliers fulfil these functions to provide the commodity to their customers but generally don’t provide these as a separate service.

Agem, *OM Nieuwe Energie* and *Energie van Ons* are examples of Dutch cooperative energy suppliers that are now experimenting with these models in real life Pilots and are developing services like this for energy communities.

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2. BUSINESS MODEL FOR ENERGY SHARING

When we look at the business model of energy sharing as described, we can distinguish 4 points of view.

1. The Business Architecture looks at the different legal entities and physical assets and their relationships.
2. The Business Model looks at the different quantifiable values that flow between the entities defined in the Business Architecture.
3. The Business Case looks to quantify the elements defined in the Business Model as to determine the (financial) proposition
4. The Proposition looks to describe the value for the different target groups within the Business Model

This approach is not a step by step toolkit where the one step leads to the other. For that, the viewpoints are to interconnected: a proposition can determine a business architecture, and vice versa.

Breaking down the energy community that organises energy sharing into different perspectives or layers does help us to look at and understand its business model and proposition better.

Before we dive deeper into the Business Models of energy sharing by actual pilot projects, we will further explore the general concepts from these different perspectives and look at the key elements that are implemental to the eventual outcome.

2.1. BUSINESS ARCHITECTURE

In very simple terms, the Business Architecture of the energy sharing model will look approximately like Figure 4: Business Architecture. Here we see an end user who is a member (co-owner) of an energy community that is owner of an assets. The production of the asset is supplied to the end user through an Energy Service Provider (ESP).

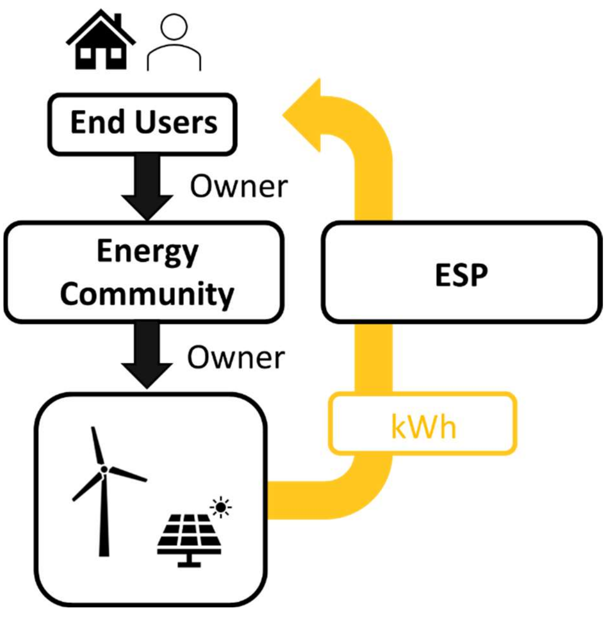

Figure 4: Business Architecture

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2.2. BUSINESS MODEL

In Figure 5: Business Model, we now add values flows to the business architecture. The end user invest equity into the Energy Community or funds the equity through crowdfunding. In case the equity is not sufficient for the overall investment it can be supplemented by a bank loan or other debt capital. The Energy Community will then invest in the production assets. The costs for the production assets are hardware, real estate, services and of course the interest on the loans.

The ESP also makes costs to provide the service needed to supply the energy to the end users. Through the energy bill, the end users pay per kWh and maybe a fixed service fee. The whole model is based on the idea that the energy bill covers all the costs within the value chain.

2.3. BUSINESS CASE

In the business case we try to quantify the key value flows within the business model. First, we will determine the cost price of production, this is the basis of the whole model. When we know this, we can also determine the required equity.

To go from the cost price of production to the cost price of consumption, we have to understand what elements effect the costs of supply to the end user to determine the final price.

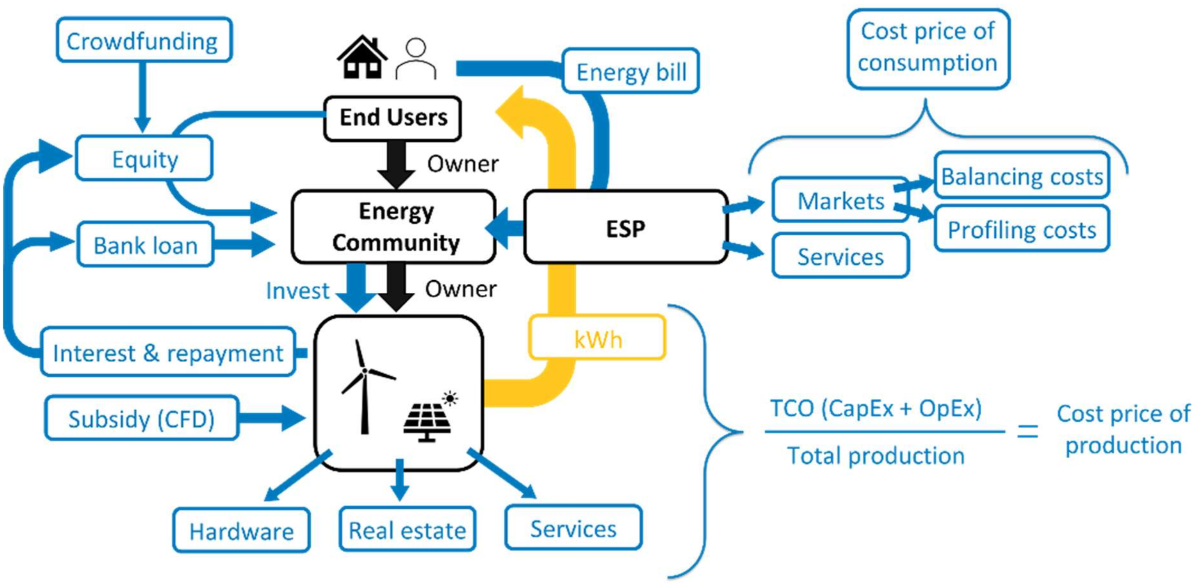

Figure 5: Business Model

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2.4. COST PRICE OF PRODUCTION

To determine the cost price of production (€/kWh or €/MWh) we have to look at the total cost of ownership (TCO) and divide this by the total production. See Table 1: Cost price of production

The TCO is made up of the CapEx (Capital Expenditure) and the OpEx (Operating Expenditure). The exploitation period that is chosen in this calculation has a great impacts on the cost price. In most cases the financial exploitation period is around 15 years, whereas the technical lifespan of the asset is around 25 years.

The cost price of production is determined in the project development phase and can differ greatly per project and has many defining elements. However, it can also be broken down into a few key figures shown in Table 1: Cost price of production. These figures have been published by PBL, the Dutch environmental assessment agency in 2024, whom also advises the ministry on the guaranteed price in the SDE++ subsidy. This is a one side contract for difference (CFD) form of subsidy. See also chapter 2.11

The numbers show quite a discrepancy between the subsidized price (SDE++ (CFD) price) and the calculated cost price over a period of 20 years.

To be on the safe side we advise to use the subsidized price of around 6-7 ct/kWh in the calculations. This is often times the price that is used by the bank to determine financial feasibility.

In further calculation examples we will use an average cost price of 6,3 ct/kWh or €63/MWh and an exploitation period of 15 years.

If the actual cost price is lower, and/or the exploitation period longer, that can be seen as a bonus.

Project type		**Wind**	**PV on land**
Capacity	MW	10	10
Investment (capex)	€/kWp	1450	472
Fixed OpEx (year)	€/kWp	13,37	12,1
Variable OpEx (year)	€/kWh	0,0089	0,0019
Full load hours		2980	855
SDE++ (CFD) price	€/kWh	€ 0,062	€ 0,066
Exploitation period		15	15
Total CapEx	€	€ 14.500.000	€ 4.720.000
Total OpEx	€	€ 5.983.800	€ 2.058.675
TCO	€	€ 20.483.800	€ 6.778.675
Production (year)	kWh	29.800.000	8.550.000
Total production	kWh	447.000.000	128.250.000
Cost Price	€/kWh	€ 0,046	€ 0,053

Table 1: Cost price of production

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2.5. FINANCE AND EQUITY

The Energy Community needs to finance the investments in the assets. See Table 2: Finance and equity. Table 1: Cost price of production shows that, generally, the investment (CapEx) is about 70% of the cost price, the rest is made up of OpEx costs.

The total investment needed is: 0,063 [cost price of production] x 70% [CapEx percentage] x 15 [years of exploitation] = € 0,67 / kWh

So for an end-user with a consumption of 3800 kWh per year, an initial investment is needed of about €2500.

Most of this investment could be done through a bank loan, but some equity is always necessary, in most cases around 20%.

For an end-user with a yearly consumption of 3800 kWh an initial equity investment of about €500 is needed.

It would make sense that the end-user is the one that puts in the equity required for their part of the consumption (so more consumption – more equity) and becomes member of the community and co-owner of the assets. However, if the end-user wants to participate and is not able to make the initial investment, the required equity could also be raised through crowdfunding.

Costprice of production	€ 0,063	€/kWh
Exploitation	15	Years
CapEx percentage	70%	
Required finance per kWh	€ 0,67	€/kWh
Equity percentage per kWh	20%	
Required equity per kWh	€ 0,13	€/kWh
Yearly consumption	3800	kWh
Required finance	€ 2.532	
Required equity	€ 506	

Table 2: Finance and equity

2.6. PROFILING COSTS

If all the electricity produced can be directly and simultaneously used by the consumers, the cost price of production can be the same as the cost price of consumption. Unfortunately, the production profile of sustainable energy is never the same as the consumption profile and so the energy community will have to sell the surplus production and buy the shortage at another moment. We call this process profiling. See: Figure 6: Profiling

Because the price received for selling the produced electricity will most likely be lower than the price at which it is bought back to consume it, this whole market interaction will increase the costs for the energy community and therefore the final price of consumption. We call these costs the profiling costs.

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The profiling costs are determined by the difference between the production profile and the consumption profile, and the price difference between buying and selling. In other words the market exposure and the market volatility.

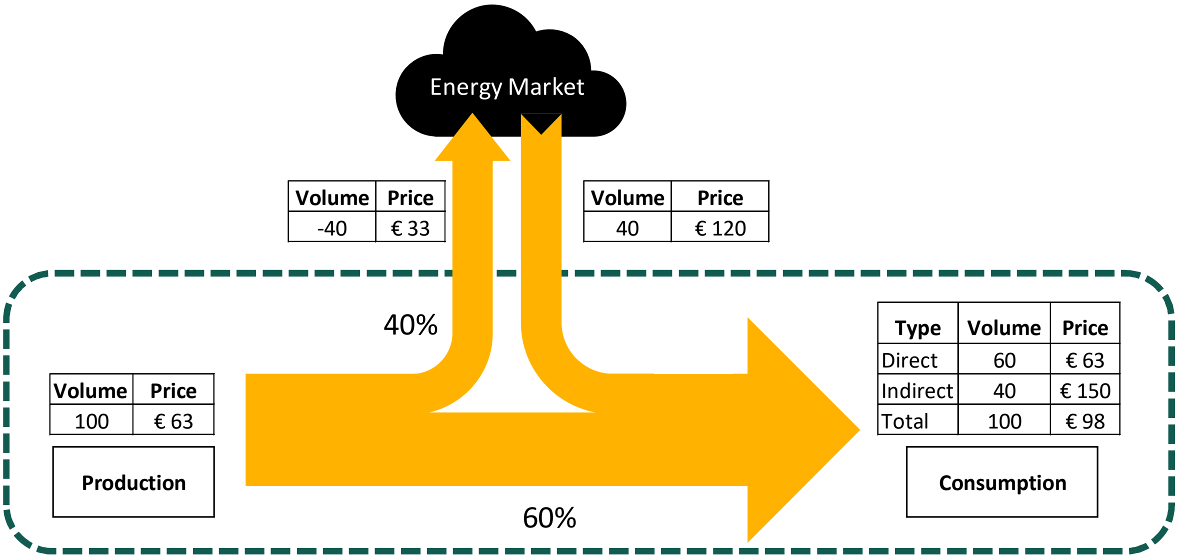

Figure 6: Profiling

To mitigate the risks of these profiling costs it is important to have a production profile that fits the consumption profile. A combination of wind and solar is therefore important. Energy storage can also mitigate this risk, but it is unrealistic to expect no profiling costs at all.

Calculation Example

The example from Figure 6: Profiling is put into a more elaborate calculation example in Table 3: Profiling costs calculation.

Energy community	**Volume**	**Price**	**Total**
Total production	100	€ 63	€ 6.300
Sell	-40	€ 33	-€ 1.320
Buy	40	€ 120	€ 4.800
Consumption	100	€ 98	€ 9.780

Market exposure	**Volume**	**Price**	**Total**
Extra cost for indirect consumption	40	€ 87	€ 3.480

End user	**Volume**	**Tariff**	**Total**
Direct consumption	60	€ 63	€ 3.780
Indirect consumption	40	€ 150	€ 6.000
Total consumption	100	€ 98	€ 9.780

Profiling factors			Factor
Profiling factor for indirect consumption			2,38
Profiling factor for single tariff			1,55

Table 3: Profiling costs calculation

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In Table 3: Profiling costs we see:

- Total production of 100 MWh at a cost price of €63
- 40% market exposure (or 60% simultaneous usage)
  - Sell 40 MWh at a price of €33
  - Buy 40 MWh at a price of €120
- The extra costs for indirect consumption are therefore: €120 [buying] – €33 [selling] = €87
- The price of indirect consumption is therefore: €63 [cost price] + €87 [extra costs for indirect consumption] = €150
- The average price of consumption is: (€63*60%) + (€150*40%) = €98

Profiling factors

The profiling factors are an indicator on how much the cost price is influenced by the profiling process. The factor for a single tariff is calculated by the relationship between the cost price and the price of consumption.

€98 [Consumption Price] / €63 [Cost Price] = 1,55 [Profile factor for indirect consumption]

In other words: the average price of consumption is about 1,5 times the cost price of production.

We can do the same if we use a double tariff structure:

€150 [Indirect Consumption Price] / €63 [Cost Price] = 2,38 [Profile factor for indirect consumption]

In other words: the price for indirect consumption is more than double the cost price of consumption.
In a perfect world, where every kWh produced would also be simultaneously consumed, nothing more, nothing less, the cost price of production would be the same as the cost price of consumption and the profiling factor would be 1.

2.7. SIMULATION

To get a realistic idea of these numbers we have used a simulation tool developed by Zenmo in the Local4Local project. See Figure 7: Simulation

This tool simulates the actual solar, wind and consumption profiles with the actual market prices of 2023. The model matches production and consumption at a cost price and trades any surplus or deficits at market prices, just as explained in the previous chapters.

In the simulation we have used

- 10.000 households without solar panels with a total consumption of 38.000 MWh/year
- 10 MW of Solar with a production of 9449 MWh/year at a cost price of €66/MWh
- 14 MW of wind with an annual production of 28752 MWh/year at a cost price of €62/MWh

This simulation shows

- Direct use of 60%
- Average cost price of production of €63/MWh.
- In-direct consumption at a price of €150/MWh.
- a profiled (single) price of €98/MWh.

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These numbers have been used in the example calculations on profiling costs.

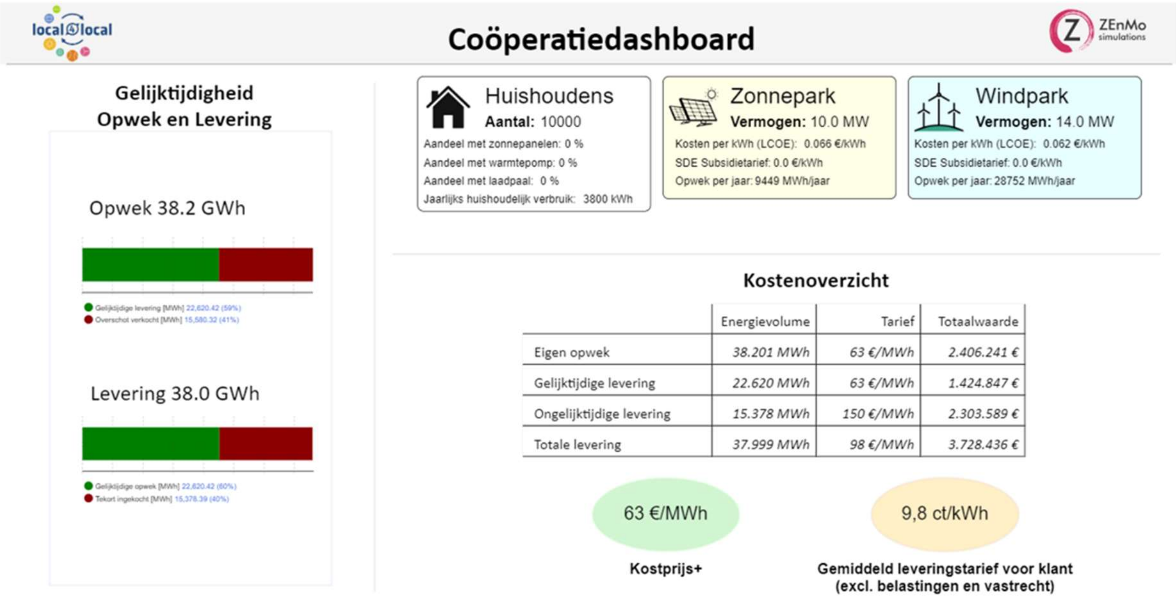

Figure 7: Simulation

2.8. BALANCING

All users with a grid connection have balance responsibility and need a Balance Responsible Party (BRP). In most cases this market roll is organised by the supplier without the end-users even knowing of its existence. Yet this roll is instrumental for the balancing and functioning of the electricity grid, especially in a unpredictable and volatile market. Also, there are risks and costs involved in the process of balancing that will impact the cost price of consumption.

A BRP has to nominate (forecast) the expected production/consumption per Imbalance Settlement Period (ISP) in their E-Programme to the Transmission System Operator (TSO) the day before its occurrence. This process is called nomination. The actual production is measured and allocated by the Distribution System Operators (DSO). This process is called allocation. The difference between the nomination and the allocation is the imbalance as shown in Figure 8: Balancing.

The imbalance can be positive or negative and has to be bought or sold for the imbalance settlement price. The settlement price can also be positive or negative. A negative price means you will have to pay if you consume less than expected and have to sell on the imbalance market (and vice versa). It can also mean you will have to pay if you produce more than expected and sell on the imbalance market (and vice versa). Sustainable production is difficult to predict (specially solar) and therefore the imbalance risk is high. Also, the imbalance

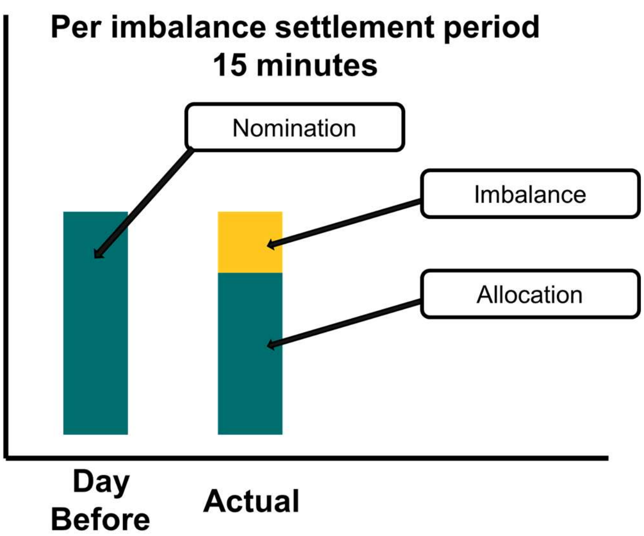

Figure 8: Balancing

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settlement price has become very volatile increasing the risk even more.

The volatile imbalance market has also become a trigger for users and producers to use their flexibility to financially gain from the negative prices by creating imbalance on purpose. This has lead to rapid oscillations in the power grid forcing the TSO to delay its imbalance price signals[5]

The imbalance costs are therefore currently hard to determine. We estimate these costs at about 10% of the profiled price.

Large scale portfolio's, curtailment and load flexibility are measures that can be taken to mitigate the risks and lower the costs.

2.9. SERVICE COSTS

The service of the energy service provider includes

- Forecasting
- Energy Sharing (internal matching within the community)
- Balancing (BRP)
- Market access and trading
- Customer care & Billing

In this document we will not go further into detail about what these services entail.

The service costs of the energy service provider are estimated at around 1 ct/kWh and a fixed fee of €5 a month.

2.10. PRICING

Now we have all elements to determine the cost price of consumption:

- Cost price of production
- Profiling factor
- Imbalance factor
- Service fees

With these factors we can calculate a realistic average cost price of consumption. This can be used to compare the price with other offers in the marketplace.

Single price format		
Cost price of production	0,063	€/kWh
General profiling factor	1,55	
Imbalance factor	1,1	
ESP service fee	0,01	€/kWh
Cost price of consumption	0,12	€/kWh

Table 4: Single cost price of consumption

[5] Tennet Market news – 13-11-24

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A single tariff for consumption does not incentivise direct use, and this is, of course, something that we should encourage. Therefore we can choose to use a double tariff. One for direct use and one for indirect use. Smart meter data can be used to determine per end-user when direct and indirect use occurs. All prices are excluded of Energy tax, VAT and network charges.

Dual price format	**Direct use**	**Indirect use**	
Cost price of production	0,063	0,063	€/kWh
Profiling factor for indirect consumption		2,38	
Imbalance factor	1,1	1,1	
ESP service fee	0,01	0,01	€/kWh
Cost price of consumption	0,079	0,175	€/kWh

Table 5: Dual cost price of consumption

2.11. SDE++ (CONTRACT FOR DIFFERENCE)

All previous calculations have been done with the assumption that there is no subsidy based on the actual market price, a so called contract for difference (CFD). In the Netherlands, the SDE++ subsidy is a one way contract for difference that guarantees the difference between the subsidy price and the market price, in the case the market price is lower than the subsidy price.

This subsidy mechanism creates a cost price of production that varies according to the market price as shown in Figure 9: One sided contract for difference.

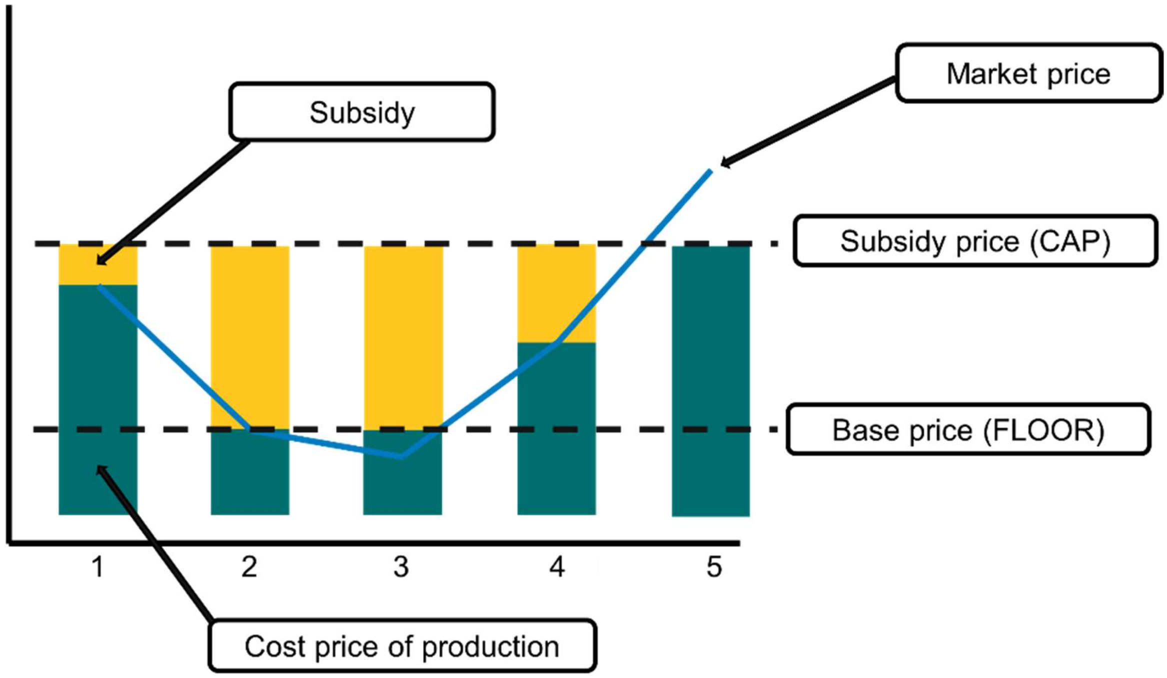

Figure 9: One sided contract for difference

The subsidy has a cap and a floor: the cost price of production will stay between these two lines. So if the market price is lower than the floor (situation 3), the cost price of production remains at the price of the floor. If the market price is higher than the cap (situation 5), the cost price of production will not rise above it. This is the actual cost price of production.

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Simulation with SDE++

If we run the simulation from chapter 2.7 and include the SDE++ option (in which the cost price is the same as the subsidy price), we see that in 2023 the cost price of production would have dropped from €63 to €50 per MWh and the average profiled price from €98 to €85.

2.12. PRIVATELY OWNED SOLAR - PROSUMERS

Until now we have not taken into account that end-users can have solar panels on their own roof (prosumers). In the Netherlands, over 30% of households have solar panels [6] (and this percentage will be higher with members of energy communities). Reason for this high (the highest in Europe) adoption of solar panels has been the financially very attractive netting regulations for feed in of solar power. These regulations are problematic for the energy sharing concept because the price the energy community has to give the end-user for the power injected into the grid is much higher then its actual value or cost price. This netting scheme will end in 2027[7].

Without the netting scheme, it is possible to integrate privately owned solar into the energy sharing model. The most consistent method would be to determine a cost price for household solar power using a similar method as done in chapter 2.4 for larger scale solar fields. The end-user then receives this cost price of production for every kWh that is injected into the grid. This guarantees the prosumer a reasonable return on its investment in the solar panels. Also, for all the electricity that is directly consumed within the building, the end-user does not have to pay taxes, adding to the individual business case.

From an energy community perspective the sum of all individual installations can be viewed as a collective installation. This also means less collective solar assets are needed in the portfolio to ensure a high direct use and low market exposure.

2.13. PROPOSITION

This brings us to the proposition for the end users:

- Invest €500 and receive locally produced sustainable energy at a cost price for 15 years (or more).
- The price of consumption is, at current market conditions, about 12 ct/kWh, which is a very reasonable price, compared to current market offers.
- Because 60% of production is directly consumed from the source at the cost price, the influence of external markets like the oil, gas or coal price is strongly reduced.
- The model and creates opportunities for democratizing the whole energy supply chain, from production to consumption. As a member you can be part of this process.
- Because the model covers the entire energy supply chain, adaptability to new market circumstances to reduce dependency, risk and lower costs is possible.
- The model is based on transparency and is non-commercial cost price driven.
- A fair price for a fair product.

[6] Netbeheerders zien aantal huishoudens met zonnepanelen verder groeien in 2023 | Netbeheer Nederland
[7] Netting scheme solar panels ends per 2027 | Business.gov.nl

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Is it cheaper?

It is difficult to compare the energy sharing model to the traditional market model in terms of price and risk. Will the cost price of consumption be lower than other commercial offers in the market place? Simulations of the past show that the energy sharing model would have had a lower price than the market. This, however, is strongly influenced by the energy price crisis of 2022. To be able to answer this question for future scenario's we would have be know how the market will develop over time, which we can't. There are however some clues that indicate the energy sharing model will be lower priced and lower risk in the long run.

Because of it's non-commercial (or not for profit) driven characteristics (as opposed to traditional market actors), it is to be expected that the cost price could therefore be lower in an energy sharing model than in a traditional market model. An energy community can choose to lengthen the exploitation period of its assets and as a result lower the cost price. A commercial player would probably use the extra exploitation period to increase its profits.

The energy price crisis of 2022 shows that the income for sustainable asset owners was much higher then it's cost price. In the energy sharing model this would have resulted in a cap on the cost price, a commercial player would just increase its profits. We do not know when another energy price crisis will occur, but it is not unthinkable that it will.

The energy suppliers are being confronted with more risk, on both the production as the consumption side. This has to do with increased unpredictability of production and consumption profiles and higher volatility of markets. A commercial player has to increase the price to cover these risks but can also use it as a revenue model (like insurance companies do). In the energy sharing model, the energy community is directly exposed to the risks involved and has the chance and direct incentive to mitigate these collectively to keep the cost price of consumption low.

2.14. CALCULATIONS

In the Excel file attached the calculations behind the different figures and tables used in this chapter can be viewed and edited.

See: TANDEMS D2.2 Attachment 1 - Business Model Calculations

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3. BUSINESS MODELS IN PILOT SITES

In the previous chapters we have looked at the business model for energy sharing from a general, theoretical perspective. Now we will look at the business models of three pilots sites in the Netherlands, Belgium (Flanders) and Bulgaria, using this same approach. The information gathered for the business model analysis was done through workshops and interviews with the pilot partners.

3.1. PILOT SITE BIOZON (NETHERLANDS)

The cooperative of BioZon is a Renewable Energy Community of citizens who invested in and became owner of a biogas installation in the town of Zelhem, the Netherlands. Originally, the electricity produces was sold to the municipality at a fixed price, but during the energy price crisis of 2022, part of the production was allocated to be consumed by the members.

Project site: [Biozon – Van stortplaats naar bron van duurzame energie!]

3.1.1. BUSINESS ARCHITECTURE BIOZON

The BioZon pilot in the Netherlands follows the basic business architecture described in chapter 0

- End-users are members of the energy community BioZon, which is cooperative.
- BioZon is owner of the biogas installation
- The electricity produced is supplied to the members of the energy community and the municipality through an energy supplier.

3.1.2. BUSINESS MODEL BIOZON

See Figure 10: Business Model BioZon

- The members invest equity into the Energy Community and receive a return on investment through a tax break on their energy bill, a subsidy scheme known as the "postcoderoos regeling".
- The BioZon cooperative invests in the biogas installation.
- BioZon receives a fixed price for the energy supplied to the members and the municipality.

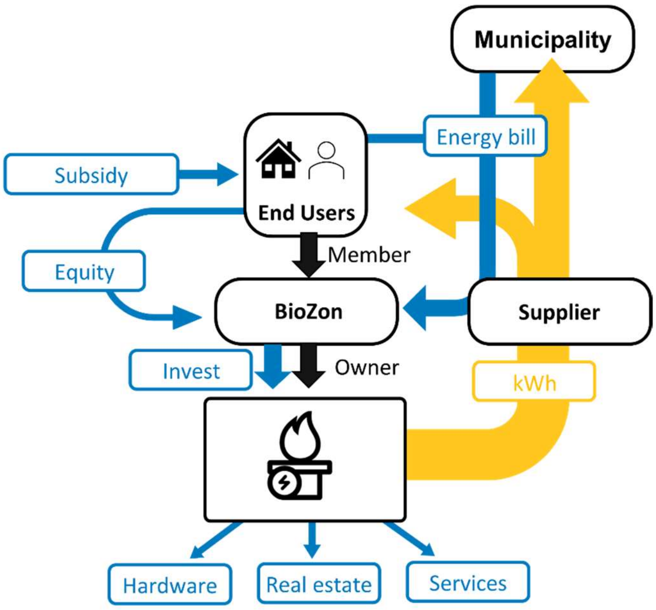

Figure 10: Business Model BioZon

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3.1.3. BUSINESS CASE BIOZON

See Figure 11: Business Case BioZon

- Thirty end-user invests an average of €1500 of equity each into the BioZon cooperative. BioZon invests €45.000 in the Biogas installation. No bank loan is needed.
- As a return on their investment, the end-users receive a taxbreak on their energy bill for 3300 kWh of 12ct/kWh for a period of 15 years through a subsidy scheme called the "postcoderoos regeling". This comes down to an annual return of 22%, which, admittedly, is very high. There is however an uncertainty on the production volume over time due to diminishing gas yields.
- The cost price of production is €0,055 per kWh. The cost price is only made up of the OpEx, because the CapEx is covered by the subsidy the members receive.
- Approximately 100.000 kWh is directly supplied to the members at a cost price of consumption of €0,08/kWh. As you can see, the profiling costs are very low (only 10%) compared to the general example (56%). This is due to the very stable production profile of the installation and the fact that the installation produces much more than the demand of the users.
- The municipality buys the rest of the electricity (about 400.000 kWh) at the cost price of production €0,055/kWh in a direct PPA. The supplier costs for this part of the electricity is being covered by the Agem Municipal Energy Company (AGE).

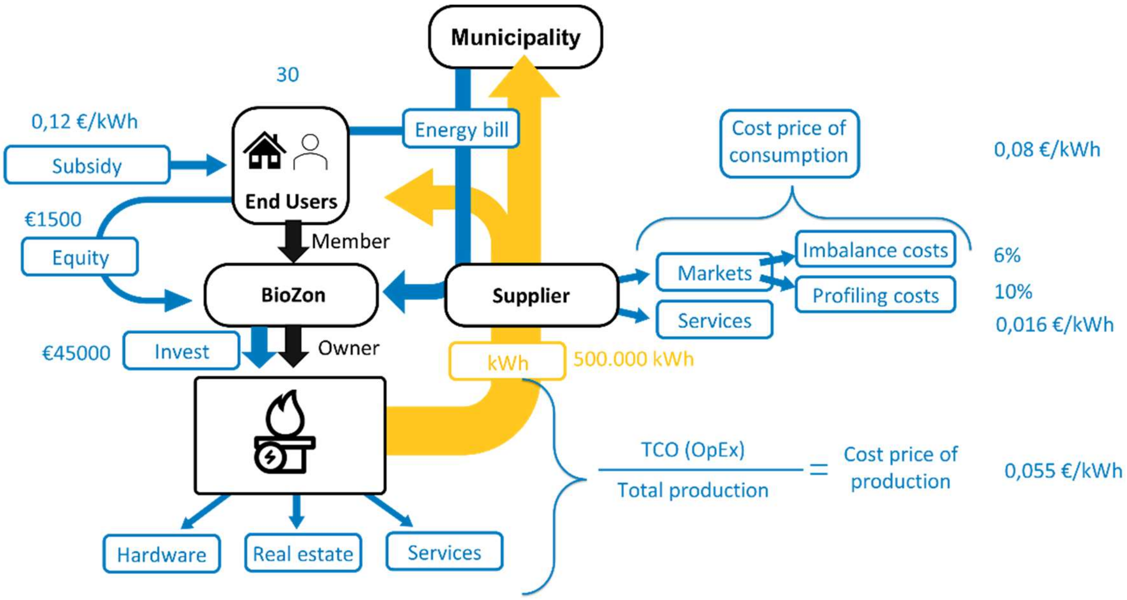

Figure 11: Business Case BioZon

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

3.1.4. PROPOSITION BIOZON

Members Proposition

- Invest in an energy community and get a great return through a tax break on your energy bill.
- Receive electricity from the energy community at a very low cost price of consumption of only 8ct/kWh
- Become a member of an energy community with a potentially very lucrative business model that can further help and develop the energy transition in the region.

Municipality proposition

- Receive locally produced sustainable electricity at a fixed cost price of only 5,5ct for a period of six years.
- Support a local energy community that can further help and develop the energy transition in the region.

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3.2. PILOT SITE OTTERBEEK (BELGIUM)

In the Belgium city of Mechelen the Energy Community Klimaan invests in solar rooftop installations on social houses in the neighbourhood of Otterbeek. Excess energy is shared with the municipality.

Project site: [Otterbeek, Mechelen - Klimaan cvso]

3.2.1. BUSINESS ARCHITECTURE OTTERBEEK

The members have a membership and investment agreement with Klimaan, and Klimaan is owner of the PV assets installed on the houses.

Klimaan has an agreement with the housing company Woonmaatschappij Rievierenland ("Woonland") for the use of the rooftops and the billing of use of solar panels.

Woonland has an agreement with the tenants for the billing of directly consumed electricity.

Klimaan has an agreement with the City of Mechelen for the purchasing of the electricity that is injected into the grid.

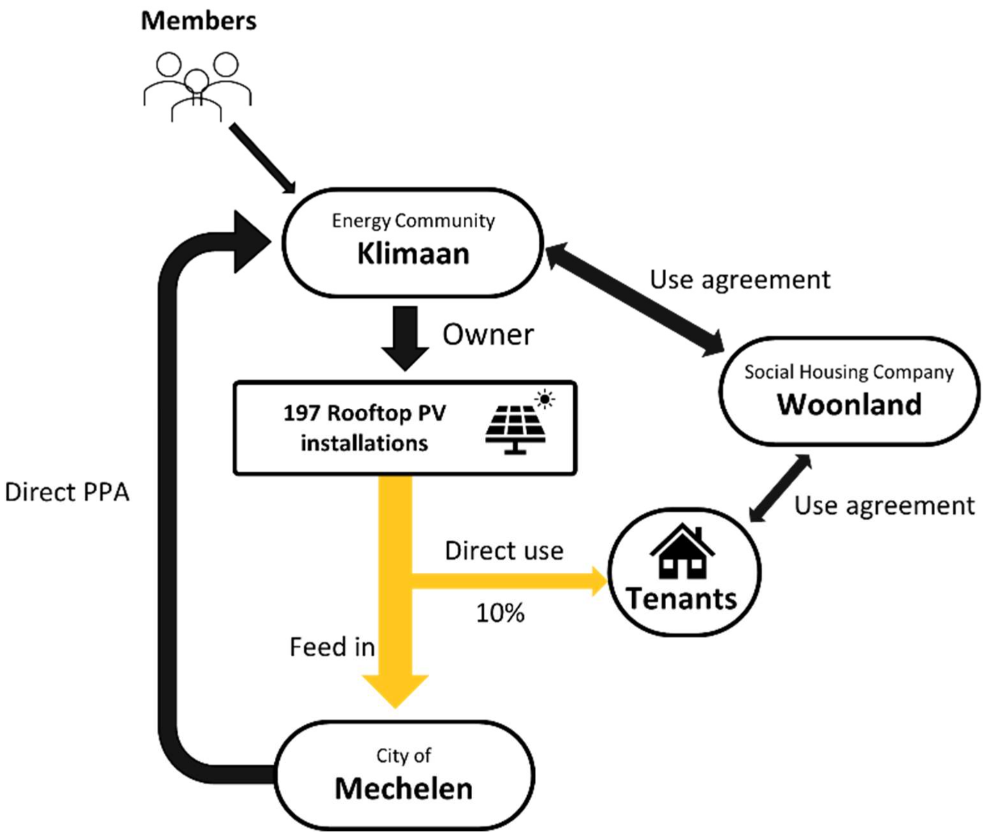

Figure 12: Business Architecture Otterbeek

3.2.2. BUSINESS MODEL OTTERBEEK

See Figure 13: Business model and business case Otterbeek

The members of Klimaan invest equity and receive interest in return. Because the equity is not sufficient for the total investment a bank supplies a loan and receives repayment and interest in return. The energy community then invests in the PV assets on the roofs of the social housing.

Part of the electricity that is being produced is directly consumed by the tenants. At an average of 10%, the direct use is low, due to over dimension of the installation. The surplus of electricity is

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

injected into the grid (feed-in) and supplied to the city of Mechelen (see for more details . This is made possible by the fact that the meter on which the installation is connected can be split into two allocation points with different contracts: one for feed-in and one for supply. The energy community of Klimaan has contracted the feed-in allocation point of the meter.

The tenants pay the housing company Woonland an energy service bill for the directly consumed electricity. The housing company pays the total of the collected energy service bills to the energy community.

The city of Mechelen pays the energy community an energy bill for electricity received.

3.2.3. BUSINESS CASE OTTERBEEK

- The cost price of production is 6,5 ct/kWh for a 25 year depreciation period.
- The cost price does not include a return on investment for the members which is not set or guaranteed.
- For the electricity that is directly consumed by the tenants they pay a price of 15 ct/kWh.
- The City of Mechelen pays is a price of 8,5 ct/kWh
- Because the sell price is higher than the cost price there is a positive business case offering an expected R.O.I. of 3% for the members.

3.2.4. BUSINESS CASE OTTERBEEK – TENANT DETAILS

- The tenant receives the electricity that is produced by the solar panels and used directly within the home.
- This will amount to approximately 30% of their consumption.
- For every kWh of direct use, the tenant saves
    - Electricity cost
    - Tax
    - Grid charges
    - VAT over the
- Some tenants (50%) will have a social tariff. Then the total amount saved would be around €0,19/kWh
- With a non-social tariff the amount saved is €0,34/kWh
- The tenants are charged €0,15/kWh
- Tenants are guaranteed that the price will not be more the 90% of the social tariff.
- The housing company will charge a fee for the used electricity in addition to the rent.
- The housing company transfers the collected fees to the energy community.

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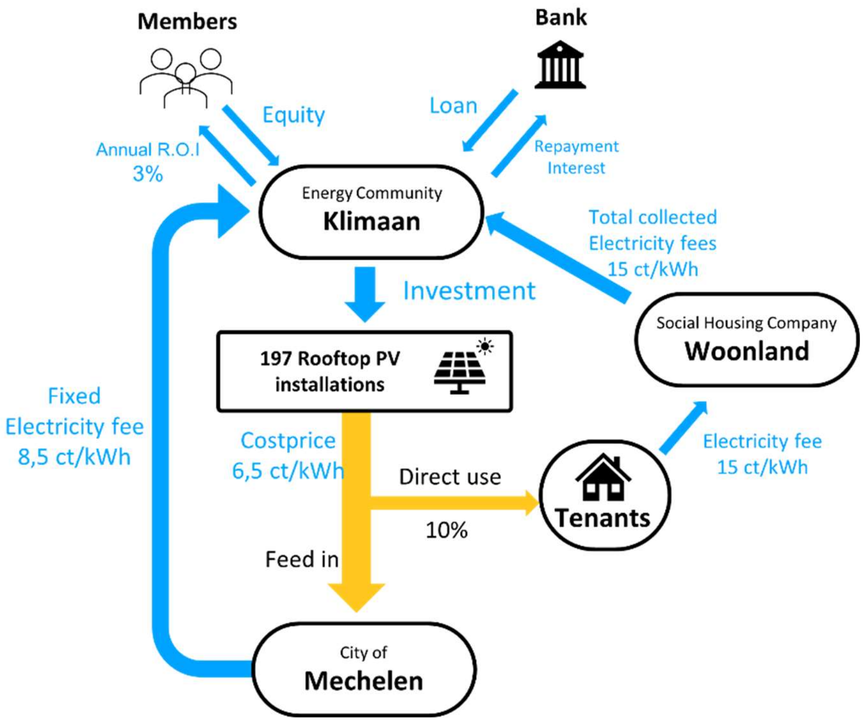

Figure 13: Business model and business case Otterbeek

3.2.5. OPERATIONAL DETAILS: ENERGY SHARING WITH CITY OF MECHELEN

The Energy Community will supply the electricity that is fed into the grid to the City of Mechelen, this is part of the agreement between the two partners. However, at the time of writing, the City of Mechelen and Klimaan are still looking for the best way to put this agreement into operational practice.

There are three operational scenario's:

1- Contract for difference (CFD)

- The energy community sells the electricity to the market at market price through an energy supplier.
- The CFD contract between the energy community and the municipality is purely financial and states that the difference between the market price and the fixed price will be exchanged between the parties. If the market price is higher than the fixed price, the energy community will pay the difference to the municipality. If the market price is lower than the fixed price, the municipality will pay the difference to the energy community.
- In this model the costs for supply are charged to the energy community by the supplier.

2- Direct PPA

- The energy community sells the electricity directly to the municipality at a fixed price.
- The municipality takes the feed-in allocation points into their own portfolio and sells it back to their own supplier.
- In this model the costs for supply are charged to the municipality.

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

3- Energy sharing

- The energy community has a contract with a supplier for on the feed-in allocation points and shares the electricity with the municipality through the energy sharing procedures in place within Flanders.
- The energy community and the municipality will be charged for energy supply and sharing cost by their suppliers.

Conclusion

- Although the energy sharing scenario was chosen as the primary option by the energy community because of its potential flexibility, the costs charged by suppliers for facilitating energy sharing makes this option financially unattractive. Which of the other two scenarios is the better option depends on the details of the supply contracts.
- The direct PPA option makes more sense than a CFD, if the supplier of the municipality is able to offered a kind of energy sharing or self-supply contract whereby they settle the feed-in on the one location with supply on another location for the same price. The supplier can credit the energy community at a fixed price for the total electricity injected into the grid. All agreements are then included in one contract and are administratively handled by one party.
- With a CFD, the energy community has a contract for supply (including costs), the municipality has a different contract with another supplier (including costs), and then there is a contract between the energy community and the municipality that has to be managed and settle financially. So a lot of administration with more risks to manage and more complexity to unravel.

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

3.2.6. PROPOSITION OTTERBEEK

Member proposition:

- Invest equity in a social project that creates environmental benefits, and benefits for the local government and social tenants.
- The investment has a reasonable return and is not high risk.
- Join an energy community to become more engaged in energy and community related issues.

Municipality proposition:

- Pay a long term stable and fair cost price for sustainable energy.
- Facilitate a social project that creates environmental benefits, financial benefits for social tenants and an investment opportunity for local citizens.

Tenant proposition:

- Receive solar power (direct use only) at a fixed price yet never higher than 90% of the social tariff.
- Save between 4ct (social tariff) and 19ct (commercial tariff) per kWh direct use.

Social housing company proposition:

- Facilitate a social project that creates environmental benefits and financial benefits for social tenants.

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

3.2.7. ALTERNATIVE BUSINESS MODEL OTTERBEEK

- The initial idea was to create an energy sharing community that would share the energy that is injected into the grid to other users, like tenants, SME's and the City of Mechelen.
- This model is legally and operationally possible, yet due to high energy sharing costs that are being charged by the energy suppliers the model would not be financially viable. For that reason, the simpler model is chosen in which the City of Mechelen is the off-taker of all injected power.

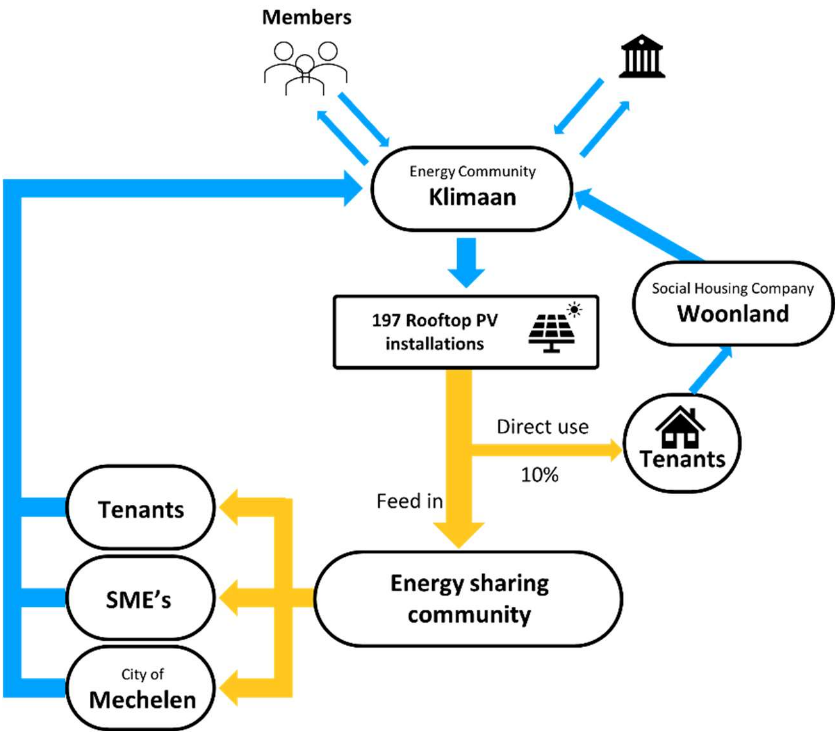

Figure 14: Alternative business model Otterbeek

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3.3. PILOT SITE GABROVO (BULGARIA)

The municipality of Gabrovo took the initiative to create an energy community in order to realize an innovative initiative for Bulgaria with the aim of dealing with challenges in the energy market. By combining various resources - finance, land, knowledge and energy, the interested parties - citizens, small and medium-sized enterprises and the municipality of Gabrovo, together build a source of their own energy. The project envisages the construction of RES for the production of 120 MWh/year of electricity, and the investment value is BGN 160,000.

Project site: [ЕНЕРГИЙНА ОБЩНОСТ ГАБРОВО | Община Габрово]

3.3.1. BUSINESS ARCHITECTURE GABROVO

- Citizens, SME's and the municipality sign a consortium agreement creating a type of Public-Private Partnership. Every member has one vote.

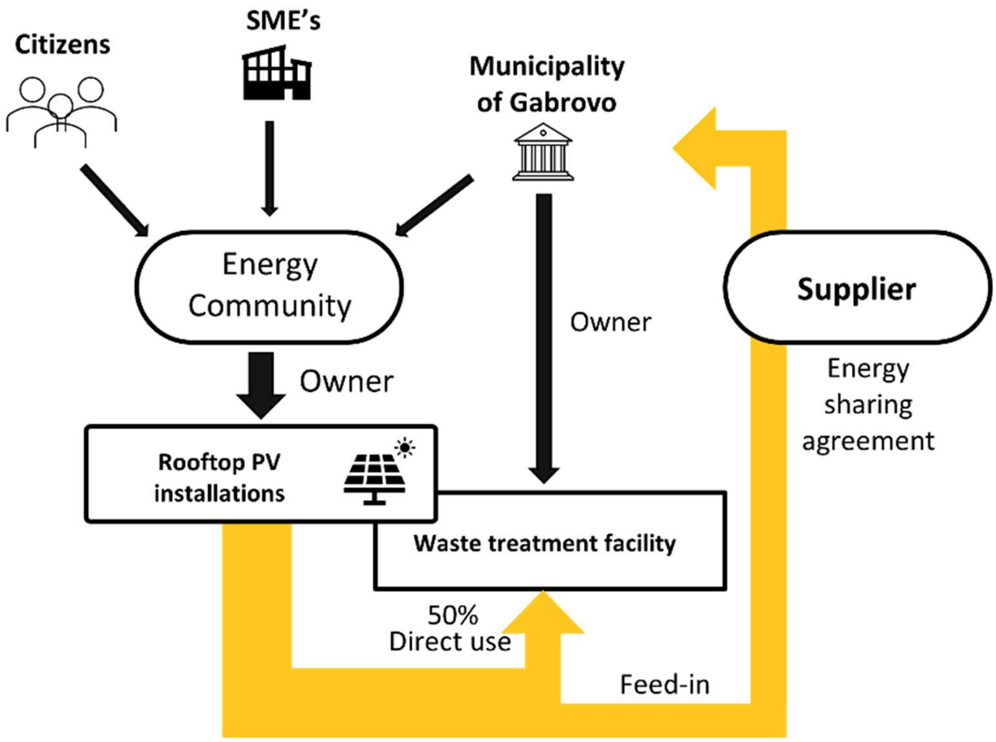

Figure 15: Business Architecture Gabrovo

- This partnership serves as the energy community but is not a legal entity in itself. The partnership does however have a VAT number and a bank account and is able to enter into agreements with other entities. This model was chosen due to the lack of an existing legal framework for energy communities.
- The energy community invests in a rooftop PV installation that is situated on the rooftop of the municipal waste treatment facility.
- The energy community is owner of the installation and has the right of use of the rooftop for a minimum of 10 years.
- After 10 years the municipality can buy the installation from the energy community.
- For the electricity that is fed into the grid, the municipality has an energy sharing agreement with an energy supplier who also supplies the energy to other municipal buildings.

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

3.3.2. BUSINESS MODEL GABROVO

- The members (68 citizens and 5 SME's) invest equity into the energy community (Shares of €250 with a maximum investment of €2500)
- The municipality did not invests equity into the project and has no financial shares in the energy community. The municipality did cover some of the technical and legal preparatory cost.
- There is no bank loan.
- The energy community invests in the rooftop installation.
- 50% of electricity produces is used on-site by the waste treatment facility. For this electricity, the municipality pays an energy bill directly to the energy community.
- The other 50% of the electricity is injected into the grid (feed in) and "sold" to the energy supplier through an energy sharing agreement. The supplier sells it back to the municipality on another location, for the same price.
- The supplier settles the financial payment with the energy community for the sourced electricity.

3.3.3. BUSINESS CASE GABROVO

- The cost price of production is 12ct/kWh, this is including a guaranteed annual return on investment (R.O.I.) for the members of 2,5%
- The cost price is relatively high because of a 10 year depreciation period.
- For the 50% direct use the waste treatment facility pays 12ct/kWh. No extra costs are charged to the energy community.
- For the 50% Feed-in the supplier pays the energy community 12 ct/kWh. No extra costs are charged to the energy community.

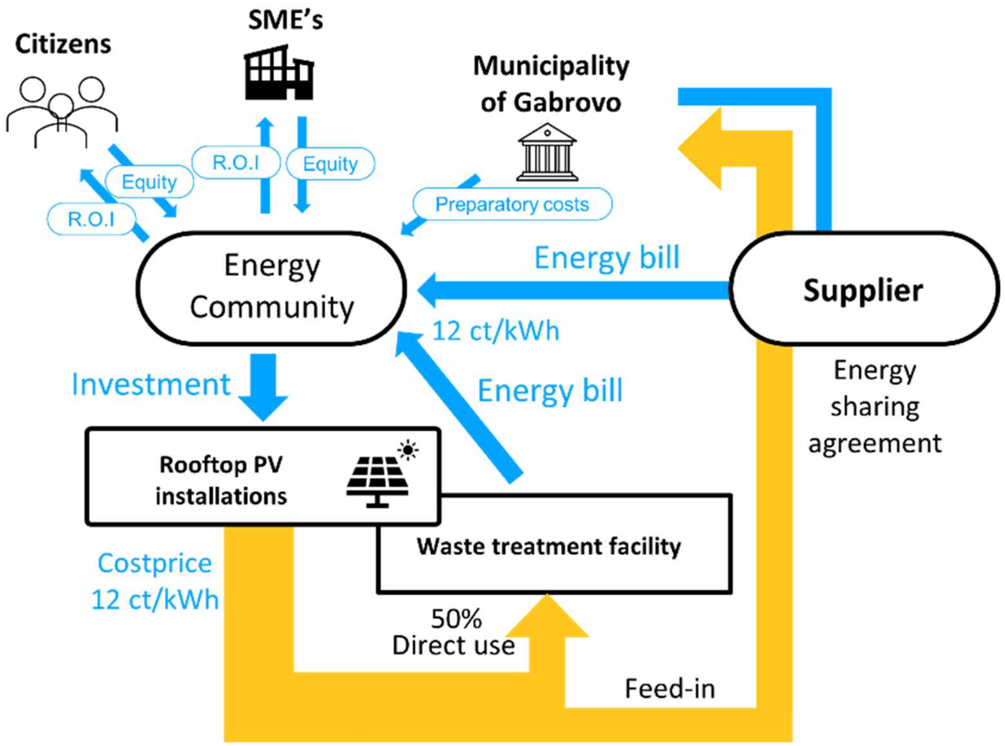

Figure 16: Business Model and Business Case Gabrovo

This project has received funding from the European Union's Life programme under grant agreement No 101077514.

- In the consortium agreement it is stated that if market prices increase, the values can be adjusted to these new market conditions, increasing the annual R.O.I. for the investors.
- Because the price received for the energy is the same as the cost price, for the energy community, the business case is break even and without much risk.

3.3.4. PROPOSITION GABROVO

Member proposition:

- Invest equity in a social project that creates environmental benefits, benefits for the local government and has a risk free and reasonable return.
- Join an energy community to become more engaged in energy related and community issues.

Municipality proposition:

- Initiate and facilitate a social project that creates environmental benefits and an investment opportunity for local citizens and SME’s.
- Pay a long term stable and fair cost price for sustainable energy.
- Save grid costs and taxes on the direct usage.

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4. COMPARISONS BETWEEN PILOT SITES

Although the circumstances and setup of the three pilots are very different we can see that the business model approach gives us a good understanding of the relationship between the different actors and the value that flows between them.

In the business architecture, we see that BioZon is an energy community of end-users that really shares their own energy to themselves. For the pilots of Otterbeek and Gabrovo this is not the case. The members of the community that put in the equity do not receive any of the electricity.

In the business model, we see the same key elements of cost price of production, cost price of consumption, equity and return. Understanding and quantifying these elements gives us a good understanding of the business case and the proposition for the parties involved.

The business model of BioZon integrates energy supply to the household end-users and on-site direct use is not part of the model.

For the pilot in Otterbeek, direct on-site use by the tenant is an important element of the model. The supply to other end-users of the electricity that is injected into the grid is still a bit of a challenge, although arrangements have been made with the municipality as an off-taker.

The pilot in Gabrovo also has a business model that is largely based on direct on-site use. Here, the supplier of the municipality organizes the sharing of the electricity that is injected into the grid to other locations owned by the municipality. The current market regulations in Bulgaria make energy sharing with the household members not yet feasible.

The business case shows that the cost price of production can vary quite a bit between pilots (from 5,5 ct in BioZon to 12ct in Gabrovo) which is mainly impacted by the chosen exploitation period (only 10 years in the case of Gabrovo).

The elements that make up the cost price of consumption as discussed in chapter 2.6, 2.8 and 2.9 were hard to determine in the Otterbeek and Gabrovo cases because the models did not integrate supply and a supplier of ESP was not part of the discussions. In the Otterbeek case these costs are reflected in the tariffs the commercial suppliers charge for energy sharing. Although energy sharing with households is legally and operationally possible in Flanders, the currently high supplier costs to facilitate energy sharing prevents this from being a feasible proposition. This show that it is good to understand these cost elements and to be able to influence them through a ESP.

In the propositions we see the same financial elements, like a return on investment, a fixed price or a tax break. These elements however fall to different players within business architecture. In BioZon, the tax break falls to the investor, and in Otterbeek to the tenant (who does not invest). These tax breaks do play an important role in the financial feasibility of all the projects.

5. DISCLAIMER

Although the author has made every effort to include correct information within this report, is not responsible for any errors or omissions.

The numbers, tables and figures used are meant to give an indication of the actual facts so that they can be understood. The information is not meant to be exact and/or complete. In many cases the information given is simplified so that it is easier to understand. Unfortunately, the reality is often more complex.

This project has received funding from the European Union’s Life programme under grant agreement No 101077514.

List of participating organizations

	AUTONOOM PROVINCIEBEDRIJF KAMP C (Kamp C)		BE
	VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V. (VITO)		BE
	DUNEWORKS BV (Duneworks)		NL
	ACHTERHOEKS ENERGIELOKET B.V. (Agem)		NL
	STAD MECHELEN (MECHELEN)		BE
	KLIMAAN (Klimaan)		BE
	ZUIDTRANT (ZuidtrAnt)		BE
	FONDATSIYA TSENTAR ZA ENERGIYNA EFEKTIVNOST - ENEFEKT (EnEffect)		BG
	OBSHTINA BURGAS (BURGAS)		BG
	MUNICIPALITY OF GABROVO (GABROVO)		BG
	OIKOPLUS GMBH (OKP)		AT

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