

Sea2Socket Project Results



**Sea to
Socket**



The Sea2Socket project was made possible by the FOD/SPF Economie.

Introduction

The Energy Transition Fund project 'Sea2Socket' is studying the feasibility of an innovative concept to enable the delivery of sustainable and affordable energy from the sea to private households.

By participating in a renewable energy cooperative, citizens are both owners of offshore wind turbines and customers of a cooperative energy supplier. This project is a collaboration between Cociter, Ecopower, Josworld, REScoop Flanders, REScoop Wallonie, UGent, UMon, 70GigaWattConsulting.

Sea2Socket investigates how a long-term purchase agreement can keep electricity prices low and stable for citizens, and to what extent citizens are willing to co-invest in order to safeguard the availability and affordability of their electricity supply.

The study contains 4 Work Packages (WPs) :

Work Package 1 was the technical investigation of the short chain approach around profiling and imbalance costs.

WP2-3 the risk assessment to contractually enable a short chain approach.

WP3-4 studies the participation behaviour of citizens and how to align communication around it.

After 2 years of research, the results have been presented in a webinar on Thursday 24 October 2024.

Presentations:

WP1 Technical modelling - Aislinn D' Hulster, UGent and Kris Voorspools, 70GigawattConsulting

WP2-3 Cooppa Bancability Model, Kristof Eggermont, Econopolis Strategy

WP3-4 Conclusions on surveys, Fabrice Collignon, REScoop Wallonie

1. WP 1 – Technical investigation of a short supply chain model

The objective of WP1 was to analyze the energy path from the offshore wind farm to the citizen's socket. To achieve this, the path was divided into two parts: from the wind farm to the energy supplier and from the supplier to the citizen.

The path from the wind farm to the supplier was studied using a model based on production data since 2019 from currently operational wind farms in Belgium (eastern zone). Publicly available time-series data on production, prices, and imbalance prices provide insight into the real costs and risks associated with managing offshore energy. Using this data led to an analysis of the cash flows generated by the energy. Visualization of these flows was enabled by an R model, which displays graphs of the various costs and revenues and compares them according to the hypothesis applied. The results were presented on October 24 during the public presentation session for the Sea2Socket results. They are documented in Document 2 – WP1 Technical Research Short Chain CASHFLOW MODELLING AND RESULTS.

The second part of the path, from the supplier to the citizen, was analysed through the lens of a pricing formula that the supplier could offer to the citizen to allow them to benefit from the fixed price of offshore electricity while applying a fair price. A fair price is one that reflects the actual costs of electricity. To this end, the working group proposed a formula with innovative parameters. This led to the creation of the following document: 1 – Note on Pricing Formulas for cooPPA, which was discussed with the CREG.

Finally, the possibility of creating a cooperative BRP (Balance Responsible Party) was discussed in an attempt to compress one of the costs addressed in the pricing formula above. This work is compiled in Document 3 - Sea2Socket – BRP Constraints. The document reviews the constraints and necessary structure to achieve this goal. Specifically, the following topics were addressed and described: IT requirements, market access, forecasting work, BRP portfolio management, legal constraints, workforce requirements, and BRP risks.

2. WP 2 – Legal analysis short chain from sea to socket

General research question: is it justifiable and possible for a citizen cooperative/energy community to take a CoopPA long term commitment?

The research question was addressed through a risk analysis, the creation of an information package to be distributed among energy communities, a risk assessment, and an exploration of demand-side management options. In the second year, the environment changed, as the term "Renewable Energy Community" from the federal Energy Law was replaced by a set of conditions that Direct Citizen Participation must meet.

The roadmap created in the first year outlines the plan to analyse the risks that the short supply chain bears and that could threaten long-term price stability and energy supply for citizens.

The risks were categorized after creating a risk matrix and step-by-step plan:

	CATEGORY	IDENTIFIED RISKS
A	<i>Strike Price Level</i>	<i>Construction cost risk Operational cost risk</i>
B	<i>Profile & Balancing</i>	<i>Profile risk & balancing risk Dependence on a single external BRP Portfolio Ecopower/Cociter</i>
C	<i>Market Conditions</i>	<i>Belpex price risk, Volume risk, Electricity market design</i>
D	<i>Demand Side Management Among Customers</i>	<i>Citizen mindset towards demand side management</i>
E	<i>Creating Social Value</i>	<i>REScoop income structure, Lack of awareness about projects in other REScoops, Insufficient communication of the added value of cooperative services, REScoop collaboration</i>
F	Image and Persuasive Power	<i>Need for broader public awareness and informing the public on managing electricity bills, REScoop collaboration, Member loyalty, Need for member recruitment for capital investment</i>

For each category, dialogue was initiated with REScoops through distribution and consultation.

An investigation was conducted on how a power purchase agreement (hereafter referred to as PPA) between a producer and one or more intermediaries can enable the supply of electricity at stable prices and how such an agreement differs from traditional PPAs. The ETF file refers to such an agreement as a “Cooperative Power Purchasing Agreement” or “CooPPA.” A CooPPA is an agreement between “the consortium that owns and operates the offshore wind farms” and an intermediary.

To establish a useful definition of a CooPPA, we must objectively describe the ultimate beneficiaries. The ETF file restricts the beneficiaries to households that, through their shares in REScoops (recognized cooperatives), become indirect shareholders of the consortium. This aligns with the definition that the primary applicants of the document give to the term “citizen participation.”

Entering into a long-term CooPPA is compatible with the legal framework. There are no options to adapt elements of consumer law specifically for a CooPPA.

On May 5, 2023, the Directorate-General for Energy organized the stakeholder conference on the progress of the preparation and organization of the Tender (May 5, 2024). In the presentation, citizen participation via the federal renewable energy community was promoted. However, the definition of the federal renewable energy communities in the federal electricity law was challenged by the Flemish Region before the Constitutional Court.

March 26, 2024: the draft Royal Decree for the tender, after approval by the Council of Ministers, was submitted to the Council of State for advice. In the draft of the Royal Decree for the Tender for the PEZ1, no reference is made to the definition of the federal renewable energy community as stated in the federal electricity law. The concepts of indirect and direct citizen participation are introduced and defined in the Royal Decree.

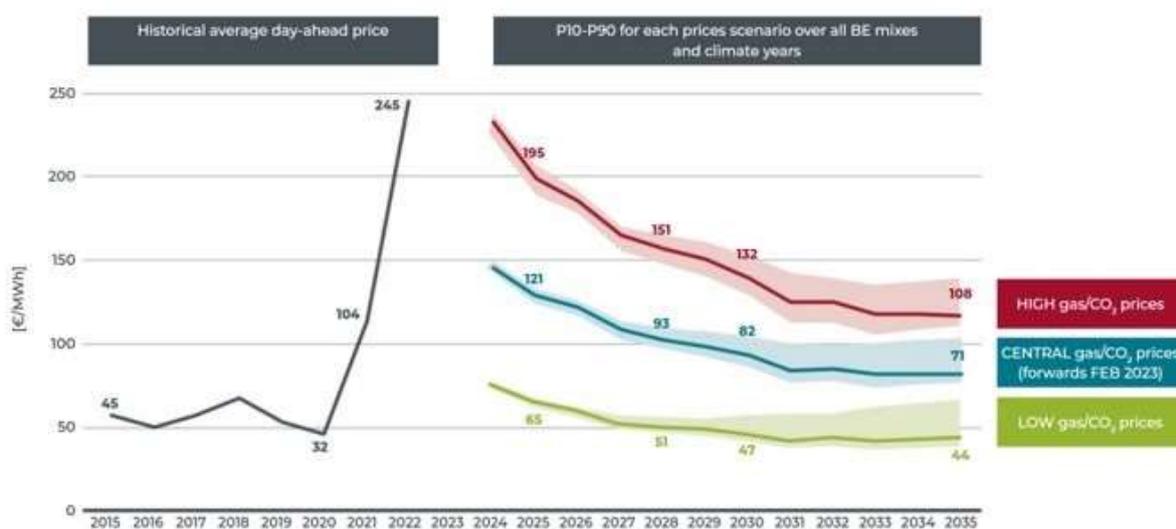
An initial draft report was prepared by Blixt. Given the above developments, the report no longer aligns with the provisions of the Royal Decree for the Tender, and the work would need to be substantially revised. The work was not completed due to the rapidly changing context. Blixt decided not to claim its part of the subsidy.

3. WP3 – Economic study: does this help secure and stabilize the citizen’s bill?

Research questions: Could an offshore wind CoopPPA lower the electricity bill of residential cooperative consumers? How does a CoopPPA affect the balancing costs of the cooperatives' portfolio? Will the consumer price be more stable by reducing exposure to volatile gas prices? What is the profile and risk appetite of current and potential consumers joining an energy cooperative? This research was conducted in coordination and consultation with the work and results of WP1.

3.1 The Evolution of Wholesale Electricity Prices

For future price scenarios, no independent modelling was conducted; instead, the results of the Elia Adequacy & Flexibility Study 2023 were used.



3.2 The conditions for a Profitable S2S Business Model (UGent)

The economic modelling of profile and imbalance costs for an offshore wind profile in the years 2019, 2020, 2021, and 2022 was conducted for six different consumption profiles for residential customers. The results of these calculations were used to map the cash flows. The algorithm of the model was developed. The modelling builds on the results of WP1 and was further elaborated under WP1.

3.3 Profile of Current Investors and Customers of Energy Cooperatives (UGent)

In this work package, we wanted to understand the profile of current investors in energy cooperatives. Thanks to our structural cooperation with the Belgian branch of a large European bank we have access to pseudonymised client level payment data. We can identify which anonymous persons pay to anonymised energy cooperatives by looking into membership payment data and regular payments for energy deliveries. Once we have identified current anonymous investors, we can draw these investors' characteristics from pseudonymised data, like age, education level, income, civil status, location, wealth, and behavioural aspects like risk appetite. This will not only allow us to clearly sketch the average profile of energy cooperative investors, but – with the help of dimensionality reduction methodologies like principal component analysis and cluster analysis – also result in a typology of current energy cooperative investors, while still preserving full anonymity of these investors. This will improve not only our understanding of the current investors, but also reveal in which social groups interest is currently still weak. The advantage of this trace data approach is that the profile will be based on traces of actual behaviour, rather than solely being based on stated behaviour from survey respondents.

A study was conducted among members of Ecopower and Energent. The data bank was collected and processed. The results were included in the Working Paper: 'Tracking demographic and financial trends in REC membership in Belgium using survey and bank transaction data': https://wps-feb.ugent.be/Papers/wp_24_1093.pdf

3.4 Market Study: Willingness to Invest in the Short S2S Chain for Existing and Potential Members (Umons)

The first part of this survey highlights the intrinsic and extrinsic motivations of current investors. Intrinsic motivations relate to the desire to contribute to limiting climate change, improving air quality..., whereas extrinsic motivations relate to more extent to the expected return/risk of the investment. This first survey will also serve to explore the degree of understanding of the Sea2Socket concept and expectations in terms of size of a potential new offshore investment and type of financial instrument to be preferred.

In this survey we inquire about respondents' 1) understanding of the Sea2Socket concept, 2) magnitude of desired investment, 3) preferred type of investment instrument, and their 4) intrinsic (climate change, air quality, fair distribution of offshore benefits, others) or 5) extrinsic (expected yield) motivations for this investment.

The study on the investment willingness of members of existing energy cooperatives was conducted. Research was also carried out on the investment willingness of citizens who are not yet members of an energy cooperative.

3.5 Economic Scenario Analysis (UGent)

This task brings together the supply- (WP3.1-3.2) and demand-side (WP3.3-3.4) economic analyses and synthesises the economic costs and benefits of the participation of cooperatives in the development of offshore wind. Uncertainties in terms of market dynamics (electricity prices, offshore CAPEX and OPEX, the impact on portfolio balancing costs, the amount of capital that can be raised from citizens under different investment instrument, etc.) are captured in a scenario analysis. This way, valuable academic insight is created about the potential economic and socio-economic benefits of the cooperative model in the context of offshore wind, in a robust and comprehensive way. Not only will this help achieve the combined goals of realising the Belgian offshore wind potential as well as the potential for citizen participation in the energy transition, but the insights will also facilitate similar ambitions internationally.

3.6 Parameter assessment of the underlying collateral of the CooPPA as an income guarantee for external financing (Econopolis)

This work package examines the extent to which the CooPPA can provide a guarantee to a financial institution that provides loans for the offshore investment. Existing (corporate) PPAs have a given value based on the industry, financial strength and business plans of the company that consumes the energy in the long term. Citizens have a different profile in this respect, but the long-term need for affordable sustainable energy is the same.

A bankability model was developed to map out the risks of a CooPPA for the cooperative suppliers Ecopower and Cociter. This model was discussed with banks and several potential consortium partners to improve it. Econopolis Strategy presented the model at the seminar on October 24, 2024; see the slides for details.

4. WP 4 – Communication trajectory "Activation short chain of wind energy sharing for energy communities (from sea to socket)"

4.1 Market study: the investment of citizens in the short chain from sea to socket including the survey of current and potential consumers joining an energy cooperative

In 2022-2023, the University of Mons carried out two surveys in collaboration with Rescoop and Josworld (see intermediate report). To recap, the first stage was an online survey of the Rescoop network's citizen renewable energy cooperatives involved in Seacoop. The survey had a response rate of around 91% (i.e. 31 cooperatives out of 34) and its aim was to find out more about the research subject: understanding of the Sea2Socket project (and how the cooperatives wanted to find out more), their cooperators' motivations for investing according to them, the obstacles to investment already identified, the profiles of their cooperators, the channels currently used to attract new cooperators, suggestions for further questions, etc..

The second online survey (covering members' understanding of Seacoop, level of interest in offshore, investment satisfaction, duration of investment, electricity supply, willingness to invest additional amounts in general and specifically in offshore, desired investment amounts, investment motivations and disincentives, how they found out about their cooperatives and how they keep up to date with the latest news, etc.) was carried out among the members of the Rescoop network (whether or not their cooperative is involved in Seacoop): 3413 valid responses were collected and used in the data processing (i.e. more than 3% of the total number of members).

In 2023-2024, the University of Mons continued in this direction by carrying out a survey of the Belgian population on the same subjects as the survey of cooperators. A representative sample of 1,000 Belgians in terms of gender, age and place of residence was constituted via a specialist external agency (paid via funding from the University of Mons). Adjustment indices were inserted into the analysis to obtain an exact match for the first three characteristics and a perfect representation of Belgians. The impact of the latter on the results is low. The results were processed in a similar way to previous surveys (Chi-squared likelihood ratio tests, Fisher's exact tests, etc.) and comparisons were made between current investors and potential investors. A profile of the typical potential investor was also drawn up (using the dynamic clustering method, ANOVA).

Two scientific articles will be submitted in 2024 by the University of Mons to scientific journals (in the CNRS and/or FNEGE classifications). Publication is expected to be no earlier than the end of 2025 (due to review periods, modifications, etc.). These will also be presented at conferences.

ARTICLE 1. Main obstacles and motivations for individual investors in renewable energy cooperatives.

The objective of this research is to identify which barriers and motivations are most important to individual investors when investing in renewable energy via cooperatives. The survey method was chosen, and statistical analyses are carried out. It reveals that the primary motivations for investing in renewable energy cooperatives are environmental and climate concerns, along with financial interests. These motivations, however, differ among the groups surveyed. Current investors prioritize environmental and climate considerations, while potential investors are more focused on financial benefits. Regarding obstacles, potential investors may exhibit some hesitation, but these issues are rarely due to the "Not In My Backyard" phenomenon. Instead, they emphasize the need for better information about investment opportunities, operational details, and the associated risk/return trade-offs.

ARTICLE 2. Changes in the behaviour of renewable energy cooperators during the energy crisis.

This article aims to explore the impact of the 2021 energy crisis on barriers and motivations to renewable energy investment. Our results suggest that the energy crisis has influenced the behaviour of renewable energy investors. New investors have encountered more obstacles than those investing before the crisis. However, although both groups share a similar motivation related to the environment and climate, disparities appear for other motivational elements, in particular an increased importance of financial aspects for earlier investors.

4.2 Study effectiveness of ways of activation

- Research and surveys were conducted to establish the profile of current investors in the cooperative.
- A benchmark and evaluation of crowdfunding and crowd engagement initiatives were carried out. This includes an overview of best practices and critical success factors.
- Analysis of (digital) distribution and communication channels.

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A test case was conducted in the form of a campaign to identify the most suitable energy supplier for Belgian consumers.

Test Methodology:

This campaign, carried out in partnership with Tree Company, encouraged citizens to complete an online questionnaire to determine which energy supplier best aligns with their values, inspired by the electoral survey used by several Belgian media outlets. Here, participants answered nine questions about their energy priorities: price stability, environmental impact, local origin of energy, co-ownership options, and investment policy in green infrastructure (wind farms, solar panels). In return, they received personalized recommendations and useful information, making it a "win-win" approach: users receive energy guidance, while the campaign generates data to better understand consumer expectations.

Key Results:

- **Support for renewable energy:**
69% of respondents rated the importance of investing in renewable energy with a score of 4 or 5, demonstrating broad support for a sustainable energy transition.
- **Return on investment:**
Interest in financial and social return is evident, with 60% valuing social aspects (combatting energy poverty) and 35.6% of participants prioritizing financial profitability.
- **Customer satisfaction and fair pricing:**
Over 90% of respondents consider customer satisfaction and fair pricing as essential, illustrating a priority for reliable and accessible services.

4.3 Qualitative Survey

The qualitative survey was conducted in November 2023 through the organization of five focus groups in five major Belgian cities (Antwerp, Ghent, Brussels, Liège, and Charleroi). For this, we enlisted the company Indicence SRL, which provided and compensated the participants for these focus groups. The objectives of this approach were to gather participants' perspectives on three key aspects: their demands/needs, their goals if they were to invest in this project, and their requirements to participate.

Summary of Results:

- **Demands/needs:**
Participants expressed a strong need for stability and accessibility in electricity prices, as well as greater transparency on project details. They want clear information on how offshore wind works, expected financial returns, and sustainability guarantees. Concerns remain about the risks associated with this investment and the reliability of the project, requiring assurances on financial security, governance, and environmental credibility.
- **Objectives:**
The main identified objectives are financial security, through stable energy prices, and predictability of returns. Participants showed strong interest in local control and a desire to contribute to environmentally responsible projects. Involvement in a community project with positive social and environmental impacts is also a motivating factor.
- **Requirements:**
To participate, participants request simple and transparent communication on financial benefits, price structure, and ecological impacts. Trust in the project is crucial, with expectations for strong references and a transparent governance model. Financial accessibility and personalized support, including post-purchase follow-up, are essential to facilitate their engagement. Sustainability guarantees, particularly regarding environmental impact, are also required.