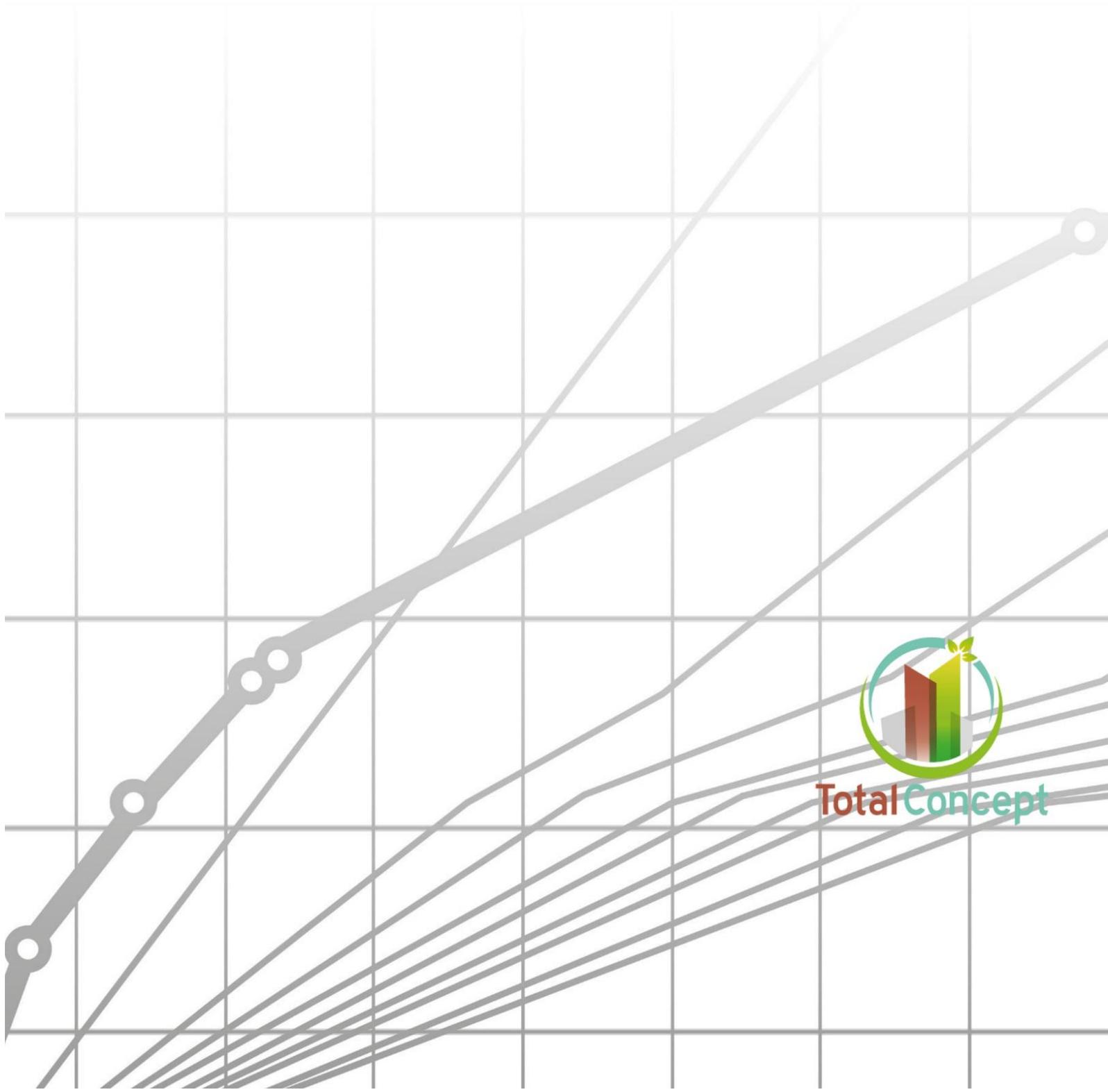


# Market potential and business opportunities with the Total Concept method



Total Concept

This report has been developed as part of the project “*Nordic Built: The BTC, BELOK Total Concept*”, supported by Nordic Innovation from the Nordic Built program, initiated by the Nordic Ministers for Trade and Industry. The project is also co-funded by Swedish Energy Agency.

Project webpage: [www.nordictotalconcept.info](http://www.nordictotalconcept.info)

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## Foreword

The Total Concept method offers new opportunities for considerably improving energy performance in non-residential buildings. The Total Concept method demonstrates that large scale energy performance improvements in existing non-residential buildings can satisfy profitability demands set by the building owner/investor and thus become a market driver for major renovation of existing buildings. However, in order for the method to be used on a larger scale, there must be commercial interest from the different stakeholders and key actors involved in the process that will start to apply the method and provide services.

This report includes an overview of the market potential for the services based on the Total Concept method, ideas for new business opportunities for the different key actors as well as guidelines on what to think about when developing new business models.

The work is based on a market analysis of possibilities and barriers for energy renovations that have been carried out in Finland, Denmark and Sweden together with experiences from pilot buildings in each country where the Total Concept method has been applied. Additionally, two kinds of interviews were carried out with a number of stakeholders and key actors involved in the renovation business in these three countries. Six stakeholders were interviewed about their view on current market conditions and their experiences with major energy retrofitting projects as well as the potential of the Total Concept method in the market. Invaluable information has been provided here by Vasakronan, Lokalförvaltningen, Diligentia in Sweden, Danish Association of Construction Clients and Rambøll A/S in Denmark and City of Oulu real estate department in Finland. Seven potential service providers, the key actors, were interviewed on their point of view on the current market situation as well as the potential business opportunities with the Total Concept method. Invaluable information has been provided here by Bengt Dahlgren AB, Sweco and WSP in Sweden, Rambøll A/S in Denmark and Enejia Group and Sweco Talotekniikka Oy in Finland.

This report has been developed as part of the project “*Nordic Built: The BTC, BELOK Total Concept*”, supported by Nordic Innovation and Swedish Energy Agency. The project aims to assure that commercialization of the Total Concept method takes place in Sweden, Denmark and Finland. This includes developing and testing strategies for commercialization and promoting the Total Concept method as a business model. The project partners include CIT Energy Management AB and Swedish Construction Clients from Sweden, Bionova Oy from Finland, Danish Building Research Institute/Aalborg University, Danish Association of Construction clients and Rambøll from Denmark.

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# 1. Executive summary

Total Concept is a method that aims to motivate property owners to carry out larger energy renovation projects in the non-residential building sector. The core aim of the method is to achieve maximum energy savings in a cost-efficient way. The Total Concept method has a great potential to become a market leader for large scale energy renovation projects. However, having a well-developed method does not necessarily guarantee that the method will be spread on a larger scale. There must be commercial interest from different stakeholders and key actors to start to apply the Total Concept method and to provide services with the method.

In Sweden experiences are that more and more building owners would like to do renovation according to the Total Concept method but it is difficult to find companies with required skills to perform the service. The main aim with this report is to present the benefits, market potential and business opportunities with the Total Concept method and thereby support the commercialisation of the Total Concept method.

The Total Concept method covers the entire renovation process starting from the pre-study phase, where a thorough energy audit is carried out and a profitable action package is formed. After design work practical construction work and functional performance checks are carried out and followed by monitoring and evaluation of the results. The aim is to have a comprehensive approach in the whole project and to assure good quality and reliability of the results.

The main customers for whom the services based on the Total Concept method creates value are property owners/clients both in public and private sector. For the property owners/clients, the Total Concept method:

- provides an opportunity to access an essential part of the energy savings potential in a commercially profitable way at the same time as the function and quality of the building is improved or retained.
- applies an easy to understand economic model in profitability assessments that reflects the potential of the long-term investments in energy saving measures and provides reliable base for the decision making.
- helps to assure the expected energy savings and investments for the energy efficiency measures through defined tasks, roles and responsibilities from pre-study phase up to monitoring phase.

A method with such a comprehensive approach for energy renovations seems not to be available on the market, especially not in Finland and Denmark.

The key activities delivered to the customer depends on the specific service provider and what is their role in the renovation process based on the Total Concept method. The energy renovation process based on the Total Concept method follows basically the same procedures as in a traditional building/renovation process. However, there are a number of additional tasks to carry out as well as the actors involved in this process may have additional roles and responsibilities.

Potential service providers that have been identified are:

- engineering companies with energy consultants,
- engineering companies with design engineers and architects,
- contractors and technology providers,
- Energy Controllers/ energy strategists,
- ESCO companies, etc.

A number of major renovation projects performed by a service provider supports the building up of a strong in-house technical competence and helps to cost-optimize the work which will give better business opportunities in future projects.

In order to maintain a comprehensive approach over the entire renovation process a new key function, a Total Concept Manager is introduced for the project. The Total Concept manager can be the clients own staff (for example the project leader) or energy specialist from an external company. The main function of a Total Concept Manager is to coordinate the tasks and activities carried out during the three steps of the Total Concept method and coordinate the hand-over between the different key actors involved in the different phases of a Total Concept project.

The actual annual market volume for the renovation projects based on the Total Concept method in the three Nordic countries is estimated to be about 4 million m<sup>2</sup>, corresponding to about 70 MEUR per year. As there are already, or will be, a number of demonstration objects carried out in the Nordic countries they can serve as good examples for demonstrating the benefits of the Total Concept method.

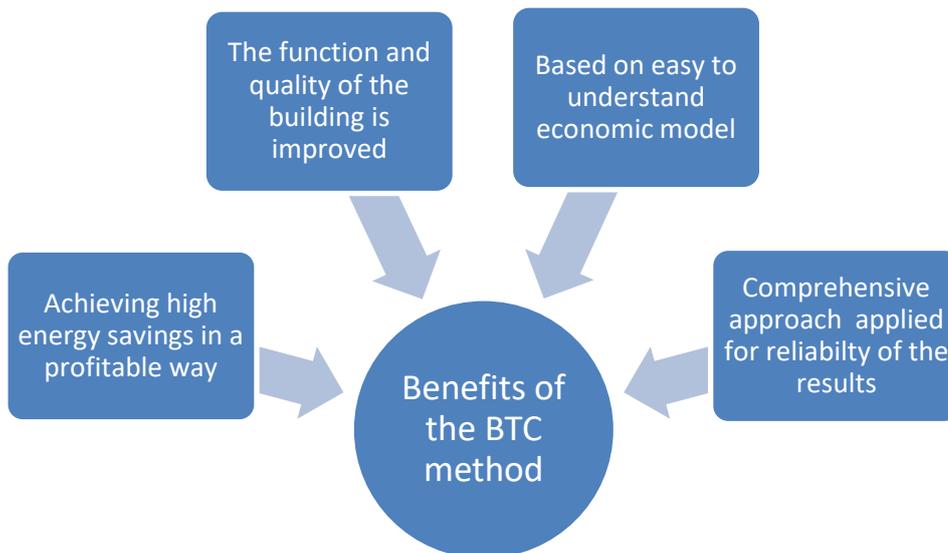
## 2. The Total Concept method and its benefits

The BELOK Total Concept is a method for improving energy performance in existing non-residential buildings and applies a refined systematic approach to the work with energy issues in buildings, with the aim of achieving maximum energy savings in a cost efficient way. The method is based on carrying out a package of energy saving measures. It considers the economic realities a building owner has to take into account, while at the same time it aims to increase the ambitions and making it possible to come much further in energy efficiency.

The Total Concept method was initially developed by the group BELOK in Sweden. BELOK is a network between 19 large Swedish non-residential real estate companies and is supported by the Swedish Energy Agency. The experiences of using the method has shown that total energy savings more than 50% are possible.

### Benefits with the Total Concept method

The main benefits of the Total Concept method are illustrated in Figure 1 and are described below.



**Figure 1.** The main benefits of the Total Concept method.

#### **Achieving higher energy savings in a profitable way**

The Total Concept method provides an opportunity to access an essential part of the great energy savings potential in existing non-residential buildings in a commercially profitable way. The method is based on a comprehensive analysis of a building as *whole* where all possible measures are identified that can lead to reasonable savings. The measures are carried out as one profitable action package. The most profitable measures make up for the investments that, on their own, are not profitable, but are important from an energy point of view.

***The function and quality of the building is improved***

The implementation of the method focuses on preserving or improving the function and quality of the building. The Total Concept method can be included to the overall renovation process of the building, in which case the additional investments required for achieving better energy performance of the building can be analysed. When combining Total Concept method with an overall renovation of the building investment costs for energy measures can be optimized.

***Based on easy to understand economic model***

Energy renovations in buildings can be considered as long-term investments since energy measures often have long economic lifetimes. Therefore economical models that reflect the potential of these investments should be used and at the same time they must be easy to understand for the decision makers. In the Total Concept method an internal rate of return model is used for profitability analysis. The method shows the actual yields, expressed as an interest rate, the investment creates. When forming a package of measures also future relative energy price changes and different economic lifetimes of the measures in the package are taken into account.

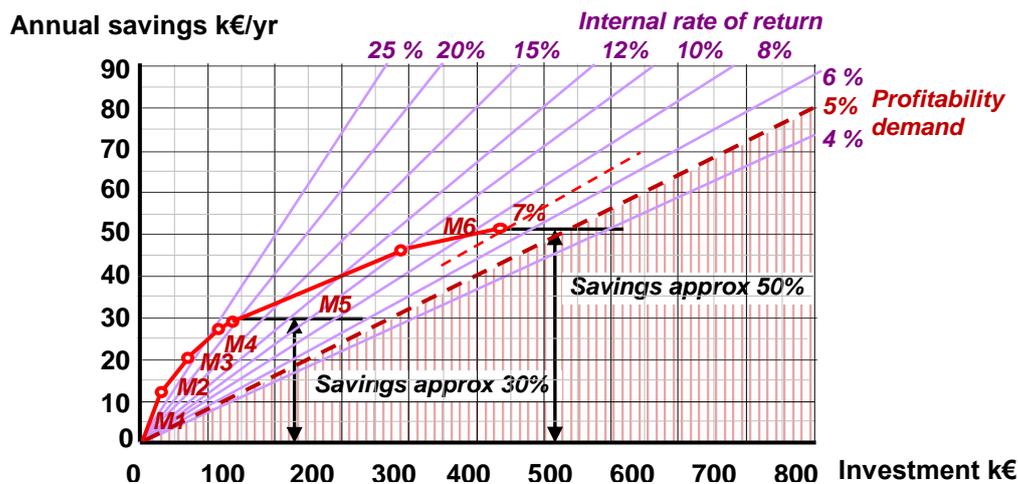
***Reliability of the results is secured through a comprehensive approach***

The Total Concept method provides a comprehensive approach in the process of improving building's energy performance. The work process is well structured with clearly defined tasks, roles and responsibilities for the different key actors involved. The whole energy renovation process can be monitored and quality assured.

**Profitability analysis in Total Concept**

Total Concept is based on an action plan comprising a package of measures that as a whole fulfils the property owner's profitability requirements. When forming the action package both the single cost-efficient measures ("low hanging fruits") and more costly measures are considered. What will be included in the action package will be determined in the profitability calculations based on the criterion that the internal rate of return for the whole package fulfils the investor's demands on cost of capital. The most economically profitable measures will assist the less profitable measures while the complete action package will fulfil the profitability frames set by the building owner.

In order to present the profitability of energy saving measures in a simple-to-understand way for the decision makers, an internal rate of return diagram is used, see Figure 2. In such a diagram every identified energy saving measure, that implies a certain investment cost (€) and results in a certain decrease in the annual operating cost (€/a), is represented by a line in the diagram with a certain length and slope. The slope represents the internal rate of return (%) which the investment creates. A package of measures is formed by arranging the different energy saving measures after profitability and calculating a common internal rate of return for a number of simultaneous measures, taking into account different economic lifetimes of the measures. The number of energy saving measures that will be included in the cost-efficient package of measures is dependent on the criterion that the internal rate of return for the whole package must fulfil the investor's demand on profitability.



**Figure 2** Visualization of an action package with six measures (M1-M6) in an internal rate of return diagram. The property owners' profitability requirement for the investment is an internal rate of return of 5% (real calculation interest rate). The whole package of measures in the example gives an internal rate of return of 7%.

In the example shown in Figure 2, the profitability requirement is that an internal rate of return is to be at least 5%. The complete action package with six measures (M1 – M6) meets this demand with an internal rate of return of 7% and leads to halving the annual energy costs, which approximately corresponds to a halving of the use of energy. The complete action package is profitable as the most profitable measures make up for the less profitable measures. If it would be required that every measure in the action package must be profitable on their own, even the last measure, then only the measures M1 to M4 would be possible to carry out, leading to energy savings only approx. 30%. It would be disadvantageous to first carry out the most profitable measures and postpone the others to a later date. In that case, the measures that were not profitable on their own, but important from an energy point of view, would most probably never be carried out. This is because there would no longer be any profitable measures to make up for the unprofitable measures.

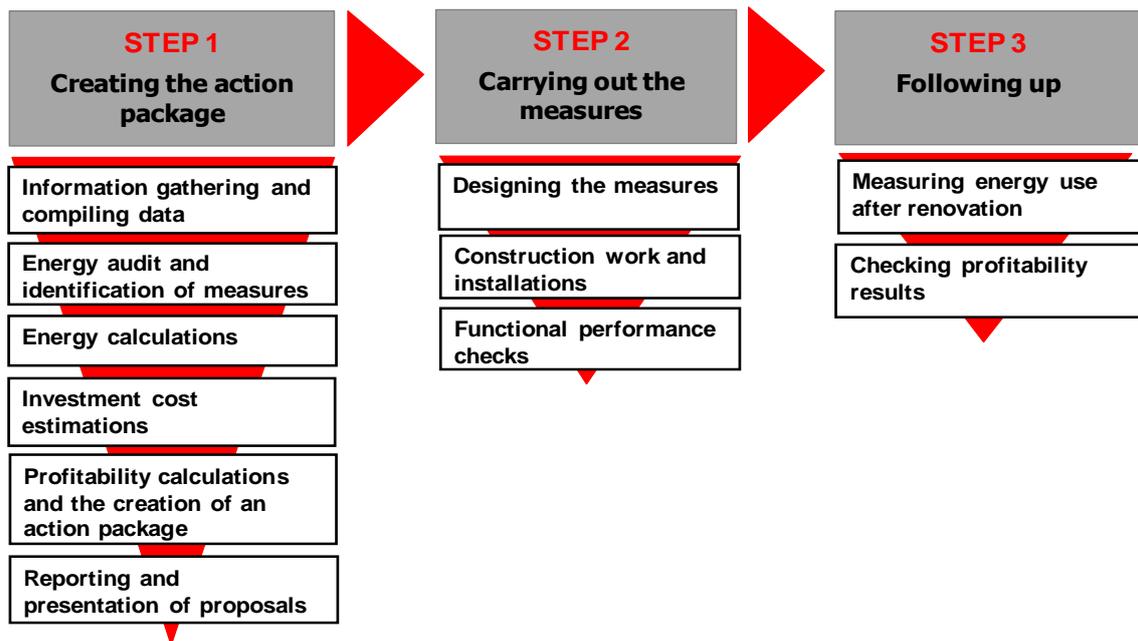
### The work process of Total Concept

In order to quality assure that the expected saving actually will be reached, a systematic approach is important through the complete renovation process of the energy retrofit. The work process of Total Concept has therefore been structured into three main steps, see Figure 3.

*Step 1- Creating the action package*, is a pre-study and planning phase of the energy renovation project where a comprehensive inventory is carried out in the building to identify all conceivable energy saving measures. Various calculations and an analysis based on the compiled data lead to a package of measures and provide an informed basis on which the owner of the building can make decisions.

*Step 2- Carrying out the measures* includes implementation of the package of energy saving measures in the building. The focus here is on the quality of the work, and to make sure that designed intent will lead to the expected energy savings. Here functional and performance checks are significant in order to reach the expected results.

*Step 3- Follow-up* of the implemented measures, including measuring and checking procedures to ensure that the expected result of energy performance has been achieved. The energy use during at least one year after renovations is compared to the energy use before implementation of the action package.



**Figure 3:** The work structure of the Total Concept method.

The technical details of the implementation of the Total Concept is described in the guidebook “The Total Concept. Guidebook for implementation and quality assurance”<sup>1</sup>.

<sup>1</sup> 2016 The Total Concept. Guidebook for implementation and quality assurance. [www.totalconcept.info](http://www.totalconcept.info)

### 3. Current conditions and demands

#### Drivers and barriers for energy renovation

There can be various reasons why a building owner wants to carry out a renovation project. The most commonly occurring reasons for renovation are summarized in Table 1, which is based on the interviews carried out with a number of building owners in Denmark, Sweden and Finland.

**Table 1.** Identified reasons for major renovation projects in Denmark, Sweden and Finland

Reasons for renovation	Often	Semi often	Rarely
Higher market value			X
Deterioration, high maintenance costs	X		
Grants, subsidies		X	
Tenant adjustments (e.g. increasing rental area/ number of tenants)		X	
Environmental and Energy Certification		X	
Improving indoor climate	X		
Energy use reduction			X
Fulfilling other requirements (fire safety, ac-			X
Change of larger tenants	X		

The most common reasons for major renovation based on the interviews with the property owners are change of (large) tenants, the deterioration of existing systems or building’s envelope, as well as problems with indoor climate. In the commercial building sector there is often a need for a total renovation for buildings built before 1970, but in practice total renovation is carried out when there is a change of larger tenants – every 15 or 20 year. In public non-residential buildings a major renovation is often carried out after approximately 20 to 30 years. Minor renovations take place about every 5 to 10 years or when there is a changes in use of the building.

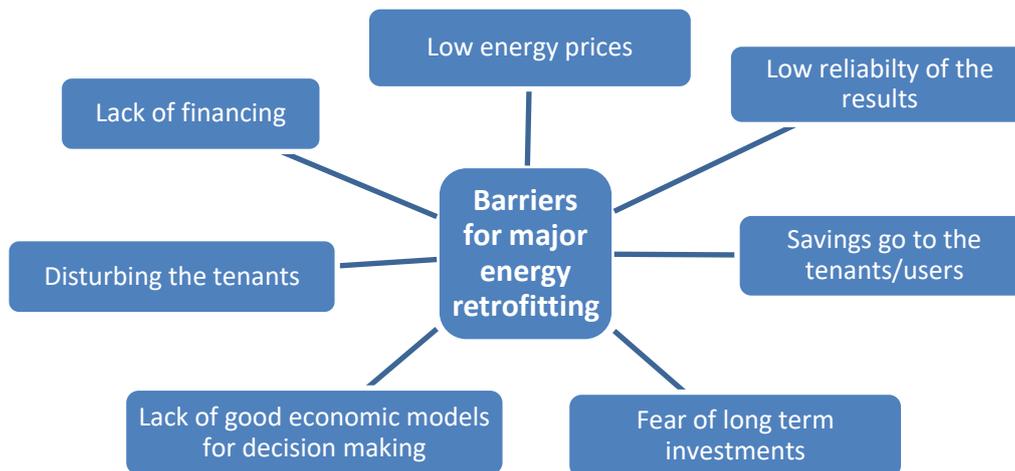
Property owners are interested to keep their premises attractive for their tenants. Renovation work can increase the attractiveness of the building, especially if there has been a high vacancy degree in the premises. The obvious opportunity is therefore to merge energy optimization with one of these projects.

The energy reduction however, is not considered to be a main reason for initiating major renovation projects. Energy is relatively cheap in Nordic countries and therefore this is a significant obstacle for starting energy renovations, except if it is a part of a bigger, more comprehensive project. However, some owners have a more environmentally friendly profile than others (in the private sector) or are stimulated by authorities’ ambitions (in the public sector). This can be an influencing factor for carrying out energy renovation projects.

The property owners, especially private ones, are very much profit oriented. According to the interviewed Swedish stakeholders the most important motivation for energy renovation is to obtain a profitable and sustainable project. The market requires simple economic arguments to show that energy renovations are a good business. For instance according to one of the interviewed stakeholder the investment in energy saving measures of 20 MEUR over the last three

years lowered their organisations annual energy costs about 10 MEUR and increased the value of their property portfolio of about 200 MEUR. This simple example shows that the investments that can be experienced to be large at the time of renovation, can have a rather short payback time.

The main barriers for energy renovations pointed out during the interviews are illustrated on Figure 4.



**Figure 4:** The main barriers for major energy retrofitting in the three Nordic countries.

Besides the low energy prices one of the major barriers for carrying out major energy renovation work seems to involve a risk of not receiving the whole profit from the energy measures. Risk of losing some profit is relevant in the situations, where tenants pay their utility bills. Without a special agreement, benefits of an investment may go directly to a tenant and not to the property owner. One solution could be special agreements with the tenants, e.g. “green deals”, where they contribute to the investment costs and in return pay less for their energy use.

There is a demand for energy retrofitting projects but in many cases the results are restricted with budgetary limitations or difficulties to get required investment. According to the interviews with the key actors in Finland in many cases the building owners do not realize that the additional cost for energy efficiency improvements is often just minimal part of the total renovation cost and even though energy saving measure would be profitable, it may be taken away from the plans to keep the total renovation investment in a given budget. Especially public sector often has limited and pre-set budgets.

Furthermore, a fear of carrying out long-term investments and lack of good economic models for analysing long-term investments are considered as barriers for energy renovations. Energy saving measures such as replacement of technical systems or renovation of building envelope often have long economic lifetimes. These measures are treated unfairly for example when using simple payback method in the economic analysis or when a short calculation period is selected with other economic models. Many property owners/clients are often evaluating investments based on payback time. To change the mind-set it is required that the stakeholders have a better understanding of the objectives and the outcomes of an energy renovation project. Good and easy to understand economic models are needed to support the clients investment decisions.

The differences between the required investment for the building upgrade and for energy savings is also often blurred. Even though there would be financially profitable energy saving measures, the whole renovation is considered to be unprofitable because both energy saving and other measures are seen as one package. The financial potential of energy saving measures is not always understood.

Disturbance of the tenants during the construction work is also considered as an obstacle for major retrofitting. The scale of disturbance (including temporary moving a work place) is of course dependent on the scope of work and chosen measures. Building owners typically choose to undertake inexpensive retrofit strategies, because the intervention is minimal, tenants can remain in the building during construction. A major energy retrofitting is on the agenda only when parts of a system or a whole system are due for replacement.

### Available financing schemes

The decision to start a major energy renovation project is made by a building owner, private or public. A building owner can finance the investment needed for energy renovation from its organizations own capital, take a loan from a commercial bank or hire a third party that carries out the investment for part of the profit as return, e.g. ESCO company.

Financing schemes can differ between public and private property owners. For example flexibility of own investment capital use is an important influencing factor for large scale energy renovations for the public sector in Finland. However, this budgetary funding issue seems to be less relevant for the property owners in Denmark and Sweden. In Sweden some property owners are more experienced and are willing and capable to take more risks and find funding for their projects.

There are also some funds and programs available on the market that can help with financing renovation projects and making it economically more attractive for the property owners. In Denmark it is possible to apply for support from two financial schemes. Private investors can apply for a "CO<sub>2</sub> scheme" funding, which means that buildings implementing energy savings can count on an one-off payment from an energy supplier (both heating and electrical energy). Public investors can receive favourable loans for public buildings. If they can show that the costs for the loan can be financed by energy savings they can get a very favourable loan and an immediate acceptance from local authorities. In Sweden, there are currently no programs available that support the property owners with financing their renovation projects. However, occasionally there are some projects administrated by national authorities that financially support a pre-study phase of a renovation project.

In Finland there is a budgetary energy efficiency investment subsidy, which can be granted for projects on application. There are also companies who are specialized in supplying financing in energy efficiency projects in form of leases, pooled to a separate fund and financed by third party investors. For instance LeaseGreen fund in Finland is specialized in financing energy retrofitting projects.

However, there seems to be a lack of structured technical help for getting funds from the different programs. One solution could be providing more clear information about where and how to apply for funds on the website of these programs. Also consultants' could have a task to point out opportunities for existing subsidies.

### Available services

Based on the market studies carried out in three Nordic countries there are different kinds of energy renovation services and business models provided on the market today. The most common ones are for example:

- **traditional contracting**, where services for energy audits and feasibility studies, design work and construction work are purchased from one or different service providers and paid by the client. The client can take the role as project manager or outsource this service.
- **energy supply contracts (ESCs)**, where energy saving measures and the construction of district heating systems (e.g. systems for wood biomass and other renewable sources) are financed by the contractor. The contractor is paid from the services of energy supply in the contractual period.
- **energy performance contracting (EPCs)**, where an external organisation (ESCO) implements a project to deliver energy efficiency, or a renewable energy project, and uses the stream of income from the cost savings, or the renewable energy produced, to repay the costs of the project, including the costs of the investment. The approach is based on the transfer of technical risks from the client to the ESCO based on performance guarantees given by the ESCO. Two major performance contracting models are used: shared savings or guaranteed savings.

Some vendors package their services commercially differently either by promising energy savings (for example 20 % savings), a fixed cost structure (price per square meter), or offering a profit sharing scheme. The more advanced business models are typically developed by companies who supply building management and monitoring systems as well as other services to take advantage of their more extensive capabilities.

The interviewed property owners have purchased and tried out many different kinds of energy saving solutions and technologies as well as energy supply solutions in their properties and continue to look for new opportunities and solutions from an expanding range of technologies. This puts a significant pressure on the consultants' competence, and on the competence of the client to ensure themselves of being able to hire consultants with sufficient technical capability.

A number of Swedish stakeholders that were interviewed find energy renovation projects to be a good business and therefore they do not wish to share the profits of investments with third parties (e.g. with companies providing EPCs). Many of these Swedish stakeholders consist of highly professional organisations with dedicated energy specialist staff in-house and they prefer to outsource services for specific tasks only.

While the Swedish clients often prefer to buy the services for specified tasks at hourly rate or fixed price, the Danish and Finnish markets are more open to other kinds of business models.

For example in Denmark the municipalities are now adopting the EPC model. At least 15 municipalities are involved in EPC contracting (without financing) today and encouraged by attractive allocated loan schemes for energy renovations. It should also be noted that energy performance contracting in Denmark primarily includes short-term contracting comprising renovation of building services systems and in very limited extent the building envelope. This means that often “low hanging fruits” are carried out in energy renovation projects.

In Finland, on the other hand, several ESCO projects have turned out to be not very successful. The limited success or outright failure in such projects has often been caused by lack of preparation, oversight or contractual terms from the client side to define and enforce the undertakings and formulas.

### Demands from building owners

The following parameters are listed to be important for energy renovation projects from the clients' perspective:

- to have a comprehensive approach for the energy renovation,
- to have guarantees that energy savings, financial savings and expected return on invested capital will be achieved,
- to have flexibility on capital use.

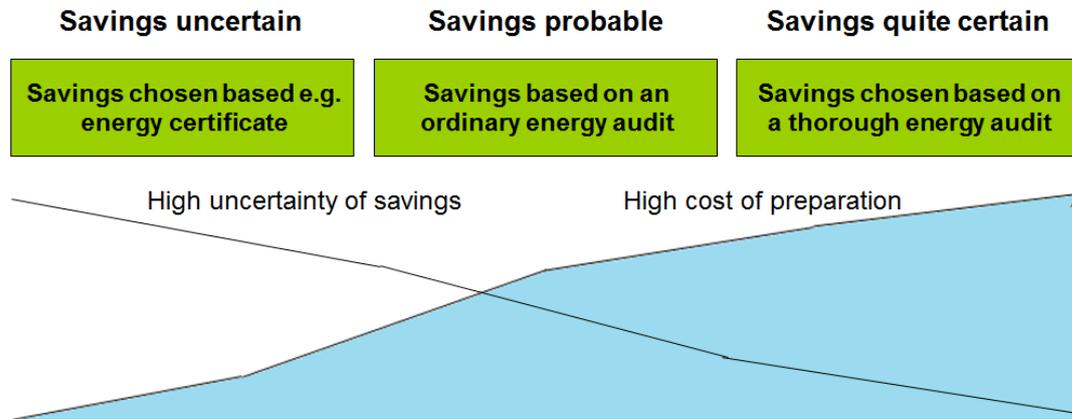
The market study also revealed that two of the success factors for the energy renovation projects is to have a good cooperation between the key actors in the process and good knowledge transfer between different stages of the project. It is good to have an energy coordinator who has an overall picture of the process and supports the property owner and other key actors to see it.

To have a comprehensive approach for energy renovations seems not to be currently available on the market, especially not in Finland and Denmark. Most companies and services commonly focus on single or few issues or solutions. The members of the design team mainly focus on their own areas of expertise and the coordination between actors is limited (design meetings). Also the involvement of the maintenance personnel is often missing. Especially there is no comprehensive coordination between the design phase, renovation and result verification phase.

Additionally, to have guarantees for the results and financial savings is considered to be important for all of the interviewed stakeholders in the Nordic countries. Uncertainty of the results is often defined by the chosen method and cost for analysis in the pre-study phase in a renovation process. Normally, the lower the uncertainty, the higher the consulting costs for pre-study phase. For example, savings calculated on the basis of energy certificate are burdened with a high uncertainty about the outcome, but at the same time the consulting cost is minimized.

An analysis from the interviews indicates that energy renovation projects carried out in the Nordic countries can be divided into categories depending on the cost of the energy audit compared with accuracy of savings, see Figure 5. Left side corresponds to the projects with little preparation in the pre-study phase, for instance measures taken from an energy certificate. On the extreme right are the projects with careful preparations, including comprehensive auditing and

more detailed calculations. For instance projects based on the Total Concept method or ESCO contracts are assumed to fall into this category. Middle part corresponds to projects with some preparation, often corresponding to ordinary energy auditing procedures.



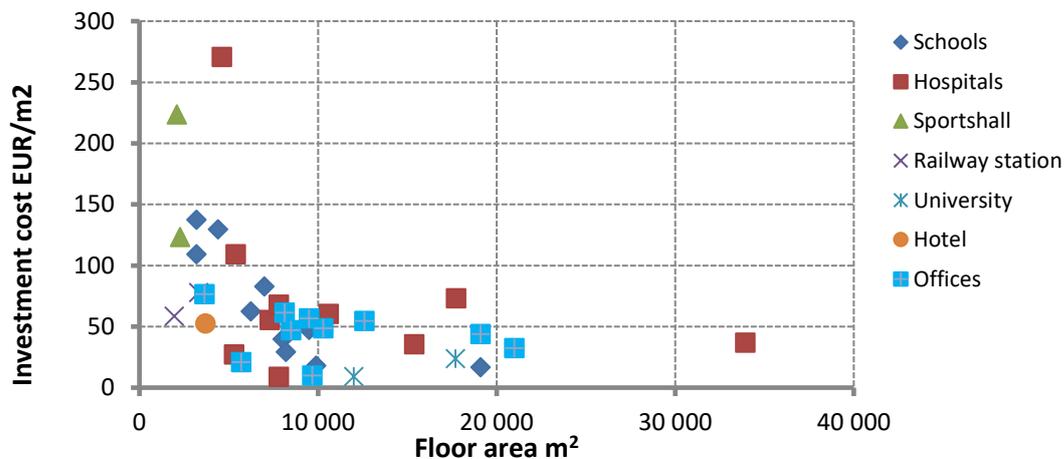
**Figure 5.** Cost and accuracy of the results of the different types of energy renovation projects carried out in the Nordic countries.

The chosen method for pre-study depends on budgets and owner's ambitions. Swedish stakeholders seem to be more willing to pay higher cost for a pre-study in order to get more reliability on estimation of energy savings and investment costs. At the same time, in Finland the property owners seem to be rather modest to order more intensive and costly preparation work. They would like this work to be carried out by an external company, such as ESCO company or comparable actor, who would then also carry out the energy measures and take the risk for uncertainties.

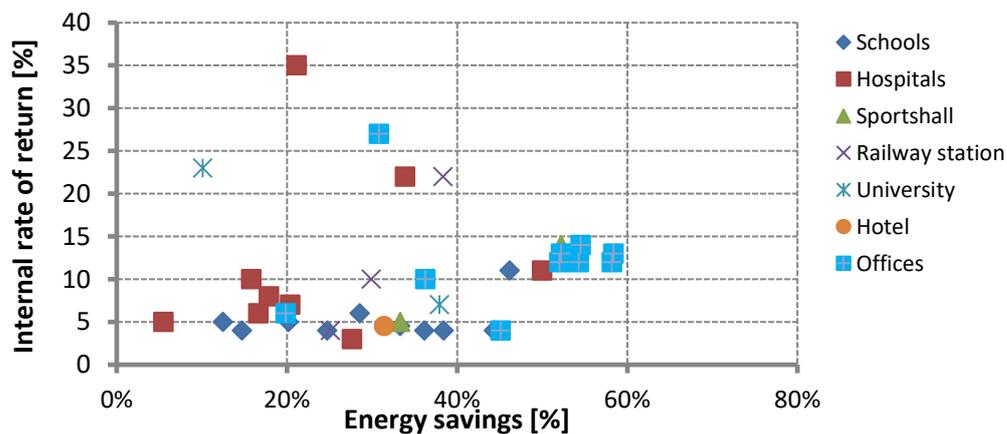
## 4. Estimation of the market potential

### Experiences of using Total Concept

In Sweden the Total Concept method has been used for schools, hospitals, sports facilities, railway stations and universities and experiences have been analysed<sup>2,3</sup>. Figure 6 gives an overview of required investment for the action package in Step 2 for the different projects that are carried out or are planned to be carried out. Figure 7 illustrated the expected energy savings in percentage and internal rate of return of the action packages. The annual savings expected from these projects is in average about 6 €/m<sup>2</sup> and internal rate of return of the action package is in average about 10%.



**Figure 6.** Required investment cost for the action package in Step 2 of the Total Concept method based on projects carried out or planned to be carried out in Sweden.



**Figure 7.** Total energy savings and internal rate of return in Total Concept projects carried out or planned to be carried out in Sweden.

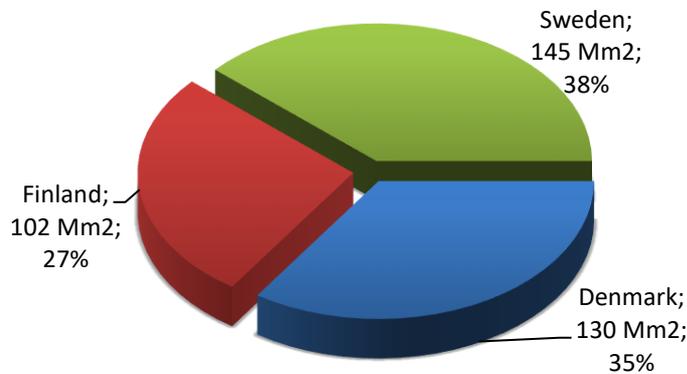
<sup>2</sup> Å. Wahlström, E. Abel and M-L Maripuu, " Total Concept-for better decision-making about Energy Efficiency Investments in non-Residential Buildings ", Accepted for proceeding of ECEEE Summer Study 2015, Toulon, France, paper 6-103-15, page 1239, 1 - 6 June, 2015.

<sup>3</sup> M-L. Maripuu, Å. Wahlström and E. Abel, "Swedish experiences of using Total Concept for refurbishment towards nearly zero-energy buildings", Proceedings of the 7PHN Sustainable cities and buildings; Copenhagen, 20.-21. August 2015.

Experiences from Total Concept projects performed in Sweden shows that the total cost for carrying out a pre-study and preparations (Step1) has been about 3 - 4 €/m<sup>2</sup>. Cost for carrying out an action package based on the Total Concept method (Step 2) has been in average about 65 €/m<sup>2</sup> and follow-up work (Step 3) about 1-2 €/m<sup>2</sup>. The investment cost for measures is depending on the current situation of the building before measures as well as the number and size of the measures in the action package to be carried out.

### Expected renovation volume

Figure 8 gives an overview of the size of the current non-residential building stocks in the three Nordic countries. The area of existing non-residential buildings is estimated to be in total about 377 million m<sup>2</sup>. With the assumption that 1 % of the area will be annually renovated based on the Total Concept method, the actual annual volume of renovation will be about 4 million m<sup>2</sup>.



**Figure 8.** Size of the current non-residential building stock distributed in between the three Nordic countries: Finland, Sweden and Denmark.

Considering that the estimated annual volume of renovation based on Total Concept method in the three Nordic countries is about 4 million m<sup>2</sup>, the estimated total investment volume on the Total Concept projects will be up to 260 MEUR per year. In the next 30 years the total investment potential on the Total Concept projects is about 7.800 MEUR based on the estimation that during the next 30 years the Total Concept is well established on the market in all three countries.

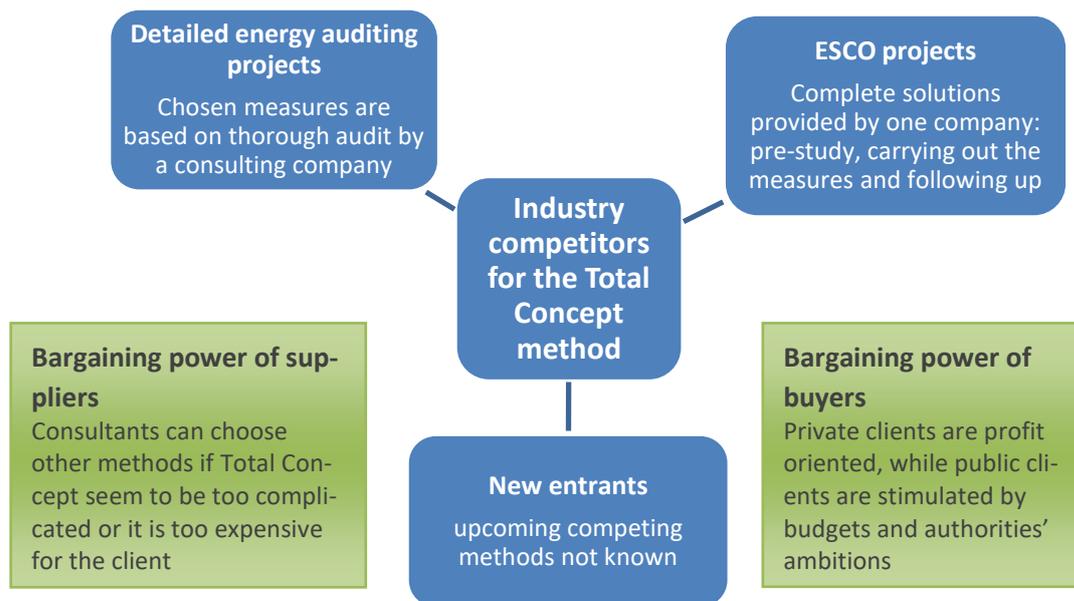
For the key actors involved in the pre-study and preparation phase in Step 1, design work and project coordination in Step 2 and follow-up in Step 3 of the Total Concept method the annual market volume is estimated to be about 70 MEUR and in 30 years about 2.000 MEUR. Distributing these values per country it means the market potential as follows:

Country	MEUR annually	MEUR in 30 years
Denmark	23	690
Finland	18	540
Sweden	26	780
<b>Total</b>	<b>67</b>	<b>2 010</b>

## 5. Competing methods

Analysis of the market competitors for the Total Concept method is illustrated in Figure 9. The market competitor analysis presumes that the property owner/client has decided to carry out an energy renovation project. The easiest alternative for any method is not to do anything at all.

Based on the market analysis there are currently no other similar methods to the Total Concept method on the market (no new entrants). The main competition for projects based on the Total Concept method seem to be traditional energy renovation projects that include more comprehensive auditing in a pre-study phase and “ESCO” projects. To compete with these two named alternative methods, the Total Concept method aims to offer a differentiated service where the main essence is to have a comprehensive approach in the energy renovation process and carry out measures as one profitable action package formed by using reliable and simple-to-understand economic model. The interviews shows that the current situation is lacking in comprehensive coordination between the design phase, renovation and result verification phase. The Total Concept method can meet this market demand.



**Figure 9.** Analysis of the Total Concept method's competitors.

It should also be emphasized that EPCs often include short-term contracting comprising only renovation of building services systems and in very limited extent the building envelope. This means that often only “low hanging fruits” are carried out in energy renovation projects, limiting the energy saving potentials. The Total Concept method on the other hand provides an opportunity to access an essential part of the great energy savings potential in existing buildings in a commercially profitable way. The measures are carried out as one profitable action package where both cost-efficient measures (“low hanging fruits”) and more costly measures are considered. The most profitable measures make up for the investments that, on their own, are not profitable, but are important from an energy point of view. This way of working has shown that total energy savings more of more than 50% are possible.

In the Swedish market, where the Total Concept method has been already tested to some extent, there is already an existing demand for energy renovation methods, such as the Total Concept method. Property owners wish to see more widespread adoption of the Total Concept method and to ensure competitive supply of qualified experts. It is very important that the market can offer consulting firms with required qualifications for providing their expertise for the method implementation.

Sweden also have a market supporting mechanism already available related to the Total Concept method implementation. The Swedish Energy Agency has supported the development and uptake of the Total Concept method, resulting in increased market acceptance of the Total Concept method. This can be considered as an advantage when the national energy agency promotes the Total Concept method and by that giving it legitimacy before it will be accepted by other property owners and other stakeholders.

The Danish Energy Agency has (in August 2015) initiated the preparation of a new general standard of planning, execution and monitoring energy renovation of large (both residential and non-residential) buildings. Both Danish Association of Construction Clients and Danish Building Research Institute/Aalborg University are involved (as members of the steering committee), and it is expected that the principles of the Total Concept method will be implemented as a standard for non-residential buildings, so that the method can be exposed and demanded.

## 6. Services needed

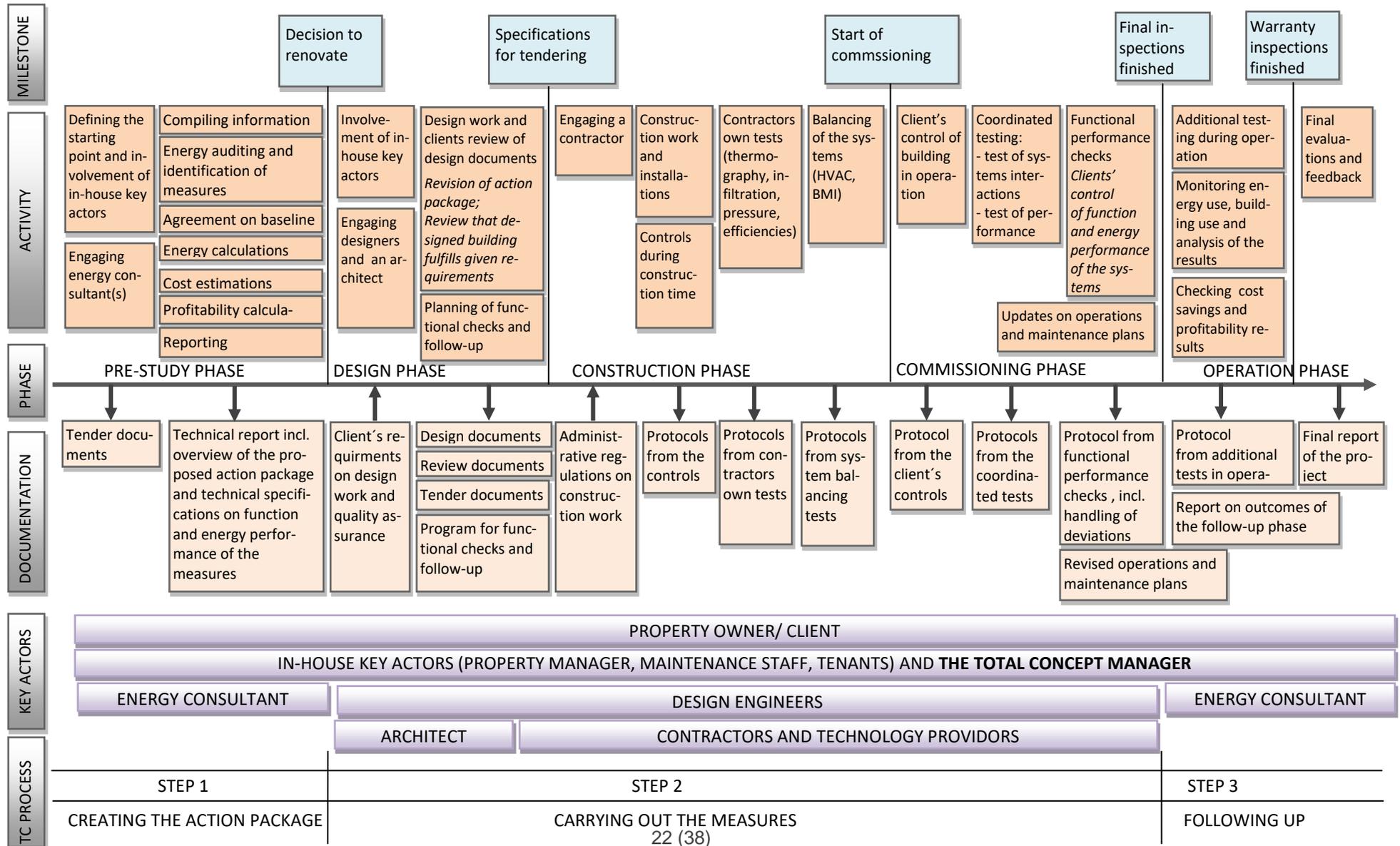
### Work procedure based on the Total Concept method

The energy renovation procedure based on the Total Concept method follows basically the same procedures as in a traditional building/renovation project. However, there are a number of additional tasks to carry out as well as the actors involved may have additional roles and responsibilities. Particularly Step 1 involves more comprehensive analysis of a building compared to traditional methods used in the pre-study phase. Also the evaluation phase is more exhaustive and involves a number of additional test (functional performance tests) to be carried out during the commissioning phase and in the operation (evaluation) phase.

Different activities during different phases of an energy renovation project based on the Total Concept method is shown in Figure 10 together with milestones and needed documentation. The work procedures described on Figure 10 can be used as a base for quality management of the Total Concept method, describing the needed actions and needed deliverables by the hand-over.

Furthermore, for quality assurance of the results it is needed that the key actors involved in the Total Concept process have sufficient skills and know-how about the Total Concept method and for their appointed tasks and services. The same applies also for the property owners/clients, who needs to have sufficient competence to understand how a renovation process works and what are the principles of the Total Concept method in order to carry out tendering processes and supervise the overall work process. And in that case, cooperation with the relevant educational institutions and course providers should continually be considered as part of the implementation of the method and the manager role.

**Figure 10.** A work procedure of carrying out an energy renovation project based on the Total Concept method.



## Roles and responsibilities of involved key actors

The Total Concept method applies a systematic approach in the energy renovation process and includes clearly defined tasks, roles and responsibilities for the different key actors commonly involved, see Table 2. However, the organisation (key actors involved) for the Total Concept project should be chosen to suit the project property owner’s organisation and therefore the selected key actors for the specified tasks can be varying. At the beginning of the project a clear overview of the tasks should be made and responsibilities between the different key actors shared accordingly. An example of how the tasks and responsibilities could be managed between the different key actors in a Total Concept project is given in Appendix 1.

**Table 2.** Common roles and functions of various key actors in a Total Concept project

<b>Position</b>	<b>Role/Functions</b>
Property owner/client	Main decision maker in the renovation process, approves goals and action plan, secures finances, responsible for tendering processes, secures internal resources for the project, assures that required input information for the project key actors is available, main supervision of the whole renovation process, reviewing of the reporting and presenting outcomes to the management.
Property manager	Responsible for the building, assures that that all the relevant information needed for the project key actors is available, supervision of the Total Concept process, reviewing of the reporting, reporting outcomes to the management.
Total Concept Manager	Coordinates the tasks and activities carried out during the three steps of the Total Concept method, coordinates the hand-over between the different key actors, involvement in the practical work in pre-study phase (Step 1), design phase and functional performance test (Step 2) or/and monitoring and follow-up phase (Step 3). Supports the property owner/client in decision making process regarding technical and economic issues, represents the client in relation to the technical consultants and contractors (when required).
Energy consultant	Forms an action package in Step 1 according to the developed guidelines for the Total Concept method, technical reporting of the outcomes. Involved in revising the action package and follow-up process of the results, if needed.
Design engineer	Detailed design work of the proposed measures, developing plans for functional performance checking in Step 2 and for follow-up in Step 3.
Architect	Detailed design work for the measures involving building envelope.
Contractor/sub-contractor	Construction work and installations of the specified measures based on the specifications, carrying out own testing of the system functions and balancing, carrying out coordinating testing and functional performance checks (under supervision of the client), revision of the operation and maintenance routines after renovations.
Maintenance staff	Responsible for operating the technical systems in the building, collaboration with the key actors during the auditing, design and construction work, carrying out measures involving adjustments in the BMS system, involvement in the follow-up and monitoring phase in Step 3, technical assessment on the documentation, revision of the operation and maintenance routines after renovations.
Tenant/ building users	Supporting the key actors with the information about the building and its use, providing information about users’ electrical energy use (if available), carrying out measures that are user’s responsibility (e.g. change of lighting, machines).

## New key function – The Total Concept manager

The experiences from the previous energy renovation projects have shown that it is important to maintain a comprehensive approach over the entire renovation process, starting from pre-study and planning phase (Step 1) up to the monitoring and follow-up phase (Step 3). This is important for assuring the quality of the results and that the planned savings are achieved.

In the major energy renovation it is or has often been building owners responsibility to manage the whole process through all steps and to make sure that relevant information is handled over between different actors involved. For many property owners this can be a challenging task.

Therefore a new key actor/ key role is proposed for the Total Concept method implementation, called the **Total Concept Manager**. The main function of a Total Concept Manager is to coordinate the different tasks and activities carried out during the three steps of the Total Concept method and coordinate the hand-over between the different key actors involved in the different phases of a Total Concept project. A Total Concept manager supports the property owner/client in the decision making process regarding technical issues of the renovation process as well as economical aspects and when required represents the client in relation to the technical consultants and contractors. A Total Concept manager helps in setting the targets in Total Concept energy issues and coordinates the work between different actors to make sure the targets are followed. A Total Concept manager would also be responsible for coordinating the follow-up work and verification of the results after renovation and committing required actors to make the needed justifications to reach the targets.

A Total Concept Manager is considered to be a role/function to be fulfilled by an in-house key actor(s), e.g. Energy Controller or by external key actor(s), e.g. consultants from an engineering company. For example, an engineering company responsible for Step 1 or/and Step 2 could also be responsible for taking the role as a Total Concept manager, if there is in-house skills and know-how to deliver the specified tasks. It is needed that there is a person who follows the entire project from pre-study to follow-up and has an organization with required competence and services for the Total Concept method behind him/her. Table 3 lists an example of qualifications and skills needed for a Total Concept Manager.

**Table 3.** Example of qualifications and skills needed for a role as a Total Concept Manager

	<b>Recommended requirements</b>
<b>Education</b>	A three-year degree, bachelor degree or higher degree from an accredited (or corresponding) technical university
<b>Field of study</b>	Civil engineering, building services engineering, facility management, building surveying, building control, environmental and energy studies
<b>Experience</b>	At least 3 years work experience in building diagnostics or building engineering or facility management
<b>Key skills</b>	<ul style="list-style-type: none"> <li>• A thorough knowledge of building codes, building energy performance legislation and standards</li> <li>• Knowledge of the technical side of a construction process and Total Concept method and its principles.</li> <li>• Have knowledge (academic-backed) of building performance and function of its technical systems (HVAC, lighting, machines)</li> <li>• Have knowledge of indoor climate parameters and their impact on building occupants</li> <li>• Have knowledge of building's energy balance, factors influencing energy performance and efficiency, environmental awareness</li> <li>• Have knowledge of energy saving measures and how measures can influence each other</li> <li>• Have knowledge of financial analysis of energy saving measures</li> <li>• Have an understanding of a design process</li> <li>• Have knowledge of energy measurement and verification protocols</li> <li>• A knowledge of project management and risk assessment</li> <li>• Time-management skills and organisational ability</li> <li>• Good problem-solving skills</li> <li>• Excellent communication and negotiating skills and ability to present to top level management</li> <li>• Good teamwork skills</li> <li>• Report writing and presentation skills</li> </ul>

By following and participating in the tasks of a Total Concept process from the start to the end provides opportunities to collect an invaluable knowledge and feedback during the process. This would create a positive learning curve and leads to increased technical competence and improved quality of the Total Concept projects carried out in the future in a more cost efficient way.

In Sweden some consultancy companies are already working with a Total Concept Manager concept in different projects as they find it very suitable to unite the entire project. In Swedish they call the function "Energisamordnare". A similar role in the building process, called "Energi Koordinator", has previously been developed and exposed in Denmark, but has not been professionally introduced, probably because of lack of a full developed concept behind.

How the role of a Total Concept Manager is managed in a Total Concept project will be strongly dependent on the preconditions that a client organisation has. For example if a property owner/client have in-house key actors available with sufficient know-how then they can take the roles and responsibilities of a Total Concept Manager themselves. Main advantage in this case is that a property owner can develop their technical competence and adopt new routines based on

the Total Concept method for their own organization. Main disadvantage in this case would be if there are problems with communication and availability of required resources in the organisation then this can have a negative impact on the work of a Total Concept manager. With external service providers for the role of a Total Concept manager these risks can be minimized.

Property owners with smaller organisations may need to engage an external energy experts from an engineering consultancy company to fulfil the role as Total Concept Manager. Smaller clients need more support in the process itself and an external Total Concept manager needs to concentrate more on supporting the process itself and coordination between the different steps.

However, the quality of the work of the Total Concept Manager will depend of practical experience, which has to come from more than a few projects. As this Nordic Built initiative is focused on setting up and developing and testing strategies for commercialization and promoting the Total Concept method as a business model, it is more likely that the Total Concept Manager role primarily will be linked to external actors.

### Required qualifications and skills for the service providers

Required technical qualifications and skills for the Total Concept service providers are principally the same as in a common building and retrofit process. However, there are some work tasks that can set somewhat higher demands on qualifications and skills for some key actors.

Carrying out Step 1 often involves somewhat more detailed analysis of a building. Therefore the energy consultant appointed for Step 1 needs to have besides the general technical background and competence in building engineering also:

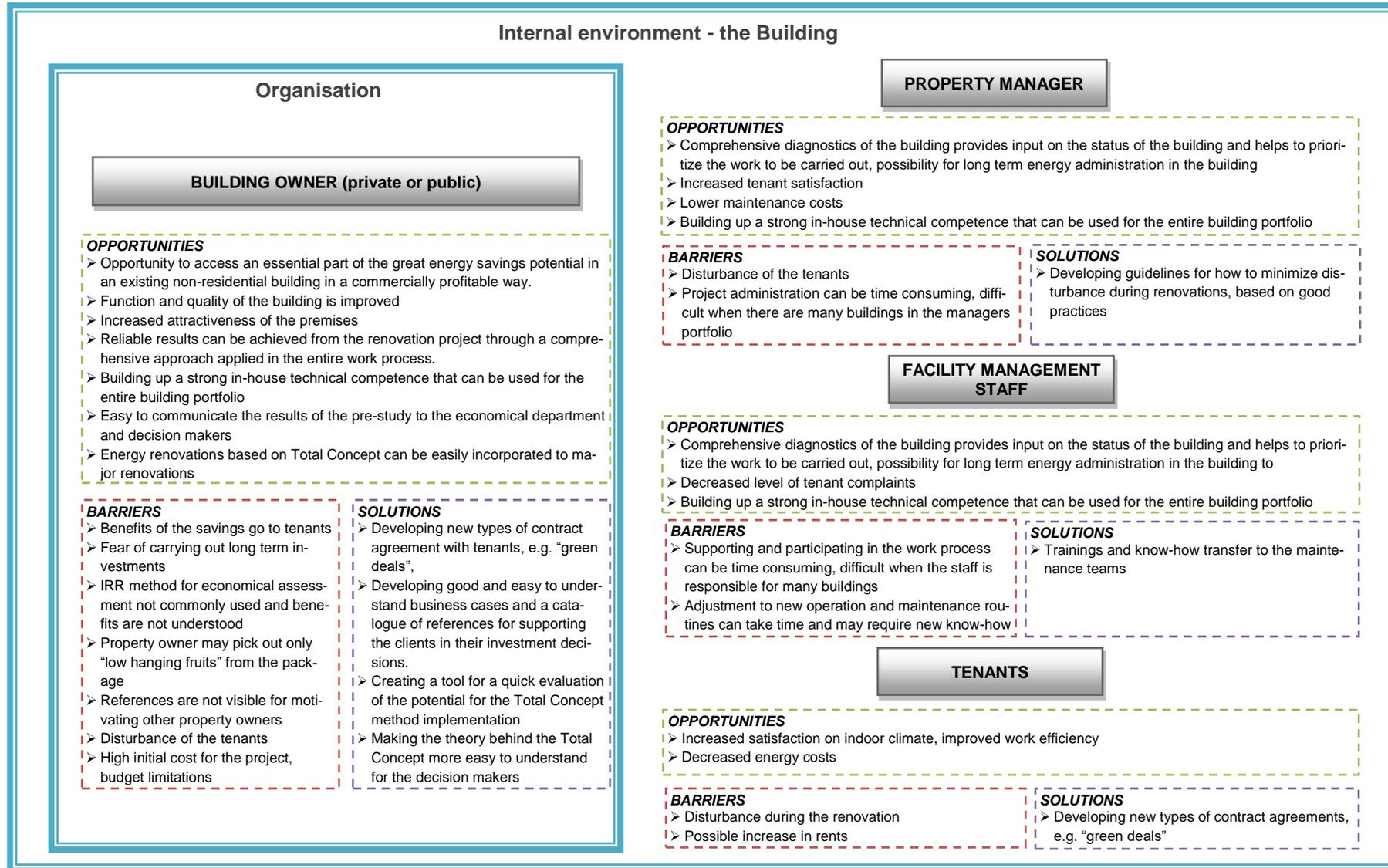
- Qualifications and experience for comprehensive energy auditing in non-residential buildings. This includes: knowledge of a building's function and the technical performance and operations of its various technical systems (HVAC, lighting, machines); understanding of indoor climate parameters and their impact on building occupants; ability to carry out detailed auditing and diagnostics of these systems and to draw up a list of potential energy saving measures.
- Detailed understanding of buildings energy balance and factors influencing the efficiency, ability to collect and analyse existing data of buildings energy use and evaluation of the baseline.
- Knowledge of using different energy simulation tools for buildings in order to carry out energy calculations for proposed measures.
- Knowledge of the construction process is also needed in order to correctly evaluate the investment costs needed for carrying out the different identified measures.

It would be beneficial if the energy consultants carrying out a Total Concept project were certified or authorized energy auditors and have passed a training course on Total Concept method implementation. This would provide a consistency in how the Total Concept method is used and can avoid any shortcomings in quality that can lead to overall uncertainty of the method implementation in the field. Existing certification schemes in the Nordic countries applies mainly for consultants carrying out auditing for energy certificates. There are no certification schemes in place for energy consultants carrying out comprehensive energy auditing in non-residential buildings, which would be needed for the Total Concept projects.

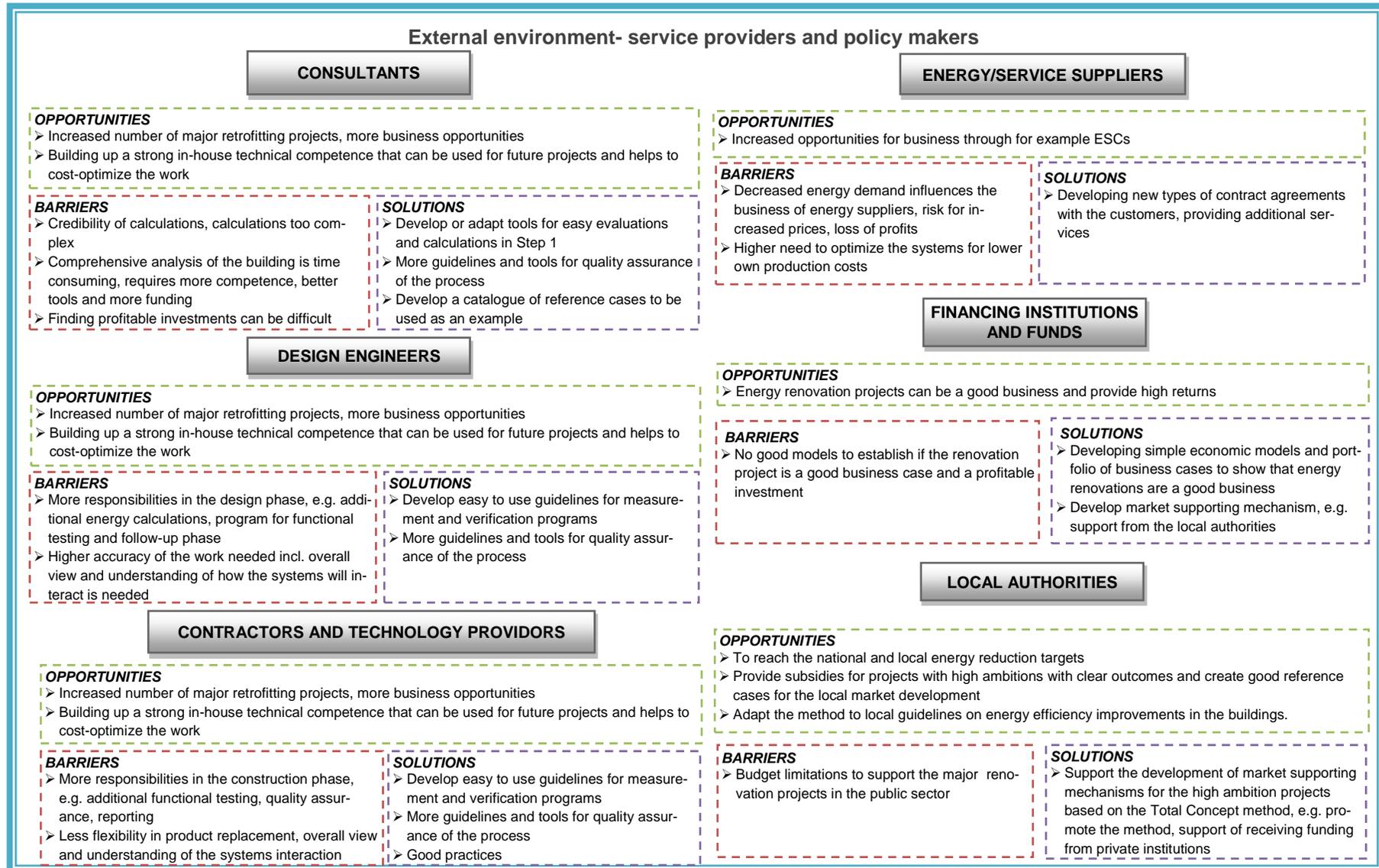
## Analysis of opportunities and challenges for the services based on the Total Concept method

The general barriers as well as solutions for major energy retrofitting projects from the property owner's point of view were discussed in Chapter 2. In Figures 11 and 12 the main identified business opportunities, possible barriers and solutions for different stakeholders and key actors are presented. Factors affecting a decision of starting and participating in a renovation project are given as well as barriers which need to be overcome to make this kind of projects more attractive.

**Figure 11.** Analysis of the business opportunities and possible barriers for the Total Concept method implementation for the internal key actors and stakeholders



**Figure 12.** Analysis of the business opportunities and possible barriers for the Total Concept method implementation for the external key actors and stakeholders.



## 7. Developing services based on the Total Concept method

### Possible service providers

Renovation projects based on the Total Concept method offer new business opportunities for a number of key actors in the building sector. The main target group here is the external key actors who will be involved with the practical implementation of the Total Concept method and who can provide services to the property owner/client (stakeholder) based on the Total Concept method, for example:

- **Engineering companies with energy consultants** who are working with energy performance improvement projects and have in-house experts and competence for detailed energy auditing of non-residential buildings. They can provide services for the key tasks in the different steps based on the Total Concept method. They could also provide services for the role of a Total Concept manager, if they have in-house technical expertise in monitoring the design work, construction, functional performance checks and follow-up processes.
- **Engineering companies with design engineers and architects** who can carry out the detailed design work for measures in an action package in Step 2 of the Total Concept method. Many engineering companies with design engineers have in-house experts also for the pre-study phase and design and monitoring phase of the renovation project.
- **Contractors and technology providers** who can participate in the construction phase in carrying out energy saving measures according to the consultants' proposals.
- **Existing ESCO companies and energy supply companies**, who already are providing EPCs and ESCs for the property owners and who can adapt the Total Concept method to their business model.
- **Energy Controller/ Energy Strategist** who work in-house for the property owner's organisation or is an external service provider for the property owner's company. In the Total Concept project they could take the role of a Total Concept Manager and/or deliver some of the tasks in the pre-study phase (Step 1) and/or function as a project manager or coordinator during renovation process.

### General business model for the Total Concept method

How the business model for Total Concept services will be developed within each service providing organisation depends on the structure and background of the company and type of services that the company can offer to their potential customers. As in any business model development it is essential for the service providing company to analyse and describe the following key elements in their business model (based on the Business Model Canvas<sup>4</sup>):

- **Offering**
  - Value propositions: what value is delivered to the customer and how it adapts to the customer needs?

<sup>4</sup> [https://en.wikipedia.org/wiki/Business\\_Model\\_Canvas](https://en.wikipedia.org/wiki/Business_Model_Canvas)

- **Customers**
  - Customer segments: who are the potential customers, for whom are they creating the value with their services?
  - Channels: which channels will be used to reach the customers and to deliver the services?
  - Customer relationships: how are the customer relationships established and maintained? Which ones have already been established?
- **Infrastructure**
  - Key activities: what key activities are included in the services provided to the customer?
  - Key resources: what are the resources that are necessary to develop and provide these services to the customer?
  - Partner networks: who are the key partners and suppliers needed to deliver the services? Which key resources are acquired from these partners?
- **Finances**
  - Cost structure: what is the cost for providing the services?
  - Revenue Streams: What are the customers willing to pay?

How these business model elements are defined and specified for the different external service providers for the Total Concept method depend on the type and size of the organisation and will not be analysed here in detail. That includes also the situation, where the Total Concept method must fit in and supplement an already established business. However, there are some common aspects that can be taken into account as discussed in previous chapters and these are summarized and further discussed below.

### **Value propositions**

The decision to start a major energy renovation project is often made by a building owner, private or public. For the property owners/ clients the Total Concept method implementation provides:

- An opportunity to access an essential part of the great energy savings potential in an existing non-residential building in a profitable way. A number of demonstration projects have demonstrated that reaching 50% annual energy savings are possible within profitability frames. Currently common approach in energy renovations is that only the most profitable measures, “the low hanging fruits”, are commonly considered and carried out. This leads also to a situation, where only modest energy savings are achieved and there is no economical motivation left to carry out the more expensive measures, which would significantly lower energy performance of the building even more.
- Improving the function and quality of the building, including improving indoor climate. Improved quality of the building will lead to increased tenant satisfaction and increases the overall attractiveness of the property and hence also increase in its market value.
- The Total Concept method helps to reach the expected energy savings through a systematic approach in the renovation process. The quality of the work is assured through coordinated activities in three steps and clearly defined activities, roles and responsibilities.

ties for the key actors involved during the work process. To have a comprehensive reliable approach for energy renovations seems not to be currently available on the market, especially not in Finland and Denmark.

- The Total Concept method applies an easy to understand economic model in profitability assessments that reflects the potential of the long-term investments in energy saving measures and provides reliable base for the decision making. Currently, fear of carrying out long-term investments and lack of good economic models for analysing long-term investments are considered as barriers for energy renovations in the market.
- The Total Concept method can be included to the overall renovation process of the building and helps to optimize the investments required for achieving better energy performance.
- The Total Concept method helps to build up a strong in-house technical competence since the method supports collecting an invaluable knowledge and feedback during the whole work process. This leads to increased technical competence and improved quality of the Total Concept project in the future that can be carried out in an even more cost efficient way.
- The Total Concept method helps to reach the national requirements of energy performance in a cost-efficient way and supports fulfilling the national and EU-targets on decreasing energy needs in the building sector.

For the external service providers the Total Concept method provides increased number of major retrofitting projects, more business opportunities and supports building up a strong in-house technical competence that can be used for future projects and helps to cost-optimize the work.

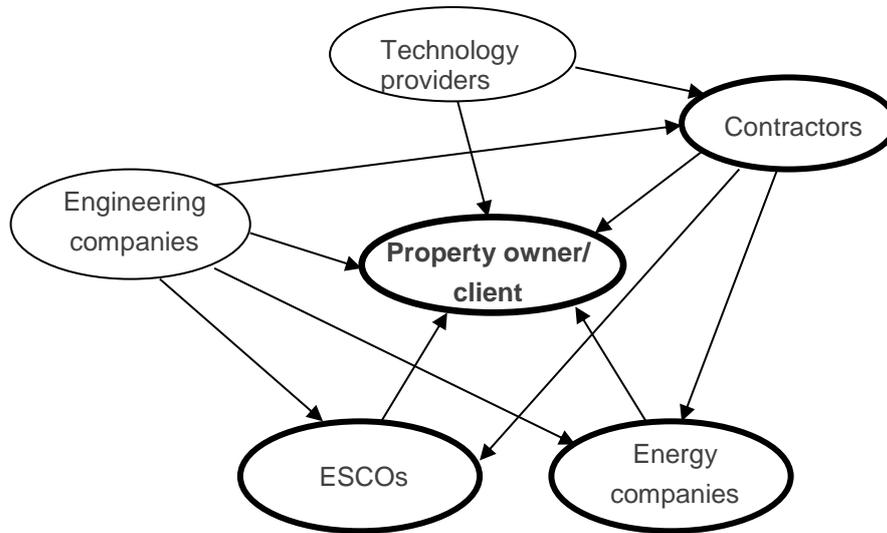
### **Customer Segments**

The main customers for whom the services based on the Total Concept method creates the value are property owners/clients both in public and private sector. The actual annual market volume for the renovation projects based on the Total Concept method in the three Nordic countries is estimated to be ca 4 million m<sup>2</sup>, corresponding to about 70 MEUR per year.

The term *client* can also refer to another investor/decision maker, who has the interest to invest in energy saving measures in the building. A client can for example be also a tenant company that pays for its own energy costs, etc.

Potential customers for the services based on the Total Concept method can also be some of the external key actors themselves. Depending on how the contracting is managed between the property owner/client and the service provider, the last one(s) can through subcontracting use the services of other key actors involved in the process. For example a contractor company can be the main customer for a design company or/and an energy consultancy company; or energy consultants, design engineers and contractors can be hired by an ESCO company or an Energy Supplier Company; or an external Energy Controller who is appointed as a Total Concept manager

can buy services from other key actors for the specified tasks, etc. The potential customer segment is illustrated in Figure 13.



**Figure 13.** Potential customers and service providers for services based on the Total Concept method.

### Channels to reach the customers

Raising awareness about the Total Concept method is important for creating the potential demand from the customers side. As there are already, or will be, a number of demonstration projects carried out they can serve as good examples for demonstrating the benefits of the Total Concept method. The property owners who have tried out the method can be a good information source for other potential customers as well as disseminating the information through the local trade associations.

Also local Energy Agency and local authorities can have an important role to play in order to increase the awareness about the Total Concept method. The Total Concept method supports in reaching the national requirements set on the energy performance of the buildings in a cost-efficient way and supports fulfilling the national energy targets. Local authorities and Energy Agency could support the development of market supporting mechanisms for the high ambition projects based on the Total Concept method, e.g. promote the method, support training of the key actors, provide subsidies for the first projects, etc.

In order to reach out to the potential customers for the first time for promoting the Total Concept method and services provided by the specific company, the following actions can be recommended:

- Identify potential energy renovation projects and their property owners.
- Arrange an information meeting with the identified property owners to discuss how they experience the current situation with their building, its energy performance, indoor climate, etc. and what their goals are with the renovation project and expectations on outcomes. Identify whether there are an ordinary renovation planned for upcoming years. The information meeting could preferably be arranged in cooperation with local property owners association, regional energy office.

- Describe the Total Concept method and experiences from earlier Total Concept projects and the advantages that are provided especially in combination with ordinary renovation.
- With the interested property owners discussion for carrying out a preliminary assessment for the potential of the Total Concept method can be initiated. Good basis for this assessment is the total energy use of the building today combined with key figures of the energy consumption of comparable buildings. For example buildings with quite good energy performance from the beginning have minor possibilities to find measures for a profitable action package that can considerably decrease the energy use. While in buildings with poor energy performance there is higher potential to find a number of energy measures and form a profitable action package with the high impact on the energy use.

In the cases where the property has a low energy use today, carrying out a renovation project can be motivated with improving quality of the building or provide a good base for environmental labelling. The Total Concept method will show the advantages/disadvantages of choosing different kind of systems and interaction with other possible measures.

The key actor who tries to market its services to the customer should also prove that they have the required skills and competence do deliver the specific services based on the Total Concept method. To present a portfolio of references for the this kind of services or similar services provided in the non-residential building sector is needed. It would be beneficial if the service provider could prove to the customer that they have participated in relevant training programs of the Total Concept method. Training courses will be established as part of the Nordic Built initiative.

Setting the demands on the services required is often stated in the tendering documentation. The customer must clearly specify the scope, requirements and responsibilities for the service providers in the tender documents as well as in the contractual agreements so that there is no gap between what the customer expects and what the service provider can deliver. Guarantees to the project delivery and outcomes need to be specified in the contractual agreements.

Last but not least, it would be a good idea to use professional organizations - for example, in cooperation with research institutes - to ally with the trade press for through serious articles to spread awareness of the method and its application - as part of market introduction.

### **Customer relationships**

The Total Concept method supports a comprehensive approach in the renovation process. Personalized customer relationship can be established via good cooperation and communication in the project. Know-how and technical competence of a project organisation and service providers can be improved by collecting an invaluable knowledge and feedback from each project, leading to more cost efficient projects delivery for a customer. Long term cooperation's can be established on this bases.

### **Key activities**

The key activities delivered to the customer depends on the specific service provider and what is their role in the renovation process based on the Total Concept method. However, there is list of

defined key activities that are included to the Total Concept work method and roles and were discussed in more detail in chapter 6 and can also be found in the Total Concept Guidebook<sup>5</sup>. An example of how the tasks and responsibilities could be managed between the different key actors in a Total Concept project is given in Appendix 1.

Each service provider should analyse what are the key activities that their value proposition require.

### **Key resources**

The main key resources needed for a service providing company in a Total Concept method is to have qualified consultants and engineers for the specified tasks, i.e. to have the human resources with the required skills available.

For providing services for Step 1, creating the action package, the service provider also need to have tools and equipment needed for comprehensive auditing on site, e.g. measurement instruments for indoor climate measurements, power measurements, pressure measurements, etc. Additionally a verified software for energy simulations of the building and its technical systems is required as well as the Total Concept profitability calculation tool.

Step 2, carrying out practical construction work, is similar to any traditional renovation work, but due to the following measurements there is more focus on quality assurance of the deliveries. So the commissioning phase is somewhat more detailed, including functional performance checks carried out in the building. For the commissioning measurement and monitoring equipment is needed.

### **Key Partners**

It can happen that a service provider for the Total Concept method may not always have all the in-house expertise required for all of the key activities included to the service. Therefore cooperation/subcontracting may be needed with other engineering companies and service providers in the building sector. For example, it can happen that smaller energy consultancy companies providing services for Step 1 may outsource for example cost estimation tasks or even carrying out diagnostics of specific technical systems to other engineering companies with qualified experts. An ESCO company can also use key partners for specific tasks, e.g. design work, constructions and installations, measurements and monitoring. Even financing institutions are an important key partner for an ESCO company who make the initial investment for the measures.

For developing quality assured services for the Total Concept Total Concept method every service provider needs to analyse their in-house expertise for carrying out the required key activities and evaluate which key partners and suppliers are needed to deliver the services.

### **Pricing model and cost structure**

The cost structure and pricing model for the services is dependent on the services delivered. For example in the case of a Total Concept Manager some of the functions may be carried out by the property owners own internal key actors, and in the calculation, it is important to separate the

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<sup>5</sup> 2014 The Total Concept Guidebook for implementation and quality assurance. [www.totalconcept.info](http://www.totalconcept.info)

costs of specific activities related to the Total Concept method, from the cost of traditional services so that the customer does not pay for the same service twice.

Carrying out Step 1 in the Total Concept method, a pre-study, is more comprehensive than traditional pre-studies and methods used in the energy renovations. It is important for the client to be aware of that and it is important for the service provider to explain, what will be delivered and included in the price.

The different services in the Total Concept method can be delivered based on a fixed price or based on an hourly rate. While the Swedish clients often prefer to buy the services for specified tasks at hourly rate or fixed price, then the Danish and Finnish markets are more open to other kinds of business models, e.g. EPC model.

In very large or complicated buildings an additional pre-evaluation may be needed in order to correctly pricing the work to be carried out. This would help to avoid problems with a too limited time budgeted that will prevent to carry out the project to a high standard and with good results. Otherwise, prices based on experiences can be used.

It is essential to discuss the prevailing conditions with the consultant before starting the project. For the service provider it is important to have a clear overview of the activities/tasks included to work in order to make a correct cost estimation.

Experiences from the Total Concept projects performed in Sweden shows that the total cost for carrying out a pre-study and preparations (Step1) has been about 3 - 4 €/m<sup>2</sup>. Cost for carrying out an action package based on the Total Concept method (Step 2) has been in average about 65 €/m<sup>2</sup> and follow-up work (Step 3) about 1-2 €/m<sup>2</sup>.

In the consultancy company it is commonly the cost for the in-house and external experts needed for the tasks is the most important cost. Additional costs can be associated with software licenses (e.g. energy simulation software) and cost for measurement and monitoring equipment.

# Appendix 1

## Roles and responsibilities of involved key actors in a Total Concept project

**Table A.1.** An example of how the tasks and responsibilities could be managed between the different key actors in a Total Concept project.

Activity	Responsible/Accomplished by*							Deliverables	Comments
	Property owner	Property manager	Total Concept manager	Energy consultant	Design engineer	Contractor/technology provider	Maintenance staff		
<b>Step 1 Creating the action package</b>									
Defining the starting point and involvement of in-house key actors (e.g. energy controller/strategist, property manager, maintenance staff, tenants, etc)	X								
Engaging a BTC Manager (in-house or external)	X							Tender documents	
Engaging an energy consultant	X							Tender documents	
Monitoring activities in Step 1			X						
Compiling background information of the building		X		X			X		The responsibility of the in-house key actors is to supply the energy consultant with all the necessary information about the building
Energy auditing and identification of measures				X					
Agreement on baseline	X	X	X	X					
Energy calculation				X					
Cost estimations				X					
Profitability calculations				X					
Reporting				X				Technical report of Step 1	
Decision for going further with Step 2 and Step 3	X								
<b>Step 2 Carrying out the measures</b>									
Involvement of in-house key actors for step 2	X								
Engaging designers and an architect (if needed)	X		X					Tender documents	Total Concept manager has a role of giving input and reviewing the documents
Design work					X			Design documents	
Review of design documents	X	X	X				X	Review documents	
Review that the designed building fulfills given requirements	X	X	X					Review documents	
Revision of action package (additional calculations)			X		X				Additional energy calculations may be needed based on the input data from design

**Table A.1.** An example of how the tasks and responsibilities could be managed between the different key actors in a Total Concept project (continues).

Activity	Responsible/Accomplished by*							Deliverables	Comments
	Property owner	Property manager	Total Concept manager	Energy consultant	Design engineer	Contractor	Maintenance staff		
Planning of functional checks in Step 2 and follow-up in Step 3			X	X				Program for functional checks and follow-up	Plans are made by the designer and monitored by the Total Concept manager
Engaging contractors	X		X					Tender documents	Total Concept manager has a role of giving input and reviewing the documents
Construction work and installations						X	X		Measures involving adjustment of setpoints in the BMS can be carried out by the maintenance staff
Controls during construction time, incl. review of changes and updates on costs	X	X	X				X	Protocols from the controls	
Contractors own tests (infiltration, efficiencies)						X		Protocols from the controls	
Balancing work of the systems (HVAC, BMI)						X		Protocols from the tests	
Client's control of building in operation	X	X	X				X	Protocols from the controls	
Coordinated testing (tests of systems interaction and performance)						X		Protocols from the tests	
Functional performance tests	X	X	X			X	X	Protocols from the tests	
Updates on operation and maintenance routines			X		X	X	X	Revised O&M plans	
<b>Step 3 Following up</b>									
Involvement of relevant key actors for step 3	X		X						
Additional testing during operations						X		Protocols from the tests	
Monitoring of energy use, building use and analysis of the results, incl. deviations			X	(X)			X	Report on outcomes	In the case of deviations calculations with the building simulation model may be needed
Checking cost savings and profitability results			X					Report on outcomes	
Evaluation of project outcomes and feedback	X	X	X					Final report of the project	