WENEXUS

DELIVERING THE WATER-ENERGY NEXUS FOR ENERGY EFFICIENCY

D2.5- MANUAL FOR DESIGN OF THE FINANCIAL MODEL

Final Version (1.0)

30th August 2024

GRANTING AUTHORITY

European Commission

EUROPEAN CLIMATE, INFRASTRUCTURE AND ENVIRONMENT EXECUTIVE AGENCY (CINEA)

Co-funded by the European Union

GRANT AGREEMENT

PROJECT 101120628 — LIFE22-CET-WENEXUS

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Project Data sheet	
Project Acronym	WENexus
Grant Agreement ID	101120628
Dissemination level	Public
Work Package	WP2
Deliverable Number	D2.5
Title	Manual for design of the Financial Model
Lead Partner	S317 Consulting
Version	1.0 (Final Version)

Document history			
Date	**Author/s**	**Partner**	**Changes**
22/07/2024	Gonçalo Duarte Inês Rocha Marina Sequeira	S317 Consulting	Writing Version 0.1 (Document Draft)
29/08/2024	Gonçalo Duarte Inês Rocha Marina Sequeira	S317 Consulting	Writing Version 0.2 (Revised Document)
30/08/2024	Marina Sequeira	S317 Consulting	Submission of Version 1.0 (Final Version)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

GA	Grant Agreement number 101120628 - LIFE22-CET-WENexus - LIFE-2022-CET-PDA - LIFE-PJG CINEA/D/01
SDGs	Sustainable Development Goals
ESCO	Energy Service Company
NPV	Net Present Value
IRR	Internal Rate of Return

1. Introduction

1.1. WENexus Overview

Under the Grant Agreement (GA), WENexus – Delivering the Water-Energy nexus for energy efficiency (hereafter referred to as "WENexus"), is a European project, financed under the LIFE - Clean Energy Transition 2022 Programme, and led by S317 Consulting in a consortium with Engidro Engineering Solutions and Sérvulo e Associados. The project started in September 2023, and it is intended to last 3 years (pilot phase).

The WENexus project aligns seamlessly with the objectives and prerequisites outlined in key documents, including the Plano Estratégico para o Abastecimento de Água e Gestão de Águas Residuais (PENSAARP2030), Plano Nacional de Energía e Clima 2030 (PNEC), the Portuguese Roadmap for Carbon Neutrality 2050, and the United Nations 2030 Agenda for Sustainable Development Goals (SDGs). At its core, the project looks for the adaptation of the water sector by directing the development, implementation, and standardization of innovative tools designed to enhance energy efficiency within the water sector. This endeavor is complemented by the provision of comprehensive technical, financial, and legal support to the organizations responsible for water and wastewater service management and operations, guaranteeing a high degree of replicability and transferability potential within the sector.

WENexus primarily focuses on mobilizing private investment for water infrastructure renovation by creating innovative financial models specifically tailored for energy efficiency investments in water services infrastructures. Additionally, the project aims to contribute to the de-risking of energy efficiency projects in water infrastructures. Summarizing, the project's goals are:

1. Contribute to the energy transition and sustainable energy use in the water sector.
2. Leverage investments that promote energy efficiency in water supply and wastewater systems in Portugal.
3. Ensure the replicability and transferability of the projects and good practices identified through the pilots developed.

Hence, WENexus' goals were designed to achieve energy and efficiency improvements specifically through four key vectors:

- Vector 1 - acting on the system's electromechanical equipment efficiency, replacing them with more energy-efficient ones, where warranted, or eliminating hydraulic inefficiencies that may exist in the systems.
- Vector 2 - acting on sustainable energy production capacity by implementing energy production systems generated from photovoltaic panels.
- Vector 3 - acting on the power storage capacity, foreseeing the installation of storage batteries.
- Vector 4 - acting on the efficiency of the overall system, introducing systems to produce biomethane.

1.2. Scope of the Document

The main focus of this document is directly linked to a comprehensive financial model, detailing the investment and operating costs for each adopted measure, as well as the associated energy efficiency savings and the quantification of the gross investment payback period.

Additionally, key insights about financial models and options are introduced to identify the barriers and opportunities to water utilities when defining energy efficiency measures and projects and their respective financial and economic viability on the long term by exploring the applicability and benefits of the Energy Service Company (ESCO) model and the Performance-Based Contract.

All thing considered the purpose of the Manual for Design of the Financial Model is:

- **Guidance on the model**: provide a clear filling framework for the financial model, ensuring consistency and accuracy.
- **Standardization**: allow the use of established and proved standard practices and methodologies in financial modelling to ensure uniformity across projects.

1.3. Document Structure

The current manual comprises 3 sections. After the current section 1, which corresponds to the Introduction, sections 2 and 3 are the foundational sections that describe the manual.

Section 2 describes the financial and legal options for financial investment, providing a list of financial alternatives the company may choose from in order to realize the project.

Section 3 presents the Financial Model that accompanies this manual and explains in detail the rationality behind the model and how the model should be used.

2. Financial and legal options for financial investment

2.1. Financial model approach and importance for the development of pilot projects in the water sector

The development of a robust financial model is crucial for analyzing investment costs versus future returns in entities within the water sector, as it allows for an accurate assessment of the economic viability of projects and initiatives. Such a model helps identify the balance between initial capital costs and long-term financial benefits, such as reduced operating costs, improved energy efficiency, and minimized energy waste. Additionally, a detailed financial model can quantify the impact of different investment scenarios, enabling the entity to make informed decisions about resource allocation.

A well-developed financial model also facilitates the evaluation of various financing options and scenarios, such as loans, grants, public-private partnerships, or another type of financial mechanism associated to project implementation. The choice of the appropriate financial mechanism can significantly affect the total cost of a project as well as its payback period. By projecting future cash flows, the model can help identify the most suitable financing method for the entity. This way, it is possible to optimize financing costs and maximize the return on investment.

Finally, a solid financial model is essential for transparency and accountability, especially in public or regulated entities within the water sector. It provides an objective basis for justifying investments to shareholders, regulators, and other stakeholders, clearly demonstrating how resources may be utilized and the expected benefits. Moreover, it enables continuous monitoring of financial performance and facilitates strategic adjustments as needed, ensuring that the entity can achieve both its financial objectives and long-term sustainability commitments.

As previously mentioned in deliverable D5.2 – Market Barriers' Report - several barriers can affect the implementation of energy efficiency projects in the water sector namely financial ones. As determined in the mentioned report, energy efficiency projects are often not prioritized due to high initial and operational costs and a lack of adequate funding. These financial barriers, including the expense of implementing and maintaining advanced technologies, make it difficult for utilities with limited resources to invest in sustainable practices.

Also, the Administrative and Legal Constraints Report – deliverable 3.1 – refers to the main legislative and administrative constraints to private investment in the water sector, highlighting sectoral concerns and barriers constraints to investment in the water sector.

In conclusion, it is essential to develop a comprehensive financial analysis model and search about adequate financial mechanisms to overcome the barriers identified in both deliverables 5.2 and 3.1. Given that high initial and operational costs, along with a lack of tailored funding, significantly hinder the prioritization of energy efficiency projects, a robust financial model would enable better evaluation of investment opportunities and returns. Additionally, searching for dedicated financial mechanisms can help address the sector-specific legal and administrative constraints, ultimately fostering private investment and supporting the transition to more sustainable and efficient practices in the water sector.

2.2. Available financial mechanisms to boost energy efficiency

There are different paths from which a company may choose to achieve the energy efficiency project, that include using its own funds, procuring funds outside the company or arranging legal contracts that may allocate some of the burdens to a third party.

Usually, the realization of any of the projects proposed within the scope of the current document will demand a significant financial effort from the company that it may not have the possibility to realize. Thus, this chapter will explore some of the alternative options that can allow the company to avoid supporting the full extent of the costs.

The options considered are two legal models that have been successfully implemented in the energy sector:

- **ESCO Model:** the ESCO model involves a partnership with an external energy service party that assumes the responsibility of financing, implementing, and managing energy efficiency projects. Under this model, the ESCO invests in the project upfront, and the company repays the investment through the cost savings generated by the project over time. This option not only reduces the initial financial outlay for the company but also transfers the performance risk to the ESCO, making it an attractive option for energy-related projects

- **Contract-based-Performance Model**: In a contract-based performance model, the company enters into a performance-based contract with a third-party contractor who finances and executes the project. Payment to the contractor is contingent upon the achievement of predefined performance targets, such as energy savings or operational efficiencies. This model aligns the contractor's incentives with the company's goals, as the contractor is compensated based on the project's success, thereby reducing the company's financial exposure.

2.2.1. Energy service companies (ESCOs)

Energy Service Companies (ESCOs) are legal arrangements where the company search for an external party to implement the works, as well as allocating the responsibility of the investment to that party. Thus, the technical and financial burden will not be supported by the company. In return, the ESCO has the right to collect renumeration based on the amount of energy saved through the project. The services offered by ESCOs are usually:

- Identification, development, and design of energy-efficiency projects.
- Financing, or acquiring the financing, of the energy-efficiency project.
- Supply and installation of energy-efficiency technology/equipment.
- Measurement, monitoring and verification of the project's energy savings.

Financial contributions and operational risks

The main benefits of the ESCOs are the financial and technical contribution that they provide to the company, allowing it to allocate the burden of the financial and technical constraints.

Regarding the financial effort, the ESCO may either finance the operation of an energy system or help arrange financing by providing a savings guarantee.

As for the technical and management side, ESCOs offer a comprehensive range of energy services, including planning, management, implementation, and monitoring of energy management services and technical upgrades. In doing so, they assume the associated economic, technical, and administrative risks involved in implementing energy efficiency improvements. The ESCO is responsible for ensuring that the equipment operates correctly and must be prepared to replace any faulty components.

The primary economic risk for ESCOs lies in not achieving the guaranteed energy savings, which can lead to reduced service fees. The company and the third party ay sign a performance guarantee that ensures that the energy savings generated by a project are sufficient to cover monthly debt service costs or that the same level of energy service is delivered at a lower cost.

Payment modalities and cashflows

There are usually three main ESCO financing models that may be arranges between both parties:

- **Company pays:** The ESCO conducts a study and makes a proposal guaranteeing certain energy savings over the contract term. The company pays for the equipment and remunerates the ESCO for project implementation, based on the energy savings achieved.

- **Financial Institution lends money:** A financial institution signs a tri-party agreement with the company and ESCO, or one or the other, providing credit either to the ESCO or the company. The ESCO conducts the study and guarantees certain energy reductions and then is remunerated for project implementation, based on the savings achieved.

- **ESCO invests:** The ESCO provides the funding to implement all necessary energy efficiency upgrades based on the ESCO's study and proposal. The company provides a bank guarantee for the cost of the investment. The ESCO guarantees certain energy reductions, receives operating and maintenance costs, and receives a major share of the savings in the first years to recover its investment.

Figure 2.1 illustrates the payment cashflow concept[1].

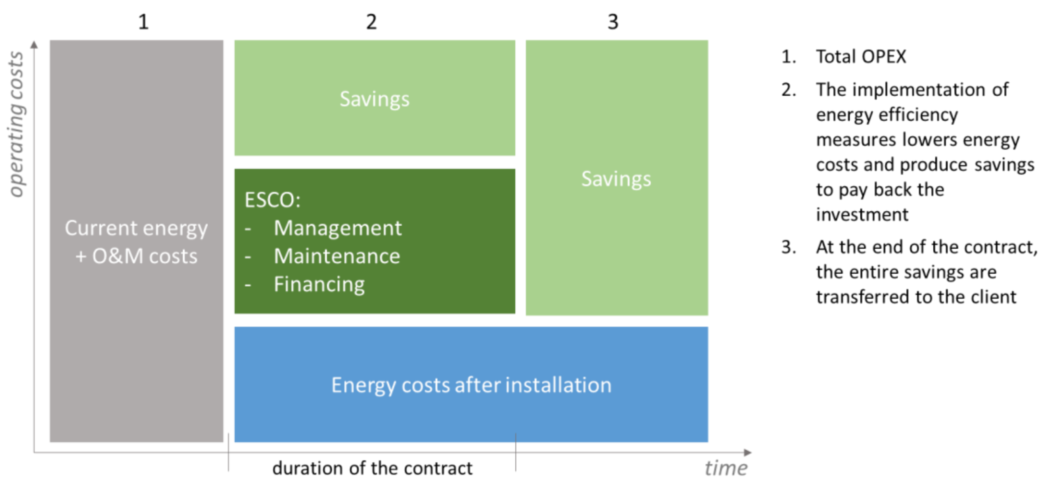

Figure 2.1 - Revenue model

In grey the costs of energy, operation, and maintenance before the implementation of the project. Throughout the duration of the contract, the company would benefit from the reduced energy bill related

[1] Source: www.resalta.com

to an important reduction in energy consumption, while the ESCO is repaid from a part of these savings. At the end of the contract, the company benefits from 100% energy savings having the same reduced bill as during the contract.

Benefits and Challenges

The main benefits of the implementation of an ESCO model are the lower financial and operational risk for the project owner, however the little number of publicly shared success cases makes it difficult for these business models to replicate and scale-up easily.

Table 2.1 presents these points in greater detail.

Table 2.1 - Benefits and challenges of ESCOs

Benefits	Challenges	Mitigation measures
Acquisition of know-how through the ESCO. The lack of technical knowledge is filled by the ESCO, made of companies with greater expertise than the Project owner. This way the operational risk is mainly on the ESCO.	**Financial risk linked with energy savings**. In the case energy savings do not match what initially established, revenues are also lower than expected. It is essential to ensure the definition of a correct baseline, and the proper implementation of the measures proposed.	Financial risk coming from lower energy savings than initially expected can be mitigated through the introduction of **clauses in the contract** with the ESCO. These clauses should consider different scenarios in the energy savings and describe how the fees may vary according to new market conditions.
No initial investment for the Project owner. The financing usually comes from a third-party financer in the form of grant or loan. In many cases is also the ESCO making the arrangement and taking most of the financial risk.	**Little support from and financial institution**. Given the limited number of success cases publicly shared, ESCO models still struggle to get the attention of investors.	If the financial sector does not show interest in the project, the company can try to get **institutional funds provided by the Portuguese Government agencies or the EU.**

2.2.2. Contract-Based Performance model

A **Contract-Based Performance** model for energy efficiency is a framework where payment for energy efficiency services is directly linked to the achievement of predefined performance outcomes. In this model, an external party or contractor (also refer as an ESCO, however, in this chapter we will use the term external party to avoid confusion with the previous chapter) is hired to implement energy-saving measures, and their compensation is based on the actual energy savings achieved rather than a fixed fee.

This model is widely used in various sectors, including public buildings, industrial facilities, and commercial properties, to promote energy efficiency, reduce costs, and achieve sustainability goals (**Figure 2.2**).

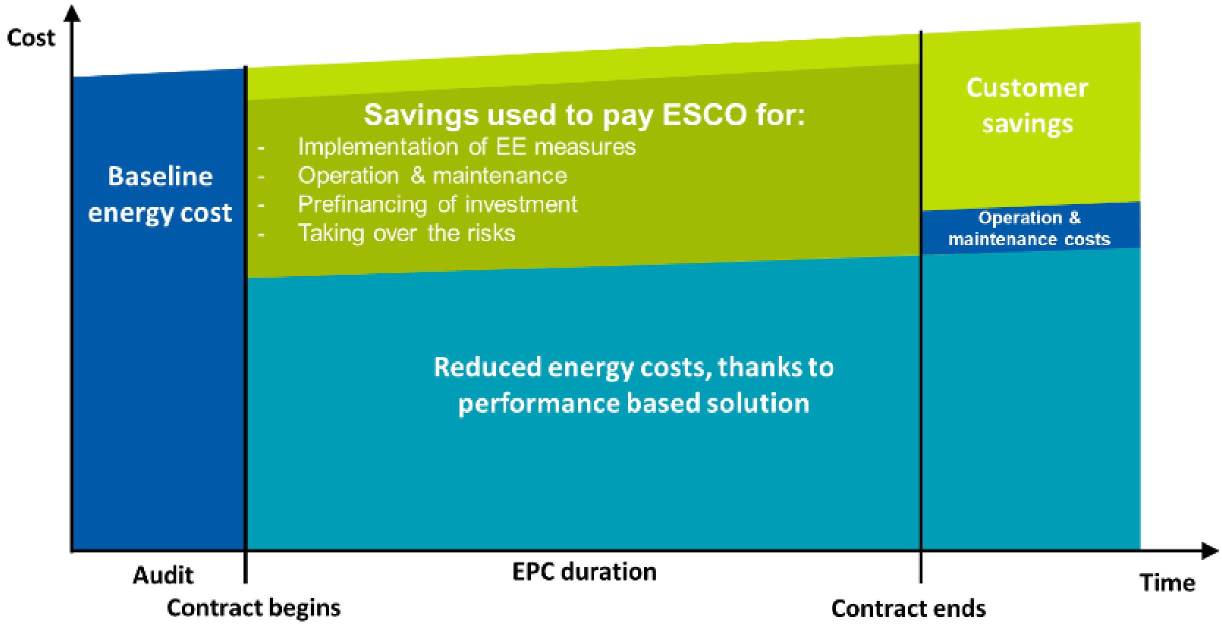

Figure 2.2 - Energy Performance contract[2]

A Contract-Based Performance model allows for the financing of investments in energy efficiency improvements through cost reduction, but it is more than just a financing model. It is a comprehensive program of energy efficiency measures that are implemented in a specific facility to achieve actual energy savings. This service may also include financing the efficiency measures themselves, so that the client is required to invest little or no capital. From the monetary savings generated through these measures, a portion is allocated to pay for the services provided by the external party. In most cases, it is necessary to verify that the energy performance improvement has been achieved[2].

Payment modalities and cashflows

Payments to the contractor are tied to the performance results. If the energy savings meet or exceed the agreed-upon targets, the contractor is compensated accordingly. If they fall short, the payment may be reduced or withheld.

There are two common types of performance-based contract structures used by the external party:

1. **Guaranteed Savings:** The external party guarantees a certain level of energy savings and assumes the risks if those savings are not achieved. The client pays a fixed amount based on the guaranteed savings.
2. **Shared Savings:** The achieved energy savings are shared between the client and the external party, with the client paying the external party a percentage of the savings realized.

These models provide different levels of risk and incentive for both parties, helping to collaboratively achieve energy efficiency goals.

Figure 2.3 summarizes the key features of the two models:

[2] Contratos de Performance de Energia (RNAE). Available at: https://www.enerdura.pt/images/stories/Documentos/Eficiencia_Energetica_Setor_Empresarial/Eficiencia_energetica_low.pdf

Guaranteed Savings

- Performance is linked to the level of energy savings achieved.
- The value of the saved energy is guaranteed to meet service obligations
- The external party assumes the performance risk, while the client assumes the credit risk.
- Extensive measurement and verification (M&V) are required.
- Allows the ESCO to undertake more projects without incurring high debt.

Shared Savings

- Performance is based on the cost of the energy saved.
- Payments to the external party are tied to the price of energy — this can be a risky approach.
- The external party assumes both performance and credit risks.
- Can serve clients who do not have access to financing.
- Measurement and verification (M&V) equipment can be leased.
- Favors large external party — smaller external party may become too indebted with new projects.
- Suitable for projects with a short payback period.

Figure 2.3 - EPC payment modalities

Benefits and Challenges

The main benefits of the implementation of a Contract-Based Performance model are similar to those of the ESCO model.

Table 2.2 provides a detailed overview of the Contract-Based Performance Model, specifically focusing on Guaranteed Savings Contracts. It summarizes the key benefits, challenges, and mitigation measures associated with this type of model.

Table 2.2 - Analysis of Contract-Based Performance model

Benefits	Challenges	Mitigation measures
Guaranteed Savings. These contracts often include a guarantees of energy savings that ensures company will see a return on investment.	**Complex Contract Negotiation.** Developing a performance-based contract can be complex and requires detailed agreements on performance benchmarks, savings guarantees, risk allocation, and responsibilities.	**Engage Legal and Technical Experts:** Involve legal and energy efficiency experts early in the negotiation process and use or adapt standardized contracts where possible.
Risk Transfer. The contracted party typically assumes the technical, operational, and financial risks associated with implementing energy efficiency measures.	**Dependence on the external party Performance:** The success of the energy efficiency project is heavily dependent on the external party ability to deliver the promised savings.	**Exit Clauses:** Include clear exit clauses that define the conditions under which the company can terminate the contract without significant penalties.
No Upfront Costs. Many contract-based performance models allow clients to implement energy efficiency measures without any upfront investment.	**Potential for Over-Reliance:** The company may become overly reliant on the external party for energy management, which can be a disadvantage if the contract ends or if the external party does not provide adequate service.	**Due Diligence:** Conduct thorough due diligence on the external party track record and schedule regular progress reviews and audits throughout the project.

3. Onset of the model

3.1. Description

The present manual aims to present the activities that need to be developed for the preparation of the financial model and the estimation of the main economic and financial variables, that allow the analysis of the project viability.

The manual explains the sections of the financial model, how these sections should be filled, and how the results should be analyzed.

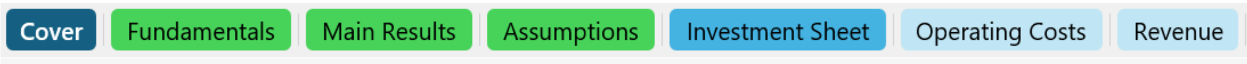

Figure 3.1 - Dashboard of existing sections of the model

The model is divided into the following sections (shown in **Figure 3.1** that constitute the dashboard on the Excel):

- **Cover:** presentation of the model and its creators.
- **Fundamentals:** summary of the most important aspects of the project, including its description and the nature of the measures, as well as how the energy savings will be achieved.
- **Main Results:** summary of the conclusions of the model, including the economic viability of the project.
- **Assumptions:** main assumptions used in the model.
- **Investment Sheet:** comprehensive overview of the total investment, broken down per investment component.
- **Operating Costs:** analysis of the maintenance and operating costs of the project.
- **Revenue:** description of the savings generated and the main sources of revenue per investment component.

3.2. Possible projects

The model considers four types of projects, according to the action vectors of WENexus, that may be realized:

- **Electromechanical equipment:** Projects aimed at replacing electrical equipment, such as pumps and motors, with more efficient alternatives are crucial for reducing energy consumption and operational costs. To ensure their financial viability, it's important to consider the upfront costs of new equipment, the expected energy savings over time, and the payback period. Additionally, exploring available incentives or financing options can further enhance the economic feasibility and sustainability of these upgrades.
- **Photovoltaic panels:** Renewable energy projects, such as the installation or substitution of photovoltaic panels, are essential for the energy transition and the reduction of carbon emissions. To ensure their financial viability, it is crucial to consider initial installation costs, the return on investment over the systems' lifespan, and, where applicable, considerations regarding financing options or available support.
- **Batteries:** Battery installation projects are critical for enhancing the efficiency and reliability of renewable energy systems by enabling energy storage and management. To ensure their financial viability, it is essential to evaluate the initial investment costs, the long-term benefits in terms of energy savings and grid stability, and the potential for securing financing or incentives to support the deployment of these technologies.
- **Biomethane production:** Biomethane production projects are vital for advancing sustainable energy generation by converting organic waste into a renewable energy source. Ensuring their financial viability requires careful assessment of initial capital expenditures, ongoing operational costs, and the potential revenue streams from energy sales or waste management. Additionally, exploring financing options or government incentives can significantly contribute to the successful implementation and economic sustainability of these projects.

3.3. Model type and settings

The type of financial model used is the Capital Investment Model. This type of model is employed in capital budgeting analysis to calculate metrics like net present value (NPV), internal rate of return (IRR), and payback period, helping to determine the viability of a project. These models are used to assess the economic feasibility of projects and to inform their long-term strategic plans for growth and expansion.

As for the setting, the **Table 3.1** summarizes the main temporal characteristics of the model:

Table 3.1 - Financial model settings

Financial Model	
Model status (e.g. draft, final)	Final
Start date	January 1, 2025
End date	December 31, 2040
Number total periods (years)	15

3.4. Characteristics of the model

3.4.1. Granularity

Granularity refers to how detailed a model needs to be. For this case, the granularity of the model is medium-low, since the information necessary does not need to be deeply detailed.

3.4.2. Flexibility

A model's flexibility is determined by its frequency of use, the number of users, and the variety of applications it supports. In this case, this model is slightly flexible, but should only be use for projects that are part of the project bundle: Electromechanical Equipment, Photovoltaic Panels, Batteries and Biomethane Production.

3.4.3. Periodicity

The model covers a period of 15 years, with the analysis presenting annual data.

3.5. Model Sections – Inception

3.5.1. Cover

The cover page serves as the introduction and gateway to the model. To enhance the user experience and accessibility, the cover page is equipped with a series of interactive Section buttons. These buttons are placed and labelled, allowing users to easily navigate through the document, and each button corresponds to a specific section of the model.

The **Figure 3.2** illustrates the cover page of the financial model.

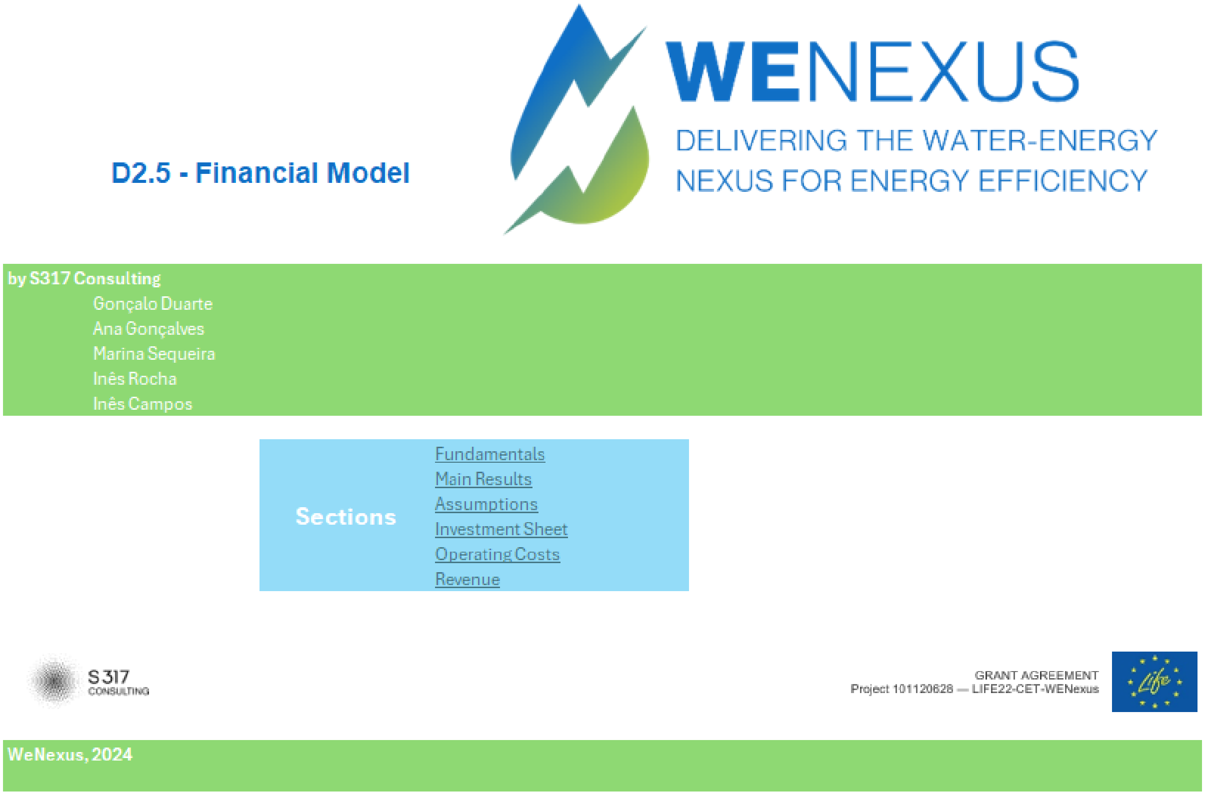

Figure 3.2 - Cover page

3.5.2. Fundamentals

The Fundamentals page present the essence of the project. In case the user intends to show the model to an outside party, it should fill this page with the information about the project, describing its nature, its goals and how it will achieve them.

Identification Of Investment Project

The first cell that can be filled by the user is the "Identification of the project" cell. In this manual, it will be assumed that the model that will be generated will not only serve for internal purposes for its owners, but also serve for external purposes such as presenting the project to potential investors. For that reason, the user of the model must start by including a description of the Investment Project that must contain:

- Detailed identification and description of the investment project, including its focus (renewable energy for example), its location, amongst others.

- Identification of the company and the management that will be responsible for the project, including the entities responsible for the implementation of the project, the main stakeholders, existing investors, managers amongst others.

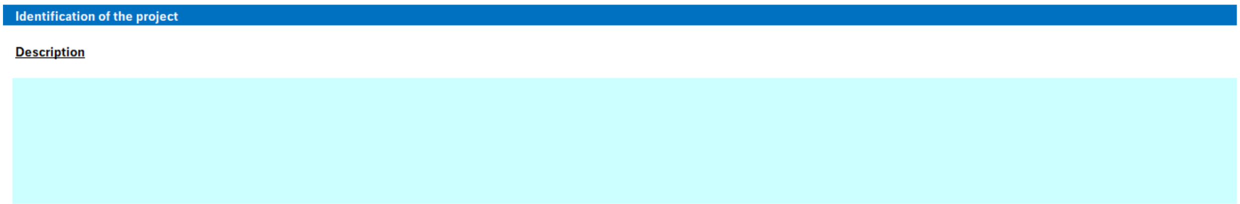

Figure 3.3 - Identification of the Project

Energy Efficiency Measures

The 2nd cell to be filled in the Fundamentals page is the “Energy Efficiency Measures” cell. The user should leverage this section to detail the specific measures that will be implemented within the project, along with a clear explanation of how these measures are expected to generate revenue. This description should include at least:

- **Identification of Measures:** Clearly outline the individual actions, technologies, or processes that will be put in place. For example, if the project involves energy efficiency improvements, specify the installation of the type of equipment.
- **Implementation Strategy:** Describe the process for executing these measures.
- **Revenue Generation Mechanism:** Explain the project will contribute to revenue generation.

By thoroughly detailing these aspects, the user can provide a comprehensive overview of how the project’s measures will be implemented and how they are expected to generate revenue, thus offering a clear pathway to the project's financial success.

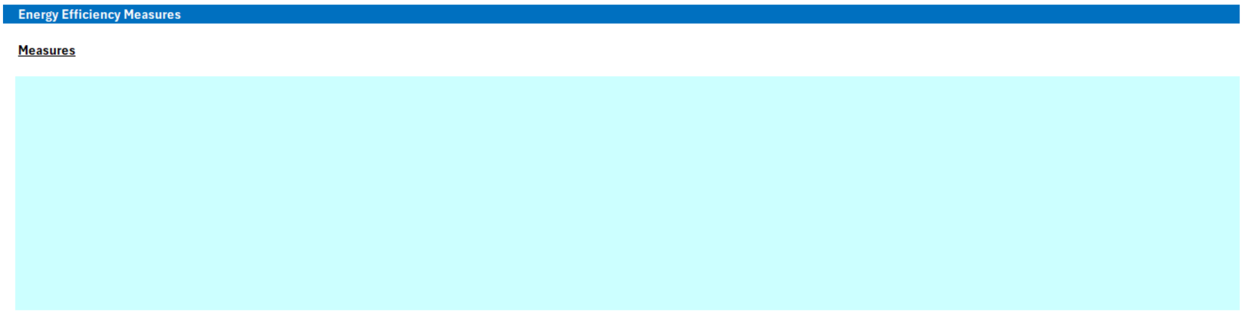

Figure 3.4 - Energy efficiency measures

3.5.3. Main results

The “Main Results” page summarizes the 4 most important components of the project:

- **A - CapEx (capital expenditure):** represents the total investment necessary to realize the project.
- **B - OpEx (operation expenditure):** summarizes the annual maintenance and operation costs of the project.
- **C - Revenues/Savings:** represents the energy savings generated by the project and estimates the financial gains generated by these savings.

All these components are then broken into the several segments that constitute them per type of project.

The last information provided is the **D - Economic Viability**. This component presents several indicators that evaluate the economic viability of the project:

- **Total Investment:** Total investment refers to the sum of all costs incurred to start the project.
- **Internal Rate of Return (IRR):** the IRR is the discount rate that makes the net present value (NPV) of all cash flows from a project equal to zero. It essentially represents the annualized rate of return generated by the investment. IRR is used to evaluate the attractiveness of a project or investment since a higher IRR indicates a more profitable investment.
- **Payback Period:** the payback period is the length of time required for an investment to generate cash flows sufficient to recover the initial investment cost. A shorter payback period means the investment is recouped faster, which is generally preferable as it reduces exposure to risk.

- **Net Present Value:** NPV is the difference between the present value of cash inflows and the present value of cash outflows over a project's lifespan. The NPV provides the value that represents the net benefit of an investment. A positive NPV indicates that the projected earnings (discounted to present value) exceed the anticipated costs, thus adding value to the company. Conversely, a negative NPV suggests that the investment would result in a net loss.

No action from the user is necessary on the "Main Results" page, since all the values will be automatically calculated.

3.5.4. Assumptions

At the core of the financial model lies a set of critical assumptions that form the foundation upon which the model is built. These assumptions encompass a wide range of variables, from macroeconomic indicators to company-specific factors, and play a pivotal role in shaping the accuracy and reliability of the model's projections.

The assumptions are divided into the following:

- **Discount Rate:** The discount rate is the interest rate used to discount future cash flows to their present value. It reflects the time value of money, risk, and opportunity cost of capital. The Discount Rate used was the ECB's Marginal Lending Facility (Source: ECB) for the year 2024. This discount rate was chosen because it is the best representation of the cost of financing, as the definition of the discount rate states. The cell is already automatically filled with the Marginal Lending Facility of 2024. However, the user may update this value if it deems necessary.
- **Inflation**: The inflation rate used was the estimated harmonized consumer price index for 2025 in Portugal, provided by the Bank of Portugal. The cell is already automatically filled with the inflation estimation of the Bank of Portugal for 2025; however, the user may update this value if it deems necessary.
- **Prices:**
    - **Annual tariff/selling price**: this price refers to the variable that will be used to value the revenues that will be generated by the replacement of the energy consumed (either with energy produced by the solar panels or simply energy saved with the implementation of the energy efficiency measures). The value of this price should be equal to the electricity

tariffs current in place when creating the project, or equal to an average of these tariffs in the previous years.

- **Variation in annual tariff/selling price:** estimation of the variation of the selling price. In case there is not an estimation, the inflation rate can be used.

Both the "*Selling Price*" and the "*Variation in annual tariff/selling price*" are cells the user has to fulfil (**Figure 3.5**).

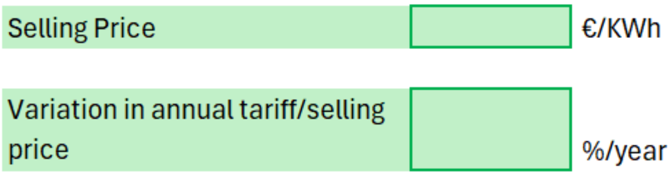

Figure 3.5 - Selling price and the Variation in annual tariff/selling price

The explanation of these assumptions is included within the model. The user of the model should use the values provided as baseline, although it can modify them if it wishes to use other assumptions.

Additionally, the user can add further assumptions in the "*Further Assumptions*" cell.

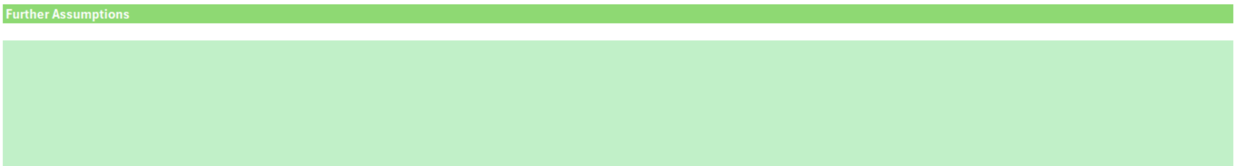

Figure 3.6 - Further assumptions

3.5.5. Investment sheet

The Investment Sheet represents the Investment necessary for the project. It is divided into Investment Components, depending on the nature of the project, and expands into 15 years. The user will have to fulfil the Blue Cells according to the project. Once this information is inserted, the model will proceed to the automatic calculations (**Figure 3.7**).

Electromechanical Equipment

Investment

Equipment						
Installation costs						
Piping and Connections						
Monitoring and Control Systems						
Others						
Total	**0**	**0**	**0**	**0**	**0**	**0**

Figure 3.7 - Investment sheet

The last Section of the Investment Sheet is the Economic Viability, that will automatically fulfil once the Investment Sheet, Operating Costs and Revenue are completed.

The definition of each variable within each Investment Component are the following:

- **Electromechanical Equipment**
    - Equipment: costs of acquiring the equipment such as electric pumps.
    - Installation costs: costs associated with the installation of the equipment.
    - Piping and Connections: costs necessary to implement the piping and connection structure that allows the function of the equipment.
    - Monitoring and Control Systems: costs associated with acquiring and installing the monitoring systems.
    - Others
- **Photovoltaic Panels**
    - Panel cost: upfront cost for the panels themselves.
    - Installation costs: costs associated with the structural setup.
    - Structure costs: costs of the structure that will support the panels.
    - Cost of monitoring equipment: expenses related with devices and systems that track the performance and efficiency of solar panels.
    - Cost of low voltage trenching: costs associated with digging trenches to lay electrical wiring that connects the solar panels to the electrical grid or inverters.
    - Cost of lifting equipment: costs for renting or purchasing cranes, forklifts, or other machinery required to safely lift and install solar panels.

- Cost of central monitoring: expenses related with the use of centralized systems that oversee and manage the performance.
- Others

- **Batteries**
  - Battery System: costs of acquiring the batteries, which can have different types (e.g., lithium-ion, lead-acid, flow batteries…).
  - Inverter/Charger: costs associated with acquiring the inverters.
  - Installation costs: costs associated with the installation of the batteries.
  - Cooling and Ventilation Systems: costs of the tools used for monitoring the performance of the battery system, energy usage, and system optimization.
  - Others
- **Biomethane Production**
  - Biogas Collection and Storage: expenses related to setting up equipment that captures and stores raw biogas produced from organic waste.
  - Installations costs: costs associated with the installation of the equipment.
  - Biogas Upgrading System: costs associated with installing systems that purify raw biogas by removing.
  - Grid Connection and Injection Equipment: expenses related with the infrastructure needed to connect the upgraded biomethane to the natural gas grid.
  - Digestate Management: costs involved in handling and processing the leftover material (digestate) from biogas production.
  - Monitoring and Control Systems: expenses related with the installation of systems that continuously monitor and manage the biogas production process.
  - Others

3.5.6. Operating costs

Operating costs are the day-to-day expenses required to run a business, excluding costs related to long-term investments. The user will have to fulfil the blue cells with its operating costs. Similar to the Investment Sheet, the operating costs were also divided by project type:

- **Electromechanical Equipment**
  - Inspections: costs associated with the inspections of the equipment.
  - Insurance: insurance of the equipment.

- Others

- **Photovoltaic Panels**
  - Cleaning: costs related with the cleaning of dirt, debris, and bird droppings.
  - Inverter Replacement: costs related with the replacement of inverters.
  - Inspections: expenses associated with a professional inspection, recommended to be conducted once a year.
  - Monitoring System: costs related with the subscription fees of solar systems needed to monitoring performance.
  - Insurance: panel insurance.
  - Repairs: costs related with unexpected repairs due to weather damage or other factors.
  - Grid Connection Fees: costs associated with staying connected to the grid
  - Depreciation: solar panels typically degrade at a rate of 0.5% to 1% per year, meaning their efficiency slightly decreases annually. This doesn't usually involve direct costs but should be factored into long-term costs estimates.
  - Others
- **Batteries**
  - Battery Maintenance: costs related to the maintenance of the batteries.
  - Others
- **Biomethane Production**
  - Energy Costs: costs of the energy necessary to run the digester, pumps and compressors.
  - Salaries & wages: costs associated with the skilled operators required to manage the daily operations.
  - Storage: costs related with the maintenance of gas storage tanks, compressors, and other handling equipment.
  - Water: costs related with the water used for cleaning and scrubbing.
  - Chemicals: costs related with the chemicals used for cleaning and scrubbing.
  - Monitoring Systems: costs for monitoring the production process.
  - Others

3.5.7. Revenue

Finally, the Revenue sheet describes the revenues generated through energy savings. Similarly to the previous sheets, the user has to fulfil the blue cells. However, in this case the Revenue Components are similar to all projects:

- **Energy production (KWh):** amount of the energy produced in KWh. This row should be filled for the Phovoltaic Panels and Biomethane projects.
- **Energy Saved (KWh):** amount of energy savd in KWh. This row should be filled for the Electromechanical Equipment and Batteries projects.

Once the user fills the blue cells, the model will automatically calculate the revenue generated based on the selling price the user has chosen.

4. References

Grant Agreement number 101120628 - LIFE22-CET-WENexus - LIFE-2022-CET-PDA - LIFE-PJG CINEA/D/01.

Resalta – Maximizing Energy Effiency Project. Available at: www.resalta.com

Contract-Based Performance. Available at: www.enerdura.pt/images/stories/Documentos/Eficiencia_Energetica_Setor_Empresarial/Eficiencia_energetica_low.pdf

WENEXUS

DELIVERING THE WATER-ENERGY NEXUS FOR ENERGY EFFICIENCY

CONTACT US

wenexus@wenexus.eu

VISIT US

www.wenexus.eu

Co-funded by the European Union