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Innovation Action

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CBDC powered Smart PerFORrmance contracTs for Efficiency, Sustainable, Inclusive, Energy use

D5.4 Online OSS demonstrated and exploitation planning and IPR report including alternative financing schemes

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Abbreviations

ACPR	Autorité de Contrôle Prudentiel et de Résolution
APR	Annual Percentage Rate
B	Background
Bn	Billion
B2B	Business-to-Business
B2C	Business-to-Consumer
CBDC	Central Bank Digital Currency
CBDC	Central Bank Digital Currency
CEPP	Climate Emergency Purchase Program
CEPP	Climate Emergency Purchase Program
CAGR	compound annual growth rate
CAGR	Compound Annual Growth Rate
C	Consultancy
CSR	corporate social responsibility
DeFi	Decentralised Finance
D(X.Y)	Deliverable
DREEM	Dynamic high-Resolution dEmand-sidE Management
ECB	European Central Bank
EGD	European Green Deal
EE	Energy Efficiency
EPC	Energy Performance Contracts
ESCOs	Energy Service Companies
ESIE	Efficient, Sustainable and Inclusive Energy
EU-ETS	EU Emissions Trading System

EU	European Union
FAIR	Findable, Accessible, Interoperable, and Reusable
F	Foreground
€G	green-euro
GDP	Gross Domestic Product
H	Hardware
IPR	intellectual property rights
IPMVP	International Performance Measurement and Verification Protocol.
IOT	Internet of Things
KEO	Key Exploitable Outcome
L	Licensing
M&S	Maintenance & Support
M	Making
M&V	Measurement and Verification
M(X)	Month
nZEB	Nearly Zero Energy Buildings
OSS	One-Stop Shop
O	Other
O(x)	Outcome
PEPP	Pandemic Emergency Purchase Program
PSP	Payment Service Provider
PSP	Payment Service Provider
PPU	Pay-per-use
PVs	Photovoltaics
PaaS	Platform as a Service

POC	Proof of Concept
S	Service
SME	Small and Medium-sized Enterprise
SSH	Social Sciences and Humanities
So	Software
SaaS	Software as a Service
SVP	Special Vehicle Purpose
SP	Spin-off
TEESlab	Technoeconomics of Energy Systems laboratory
TRL	Technology Readiness Level
TBD	To Be Decided
U	Use

Executive Summary

This report takes a full perspective on the business and exploitation plans of FORTESIE technologies and renovation packages with guarantees and investigates innovative financing solutions to support the financial burden of renovation projects for stakeholders. It explores a range of methods, including established lending and refinancing practices, crowd-funding platforms like Goparity, and up-and-coming financial instruments like DeFi lending and Green Loans in green euros.

The report also presents the development of an online One-Stop Shop (OSS) marketplace, specifying its target audience, structure and design. Furthermore, it lays the groundwork for the exploitation plan of the FORTESIE project, with a keen focus on the identified Key Exploitable Outcomes (KEOs).

By refining the originally proposed KEOs to harmonize with the project's overarching vision, the document ensures strategic alignment. It then navigates through strategies for optimally positioning each KEO for robust market exploitation, while meticulously addressing their associated intellectual property rights (IPR) registry.

1 Introduction

The overall vision of FORTESIE is to design, demonstrate, validate and replicate innovative renovation packages in the building industry with Smart Performance-Based guarantees and financing, aiming at Efficient, Sustainable and Inclusive Energy (ESIE) use to accelerate the Renovation Wave in Europe. The renovation packages will combine state-of-the-art construction materials and technologies components (prefabricated facades, BIPV, heat pumps, etc.), innovative digital technologies for measurement and verification, and attractive financing (e.g. contractual frameworks for smart performance guarantees, financing mechanisms, engagement techniques, green-euros, etc.), to raise the overall EPC value proposition. The renovation packages will be tailored to specific target groups needs and optimised to improve the ESIE performance considering energy, CO2 and comfort. Each package will be demonstrated and validated in real life use cases and customised for replication in all other partner countries for immediate market take-up.
Methodologies from Social Sciences and Humanities (SSH) will be adopted for:

- the creation of collaborative business models that boost the Renovation Wave by considering all stakeholders' value and revenue streams,
- novel incentivisation and behavioural change models that aim to stimulate long term engagement with focused interactions to adopt green behaviour
- the incorporation of a digital currency, green-euro, (€G) for financing, rewarding and creating an inclusive / collective narrative in the fight against climate change
- the collection of feedback for recommendations to policy and business stakeholders,
- Mapping and understanding the complex interplay between the different stakeholders to deliver an engagement strategy across the value chain.

These demonstrations will potentially constitute the green-euro as a retail Central Bank Digital Currency (CBDC), hence revolutionising the financing of renovation approaches. An online marketplace, will be offering first level advice, directing consumers through the value chain of stakeholders and facilitating access to these "packaged" renovation services.

1.1 Deliverable Purpose and Scope

The purpose of this deliverable is to prepare the market positioning for the FORTESIE solutions and the requirements for putting the business models in action, to fill in the current market gaps and the identified needs for the stakeholders that the FORTESIE ecosystem can address. An important aspect to facilitate the business is the financing options, which FORTESIE addresses by providing the alternative financing mechanism. Moreover, this deliverable aims to present the expected exploitable outcomes of FORTESIE and provide early considerations for their future market positioning. During the first 18 months, the identified requirements of potential end users, the architecture –together with the final use cases and pilot business models- have revealed the FORTESIE potential exploitable outcomes. This deliverable is considered complementary to D2.4: Business models analysis for each service M9, that present the foreseen novel FORTESIE business models, starting with one (in France) as an example to show how the partners are complementing each other for the provision of the FORTESIE service and what indicative stakeholders and roles are necessary. The other pilots will follow in the next deliverable. These are matching with the description of the exploitable results and the way that each result will be exploited by the consortium and each individual partner.

2 Alternative financing schemes

Alternative financing schemes are being formulated by adopting the green-euro loans with combination of crowdfunding, to support the financing border of renovation packages, in a way that also facilitates the circulation of the green-euro currency, and builds a new collective narrative on energy/climate/EU green deal. This means that massive investments will be initiated from the mass, and not top down with subsidies and other policies which many distort market operation.

FORTESIE aims to mobilise investments and to empower citizens to realise that by investing in renovation technologies they do not only improve their living conditions, but also they construct a collective narrative on climate change requested by many economists, a key missing element to enable the green transition. This approach presents an alternative with big potential to mobilise and educate the mass about the contribution of renovation technologies to the fight against climate change, comfort for individuals and overall valorisation of existing building stock. This is proposed as opposed to current transition bounty hunting individual behaviour, to participation in a collective narrative on winning the climate battle. The monetary innovation has been suggested as a not fully explored economic tool, to align goals of two stakeholders: economic agents and policy makers.

To align all participants with monetary innovation and the loan focus, we outline below basics money and lending principles and outlining the concept of operation and co-operation of actors to support the alternative financing schemes.

2.1 Basic lending principles

The current economic operations suggest that when an economic agent borrows €10k, the commercial bank creates €10k on its own account, and then transfers it to the account of the economic agent.

For example, when M. John Doe borrows €10k from Bank 1, he sees a credit of €10k on his Bank 1 account. When he buys a car with these €10k, he transfers it to the car seller's Bank 2 account. The €10k thus circulates in the economy, moving from one commercial bank to another.

M. Doe's debt to Bank 1 (materialised by a contract between M. Doe and Bank 1) therefore generates 10k of "new" euros that feed the economy. The Monetary and Financial Code specify the rules that authorise banks to make these entries as follows: Bank 1 issues €Bank1 10k (the debt to bank1 from Mr Doe) on the basis of a contract with M. Doe. Once this amount is transferred to the car seller's Bank 2 account becomes €Bank2 10k (deposit in Bank 2 generates a debt from Bank 2 to the account owner, here the car manufacturer). This is possible because Bank 1 and Bank 2 follow the rules implemented by the European Central Bank and the local national central bank (*i.e.* Banque de France in the case of France for example): They both **have an account at ECB in ECB's euros**. At the end of each day, banks aggregate all financial movements in between accounts and compensate the balance in ECB's euros. In the previous example, there is a 10k movement from Bank 1 to Bank 2. Maybe during that day, a customer of bank 2 also paid to someone holding an account in Bank 1 the amount of 7k. At the end of the day, Bank 1 must thus pay to Bank 2, the amount of 3k (10k-7k) in ECB's euros. "There is no free lunch", as per the fundamental economic principle!

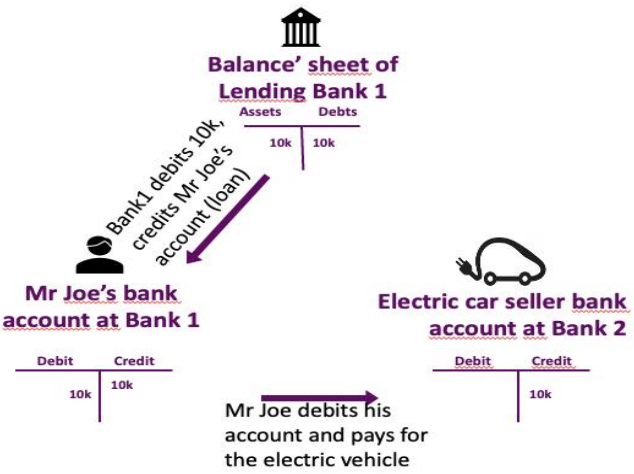

Figure 1: Financial flows consecutive to a loan granted by Bank 1 to a household buying an electrical vehicle.

In simple terms, these rules only allow a bank to lend if it owns at least 10.5% of the money it lends (Basel III ratio). For each loan, the commercial bank therefore recycles 10.5% of pre-existing euros and creates (also called "issues") 89.5% of new euros. Because of compensation at the end of the day, banks need to find the 89.5%. **This activity is called refinancing.**

2.2 Basic refinancing principles

There are mainly 3 options to refinance a loan for commercial banks. All those options are based on market practices, i.e., money is found on money markets.

Option 1: Interbank market. Banks will refinance themselves by borrowing them or at ECB. This first compartment of the money market, brings together financial players and central banks. The largest volumes are traded here.

Option 2: **SVP, for Special Vehicle Purpose**. Banks create a new company, so called SVP. All the loans, i.e. loans's contracts also called securities, are transferred to this new corporation (SVP). They are thus off the bank's balance sheet. Those operations are known as securitisation principle. The SVP then issues bonds that are sold on money market. This second money market compartment, called negotiable debt security market, brings together financial and non-financial companies.

Option 3: Bank issues bonds to be sold on the debt security market. Bonds stay on the bank's balance sheet.

Obviously, in reality, banks operate combinations of the three options.

What appears to be clear is that there is no "ex-nihilo" money creation. The money created in the bank model, is then refinanced with existing liquidity on money markets. Money markets reallocate liquidity, which is preexisting savings on their own accounts. Obviously nobody is

able to create money! Banks and markets have separate roles, banks grant loans and financial markets lend liquidity over time, against risk (default) and remuneration.

2.3 Crowd funding lending: Goparity's case

Making use of financial innovation, namely in regards digital management of large amounts of payments simultaneously as well as digitalization of contractual procedures, namely loan agreements between individuals and/or organizations, in the past years, Europe has seen the appearance of crowdlending.

Crowdlending is nothing more than Peer-to-Peer lending of small amounts at a scale level. Meaning that many investors (individuals or organisations, including companies, cooperatives, etc.) can come together to fund a particular venture. Now, this can traditionally be funded with equity, but more an more, especially for sustainable energy investments, the option of debt - of crowdlending - has been adopted, as it allows for increased traction on investors - to reach a larger pool of investors, that are willing to invest recurrently in different projects, aiming at constituting a loan portfolio that is part of their investment strategy.

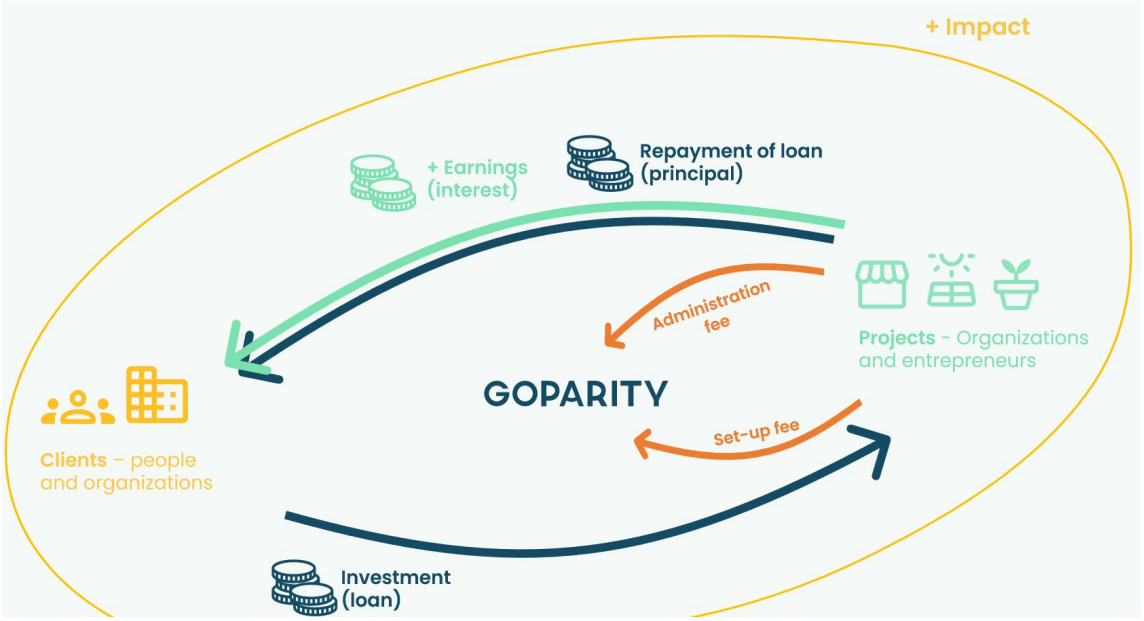

Figure 2 Goparity's case

The previous figure exemplifies how a group of investors can P2P lend to an organization, mediated by a crowdlending platform such as Goparity (www.goparity.com).

Crowdlending is regulated at EU-level through the recently enacted Regulation (EU) 2020/1503[1], transposed by all Member-States, that allows for a local platform to apply to its national regulator for a European Passport, thus being authorised to operate in the desired EU Member-States other than the one they have registered originally.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R1503

The aspect that differentiates Goparity (together with a few other platforms operating in Europe), is the focus on Impact and Sustainable projects. Thus, in the scope of FORTESIE, Goparity uses its community of investors (over 45.000 citizens from 67 countries, including all EU Member-States) who are looking to support sustainable energy investments such as heat pumps, building renovation and solar PV assets, with loans that can reach maturities up to 10 years.

By launching a crowdlending campaign, Goparity promotes a project, raises a predefined amount from the crowd, and establishes a multitude of loan agreements with the collective of investors that decide to place money on that campaign (project). The promoter (the loan taker) will only have to do one transfer per instalment, and the platform manages all payment disbursements, interests, contracts, etc.

Besides being an alternative to standard banking, crowdlending can engage the community of a specific promoter (an Association's members, a neighbourhood's inhabitants, etc.), as well as raise awareness and interest from the local community towards the project being funded.

Under the FORTESIE project, another relevant angle has been explored together with CCO2, as GOP has experience in financing Energy Service Companies (ESCOs) operating with Energy Performance Contracts (EPC). To this avail, GOP can provide ESCOs with further debt that can be leveraged on top of own funds (equity) and market debts (bank loans), to allow for these companies to install assets (for example heat pumps) and receive a recurrent revenue through an EPC contract. On the same model, GOP can provide funding to CCO2 to promote €G loans as shown in figures 5 and 6 in paragraph 3.2.1. ESCOS could also use €Gs to develop new products priced in €Gs.

Therefore, crowdlending becomes a scalability factor, to allow for ESCOs and CCO2 operating in the renovation and electrification markets to raise more capital for their activities, thus increasing their portfolio of EPC/€Gs clients in a sustainable way based on ACHEIVED reductions in kWh consumption and/or CO2 emissions).

2.4 ECB quantitative Easing and DeFi Lending

Two specific refinancing options should be considered later in FORTESIE, once first green-euro loans are sold on the market: ECB and Defi.

European Central Bank (ECB). As presented above, banks can refinance themselves at the ECB. In practice this means that the ECB will buy securities (loan contracts) from commercial banks. ECB can do this either with current cash on its balance's sheet (reallocation of existing assets), or by increasing its balance sheet, by emitting new money. This so-called "non standard" monetary policy allows the ECB to emit money to buy securities. This was the case for example, in large amounts (€1.85 Bn), during the COVID19 crisis, under a program called PEPP, for Pandemic Emergency Purchase Program[2]. It is possible to argue and to defend the idea of a Climate Emergency Purchase Program (CEPP) to support the European Commission's priority number one: the EU Green Deal. Securities labelled in green-euros, are green by design and should be able to benefit from favourable CEPP financing conditions. In

[2] https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html

addition green-euros could be tested as potential retail Central Bank Digital Currency (CBDC), a project currently running at ECB. Combining CEPP and CBDCs should be explored in potential discussions at the end of the project with the ECB.

DeFi Lending. Decentralised Finance, or Defi, allows owners of crypto currencies to borrow on the crypto market an amount proportional to the amount of crypto owned. This amount of crypto owned acts as a reserve or collateral to the loan. In the crypto world all transactions can be automated (smart contracts) and so if the value of the collateral gets below the amount borrowed, the collateral is sold automatically to cover the loan amount. However in this crypto world there are no lenders yet willing to lend money at low or 0% rate to support other members of the community. The work to be done in FORTESIE with GOP for the refinancing of green-euros loans, combined with the work of putting data (energy consumption) and payments on blockchain should be used at the end of the project to further explore Defi lending functioning and opportunities.

2.5 Specificity of ESIE loans

European Green Deal, Green finance appears a lot capitalising on the climate change efforts and vision. Given the climate and energy emergencies, how can alternative financing mechanisms support the investments that can ultimately turn the world greener? How can we incentivise all economic agents to favour investments towards moving green? How can we stimulate an economic arbitrage that would favour green investments instead of spending the same amount into pleasant activities (family vacation in a sunny place for example).

The questions are difficult to answer as we need to change what we did not manage to achieve in the past 50 years, and although monetary incentives have been demonstrated in the past to achieve social objectives, these have not been fully adopted in the fight against climate change.

Indeed, since the first oil crisis (1973), Europe and France have put in place economic tools to limit the quantities of imported fossil fuels, and consequently CO2 emissions. However, emissions continued to rise. The limitations of the four principal instruments employed are readily apparent:

- **Regulations**: These have been often accompanied by significant monitoring costs and inadvertently encouraged fraudulent activities due to stringent control measures.
- **Taxes**: Their efficacy has been frequently undermined by the rebound effect, where the intended benefits are offset by subsequent behaviours that negate the initial impact.
- **Subsidies**: While intended to support economic activities, subsidies lead to distortions in market pricing mechanisms, provided an impetus for fraudulent claims, and result in unintended windfall profits.
- **Allowances**: in the form of EU carbon market, introduced since 2005. whose effectiveness has been slowed by the players in this carbon market, who are seeking to limit the quota caps.

In France, the government's failure to combat climate change, as established by the ruling of the Paris Administrative Court on 3 February 2021, highlights the ineffectiveness of current public policies, while the low level of social acceptance of these measures is currently limiting

their widespread deployment and, by the same token, their effectiveness in terms of climate change. Therefore, new ways should be explored which combine existing measures and, with new solutions that will enable to build a shared narrative around the climate issue. Monetary innovation remains experimental at this stage, and FORTESIE designs and tests its usage though the distribution of green-euro loans presented hereafter.

In this context, FORTEISE proposition is to value the ACHIEVED efficiency and/or CO2 emissions ACHIEVED avoidance. Those avoided consumption and emissions can generate value that would in turn be used to lower interest rates down to 0% (or even negative) for the economic agent willing to change today his behaviour and equipment.

By valuing consumption and emission which was avoided, there is a dual effect:

1) reward, and thus motivate the economic agent for social purposes: **social** motivation.

2) offer “green loans” that are unbeatable on the market : 0% or lower, **economic** benefit.

3 The Green Loan in green-euros (€G)

As a proof of concept of innovative financing, Fortesie designs and makes available in France the loan offering, to households currently heated with fuel. OKT will offer these loans to their customers for the upcoming projects and will offer a loan to an appropriate renovation tasks, including for example the walls insulation, and/or replacement of the fuel boiler by an electrical heat pump that reduces both:

- heating/cooling **energy demand** and consequently energy consumption. One kWh of electricity gives 4 kWh of heat with a heat pump, while for a fuel boiler of an uninsulated house, the need would be of 6 kWh for the same comfort level.

- **CO2 emissions,** as electricity in France is produced by nuclear and hydrolic sources, and thus does not emit CO2. So 1 kWh of electricity to produce 4 kWh of heat will not emit CO2, compared to the 6 kWh produced by fuel, burning around 0.6 Liters of fuel, and emitting 1.16 kg of CO2. On top of this, Electricity production is regulated by EU-ETS (carbon market), and thus CO2 emissions are already considered by producer, which is not the case for fuel dealers. Thus, when a household switches from fuel to electrical heat pump, we can consider an emission factor of 0 gCO2/kWh produced, to avoid double accounting of CO2 emissions. Emissions from electricity production are not considered or considered in this calculation, as CO_2 emissions from electricity production are already considered and managed under the EU Emissions Trading Scheme also known as the EU carbon market. The responsibility for those emissions are born by energy producers, and consequently, to avoid double counting of CO_2 emissions are not counted at the household level.

A typical € 10K loan, will be sold to households around an average APR (annual percentage rate) of 5.5 %. Assuming a loan duration is 5 years, monthly payments (instalments) equal to 190.37 €, and in total the customers pay 11 422.41 euros for the borrowing of € 10k. The total cost of loan is thus 1 422.41 euros (11.422k-10k) as shown on figure 3.

Amount of Loan in €	10 000 €
Duration	60
Monthly rate	0.45%
APR	5.50%
Installment	190.37 €
Total amount paid	11 422.41 €
Cost of loan	**1 422.41 €**

Figure 3 illustrates a typical € 10k loan at 5.5% APR

If FORTESIE values the avoided electricity consumption and CO2 emissions for €1422.41, then the cost of the loan would be equal to 0€, implying an APR of 0%. In other words, an interest free loan as per figure 4 below, or a « free loan ».

Amount of Loan in Green-Eur	10 000 €	10 000 €
Duration	60	60
Monthly rate	0.45%	0.45%
APR	5.50%	5.50%
Installment	190.37 €	190.37 €
Total amount paid	11 422.41 €	11 422.41 €
Green earnings		**1 422.41 €**
Cost of loan	**1 422.41 €**	**0.00 €**

Figure 4 illustrates a €G 10k loan at 0 % APR, thanks to valuation of the avoided energy consumption and CO2 emissions.

3.1 Customer proposition

The value proposition to the customer should be stated in simple terms such as :

« Dear Customer,

should you consider insulating your house and changing your fuel boiler today, with a free loan to install the heat pump? Thanks to the avoidance of energy consumption and CO2 emissions, your heat pump will generate rewards which will be credited in green-euros on your CO2 Account and will finance your loan, to make it interest free. Thus the investment will be more affordable, you will enjoy immediately the benefits of the improved comfort, as you will pay for the investment in the long term, and finance your loan through the positive contribution to the environment. A social goal that helps your comfort. Good deal?

Why are the euros green?

Green-euros are euros credited in your digital wallet when achieved reductions of CO2 emissions savings are monitored. They are thus regular euros backed with CO2 reductions and energy savings.

How Green Euros supports the 'Free' loan?

The generated green-euros rewards, pay for the interest of the loan, thus making it free.

How can you use the digital green-Euros? Can I use it only for fuel boiler?

With your CO2 Account and the CO2 Card, you spend your €G in all shops (and online sales): the CO2 card is a classic MasterCard, which is accepted at a large number of merchants and online. You can also transfer €Gs to all the people on your contact list with your smart phone. With the CO2 Account and CO2 Card, you can easily circulate €G money. And so, you fight against climate change in your daily life.

Where do I apply?

Directly on the FORTESIE website, at http://fortesie.eu/ or on the CO2 Account website at : https://www.compteco2.com/en

How long is the loan?

Typical loan duration is between 4 to 6 years, depending on your situation.

To whom do I pay it?

Money lent on your CO2 Account needs to be reimbursed on your CO2 Account.

3.2 Financing mechanics by CCO2, GOP, ED

3.2.1 The definition of the loan offering in France as part of the renovation package

FORTESIE Partners reworked jointly the OKT radar chart of figure 6 below, and identified the role, contributing value and benefit for each needed actor, to place the offering of these loans in France for OKT customers. OKT customers will receive the option to finance part of their renovations with a

green Euro. Given that the France subsidies support a big part of the renovations, the loans will further ease the investment decisions for the rest of the own money that building and home owners need to invest.

CCO2 acting as a Payment Service Provider (PSP) under the licence of TREEZOR, will offer those loans. As money and banking services are highly regulated activities, 450 signed an agreement with Fintech TREEZOR to operate the €G *Payment Card* and so does not need to get an agreement from financial regulation body (French Autorité de Contrôle Prudentiel et de Résolution - ACPR). 450 also ran in 2018 a preliminary check of the feasibility of this €G *loan* product, and consulted the law firm DS Avocat (Me Thibault Verbiest)[3] in Paris, specialised in Financial compliance, to evaluate the legal feasibility of lending €Gs, which concluded that:

- The €G loan project is not affected by the activities which are covered under the scope of the **banking monopoly**.
- If a Company does not have an authorisation to offer **payment services**, its exchange/sale system meets the conditions of the exemption described under the terms of Article L. 521-3 of the French Monetary and Financial Code:
  - a mean of payment accepted exclusively at the company's premises (on the platform) issuing it for the acquisition of goods or services (the services and products offered on the platform); or
  - in a limited network of people who accept this mean of payment (platform's service partner providers).

The €G loan offer falls within the above-mentioned exemption.

CCO2 will measure the CO2 emissions and energy savings before and after the €G loan. CCO2 will reward the end customer, 44.60 green-euros for each ton of CO2 abated. The CO2 calculation will be done as follows: CCO2 will collect from FORTESIE the energy savings and earnings.

Both, the CO2 and energy avoided emissions and consumption will entirely be used to pay the loan interest. Amount of the loan and duration will be adapted to earnings from energy and CO2 in order to make it a free loan.

CCO2 will establish the financial contract for the loan between the end customer and CCO2. CCO2, operating as a Payment Service Provider (PSP) by offering customers a CO2 Account and a CO2 Card follows financial regulation (typically the need to perform the Know Your Customer procedures). The loan financial contract complements the Energy Performance Contract signed by the customer with his energy providers, as energy savings credited on the CO2 Account by the Energy Provider will be used to pay loan interest.

GOP will provide a refinancing solution to CCO2. Following various risk analysis meetings with CCO2, GOP, and ED, to reduce the risk born by GOP's investors, ED and CCO2 are currently evaluating the possibility for ED to provide a risk coverage solution, should CCO2 default on its refinancing engagement.

The design and execution of this POC should serve as a demonstrator and market test and as a testbed for the design of bigger loan offerings within the project and beyond it. Should partners feedback and market reaction be positive, the new €G loan could be extended throughout Europe.

[3] http://ds-savoirfaire.com/en/savoir-faire-on-the-leading-edge/

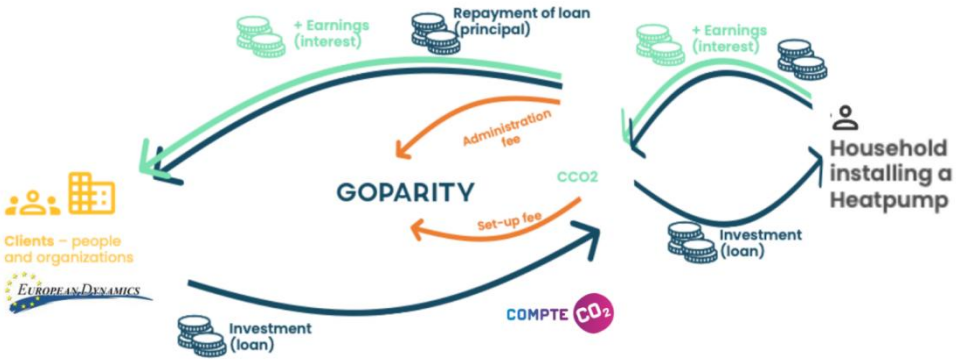

Figure 5 illustrates all the actors mobilised for the POC : GOP, CCO2, ED

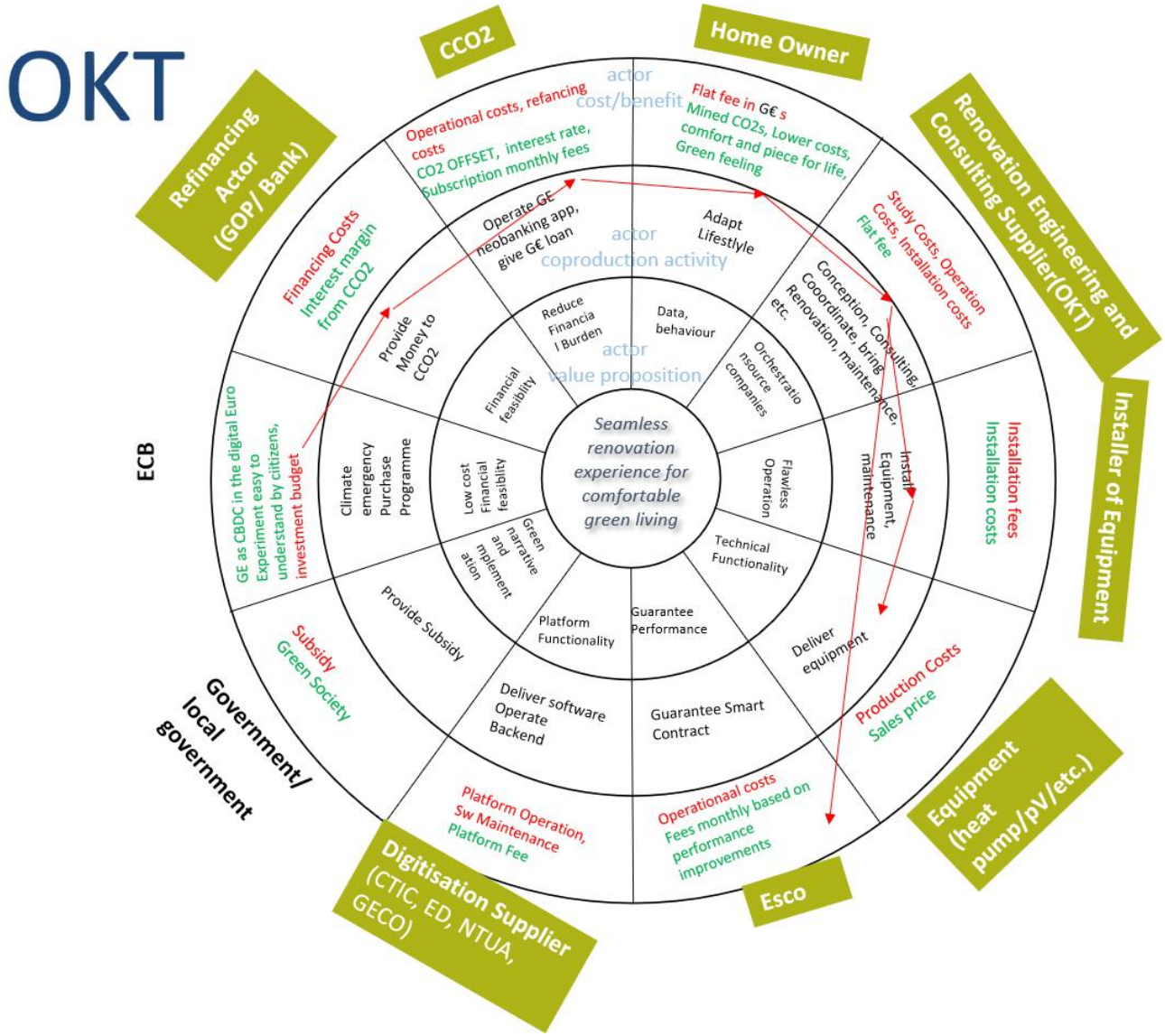

Figure 6 illustrates all the actors mobilised for the POC : GOP, CCO2, ED and compares the initial theoretical radar business model.

3.2.2 Long term: Scaling up

To prepare a longer term scale up or pan EU launch, all the elements from the POC would need to be consolidated. We list below the key points to be addressed to scale up. We also list important points that are not major, but would be useful. A typical long term business plan is presented assuming all the key barriers can be overcome.

3.2.2.1 Key Point 1: Exploiting Carbon markets to enable green Euro rewards

The reward of Green euro to households practically means that carbon credits are purchased by CCO2 from the house owners at the price of **€ 44.60 per tCO2**. This is the "green earning" for the customer,

and the unique benefit of green euros. This price is set to equal the French carbon tax level to make all climate policies tools consistent.
To illustrate this with an example, the replacement of the fuel boiler by a heat pump reduces the emission of a number of tCO2 annually (for example, 4.02 tCO2 for the consumption of 1500 liters of fuel), and generates **X carbon credits,** annually (4 carbon credits in our example).
Carbon credits are then sold by CCO2 to companies or institutions that voluntarily offset their emission. The price on the voluntary carbon market is at **€ 11 per tCO2.**
For each carbon credit there is a net cost for CCO2 of 44.60 - 11 = 33.60 euros. Those numbers are highlighted in the business plan table presented below in the orange line. In addition this formula implies that CCO2 is able to sell 100% of all its carbon credits. This might not be sustainable as the business grows and more carbon credits are available in CCO2 account. Therefore a complementary action to companies voluntarily offsetting their emissions should be designed. Three alternatives are evaluated:

1. EC or Member states reallocate current subsidies to those ex-post real CO2 reductions. This ex-post measurement would ensure efficiency of public spending, at a time where many Member States have public deficits far above the EU rules (as of March 26th 2024, French Public Deficit is raising 5.5% of GDP, far above the 3% EU limit). Continuous meetings with cabinets are on going to promote this €G narrative dedicated to reaching the EU Green Deal.
2. Sell the carbon credits resulting from the €G loan activity to Airline Companies that have to comply with the carbon offsetting scheme called CORSIA. CCO2 applied in 2020 to CORSIA, and realised that this objective could be reached only if the French Gov, or other Member States would accept that a carbon credit given to an economic agent, would correspond to the destruction of a carbon allowance of the government. This was the case in France, Germany and Belgium until 2012 under the Kyoto's Protocol. Discussion with DG energy/climate of the EU commission, and member states should continue to obtain such an agreement. At least an experiment should be conducted.
3. Sell the carbon credit on the EU carbon market (EU-ETS). This is a medium objective that should be started during FORTESIE's project.

In all cases, the €G lending activity represents an opportunity to mobilise private investments from the public/mass and only this activity can speed up the renovation wave. Consequently, it is safe to assume that our governments are rational economic agents, who could consider a risk free solution, by redirecting the policies and subsidies, with potential huge public spending savings. Small rewards may result in large investments.

3.2.2.2 Key Point 2: Exploring Energy Efficiency (EE) markets to enable green Euro rewards

Like for Carbon Credits, the second "green earning" that would generate green euros, is a reduction in energy consumption. So far many schemes are implemented to stimulate reduction in Energy consumption, but do not reward the economic agent at the root of the EE action. The case of white certificate is the most important one in France, and was not successful in reducing energy consumption, nor in stimulating economic agents to act immediately (no change in free rider behaviour). In addition the mechanism is known to favour massive fraud[4] and cost a lot of money to public finances.

[4] https://ec.europa.eu/anti-fraud/media-corner/news/27-10-2020/hungarian-fraudsters-indicted-after-olaf-investigation_en

Combined with carbon credits, white certificates could increase earnings for the economic agent, and facilitate the delivery of "free loans". Consequently, if the loan offering (POC) is positive and if we can continue to sell few €G loans, this experiment will be used to propose institutions to reallocate current subsidies into green euros, and green-euro lending to accelerate the renovation wave and consequently reduction in CO2 emission, reduction in energy consumption, and reduction in inefficient public spending.

3.2.2.3 Key Point 3: Refinancing

The business plan of Green Euro, presented in the below table, shows, in the yellow line to cost of refinancing and its impact on the profitability of the overall business model. The main assumption is that the new €G loans will generate new €G securities.

Those securities, green by design because they are linked with green activities, would allow to track accurately in companies, commercial banks and central banks, on their balance sheet, the part of the economy which is green, unlike with green bonds: a company emitting a green bond, receives the money in its treasury department and can then use it for "business as usual". Many economists are calling for systems to rate firms instead of bonds, and green-euros would allow this accurate tracking of a transition from brown to green economy.

Economic consequences of energy consumption and climate change are such, that many major actors of the Eurosystem now recognize the need for a "green" monetary tool for economic intervention, compatible with the mandate entrusted to the ECB[5]. As expressed by the President of the ECB[6], "I have children, I have grandchildren. I don't want to have to face those pretty eyes, asking myself and others, 'what have you done? ' ".

The green-euro, and the green-euro securities, will contribute to build a stronger Europe by exploring the benefits and risks of a third form of the euro, the digital (complementary to cash and scriptural euros), that will continue to serve Europeans well, in particular by dedicating this new form of a euro to delivering the European Green Deal.

In particular, the ECB could test a Climate Emergency Purchase Program (CEPP) that would create traction on this new form of the euro, and accelerate the transition to a carbon-free economy. Loans issued in green-euros could accelerate investments for EGD, and how the European Commission and Member States could save up billions of euros in public spending by transforming EGD financing with the green-euro (up to € 20 Bn for France only) as pointed out in Key Point 1 & 2.

Consequently, the consortium will pursue meetings with ECB representatives in order to present its work and results, and to demonstrate how ECB could purchase €G securities at better rates then securities in brown-euros (or lend at cheaper rates in green-euros vs brown-euros).

Given the key points 1, 2 & 3, the potential long term profitability (and thus existence ?) of FORTESIE is unfortunately linked to political decision that are out of its scope. However, we will continue our relentless effort to meet and convince political decision makers.

[5] https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200928_1~268b0b672f.en.html, and speech of French Central Bank Governor Villeroy de Galhau of 13 December 2019.

[6] Interview to the Financial Times, July 8th, 2020

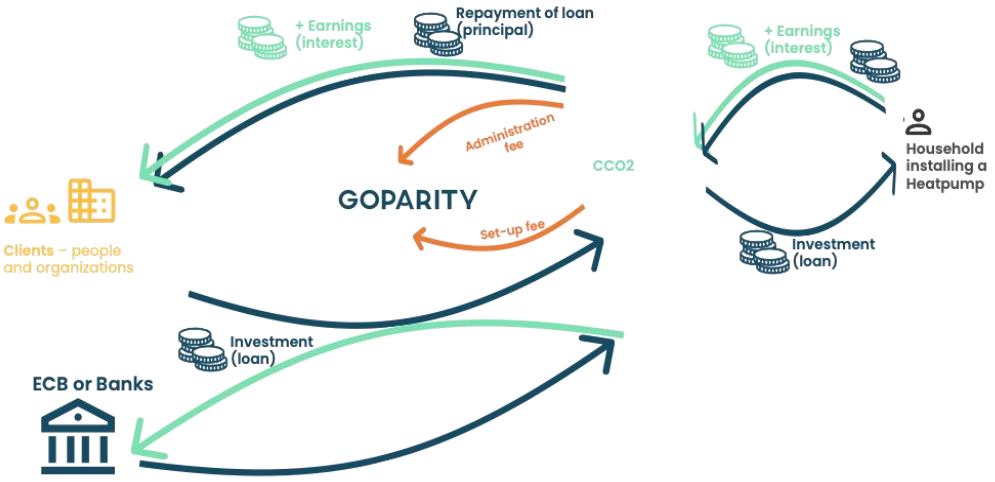

Figure 7 Long term refinancing options

3.2.2.4 Regulatory issues

For CCO2 the distribution of loans at a large scale imply to change its PSP regulatory status and apply for a bank licence. This issue is a matter of money and time mainly, to hire the appropriate staff, and to pay the fee services to law firms specialised in this field. The collaboration and experience of GOP for this specific task will be a strong asset. The expected time to receive a bank licence is around two years.

3.2.2.5 Loan Operations

For CCO2 the management of loans at a large scale will imply to develop loan operation capacities. In the Cloud Lending revolution, in order to build lending experiences that CCO2 customers will love, CCO2 identified a potential EU financial company to provide this service : CIRCEO. The CIRCEO SME position itself as a "Loan Factory". Early discussions with their staff and customers convinced CCO2 of the potential capabilities of CIRCEO and as a supplier of choice.

Consequently, scaling up loan operation capacities is a matter of liquidity mainly, to hire the appropriate staff, and to pay the fee services to CIRCEO. Implementation of the CIRCEO solution needs less than a year.

3.2.2.6 Blockchain

Within FORTESIE a blockchain solution will be put in place and evaluated to calculate energy savings and to establish trust in EPCs. This could lead to Smart EPCs, with automated payment on a chain.

A second chain could be used to record all CO2 savings. This will insure no duplication rewards for the same CO2 reduction, and would allow to aggregate automatically the entire CO2 reductions that took place. This chain would thus register all distributed carbon credits and will build trust in the recording and distribution of Carbon Credit management, and therefore €G circulation.

These two chains could be could then be used by ECB within the digital euro project, to generate automatic payments on the chain. It could be used to develop a EU payment solution, complementary to the SEPA payment system, and to relieve the dependency on VISA, Mastercard or AMEx, the current American Card Payment Operator.

This blockchain activity is a long term goal, adding more benefits on the €G monetary innovation.

In Particular FORTESIE will hep to materialize this long term potential in two specific ways :

- Should €G loans become successful, Green-euros could be ready to be presented for a CBDC trial : Results obtained within FORTESIE on the selling of €G loans, and €G adoption by user, will be used to conduct meeting at ECB, and to offer to run a pilot trial of €Gs as a version of a potential retails EU CBDC conducted under its "Digital Euro" project.
- Also, as the €G loans become successful, new Smart Electricity contract could emerge, and would comprising of a fixed fee, various €G/kWh depending of the hour of the day, and rewards that would offset kWh price increase : Once EPCs and CO2 emission are recorded on a blockchain, CCO2 will look at putting EPCs payments on the chain as well. This would allow to fast and automated payments with no human intervention. Should those automated payment on a blockchain been able to happen (smart contracts), then the coin of the chain could also become a potential candidate for a retail CBDC trial. merging this coin with €Gs could further open doors for a "green-deal" CBDC candidate under ECB's "Digital Euro" project
- Consequently, the blockchain work done within FORTESIE could very interestingly materialize into concrete applications.

3.2.2.7 Typical long term business plan

A very first excel business plan has been made as per table below, to estimate the potential of a green-euro banking model, selling payment services and green-loans. This first exercise shows how profitable the business could be in the long run, and how much cash would be needed to achieve break even. Given its favourable outcome, this model and assumption will be further thoroughly evaluated, finalised and presented at the end of the project.

€G loans Proforma Income Statements

in k€

	YR	YR2	YR3	YR4	YR5	YR6
Total quantity of Wallets (CO2 Cards) in k	10	40	100	500	1 000	2 000
Total quantity of abatted CO2 in tCO2 by loans	910	23 307	82 636	214 725	485 735	1 050 625
# loans	777	7 127	22 277	52 577	115 430	249 066
Outstanding	**7 987 €**	**67 134 €**	**197 270 €**	**436 983 €**	**924 295 €**	**2 001 672 €**
Sales						
Loan revenues	77 €	2 937 €	11 324 €	33 047 €	85 650 €	201 450 €
Sale of abatted CO2 at € 11/t (offset)	14.8 €	368 €	1 451 €	4 391 €	11 690 €	27 890 €
Total Loan	**92.2 €**	**3 305 €**	**12 775 €**	**37 439 €**	**97 341 €**	**229 340 €**
Loan revenues in % Outstanding		*4%*	*6%*	*8%*	*9%*	*10%*
Card revenues	50 €	200 €	2 000 €	10 000 €	25 000 €	50 000 €
Total Loan + CO2 Card Sales	**142.2 €**	**3 505.2 €**	**14 775 €**	**47 439 €**	**122 341 €**	**279 340 €**
€O2 Loan Cost of Good Sold						
Compensation & Benefits	42 €	130 €	448 €	968 €	2 408 €	5 432 €
Refinancing costs	0 €	126 €	784 €	1 946 €	5 046 €	11 598 €
Processing fees (Circeo)	374 €	221 €	511 €	958 €	1 967 €	1 883 €
Purchase of abatted CO2 at € 44.6/t	60.05 €	1 491.30 €	5 882 €	17 804 €	47 399 €	113 083 €
Other CGS (risk mostly)	122 €	725 €	2 412 €	6 998 €	17 509 €	40 450 €
Total Loan CGS	**598 €**	**2 692 €**	**10 036 €**	**28 674 €**	**74 329 €**	**172 445 €**
CO2 Card Cost of Good Sold						
Treezor	320 €	1 220 €	2 820 €	12 520 €		
Compensation & Benefits + infrastructure	318 €	700 €	1 300 €	2 750 €	37 200 €	72 200 €
Total Loan + CO2 Card CGS	**918 €**	**3 912 €**	**12 856 €**	**41 194 €**	**74 329 €**	**172 445 €**
Gross Profit	**(776 €)**	**(407 €)**	**1 919 €**	**6 244 €**	**48 012 €**	**106 895 €**
GP in %				*17%*	*49%*	*47%*
OPEX						
R&D	399 €	584 €	499 €	474 €	422 €	504 €
Sales and Marketing	946 €	1 030 €	2 319 €	4 612 €	8 808 €	19 764 €
G&A	206 €	267 €	571 €	571 €	571 €	571 €
Total OPEX	**1 551 €**	**1 881 €**	**3 389 €**	**5 657 €**	**9 802 €**	**20 840 €**
Opex in %	*2005%*	*64%*	*30%*	*17%*	*11%*	*10%*
EBIT	**(2 327 €)**	**(2 288 €)**	**(1 471 €)**	**587 €**	**38 210 €**	**86 055 €**
EBIT %					*45%*	*43%*
Tax 33%	**0 €**	**0 €**	**0 €**	**194 €**	**12 609 €**	**28 398 €**
Net Profit	**(2 327 €)**	**(2 288 €)**	**(1 471 €)**	**393 €**	**25 601 €**	**57 657 €**
Net Profit %	*-3009%*	*-78%*	*-13%*	*1%*	*30%*	*29%*
Cumulated Net Profit (approx cash flow)	**(2 327 €)**	**(4 615 €)**	**(6 086 €)**	**(5 693 €)**	**19 908 €**	**77 565 €**

Figure 8 €G Loans Proforma Income Statement

4 OSS Marketplace

Buildings are significant contributors to global energy consumption and greenhouse gas emissions. Energy renovations offer a key solution, but the process can be complex and fragmented. This section outlines the design and functionalities of the One-Stop-Shop (OSS) Marketplace for energy renovations. This innovative platform will serve as a central hub for stakeholders in this domain, fostering collaboration and promoting data-driven approaches for cost-effective solutions. This is the first early version of the marketplace, which will incrementally develop and enrich services as the project matures.

4.1 Description

The European building energy renovation market is booming, driven by ambitious EU targets for energy efficiency and rising energy costs. While the market holds significant potential, stakeholders face challenges due to a fragmented landscape with limited user awareness and a lack of centralised information. This presents a prime opportunity for a OSS marketplace that fosters collaboration and knowledge sharing for the general public and professionals and any kind of private and/or public building owner who wants to invest in renovations of their own buildings (houses or other) and do not know where to start. By streamlining the renovation process and catering to regional variations, such a platform can empower stakeholders, reduce project costs, and contribute to a more sustainable European building stock.

This user-centric marketplace offers a multitude of benefits for stakeholders involved in building energy renovations:

- **Improved Collaboration**: Brings together various stakeholders (owners, designers, policymakers, contractors, financiers) in a single platform, fostering communication and collaboration throughout the renovation process.
- **Knowledge Sharing**: Provides a central repository for best practices, case studies, and resources, empowering stakeholders with the latest information and successful renovation strategies. Provides initial information about what renovation is, why it is needed and what technologies are there.
- **Transparent information**: Offers a user-friendly platform that guides users through the renovation journey, streamlining the process for all stakeholders, bringing together suppliers and building owners, collecting and publishing available offerings and packages and enabling transparency in the market.

  More services will be added later, by promoting results of the project, regarding data collection and guarantees that could link with renovation investments, in the sense of Data-Driven Decision Making: Leverages data analysis to propose cost-effective technical solutions for building renovations. This can significantly reduce project costs and improve the overall efficiency of the process.

The marketplace leverages the expertise of ED by incorporating best practices from their existing marketplaces. In addition, a thorough analysis is conducted to identify the specific requirements unique to the building energy renovation domain, the existing offerings in the market to consider the best services for the marketplace acting as a European one stop stop.

4.2 Target audience

The OSS Marketplace caters to all stakeholders involved in the energy renovation process, including:

- Building owners
- Design professionals (architects, engineers)
- Policymakers
- ESCOs
- Renovation companies
- Financing entities (banks, government agencies)
- Digital solution providers
- Equipment providers
- Building owners
- Building occupants
- Building managers
- General public

4.3 Marketplace structure

The OSS Marketplace is meticulously crafted to swiftly and systematically address the primary inquiries of external visitors. It endeavours to provide clear insights into ESIE's purpose, renovation policies, funding options, and assistance available for designing and implementing renovations. Additionally, it outlines the anticipated benefits and offers a convenient search tool to identify potential partners and innovative renovation technologies for your building. Moreover, it furnishes comprehensive details on communication protocols, both internally and externally, along with designated contacts for further information.

As the project progresses, the OSS Marketplace will undergo continuous refinement and enhancement to align with evolving requirements. To ensure adaptability and efficacy, a dedicated server provisioning solution has been embraced, facilitating the selection of optimal tools and technologies to support future website functionalities seamlessly. The OSS Marketplace will be accessible via www.fortesie-marketplace.eurodyn.com.

4.3.1 OSS Marketplace Home Page

Entering the Marketplace home page, five menus appear on the top: "ABOUT US," "ESIE," "RENOVATION POLICIES AND FUNDING OPTIONS," and "FIND A PARTNER".

Selecting the first option, "ABOUT US," will navigate users to a dedicated page detailing the purpose and functionality of the marketplace, alongside information on its target audience and the reasons behind its reliability and trustworthiness.

Opting for "ESIE '' will direct users to an informative page containing comprehensive details on renovation, ESIE's role, and the manifold benefits it offers to buildings and stakeholders alike.

Choosing "Renovation Policies and Funding Options" will unveil a dynamic map interface, allowing users to hover over and select their desired country. Upon selection, a popup square will display pertinent information on renovation policies and available funding opportunities specific to the chosen country.

Lastly, clicking on "Find a Partner" will seamlessly guide users to the search page, facilitating the exploration and discovery of specific partners, products, services, or other offerings tailored to their needs and preferences, through specific filters.

Scrolling down the home page, users will immediately encounter a tagline accompanied by a prominent "Find a Partner" button, facilitating swift access to the search page. As users scroll further down, they will find a dedicated banner section, serving as valuable space for promotional content, including events, sponsored advertisements for products, services, and partners.

Following this, users will be greeted by the "Innovate, Renovate, Elevate!" section, featuring six interactive tabs for navigation. These categories include: "Find a Renovation Partner," "Find a Product," "Find a Service," "Find a Renovation Package," "Unconventional Green Financial Paths," and "Diagnose Your Needs."

Upon exploring these options, users will find that the first four tabs seamlessly direct them to the search page, already equipped with preselected filters to streamline their search process. The "Unconventional Green Financial Paths" tab will lead users to a dedicated page outlining alternative financial schemes and loans, such as crowdfunding and green euro initiatives.

Lastly, selecting the "Diagnose Your Needs" tab will direct users to a static diagnostic tool. Here, users can input relevant information, and based on their responses, receive tailored suggestions for renovations aimed at enhancing their building's energy efficiency.

Following the "Innovate, Renovate, Elevate!" section, users will encounter the "Recently Added/Popular Products and Services" segment. Initially, this section will showcase recently added products or services from partners who have joined the marketplace. As traffic to the marketplace increases, the display will evolve. Once the marketplace has garnered sufficient traction and an ample number of partners have signed up, it will transition to showcasing the most viewed products or services. This dynamic feature ensures that users are presented with the latest offerings or the most sought-after items, enhancing their browsing experience.

Finally, the "Design Tomorrow" section will greet users at the bottom of the page. Here, users will discover the FORTESIE network of local one-stop-shops distributed across various regions. By clicking on their desired country, users can effortlessly locate the OSS and access its comprehensive profile, equipped with all the information and support necessary to embark on their renovation journey.

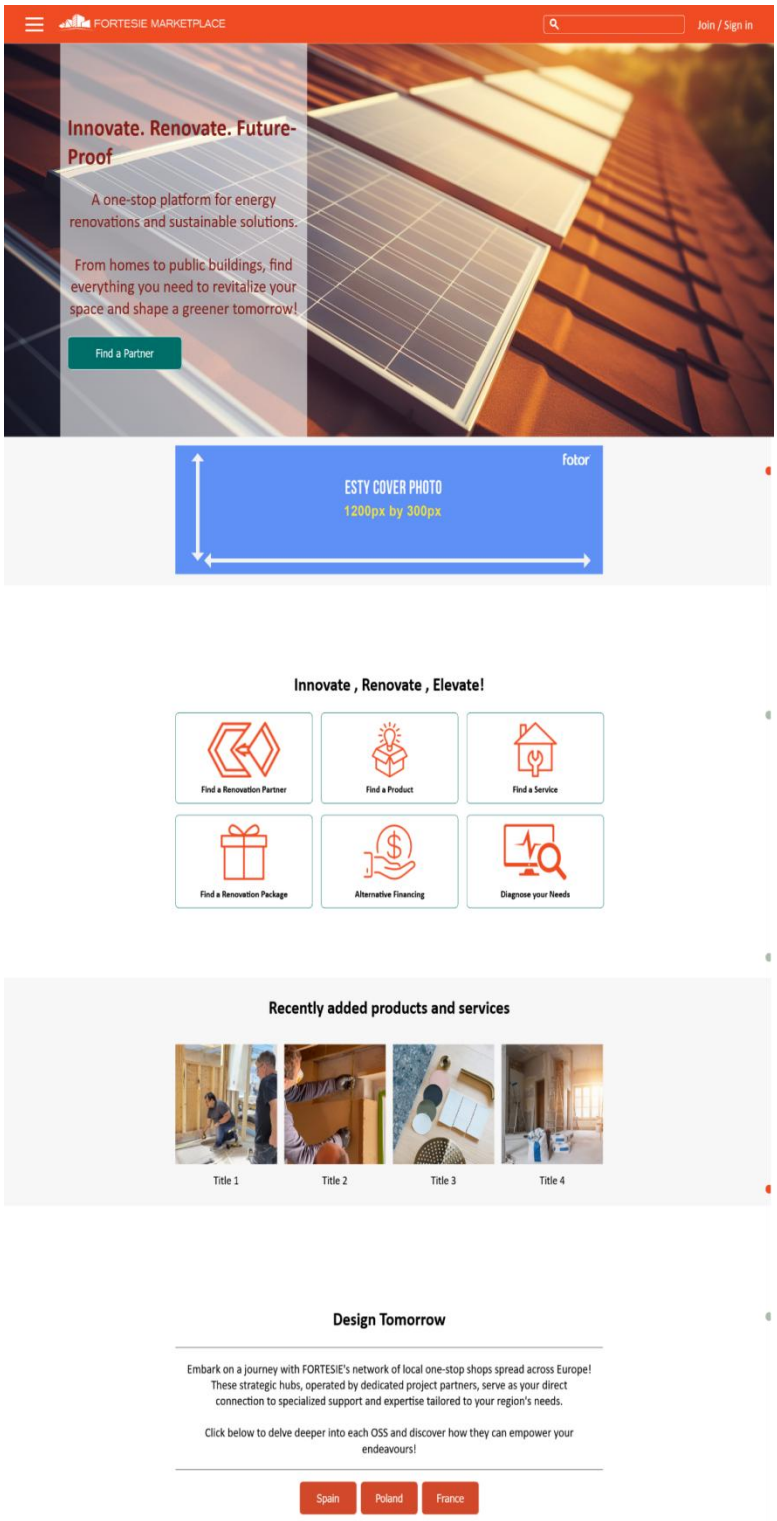

Figure 9 OSS Marketplace Home Page

4.3.2 Partners' Sign up/ Log in

To streamline partner engagement and access to products and services, every partner aligned with the Marketplace's stakeholders must complete a registration process. Users will readily spot a prominent "Sign Up" and "Log In" button conveniently located in the top-right corner of the main FORTESIE website.

Accessing the Sign-Up Page: Partners interested in joining the Marketplace will navigate to the FORTESIE website and click on the "Sign Up" button located prominently in the top-right corner of the homepage.

Entering Email and Password: Upon clicking "Sign Up," partners will be directed to a dedicated registration page where they will be prompted to enter their email address and choose a secure password. The email address will serve as their unique identifier for logging into the platform in the future.

Verification and Confirmation: After entering their email and password, partners will be required to confirm their email address. They will receive a verification email containing a unique link or code. Partners must click on the link or enter the code provided in the email to verify their email address and proceed with the registration process.

Completing Registration Form: Once email verification is complete, partners will be directed to a registration form where they will provide additional required information. This may include their legal entity name, contact details, type of partner(e.g renovation company, equipment provider, etc), in which country/countries the partner operates, company logo photo, a brief description of their business, and any necessary verification documents.

Creating Profile: Partners will then proceed to create their profile by adding their products and services separately, along with any relevant past experiences or success stories. Each item will be added individually, ensuring clarity and ease of navigation for users browsing the Marketplace.

Review and Submission: Before final submission, partners will have the opportunity to review all information entered and make any necessary edits or adjustments. Once satisfied, they will submit their registration form and profile information for review and approval.

Confirmation and Login: Upon successful submission, partners will receive a confirmation message indicating that their registration has been received. They will then be prompted to log in using their email address and password to access their personalised dashboard and manage their profile on the Marketplace.

Profile Management

After successful registration, partners will have seamless access to their profiles through the "Log In'' button on the FORTESIE website's top-right corner. Upon clicking "Log In," partners will be directed to a secure login page where they'll enter their credentials—typically their email address and password—previously used during the registration process.

Once logged in, partners will gain access to a personalised dashboard, empowering them to manage and refine their profiles as needed. This dashboard will offer intuitive controls for updating information, such as modifying product or service details, refreshing company descriptions, or uploading new success stories and accompanying photos.

In addition to profile management, partners will also have the capability to remove their offerings from the Marketplace if desired. Within their dashboard, partners will find straightforward options for editing or deleting products, services, or even their entire profile from the Marketplace.

4.3.3 Search Page

The search page serves as the cornerstone of the Marketplace, enabling users to effortlessly explore partners, services, products, and packages. With the primary goal of enhancing accessibility to renovations, the search functionality is designed to cater to the diverse needs of users.

Users can initiate their search journey through a variety of filters. One option allows for searches via free text input, empowering users to enter specific keywords or phrases relevant to their renovation needs. Additionally, users can utilise dropdown lists within another filter to narrow down their search based on predefined categories or criteria.

Flexibility is key, as users have the freedom to utilise one or more filters according to their preferences. In instances where no filters are applied, the search will yield comprehensive results, showcasing all joined partners along with their respective products and services.

Below the search tool, detailed analyses of the filter options are provided, ensuring users can make informed decisions and refine their search effectively. This user-centric approach ensures a seamless and intuitive search experience, aligning perfectly with the Marketplace's mission of simplifying renovations for all users.

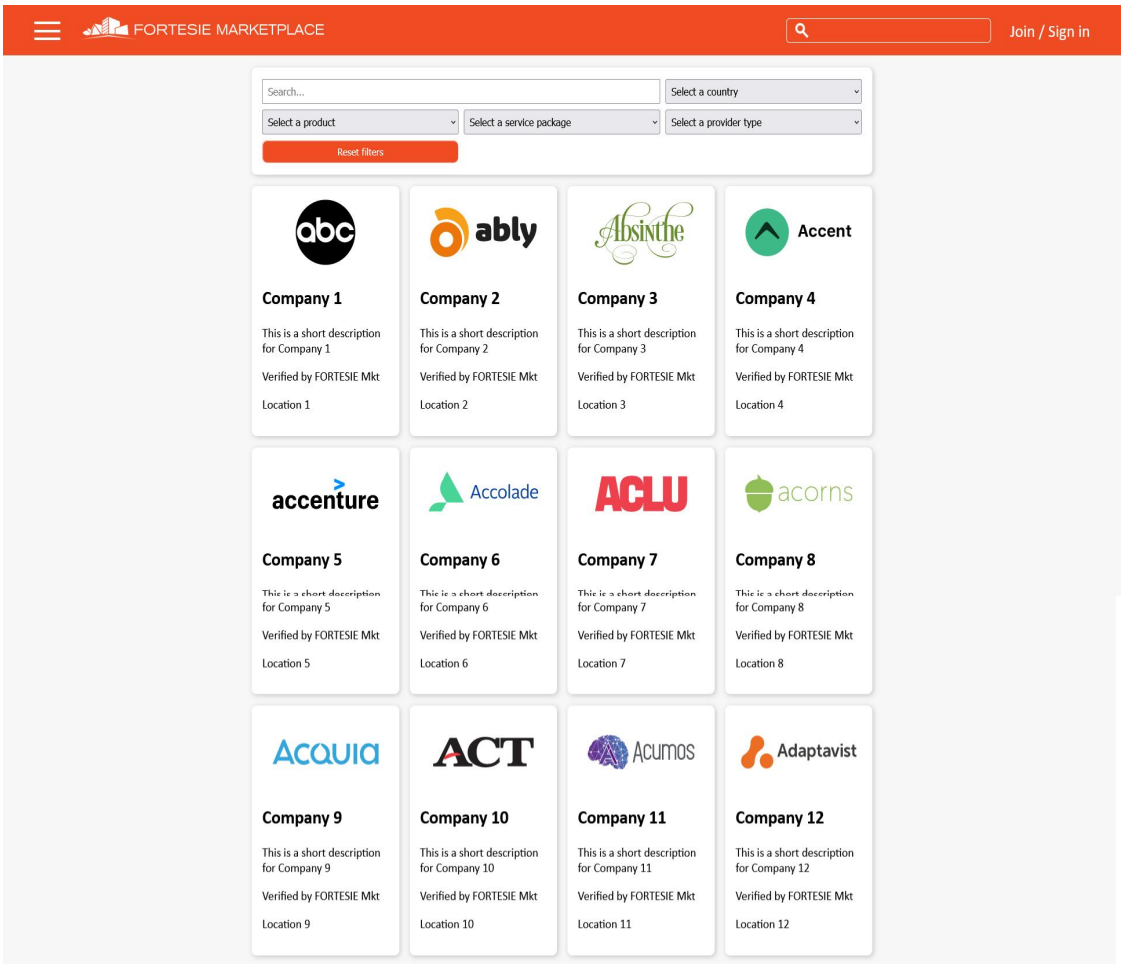

Figure 10 OSS Marketplace: Search Page

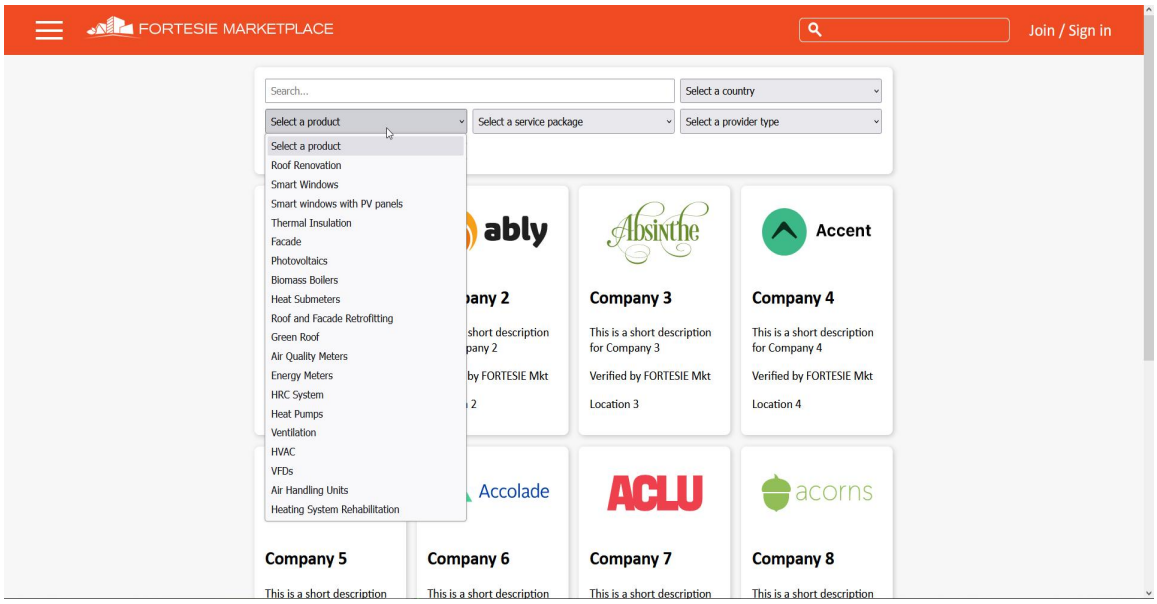

Figure 11 OSS Marketplace: Search Filters

Search tool – Filters (more than one option)

1. Search (free text)
2. Location (all Europe countries)
3. Renovation Products
   - Roof Renovation
   - Smart Windows
   - Smart windows with PV panels
   - Thermal Insulation
   - Facade
   - Photovoltaics
   - Biomass Boilers
   - Heat Submeters
   - Roof and Facade Retrofitting
   - Green Roof
   - Air Quality Meters
   - Energy Meters
   - HRC System
   - Heat Pumps
   - Ventilation
   - HVAC
   - VFDs
   - Air Handling Units
   - Heating System Rehabilitation
   - Other
4. Renovation Service Packages (TBD)
5. Type of Provider
   - Design Professionals (Architects, etc)
   - ESCOs
   - Construction Companies
   - Financing Entities
   - Digital Solution Providers
   - Equipment Providers
   - One Stop Shops

When utilising the "Find a Service" or "Find a Product" filters, the search results will display a list of partners who have included these specific products or services within their profiles. This targeted approach ensures that users receive relevant and tailored results aligned with their search criteria. By focusing on partners who offer the desired products or services, users can efficiently identify potential collaborators and explore offerings that meet their specific needs and preferences.

Selecting a Partner

Upon selecting a partner by clicking on their image, users will be directed to the partner's comprehensive profile, where they can access detailed information and offerings. Here's what users can expect to find:

1. Logo: A visual representation of the partner's brand identity.
2. Company Name: Clearly stated for easy recognition.
3. Short Description: A concise overview highlighting the partner's key attributes and offerings.
4. Verification Status: Indicates whether the partner is verified by FORTESIE Marketplace or not, ensuring transparency and reliability.
5. Location: Provides information on the partner's geographical location, aiding users in identifying local partners.
6. Type of Organization: Specifies whether the partner is a private, public, or other type of organisation, offering insights into their structure and nature.
7. Website: Direct link to the partner's website for further exploration.
8. Products Provided: A detailed list of products offered by the partner, enhancing clarity and facilitating decision-making.
9. Expertise: Highlights the services provided by the partner, showcasing their areas of expertise and specialisation.
10. Past Work: Showcases listings of the partner's previous projects, accompanied by short descriptions and photos, offering users a glimpse into their capabilities and track record.
11. Contact Us: Provides options for users to initiate communication with the partner, whether they're a marketplace member or not. Members can directly message the partner, while non-members are prompted to sign up, fostering engagement and collaboration.

5 Key Exploitable Outcomes and Scientific Results

This is an updated and final list of the FORTESIE project exploitable results and the scientific results. The Key Exploitable Outcomes (KEOs) of the FORTESIE project may be commercially exploited either by each partner individually, or by the consortium collectively, and at different levels. The highest exploitation level concerns the complete FORTESIE system, which includes all the offered FORTESIE solutions. At the next lower level, we find the major modules of the FORTESIE platform that the lead contributing partner can exploit each of them individually or in collaboration with other contributing partners. For each developed module, we can exploit at a lower level the corresponding accumulated lessons learnt and know-how. The following table 1 summarises the KEOs of the FORTESIE project; and the next subsections describe them in more detail. The table 2, summarises the scientific and methodological results and how these will be exploited/disseminated.

Table 1 Key Exploitable Outcomes of FORTESIE

Exploitable Outcome ID		Title	Description	Lead Partner	Partners contributing	Potential exploitation form
Integrated digital solution for renovation	O1	Integrated digital solutions for trustworthy, automated and standardised ESIE performance improvement calculation and visualation	An automated digital solution that uses sensors and data analysis to guarantee renovation savings, measure performance improvements, and incentivize energy efficiency through financial rewards.	**ED**, CTIC, NTUA, CCO2	All technical partners	Open Source
Application/ software products parts	O2	Integrated renovation packages solutions to raise the overall EPC value proposition	Pre-configured renovation packages with construction services, digital tools, and financing to simplify the process, guarantee results, and attract more building owners to energy-efficient upgrades.	**ED**, CTIC, NTUA, CCO2, MESH, GAR	All partners	Open Source, Selling services on top of them
	O3	Data Analytics and Recommendation engine	A module of the FORTESIE APP that receives as input aggregate information and generates novel knowledge in the form of analyses and intuitive visualisations.	NTUA		
	O4	Gamification app	A user-friendly app that provides consumers with near real-time energy use, indoor quality data, progress feedback,	**ED**		

			personalized recommendations, and earnable rewards all displayed in an easy-to-understand interface to motivate energy-efficient behavior.			
	05	Data Sovereignty	A software data sovereignty service, built on the esthesis platform, gathers renovation data across FORTESIE pilots, integrates with FIWARE for universal access, and publishes it in a common data model for easy use by third-party applications.	ED	-	Reference service, licencing, software resale, repurposing for other engagement projects.
	06	EPC and IPMVP standard based M&V	A module of the FORTESIE platform that manages all of the relevant data for EPC to improve both the interoperability and the trustness of the data, enhancing transparency.	CTIC	-	Open Source, Selling services on top of them
	07	DREEM model	A module of the FORTESIE app that receives as input pilot specifications and derives recommendations on the energy saving potential and cost-effectiveness of different renovation packages for efficient, sustainable, and inclusive energy use.	IEECP	-	Open Source
	08	Automated measurement and monitoring of building performance improvements	Data availability of monitoring systems.	MESH/ ED	All technical partners	Open Source, Selling services on top of them

	09	FORTESIE online OSS marketplace for sustainable service provisioning and value chain networking (One-Stop-Shop for building renovation for ESIE, networking and empowering local actors)	A user-friendly web interface that serves as a one-stop shop for building renovation, informing stakeholders about renovation packages, financing options, local partners, relevant data, reports, case studies, best practices, financing schemes, ESIE measures (with evidence), start-of-the-art technologies, investment impact (economic & environmental), innovative financing schemes for public administration, state-of-the-art renovation systems, operation of energy performance contracting, and Energy Performance Contracts offerings – all tailored to specific building types and target groups.	**ED**	GW, ENER, OKT	PUblic, open marketplace
Digital Euro and novel Financing schemes	O7	Financing schemes for integrated renovation packages	A complete €G loan product ready to be sold at large scale : customer proposition and leaflets, financial contract, refinancing schemes.	CCO2	GOP	Public offering For visibility

In addition to the above KEOs, the following table summarises the current outcomes in terms of scientific and technical results and methodologies that would be promoted and reused.

Table 2 Scientific and technical outcomes and methodologies and Business know-how

Exploitable Outcome ID		Title	Lead Partner	Partners contributing	Related Dels	Potential exploitation form
Business know-how/ methodology	O1	Collaborative business models for immediate take up (adopting legal, regulatory and ethical aspects)	ED	All partners	D2.4	Open and public document, Regional uptake and maybe replication by partners and other actors, consulting services and financing schemens offering to attract more businesses

	02	Reference architecture and blockchain digitisation suite which improves the automated and International Performance Measurement and Verification Protocol (IPMVP)	ED	CTIC NTUA CCO2 MESH	D2.2, D2.3	Openly published to indicate the potential extensions and tools additions. Consulting and integration services.
	03	Behavioural model for inclusive, efficiency and engagement of buildings' owners to renovation investments	SIN	All pilots	D3.2	Open and public documents to disseminate the outcomes and support in uptaking the project results. Build upon the learnings to develop future models closer to commercialisation.
	04	Regulatory framework	LUH	All pilots	D1.3, D1.5, D1.6	Consulting services, development services

Table 3 Integrated digital solutions for trustworthy, automated and standardised ESIE performance improvement calculation and visualation, with guarantees

Message/ Teaser to potential user	Measure and understand the effects of Renovation.
Brief description	Integrated digital solutions of FORTESIE aim to digitise and automate the complete process of data capturing (before and after the renovations, in order to be able to guarantee the savings of performed renovation investments, and measure the exact contribution they offer to the building performance. The Digital solutions encompass: ● hardware sensor devices that are readily available to deploy, at affordable prices and with simplified deployment and maintenance procedures. The project improves partners' (MESH) own hardware sensors to meet the challenges and market demands of renovation target groups. ● Data gathering data sovereignty to store and homogeneise data in the same format and make it available for other applications to analyse and visualise performance improvements. ● M&V module and analytics engine that gathers data and performs periodic comparisons to calculate the exact performance improvements and comparison to the guarantees. ● EPC contracts generate the smart contracts depicting the agreed terms for investments in the building, financing schemes, guarantee savings and calculates the periodic cost and payments for the actors involved (building owner , ESCO, financing organisation) ● Data analytics and recommendation engine analyse the data stored in data sovereignty and provide the necessary personalised and statistical results of the performance improvements. The recommendation engine analyses the current performance of the building and considering the specific target group set challenges triggers personalised recommendations. ● The Green Euro neobanking app is a monetary rewards system for

	achieved savings and desired behaviours therefore changing the landscape from top-down (policies with limited effect) to bottom-up initiatives (with potential for wide scale take-up).
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Renovation and Energy efficiency Energy efficiency, IOT, smart meters, gamification app, person-centered, EPC smart contracts, renovation with guarantees, gamified and financial incentives, engagement, monetary rewards, climate policies, EU Green Deal.
Innovation introduced compared to already existing products/Services	The innovation introduced in the Integrated renovation packages solutions compared to existing products/services lies in their holistic approach to raise the overall EPC (Energy Performance Certificate) value proposition. By integrating cutting-edge renovation and digital technologies into customizable packages, these solutions transform the renovation experience by addressing the limitations that hinder the widespread adoption of the renovation and digitisation technologies. Leveraging data-driven decision-making, sustainable practices, and collaborative approaches, superior outcomes in terms of efficiency, sustainability, and user-centric design are ensured. The innovative materials, smart systems, and seamless project management solutions, Integrated renovation packages redefine traditional offerings, setting a new standard in the industry and elevating the EPC value proposition for clients.
Product/Service Market Size	The market size for Integrated renovation packages solutions targeting the enhancement of Energy Performance Certificate (EPC) value proposition is significant and growing. With increasing demand driven by factors like aging infrastructure and environmental consciousness, these solutions are poised to capture a substantial share of the global renovation market. Additionally, government incentives and regulations supporting energy efficiency further boost the demand for such offerings, indicating a promising outlook for their market growth in the foreseeable future.
Prospects/Customers	· B2C: Households who have realised the value of ±100 households in 4 countries have tested and contributed feedback to the development of this system. · B2B: Renovation manufacturers and ESCOs who want to contribute to the EU Green Deal by empowering bottom-up, wide scale take-up of energy efficient behaviour.
Results maturity	Although the system depends on developed components that are customised and being integrated.

Current stage and next steps	The system is basically in early integration stages where several of the components have started to exchange with each other but not yet fully integrated all the modules together.
Status of IPR: Background (type and partner owner)	Several partners own IPRs background
Status of IPR: Foreground (type and partner owner)	All partners
Do you have a scalable model?	The model of FORTESIE is scalable and adaptable to any customers' needs. Already we offer several alternative ways to adopt it. The flexibility of end-to-end design, adoption of open interfaces and tools, operation in both iOS and Android, compliance to GDPR, are indicatives of scalability.
Is your result replicable?	The result is highly replicable: The entire system is ready for replication: a. immediately through integration with any existing and open energy sensors installed or database integration when closed sensors are installed. b. through complete installation of sensing and gateway components when nothing is installed.
Is your result and business model sustainable in the long-term?	As the renovation market takes up the integrated digitization solution is vital for ensuring transparency and trust among the investors and the building owners. The gamified green-euro neobank app is priced at € 7 per month, which is in the low range of banking fees, which can be reduced with mass adoption or big agreements with utilities. Rewarding green-euros for achieved savings and behaviour further reduces monthly costs. Energy savings can eventually fully offset the APP monthly costs.

Table 4 Integrated renovation packages solutions to raise the overall EPC value proposition

Message/ Teaser to potential user	Simplify renovations, guarantee energy savings, and enhance comfort with Integrated EPC Packages.
Brief description	Integrated packages are sets of services and solutions offered to a provider to facilitate the renovation of buildings. These packages include a. construction and renovation components (such as wall insulation, HVAC systems, green roof, windows and doors renovation, solar panels, etc), b. digitisation components such as digital standard based Monitoring and verification, mobile app with gamified elements to visualise building performance and improve personal green behaviours, Energy Performance Contracts in smart contracts, that enable transparent monitoring of ESCO and c. financial agreements, such as green loans and crowdfunding, to make EPCs a more attractive option, promoting wider building renovations and energy efficiency. Renovation packages offer and combine in readily available packages solutions tailored to each specific target group and they intend to shorten deployment time and mobilise all actors to collaborate fast and effectively, to accelerate the renovation time and reduce costs. They combine various renovation options, as fit for the specific building and target group, into a single solution, simplifying the process for owners. These options are offered with specific guarantees on energy savings and overall building performance through EPCs depicted in smart contracts, which will also be readily available for ESCOs to offer to their customers.

Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Energy efficiency solutions, Building renovation services, Sustainable construction, Environmental consulting Keywords: Integrated EPC packages, Building renovations, Energy efficiency optimization, Insulation and heating solutions, Guaranteed energy savings, Cost reduction, Comfort enhancement ,Indoor air quality improvement, Thermal comfort, Sustainable building practices
Innovation introduced compared to already existing products/Services	The Integrated renovation packages solutions compared to existing products/services simplify and provide a holistic approach to renovation raising the overall EPC (Energy Performance Certificate) value proposition and facilitate the deployment on a large scale. By integrating cutting-edge renovation and digital technologies into customizable packages, these solutions transform the renovation experience. The aim is to prepare the market for large scale deployment, shorter times and reduced costs, thus ensuring wider adoption and fast replication.
Product/Service Market Size	The market size for Integrated renovation packages solutions targeting the enhancement of Energy Performance Certificate (EPC) value proposition is significant and growing. With increasing demand driven by factors like ageing infrastructure and environmental consciousness, these solutions are poised to capture a substantial share of the global renovation market. Additionally, government incentives and regulations supporting energy efficiency further boost the demand for such offerings, indicating a promising outlook for their market growth in the foreseeable future. The European market for energy efficiency renovations is estimated specifically to be around €58 billion in 2022, with a projected growth to €137 billion by 2027, representing a significant Compound Annual Growth Rate (CAGR) of 19% [Source: XAnge, July 2023].
Competitors	● Traditional Piecemeal Renovations ● Online Renovation Platforms ● Specialised Renovation Contractors ● Local Builders and General Contractors ● Energy service companies (ESCOs) specialising in energy performance contracts (EPCs) ● Energy management companies offering comprehensive solutions for energy efficiency improvements ● Environmental consulting firms providing services for improving indoor air quality, thermal comfort, and overall building health alongside energy efficiency upgrades.
Prospects/ Customers	● Building Owners: Owners of commercial, industrial, and institutional buildings seeking to improve energy efficiency, reduce operating costs, and

	enhance the overall value and performance of their properties. ● Property Managers: Professionals responsible for managing and maintaining buildings on behalf of owners, who are interested in implementing cost-effective energy-saving measures while maintaining tenant satisfaction and comfort. ● Facility Managers: Individuals tasked with overseeing the operations and maintenance of facilities, who are focused on optimising building performance, reducing energy consumption, and ensuring occupant comfort and safety. ● Real Estate Developers: Developers involved in new construction projects or major renovations, who may seek integrated solutions to meet energy efficiency goals, comply with regulations, and enhance the marketability of their properties. ● Government Agencies, Municipalities and Policy Makers: Local, regional, or national government entities responsible for promoting energy efficiency, sustainability, and environmental stewardship, which may provide incentives or mandates for building owners to undertake energy-saving renovations. ● Institutional Clients: Organisations such as schools, hospitals, universities, and government facilities with large building portfolios, which are motivated to reduce energy costs, meet sustainability targets, and improve the environmental performance of their facilities. ● Corporate Clients: Businesses and corporations committed to corporate social responsibility (CSR), sustainability initiatives, and cost-saving measures, which may invest in energy-efficient renovations to reduce their carbon footprint and demonstrate environmental leadership. ● Museums and cultural buildings: Museums require specialised solutions that balance artifact preservation with energy efficiency.
Results maturity	The renovation packages will be poised to capture the market upon project completion.
Current stage and next steps	Implementation and validation of renovation packages in households and other buildings to assess their effectiveness in achieving energy savings and upgrades. These real-world installations serve as proof of concept, allowing us to quantify the actual energy savings and performance improvements achieved through the renovation packages. By deploying these packages in diverse settings and gathering data on their outcomes, we can validate their efficacy and fine-tune their design to maximise their impact. This hands-on approach ensures that the renovation packages are not only effective in theory but also deliver measurable results in practice, thereby instilling confidence in their market readiness. Replication will be addressed by "customising" these packages in the regions of partners and promoting them locally in their markets.
Status of IPR: Background (type and partner owner)	Several partners own IPRs background
Status of IPR: Foreground (type and partner owner)	All partners
Do you have a scalable model?	A scalable model involves the initial design in each region of at least deploy these packages across different types of buildings and locations, ensuring widespread adoption and impact. Through standardised processes and protocols, as well as leveraging data-driven insights, we can effectively tailor our renovation solutions to meet the diverse needs of our customers while maintaining consistency and reliability in implementation.

Is your result replicable?	Yes, the renovation packages are replicable.
Is your result and business model sustainable in the long-term?	FORTESIE prioritises environmental sustainability, energy efficiency, and customer satisfaction in our operations. By offering renovation packages that provide tangible benefits such as energy savings, improved indoor comfort, and cost reductions, our project creates value for the building's owners while contributing to a more sustainable future. Additionally, FORTESIE's scalable model allows us to adapt to changing market conditions and technological advancements, ensuring relevance and effectiveness over time. Moreover, the commitment to innovation, ongoing research, and collaboration with industry partners positions us well for long-term success in the energy efficiency market.

Table 5 Data Analytics and recommendation engine

Message/ Teaser to potential user	Get more information from your energy data andd use that information to increase your sustainable energy behaviour.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Energy efficiency solutions, building analytics Energy/building data, knowledge generation, visualisations, energy efficiency
Brief description	A backend service provides a suite of endpoints designed for executing predefined analyses on stored data, such as calculating users' baselines and trends, as well as aggregations.
Innovation introduced compared to already existing products/Services	This service will not only encompass existing analyses but will also introduce newly developed analyses, custom-tailored to meet the specific requirements of the FORTESIE project.
Product/Service Market Size	The market size for energy-related data analytics can only be estimated under the context of an "energy management" platform/ application like the ones that will be developed in FORTESIE. According to some estimations, the market size for such digital services in the EU, is estimated to reach a revenue of 3.11 million euros by 2024 and 150 million users by 2028[7].
Market	Currently, digital services that offer energy-related analytics (consumption, emissions, etc.) are offered mainly by ESCOs and only provide analytics that are related to energy consumption. The FORTESIE data analytics service will also offer analyses related to the internal conditions of a building and will also be targeted to end-users through the FORTESIE mobile application, making their

[7] https://www.statista.com/outlook/dmo/smart-home/energy-management/europe

	impact much more direct to the end users.
Prospects/Customers	ESCOs, public/private buildings, homeowners, investors, construction/renovation companies
Prospects/Customers	● Building Owners: Owners of commercial, industrial, and institutional buildings who want to have more intuitive information based on their building's aggregate data. Such information and accompanying visualisations can help them reduce their energy consumption and their energy bills. ● Tenants: People who live in a building/apartment and want to also reduce their energy consumption and their energy bills. ● Property Managers: Professionals responsible for managing and maintaining buildings on behalf of owners, who are interested in having more information from the properties' energy data, which can in turn help them better manage the properties and suggest more sustainable energy behaviours to the tenants. ● Facility Managers: Individuals tasked with overseeing the operations and maintenance of facilities, who are focused on optimising building performance, reducing energy consumption, and ensuring occupant comfort and safety.
Results maturity	The Fortesie data analytics will be fully developed and ready to be used by the end of the project, catered to each pilot's/stakeholder's needs. They will offer various analyses and visualisation according to the users' requirements.
Current stage and next steps	The data analytics service is currently being connected to the Fortesie backend infrastructure developed by ED. Next steps include receiving the requirements from the behavioural recommendation engine so that suitable and appropriate analytics can be designed, run, and assessed by the pilot users.
Status of IPR: Background (type and partner owner)	This key exploitable result is building on top of NTUA's knowledge and expertise with analytics systems and energy-related value-adding services as well as the business expertise of the pilot partners who will provide feedback and validation for the tool.
Status of IPR: Foreground (type and partner owner)	The standalone data analytics services will be owned by NTUA, as the main developing organisation, and will be offered as an open-source component. The IPR status of the data analytics in the context of their implementation in the FORTESIE mobile app will be defined at a later stage.
Do you have a scalable model?	The data analytics model will be scalable and extendable to various settings. new users and/or new use cases will be able to be easily onboarded to the data analytics services by homogenising their data (according to the Fortesie data sovereignty module) and selecting the analyses that they want to see.
Is your result replicable?	The fact that data analytics will offer analyses such as data aggregations, averages, max and min values, among others means that the results of the service will also be replicable in other systems as well.
Is your result and business model sustainable in the long-term?	The data analytics service will be sustainable in the long term as it meets a very real need/requirement of green digital solutions; the provision and generation of intuitive analyses that can present complex information in a simple way to the end users. Since end-users such as tenants, building owners, and so on are vital in green goals and sustainable development, it stands to reason that a robust data analytics service will always be needed. As for the business model, the service is being developed by the DSS lab of the NTUA, which will continue working on it for future research projects for which it will receive funding.

Table 6 Gamification and engagement app

Message/ Teaser to potential user	Learn and Act to Go green with your building /home with FORTESIE! Track energy, earn rewards with the gamification app
Brief description	The gamification app offers direct communication with the consumers providing energy near real-time consumption and indoor quality information and feedback regarding their progress in achieving energy savings through an easy-to-understand visualisation. It displays energy measurements, disaggregation results, recommendations, badges and earned Green Euros to the consumers. Personalised recommendations and available badges guide the consumers towards a more energy efficient behaviour. If the goals related to the badges are successfully completed and energy savings are achieved, the consumers are awarded with Green Euros.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors Keywords	Energy efficiency, IOT, smart meters, gamification app, person-centered, incentives, engagement, monetary rewards, climate policies, EU Green Deal.
Innovation introduced compared to already existing products/Services	Gamification application aims to provide a comprehensive and engaging platform for energy management, combining innovative features to drive sustainable behaviour change effectively and introduces several innovations compared to existing products/services: ● Gamification: It utilises gamification techniques to engage users in energy-saving behaviours, making the process more enjoyable and motivating. ● Real-time Feedback: Providing near real-time feedback on energy consumption and indoor air quality, enabling users to make immediate adjustments for better efficiency. ● Green Euro Rewards: The introduction of Green Euros as a reward system specifically for sustainable actions sets it apart, incentivizing users to adopt eco-friendly behaviours. ● Seamless Integration: The seamless integration of the mobile app with data-consuming applications and the Green-Euro Wallet simplifies the user experience, making it convenient to track progress and manage rewards. ● Personalised Recommendations: Offering personalised recommendations based on user behaviour and preferences, guiding individuals towards more energy-efficient practices tailored to their needs.
Product/Service Market Size	The opportunity in the market for Green Deal and climate change is big.Investors start to realise the potential of the Energy transition in terms of technologies as well as social support and engagement.
Prospects/ Customers	The app is aimed to teach, engage and track the progress of individual household owners, office workers, swimming pool users and teachers and students in activities to support the improvement of building performance through renovation technologies.

Results maturity	The app will be ready to use for the various target groups of the FORTESIE pilots fully customised to their needs, including households, office workers, teachers and students and members of the municipal swimming pool.
Current stage and next steps	The app is currently being extended to address new target groups and new challenges in comparison to the previous available version which was focused on households.
Status of IPR: Background (type and partner owner)	The mobile app is based on a previous version owned and developed by ED.
Status of IPR: Foreground (type and partner owner)	ED retains ownership of the intellectual property rights for the foreground developments of the mobile app
Do you have a scalable model?	The FORTESIE mobile app is scalable and adaptable to any customers' needs (ability to select the information to be displayed per screen according to the needs and interests of consumers, different approach for different consumer segments).
Is your result replicable?	The replicability is already proven as the mobile app has been already used in other applications as presented above.
Is your result and business model sustainable in the long-term?	The opportunity in the market for Green Deal and climate change is big.Investors start to realise the potential of the Energy transition in terms of technologies as well as social support and engagement. The market of Energy Efficiency is actually booming. However, not a lot of the existing products can offer all the combined and multifaceted incentivisation service the mobile app is offering, including, consumption monitoring, gamification, personalised recommendations and monetary rewards for actual achieved savings. The mobile app, with its multifaceted capabilities encompassing real-time energy and indoor quality monitoring, personalised recommendations, and incentivized engagement, serves as a cornerstone for informed decision-making in energy management. Its capacity to evolve alongside technological advancements and regulatory frameworks underscores its enduring relevance in the dynamic landscape of energy efficiency. Positioned at the forefront of sustainable solutions, holds promise for sustained viability within the energy efficiency market.

Table 7 Data Sovereignty

Message/ Teaser to potential user	Gather and share data in flexible ways.
Brief description	This is a software data sovereignty service for the renovation data across all FORTESIE pilots. It is built over the esthesis platform and integrates with the FIWARE context broker and the relevant data models. Its main function is to gather data from various sources and provide it for third parties' services in a universal way or align the data in a common data model that will be published in FIWARE NGSI to make them fully findable, accessible and reusable. The data model has been designed to support the data of all pilots, for all measurements of ESIE related performances. The service can be used to gather data from sensor or software agents and provide them through an API as necessary to any data consuming applications.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions**

	EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Renovation and energy monitoring, Air quality, and comfort. Energy Efficiency and Renovation sectors. Data Sovereignty, data spaces, IOT and common data models, FAIR data, interoperability.
Innovation introduced compared to already existing products/Services	· Custom and open interfaces to fit to any customer application · Data captured by IOT gateway as well as databases or other data providers. · Remotely controlled data agents · Already deployed in 3 projects. · Modern open and scalable design compliant with FIWARE Orion Context Broker.
Product/Service Market Size	The service is very much in growth as increasingly more sensors are installed, and more data is provided on the internet. According to a research, "investment in big data will be around $76 billion and 1.7 MB of data will be created every second for every person on earth by the end 2020"[8]. Data is considered the driver of the 21st century economy and therefore is a growing area of interest due to the increasing importance of data control and security. Data sovereignty refers to the concept that data are subject to the laws and governance structures within the nation it is collected. With the rise of the data economy and the proliferation of data sharing and processing, ensuring that foundational rights are preserved during and after data sharing becomes crucial
Prospects/Customers	A variety of applications need data and data sovereignty platforms to gather and store data in Europe. Almost all sectors of the economy deal with data and particularly buildings and the green Deal policies.
Results maturity	The data broker service is mature and has been tested within BENEFFICE in actual environments so it is already TRL7.
Current stage and next steps	Extended for fully deployment with all pilots. Extension and support. Replication to any sector, offering data for continuous monitoring.
Status of IPR: Background (type and partner owner)	ED
Status of IPR: Foreground (type and partner owner)	ED

[8] https://www.feedough.com/the-data-monetization-big-data-business-models/

Do you have a scalable model?	The service is scalable and developed based on open standards, fully compliant with FIWARE Orion context broker[9], which is already a standard used in several applications.
Is your result replicable?	The replicability is already proven as the system has been already used in other applications as presented above.
Is your result and business model sustainable in the long-term?	The data sovereignty system great potential as it enables to guarantee savings in a trustworthy and transparent manner for both households/building owners and investors (ESCOS, or financing organisations). The need to collect data and provide it in new formats for processing is realised in a variety of applications in Green Deal and enable the offering of informed guarantees for the investors. The service is located in the middle of data users who need data to take their strategic decisions or offer data related services, and data suppliers who found their business model on gathering and aggregating and finally selling data to various stakeholders. As long as this service is based on open source tools created in the project the business model is based on the concept of "time and material" to design, integrate and deploy this service in the requested application.

Table 7 EPC and IPMVP standard based M&V

Message/ Teaser to potential user	Transparent and accurate monitoring of performance improvements.
Brief description	The reference architecture of the FORTESIE platform stores all of the relevant data for EPC to improve both the interoperability and the trustness of the data. This architecture will allow EPCs to function in a smart way allowing the calculations to be made in an standard way allowing to show the results in an understandable way.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Renovation and energy monitoring, Air quality, and comfort. Energy Efficiency and Renovation sectors. Blockchain, ZKPs, data spaces, IOT and common data models, FAIR data, interoperability and privacy.
Innovation introduced compared to already existing products/Services	The biggest innovation in this architecture is the use of blockchain technology. Moreover the architecture is developed to work with public blockchains, allowing the maximum degree of trustiness and decentralisation. Blockchain technology is used to assure that the data used for the EPC calculations has not been tampered with and to check if the EPC calculations are done correctly. The calculation check is done using Zero Knowledge Proof technology in

[9] https://fiware-orion.readthedocs.io/en/master/

	combination with smart contracts. This approach is quite novel as we don't know of any other existing project or research using it in the EPC domain.
Product/Service Market Size	It is still very early to determine a market size for the innovations developed under this component, due to its novelty.
Prospects/Customers	All of the following stakeholders can benefit from the architecture, as it serves various purposes in a transparent way: ESCOs, proprietors overseeing both public and private buildings, individual homeowners, investment firms, and entities involved in construction and renovation endeavours.
Results maturity	The application of ZKPs in the context of ESCOs is very novel, in fact we have no reference of another project or research performing it. However we are very pleased with the result and think that the technology is ready to withstand a commercial use for it.
Current stage and next steps	The main focus for the development of this component is the exploration on how novel techniques can unlock a variety of use cases for the ESCOs. Currently the "basic" use case is to provide customers a privacy friendly way of checking their contracts, but the designed architecture provides the necessary building blocks to design new use cases for the whole industry.
Status of IPR: Background (type and partner owner)	The pivotal outcome aimed at exploitation draws upon the expertise and knowledge of CTIC in blockchain technology and energy innovation projects experience.
Status of IPR: Foreground (type and partner owner)	As the main designer and developer of the EPC and IPMVP standard based M&V, CTIC retains ownership of the intellectual property rights for the foreground developments of this component.
Do you have a scalable model?	The scalability of this component depends on which is the blockchain selected to work with the smart EPC platform. We are working towards the use of second layer Ethereum blockchains which has a cost of around 0.1$ per transaction, which can be assumed for a client once a month. This can be reduced or even dismissed depending on the level of security of the transaction comprobation and the blockchain used.
Is your result replicable?	The results of these components are replicable, although some adaptation might be needed to replicate the functioning of different ESCOs.
Is your result and business model sustainable in the long-term?	As a very novel technique it is still too early to make predictions on the long term sustainability of the business model and we should gather more feedback on the component during the project, to evaluate how ESCOs respond to the new possibilities offered by this tool. What is sure is that the component will be susceptible to continue the work improving it.

Table 8 DREEM model

Message/ Teaser to potential user	Simulation of integrated renovation packages for efficient, sustainable, and inclusive energy use in buildings.
Brief description	The Dynamic high-Resolution dEmand-sidE Management (DREEM) model is a fully-integrated energy demand and demand-side management simulation model in the building sector, which expands the computational capabilities of existing Building Energy System and demand-side models, by, not only

	calculating energy demand, but by also assessing the benefits and limitations of demand-flexibility, primarily for end-users (consumers/citizens), and, then for other power actors involved (e.g., energy suppliers/retailers, etc.).
Target Audiences (select)	**X Others/ No specific audience** **X Public or private funding institutions** **X EU and Member State Policy-makers** **X International Organisations (ex. OECD, FAO, UN, etc.)** **X Other Actors who can help us fulfil our market potential** **X Research and Technology Organisations** **X Academia/ Universities** **X Private Investors**
Business sectors **Keywords**	**Building sector:** Energy Efficiency & Renovation services, Thermal comfort & Well-being analysis, Behavioural & Lifestyle changes, Electrification & heating solutions, Smart Energy Systems, Energy Poverty, Energy Storage, Urban development, Real Estate development, Integrated Renewable Energy solutions, Nearly Zero Energy Buildings (nZEB). Keywords: **Building sector, Electrification, Energy efficiency, Energy system modelling, Renovation packages, Thermal comfort, Heating, Residential sector, Energy poverty, Energy transition, Smart technologies, Smart energy systems, Smart grid, Demand Response, Nearly Zero Energy Buildings (nZEB), Renovation Wave, Fit-for-55, REPowerEU.**
Innovation introduced compared to already existing products/Services	The main premise behind the development and the use of the Dynamic high-Resolution dEmand-sidE Management (DREEM) model has been that, in order for end-users to have a more active participation to the energy transition, they first need to become more aware of the benefits from investing in new energy products and services. In this context, the novelty of the model lies in its potential to be used in a wide range of applications, not only to assess the existing technological infrastructure, but also to support the development of business models and regulatory innovations that maximise the value of energy products and services, and monetise them, to fairly compensate end-users and other energy actors. Overall, DREEM: ● Embodies key features towards the simulation of renewable energy, energy efficiency, and other demand-flexibility actions, like demand response, in the building sector. ● Builds on the concept of modularity consisting of multiple components, each of which is composed of additional modules, allowing for more flexibility in terms of possible system configurations and computational efficiency (high time resolution and quick simulations) towards a wide range of scenarios, to study different aspects of end-use and energy transition. ● Provides the ability to incorporate technological breakthroughs in a detailed manner, such as the inclusion of heat pumps, or electric vehicles, in view of energy transitions envisioning the full electrification of the heating and transport sectors. ● Produces outputs for a group of buildings, for example a neighbourhood, a

	district, a municipality, or an energy community. ● Serves as a basis for modelling energy demand in the building sector, within the broader field of local, regional, and national energy systems, in different geographical/ climate and socioeconomic contexts of interest.
Product/Service Market Size	Based on its unique characteristics and features, DREEM demonstrates high potential for tapping into a significant market niche in the building sector. As global initiatives emphasise the key role of energy efficiency and sustainability towards the transition to a fair and inclusive, decarbonised and climate-neutral future, DREEM's ability to evaluate the benefits of demand flexibility makes it well-suited for meeting the needs of this constantly growing market. While precise market size assessments necessitate further analysis, DREEM's adaptability across various applications- from the calculation of energy demand and the assessment of existing technological infrastructure to the development of novel business models and regulatory innovations- suggests a substantial market opportunity within a wide range of business sectors related to energy.
Prospects/Customers	Public/ Private buildings, Private entities handling a large portfolio of buildings, Homeowners, Energy Service Companies (ESCOs), investors, National, Regional, Local Policymakers & Decision-makers, Construction/ Renovation companies, Facility managers, Building occupants, Energy consultants, Energy utilities and providers, Green Building Certification Programmes (e.g., LEED), Research institutions and Academic organisations.
Results maturity	The maturity and applicability of the DREEM model have been demonstrated through a course of different actions over the past five (5) years. In particular, the model has been developed and applied, while is also currently further developed and applied, in the context of the following European Commission-funded projects (past and ongoing, Horizon 2020, Horizon Europe, LIFE CET): H2020 TRANSrisk, H2020 SENTINEL, H2020 SENSEI, H2020 SocialWatt, H2020 ENCLUDE, H2020 Tipping+, H2020 ENPOR, HE DigiBUILD, HE FORTESIE, HE INHERIT, CET LIFE ENSMOV+, CET LIFE RENOVERTY, and CET LIFE SRI2MARKET. In addition, the model has been used by the Greek Ministry of Energy and Environment for the revisions of the National Energy and Climate Plan (NECP) and the Greek Regulatory Authority for Energy (RAE). This track record showcases the model's effectiveness and readiness for real-world applications.
Current stage and next steps	The DREEM model currently encompasses crucial features for simulating renewable energy, energy efficiency, and demand-flexibility actions such as demand response within the building sector. As part of the FORTESIE project, the model will undergo further development to integrate additional smart energy efficiency technologies across various country contexts and building typologies, including different real-world typologies of public buildings.
Status of IPR: Background (type and partner owner)	DREEM is part of the Technoeconomics of Energy Systems laboratory (TEESlab) Modelling suite (TEEM). All the model's modules have been developed using the "Buildings" library an open-source, freely available Modelica library for building energy and control systems. Alongside to the Modelica models, Python scripts have been developed to model parts of the model's components and to enable the interface with the Dymola simulation environment. Dymola software and MODELICA commercial libraries are used, under the licenses purchased by Dassault Systèmes and MODELICA Association, respectively. The use of the Dymola software and Modelica commercial libraries is restricted by the conditions of the respective licenses as purchased by Dassault Systèmes and

	MODELICA Association. Partners may not use the Dymola software and the Modelica commercial libraries for own exploitation, but need to arrange for access, either to the software, or to the commercial libraries, themselves. The model is open access under the "GNU Affero General Public License" here.
Status of IPR: Foreground (type and partner owner)	All the results and outcomes of the DREEM model, in the context of its application in the FORTESIE project, will be property of, and further exploited by, the Institute for European Energy and Climate Policy (IEECP).
Do you have a scalable model?	Yes. DREEM serves as a basis for modelling energy demand in the building sector, within the broader field of local, regional, and national energy systems, allowing for the scalability of its application in different geographical/ climate contexts of scale and different socioeconomic contexts of interest.
Is your result replicable?	Yes. The DREEM version used in the context of the FORTESIE project, along with a short manual of use and documentation of results will be made openly available in GitHub (here) to allow transparency and replicability.
Is your result and business model sustainable in the long-term?	The DREEM results and business model are designed for long-term sustainability. Its modular approach allows for more accuracy and flexibility in terms of possible system configurations and computational efficiency towards a wide range of scenarios studying different aspects of end-use. It also provides the ability to incorporate future technological breakthroughs in a detailed manner, in view of transitions envisioning future energy systems.

Table 9 Automated measurement and monitoring of building performance improvements

Message/ Teaser to potential user	Indoor air quality and microclimate measurement combined with management of ventilation and heating system.
Brief description	With the MESH system it is possible to install ventilation equipment to ensure a high-quality room microclimate with monitored air quality (CO_2) and on-demand control of ventilation intensity without construction documentation and major building alterations.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Energy efficiency solutions, air quality measurements, ventilation and heating, CO2. Indoor air quality, microclimate on demand, ventilation and heating system, energy on demand.
Innovation introduced compared to already existing products/Services	The digitisation technologies include IOT and energy management systems to enable synchronisation of heating and ventilation systems. Key idea of innovation is to make it possible to control HVAC systems on demand at each room level, therefore eliminating any possible energy waste. This collects the

Message/ Teaser to potential user	Indoor air quality and microclimate measurement combined with management of ventilation and heating system.
	data from the local management panels with integrated CO2 gas sensors, radiator's regulators, fan-coil control hardware, central control hardware and processes them at the backend to derive control and maintenance decisions. The monitoring of the building is supported by a closed Mesh developed protocol, which operates on an 868 Mhz frequency. This approach is innovative and particularly necessary for big buildings in which smart thermostat analogues cannot function due to technical restrictions. The visualisation dashboard allows the building's administrator to keep track of the system's operation, monitoring the whole building portfolio in one place right up to the level of detail of a specific radiator. LEED certification requirements will be addressed.
Product/Service Market Size	MESH **wireless data exchange network** - MESH hardware communicates mutually via a wireless network. This network has been specially developed for secure AES encrypted communications within a closed MESH developed protocol, which operates on an 868 Mhz frequency. MESH local **management panel** - universal LRC series control hardware, which reduces the amount of work to be done by the administrator, retaining complete control. Depending on the configuration, this hardware will provide: - accumulation of various sensor data, - delivery to regulating hardware, - limited zonal control in accordance with the administrator's set permissions. **Radiator regulator** - hardware that turns a radiator into a smart device and which continually learns and regulates room temperature so that the climate cannot be felt and is neutral. It can quickly heat up a room, quietly regulate it to the desired temperature and completely stop heating in a room where it is not required. **Fancoil control** hardware will replace the old automation and facilitate the introduction of complete heating and cooling centralisation, including the old apparatus. It is also an advantageous alternative in new projects, choosing hardware, which is not configured with automation. **Central control hardware** ensures the exchange of data between all Mesh equipment installed in the building and the Internet website. The E-Mesh **website** is a cloud service platform, which is available in 24/7/365 mode from any hardware connected to the Internet, which has an Internet browser. Servers are installed in a secure (SSAE16 certified) international data centre with 99.9% guaranteed accessibility.
Prospects/Customers	Our customers are all those public or private building owners and households who are potentially interested in reducing their energy consumption and improvement of indoor air (microclimate) quality.
Results maturity	The MESH system improves energy efficiency and indoor air quality.
Current stage and next steps	MESH aim is to develop an energy management platform together with equipment which improves energy efficiency and people's indoor wellbeing.
Status of IPR: Background (type and partner owner)	MESH developed and owns the right for heating and ventilation system on demand and monitoring system.

Message/ Teaser to potential user	Indoor air quality and microclimate measurement combined with management of ventilation and heating system.
Status of IPR: Foreground (type and partner owner)	MESH developed and owns the right for heating and ventilation system on demand and monitoring system.
Do you have a scalable model?	The E-Mesh **website/platform** is scalable.
Is your result replicable?	Yes.
Is your result and business model sustainable in the long-term?	Definitely yes, as we are continuously reducing energy consumption while improving people's wellbeing.

Table 10 FORTESIE online OSS marketplace for sustainable service provisioning and value chain networking (One-Stop-Shop for building renovation for ESIE, networking and empowering local actors)

Message/ Teaser to potential user	Sustainable Transformations Made Simple: Fortesie's OSS- A Gateway to Green Renovations
Brief description	FORTESIE's European One Stop Shop (OSS) for building renovation packages is a service model designed to simplify the renovation process of building owners. It acts as a centralised service to connect customers and suppliers making it easier for owners to take renovation investment decisions. Gathering information in a central place and educating the public about renovation potential, tools and local suppliers could be beneficial in achieving Efficient Sustainable and Inclusive Energy use and facilitating the "deep" renovation wave uptake.
Target Audiences (select)	Others/ No specific audience **X Public or private funding institutions** EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Renovation technologies, renovation manufactures, construction, ESCOs Renovation wave, Energy performance contracts with guarantees, Local One Stop Shops.
Innovation introduced compared to already existing products/Services	● Connects ESCOs with expertise in energy-efficient solutions, driving a focus on sustainability throughout the renovation process, in the local regions in FORTESIE partners (to start with) ● Networks local actors such as ESCOS, suppliers of renovation products and technologies, designers and building owners fostering regional

	partnerships and join investments. ● Going beyond basic information sharing it offers collaboration tools for the establishment of partnerships. ● Promotes the pre-defined renovation packages FORTESIE is putting together. ● Provides standardized packages, streamlining reuse and shorter deployment time. ● Leverages data analysis to provide targeted recommendations, potentially exceeding the functionalities of existing directory-based platforms. ● Offers alternative financing schemes processes, to facilitate investments and takeup of the the offered packages.
Product/Service Market Size	**European Building Energy Renovation Market:** The potential building renovation market in Europe, including public sector buildings, is substantial. It was valued at $956.88 billion in 2021 and is predicted to grow to $1012.47 billion by 2026, with a compound annual growth rate (CAGR) of 0.67% over the forecast period from 2022 to 2026[10]. The European market is expected to reach **€542.7 billion by 2027** with a CAGR of **7.8%.** With the support of policies and regional subsidies that support the acceleration wave, the renovation market is expected to take up significantly in European regions.
Competitors	Several European countries are developing or implementing national platforms to support building energy renovations. These platforms might cater to specific aspects like renovation planning, service provider directories, or financial incentives. FORTESIE can differentiate itself by networking at European level the local stakeholders and gathering the best practices that could be replicated rapidly in European regions. ● **France:** rénovation énergétique https://france-renov.gouv.fr/ (French government platform) ● **Germany:** Gebäude-Energieberater https://www.dena.de/ (German Energy Efficiency Experts Directory) ● **UK:** TrustMark https://www.trustmark.org.uk/ (Government endorsed scheme for finding qualified tradespeople) ● **IE**: Renovation Hub https://renovationhub.ie/ (Irish Renovation Hub is part of the Turnkey Retrofit project that received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 839134.) **2. Industry Associations and Standards:** Although industry associations may look as competitors of FORTESIE OSS they can also be considered as partners who can faciliate fast update at regional level of the FORTESIE renovation packages and digitisation tools. ● European industry associations like buildingSMART Europe and building renovation clusters might offer resources, best practices, and events related to

[10] www.businesswire.com, https://www.statista.com/statistics/1324263/building-renovation-market-size-in-europe/

	sustainable renovations. FORTESIE can establish partnerships with these associations to leverage their expertise and expand its reach. ● buildingSMART Europe: https://www.buildingsmart.org/ ● Renovate Europe: https://www.renovate-europe.eu/ (Campaign for a European Renovation Wave)
Prospects/Customers	The envisaged customers are all those public or private building owners and households who are potentially interested to renovate their houses On the other side the various suppliers
Results maturity	The OSS will be live and will be continuously extended as new tools, knowledge and best practice case will be collected.
Current stage and next steps	The Marketplace is already accessible live at fortesie-marketplace.eurodyn.com and directly form the project website.
Status of IPR: Background (type and partner owner)	Based on previous marketplaces of ED, the backend system.
Status of IPR: Foreground (type and partner owner)	ED developed and owns the software and initial content.
Do you have a scalable model?	The platform will be available for free, maintained by ED. Later on, when a business model to scale this will be considered by all
Is your result replicable?	Although replicable as a marketplace (already created based on existing backend) it can be replicated in terms of local one stops that can be added, to replicate the approach and content in various countries to become pan-European.
Is your result and business model sustainable in the long-term?	The platform having attracted sufficient interest will become sustainable by potentially offering registrations and advertisement opportunities.

Table 11 Financing schemes for integrated renovation packages

Message/ Teaser to potential user	Dear Customer, consider insulating your house and changing your fuel boiler today, with a free loan to install the heat pump? Thanks to the avoidance of energy consumption and CO2 emissions, your heat pump will generate rewards which will be credited in green-euros on your CO2 Account and will finance your loan, to make it interest free.
Brief description	By joining the green-euro community, members transact in €Gs and transition to a carbon free economy. in order to accelerate the desire to switch away from current functioning equipment burning fossil fuel to carbon free appliances, members of the €G community, i.e. holders of a CO2 account, beneficiate of interest free loans and €Gs rewards for energy and carbon reductions
Target Audiences (select)	General Public, SMEs, cities Public or private funding institutions EU and Member State Policy-makers International Organisations (ex. OECD, FAO, UN, etc.) Other Actors who can help us fulfil our market potential Research and Technology Organisations

	Academia/ Universities **X Private Investors**
Business sectors **Keywords**	Households, SMEs, Cities and Local Government
Innovation introduced compared to already existing products/Services	● Reward and incentivisation of switching from fossil energy to carbon free energy ● Ex-post calculation to avoid rebounce effect.
Product/Service Market Size	CO2 Account, which is a bank account. Financing needs are quantified in trillions….
Competitors	● All banks, and costly public inefficient subsidies.
Prospects/ Customers	Households, SMEs, Cities and Local Government
Results maturity	Ready to operate
Current stage and next steps	Demo in 5 houses in Pilot Country France
Status of IPR: Background (type and partner owner)	Open source
Status of IPR: Foreground (type and partner owner)	NA
Do you have a scalable model?	Scalability, is a refinancing question, potentially solved with consortium partner GOP
Is your result replicable?	Yes, in the mobility sector for example.
Is your result and business model sustainable in the long-term?	Yes, the first business model shows positive cash flow after year 5.

6 IPR registry

6.1 Overview

In the course of the design and execution of the exploitation strategy IPR is very important and all actions should be characterized by different exploitation levels.

i. Confidential, accessible / available only for / to individual members of the consortium;
ii. Confidential, accessible / available only for / to members of the consortium (including EACEA, Commission services & project reviewers);
iii. Restricted to other program participants (including Commission services & project reviewers);
iv. Core target group, stakeholders and decision makers; and
v. The general public.

The aforementioned actions have been classified for the different exploitation levels in the course of the project and past its project lifecycle they will be updated to reflect on the overall agreement of the consortium for the joint exploitation of the results.

6.2 FORTESIE Overview of IPR Registry

The IPR Registry used in FORTESIE captures the following information concerning each KEO from all the partners of the project:

Information:

- **Background (B)**: information brought to the project from existing knowledge, owned or controlled by partners in the same or related fields of the work carried out in the project
- **Foreground (F)**: information, including all kinds of exploitable results, generated in the action by the project partners, whether or not they can be protected.

Exploitation:

- **Licensing (L)**: selling of the software license (integrated platform or stand-alone modules)
- **Making (M)**: Making the products, manufacturing and selling or directly implementing it through own facilities and skills
- **Use (U)**: internal use of the result (e.g. University, other research project/end users)
- **Service (S)**: selling using service contract.
- **Pay-per-use (PPU)**: selling a pay-per-use contract.
- **Software (So)**: selling as software.
- **Hardware (H)**: selling as hardware.
- **Software as a Service (SaaS)**: selling as SaaS.
- **Platform as a Service (PaaS)**: selling as PaaS.
- **Consultancy (C)**: providing consultancy services.
- **Maintenance & Support (M&S)**: providing maintenance and support services.
- **Spin-off (SP)**: potential exploitation through spin-off-company.
- **Other (O)**: other means of exploitation such as patents, publications, or communication materials (leaflets, brochures, etc.)

Following the identification of KEOs, the following table presents the overview of the IPR registry that has been agreed for the FORTESIE project. The above identified IPR claims have been agreed and claimed for the KEO identified so far in the following Table.

Table 12 IPR registry of FORTESIE

	ED	EDGR	NTUA	CCO2	IEECP	SIN	LEIF	COOP	LUH	CTIC	VEO	OKT	TGT	INCL	ENE	GAR	+48	GOP	JUST	APES	ECN	CRD	GSIS	EEF	MESH	DEE	GKW
O1-Integrated digital solutions for trustworthy, automated and standardised ESIE performance improvement calculation and visualation	F, C			F, B																							
O2- Integrated renovation packages solutions to raise the overall EPC value proposition	F, C	F, C	F, C	F, C	F, C	F, C	F, U	F, U	F, C	F, C	F, U	F, U	F, U	F, O	F, U	F, U	F, U	F, C	F, U	F, O	F, O	F, U	F, U	F, U	F, U, C	F, U	F, U
O3- Data Analytics and recommendation engine																											
O4- Gamification app	B,F, M, L, U, O																										
O5- Data Sovereignty	B, F, SaaS, M&S																										
O6- EPC and IPMVP standard			C							B	U	U	U									U					

based M&V										F U L O																	
O7- DREEM model			C		B F U C O																						
O8-Automated measurement and monitoring of building performance improvements																									B F L M U S H C M & S		
O9- FORTESIE online OSS marketplace for sustainable service provisioning and value chain networking (One-Stop-Shop for building renovation for ESIE, networking and empowering local actors)	B,F , Paa S, M, L, U, O, M& S																										
O10- Novel Financial schemes				F , S , C																							

6.2.1 Detailed Presentation of IPRs

The following chapter presents in detail the rights claimed in the above-mentioned table.

KEO 01: Integrated digital solutions for trustworthy, automated and standardised ESIE performance improvement calculation and visualisation

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge**:Background (B) is claimed by all involved partners in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Foreground knowledge:** Foreground (F) is claimed by all involved partners in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Exploitation by the IPR owners:** All technology partners intend to (U)se this KEO with free License (L), intended to sell additional services for deployment, customization and consulting to any potential client as well as to repurpose it as necessary for other domains. This Licence is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes (see Commercialization agreement).
- **Exploitation by other partners:** IPR owners would be interested to use (U) the service as consultant (C) and or sell (L)icences to customers.

KEO_02: Integrated renovation packages solutions to raise the overall EPC value proposition

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge**: No background IPR is claimed for this KEO.
- **Foreground knowledge:** Foreground (F) is claimed by all involved partners in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Exploitation by the IPR owners:** ED , EDGR are interested to provide consultancy (C) services
- **Exploitation by other partners:** LEIF, COOP, VEO, OKT, GAR, ENE, TGT, CRD, +48, GKW, EEF, MESH, GSIS, DEE would be interested to use (**U**) the integrated renovation packages solutions and respective results and outcomes , NTUA, CTIC, CCO2, IEECP, MESH, LUH, GOP and SIN to provide consultancy (C) services and INCL, ECN and APES to provide other (O) services for this KER.

KEO_03: Data Analytics and Recommendation engine

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge**: No background IPR is claimed for this KEO.
- **Foreground knowledge:** No foreground IPR is claimed for this KEO.
- **Exploitation by the IPR owners:** NTUA intends to (U)se the analytics, green scheduling, and recommendation engines with free License (L). This License is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes (see Commercialization agreement).
- **Exploitation by other partners:** ED would be interested to use(U) by selling (L)icences to its customers as an extension of the FORTESIE backend and gamified app.

KEO_04: Gamification app

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge:** Background of ED and EDATH is claimed for the mobile app design and implementation that was developed in a previous project has been adapted and extended in FORTESIE.

- **Foreground knowledge:** ED and EDATH have foreground rights (F) as they were a core contributor to the design and development of the concept and mobile app. **CCO2** has the foreground right (F) as it has designed and developed the concept and mobile app of the Green Euros for rewards.
- **Exploitation by the IPR owners :** ED and EDATH intends to (U)se the mobile app with free License (L), intended to sell additional services for deployment, customization and consulting to any potential client as well as to repurpose it as necessary for other application domains. This License is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes (see Commercialization agreement).
- **Exploitation by other partners:** ED would be interested to use (U) the service as consultant (O) and or sell (L)icences to customers.

KEO_05: Data Sovereignty

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge**: No background IPR is claimed for this KEO.
- **Foreground knowledge:** ED and EDATH have foreground rights (F) as they were a core contributor to the design and development of the concept and software aspects of this system, focusing on the backend system, and frontend of the esthesis platform. They have the right of Making (M) this KEO.
- **Exploitation by the IPR owners:** ED and EDATH intends to (U)se this KEO with free License (L), intended to sell additional services for deployment, customization and consulting to any potential client as well as to repurpose it as necessary for other application domains. This License is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes (see Commercialization agreement).
- **Exploitation by other partners:** ED would be interested to use (U) the service as consultant (O) and or sell (L)icences to customers.

KEO 06: EPC and IPMVP standard based M&V

- **IPR Owners:** As the main designer and developer of the EPC and IPMVP standard based M&V, CTIC retains ownership of the intellectual property rights.
- **Background knowledge**: Background (B) is claimed by CTIC regarding blockchain design and development. CTIC has a wide experience in the development of different blockchain-based traceability systems aimed at the energy industry, to track energy consumption and also tracking energy consumption reduction. CTIC also claims know-how in the development of smart contracts, including the use of a wallet for storing and trading tokens, redeemable by goods and energy, as part of a gamification strategy.
- **Foreground knowledge:** CTIC claims foreground rights (F) as the main contributor to the design and development of this component. The introduction of the Zero Knowledge Proof technology in combination with smart contracts for the FORTESIE context has been proposed, designed and implemented by CTIC.
- **Exploitation by the IPR owners:** CTIC intends to use (U) this KEO with free License (L), intended to sell additional services for deployment, customization and consulting to any

potential client as well as to repurpose it as necessary for other application domains. This License is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes. CTIC will also use this KEO to (O) other kinds of exploitation in the scope of research, such as scientific publications or communication materials.

- **Exploitation by other partners:** VEO, TGT,OKT,CRD intends to (U) the service

KEO_07: DREEM model

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge**: Background (**B**) IPR is claimed by the Technoeconomics of Energy Systems laboratory (TEESlab) and IEECP. TEESlab has developed the original version of the DREEM model, openly available in GitHub (here), while they continue further developing the model and applying in different applications in the context of European Commission-funded projects and through other public/ private funds. IEECP has been using the model in the context of different European Commission-funded projects through colleagues who have been involved in the development of the original model's version.
- **Foreground knowledge:** Foreground (**F**) IPR is claimed by IEECP in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Exploitation by the IPR owners:** Use (**U**) IPR is claimed, in the context of the FORTESIE project, by IEECP to make results and the model's version as developed and used openly available under the "GNU Affero General Public License" (**L**) in in GitHub (here), for further research and academic applications and other means of exploitation such as scientific publications, policy briefs, and communication materials (leaflets, brochures, etc.) (**O**).
- **Exploitation by other partners:** IEECP would be interested to use (**U**) DREEM and respective results and outcomes to provide consultancy services (**C**).

KEO_08: Automated measurement and monitoring of building performance improvements

- **IPR Owners:** As the main designer and developer of the automated measurement and monitoring of building performance improvements, MESH retains ownership of the intellectual property rights.
- **Background knowledge**: Background (B) is claimed by MESH.
- **Foreground knowledge:** Foreground (F) is claimed by MESH in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Exploitation by the IPR owners:** MESH keeps rights for exploitation.
- **Exploitation by other partners:** MESH keeps rights for exploitation.

KEO_09: FORTESIE online OSS marketplace for sustainable service provisioning and value chain networking (One-Stop-Shop for building renovation for ESIE, networking and empowering local actors)

- **IPR Owners:** The IPR owners (those claiming foreground) share equally the entire method.
- **Background knowledge:** No background IPR is claimed for this KEO.

- **Foreground knowledge:** ED and EDATH have foreground rights (F) as they were a core contributor to the design and development of the concept and the OSS marketplace.
- **Exploitation by the IPR owners :** ED and EDATH intends to (U)se the OSS Marketplace with free License (L), intended to sell additional services for deployment, customization and consulting to any potential client as well as to repurpose it as necessary for other application domains. This License is provided as such to the entire consortium ensuring further (U)se for internal or commercial purposes (see Commercialization agreement).
- **Exploitation by other partners:** ED would be interested to use (U) the service as consultant (C) and or sell (L)icences to customers.

KEO_10: Green euro and Financial schemes

- **IPR Owners:** As the main designer and developer of the €Gs and the Compte CO2 banking App, CCO2 retains ownership of the intellectual property rights.
- **Background knowledge**:No background IPR is claimed for this KEO.
- **Foreground knowledge:** Foreground (F) is claimed by CCO2 in terms of results and outcomes that will be produced in the context of the FORTESIE project.
- **Exploitation by the IPR owners:** CCO2 keeps rights for exploitation.
- **Exploitation by other partners:** CCO2 keeps rights for exploitation and is open to give free licence to any of the consortium members having potential interest in growing the €G community.

7 Conclusions

The deliverable presents alternative financing schemes aimed at promoting the circulation of the green-euro currency and fostering a new narrative around energy, climate, and the EU Green Deal. This is achieved through the adoption of green-euro loans combined with crowdfunding, exemplified by a proof of concept green-euro loan to be offered in France by OKT. CCO2 will serve as the Payment Service Provider, measuring CO2 emissions and energy savings while rewarding customers with green-euros. GOP will provide refinancing solutions.

The design and execution of this proof of concept will function as a demonstrator, market test, and testbed for larger loan offerings. Should feedback prove positive, the green-euro loan concept could potentially expand throughout Europe. To prepare for long-term scalability, strategies include leveraging carbon markets and exploring energy efficiency markets for green-euro rewards, alongside potential refinancing through the ECB's Climate Emergency Purchase Program.

The potential long-term profitability of FORTESIE is tied to external political decisions, but relentless efforts will continue to engage decision-makers. In summary, the deliverable highlights the design accomplishments of alternative green-euro financing schemes as a proof of concept, setting the stage for testing and potential scaling.

Furthermore, it outlines the development of an online One-Stop Shop (OSS) marketplace and lays the groundwork for the exploitation plan of the FORTESIE project, refining Key Exploitable Outcomes (KEOs) along with their IPR to align with the overarching vision.

Acknowledging this document as a foundational blueprint, it propels further refinement and development. The final and more mature version of this deliverable will be presented in D5.5, slated for M36. In D5.5, deeper exploration into market exploitation strategies, intellectual property rights considerations including the IPR registry, and a comprehensive roadmap for maximising KEOs will be provided. This ongoing iterative process ensures the project's adaptability and responsiveness to evolving challenges and opportunities in sustainable renovation financing.