Smart Energy Services to Improve the Energy Efficiency of the European Building Stock

Variants of P4P schemes to engage third-party investors in energy efficiency

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1 EXECUTIVE SUMMARY

In this deliverable we focus on the **financial stakeholders' view** with respect to funding payment for performance (P4P) programmes in the EU. In doing so, we distinguish between public and private investors. This document mainly provides the perspective of the *private* investor, as it is ultimately expected that public finance (subsidies, guarantees, etc.) will have to leverage private funding into the energy transition. Hence the title of this document: 'Variants of P4P schemes **to engage third-party investors in energy efficiency.'**

Rather than plainly reporting the financial stakeholders' view, we have opted to formulate the insights obtained into **recommendations for the future deployment of P4P pilots in the EU promoting energy efficiency as a resource**.

We set the scene by describing how a P4P programme works, with particular focus on the investor's angle (2.1). We then compare the current status of P4P in the US and the EU, and pinpoint certain differences in the boundary conditions (2.2 and 2.3). Finally, in this introductory chapter, we provide an overview of existing *non* P4P initiatives to improve the energy efficiency of buildings (2.4). This may seem strange, but we are convinced that the wheel should not be reinvented (i.e. coming up with an entirely new P4P model). A lot of experience has already been built up in the energy efficiency community over the past decades, and there are elements and concepts that could be 'recycled' in the design of a P4P programme in the EU. An important element here is the existing expertise related to (green) securitization mechanisms.

In terms of research methodology, we adopted a staged approach to generate the recommendations.

We started by conducting **'internal negotiation games'** (3.2). These consisted of organizing virtual negotiations amongst selected consortium partners. Partners had to act as if they represented other stakeholders: e.g. a consortium partner that in real life was involved in managing buildings was asked to play the role of the building owner. This way we were able to extract expertise from within the consortium, which was summarized in a first set of design recommendations (3.2.3).

Subsequently, **external stakeholder consultations** (3.3) were held. We preferred to go beyond the common survey approach, and opted for conducting semi-structured interviews with external stakeholders from the financial world. During these interviews, the internally developed ideas and insights from the first step were subjected to the opinion of real players. This second step could be seen as an informal validation process. Again, the outcome was summarized into a set of recommendations related to designing P4P programmes that can attract private capital (3.3.3).

The recommendations may be summarized as follows:

Programme set-up

1. Make sure that a P4P programme has sufficient critical mass to cover all transaction costs. This implies a sizeable portfolio having a decent share of large buildings (commercial, public, …). (R8)
2. Standardize the energy retrofit contracts, in analogy with power purchase agreements for renewable energy installations, to facilitate the development of a

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large pipeline of green assets that can be easily and cost-efficiently bundled together. (R20)

3. Make a detailed regulatory risk analysis and assign the risks of a changing regulatory framework to a party willing/able to assume these risks. (R4)
4. Draft unambiguous clauses that establish a clear stakeholder allocation of the risks of non-fulfilment of obligations. (R2)
5. Use state of the art monitoring tools (“M&V 2.0”) to enable transparent and trustworthy programme management. (12)

Financing a P4P programme

6. Engage well-targeted investors with matching risk aversion profiles for each market development phase. (R5, R16).
7. In a start-up phase, earmark government guarantees to enable the ‘bankability’ of a P4P programme. (R17)
8. Give the start-up phase a boost by having a pool of public buildings, such as schools, hospitals, etc, integrated into the building portfolio. (R17)
9. When designing P4P programmes, make sure that the revenue streams of the foreseen energy efficiency measures are predictable enough to attract external financiers. (R12)
10. Adopt a valuation approach in line with an investor’s valuation standards. (R3)
11. Set up the financing structure of the programme between investor and aggregator, rather than with each ESCO/individual project. (R10)
12. Double-check that EU Solvency ratio requirements are not a stumbling block for investors to venture into large-scale energy efficiency programme investments like P4P. The initiators of the programme should take this into account by involving investors from the very start of designing the programme financing structure (R11).
13. When financing a P4P programme make use of the current momentum of ESG and SRI funds. (R22)

Role and competence of the aggregator

14. A standardized assessment procedure must be used when deciding whether to include an energy efficiency project into the aggregator portfolio (R1)
15. The programme participant acquisition process should be managed by the aggregator with market access to a large pool of candidate ESCOs, with strong expertise in both market communication and energy efficiency projects. Aggregators have to bring together (i) pooled energy efficiency projects by building types, geographic origins, industry sectors, etc. and (ii) source a combination of public and private financing from several types of investors to provide funding to those designated energy efficiency projects, via e.g. an investment platform. (R18, R19)
16. Adopt a comprehensive approach of retrofitting buildings, that goes beyond energy efficiency, and also encompass other non-financial benefits. (R21)

Involvement of power system operators

17. Even if power system operators are (currently) not interested in participating in a P4P programme for the benefit the programme may bring to the power system,

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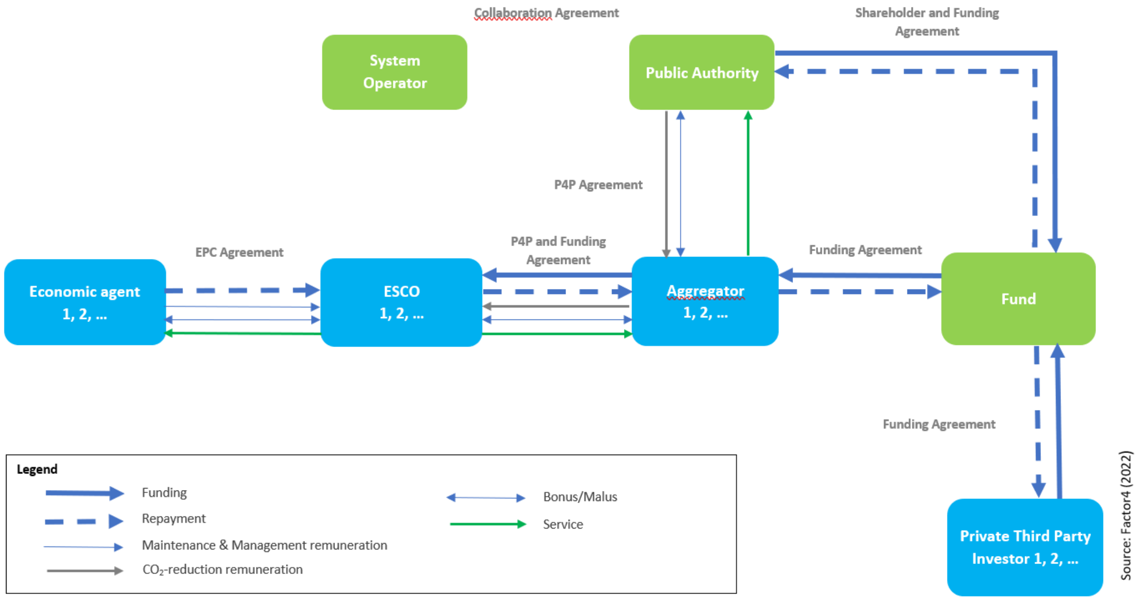
they should be involved as a programme partner, for the mere fact that they are an indispensable key data provider. (R15).

18. Especially in a pilot phase, P4P programmes should seek the involvement of a power system operator as entry point or preferred channelling partner for investors. This is because of the data they hold on participating end consumers and because they are seen as a financially stable party. (R13)

We finalize the report by suggesting in a last chapter (4) a **potential funding structure of a P4P model fit for the EU context**, while taking into account the recommendations. The proposed Basic P4P model is presented in 1 .

Figure 1: Basic P4P model



In the last chapter, the basic model is explained by discussing the role of the main actors: Aggregator, ESCO, Public authority, Private third-party investor and Fund.

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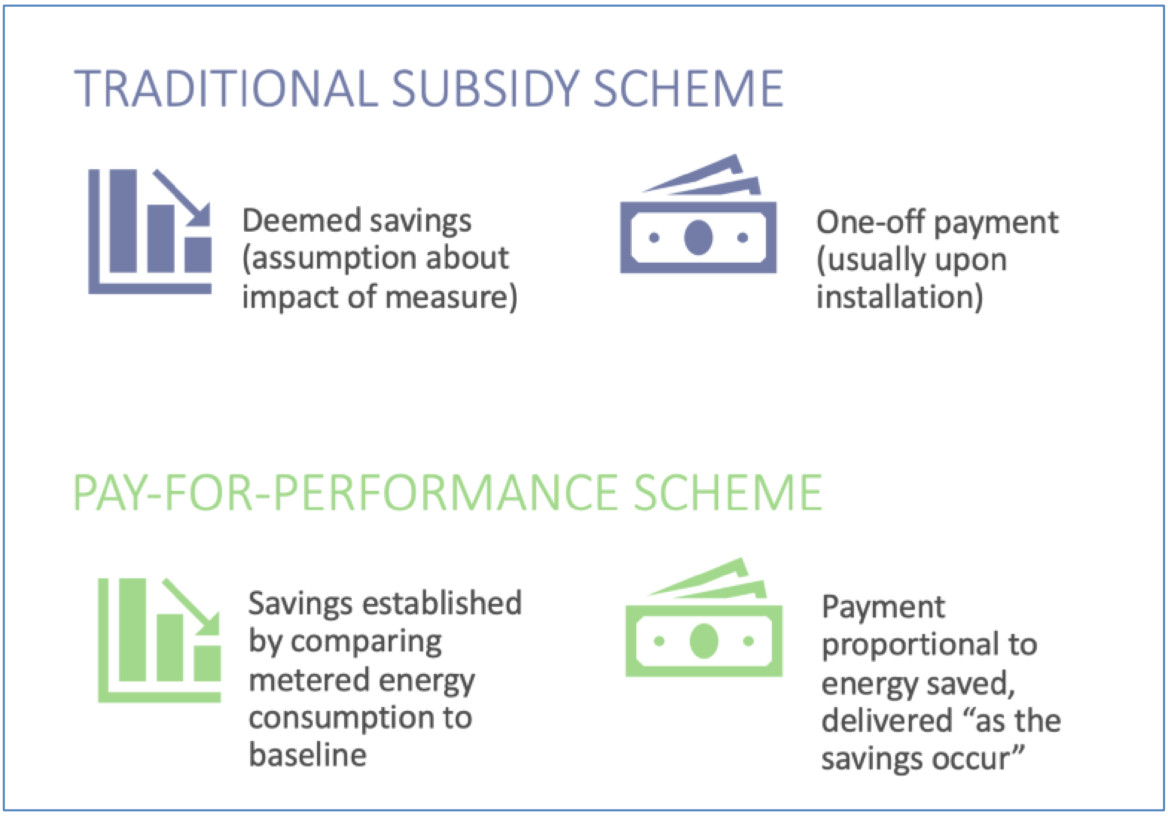
2 P4P: THE BASICS FOR INVESTORS

2.1 P4P general discussion

2.1.1 P4P programme versus traditional subsidy programme

P4P programmes or schemes provide financial compensation for energy efficiency resources, based on a comparison of metered energy consumption and modelled counterfactual energy consumption, i.e., consumption as it would have been in the absence of the energy efficiency action (Rosenow and Thomas, 2020). The difference with a traditional subsidized energy efficiency programme is presented in Figure 2.

Figure 2: Comparison of a P4P programme versus a traditional subsidy programme



Source: RAP, video: https://www.youtube.com/watch?v=JNJqqbyUJmo , 2020

2.1.2 The SENSEI Model

Schematically, the core version of the SENSEI P4P model - as agreed by the SENSEI consortium - is presented in Figure 3 below.

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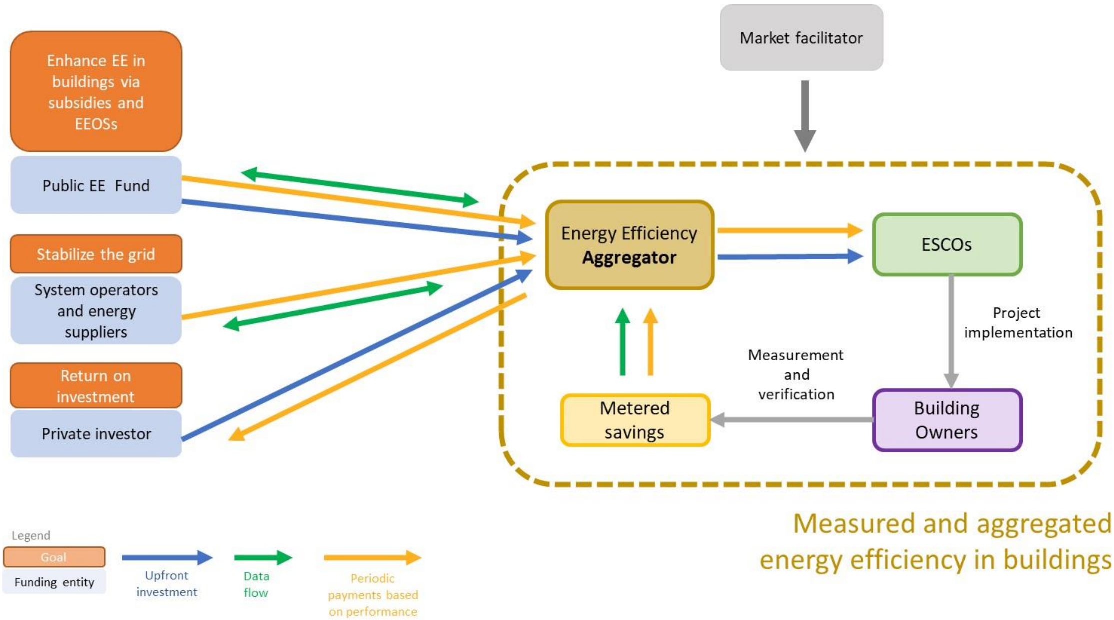
Figure 3: Detailed SENSEI Model, general version (status January 2022)



Source: SENSEI model (internal publication within consortium)

It is important to note that the presented Model specifications, including the actors involved, their role in the Model, and the concrete financial and data flows described, are **only one of several options available when designing a P4P programme**. The one provided here is a general overview of a how the SENSEI Model is structured, but the concrete specifications of each P4P scheme built under this framework will have to be decided based on the stakeholders involved, the regulatory environment, and the analysis of the market in which the programme will be carried out.

An important additional factor is the allocation of risks: e.g. performance risk, building occupancy and use, non-predictable events and financial risk (SENSEI Deliverable 6.1, available on Zenodo[1])

The SENSEI project envisions rewarding energy efficiency in buildings as an energy resource and/or grid service. It seeks to upscale building energy efficiency from individual energy performance contracting projects to a programme level using the P4P concept as a vehicle for aggregation. So, **aggregation** is expected to enable and facilitate collateral advantages such as:

- generating income from providing benefits to the power system, which will improve the business case of energy retrofits in buildings
- attracting capital from investors and/or public subsidy providers to invest in energy efficiency measures (EEMs).

[1] https://zenodo.org/record/4771652#.YpXiXShByQc

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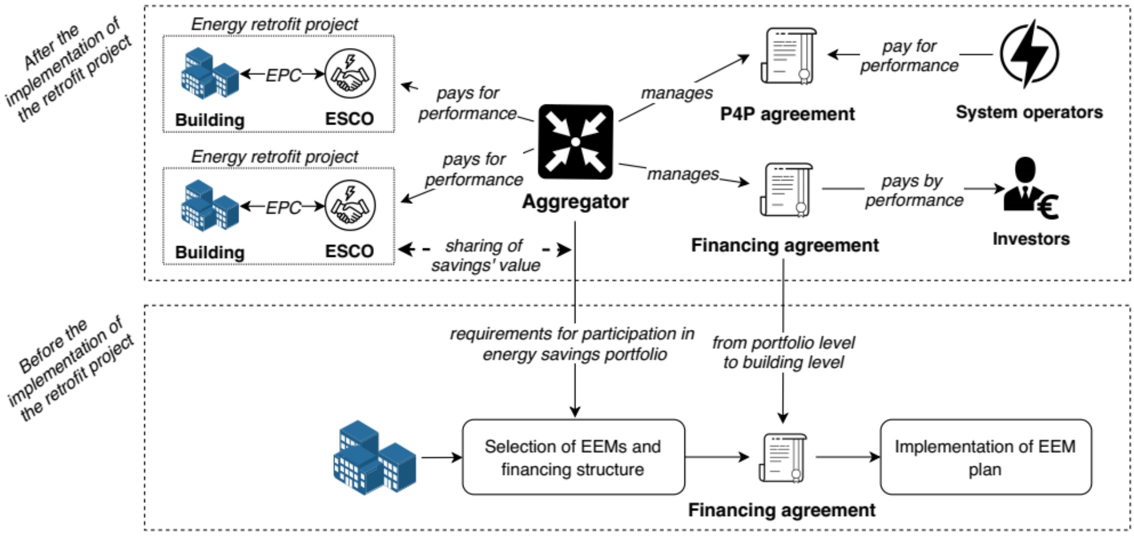
The SENSEI project also investigates which **supporting services** are needed to run such programmes, e.g. (dynamic) measurement and verification (M&V), data validation, data sharing, etc. This is crucial when implementing energy efficiency programmes based on measured savings rather than deemed savings. Indeed, in P4P programmes only energy savings that can be measured against a business-as-usual baseline are rewarded: metered energy data is linked to payments. This performance characteristic provides investors and decision-makers with greater certainty that efficiency measures will actually improve building performance. In other words, the performance risk of those parties investing in energy efficiency will be reduced.

The paragraphs above are illustrated in Figure 4.

Figure 4: process of the energy retrofit project



Source: HEBES

2.1.3 Definitions of main elements

2.1.3.1 Programme, project and model

The definitions of the terms 'programme', 'project' and 'model' used in this document are presented in Table 1

Table 1: Definition of programme, project and model

Concept	Definition
Project	Energy efficiency project executed in a specific building
Programme	Cluster of concrete projects performed by one or more aggregator. A programme is sometimes also called a 'scheme'.
Model	A conceptual way to organize a programme.

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2.1.3.2 Financial flows, data flows and service flows

P4P programmes are structured around three categories of flows: **financial flows**, **data flows** and **service flows.** The typical financial flows in a P4P programme are described in Table 2.

Table 2: Financial flows in a P4P programme

Who pays?	A public authority, a utility or another entity channels and/or provides the payments to the entity tasked with delivering the performance.
Who receives?	End users (e.g., households, businesses, etc.) are the final beneficiaries of the programme, but do not necessarily receive payments proportional to the energy saved. Indeed, aggregators or programme implementers, whose number varies according to the programme, often act as intermediaries between end users and the organization delivering payment.
How much is paid?	In principle, payments are proportional to the amount of energy saved. If part of the payment is not linked to the amount of metered energy savings, other performance levels are defined.
What is paid for?	The eligibility of projects can depend on several factors, including the depth of the energy savings, fuel saved, customers, sectors, geographical area, measures, and the objective pursued (energy savings or demand response).

The management of the data flows consists of two key steps, which are explained in Table 3.

Table 3 : Data flows in a P4P programme

Collection of data	P4P programmes need a reliable set of meter readings. This does not necessarily imply that smart meters are strictly necessary. However, P4P programmes often use advanced energy metering technologies.
Analysis of data	Setting the baseline is a crucial part of the data analysis. This exercise is based on historical data and uses M&V protocols and data analytics to adjust for parameters such as weather, building use, etc.

2.1.4 Main advantages of performance-based energy efficiency measures in a programmatic approach

2.1.4.1 Transferring the performance risk

Most traditional energy efficiency programmes provide subsidies for the installation of measures as a one-off payment. Where subsidies are linked to the energy saved, the amount of energy savings is usually ‘deemed’, meaning that a fixed amount of savings is associated with the delivery of the measure. This provides an incentive for the private sector to install as many measures as cheaply as possible, without necessarily ensuring high-quality installation and with no concern over the use and maintenance of equipment. Additionally, deemed savings are often overestimated, hence misleading.

A P4P model, on the other hand, is output based, comprising incentives to maximize energy savings for a certain investment cost. In principle, this should result in a higher

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quality of installation and maintenance and a more targeted deployment of measures where they can deliver the largest savings.

2.1.4.2 Energy efficiency as-a-service within the P4P model

Future challenges for energy efficiency and energy retrofit projects are enormous, and time is lacking. The latest report of the Intergovernmental Panel on Climate Change (IPCC, 2022)[2] stresses this again. Grants, rebates and other incentives for energy efficiency from public authorities or energy utilities will not be sufficient to reach the efficiency goals and targets, and capital needed for energy efficiency investments will need a combination of public and private financing tools and solutions (Henner and Howard, 2022).

Within the concept of P4P programmes, next to the element of meter-based payments, energy efficiency as-a-service (as already used in the US) can prove valuable for unburdening 'energy efficiency clients', and at the same time help energy efficiency providers implement energy retrofit projects at a larger scale (Kats et al., 2011).

Energy efficiency as-a-service allows energy efficiency upgrades to be implemented in an agreement that covers the upfront cost of the retrofit/renovation works and materials, which is then paid back through future energy savings via a long-term contract.

Energy-as-a-service within a P4P model is likely to boost the implementation of energy retrofits at a larger scale, and across different types of facilities or buildings.

2.1.4.3 Recognizing the value of energy efficiency for the energy system

As the electrification of energy end use accelerates, with mass adoption of heat pumps and electric vehicles, and as renewable energy sources increase their share in the electricity production mix, the value of demand-side resources to energy systems will increase substantially. Demand-side resources provide flexibility and reduce the overall energy demand and capacity needs of the grid, including deferral of investments in new grid capacity.

The resources required to ensure electricity system adequacy will be different, depending on the time of day, the weather, seasonal factors and location. In this environment, energy efficient buildings can play a significant role in reducing electricity system costs.

By using advanced measurement and verification methodologies, P4P programmes can reward energy efficiency for the services they provide to the energy system (Fawkes, 2017). Financial institutions will appreciate the use of these advanced measurement and verification as they provide a transparent accounting of costs and benefits, hence enabling a correct valuation of their investments.

2.1.5 Preliminary analysis from investors' perspective

2.1.5.1 Initial reflections

In general, the market potential for the implementation of energy efficiency projects is still largely untapped in all European countries. The main barrier in many cases is the difficulty of attracting financing.

Today, renewable energy projects face little difficulty in getting financed. Third-party financing is common, and the list of possible projects grows every day. For investing in energy efficiency, however, several hurdles are still present. These include a lack of

[2] https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf

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standardized contracts, lack of technical understanding among potential investors, quality/predictability of cash flow generation, valuation and measurement of energy savings, and finally – when it comes to using energy efficiency as a grid resource – a conservative mindset at the level of distribution system operators.

Energy efficiency projects involve a range of stakeholders, including building users, technology providers, engineers, project developers, investors, financiers and utilities. Given this mix, financing of energy efficiency projects can quickly become complex due to diverging stakeholder interests.

Integrating financing from multiple sources (e.g., private investors, utilities, governmental sources) to address some of these challenges is further complicated by high transaction costs, especially in the more fragmented commercial and residential segments (Bertoldi et al, 2018).

2.1.5.2 Involvement of power system operators (or energy suppliers)

From recent discussions it remains unclear if power system operators in the EU are interested in participating in a P4P programme. Direct and indirect feedback from system operators in the EU tends to point out that there is little or no express interest in using energy efficiency, or structural load reduction, as a resource in the short term. It seems networks have large redundant capacities. Outside imposed programmes, like EEO schemes, system operators in the EU have not engaged in energy efficiency programmes like P4P schemes so far. For system operators, load reduction also results in revenue loss. It is interesting to point at the fact that in the US, the loss of revenue for utilities (i.e. system operators and energy providers alike) had to be addressed by special compensation mechanisms in 17 States ("LRAM, Loss of Revenue Adjustment Mechanism"). Another important issue from the point of view of system operators is the performance risk of load reduction, meaning the non-wired capacity it provides is not as secure as wired capacity. These elements might imply limited eagerness on the side of European system operators to reward initiatives such as P4P programmes for their contribution towards stabilizing the grid and/or avoiding investments in their grid (note: the above applies to load reduction, not load shift; the latter being looked at with great interest by the system operators). This also means that, unlike the US, one possible additional revenue stream is not (yet) available in the EU. For P4P to become a market mechanism of interest for system operators, a stimulating regulatory framework will have to be put in place, like the ones governing EEOs.

Nevertheless, power system operators (and energy suppliers) remain important parties with added value in a potential EU P4P programme because they (i) are important sources of data, (ii) have the knowledge and capacity to perform value assessments and measurements, and (iii) can be potential 'as-a-service' providers (Henner and Howard, 2022). They also may provide a structured customer base to select buildings that are appropriate to participate in P4P programmes.

2.1.5.3 Bankability of energy efficiency projects

A major concern when attracting private funding at any level (senior, mezzanine, subordinated[3] or equity) is the 'bankability' of the projects. This is a function of various

[3] Within a financing structure (either through a fund or through direct financing on an individual basis) senior debt is borrowed money that a lender must repay first to its senior borrowers, along a pre-approved amortization table or in workout. Each type of financing has a different priority level within the amortization table. Senior debt holders that have

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aspects: risk, valuation, measurement, performance, transparency, reporting, etc. For many European investors, P4P will be considered as a ‘new asset type’, for which not much knowledge nor experience currently exists. Such asset types are categorized as 'innovative' investments, which implies that the funding cost will be higher than normal. The bankability – and the underlying risk analysis – will also depend on the type of buildings that will be grouped: public, commercial, residential. In addition, long payback periods may discourage energy efficiency investments, even when investment capital is available. It may also be that the risk to invest will turn out to be too high versus the net return on investment.

Another element in potential investors’ risk analysis is the creditworthiness of the participating parties, in particular aggregators, energy service companies (ESCOs) and building owners. This type of analysis has some similarities with ‘project finance’ analysis. The default risk (potential failure or bankruptcy) of building owners and energy efficiency service providers in these projects may be hard to assess. It is therefore important to work with standardized contracts at the level of building owners/ESCOs, aggregator/investors, aggregator/power system operators, etc.

The cash flow of energy efficiency service projects comes from cost savings and is not generated through sales of renewable energy on the electricity market.. In case of bankruptcy of the owner of a renewable electricity plant, the plant will still generate electricity and thus cash flow for paying back the loan. On the other hand, the risk of bankruptcy of the building owner is more pronounced in energy efficiency service projects as the building owner will not use the building anymore and thus the cost savings cannot be used for paying back the loan.

In addition, it is important for investors to have sufficient access to data (transparent reporting) to have insight into the stability of revenue streams. The core question is: Is the cash flow generated through energy savings sufficient and predictable enough to cover the required repayment, plus a return to the investors? In other words: how big is the performance risk?

Energy efficiency projects are ‘brain-driven’, i.e. a considerable share of the project value does not relate to the value of the invested assets, but rather to the know-how behind the optimal application of the assets. In turn, this means that the value of the assets usually does not cover the full amount of the outstanding loan. This raises the question: To what degree can the technical equipment (assets) be used for (additional) collateralization?

In addition, for some types of energy efficiency projects non-energy benefits (e.g. increased asset value, increased productivity, increased health and well-being) might be created and could be taken into consideration when assessing the bankability of energy efficiency projects.

Finally, the non-recourse financing of most energy efficiency projects increases the risk profile of the financing. Indeed, in case of non-recourse financing, the lender can only claim the collateral (e.g. 30% energy saving,…) when a borrower fails in repaying the loan (‘default’). In case of recourse financing, the lender can claim also other assets, for instance the building or the income of the borrower.

In conclusion, **bankability will probably emerge after a number of successful P4P trials, pilots and tenders have taken place and a trustworthy track record has become available**. Most likely, government guarantees or federal/regional start-up

lend money through e.g. revolving credit lines, bonds, etc. will be repaid first, followed by mezzanine debt holders and thereafter subordinated debt holders and potentially hybrid debt instruments, and last the equity holders (preferred and/or common stock holders).

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interventions will be needed to enable the bankability. Once a track record is available and credit enhancement tools are in place, banks, insurers and pension funds could be interested in becoming funding partners to bundled energy efficiency projects via P4P.

2.1.5.4 Bundling of projects

As energy efficiency improvements are intangible, many energy efficiency projects are perceived as complex and granular.[4] Projects struggle with an unfavourable ratio between perceived project revenue and transaction cost as most projects are small. Hence the advantage of P4P programmes which bundle various small projects into one larger programme.

However, bundling itself brings some complexity. In order to manage this complexity, the commercial and communication skills of an aggregator are key. An acquisition process of energy efficiency projects based on standardized eligibility criteria (by size, by type…) is also instrumental in addressing the complexity. Scaling up the bundles results in lower administrative costs per project.

By getting access to bundled projects, and thus volume, ESCOs, installers, equipment providers etc. are likely to be prepared to work with rebates, e.g. to be split between the P4P programme and the building owners.

2.1.5.5 Measurement, verification and valuation

Taking all the above into account, there is no doubt that measurement, valuation and verification of energy efficiency savings is also a key element for the successful implementation of a potential EU P4P model.

A tight and transparent system on how the performance will be measured and evaluated needs to be put in place. The investor's **eagerness to be involved in a P4P programme will to a large extent depend on a performance monitoring system that provides reassurance**.

Since the measurement and verification of energy efficiency savings and costs, plus stable and predictable valuations, are critical decision points for both building owners and finance providers, continued innovation in these areas will provide crucial tools to facilitate financing for P4P (Fawkes, 2017).

2.1.5.6 Potential investor relationship

At a theoretical level, several third-party investor relationships may be conceived, which are visualized in Figure 5. In case of Options C and D, the financing goes directly to the final parties that are involved in the technical investment, whereas in options A and B the financial flow goes indirectly - via the system operator and the aggregator - to these parties.

[4] Large and small, complex and simple, high-risk and low-risk EE projects with their own characteristics will need to be aggregated, and therefore it is being suggested to use subdivisions for further granularity, meaning that buildings for retrofit should be subdivided and grouped into e.g. commercial constructions, industrial constructions, and residential constructions, but also by e.g. geography: into local regions, areas, etc

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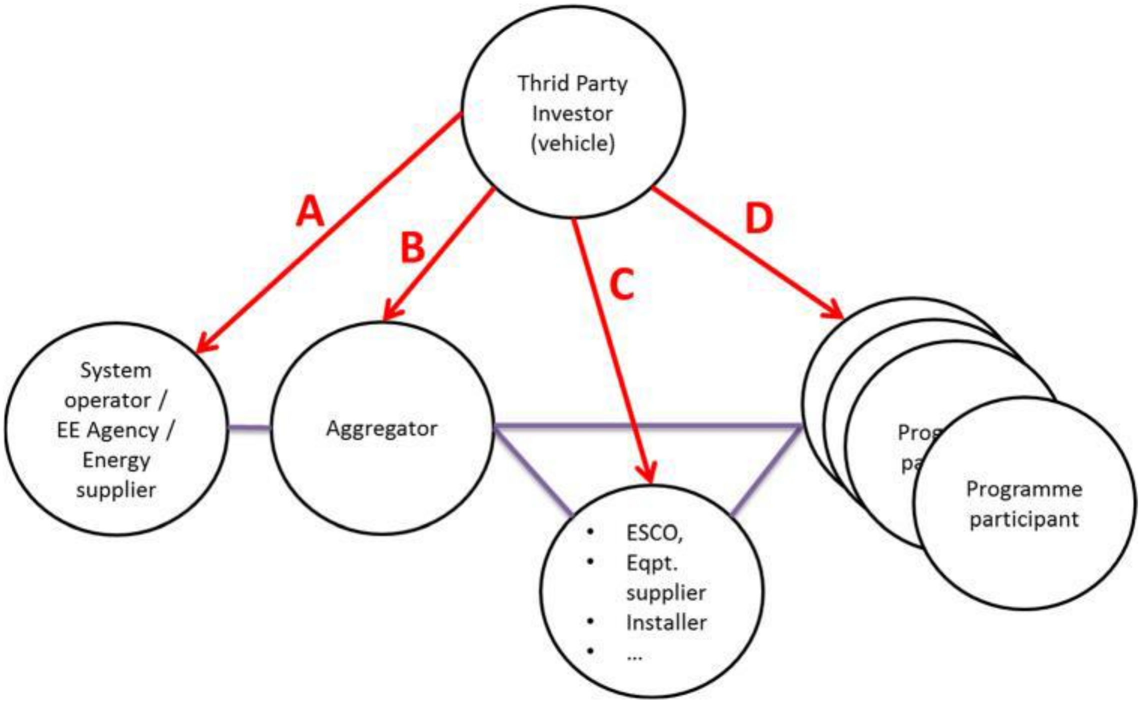
Figure 5: Potential investor relationships



Source: Factor4

Through the different market surveys and Q&As with financial institutions, it has become apparent that Option B in Figure 5 would be the preferred model from the potential investors' point of view (for an explanation, see 3.3.1.2).

Chapter 4 gives a more detailed analysis resulting in a fine-tuned scheme (Figure 11).

2.2 P4P situation in the US

There is a diverse spectrum of P4P programmes in the US but, at the most basic level, these programmes track and reward energy savings as they occur, usually by examining data from a building's energy meters – as opposed to the more common approach of estimating savings in advance of installation and offering upfront rebates or incentives in a lump-sum payment (Thompson et al., 2014).

P4P programmes in the US have existed for 20 years, but primarily in the commercial and industrial sectors. With the increasing availability of household and business energy meter data and evolving data analysis techniques, new opportunities have been developed over the last few years for deploying P4P programmes based on that data.

Currently in the US, energy efficiency finance focuses on providing building owners with a cost-effective alternative as to using their own cash savings for the purchase or installation of energy efficiency improvements.

Energy efficiency finance structures offer building owners access to upfront capital and financing for a specific set of facility energy improvements, which are then repaid over time as energy savings are generated.

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Varying financing structures propose different arrangements for how and when the cash flows from energy savings are shared among the finance provider, customer, end-user, or other project investors.

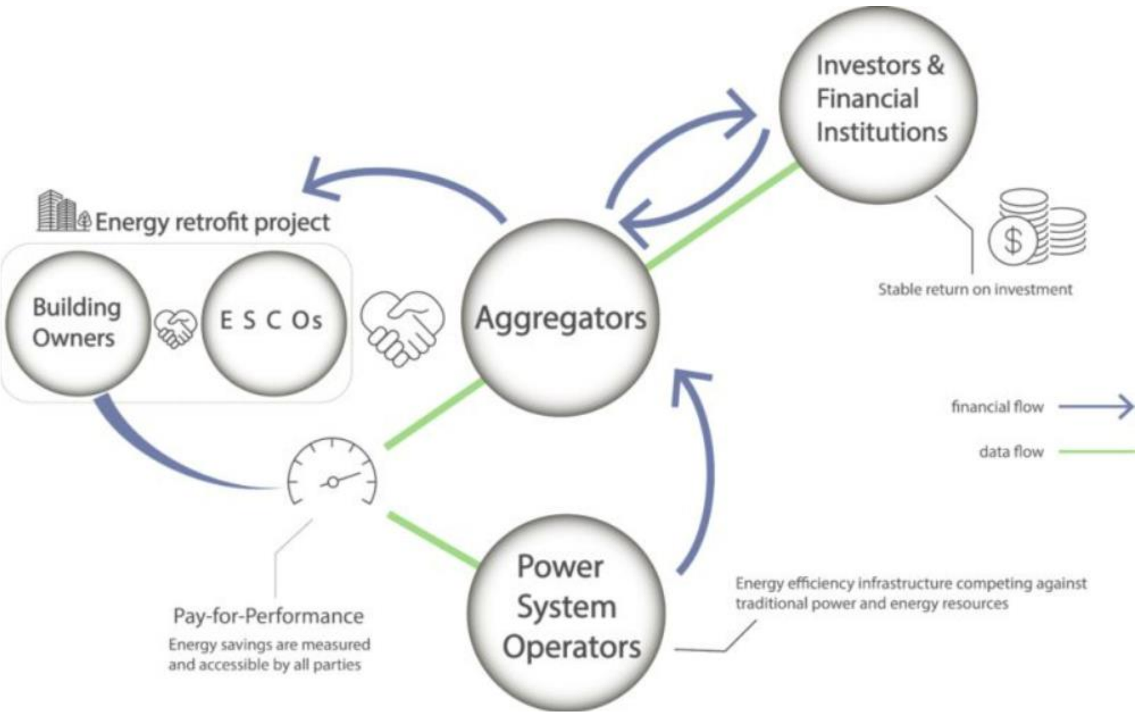
The suitability of a particular financing programme often depends on a combination of factors, from project size and anticipated payback period to utility incentives/rebates and security features.

Next to existing US programmes (such as energy savings performance contracting, energy services agreements, carbon market funding, mortgage-backed energy efficiency financing, utility on-bill financing, property assessed clean energy (PACE) and unsecured consumer loans) and strategies (such as revolving loan funds, preferential loans, E-loans), the energy efficiency aggregator business model with pay-for-performance, at-the-meter, as a programme performance contract has been deployed in the US for several years (Dolan et al., 2018). This business model has been used to address the needs of specific end-user and customer markets, which may be categorized as follows:

19. Municipalities, universities, schools, and hospitals (the ‘MUSH’ market) (Charlotte et al., 2014)
20. Commercial and industrial businesses
21. Residential customers.

At the start of the SENSEI Project, a potential conceptual model was visualized (Figure 6), based on the knowledge of P4P programmes within the consortium at that time, which was mainly based on literature from the US.

Figure 5: Conceptual SENSEI Model, based on the situation in the US



Source: SENSEI D.5.2 2021-10-28 v0.4

Figure 6 could have the following ‘financial’ reading:

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22. Aggregators bundle energy retrofit projects (ESCOs/building owners).
23. Through a finance agreement with investors, debt is collected by the aggregators to be used to finance the bundled projects.
24. Investors as understood in this report can be subsidies, public funding and/or private investment, depending on the stage in the evolution of the P4P programme, or a combination of the three.
25. Via the P4P mechanism, building owners pay e.g. x% of their energy invoice to the power system operator and e.g. (100-x) % to the aggregator, which in turn will use this as part of the debt repayment to investors.
26. This debt repayment will be completed with e.g. 10% of extra cash flow generated by the power system operator, through a more optimal use of its network, payable via the aggregator, under a P4P agreement.

2.3 P4P situation in the EU

2.3.1 Is there room for P4P initiatives in the EU?

A wide range of policies at **EU level** require Member States to set regulatory, informative and economic measures with the aim to improve the energy performance of buildings (e.g. the Energy Efficiency Directive and the Energy Performance of Buildings Directive).

Many individual **European countries** choose to deploy a combination of economic instruments, each tailored to address different barriers, specific segments and recipient groups within the building sector. It is not possible to derive a clear pattern as a fixed combination of instruments cannot be singled out as the best solution across all Member States. France, for example, has all types of instruments in place, while Germany has had a long successful tradition with grants and loans through its KfW programme. Sweden's policy measures on energy renovations in 2013 included no financial/economic incentives, but were of a regulatory or informational nature. Many of the existing instruments, such as energy saving obligations/white certificates, tax incentives, public loans and grants/subsidies, were designed to work together with other economic instruments or be part of a policy package. This provides a strong starting point, but more will be necessary and a P4P at-the-meter system can offer several benefits (Bertoldi et al., 2014).

2.3.2 Impact of differences between US and EU energy system/market

In the EU today we see mostly energy retrofit project-by-project financing through credit financing, leasing financing, project financing, cession and/or forfaiting. As more energy efficiency finance projects become ‘bankable’ and are aggregated, innovative energy efficiency financing options, such as P4P, may find fertile soil. With their vast footprints and infrastructure, energy utilities, energy service providers and intermediaries have the potential to be important aggregators or facilitators in this process.

However, after further research and market surveys, it has become apparent that the energy efficiency aggregator business model, as currently operating within the US energy market, cannot simply be copied to the EU energy market without distinguishing between the different characteristics of both energy markets:

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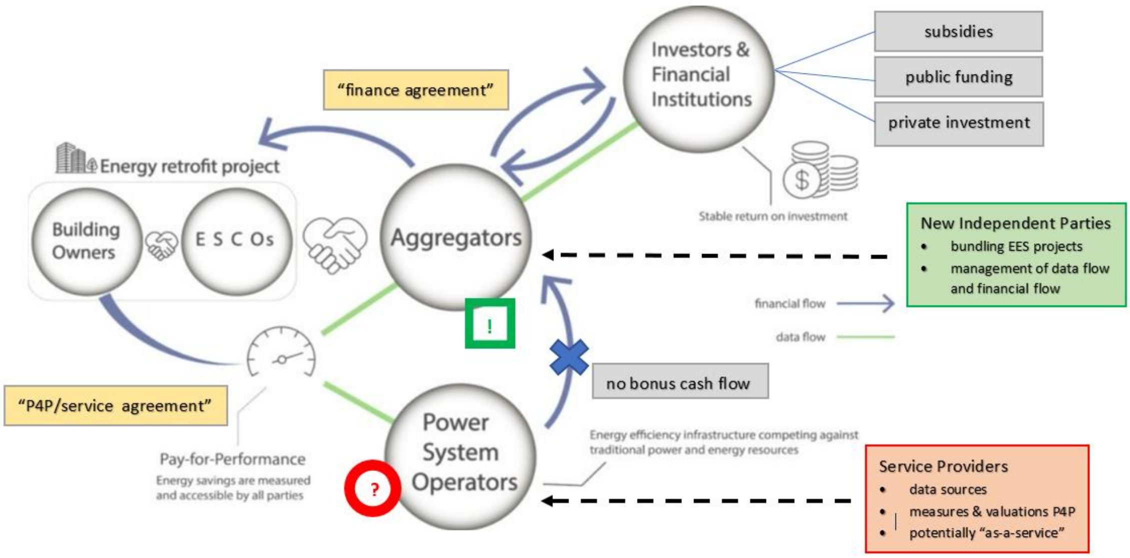
27. The energy efficiency aggregator business model with P4P is a new and innovative mechanism for the EU energy market and as such will be viewed as a 'new asset type' by potential investors (more analysis requirements), as 'complex' by regulators, ESCO associations and governmental agencies, and as an 'innovative mechanism' by, for example, the power system operators or energy suppliers.
28. Within the energy efficiency aggregator business model with P4P, the energy efficiency aggregator is a new party which does not yet exist in the EU, certainly not in the format as used in the US, where it is a separate, independent party, with its own legal form and own business plan and mission. The energy efficiency aggregator is responsible for bundling the projects and is the custodian of the various cash flows (upfront investments), periodic payments based on performance (P4P) and data flows.
29. From recent discussions it remains unclear if power system operators in the EU are interested in participating in a P4P programme (cf. 2.1.5.2). In other words, this would mean that the bonus cash flow stream expected from system operators, in addition to the cash flow stream coming from building owners, might not be in place and cannot contribute to the (partial) repayment of the investment costs.
30. In any case, however, the power system operator (or energy supplier) must remain involved in the EU energy efficiency aggregator business model with P4P as it is the party that will provide the bulk of the accurate data necessary to fulfil the at-the-meter measures and valuations. It can also potentially act as anenergy efficiency as-a-service provider (Henner and Howard, 2022).

Figure 6: Conceptual SENSEI Model, including remarks from EU perspective



The essential building blocks for a broader energy efficiency finance framework are becoming apparent, such as:

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31. Innovations in how upfront costs and subsequent energy savings are measured
32. Increasing understanding in the appraisal community about green appraisals and valuing energy efficiency improvements
33. Innovations in technologies to conduct more cost-effective and standardized energy audits
34. Reinvigorated interest among investors and local governments
35. Advances in local legislation to encourage some forms of energy efficiency finance
36. Growth of financing structures such as:
    - the energy savings performance contract (ESPC) model implemented by an energy service company (ESCO);
    - the energy services agreement (ESA) model;
    - the managed energy services agreement (MESA) model;
    - the Property Assessed Clean Energy (PACE) model; and
    - on-bill financing and on-bill repayment (OBF/OBR) approaches.
37. Political support for increased energy efficiency.

Examples are the '2.0 formats' of the ESA and MESA financing structures. A very interesting recent example is the multibillion-dollar "Net Zero program" from the US military department[5].

Other examples are:

Metrus Energy: Nationwide Deployment of Efficiency Services Agreement: Metrus Energy deployed multi-measure energy efficiency retrofits in BAE Systems facilities with no upfront costs using an Energy Services Agreement (ESA).

AT&T, Redaptive Efficiency-as-a-Service Program: Redaptive partnered with AT&T to implement energy efficiency measures at nearly 650 facilities using an efficiency-as-a-service financing solution, resulting in nearly 20 million USD in annual energy cost savings.

Citi Riverdale Data Center Energy Services Agreement: Citi used an energy services agreement to deliver efficient electricity and cooling at its London data center. The project delivered 1.1 million USD in annual cost savings.

Metrus Energy: Financing Kuakini Medical Center Upgrades with an Efficiency Services Agreement: Metrus Energy's Efficiency Services Agreement structure funded 100% of critical facility improvements and equipment upgrades for Kuakini Medical Center, with a projected 25% reduction in its total annual utility bill.

Citizen Energy uses Efficiency-as-a-Service to Finance Multifamily Properties: Citizen Energy completed projects at two separate multifamily properties with different ownership structures using an efficiency-as-a-service financing solution, resulting in cash-flow positive outcomes.

[5] Net Zero Program: The US Army released its first climate strategy in February 2022 with goals to reduce the Army's greenhouse gas pollution by 50% by 2030 and attain "net-zero" emissions by 2050. Drivers are the creation of Net Zero programs for Energy, Water and Waste (mostly via fund structures).

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In conclusion, emerging energy efficiency finance structures and ongoing legislative changes are enabling investors to enter this market at an increasing rate[6], providing more customers and energy efficiency project developers with capital necessary to perform retrofits and install energy efficiency technologies and improvements.

Tax, accounting, regulatory, and legal issues surrounding energy efficiency finance structures are in flux, shifting the relative merits of these models.

Key stakeholders at the forefront of energy efficiency finance are actively exploring further innovations in energy efficiency finance structures.

Increasingly, parties are beginning to work out solutions to the challenges and realize the opportunities that energy efficiency finance through P4P at-the-meter presents to promote more sustainable economic development, increase energy security and improve economic competitiveness.

2.4 Existing non-P4P initiatives to improve the energy efficiency of buildings

2.4.1 Overview

In the past, several initiatives and tools other than P4P were already deployed aiming to stimulate investments in energy efficiency. This should not be overlooked, as these initiatives can be inspiring when developing a P4P programme in general and making a P4P programme more attractive for investors more specifically.

In the following paragraphs, some important non-P4P initiatives are discussed in detail. Table 4presents an overview.

Table 4: Overview of non P4P initiatives

Type	Examples
Technical, organizational and legal initiatives	Energy audits (2.4.2) Measurement and verification (M&V) (2.4.3) Energy performance contracting (2.4.4) Energy efficiency obligation schemes and alternative policy measures (2.4.5)
Financial initiatives	Initiatives linking the financial sector with the energy efficiency sector (2.4.6) Green funds in general (2.4.7) Green securitization mechanism (2.4.8)

2.4.2 Energy audits

The type of energy audits conducted depends on the function, size and type of the project, the depth to which the energy audit is needed, and the potential and magnitude of energy savings and cost reduction desired. Based on these criteria, energy audits can be classified into three types:

6 (law firm) Wilson Sonsini (WSGR) - 2021: "Energy Efficiency – Structured Finance Solutions", https://www.wsgr.com/en/services/practice-areas/corporate/energy-and-climate-solutions/index.html

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Preliminary audits

General energy audits

Investment-grade energy audits

An audit is, however, worth nothing if managers do not use the information productively. Once audits are complete, managers should incorporate the findings into an energy savings plan to immediately begin reducing costs and eliminating energy waste (Namdhari, 2021).

After identifying the preferred energy-conservation measures and their associated costs, managers can use the audit's financial analyses to convince building owners of the potential financial and energy-saving benefits. The owner then can budget for the cost of implementing the approved measures.

Depending on the complexity of the measure, in-house technicians or an outside contractor then can perform the energy-conservation measures. Once installed, technicians should measure the performance of the upgraded systems regularly to ensure efficient performance and energy savings (Zimmerman et al., 2018).

In the following paragraphs, we discuss the three major types of audits.

The **preliminary audit** is the most basic type of energy audit. In-house maintenance and engineering technicians or an outside auditing firm can conduct this audit. In a preliminary energy audit, readily available data are mostly used for a simple analysis of energy use and performance of the plant. This type of audit does not require a lot of measurement and data collection. These audits take a relatively short time and the results are more general, providing common opportunities for energy efficiency.

The **general energy audit**, typically performed by an outside auditing firm, expands on the preliminary by collecting more detailed data over a longer period. The general audit also might involve the expertise of a programmer who builds a computer model of a building's mechanical or electrical systems. The computer model helps identify energy losses because it allows users to test different energy-conservation measures to optimize overall building performance.

An **investment-grade audit** is the most detailed energy audit. It analyses the financial aspects of energy savings and the return on investment from potential changes or upgrades. A building operator typically uses the investment-grade audit as a budgeting tool when planning facility upgrades. This audit finalizes the modelling performed during a general audit and combines the information gathered with monetary figures. Life-cycle cost analyses can determine the long-term cost savings. For detailed (or investment-grade) energy audits, more detailed data and information are required. Measurements and a data inventory are usually conducted and different energy systems are assessed in detail. The time required for this type of audit is longer than for preliminary audits.

The results of these audits are more comprehensive and useful since they give a more accurate picture of the energy performance of the building and more specific recommendations for improvements. The economic analysis conducted for the efficiency measures recommended typically goes beyond the simple payback period and usually includes the calculation of an internal rate of return (IRR), net present value (NPV) and often also life cycle cost (LCC).

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2.4.3 Measurement and verification (M&V)

Financial institutions don't like uncertainty and standard M&V protocols provide open, transparent and replicable methods of calculating energy savings for any type of energy conservation measure. This helps in reducing uncertainties associated with using different M&V protocols for different projects and reduces the possibility of disagreements over the M&V protocol used.

In the following paragraphs we discuss the three M&V protocols most relevant for the EU: IPMVP, ISO 17741 and the ASHRAE Guideline 14.

2.4.3.1 IPMVP

IPMVP ('International Performance Measurement and Verification Protocol') defines standard terms and suggests best practice for quantifying the results of energy efficiency investments and increasing investment in energy and water efficiency, demand management and renewable energy projects. IPMVP was developed in 1994-1995 by a coalition of international organizations (led by the United States Department of Energy). It has become the national M&V standard in the United States and many other countries and has been translated into 10 languages.

IPMVP provides four options for determining savings (A, B, C and D): see Table 5

Table 5: IPMVP options

Option	Explanation
Option A Retrofit Isolation: Key Parameter Measurement	Savings are determined by field measurement of the key performance parameters which define the energy use of the systems affected by the energy efficiency measures and/or the success of the project. Parameters not selected for field measurement are estimated. Estimates can be based on historical data, manufacturer's specifications or engineering judgment. Documentation of the source or justification of the estimated parameter is required. Example: a lighting retrofit, where the power drawn can be monitored and hours of operation can be estimated.
Option B Retrofit Isolation: All Parameter Measurement	Savings are determined by field measurement of all key performance parameters which define the energy use of the system affected by the energy efficiency measure. Example: a lighting retrofit where both power drawn and hours of operation are recorded.
Option C Whole Facility	Savings are determined by measuring energy use at the whole facility or sub-facility level. This approach is likely to require a regression analysis or similar to account for independent variables such as outdoor air temperature, for example. Example: measurement of a facility where several energy efficiency measures have been implemented, or where the energy efficiency measure is expected to affect all equipment in a facility.
Option D Calibrated Simulation	Savings are determined through simulation of the energy use of the whole facility, or of a sub-facility. Simulation

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Option	Explanation
	routines are demonstrated to adequately model actual energy performance measured in the facility. This option usually requires considerable skill in calibrated simulation. Example: measurement of a facility where several energy efficiency measures have been implemented, but no historical energy data is available.

IPMVP is presently the most used M&V protocol in the EU.

2.4.3.2 ISO 17741

ISO 17741 is a standard published by the International Organization for Standardization and accepted as a national standard in several European Member States. It establishes a set of general rules for measurement, calculation and verification of energy savings of projects. These general rules are considered universal and are applicable irrespective of the M&V methodology used.

In general, the standard is designed to be used by all stakeholders that aim to quantify the energy savings over a specific period in new or retrofit projects. It could reduce the technical and financial barriers in the measurement, calculation and verification for energy saving projects. It specifies the basic procedure of M&V of energy savings. A common understanding of M&V at project level is established by outlining how calculation methods for M&V could be selected under different project scenarios. It is intended as a set of principles, guidance and methods for M&V of energy savings that can be applied to a broad variety of projects.

More specifically, energy savings are determined by comparing measured, calculated or simulated energy consumption before and after and/or with and without implementation of a project, making suitable adjustments for changes in variables (routine adjustment) or static factors (non-routine adjustment). Energy savings are the difference between the adjusted energy baseline and the energy consumption over the reporting period.

2.4.3.3 ASHRAE Guideline 14-2014

ASHRAE Guideline 14-2014 on 'Measurement of Energy, Demand and Water Savings' is an M&V guideline published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers. This US guideline provides procedures for using measured pre-retrofit and post-retrofit billing data (e.g., kWh, kW, Mcf, kgal) for the calculation of energy, demand and water savings. The guideline:

38. Includes the determination of energy, demand and water savings from individual facilities or meters
39. Applies to all forms of energy, including electricity, gas, oil, district heating/cooling, renewables, and water and wastewater
40. Covers all types of facilities: residential, commercial, institutional and industrial.

2.4.4 Energy performance contracting

Energy performance contracting is a method for contracting energy efficiency measures where:

41. The energy savings are verified and monitored during the whole term of the contract.

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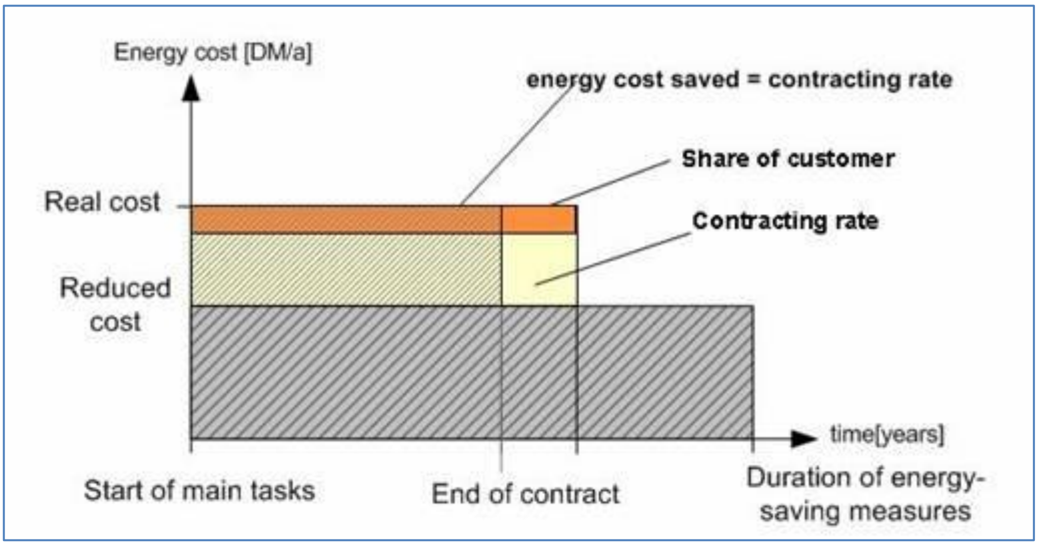
42. The contractor receives remuneration for its services – i.e. investments, maintenance and management – based on a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings.

Energy performance contracting transfers the technical risks from the client to the ESCO based on performance guarantees given by the ESCO. It is a means to deliver infrastructure improvements to facilities that lack energy engineering skills, workforce or management time, capital funding, understanding of risk or technology information.

Figure 7 presents a simplified breakdown of the costs to the client in an energy performance contracting project.

Figure 7: Costs of the client in an energy performance contracting project



Source: Berliner Energieagentur GmbH

In a conventional energy performance contracting approach, the ESCO gives only a performance guarantee for the energy savings. In more advanced approaches (such as the building performance contracting approach developed by Factor4) the ESCO delivers additional performance guarantees (residual value, comfort, circularity) which are visualized in Figure 8.

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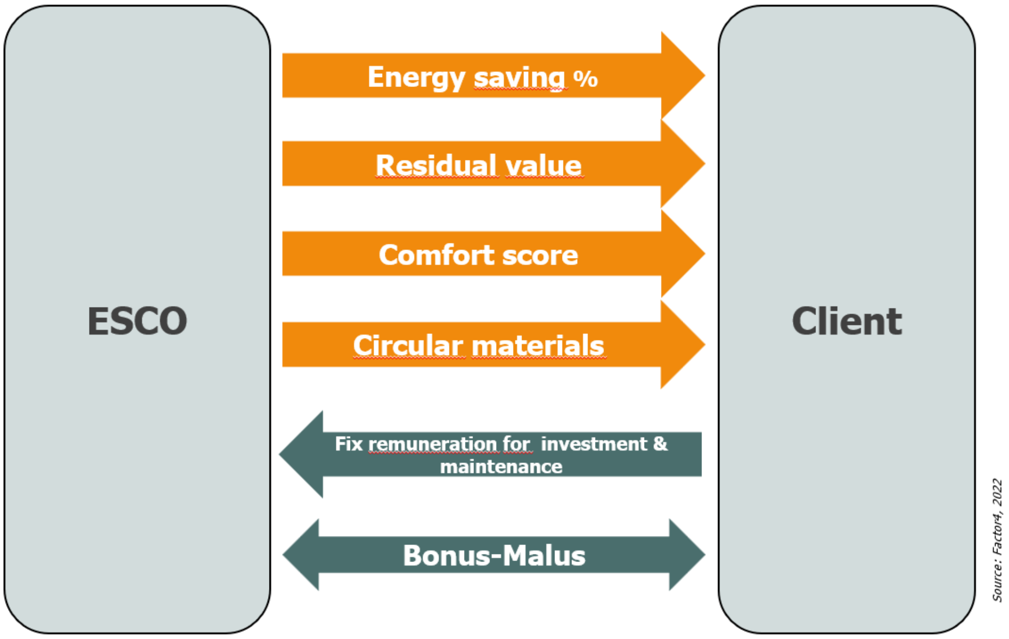
Figure 8: Building performance contracting approach



Energy performance contracting, when implemented correctly, is considered by many experts as the most appropriate and cost-effective way to deliver and optimize energy efficiency measures and investments in buildings and industrial facilities. It has delivered guaranteed and sustainable savings since the 1980s in North America and since the 1990s in Europe and the rest of the world.

2.4.5 Energy efficiency obligation schemes and alternative policy measures

In the frame of the Energy Efficiency Directive (2012/27/EU), EU countries must set up an **energy efficiency obligation scheme**[7]. This scheme requires energy companies to achieve yearly energy savings. Member States can allocate targets so that the scheme saves each year 0.8% of annual final energy consumption.

To reach this target, companies need to carry out measures which help final consumers improve energy efficiency. This may include improving the heating system in consumers' homes, installing double-glazed windows or better insulating roofs to reduce energy consumption.

EU countries may also implement **alternative policy measures** which achieve the same amount of fenergy savings, or a combination of energy efficiency obligation schemes and alternative measures. Alternative policy measures could include

43. Regulations or voluntary agreements that lead to the increased use of energy efficient technology
44. Energy labelling schemes beyond those that are already mandatory under EU law

7 https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L2002&from=EN#d1e636-210-1

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45. Training and education, including energy advisory programmes
46. Energy or CO_2 taxes
47. Financial incentives that lead to an increased use of energy efficient technology

2.4.6 Initiatives linking the financial sector with the energy efficiency sector

In the last few years, several initiatives have been developed that aim to link the financial sector with the energy efficiency sector. Table 6 presents some important examples.

Table 6: Examples of initiatives linking the financial sector with the energy efficiency sector

Initiative	Explanation
ICP Europe	ICP ('Investor Confidence Project') aims to standardize the way energy efficiency projects are developed, documented and measured to facilitate private investments and enable project aggregation. It intends to increase transparency, consistency and trustworthiness of energy efficiency projects, building investors' confidence in this market. ICP was initiated in the United States in 2011. In 2015, it was brought to the EU as a a Horizon 2020 project. More information: https://europe.eeperformance.org
DEEP	DEEP ('De-risking Energy Efficiency Platform') is an open-source database for performance monitoring and benchmarking of energy efficiency investments. It provides an improved understanding of the real risks and benefits of energy efficiency investments by providing market evidence and investment track records and includes 15,000+ energy efficiency projects in buildings and industry from 30 data providers. DEEP is an initiative of EEFIG. More information: https://deep.eefig.eu
EEFIG	EEFIG ('Energy Efficiency Financial Institutions Group') was established in 2013 by the European Commission Directorate-General for Energy and the United Nations Environment Programme Finance Initiative (UNEP FI). EEFIG comprises over 200 organizations working on energy efficiency investments throughout the EU. These include financial institutions, investors, bank associations, energy efficiency practitioners, academia and other experts across the finance market. EEFIG is providing a significant contribution in accelerating private finance to energy efficiency. EEFIG addresses barriers to energy efficiency financing through both policy design and market-based solutions to increase the scale of energy efficiency investments across Europe. More information: https://ec.europa.eu/eefig/index_en

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2.4.7 Green funds in general

Within green structured funds the **main organizational principles** are:

The blended character of funding (public–private from different types of funders through risk-taking)

The 'tranching' within the structured fund along the risk profile of potential investors. A specific application of tranching is securitization.

Concerning **tranching**, we make the following observations:

Establishing a senior/subordinated structure or a risk tranching structure is an effective mechanism to create a security that helps attract new investors to projects, allowing investors with different risk-return profiles to invest in the same project or in an aggregation of pooled projects through a fund structure. The structure shields investors from losses incurred by the project or the portfolio of projects (Golden et al., 2019).

Typically, a structured fund combines both equity and fixed-income products (receivables), such as market indices, loans, bonds, commodities, currencies, interest rates or a mix of these, to provide investors with a degree of both capital protection and capital appreciation.

A green structured fund (revolving or not) can help to create a market for investor-ready energy efficiency projects, bringing the energy efficiency industry closer to mechanisms of securitization, in which energy efficiency projects can be valued based on consistent parameters with project-specific analysis and vetting processes.

Investors need a way to manage risk, and they abhor uncertainty. The fact that historically every energy efficiency project is unique makes the process of underwriting performance risk very challenging and expensive.

A green structured (revolving) fund must create a standardized class of projects assembling existing technical standards into a set of energy performance protocols/contracts that outline best practices, stable standards, M&V and reliable documentation that can enable financing or managing of energy performance risk.

These factors, in combination with aggregated pools of projects, can help remove long-standing barriers to large-scale investments in energy efficiency.

Securitization is a mechanism through which subordinated debt is allocated to a public finance provider alongside senior debt from a private lender, absorbing all default losses up to the amount of the subordinate debt. By covering all losses until it is exhausted, the subordinated debt takes on the majority of the default risks and acts as a credit enhancement for senior debt. In the case of a portfolio of assets, the subordination concept provides credit enhancement by creating multiple tranches or layers with different levels of seniority in relation to the cash flows generated by the fund (often structured as a special purpose vehicle (SPV)) to pay the notes, starting with the most senior notes before repaying subordinated tranches (mezzanine, junior or first-loss-piece tranche (~equity)). This is the so-called 'waterfall structure'. In blended finance, public finance providers usually hold the first-loss piece in order to provide a cushion to more senior, private investors.

2.4.8 Green securitization mechanism

2.4.8.1 Securitization in general

2.4.8.1.1 Definition

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Securitization is a form of debt financing technology (a marketable financial instrument), actively used in a variety of forms to raise off-balance and alternative financing for companies and banks. In its most recent modification, synthetic securitization is used as a risk transfer rather than financing mechanism.

In its most generic form, securitization involves the sale, transfer or pledge of the specified assets (merging or pooling various financial assets into one group of repackaged assets) to a special purpose, bankruptcy-remote vehicle or trust (SPV), which in turn issues notes or certificates (tranches) to investors.

Trusts issue these tranches linked to a certain risk-return profile in order to tap different type of investors (high-risk or low-risk takers): senior, mezzanine and subordinated bonds and equity.

This implies that cash flow from the underlying portfolio in such trusts will flow from top to bottom through the so-called waterfall, and losses will go the opposite way, being absorbed first by equity up to senior bonds.

Investors generally rely on those assets and associated pledges for the redemption of their bonds, either from the cash flows generated by the assets or from the assets' sale/liquidation under adverse conditions. Securitization and structured finance are generic terms, which are applied interchangeably.

Securitization offers opportunities for investors and frees up capital for originators, both of which promote liquidity in the marketplace. In theory, any financial asset can be securitized – that is, turned into a tradeable, fungible item of monetary value.

2.4.8.1.2 Organizational structure and practical example

Figure 9 presents the organizational structure of securitization:

There must be a particular structure that allows 'absolute' separation in the ownership of these assets from the originator in order to avoid the threat of the assets being consolidated back into the bankruptcy estate of the originator.

One of the aspects of the separation is the so called 'true' sale of the assets, i.e. ensuring that no creditors of the originator have any claims against the sold assets, and those assets cannot be consolidated in the bankruptcy estate in case of insolvency proceedings against the originator.

Another element in the structure is the SPV (issuer), a bankruptcy remote, not bankruptcy proof, entity. The SPV could be structured as a corporate entity or a trust, in all cases independent from the originator. Arrangements are made so that the risk of involuntary or voluntary bankruptcy of the SVP is remote.

Key parties to securitization are originator, issuer, outside credit enhancer (~insurer), servicer, liquidity provider and rating agencies.

A common feature of all types of securitization transactions is the use of credit enhancement, i.e. a cushion put in place to protect investors against expected losses. The credit enhancement is sized to reflect an expected loss level determined under a series of adverse scenarios that could affect the asset pool during its life.

The credit enhancement for a specific deal is usually a combination of several forms of credit enhancement mechanisms:

- internal – within the trust by mezzanine and subordinated tranches, equity, over-collateralization and potentially excess spread;
- external – provided by an outside party (bank letter of credit, insurance company surety bond, financial assurance company guarantee, or subordinated loans from third party),

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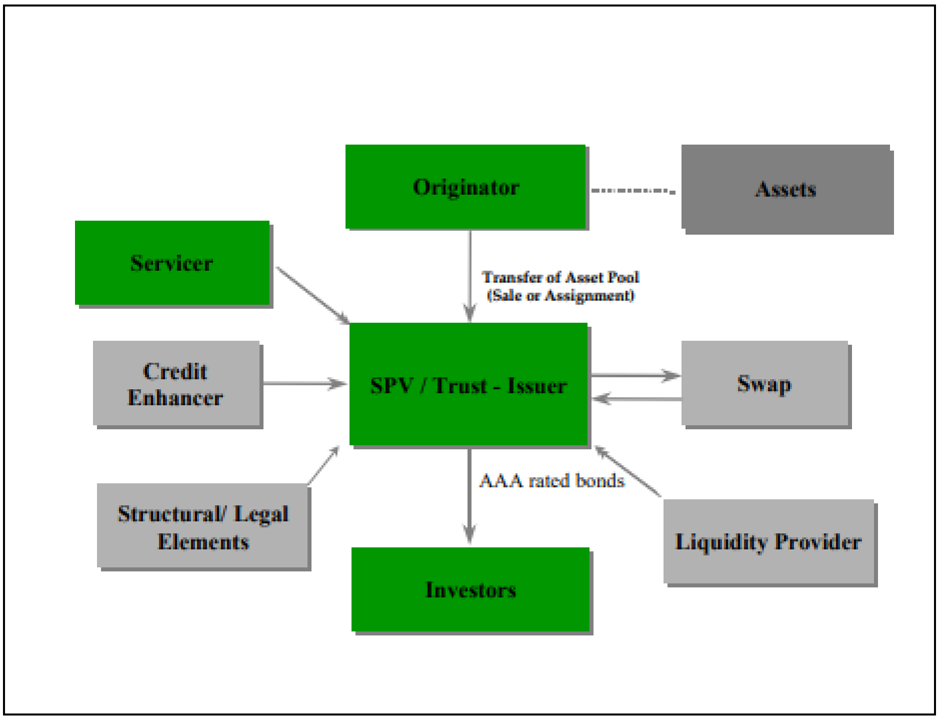
- internal - provided by originator or within the deal structure: reserve account/refunded or build up from excess spread, originators guarantee, senior-subordinated structure, excess spread, overcollateralization and/or a minimum required debt service coverage ratio, and trigger events.

Figure 9: Organizational structure of securitization



Source: Merrill Lynch

Figure 10 presents a practical example of a typical securitization of an asset pool, in actual or synthetic format (fixed-income products, market indices, loans, bonds, mortgages, commodities, currencies, interest rates, etc., in financial terms called 'receivables').

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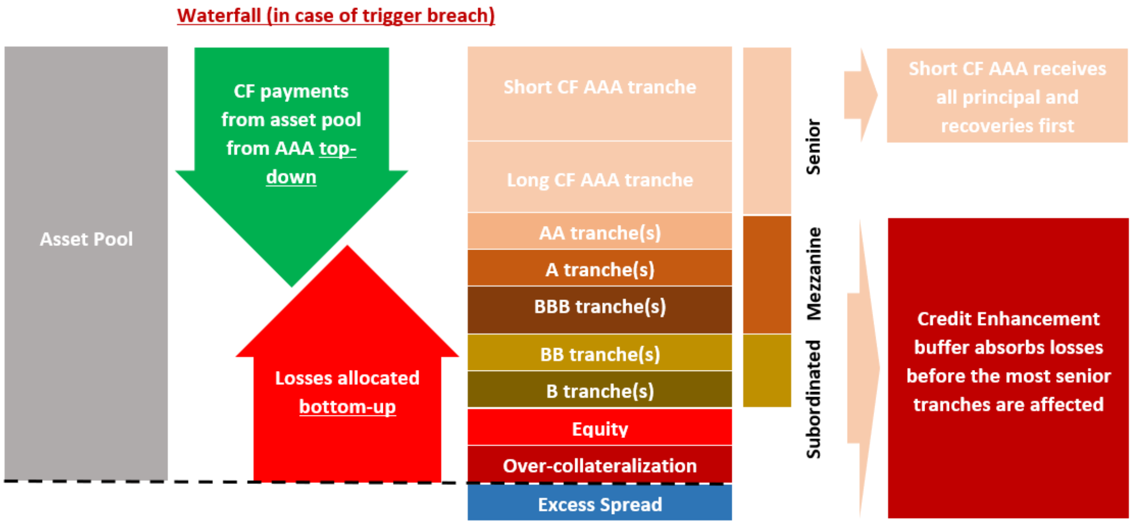
Figure 10: Practical example of securitization



Source: Factor4 (2022)

2.4.8.2 Green securitization situation US

Securitizations are becoming a more common technique in the US [8] to raise low-cost debt for energy projects.

Historically, securitization has not been an option in the US project finance market because, in most project finance deals, you have a single borrower. There is not the diversification of customer risk that you have in more traditional securitization transactions where there is a pooling or aggregation of eligible assets. Nevertheless, people have become more comfortable over the years with such securitizations whereby more energy efficiency projects are grouped by an independent aggregator.

For example, a subset of securitizations involves property assessed clean energy (PACE) bonds (Dolan et al.,2018). There are both residential and commercial PACE programmes. Senior tranches of PACE bond securitizations are often rated AAA. Municipalities borrow and make loans to local residents and businesses to install solar systems and make other energy efficiency improvements. Homeowners and businesses repay the amounts borrowed through additional property tax payments over time. The bonds issued by the municipality are secured by a lien[9] over the house or building on which the improvements are made. The lien is a first-priority lien, so it comes ahead of all other creditor claims to the property apart from other property taxes. The additional

[8] Citigroup: Energy efficiency industry needs to talk securitization – by Anthony Clark interviewing Michael Eckhart at the Clean Energy Finance Forum: quote-unquote Michael Eckhart: "I think we are 40 years into a 100-year transition to a clean energy economy. The momentum is going in our favor and we are succeeding. From the Public Utility Regulatory Policies Act paving the way for independent power producers, to feed-in tariffs, the Production Tax Credit and Renewable Portfolio Standards, I feel good about the policies I and my colleagues in the United States and around the world have worked to implement. More recently, green bonds, securitization and yieldcos are all connecting clean energy projects to capital markets. With four decades of technological progress and two decades of smart development of energy policies and incentives, we are finally arriving. We are getting there".

[9] A lien is a claim or legal right against assets that are typically used as collateral to satisfy a debt. A lien serves to guarantee an underlying obligation, such as the repayment of a loan.

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assessment is a separate line item on the property tax bill (on-billing).The PACE assessment travels with the house or building. ,If the house or building is sold, the new owner must continue making the additional property tax payments. If there is a default on the additional property tax payment, only the defaulted instalment of the PACE assessment gets accelerated. The trustee for bondholders holding the securitized paper cannot accelerate the full remaining payment obligation of a defaulting customer.

More examples of successful application of (green) securitization in the US, Canada and Australia are listed below. In the US such applications only became possible thanks to the role of the public sector in green securitization. Important actions included:

(1) Providing guidelines for 'green' assets to support identification of green investments in existing portfolios
(2) Supporting the development of standardized contracts for loans funding low-carbon assets
(3) Supporting financial warehousing of standardized green loans.

In the US developments in standardization and securitization hold tremendous potential for moving the finance industry forward. Bankers and financiers are working hard to understand and manage risk of e.g. energy efficiency projects.

In the last five years, the clean and renewable energy industries in the US have demonstrated with solid evidence what their risk profiles are. There are, for example, several years of operating history for wind and solar farms. These industries are providing the historical information that capital markets require to invest.

Examples:

Solar Access to Private Capital (SAPC) initiative under the US Department of Energy

The SAPC recommended taking a staggered approach to facilitating securitization of what was during the first phase (2012-2014) a new asset class. The first years of funding focused on facilitating reduced transaction costs and increased investor confidence in solar PV. The SAPC worked closely with the private sector players, in particular law firms, developers and banks. The second phase (2014-2017) focussed on facilitating financial warehousing structures for solar PV loans. This involved the development of the legal structures that other entities could use to establish warehouses, rather than directly setting up a warehouse. The SAPC worked with private banks for implementation, and engaged established public green banks that were looking for credit enhancement opportunities in the green space. Credit enhancement will be most relevant for unrated assets at the commercial/industrial level and lower rated residential mortgages. The SAPC aimed to encourage the use of its standardized contracts and best practice guidelines by the loan originators in this process to simplify the securitization issuance process.

Public–private partnership for energy efficiency securitization: WHEEL, Pennsylvania, US

The Warehouse for Energy Efficiency Loans (WHEEL) was established as a public–private partnership in 2014. First, approved local contractors offer low-cost loans to

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customers to finance energy efficiency projects. The loans were brought into a financial warehouse by the company Renewable Funding, using a credit facility provided by a mix of public money, from the State of Pennsylvania Treasury, and private money, from commercial bank Citi. This process continues until the aggregated amount of loans in the warehouse meets the size requirements of the capital markets, and the loans are bundled (aggregated) together and sold to institutional investors as securities backed by energy efficiency loans. The issuance of asset-backed securities is made feasible by data on performance (historical track record) of energy efficiency loans under a low-cost loan programme offered by the State of Pennsylvania since 2006 till 2014, which allows investors to evaluate the expected credit risk and financial performance of energy efficiency loans. Citi has replicated this process in New York State, in collaboration with the New York Green Bank

SolarCity ABS issuances backed by residential solar power purchase agreements

SolarCity, the largest installer of residential solar in the US, was the first US company to issue securities fully backed by cash flows from solar assets, in November 2013. The US$54.4 million issuance was backed by the cash flows from power-purchase agreements for the electricity generated by a bundle (aggregation) of residential rooftop PV installations of around 5,000 of its customers. Since then, it has issued another two rounds of asset-backed securities (ABS) backed by power-purchase agreements from its customers, with a gradual expansion in the size of the issuance and number of individual power-purchase agreements in the pool. The most senior tranches of these issuances were rated BBB+. All of the ABS issuances from SolarCity have been private placement offerings.

Hannon Armstrong's US$100 million ABS for wind, solar and energy efficiency

Hannon Armstrong, a US-based listed sustainable infrastructure investor, issued US$100 million of low-carbon ABS in December 2013. The credit profile of the issuance was based on the cash flows from over 100 individual wind, solar and energy efficiency projects (all investment-grade credit profiles). This deal is a good illustration that a blended portfolio approach, bundling (aggregating) a mix of different green assets in a single ABS issuance, is possible. In October 2014, Hannon Armstrong issued more low-carbon asset-backed securities for US$115 million, backed by wind assets. Hannon Armstrong discloses annual emissions reduction estimations from both bond issuances to give investors confidence in the green credentials of the bonds.

Toyota green ABS for low-carbon transport

Toyota Finance, the US lending and leasing arm of Toyota Motor Corporation, has issued three separate green ABS, in 2014, 2015 and 2016 (for a total of US$4.6 billion), all three being the largest green ABS ever issued. The bonds were fully backed by the cash flows from a specified portfolio of automotive financing. The securitized assets consisted of leases and loans against an eligible set of 'green' Toyota and Lexus hybrid and electric vehicles that meet specific emissions hurdles. The 2014 ABS pool financed the purchase of 39,900 vehicles from a list of eight models with specific criteria. The vehicles were required to satisfy standards of energy efficiency in regulations set by the California Environmental Protection Agency's Air Resources Board.

Renovate America/Hero Funding Trust issued eight green ABS for low-carbon building projects

Renovate America is a California-based residential PACE financing provider. It partners with local governments to provide its version of PACE, the HERO Program (Home

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Energy Renovation Opportunity), to homeowners who finance a wide variety of product installations to conserve water and energy. HERO finances more than 60 types of home energy improvements, providing renewable and alternative energy, energy efficiency and water efficiency renovations to homeowners through voluntary property tax assessments. Renovate America is the most recurrent green ABS issuer with US$1.7 billion raised so far via a special purpose vehicle called HERO Funding Trust.

Canadian company Northland Power ABS issuance backed by solar projects with proceeds for renewables

In 2014, Canadian company Northland Power issued CA$232 million of ABS from a special-purpose vehicle (Northland Power Solar Finance One LP). The bond was backed by solar projects, and had an 18-year tenure with a semi-annual coupon of 4.397%. The Canadian rating agency DBRS rated the issuance BBB. The specific assets backing the issuance were six 'Ground-Mounted Solar Phase I projects' (aggregated), each operating a 10MW solar facility, that sell all electricity to the Ontario electricity grid. Stable revenue streams for the duration of the bond are provided by the 20-year feed-in tariff contract between Northland's solar projects and the Ontario grid. The securitization allowed Northland to move operational-phase solar energy assets off its balance sheet, freeing up space to make new renewable energy investments. Proceeds from the bond were allocated to refinancing six solar projects backing the issuance and purchase of an offshore wind project, Nordsee One. Essentially the bond is an ABS version of the corporate green use-of-proceeds bonds, where proceeds are earmarked for specific green purposes. This matters as the bond not only refinances the underlying projects but also enables Northland Power to grow its green portfolio. This refreshed capacity to fund incremental green assets is what so many investors are looking for.

Flexigroup ABS for rooftop solar

Australian based FlexiGroup Ltd issued a landmark green asset-backed security of AU$50 million for refinancing of residential rooftop solar PV systems. FlexiGroup's issuance was the first Australian green-labelled ABS as well as the first Climate Bonds Certified Australian ABS. A second issuance followed in February 2017. The initial FlexiGroup Green ABS Notes were issued as part of a term securitization transaction for the Flexi ABS Trust within a wider collateral pool of AU$260 million of consumer receivables.

2.4.8.3 Green securitization situation in the EU

As in the US, in Europe 'green' securitization can address the low-carbon financing gap by allowing smaller-scale assets to be aggregated to access the bond markets. This can provide access to capital at scale and lower the cost of capital. To tap into the potential of green securitization, EU policymakers and the public sector can play a role by working with the private sector to address barriers that currently exist in the market (Hill et al., 2020).

There is a strong rationale for green securitization as a viable financing mechanism. The assets with a significant potential for green securitization include mortgages/loans to green buildings, cash flows from operating solar and wind assets or loans to these projects, energy efficiency project loans, including P4P and as-a-service, loans to green SMEs and loans for electric vehicles (Climate Bonds et al, 2015; Henner and Howard, 2022).

The potential benefits of securitization of these small-scale low-carbon assets are well known (see the US examples), and include improved access to capital and access to capital at lower cost. However, barriers currently remain that prevent private market actors from rapidly growing a green securitization market in Europe:

The opportunities of green securitization are intertwined with the overall securitization market in Europe. A preliminary recommendation is therefore for EU policymakers to reiterate their policy support to revive a high-quality securitization market in Europe. They should also continue to educate the market on the potential benefits and risks of securitization and how policymakers have learnt from the financial crisis, avoiding the abuses of the securitization mechanism in this respect. The securitization mechanism as such was not at the origin of the financial crisis, but rather the improper use (or abuse) of it by originators/issuers (to offload risk from their balance sheets in an irresponsible manner) on the one hand, and on the other by investors (through their search for yield without thorough analysis work).

In Europe, however, energy efficiency is a category by itself, and energy efficiency projects do not yet meet the requirements of the European capital markets.

48. The industry is still too disaggregated. Securitization seems not practical or possible under these circumstances. There is a need for standard energy savings performance contracts.
49. The energy efficiency industry in EU has been built for years on the local and regional ESCO models and not with the idea of securitization and reaching capital markets for their funding purposes.

Challenges for green securitization in Europe are:

General:

- No clear, harmonized standards to define ‘green’ assets at the EU level
- Identifying green assets in existing loan books.

Supply side:

- Loan contracts for renewable energy and energy efficiency are not sufficiently standardized
- Lack of sufficient volume of green loans within individual lenders to bundle in order to achieve deals at scale
- Low credit ratings for green ABS due to lack of historical data on credit performance of green assets and limited asset pool.

Demand side:

- Investor demand for green ABS in new asset classes cannot be proven until there are deals available in the market.

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Nevertheless, banks are beginning to offer more green products and governmental agencies across the EU are starting to step in to address energy efficiency finance meeting the needs of the capital markets.[10]

[10] Obvion: green RMBS (residential mortgage backed security) from the Netherlands to finance low-carbon residential buildings. This 500 million Certified Climate Bond was issued in June 2016 by Obvion, a wholly-owned Dutch subsidiary of Rabobank. It was the world's first 100% green RMBS, with both the securitized assets and the proceeds of the ABS being 'green'. The bond was backed by a pool of green residential mortgages for energy-efficient houses in Holland, based on Dutch energy performance labels for private homes.

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3 RECOMMENDATIONS FOR FINANCING P4P PROGRAMMES

3.1 Introduction

P4P is not well known by most energy efficiency market stakeholders in the EU today. Also, as explained above, the US and EU contexts in which P4P is deployed show major differences. It is therefore an important part of the SENSEI project to explore how to set up and finance future P4P pilots in EU Member States. This exploration within the SENSEI project has consisted of the following steps:

Step 1: **Internal negotiation games** capturing expertise within the consortium by means of virtual negotiations (3.2).
This step comprises:

- Organizing the internal negotiation games
- A critical review of the results of the internal negotiation games by a financial expert
- Summarizing the exercise by formulating recommendations.

Step 2: **External stakeholder consultations** in which semi-structured interviews with external stakeholders were conducted (3.3).
This step includes:

- Organizing an external stakeholder consultation process by means of semi-structured interviews. During these interviews, the internally developed ideas and insights from Step 1 were subjected to the opinion of real players. This second step could be seen as an informal validation process.
- Summarizing the exercise by formulating recommendations.

Step 3: **Final recommendations** derived from the previous steps.
This step includes:

- Reconciliation and summarizing the information from internal (Step 1) and external (Step 2) sources.

3.2 Internal negotiation games

3.2.1 Methodology

Before consulting external stakeholders, we decided to capture views, experience and expertise available within the SENSEI consortium. Rather than conducting a survey, it was decided to organize virtual negotiations ('negotiation games').

These are based on roleplay, in which various statements are presented to a panel of internal project partners in stakeholder roles, the game participants, to reflect upon following a specific format. In this case, during the negotiation game participants focused on the perspective of the investor. Statements were structured along the following lines:

"As an investor, I would expect that …"

"As an investor, I would be reluctant to …"

"As an investor, I would address this issue by …"

Following this format, during the sessions, the SENSEI partners imagined/described the various stakeholders' perspectives in terms of probable:

Expectations/drivers

Perceived threats/risks

Potential solutions.

This exercise was conducted for different impact areas that P4P can have on existing business models:

Financial aspects

Legal aspects

Operational aspects

Commercial aspects

Risk aspects.

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3.2.2 Intermediate results

The investors' perspective explored during the negotiation game, as well as a first review by a financial expert of Factor4 (Danny Frans), are presented through a list of highlights in Table 7. These highlights are translated into recommendations in 3.2.3.

Table 7: Results of negotiation games and review by financial expert (investors' perspective)

Item		Expectations	Threats	Solution elements
Financial aspects	Negotiation games	? Quick rate of return ? Quick or slow payback period ? Low returns over a long period of time ? Looking for investment opportunities ? Low default rate ? Low tax burden ? Access to cheap credit ? Predictable return. ? Wish to put capital into best use ? Know the ratio between risk and return	✘ Reluctant to invest in projects without infrastructure ✘ Avoid high transaction costs. ✘ Reluctant to invest for more than three years	✓ Exit options ✓ Leverage ✓ Access to secondary markets and new financial products ✓ Securitization ✓ Insurance mechanisms
	Review	? Need for stable and transparent revenue streams ? Reliability of the measurement, verification and	✘ Risk of being looked at as a 'new' asset class	✓ Exit options: see refinancing options ✓ Transparent cash flow modelling and planning based

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Item		Expectations	Threats	Solution elements
		valuation plans (i.e. cash flow projections) ? All above expectations can be summarized into 'bankability'		on a measurement, verification and valuation plan ✓ In certain US P4P programmes, potential investors rely on two revenue streams to get repaid: energy efficiency savings from the building owner and optimization of the use of the grid for the power system operator (bonus cash flow) ✓ Still unclear if in an EU P4P programme a power system operator is prepared to pay – for performance for optimizing the energy grid or network ✓ Nonetheless, the power system operator must be part of the P4Pprogramme with roles such as data source provider, M&V agency and potentially as-a-service provider ✓ Possible guarantees on two levels: building owners/ESCO vs aggregator and aggregator vs power system operator (depending on the latter's role)

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Item		Expectations	Threats	Solution elements
				✓ Grouping of a large enough number of energy efficiency projects ✓ Search for different type of investors during different phases of market development (e.g. start-up phase: combination of public authorities and private high risktakers such as business angels, family offices…; growth/development phase: seed money, risk capital…; strong development phase: hedge funds, banks, insurers, pension funds…) ✓ Risk of high transaction cost is probably lower within P4P as in-depth analysis and due diligence can be standardized and grouped for multiple projects instead of project-by-project ✓ Need to adjust or find a structure that can also attract long-term investors with e.g. risk mitigating factors (e.g. through refinancing options such as securitization, green bonds, forfaiting, etc.)

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Item		Expectations	Threats	Solution elements
Legal aspects	Negotiation games	? Simplified bureaucracy ? Fair and equal treatment compared to other potential investors in the programme	✘ Immune to risks such as Covid-19	✓ Efficient dispute settlement mechanism ✓ Insurances
	Review	? Stable regulatory policy ? Simple and transparent legal format (funding structure) ? Straightforward approval procedures throughout the investment process (policies, criteria and guidelines)	✘ Unstable regulatory policy (need for direct or indirect involvement of public authorities (guarantees, equity, debt, subsidies, etc.) ✘ Legal execution risk: due to possible high number of agreements/contracts ✘ Programme without any recourse clauses for investors ✘ Potential conflicts of interest between the different parties involved (to be mitigated by solid contracts)	✓ Grouping energy efficiency projects will bring down legal and administrative cost ✓ More or less 'secured' lending via available guarantee mechanisms at different levels
Operational aspects	Negotiation games	? Track record of previous success ? Collaborators with practical technical experience ? Simplified bureaucracy ? Transparency in the strategic decisions being made by the aggregator	✘ Technical risk taken up by someone else ✘ Avoid new and untested systems, products or services. ✘ Agreement in advance on how performance will be measured and financially valued ✘ Afraid of high energy prices.	✓ Standardization, scalability, replicability ✓ Professional and accurate due diligence processes ✓ Have a single point of contact in this seemingly complicated mechanism

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Item		Expectations	Threats	Solution elements
		? To be involved in the way projects or selected investment projects are selected ? Transparent reporting coming from own investment portfolio.		✓ Have collaborators with practical technical experience ✓ Intermediate finance structuring organizations with more expertise in the specific field of investment ✓ Clear reporting protocol
	Review	? Possible need for working e.g. with a pre-selected group of ESCOs ? Clear and transparent programme definitions by aggregator and investor(s) ? Mitigating factors for non-recourse character of potential investment (guarantees/credit enhancement, excess spread, reserve levels, etc.)	✖ Possible fluctuations and volatility of (sustainable) energy prices ✖ Default risk on clients (meaning building owners, ESCOs and contracts between them - failure of projects)	✓ Power system operators are owners and archivers of data and performance information, and play a role in the measure, verification and valuation plan, and can also become an as-a-service provider. ✓ Transparent ongoing investor reporting on performance
Commercial aspects	Negotiation games	? Know the total potential ? Business insights ? More interested in projects that can expand our business than reduce our costs. ? Individual private investors to join the investments at the project level ? Glad to see large institutional organizations in the whole	✖ Reluctant to invest in energy efficiency ✖ Reluctant to enter a market I do not know ✖ Reluctant to finance in a wider geographical area ✖ Reluctant to finance cost saving investments	✓ Align investment decisions with strategic priorities ✓ Single point of contact ✓ Access two platforms with multiple projects ✓ Know the worldwide maximum investment potential ✓ Know what other investors are investing in

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Item		Expectations	Threats	Solution elements
		investment setup in the investment platform or mechanism ? Investments aligned with ESG metrics and indicators ? Know that investments in the ESG realm can be accredited ? Transparency in the strategic decisions being made by the aggregator ? Invest in new technologies		✓ Welcome Institutions such as green investment banks or European Central Bank taking on some junior debt
	Review		✘ Reluctance to invest in energy efficiency will become less and less of a 'threat', if we look at e.g. the ESG objectives of financial institutions, and their search for 'green' investments ✘ Need for a clearly targeted scope in terms of geography, type, etc. of energy efficiency projects	✓ 'Know your potential investors': types, risk profiles, interests, markets = define targeted investors
Risk aspects	Negotiation games	? Supportive political framework for the business I am investing in ? Regulatory certainty ? Know what the underlying asset is and what part of it I own	✘ Low default rate	✓ Insurance mechanisms or securing mechanisms for the risks that are with different parties in the investment ✓ Know the people I am investing in ✓ Need data to evaluate risk

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Item		Expectations	Threats	Solution elements
				✓ Agreement in advance on how performance will be measured and financially valued
	Review	? For a number of investors this will be considered as a new asset class, meaning internal approval process, high analysis and due diligence cost	✘ Insolvency of certain parties involved (aggregator, …) ✘ Need for measurement, verification and valuation plan – if not sufficiently clear and/or reliable, it could be a threat or a risk	✓ Need for data to evaluate risk: power system operators own data and have customer contacts ✓ Creditworthiness of involved parties ✓ Strong financial approval procedures ✓ Mitigate risk of only ex ante impact on the grid via power system operator (e.g. via preapproved performance matrix system, …)

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3.2.3 Recommendations

3.2.3.1 Contractual aspects

3.2.3.1.1 Project assessment procedures

From the investors' point of view, P4P could bring the benefit of lower costs for due diligence and project eligibility analysis. This will only materialize if investor and aggregator define and agree on robust, transparent standardized processes for those overhead tasks. The standardized process will enable investors to trust that not every single project within the programme goes through a complete detailed due diligence process.

The standard assessment process must include preapproved eligibility and contractual criteria which must be met by the energy efficiency projects (e.g., the application of underwriting[11] criteria).

The development and promotion of frameworks for the standardization, aggregation and benchmarking of sustainable energy investments is recommended. This should include, among other things, labelling programmes, project rating methodologies and risk assessment tools, and standardized legal and financial structures.

Recommendation 1: A standardized project **assessment procedure** must be used.

3.2.3.1.2 Failure in fulfilling obligations

As in energy performance contracts, the programme design needs to define rules dictating what happens when a stakeholder fails to meet their contractual and financial obligations.

One of the elements is to map the risks (business, performance, financial) and allocate them to the stakeholders that are most suitable to bear the risk from the start.

Secondly, like in energy performance contracts, legally binding recourse rules need to be included to enable efficient continuation of projects and programme (insurance, operation and maintenance, property rules, comfort levels…).

Recommendation 2: Clauses must be drafted establishing a clear stakeholder allocation of the risks of non-fulfilment of obligations as well as ensuring the efficient continuation of the project in case of non-fulfilment.

3.2.3.1.3 Measurement, verification and valuation

There is a need for gathering, processing and disclosing large-scale data on actual financial performance of energy efficiency investments, in order to create a track record for energy efficiency in different sectors. To a certain extent this need is addressed by the DEEP platform[12].

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[11] Underwriting is the process by which a lender verifies a borrower's assets and liabilities in order to issue final approval on a loan application.

[12] https://deep.eefig.eu/

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Investors will focus on the financial value of the programme as a whole. Hence, besides defining a technical M&V plan, it will be crucial to make cash flow projections and forecast guaranteed returns (=financial *valuation*) for investors. In other words the programmes need to be bankable. Just as an energy performance contract contains guarantees of technical and financial performance at project level, investors would expect the same type of guarantee at programme level.

Financial decisions differ significantly from decisions related to technical issues. While technical decisions rely mostly on time-independent and well-known inputs, such as physical properties of materials, financial decisions are not that straightforward. Financial valuation usually requires forecasts of different inputs, such as energy prices, that seldom tend to be completely accurate. In addition, complexity is increased by the fact that common financial analysis tends to neglect project results that are not obvious and easily monetized. The financial analysis of energy efficiency investments is typically based on two distinctive steps:

Determining project cash flows

Discounting them.

This approach results in a set of financial indicators used for the project valuation, such as net present value (NPV) and internal rate of return (IRR).

Further integration of non-energy benefits in project valuation, in particular in the building sector, must lead to evolution of new or adapted financial products.

Whereas energy efficiency investments are usually expected to be paid back exclusively through the reduction of the energy bill, there is increasing evidence that non-energy benefits can play a key role in the decision to invest in energy efficiency. This includes for instance:

Increased building value

Lower tenant turnover or vacancy rates etc.

These benefits need to be quantified through data collection and monetized in order to evolve the parameters used by investors to assess an energy efficiency investment.

Recommendation 3: An M&V *and valuation* plan must be adopted, following the investor's valuation standards, and the linked programme guarantees.

3.2.3.1.4 Regulatory frameworks

Energy efficiency and renewable energy regulatory frameworks are often subject to changes, due to evolving political priorities being put in place when governments change. Subsidy programmes and energy tariff structures change often and sometimes drastically. Since a P4P programme will most likely group the same type of projects, if regulatory changes affect the specific type of project, this could mean a large impact on financial return for the programme as a whole. This is already occurring today at individual energy efficiency and renewable energy project level, and the risk is higher if many bundled projects are impacted at the same time.

Financial sector regulations are also complex and change over time. This may have an impact on the data flows and processes used in the programme management. It is therefore important to assess the impact of revised risk ratings and requirements for energy efficiency on financial regulations (Basel III, Solvency II).

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Privacy legislation (e.g. GDPR) also falls within this category.

The risks of changing regulatory frameworks cannot be controlled by the direct stakeholders in a P4P agreement (e.g. the aggregator). Hence, allocating these risks to them would increase their risk fee, and would create extra programme costs while not increasing the performance of these stakeholders. For this reason, the risk of a changing regulatory framework should be kept out of the programme and borne preferably by a party willing/able to assume these risks (e.g. the government). This risk allocation should be laid down in the programme contract, as is already done in (well-designed) energy performance contracts.

Recommendation 4: Make a detailed regulatory risk analysis and assign the risks of a changing regulatory framework to a party willing/able to assume these risks (e.g. the government).

3.2.3.2 Stakeholders

3.2.3.2.1 Different investor profiles

P4P will initially be perceived as a new type of financial asset from an investor's perspective. It is only over time that a track record of financial performance and financial manageability will emerge. Each phase of this development process is likely to attract another type of investor:

Start-up phase: combined public financing structures and private investors investing in a dedicated programme fund, with remaining risks (partially) covered by a public guarantee mechanism

Market development phase: seed money, risk capital

'Going concern'[13] phase: hedge funds, banks, insurers, pension funds.

It is important to target institutional investors in order to increase the share of their funds invested in energy efficiency, or to develop specific funds or investment products. This includes supporting the integration of energy efficiency in portfolio management strategies for institutional investors and/or fund managers, including through re-definition of fiduciary duties.

Recommendation 5: Engage well-targeted investors with matching risk aversion profiles for each market development phase.

3.2.3.2.2 System operator

Investors will appreciate availability of energy data that may reduce investment risk. The natural partner for the first P4P pilots would therefore be the system operators, from the viewpoint of the investor. The system operator is closest to energy data and has a large customer base facilitating the choice of potential projects. The first projects could be set up by a consortium of financial institution(s), a system operator and a government energy/climate agency (SEIF, European Commission, 2021).

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[13] Going concern: in operation, active

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Recommendation 6: System operators should be involved as a programme partner, especially in the start-up phase of the P4P programme.

3.2.3.2.3 Aggregator

The programme participant acquisition process should be managed by an aggregator with market access to a large candidate participant base (for example the customer base of a system operator), with strong expertise in both market communication and energy efficiency. This access is needed to set up a large-scale pipeline of (standardized) sustainable energy investments (in terms of number of and/or amount of investments).

Aggregators have to 'match' and combine public and private financing from several types of investors to provide funding to designated projects, via e.g. a well-designed and incorporated investment platform:

Identifying market gaps and providing financing or support to sectors and/or projects that are not currently sufficiently serviced by traditional financial intermediaries

Aggregating and pooling projects

Facilitating the inclusion of investors towards the financing of projects

Blending public and private funds

Focusing on geographic and/or sectoral/thematic scope (e.g. building renovation).

Recommendation 7: The programme should be managed by an aggregator with strong expertise in both market communication *and* energy efficiency.

3.2.3.3 Other

3.2.3.3.1 Programme scale

After the start-up phase of the P4P market, a large number of projects participating in a P4P programme is key to accommodate the efforts and costs related to standardization of due diligence analysis and transaction costs. Scale (aggregation) will bring additional financial benefits and overall return for all stakeholders, such as grouped procurement of equipment, and sales and marketing costs amortized over a much larger project base.

Recommendation 8: Sufficient critical mass is required in a P4P programme to cover all transaction costs. This implies a sizeable portfolio having a decent share of large buildings (commercial, public, …).

3.3 External stakeholder consultations

3.3.1 Methodology

External stakeholder consultations took place between June and August 2021. During the external stakeholder consultation process, the internally developed ideas and recommendations were subjected to the opinion of financial stakeholders: financiers, bankers, insurers, pension fund managers, etc. Rather than asking the external stakeholders for feedback on documents describing the SENSEI P4P programme basics

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in detail, the external stakeholder consultations were conducted as semi-structured interviews, after a brief presentation of the SENSEI project and the P4P concept. Factor4 conducted the interviews.

The interviews were approached as a conversation between industry colleagues, aimed at collecting first-hand feedback, both positive and negative, and useful practice-based inputs on three aspects of the conceptual P4P programme being developed within the SENSEI project. The motivation for this approach is that most P4P programme experience and literature obtained so far originates from a US context. Also, during the internal negotiation games only theoretical exercises were conducted to try to identify the different stakeholders' perspectives. This delivered hypothetical interpretations of the usability of P4P programmes in an EU context. It was therefore judged more useful to engage with real (external) EU stakeholders from the finance/energy arena in Europe to discuss the basics of the P4P programme concept in a spirit of co-creation.

3.3.1.1 Questions discussed with external stakeholders

In the semi-structured interviews, the questions were grouped according to three main categories (Table 8):

50. **Communication** of the P4P programme concept: Does the interviewee understand the concept and its implications?
51. **Evaluation** of the P4P programme concept: What is the interviewee's first evaluation in terms of pros and cons?
52. **Potential roll-out** of a P4P programme: Can the interviewee spot local potential for piloting a P4P programme?

Table 8: Question set of the semi-structured interview for financial stakeholders

Category	Question
Communication	Have you heard of P4P programmes before?
	Are all aspects of the concept clear to you? Can the concept be better defined or described? Are there some (important) missing details, in your opinion?
Evaluation	According to you, what are potential drawbacks, if any, of P4P programmes especially compared to the existing energy efficiency financing programmes?
	What would be the preferred way of financing a P4P programme from an investor's point of view? (options A, B, C, D as described in D6.1, chapter 2.3 'Possible contractual arrangements')
	Would it be a good way to boost/scale-up investments in energy efficiency?
	Could the concept of large-scale aggregation of energy efficiency projects lead the way to securitization of energy investments?
	Do you think P4P programmes will be seen as a new type of asset by investors (separate from the existing energy efficiency investment programmes)? What with bankability?

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Category	Question
	Is the involvement of a system operator and/or government (agency) in the P4P programme an advantage for investors?
Potential roll-out	Do you think a P4P programme might be attractive for (some type of) investors, especially compared to the existing energy efficiency financing models like energy performance contracting?
	What would an investor expect as time perspective for a P4P programme?

3.3.1.2 Consulted external stakeholder organizations

Table 9 presents the consulted financial stakeholders. The opinions of these stakeholders are presented in 3.3.3 and labelled with codes (e.g. 'STH7') to ensure the anonymity of the surveyed stakeholders.

Table 9: Financial stakeholders

Name of financial stakeholder	Activity
AG Real Estate	Real-estate investment and development
Argenta Spaarbank	Bank
Belfius	Bank
Catalan Institute of Finance	Public financial institution
NN Insurance Belgium	Insurance company
PensioPlus	Association of pension institutions
TINC TDP NV (TINC)	Private investment in infrastructure assets

3.3.2 Intermediate results

The proceedings of the consultations are summarized in an anonymous way in paragraph 3.3.3. The interviewed stakeholders have been numbered and referred to as STH + nr.

3.3.3 Recommendations

3.3.3.1 Contractual aspects

3.3.3.1.1 Project assessment procedures

Financial institutions are reluctant to invest in non-transparent packaged programmes, especially after the financial crisis of 2008. Transparent management of project selection and financing by the aggregator is crucial. Rules for that will have to be set up according to financial regulations and rigorous and transparent reporting is essential (STH2). A SENSEI P4P programme could be interesting for pension funds in EU Member States, but the following points need to be taken into account: the strict EU regulated market of pension funds, the reporting that pension funds are required to deliver to the regulators on a periodic basis, and the observance of 'corporate governance', which needs to be in

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place as well. Transparent, correct, fixed, stable cash flows from the programme, together with good reporting and follow-up of the investments, are of utmost importance (STH2).

The choice of investing at the aggregator level rather than directly at the level of an ESCO or power system operator can offer the possibility of agreeing eligibility criteria between an investor and an aggregator, which has the potential to mitigate some risks and improve the risk profile of the investment.

Recommendation 9: Financial approval procedures for projects and financial flows within a P4P programme should be set up together by its initiator, aggregator and financing parties, taking into account specific financial transparency regulations in force.

This recommendation is complementary to **Recommendation 1**.

3.3.3.1.2 Failure in fulfilling obligations

Banks, insurers and pension funds are used to invest in assets or programmes where a form of 'recourse' is embedded in the structure (e.g. pool of residential mortgages, commercial properties, etc.). In the case of a P4P programme, through the mechanism of an aggregator, this becomes more difficult. Such investments will probably be categorized by investors as having a higher risk profile (read: higher cost of funding) (STH3).

Recommendation 10:Set up the financing structure of the programme, and related eligibility and risk criteria for projects, between investor and aggregator, rather than with each ESCO/individual project.

This recommendation is complementary to Recommendation 2**Recommendation 2**.

3.3.3.2 Financial aspects

3.3.3.2.1 EU solvency requirements

An insurer said that the solvency ratio, imposed by the EU, is very important. The solvency ratio is comparable to the RWA ratio for bank (risk-weighted assets – i.e. what amount of capital must a bank or insurer put in reserve relative to an investment). For insurers, however, the requirements are more stringent. (STH7).

Another interviewee stated that risk-weighted assets (RWA) are often a stumbling block as they specify in certain investment cases to set aside a high capital reserve in comparison to the return. (STH6).

Another important element on the side of the investor (in this case an insurer) is the 'solvency' requirements imposed by the EU i.e. comparable to the capital requirements (or 'risk-weighting') of banks: how much capital must be put in 'risk reserve' compared to the investment made (is an extra cost for banks, insurers and pension funds, and an additional reporting action). (STH3).

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Recommendation 11: EU solvency ratio requirements might be a stumbling block for investors to venture into large-scale energy efficiency programme investments like P4P. The initiators of the programme should take this into account by involving investors from the very start of designing the programme financing structure.

This recommendation is complementary to **Recommendation 4**.

3.3.3.2.2 Predictable cash-flows

"A critical success factor is the need for stable cash flow streams. Revenues are aggregated from different sources within the P4P programme, but an important aspect for investors will probably be the need for predictability" (STH3). This puts limitations on the type of measures to be included in the programmes but also demands the correct baseline calculation, monitoring and verification tools.

Recommendation 12: When designing P4P programmes, special attention should be paid to stability of achieved revenue streams of the foreseen energy efficiency measures and to having the right monitoring tools to support advanced financial performance M&V and valuation.

This recommendation is complementary to **Recommendation 3**.

3.3.3.2.3 Financing options

The discussion below is related to Figure 5 which is presented above in this document.

When asked if and at what level (building owners, ESCOs, aggregators, power system operators) they would possibly participate in a pilot project (e.g. via Flemish government/VEKA), STH7 reiterated an earlier comment: that they would mainly look at the level of the power system operator installing an independent private party (like an aggregator) to group and 'facilitate' energy efficiency projects (STH7).

STH6 expressed interest in the concept of P4P (and possibly participating in a pilot project) and sees a major advantage at the level of the aggregator because of the grouping, which means that the analysis and administration can be done more cost (and time) efficiently. But at the project level there are too many different risks, e.g. the power system operator level would require a more 'corporate finance approach' analysis within the bank (STH6).

STH3's chosen direction of investment goes to the level of the aggregator, rather than directly to the level of ESCOs or power system operator, because of the possibility to agree e.g. 'eligibility' criteria between investor and aggregator, which improves the risk profile of the project for the potential investor (STH3).

STH1 felt that the power system operator is the most appropriate investment level because the power system operator has a large database regarding energy consumption of consumers. Private financiers could be interested in an initiative led by the power system operator to cooperate with large building owners (read: large energy consumers). STH1 suggests a top-down solution led by the power system operator is a better solution than investing in an aggregator, which can only be successful when both ESCOs and building owners work together.

STH1 is interested to be part of a pilot project and to remain involved in the possible further development of a SENSEI P4P programme, but with an appropriate risk/return

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ratio (IRR) and caution towards the different types of risk. For the latter, it is important for STH1 to (a) have a lower limit on the investment (i.e. the downside risk is covered as much as possible) and (b) have upside potential (IRR) present (STH1).

STH5 prefers an option where existing power system operators become both aggregators and programme owners/tenderers (STH5).

Recommendation 13: Especially in a pilot phase, P4P programmes should seek the involvement of a power system operator as entry point or preferred channelling partner for investors. This is because of the data they hold on participating end consumers and because they are seen as a financially stable party.

This recommendation is complementary to **Recommendation 6**.

3.3.3.3 Stakeholders

3.3.3.3.1 Energy data provider

STH5 sees the power system operator as the key data provider. They agree with the vision that the power system operator can be both data source servicer and aggregator. Alternatively, the power system operator can be a party within the programme (fund or other structure) as a provider of data and information on energy consumption, but also as the party that can determine the measurability and value of the energy savings (STH5).

Recommendation 14: The power system operator is an indispensable programme partner as key data provider.

This recommendation is complementary to **Recommendation 6**.

3.3.3.3.2 Different investor profiles

Potential investments for banks and insurers (and certainly pension funds) should have a long-term duration (8 to 15 years or longer instead of 3 to 5 years) in order to cover banks' and insurers' long-term liabilities (STH3, STH6).

Also, size is important: certain banks and insurers will no longer look at small transactions because of the cost- and time-efficiency versus potential financial return (STH3).

Combining different investor types (senior, mezzanine, subordinated) plus guarantees (government) would probably be a good way (~securitization or structured funding) to get P4P pilots financed (STH3).

Recommendation 15: Engage the right investors with the right risk profile for each market development phase.

This recommendation is complementary to **Recommendation 5**.

3.3.3.3.3 Different risk profiles of stakeholders

STH6 suggests that a clear division should be made by type of building owners: government (local/regional), SMEs, etc, grouped into substantial numbers. Then recognize a structure in which, for example, private debt capital can be sized up to 80%

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of the financing format for government buildings, but only up to 30% for buildings of SMEs, depending on the risk profiles (STH6).

STH6 and STH3 see opportunities in P4P programmes, but suggest to start first with a pool of government buildings, grouping infrastructure projects of local and regional governments (schools, hospitals, libraries, and/or other public buildings). In other words, pilot projects when elaborated should go first through government input and participation, as a kind of 'lead-by-example' (STH6, STH3).

In such a P4P programme, with the involvement of multiple parties, it is important to have adequate transaction documents in place, defining all duties, responsibilities and rights, between the different parties, including when governmental participation is present (read: policy framework) (STH1).

Recommendation 16: In a start-up phase, government guarantees or federal/regional financial interventions will be needed to enable the 'bankability' of a P4P programme. This can be reinforced by bringing a group of public buildings, such as schools or, hospitals, to the aggregator.

This recommendation is complementary to **Recommendation 5**.

3.3.3.3.4 Aggregator

A system with aggregators as in the US, depending on the potential volumes and the number of large and/or small aggregators in the market, will possibly form too much fragmentation or too many compartments, which could lead to an inefficient operation (STH7).

In contrast to the US, STH7 sees the role of aggregation rather with the power system operators or network distributors. For potential investors such as STH7, a system with (i) existing project construction building owners/ESCOs and (ii) power system operators as aggregators (being a stable party) is easier to analyse from a risk perspective: see e.g. solvency of parties, available data, etc. (STH7).

STH3 agrees that aggregators (as in US) today need to have a combination of energy efficiency expertise and communication/marketing skills to mobilize building owners, and this is certainly not yet the case in e.g. Belgium. For them, the power system operator operating in the current Belgian energy market can be, or even is already acting as, a kind of aggregator, and as such no new structure has to be invented (STH5).

STH2 considers it important that the aggregator is a separate, independent party (compared to e.g. a power system operator acting as an aggregator, creating a risk of conflict –of –interest). STH2 suggests working via a fund structure for Belgian pension funds, where the different investment criteria of different pension funds can be met.

Recommendation 17: The programme participant acquisition process should be managed by the aggregator with market access to a large pool of candidate ESCOs, with strong expertise in both market communication and energy efficiency projects. Aggregators have to bring together (i) pooled energy efficiency projects by building types, geographic origins, industry sectors, etc. and (ii) source a combination of public and private financing from several types of investors to provide funding to those designated energy efficiency projects, via e.g. an investment platform.

This recommendation is complementary to **Recommendation 8**.

3.3.3.4 Other

3.3.3.4.1 Programme scale

There is a difference in investment strategy between banks and insurers regarding energy efficiency projects: banks can more easily deal (allocation, follow-up, administration, risk management, etc.) with smaller projects and thus with withdrawals/refunds from individual customers, whereas insurers prefer grouped projects and thus grouped repayments (with a higher degree of repayment capacity and risk spread) (STH7).

In this sense, insurers see merit in a concept such as SENSEI P4P programme because of larger packages/projects and higher certainties regarding repayment capacity, e.g. with a performance guarantee via the power system operator (correct hedging and certainties) (STH7).

P4P is a positive factor towards grouping efforts and projects (analogous to group purchasing), quantified projects at rates better than today's ESCO's one-to-one projects. Today there is too much fragmentation in projects (often limited to a size of €1 million), so that at a certain point the cost of the analysis, administration and follow-up becomes too high for a bank, and the return on investment may no longer be worthwhile. Grouping means the analysis and administration can be done more efficiently (STH6).

STH5 is open to grouping of projects because then all aspects become more efficient, especially towards potential terms of funding opportunities (STH5).

The concept gives the advantage of scale and diversification to partially offset possible under-performance among some end-users, but effective savings must ensure timely repayment of the investment. Financing of energy efficiency projects through ESCOs is still limited in the EU and often still concerns small-scale projects (STH1).

The energy efficiency market is far from its potential development. There is a need for much greater energy efficiency investment projects (grouped or individual), and the market is far too small at the moment (stressed several times by almost all interviewees).

Recommendation 18: A large scale P4P programme is required for optimal cost-efficiency. The programme should be managed by an aggregator with strong expertise in both market communication and energy efficiency.

This recommendation is complementary to **Recommendation 8**.

3.3.3.4.2 Non-energy-saving benefits

There is a need for a comprehensive understanding of energy retrofits of building projects. This should go beyond energy efficiency (as only one aspect) to cover aspects such as comfort, well-being, health, maintenance, circular economy, etc. An comprehensive approach of energy efficiency projects that also looks at other benefits, would avoid sub-optimal choices in the long term.

Recommendation 19: Adopt a comprehensive approach of energy retrofit building projects, that are not only about energy efficiency, but also encompass other non-financial benefits.

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This recommendation is complementary to **Recommendation 3**.

3.3.3.4.3 Environmental, social and corporate governance (ESG) and socially responsible investing (SRI)

The ESG agenda also needs to be reflected in the profile of the tendering party or other stakeholders (STH3). The same applies to the current attention being paid to SRI.

Recommendation 20: Make the P4P concept more concrete and amenable, especially within the current momentum of ESG and SRI.

3.3.3.4.4 Measurement and valuation in an EU P4P programme

One critical success factor, which recurred during the Q&A session with almost all types of investors, is the question of measurability and valuation of energy efficiency savings at the level of building owners/ESCOs (and potentially also at the level of the network with the power system operator). The concern is about how to correctly and appropriately monitor and track performance (energy efficiency) at building level, because this will form an important element of risk analysis (performance risk, default risk, predictability of cash flow, control risk, ex-post reporting, etc.) for potential investors (STH1, STH5, STH3, STH6).

Recommendation 21: A well-designed M&V plan is key to measure performance and filter out the different risk components in case of under- or over-performance.

This recommendation is complementary to **Recommendation 3**.

3.4 Summary

3.4.1 Summarized recommendations

In sections 3.2 and 3.3 above we have sequentially provided the results of the internal negotiation games and the external stakeholder consultations. In order to make these recommendations better readable, we have grouped them per topic underneath.

3.4.1.1 Programme set-up

1. Make sure that a P4P programme has sufficient critical mass to cover all transaction costs. This implies a sizeable portfolio having a decent share of large buildings (commercial, public, …). (R8)
2. Standardize the energy retrofit contracts, in analogy with power purchase agreements for renewable energy installations, to facilitate the development of a large pipeline of green assets that can be easily and cost-efficiently bundled together. (R20)

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3. Make a detailed regulatory risk analysis and assign the risks of a changing regulatory framework to a party willing/able to assume these risks. (R4)
4. Draft unambiguous clauses that establish a clear stakeholder allocation of the risks of non-fulfilment of obligations. (R2)
5. Use state of the art monitoring tools ("M&V 2.0") to enable transparent and trustworthy programme management. (12)

3.4.1.2 Financing a P4P programme

6. Engage well-targeted investors with matching risk aversion profiles for each market development phase. (R5, R16).
7. In a start-up phase, earmark government guarantees to enable the 'bankability' of a P4P programme. (R17)
8. Give the start-up phase a boost by having a pool of public buildings, such as schools or, hospitals, etc, integrated into the building portfolio. (R17)
9. When designing P4P programmes, make sure that the revenue streams of the foreseen energy efficiency measures are predictable enough to attract external financiers. (R12)
10. Adopt a valuation approach in line with an investor's valuation standards. (R3)
11. Set up the financing structure of the programme between investor and aggregator, rather than with each ESCO/individual project. (R10)
12. Double-check that EU Solvency ratio requirements are not a stumbling block for investors to venture into large-scale energy efficiency programme investments like P4P. The initiators of the programme should take this into account by involving investors from the very start of designing the programme financing structure (R11).
13. When financing a P4P programme make use of the current momentum of ESG and SRI funds. (R22)

3.4.1.3 Role and competence of the aggregator

14. A standardized assessment procedure must be used when deciding whether to include an energy efficiency project into the aggregator portfolio (R1)
15. The programme participant acquisition process should be managed by the aggregator with market access to a large pool of candidate ESCOs, with strong expertise in both market communication and energy efficiency projects. Aggregators have to bring together (i) pooled energy efficiency projects by building types, geographic origins, industry sectors, etc. and (ii) source a combination of public and private financing from several types of investors to provide funding to those designated energy efficiency projects, via e.g. an investment platform. (R18, R19)
16. Adopt a comprehensive approach of retrofitting buildings, that goes beyond energy efficiency, and also encompass other non-financial benefits. (R21)

3.4.1.4 Involvement of power system operators

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17. Even if power system operators are (currently) not interested in participating in a P4P programme for the benefit the programme may bring to the power system, they should be involved as a programme partner, for the mere fact that they are an indispensable key data provider. (R15).
18. Especially in a pilot phase, P4P programmes should seek the involvement of a power system operator as entry point or preferred channelling partner for investors. This is because of the data they hold on participating end consumers and because they are seen as a financially stable party. (R13)

3.4.2 P4P pilots

It is important to stress the context of limited information – i.e. the lack of a convincing example of a P4P programme in a European context – in which especially the external stakeholders had to contribute to the results:

The stakeholders gave their feedback based on the presentation of the *theoretical* SENSEI P4P concept, including a brief reference to existing P4P examples in the US.

Stakeholders based their opinions and expectations on their own experience with the existing market for energy efficiency, programmes and financial schemes in their own EU Member State context.

Stakeholders raised many questions on the practical aspects of rolling out P4P programmes and on the feasibility of P4P in an EU Member State context.

The context of limited information is unavoidable but evidently has an impact on the results generated by the consultations. The best answer to reduce the existing information gap, and natural next step in the analysis, should be to start one or more P4P pilots in the EU, designing the programme(s) with the above sets of recommendations in mind. This is also the conclusion of the interviewed stakeholders.

Most are interested in participation and, as indicated in the list of recommendations, have specific ideas on elements needed in the first pilots.

The process towards P4P pilots could follow the following stepwise approach:

Step 1: Design a detailed model for a P4P programme including all market parties involved, role descriptions and contractual and financial flows. The model should take into account the recommendations resulting from the internal negotiation games and external stakeholder consultations. The next chapter 4 presents such a model.

Step 2: Select in collaboration with a European system operator an existing energy efficiency programme for which energy savings are calculated and rewarded in a conventional way, and for which a good amount of energy performance data is available. Next, use the performance data and other information to estimate the probable energy savings if the programme had been organized as a P4P programme. Finally, analyse the results and improve the details of the initial model of the P4P programme.

Step 3: Set up a first concrete P4P programme organized according to the model designed in the previous steps. For this, bring together a group of all types of stakeholders and select an existing energy efficiency programme that could be replaced by a P4P programme. Most stakeholders indicated that a first pilot should include the system operator and focus on public buildings and state guarantee for financing.

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In the next chapter, we describe a 'basic P4P model' that might work in the EU. The model was developed taking into account the recommendations and insights of the previous chapters of this report.

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4 POTENTIAL STRUCTURE OF A P4P PROGRAMME IN THE EU, WITH FOCUS ON INVESTORS

4.1 Basic P4P model

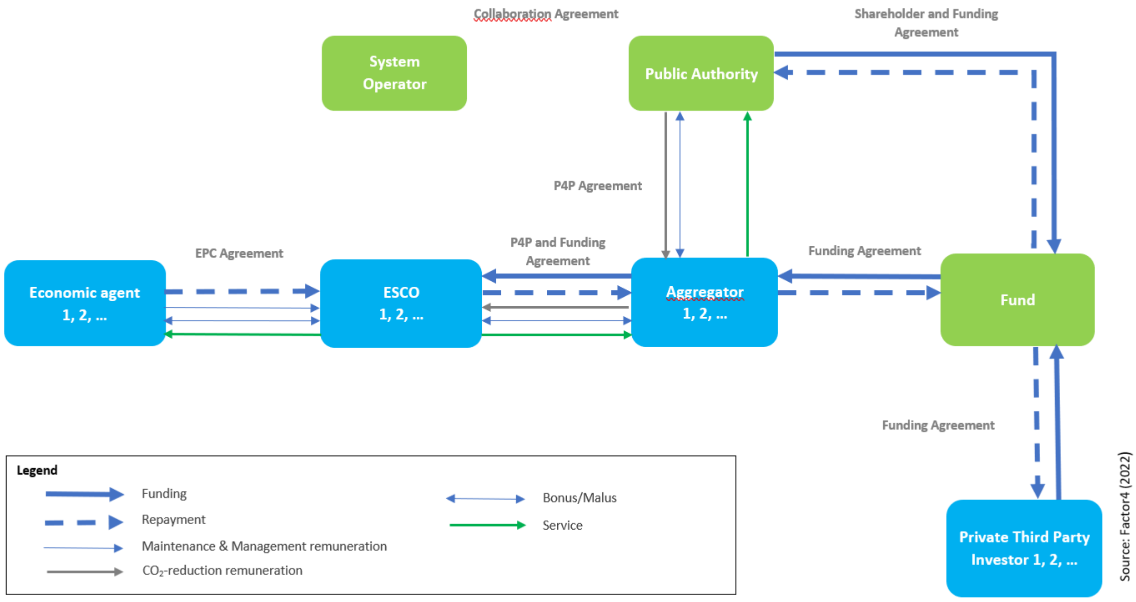
4.1.1 Overview

Figure 11 presents a potential P4P model in the EU, named 'Basic P4P model' in this chapter. In this model:

The funding goes to the aggregator – the investor relationship is equivalent to Option B in Figure 5.

The green boxes are public entities, the blue ones are private entities. As public money – e.g. CO_2 reduction remuneration (see further) – is involved, the private entities with a direct link to the public entities, i.e. the aggregators and the private third-party investors, will have to be assigned via a public tender procedure.

Figure 11: Basic P4P model



We explain the basic model by discussing the role of its main actors:

- Aggregator (4.1.2)
- ESCO (4.1.3)
- Public authority (4.1.4)
- Private third-party investor (4.1.5)
- Fund (4.1.6)

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4.1.2 Aggregator

4.1.2.1 Overview

Aggregators are at the centre of the basic P4P model. They will coordinate the realization of energy efficiency projects in different sectors defined by the public authority during the programme period (e.g. five years). We define in this chapter energy efficiency projects as projects focusing on the reduction of CO_2 via energy efficiency measures and/or renewable energy sources such as solar energy.

By 'sector' we mean a cluster of 'economic agents':

With a specific type of economic activity, e.g. all offices with a floor surface up to 5.000 m², all hairdressers or all households living in apartment blocks

In a specified geographic area, e.g. region or country

In the following paragraphs we describe some boundary conditions for the aggregator:

The CO_2 reduction remuneration that the aggregator receives from the public authority, and that it will partially transfer to the ESCOs (4.1.2.2);

The public procurement of the aggregator (4.1.2.3).

The P4P agreement between the public authority and the aggregator (4.1.2.4).

The funding agreement between the fund and the aggregator as well as between the aggregator and the ESCOs (4.1.2.5);

4.1.2.2 CO_2 reduction remuneration

4.1.2.2.1 Overview

The aggregator receives from the public authority an agreed CO_2 reduction remuneration calculated via the following formula:

CO_2 reduction remuneration = CO_2 reduction price x Measured CO_2 reduction

whereby

CO_2 reduction price: this price is based on the offer of the Aggregator who is assigned after via a competitive public procurement (4.1.2.3). The agreed CO_2 reduction price is an important part of the P4P agreement between the public authority and the aggregator (4.1.2.4).

In the following paragraphs we discuss in more detail the measured CO_2 reduction (4.1.2.2.2), the fact that the remuneration system will ensure high cost efficiency (4.1.2.2.3) and the remuneration system recommended in the first programmes (4.1.2.2.4):

4.1.2.2.2 Measured CO_2 reduction

The Measured CO_2 reduction is the CO_2 reduction measured at the economic agents in the sector in which the aggregator implements energy efficiency projects via the ESCOs.

In general, the procedure for measuring the CO_2 reduction (method, assumptions such as the lifespan per type of investment, etc.) is **laid down in the P4P agreement** between the public authority and the aggregator.

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In principle, only the CO_2 reduction during the programme period is considered. However, in case of investments, the expected future CO_2 reduction due to this investment during its remaining life is 'measured' via an extrapolation of the measured CO_2 reduction during the programme period. By **taking into account the lifespan of the investment** (e.g. most HVAC investments have a lifespan of 20 years, insulation measures 40 years, etc.), the aggregator is motivated to realize energy efficiency projects with long-term measures. Factor4 applied this approach already successfully in its Building Performance Contracting method where ESCOs are stimulated taking long term measures, and the approach is also applied in P4P programmes in the US (Table 10).

Table 10: effective useful life in P4P programmes in the US

Measure	Sector	Effective Useful Life
Lighting	Com / Res	12
HVAC Retrofit	Com / Res	15
Heat Pump Retrofit	Com / Res	15
HVAC Maintenance	Com / Res	3
Chillers	Com	20
Refrigeration	Com / Res	12
Building Envelope	Com / Res	20
Pumps/Motors/Drives	Com	15
	Res	10
Smart Thermostat (New Install Only)	Res	9
Water Heater	Com	15
	Res	10
Storage	Com / Res	1
Controls or Behavior Based Interventions	Com / Res	1

* Aggregators can propose additional EULs that are supported through work papers or eTRM data for approval by market sponsor.

Source: Presentation of Matt Golden of Recurve, in the frame of the Green Week workshop on May 31 2022

The CO_2 reduction can be estimated assuming an average CO_2-emission reduction per kWh saved, or can take into account also the **time/hour** (month, day of the week and hour) **hour when the kWh is saved**. The CO_2-reduction per kWh saved during peak hours – when a part of the electricity is produced via gas power plants – is for instance much higher compared with a kWh saved during non-peak hours where the share of electricity generated by renewables will be higher.

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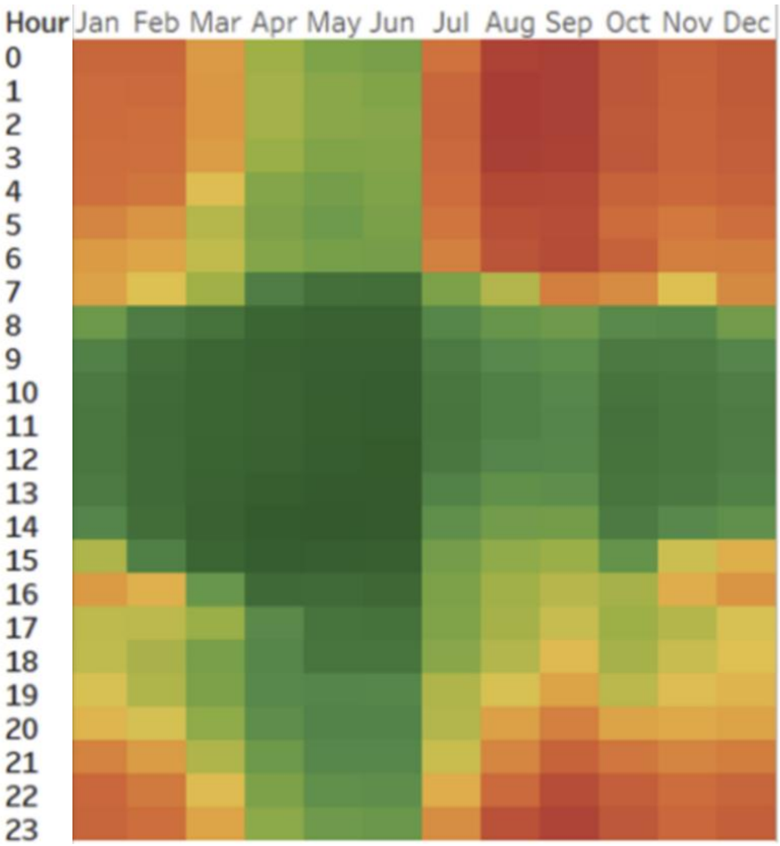
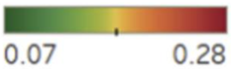
Figure 12 presents for example the expected CO_2 intensity in California per kWh consumed 2030. The figure shows clearly that the CO_2 reduction per kWh saved will vary in function of the month and the hour in the day when the electricity is saved.

Figure 12: expected CO_2 emission per kWh consumed in California in 2030



Legend



Source: Golden, M. et al. (2019)

Figure 13 presents the avoided CO_2 emission and the avoided utility costs per consumer in an energy efficiency programme in the US in 2020 in function of the hour of the day. The avoided CO_2 emission and avoided utility cost per consumer is around 18:00 in the evening compared with 12:00 at noon more than 5 times and 10 times higher, respectively. The graph illustrates again the importance of taking into account the time when a kWh is saved when measuring CO_2 reduction.

Moreover, and especially when the avoided utility cost is not or only partially integrated in the electricity price (e.g. by increasing the kWh price during peak hours), it is in the interest of the System Operator to join the programme and to subsidize the saved kWh during hours when the avoided utility cost is high.

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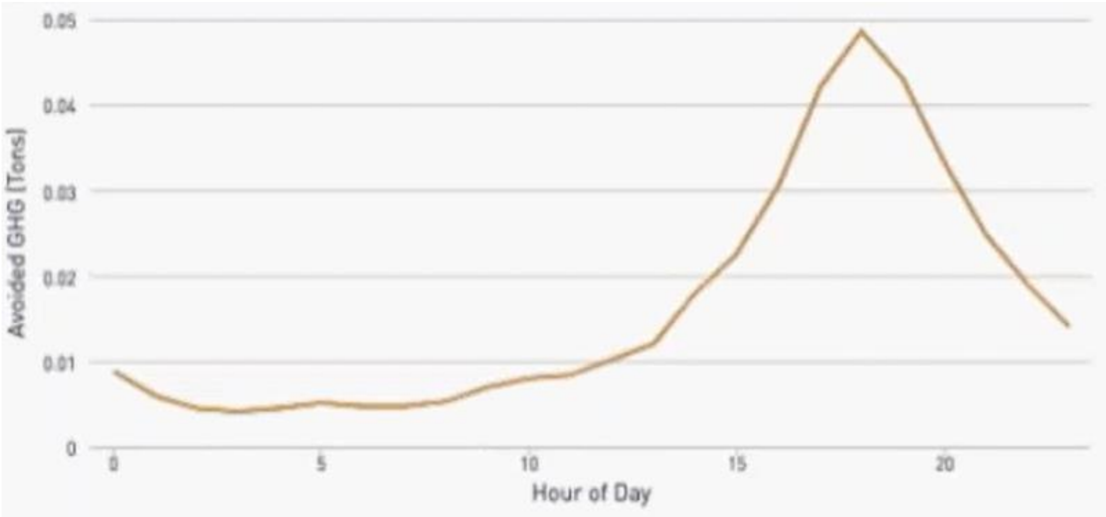
In that case, the remuneration of the Aggregator would be composed out of two principal components:

CO_2 reduction remuneration

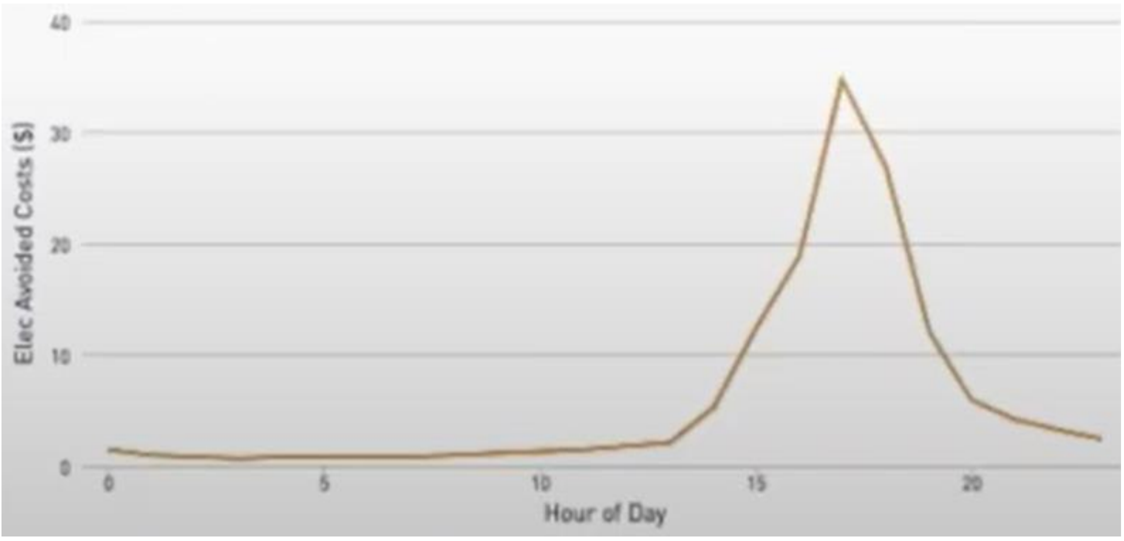
Remuneration for the avoided utility costs

Figure 13: avoided CO_2 emission and utility costs per consumer in an energy efficiency programme in the US in 2020

Avoided CO_2 emission per consumer (Tons)



Avoided utility costs per consumer ($)



Source: Golden, M. (2018)

Evidently, when time/hour of the kWh saved has to be taken into account, more advanced M&V techniques and tools will have to be used. A possible tool is FLEXmeter of the US-based company Recurve that allows the measurement of the electricity load

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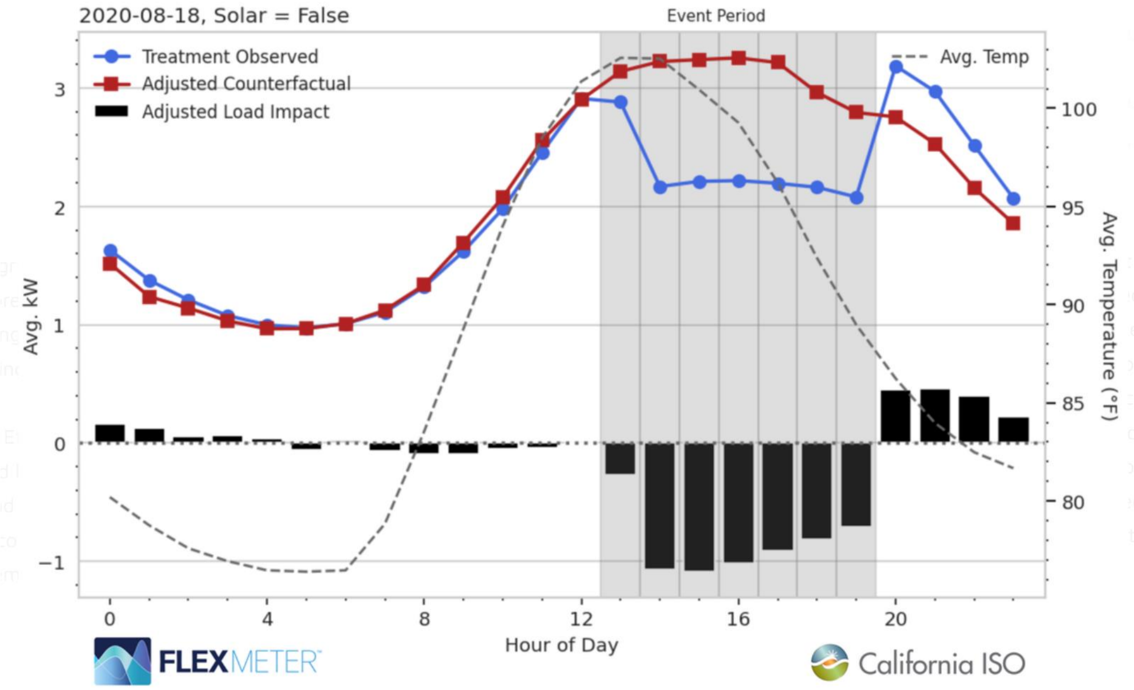
impact – and thus also the avoided CO_2 reduction and utility costs - of a P4P programme each hour of the day.

The red line in Figure 14 presents for instance the load that on August 18th 2020 could have been expected without the programme while the blue curve is the observed/measured load. The difference is the load impact that is also visualised by the black bars at the bottom of the graph.

Figure 14: Measurement of load impact of P4P programme



4.1.2.2.3 Remuneration system ensures high cost-efficiency

This model ensures cost-efficiency of the subsidy spent by the public authority via the CO_2 reduction remuneration for the following reasons:

The aggregator is a private company and will try to maximize its profit by selecting the energy efficiency projects in its sector that will deliver the greatest CO_2 reductions for the lowest cost.

In the basic model, ESCOs technically implement the projects. The aggregator will thus engage only those ESCOs that are capable of realizing projects that generate the highest CO_2 reductions for a minimal CO_2 reduction remuneration paid by the aggregator to the ESCO.

It is in the direct interest of the aggregator to maximize the real CO_2 reduction generated by the selected projects, as it is the measured CO_2 reduction that determines the CO_2 reduction remuneration the aggregator receives. For this reason, the aggregator will conclude P4P agreements with ESCOs that include a minimum agreed CO_2 reduction and a bonus/malus remuneration in case of over- or under-performance.

Finally, as will be explained further, the aggregator and the CO_2 reduction remuneration are determined via a competitive process, ensuring a competitive minimum CO_2 reduction remuneration paid by the public authority.

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4.1.2.2.4 Recommended remuneration system in the first Programmes

The remuneration of the aggregator is very dependent of the realised CO_2 reduction. Especially in the first P4P programmes, there will be an major uncertainty about the CO_2 reduction that is feasible. This will generate an important risk in these projects and thus also an important risk fee charged by the aggregator which in turn will reduce the cost-efficiency of the programme.

For this reason, it is probably recommended to remunerate the aggregator in the first pilot projects only partially in function of the realised CO_2 reduction (e.g. CO_2 reduction remuneration = Measured CO_2 reduction x 50% of the CO_2 reduction price) and to use the other 50% for the remuneration for the tasks the Aggregator performed, independently of their actual CO_2 reduction. The first P4P contracts thus would be partially performance/output based and partially input based.

4.1.2.3 Public procurement

As the aggregators receive public money, they will have to be assigned via a public procurement procedure. The following procurement procedures could be considered:

The first P4P programmes could be considered as research projects, for which in many jurisdictions <u>no formal procurement procedures</u> are required. However, as in this case there is no competition, it is possible that they will be challenged in court by other parties who were not part of the programme.

A safer way of procuring the first P4P programmes is a <u>competitive dialogue</u> where the public authority in collaboration with selected potential aggregators develop the structure of the P4P programme, after which the participating aggregators can make an offer.

Once the organization of a P4P programme becomes clearer, the best procurement procedure is most probably a <u>competitive procedure with negotiation.</u> We will assume further in this chapter that this procedure is applied.

A competitive procedure with negotiation is a public tendering procedure where the aggregators are selected in two steps:

In the first step, the selection phase, a limited number (e.g. 3-6) of candidate aggregators are selected based on criteria such as the quality of the proposed project team, references, financial solvency, etc.

In the second step, the award phase, the selected candidate aggregators receive a quotation request containing the following information:

- A detailed description of the different sectors in which a P4P programme will be rolled out
- The award criteria, e.g.:
    - A price criterion, i.e. the requested CO_2 reduction price, expressed in €/tonne CO_2, for reducing CO_2 in the sector. This criterion could count for, for instance, 50% of the points.
    - Quality criteria, i.e. the quality of the proposed programme plan. The programme plan describes how the aggregator will concretely implement the programme in a sector. Qualitative aspects are, for instance, the level of detail of the proposed plan and its feasibility.

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- The P4P agreement (4.1.2.4) and funding agreement (0) that will be concluded between the aggregator and the public authority.

The aggregator with the best offer for a sector – i.e. the highest total score for the award criteria – will implement the P4P programme in this sector.

4.1.2.4 P4P agreement

The P4P agreement between the aggregator and the public authority includes:

The key performance indicators that will have to be fulfilled, e.g. on reporting, service quality, etc.

The CO_2 reduction price requested by the aggregator

The CO_2 reduction target that will have to be realized in each sector and the bonus/malus that is applicable. The CO_2 reduction target could be for instance 100,000 tonnes CO_2 reduction, with a bonus of 5 €/tonne in case of over-performance and a malus of 10 €/tonne in case of under-performance.[14]

The P4P agreement should fix the procedure for adjusting the basic parameters (e.g. the CO_2 reduction price and the CO_2 reduction target) in case of changing external circumstances: see Table 11. This procedure is needed to decrease the risks for the aggregators generated by external circumstances, and thus also the risk fee charged assumed by them. Including a well-thought adjusting procedure will increase the cost-efficiency of the programme.

The procedure is fixed by the public authority and should evidently be known by the aggregators when they make an offer.

Table 11: Examples of possible changing external circumstances

External circumstance	Example of the impact
Energy price	If energy prices decrease, economic agents are less motivated to save energy, so the CO_2 reduction price should increase and/or the CO_2 reduction target should decrease
Investment costs	If investment costs on the market increase, the CO_2 reduction price should increase
Business cycle	In case of a recession, hence decreased willingness of economic agents to invest, the CO_2 reduction price should increase and/or the CO_2 reduction target should decrease
Building use	In case of working from home (and less work at the office) because of lockdowns (cf. Covid-19) the

[14] This CO_2 reduction target is a performance target that - to a certain extent - corresponds with the guaranteed energy savings in an energy performance contract (EPC) project. However, with a P4P Programme this performance target is fixed by the government. Furthermore, the applicable bonus/malus should be kept low, in contrast with an EPC project where the malus corresponds for instance with the entire energy price. The reason for the low bonus/malus in case of a P4P Programme is that it is difficult to estimate in advance the total CO_2 reduction potential in a Sector. Therefore a high bonus/malus would - given the unpredictability of the possible CO_2 reduction - generate a (very) high risk fee which would result in a low cost efficiency of the Programme.

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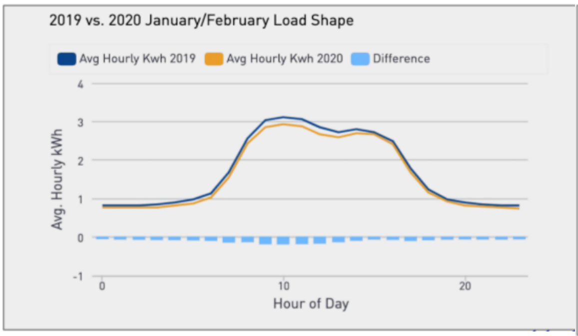
External circumstance	Example of the impact
	energy consumption in houses will increase and in offices will decrease

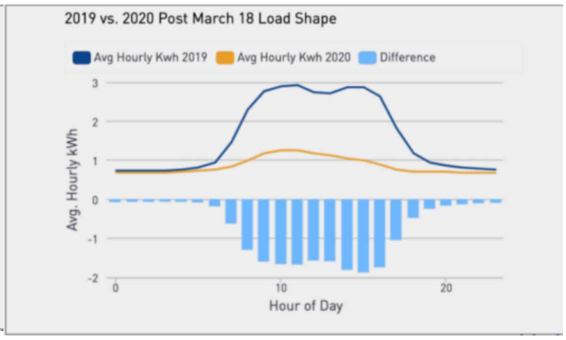
Figure 15**Error! Reference source not found.** illustrates for instance the impact of Covid-19 measures (lock down etc.) on the electricity load profiles of dentist offices in the US.

Figure 15: Example of the impact of Covid-19 on electricity profiles of dentist offices

Jan-Feb 2020 compared with Jan-Feb 2019, where both non-Covid-19 periods



March 2020 compared with March 2019, where March 2020 is a Covid-19 period



Source: Matt Golden (2022)

The reduced or increased loads due to changing external circumstances should evidently be filtered out when estimating the measured CO_2 reduction. The procedure followed by Recurve for doing this is based on the statistical comparison of the load of the actors participating in the P4P programme with the load of non-participating similar actors (same sector, same climate zone,…) during the same period and thus also impacted by the same external circumstances.

4.1.2.5 Funding agreement

The aggregator funds the ESCO's investment in projects, and should conclude a funding agreement with the ESCO.

The aggregator in turn receives funding, based on the rules laid down in a funding agreement, from the fund, which itself receives funding from private third-party investors and the public authority. The fund format will also offer aggregators the possibility to source different types of funding via debt investors with different risk profiles and return requirements.

The interest rate of the funding will be low because:

Many private investors such as pension funds are looking for green investments, which will decrease the requested rate.

The public authority can further decrease the interest rate, for instance by bearing a part of the funding risks of the fund and thus decreasing the risk prime asked by the private third-party investors.

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4.1.3 ESCO

In the basic P4P model, the aggregator transfers a part of this remuneration to ESCOs in order to incentivize them to set up energy efficiency projects in sectors that otherwise would not be profitable and thus would not take place.

The ESCO and aggregator will conclude a P4P agreement and funding agreement. An agreement can be a general framework agreement or an agreement for a specific project.

The ESCO in turn concludes an energy performance contracting agreement with an economic agent for the specific project. This lays out the minimum energy cost savings that the ESCO guarantees, via a bonus/malus system. The economic agent does not have to fund the investments of the energy efficiency project and only pays the ESCO a yearly remuneration, composed of repayment, maintenance and management fees and a bonus/malus fee.

4.1.4 Public authority

The public authority capitalizes the fund at the required equity level, especially at the start of the fund in order to attract private third-party investors at senior/subordinated debt level. The public authority acts as 'primary' shareholder and receives a 'double dividend', i.e. financial dividend and policy dividend via CO_2 reduction. It holds the starting equity of the fund and possible additional debt.

Responsibilities, duties, agreements, and representations will form part of a shareholders and funding agreement between the public authority and the fund.

The public authority is also responsible for the tendering of the aggregators (4.1.2.4) and the follow-up of the P4P agreements concluded with the aggregators, including for instance the payment of the CO_2 reduction remuneration and the bonus/malus fee.

As discussed, including the system operators in the overall programme is recommended, especially in the start-up phase. For this, the public authority and the system operator should conclude a collaboration agreement.

4.1.5 Private third-party investor

The private third-party investors (institutional investors at senior/subordinated debt level) finance the fund and receive a repayment according to the risk level and the market conditions.

They are assigned by the fund, which is a public entity, via a procurement procedure. The award criteria will be the financing cost that depends on the:

Risk profile of the involved actors: aggregator, ESCO and economic agent,…

Market circumstances, e.g. reference interest rate

Extent to which financing risks are taken over by the public authority

4.1.6 Fund

4.1.6.1 Organization

It is recommended to separate the fund from the aggregator, for several reasons:

Funding is a <u>completely different (core) activity</u> and requires other skills and staff than promoting, coordinating and realizing energy efficiency projects. Bundling these activities in one entity, e.g. an aggregator, would:

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- Reduce the number of possible aggregators and thus the competition during the procurement process
- Force the formation of 'consortia' composed of a technical aggregator *and* a fund, which would increase the coordination cost.

The different sectors (e.g. offices, retail) require targeted aggregators with specific technical and communication skills needed for coordinating energy efficiency projects in these sectors. There will be many aggregators, but only one fund is recommended. This is another reason to separate the fund from the aggregators.

At least two parties are important for managing the fund properly during the lifecycle of investments:

Portfolio servicer (funding positions) is entrusted with the servicing and monitoring, by collecting and following up the periodical repayments by the aggregators, and by alerting the fund manager in case of delayed payments, defaults and other deviations from the reimbursement schedule.

Fund manager is responsible for:

- General corporate services to the fund, such as accounting, tax, internal audit, link with external audit, asset and liability management etc.
- Tasks related to the energy efficiency projects' funding positions:
    - Overview of funding portfolio/positions management and administration
    - Monitoring risk management
    - Strategy and performance
    - Reporting
    - Research.

4.1.6.2 Capitalization and refinancing

Initially, the fund will be **capitalized** via equity funding by the public authority. Over time, once a historical performance track record is established, a combination of public/private capitalization will become possible.

Refinancing solutions (such as securitization, green bonds or forfaiting) can be considered, for example in a later phase depending on the development of the Fund, when:

The Fund becomes mature in size, duration and performance

Market conditions favour refinancing operations.

The aim of a refinancing solution is to increase the leverage of the public funds committed to the fund, but should not be essential to the orderly working nor the viability of the fund as such.[15]

By refinancing the outstanding funding positions, the rotation of the funds can be accelerated. The implementation of this component is conditional on the creation of a sufficiently large portfolio of funding positions and favourable economic conditions.

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[15] Public funding: here we mean the repayment of the funding (could be capital under the format of equity, subordinated debt, etc.) a Public Authority has provided to the Fund, and which can be repaid/or pay dividend once the proceeds from the refinancing exercise is realized and paid (this is the 2nd element of "revolving" Fund).

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An alternative to refinancing could be that the public authority increases its equity stake in the fund in order to attract additional debt with private third-party investors.

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4.2 Possible adaptations of the basic P4P model

4.2.1 Organization of the fund

4.2.1.1 Separate funds

In the basic model, the fund can already be structured in such a way that certain groups of energy efficiency projects are not mutualized[16] with each other. This structuring can be increased by creating separate funds. A disadvantage of this approach is, however, a higher set-up, management, servicing and administrative cost.

4.2.1.2 Revolving fund

The fund can be structured as a revolving fund, becoming a flexible finance solution that is self-replenishing. A revolving fund uses interest and principal payments on existing project funding positions to fund new bundles of projects. Evidently, the public authority and/or the private third-party investors have to agree with this principle. If the market conditions are favourable, a second level of 'revolving' solution would be refinancing (see above).

4.2.2 More direct funding

4.2.2.1 Direct funding of the aggregators by private third-party investors

Direct funding of aggregators – instead of working via a fund – is one possible adaptation. Since one of the primary tasks of the aggregator is bundling projects, private third-party investors with an extensive knowledge and experience with project finance analysis could prefer to fund certain aggregators directly.

4.2.2.2 Direct funding of ESCOs by a fund

The fund might directly finance the investments realized by the ESCO, without transferring the financial flow via the aggregator. This could reduce the risk fee of the funding because the aggregator is removed from the funding process, and thus also the risk associated with its possible insolvency. However, the funding becomes more complex for the fund as there is no bundling.

4.2.2.3 Direct funding of economic agents by a fund

The fund might directly finance the investments of the economic agent. The economic agent pays the investments to the ESCO after the provisional acceptance of the investment. The investment is consequently booked at the economic agent 'on balance sheet', and not 'off balance sheet' as would be the case when the ESCO is funded for the realized investment.

This increases the debt of the economic agents, which would be a disadvantage for some. In many cases, however, the overall interest rate paid by the economic agent will be lower in case of 'on balance sheet' financing, which is an advantage.

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[16] In "finance" terms, mutualization means that groups of assets with different characteristics and specifications are used to repay whatever debt outstanding coming from the investors.

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4.2.3 Other operational options

4.2.3.1 The aggregator realizes the energy efficiency projects

In the basic P4P model, the aggregator outsources the technical realization of the energy efficiency projects to ESCOs. Evidently, the aggregator could also realize (part of) the projects directly.

5 ANNEXES

5.1 Annex 1: Literature

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