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Stakeholders View on Commercial Benefits for Energy Neutral Refurbishment of Let Properties

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ABSTRACT

In Europe, the DIRECTIVE 2010/31/EU requires increasing the number of nearly zero energy buildings. The existing building stock needs to be included in order to achieve the 2020 EU environmental targets. The main barriers of energy neutral refurbishment of existing non-residential buildings appear to be financial rather than technical, next to a number of other extrinsic factors that do not stimulate such an investment. While a business case for new energy neutral buildings is believed to exist, controversial opinions can be found with respect to refurbishment of existing large buildings. Let properties, in particular, have a harder-to-justify business case because of contractual agreements between landlord and tenant: the former is usually accountable for renovation and the latter for energy bills.

The present study aims at providing an overview of the barriers and benefits of energy neutral refurbishment according to relevant stakeholders. Through interviews with real estate investors, energy service companies and tenants, the main interests and risks encountered today to undertake deep energy retrofit as well as technical constraints were investigated. Subsequently, a roundtable discussion was organized with the interviewed real-estate investors. During the roundtable, the investment needed to refurbish an existing office building, meeting the zero energy target was presented and different strategies to improve the financial attractiveness of energy retrofitting were discussed.

The study has shown that combining different benefits in the renovation is fundamental to convince investors. When the design provides additional benefits, such as increasing the rent, or allocating an energy budget to the tenant, the refurbishment can become feasible. Ultimately, a screening-checklist is proposed for a qualitative estimation of the potentials offered by a given building for a feasible energy neutral refurbishment.

Keywords: *energy neutral, deep building renovation, stakeholders*

1. INTRODUCTION

Of all the large building stock in Europe, only about 1.2% is renovated and about 0.1% demolished in any given year (Energy Performance of Building Directive, 2013). Approximately 1% of new constructions are added to the existing stock and since buildings are long-term assets, designed to function for at least 50 years, it is foreseen that 75-90% of those standing today will remain in use in 2050. Given the fact that energy use in buildings represents about 40% of Europe's total energy consumption and CO_2 emission (European Commission, 2008), deep energy retrofit should increase strongly, aiming at a rate of at least 2% yearly and with no less than 60% of energy savings (European Commission, 2015). Both the quality and the speed of refurbishment need to improve. This is why this study addresses the zero energy refurbishment, as a way to analyse a high, but soon required, energy goal. Here the term zero energy refers to a building with zero net energy consumption, meaning that total amount of energy used by the building on an annual basis, is roughly equal to the amount of renewable energy created onsite (Torcellini et al., 2006).

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Contrary to the case of refurbishment, the business case existence for new buildings to achieve the zero energy target is not subject of discussion. This is not only because of the return of investment new buildings can offer, but mainly because energy neutrality will be a compulsory practice for all new buildings from the year 2020 (European Commission, 2010). A rather complex business case concerns let properties. Rented properties in The Netherlands host 32% of Dutch residents (EUROSTAT, 2016) and 63% of office buildings (Rijksdienst voor het cultureel erfgoed, 2013). The contractual agreement for these properties usually considers the building owner accountable for renovation costs while the tenants for energy bills.

Under this condition, the present study analyses barriers and opportunities of the energy neutral refurbishment according to relevant stakeholders. Knowing the perspective of actors involved in the decision-making and design processes, as well as the one of the users, can help policy makers and designers achieving the zero energy target. First, the main interests and risks encountered today to undertake deep energy retrofit as well as technical constrains, were investigated, through interviews with real estate investors, energy service companies and tenants. Subsequently, a roundtable discussion was organized with the interviewed real-estate investors. Finally, a screening-checklist is proposed for a qualitative estimation of the opportunities of a given building for a feasible zero energy refurbishment.

2. METHODS

The method to discuss the viewpoint of some relevant stakeholders on the zero energy refurbishment of let properties, included two phases: first a set of interviews were conducted, to identify barriers and opportunities; then a roundtable discussion with different real-estate investors was organized, to evaluate the proposed business cases.

2.1 Interviews

For the scope of this research, a general interview guide approach (Turner, 2010) was chosen. A list of questions was prepared but only used as outline to assure covering the intended topics. A total of 9 interviews were conducted covering the following topics:

- Personal knowledge of energy neutral concepts applied to existing buildings;
- Drivers for refurbishment and drivers for zero energy refurbishment;
- Opportunities (business/ market/ design/ innovation related) of zero energy refurbishment;
- Barriers for zero energy refurbishment.

The interviewed stakeholder were investors, designers, real estate experts, energy service companies (ESCOs), tenants.

2.2 Roundtable discussion

At the roundtable discussion the following was presented to investors:

- A case study design, aiming at determining the interventions and the costs needed to refurbish an existing office building, meeting the zero energy target;
- A set of strategies studied using Monte Carlo simulations for risk and sensitivity analysis;

The methods for the zero energy design and the Monte Carlo simulations, can be found in Greco et al. (2016).

The roundtable discussion was structured as follows:

- Introduction/brainstorming session on barriers for the zero energy refurbishment of commercial buildings;
- Presentation of the case study, model and strategies;
- Model inputs change, using participants' suggestions;
- Running of the improved Monte Carlo simulations;
- Discussion of new results;
- Wrap-up expressing participants' vision on the future of zero energy refurbishment.

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2.2.1 Case study design

The case study presented to investors consisted of a single-tenant Office building from 1980, occupying a gross floor area of approximately 35,000 m^2. For this, it was initially estimated a price of about 12 mln € to upgrade from energy label G to zero-energy, with a payback time of 18 years and a NPV equal to 3.27 mln €.

2.2.2 Strategies

The deterministic analysis that brought to the results above mentioned was carrying a certain degree of uncertainties, related to volatility of the variables used as inputs. Therefore, a stochastic model was made, in order to take into account such uncertainties, allowing for a more objective discussion with investors.

The following strategies were proposed (further explanation follows below):

- Base Case
- Budget Allocation
- Increase of surface
- Combination

All the strategies describe a renovation consisting of the minimum interventions needed to reach zero energy with a rent within the market range for that specific location. The base case represents today's common practice, where the owner pays for the renovation and the tenant for the energy bills. In the budget allocation strategy the tenant pays a quota that is equal or smaller than the previous energy bill, which is added to the competitive market rent. The owner officially pays for energy, but with zero energy buildings the only energy to be paid is for backup system (lack of renewable energy supply) and grid connection. Should the tenant demand too much energy, he would need to pay for it. Such a measure seems to offer a win-win situation for tenant and owner solving the typical user-behavior problem of all-inclusive contracts and allowing the owner benefiting from renovation. The increase of surface strategy aims at increasing the rentable space with the renovation, allowing increasing the rent within market range. The combination strategy couples the two strategies above mentioned. Table 1 summarizes the assumptions made for each strategy, together with the probability for each strategy to provide a positive NPV and a payback period shorter than 15 years. Note that a 5% discount rate is used in the NPV calculation. It can be seen that the probability for the NPV to be positive goes from 32% with the base case strategy to 91% with the combination strategy.

	Increase of floor area	Owner does not pay for energy	Owner pays for energy	Probability NPV>0 (%)	Probability payback t < 15 years (%)
Base Case		✓		32	6
Budget allocation			✓	70	31
Increase of surface	✓	✓		65	28
Combination	✓		✓	91	61

Table 1: Description of the Four Strategies and the Related Probability

3. RESULTS

3.1 Subtitle

3.1.1 Investors

According to all the investors interviewed, one of the main drivers for any type of refurbishment is location. In real-estate evaluation, location is considered to be the most relevant factor. The minimum and maximum rental prices are related to location. The limit of rental increase given by location can be therefore determinant for the decision making of energy retrofitting.

The second top driver is considered to be the tenant. In particular: the number of tenants per building and the tenants' prestige.

In case of a single tenant who is asking for a building renovation, the owner is in a weak position when it comes to decision-making. If the tenant leaves, it would be more difficult to find a different tenant that suits the building

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dimension. Changing tenant has also the risk of having to undertake the renovation again if required, under certain market conditions. On the other hand, multiple tenants are more difficult to manage and the owner would rather agree on renovating than losing a single tenant for a large building. When the tenant is prestigious, corporate image could be an important factor, as being located in sustainable buildings is more desirable. In addition, when the tenant is prestigious, it is more likely to have the financial possibility of moving to a different building, in case the current one does not satisfy his requirements.

Moving to the barriers, the most relevant is that the energy efficiency does not (yet) directly reflect in a pre-definable increased building value or revenue. A general remark is that investors are hesitant about the technical feasibility of zero energy renovation.

3.1.2 Designers

Designers follow their clients' requests concerning energy efficiency. Only when making an offer to the client, they might suggest different energy targets. Concerning energy efficiency, their primary role consists in providing clients with solutions for energy saving and an estimation of the actual savings they can "guarantee" when a certain measure is applied.

Designers see more challenges in refurbishment than in new buildings, independently of the energy target. However, for high standards of energy efficiency, the interventions are objectively more risky and complex.

3.1.3 Real estate experts

With real estate experts, the barriers and drivers identified were similar to the ones mentioned by the investors. Location, property value increase and vacancy rate are the most important drivers. The return of investment and the revenue coming from a renovation are expected to be the decision-making parameters for a building owner.

3.1.4 ESCOs

Energy Service Companies are concerned about the "de-centralization" of energy that follows from the application of renewable sources. In other terms energy production is coming from different sources (e.g. from a rooftop with solar panels) and not anymore from few dominant energy providers. ESCOs are trying to get a managing role in this new market. They are also starting to invest in energy renovation for commercial or public buildings, while they do not do it for houses (this is to invest on buildings that can provide a more safe return of investment). As far as zero energy is concerned, the general impression is that many technological and economical limitations do not allow for an actual implementation of high-energy efficiency measures. High initial costs with a too long payback periods are to be considered the main barrier in this context.

3.1.5 Tenants

The tenant interviewed affirmed that zero energy is not a target he would consider for his building. He also doubts whether a zero energy renovation would actually be possible. The tenant does care about energy savings and corporate image. The office is the working place for employees and meeting points with clients, what is therefore considered important is a degree of sustainability that can be seen and felt by clients and personnel working in the building.

3.2 Roundtable discussion

According to the investors invited to the roundtable discussion, the most important barriers for an attractive business case for the zero energy refurbishment are the capital investment required and the way such interventions are reflected in the final value of the refurbished building. Another problem already mentioned that brings doubts among investors is the difficulty to guarantee that a certain building performs as zero energy, taking the user behavior and the availability of renewable energy supply into account. The investors confirmed the hypothesis that the most important parameters to affect the zero energy refurbishment of commercial buildings are location and age of the building.

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Figure 1: Roundtable discussion

When the location is central and the building needs to be renovated for additional reasons (e.g. it is old and needs upgrade or needs to be adapted to a different function), it is easier to create the business case. Changing the building function could help creating the business case depending on location. The more convenient building age for a zero energy renovation is 25-30 years old. This is a time when the building needs renovation anyway and it is therefore a good moment to add zero-energy as a goal of the renovation plan.

Generally, the investors found the model representative and considered that the strategies made are realistic and helping building the business case for the zero energy refurbishment. It was also suggested that risk and sensitivity analysis, are an excellent approach to evaluate business case opportunities.

4. DISCUSSION

Including the zero energy target as objective of a refurbishment is considered a time and resource consuming process by both investors and designers. To support this process, a screening checklist is proposed (see Figure 2). The checklist was based on the barriers identified and highlights the parameters that were considered important for the business case. Thus, it can speed up the decision making process and help predicting if the zero energy target can bring financial benefit, suggesting to explore this option with a preliminary design. If all the conditions stated in both a) and b) subsist (the ones in the darker area, excluding additional benefits), then meeting the zero energy target will most likely bring financial benefits to the owner who invests in the refurbishment and rents out the building. The conditions under "additional benefits" are indeed extra and can only improve the business case; alone, they are not sufficient to create it.

Business case screening checklist for zero energy refurbishment	
a) Building description	
The building is located in an area that is considered a good location for its specific function	☐
The building is in need of major refurbishment because of one or more of the following reasons: • It is between 25-30 years old and never had a major refurbishment • More than 25 years have passed since the last major refurbishment • The current tenant strictly demands deep energy retrofit • A new function has already been planned, which implies major architectural transformations • Other	☐
Additional benefits if:	
The renovation gives opportunity for rentable floor area extension	☐
Replacing of the building envelope gives opportunity for on-site energy production (e.g. PV panels installation on the façades)	☐
b) Commercial conditions after renovation	
The building has an occupancy rate of at least 50%	☐
It is possible to increase the total rent* (e.g. tenant changes; same tenant is willing to pay more; market, regulations and location allow it)	☐
The building value increases	☐
Additional benefits if:	
Contractual agreements allow allocating an energy budget to the tenant	☐
*Total rent: surface **x** rent **x** occupancy rate	

Figure 2: Screening check list to support the evaluation of the financial attractiveness of energy neutral refurbishment

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5. CONCLUSION

Zero energy refurbishment does not belong to regular practice, particularly in the commercial sector. The stakeholders interviewed agreed that zero energy refurbishment of let properties lack of financial attractiveness. This represents a great barrier for the so needed large-scale implementation of the energy neutral refurbishment. It can be concluded that the most important parameters that play a role in determining the business case are location, building characteristics and tenants' requirements.

Therefore, different strategies where proposed to a group of relevant real-estate investors to discuss the opportunities to improve the financial attractiveness of those interventions. Strategies such as increasing the building surface with the renovation and allocating an energy budget to the tenant, proved to improve the business case and were appreciated by investors. Increasing the rentable surface however, is neither always possible nor at all times convenient. Different is the case of the energy budget allocation strategy, which would provide a zero-cost solution for improving the business case. Further action by governmental entities would be needed to regulate and support such and similar strategies. This study shows that there are opportunities to improve the financial attractiveness of zero energy refurbishment. Stakeholders' awareness about the opportunities of undertaking deep energy retrofit meeting the net-zero energy target, should increase strongly. It is also crucial to consider the weight that real-estate investors give to certifications showing the need of warranty for zero-energy performance. The latter suggests that zero-energy will become more common as improved certification system will be introduced and a surplus value will be given to the energy performance of buildings in real-estate evaluation.

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