



PROFITABLE ENERGY EFFICIENCY IMPROVEMENTS — MYTH OR OPPORTUNITY



Independent continuation of the 'Million Homes' report

FOREWORD

The improvement of buildings from the 1960s and 1970s in Sweden (also referred to as ‘the Million Programme’, see page 4) still represents a major challenge for politicians, housing companies and residents. The Swedish Association of Public Housing Companies (SABO) is the organisation of the municipality owned public housing companies in Sweden. SABO described the preconditions for this improvement work, the choices facing housing companies and their opportunities and limitations in its report entitled *Hem för miljoner* [Homes for Millions] (November 2009). There has subsequently been increased awareness regarding the challenges of the Million Programme and the question of the possibility of making energy efficiency improvements in conjunction with properties being improved has increasingly been raised.

This report *Lönsam energieffektivisering — myt eller möjlighet?* [Profitable energy efficiency improvements – myth or opportunity?] is an independent continuation of *Homes for Millions*. It raises the issue of improving energy efficiency during improvement work, a challenge that is very important, highly topical – and complicated. In the discussions currently being held, a picture is often painted that it is profitable for housing companies to carry out improvements to energy efficiency during improvement work, regardless of the current standard and energy use of the property. Politicians from various parties and the construction industry argue that such measures finance themselves or may even save a large amount of money for housing companies. However, is this true in all districts, for all undertakings and for all properties?

SABO wants this report to be a supporting document for decision-makers and interested parties for discussions relating to energy efficiency improvements for buildings and in order to shed light on the complexities of this challenge. In order to illustrate what companies have to consider when improving energy efficiency in conjunction with improvement work, we describe this issue on the basis of the actual situation for one of our member companies.

We would like to say a big thank you to ÅF and WSP, our energy consulting firms, which contributed to this study, and also Botkyrkabyggen, which put one of its Million Programme properties at our disposal for an energy investigation. Thanks also Karl-Erik Käck, Ulf Nyqvist and Ronny Fridell at AB Botkyrkabyggen, Patrik Sundberg at Skebo AB, Rikard Lindegren at Signalisten i Solna and Mattias Westher at Bostad AB Poseidon.

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SUMMARY

A large number of homes in the Million Programme still require improvement work. This creates expectations from politicians, the construction and energy sector, tenants and the housing companies themselves. One picture that many are keen to present is that it is often profitable to improve energy efficiency in conjunction with improvement work and that the savings may finance some of the improvement work. This study shows that unfortunately this is not the case; the reality is much more complex than this.

Of course, housing companies should always consider the possibilities of improving energy efficiency in conjunction with improvement works. However, this decision must be taken following careful deliberations. It would be very difficult, financially, to halve energy use each time that improvement work is carried out, though this will have to be achieved to attain the national environmental objective of halving energy use in the housing sector by 2050.

SABO has commissioned two consulting firms to conduct independent energy investigations at the same property in Botkyrka and for each of them to propose packages of measures that would save 20 and alternatively 50 per cent of energy. Based on their proposals and other analyses, SABO has been able to identify a number of key factors that the housing companies will have to deal with and adopt a position on; factors where there are currently some aspects of great uncertainty:

- There are different ways of defining profitability, and the definition chosen will affect the companies' financial calculations and choice of measures for improving energy efficiency in conjunction with improvement work.
- Energy consultants make different assessments of the measures that should be taken, what they cost, their technical life and the assessment of the gains from improving energy efficiency. It may be difficult for a company to assess what is right in their particular situation.
- The same measures will affect the company's finances in different ways depending on the market to which the property belongs. There may still be an adverse effect on the company's result even if these measures increase the value of the property by as much as it costs to implement all of the measures. This means that in addition to the change in the property's value the company must also consider the development of the result, cash flow and equity/assets ratio when making economic considerations.

- Price trends and the tariff structures for electricity, heat and water are decisive. Uncertainty prevails even here in relation to how suppliers will act when use reduces. If they increase the proportion of fixed costs, this will have an impact on the possibility of companies saving money by improving energy efficiency.
- In the vast majority of cases, halving energy in the Million Programme cannot be solely financed by reducing operating costs; rents must be increased. However, purchasing power in these areas is low and improvement work must be adapted to the level at which residents are able to pay.

Current preconditions are making it difficult for housing companies to achieve the halving target and it will at the same time be difficult for some of them to cope financially. When assessing which measures are to be finally implemented, the environmental objectives may clash with the finances. Priority may have to be given to measures that provide a rapid pay-off for the company. The additional resources required to achieve the halving of consumption become directly unprofitable.

There are no given measures to improve energy efficiency that suit all properties in all parts of Sweden. Not everything is profitable and, even if a lot is, the repayment period may be too long. A careful analysis must be conducted in each individual case of the company's total finances, conditions in the local market, the technical status of the property in question and the willingness and capacity of tenants to pay before improvement work is carried out.

For this reason, it is particularly important for politicians, the construction industry, energy consultants, energy suppliers and property owners to jointly discuss sustainable solutions. This study should be viewed as a supporting document for such discussions.

The Million Programme

Due to the huge housing shortage at the beginning of the 1960s the Riksdag (Swedish Parliament) introduced the 'The Million Programme' with the aim of building 100 000 dwellings each year between 1965–74. The buildings from this period are highly standardised and industrialised. However, standards of living increased rapidly thanks to this programme.

BACKGROUND

AMBITIOUS AND IMPORTANT TARGETS FOR THE HOUSING SECTOR

Residential and non-residential properties account for almost 35 per cent of Sweden's total final energy use, of which SABO's member companies represent around three per cent. It is important to reduce energy use in buildings to achieve Sweden's environmental objectives such as, for instance, reduced greenhouse gas emissions and reduced consumption of resources. For individual housing companies this matter also of course involves reducing operating expenses.

Public housing companies often assume great responsibility and actively work to reduce energy use in their buildings, both for environmental and financial reasons.

One hundred and three of SABO's three hundred or so members have adopted and signed the SABO companies' Skåne Initiative. They jointly own 383,970 apartments, which is a significant proportion of the SABO companies' stock. Companies in the Skåne Initiative have undertaken to jointly reduce their energy use by 20 per cent between 2007 and 2016. This target is more ambitious than both the EU's and Sweden's national targets, yet it is considered that the companies will achieve this.

Besides SABO's ambitious target, the Riksdag (Swedish Parliament) has decided that the Swedish building stock must reduce energy use by 20 per cent by 2020 and that it should be halved by 2050 compared with 1995 levels. According to the National Board of Housing, Building and Planning, the trend is moving in the right direction, but further measures are required to achieve these targets. Besides the Riksdag's target for reduced energy use, further tightening up is required from the EU for energy efficiency improvements in order to achieve the energy and climate targets for 2020 set by the EU.

ECONOMIC FRAMEWORKS AND BUSINESS-LIKE PRINCIPLES

Substantial resources are required to halve energy use in apartment blocks. In October 2007, SABO conducted an impact analysis of the economic effects if energy use requirements were the same as those for new construction. The findings were presented in the report *Snabbanalys – SABO-företagens förutsättningar att klara krav på energieffektiviseringsåtgärder vid underhåll, renovering och ombyggnad* [Brief analysis – the preconditions of SABO companies to meet requirements for energy efficiency improvement measures during maintenance, renovation and rebuilding work]. This analysis showed that while there was some scope for investing in measures to improve energy efficiency for

homes in attractive locations, it is only economically viable to implement a very limited number of measures in less attractive locations. The report also showed that the financial scope for maintenance measures reduces when interest rates rise.

A new law entered into force on 1 January 2011 which makes it clear that public housing companies must operate according to business-like principles. Each municipality must set a minimum return required in line with market rates, taking account of the market situation, the location, age and maintenance status of the stock and also the risk prepared to be taken. The management of the companies can set different requirements and apply different minimum returns required in respect of, for example, different properties and projects.

Another important issue is what reasonable and business-like risk compensation would entail and how much this should differ depending on the market situation and technical status of the property. The prospects of generating a surplus are significantly worse in a declining market than in a rising market with a high demand for homes. Stakeholders that are considering investing in properties therefore require a higher return in a declining market, where the risk is greater.

All of the company's investments are assessed as being profitable in the long term. However, it is compatible with business-like principles to run pilot projects with a view to testing new methods for improving energy efficiency, subject to the precondition that findings are followed up and lessons learnt.





THE EFFECT OF ENERGY EFFICIENCY IMPROVEMENTS ON COMPANY FINANCES

We will illustrate factors that have a significant impact on housing undertakings

1. How is 'profitability' defined and what should be considered when calculating profitability?
2. How much do energy efficiency improvements reduce energy costs?
3. The willingness and capacity of tenants to pay.

1. HOW IS 'PROFITABILITY' DEFINED AND WHAT SHOULD BE CONSIDERED WHEN CALCULATING PROFITABILITY?

The measures taken by housing companies must be conducted according to business-like principles. The company must conduct a profitability analysis in order to determine what measures are possible within a project. So what does a profitable energy measure actually constitute? SABO commissioned two consulting firms, ÅF and WSP, to conduct their own energy investigation at the same property in Botkyrka and each propose packages of measures that would save 20 and alternatively 50 per cent of energy. Their findings are described in more detail on pages 15 to 16 of this report. SABO has also asked these consulting firms to define profitability, and their responses indicate different definitions.

In this section we briefly report on the various models for calculating profitability.

PROFITABILITY ACCORDING TO BELOK'S MODEL FOR A TOTAL PROJECT FOR IMPROVING ENERGY EFFICIENCY

BELOK (a procurement group for non-residential premises) is a network whose members are property owners of non-residential premises. This network has produced a model that is specifically for property owners of non-residential premises called *BELOK Totalverket* [BELOK Total Tool]. This aims to look at measures based on packaged solutions so that it is not just the most profitable measures from an energy perspective that are implemented. The package of measures shall even include those measures that contribute to, though cannot achieve on their own, real energy savings. The first measures, which may be very profitable, help to achieve the entire package, satisfying the property owner's requirement for the investments' profitability.

The internal rate of return is defined on the basis of the reduction in annual operating costs attributable to the energy measure, cleared of expected energy price increases over the technical life of the measures, and is related to the investment expense. The longer the technical life, the more the internal rate of return curve will be flatter. If an assumption is made of a life in excess of 20 years, there will be no appreciable effect on the internal rate of return if the assumption transpires to be slightly incorrect. However, the adverse impact on the internal rate of return would be significant if it were to transpire that the life of a measure, which was assumed to be 17 years, was really only 15 years and vice versa. It may be difficult to get

costings and energy calculations that are more accurate than +/- 10 per cent when reviewing an existing building.

ÅF has chosen BELOK's model to calculate the internal rate of return and describes profitability in its report on the basis of the return required on invested capital:

"Profitability for both private property managers and those subject to competition is based on the amount invested yielding a short-term return and will always be calculated using those measures that will make a positive contribution to the value of the property; this is because it should be possible to sell the property at a profit at short notice. A desired internal rate of interest on investments for these managers is probably at least 15 per cent for a period of five years."

ÅF states the following in relation to what a reasonable minimum return required would be for a public housing company with long-term ownership:

"A slightly lower return on capital invested is acceptable for properties managed by public companies on a long-term basis and which are therefore not continually on the market for sale. An internal rate of return of five to ten per cent should be acceptable. As the internal rate of return is dependent on expected useful life, measures with a short expected life have a significantly quicker repayment period for achieving the same required return as measures with a long life. If it is also assumed that energy prices will continue to increase on average by more than inflation, then the requirement for an internal rate of return can be reduced by the likely energy price increase over and above inflation. This increase has historically been approximately two per cent above the inflation rate. The measures chosen in our proposal have an expected life of between 20 and 30 years and therefore achieve an internal rate of return of five per cent even in the case of an energy saving of 50 per cent. This means that the package of measures produced is considered to be profitable in the long term."

PROFITABILITY ACCORDING TO THE PAY-OFF METHOD

The pay-off method focuses on the repayment period. Imputed interest is ignored and the only aspect calculated is how quickly the investment will be paid based on the annual surplus of income over expenditure being deducted from the basic investment until it is repaid (also known as the 'payback method') in relation to the initial investment. One disadvantage of this method is that it favours short-term investments. This method is most appropriate when comparing which measures have the shortest pay-off period. WSP considers that:

"Measures are profitable when the repayment (pay-off) period is around ten years."

They also consider that there are measures that would only be justifiable during extensive renovation or rebuilding work.

When calculating pay-off periods, the energy saving in SEK has been reduced by the cost of maintaining and servicing the new installation. Capital costs have not been considered.

PROFITABILITY THROUGH THE PRESENT VALUE METHOD

The present value method calculates the value of all expected payments and receipts which are recalculated as of one and the same time, the time when the initial investment was made. The potential for savings then becomes fundamental from the perspective of price and the amount of the energy saving, the amount and life of the initial investment and the assumed cost of capital. The investment is profitable if the present value exceeds zero.

A simplified form of the present value method is to make a rough estimate of how the value of the property has increased as a result of the resources deployed. This is done by dividing the improvement in the first year's net operating result by the applicable dividend yield required for the property in question. It is assumed that the benefit of the measure will extend so far into the future that the present value becomes the same regardless of whether we capitalise in perpetuity the increase in the first year's net operating result or discount all future payments by a discount rate.

This shows some of the different ways of defining and assessing profitability, and there are doubtless many more. However, the finances of the company will be affected regardless of the method chosen by the company. Therefore the financial capacity of the company will determine which measure can be taken.

HOW THIS AFFECTS THE COMPANY'S RESULT – AN EXAMPLE

Besides choosing the profitability method, it is also important for the company to consider the development of the result, cash flow and equity/assets ratio. Measures that require increased borrowing result in a higher interest expense. The cost savings achieved through the measures taken thus become critical to cash flow. Problems may

arise even if the measures have a long life and can largely be said to increase the value of the property. In other words, it is uncertain whether or not a measure, which is profitable according to certain definitions, is actually the right one to take.

We are using this example as an illustration. It relates to two properties: one in a declining market and one in a strong market.



ASSUMPTION	Property 1 in declining market			Property 2 in strong market		
Required yield	8.5 per cent			4.5 per cent		
Measures to improve energy efficiency	SEK 1,500 per m²					
Reduced energy use	50 per cent, corresponds to SEK 97 per m2 and year¹, increasing two per cent more than inflation					
Bank loan taken out	SEK 1,500 per m²					
Technical life	20 yrs					
Assumed interest rate	4.5 per cent			4 per cent		
The final calculation will be	Property 1			Property 2		
SEK/m²	Yr 1	Yr 2	Yr 3	Yr 1	Yr 2	Yr3
Loan	1,500	1,443	1,386	1,500	1,425	1,350
Energy price's adjustment over and above inflation	2 per cent			2 per cent		
One-off costs	(1 140-1 500) = -SEK 360 per m²			SEK 0 per m²		
Assumed interest rate	4.5 per cent			4 per cent		
	Property 1			Property 2		
SEK/m²	Yr 1	Yr 2	Yr 3	Yr 1	Yr 2	Yr 3
Reduction in operating costs	97	99	101	97	99	101
One-off costs	-360	-	-	-	-	-
Interest expense	-67	-65	-62	-60	-57	-54
Cost of depreciation (5%)	-57	-57	-57	-75	-75	-75
Effect of measure on the company's result (SEK/m²)	-387	-23	-19	-38	-33	-28
Internal rate of return acc. BELOK	3 per cent			3 per cent		
Pay-off period	14 yrs			14 yrs		
Pay-off period considering increased interest expense	20 yrs			18 yrs		

¹ According to SABO's economic statistics for 2010, the average cost of energy (heating, electricity and water) is SEK 193 per m² and year

² Will be expensed in the income statement as a maintenance cost

When making investments, an assessment should be made of whether the entire expenditure can be considered to increase the value of the property. A one-off cost will arise if expenditure is more than the increase in the value of the property; which must affect the company's result in the first year. In the event of improvement work, some expenditure should be recognised as one-off costs (maintenance) while others increase the value of the property. In the example on page eight, this interpretation is based on the property being considered to use less energy following the measures than prior to the energy efficiency improvements, which means that its value increased following the improvement work. For a simplified assessment of how much the value has increased, divide the increase in the net operating result by the dividend yield required.

This means that there would be a high one-off cost for **Property 1** and it would take 20 years before the company earns this money back, taking account of the increased interest expense. **Property 2** would increase in value by an amount corresponding to expenditure, which may justify the measure being implemented. The value may possibly increase by more than the cost of the measure when sold. The repayment period, when considering the interest expense for the loan, is then 18 years.

The increased value of the property will affect the result through annual depreciation. In this case, the life of the measures is considered to be 20 years. This involves an annual depreciation rate of five per cent. Given the above assumptions, there is no margin for miscalculation.

According to BELOK's Total Tool model, these input resources would yield an internal rate of return of three per cent for 20 years and, according to the pay-off model (excluding interest expense), pay for themselves within 14 years. Whether or not these results should be interpreted as profitable probably depends on the discussion relating to risks, the market you are in and expectations concerning trends in interest rates and energy prices.

Poorer ongoing financial results

However, it is a fact that the measures for both of the premises will lead to poorer ongoing financial results. For **Property 1**, the first year will result in a high one-off cost and after that a decreasing negative result that will start turning into a positive result already by Year 7. **Property 2**, which will increase depreciation more than **Property 1** as the entire expenditure increased the value of the property but has the same economic life as **Property 1**, must wait until Year 9 before seeing a positive result. What is profitable? What can the company do? The company's financial capacity and market then become vital.

In other words, the measures in both cases will have an adverse effect on the company's annual result, despite



halving energy use and energy costs .

This example shows that one and the same measure affects a company's finances in different ways depending on the property's market. In a declining market a greater proportion of the expenditure must be treated as one-off costs. Measures taken at a property in an attractive market could increase its value by as much as the entire measure cost to implement, but there would still be an adverse effect on the company's result. If these measures are taken, there may be a need to increase rents to avoid any deterioration in the company's economic result.

Effects with other preconditions

Assume instead that the expenditure for measures to improve efficiency was SEK 2,500 per square metre, which is not an unusual level on the basis of experience, and implement these for the same properties. In general the same assumption of energy trends and interest rate levels are used, but the halving of energy use only yields a saving in SEK of 40 per cent; i.e. SEK 77 per m² in Year 1. This generates two completely different values.

The internal rate of return for the project becomes 0 per cent, the new pay-off period (not considering interest expense) becomes 26 years and if the company is to cover the additional interest expense, rent increases of around 8–10 per cent would be required, based on the gross average rent for SABO's member companies for 2010. In addition, there would be a one-off cost of around SEK 112,000 for a 70 m² apartment in **Property 1**. This corresponds to almost two years' rent for the apartment. In this case, a one-off cost would also have an adverse

effect on **Property 2**. This would amount to around SEK 55,000 for a corresponding apartment, which is almost a full year's rent.

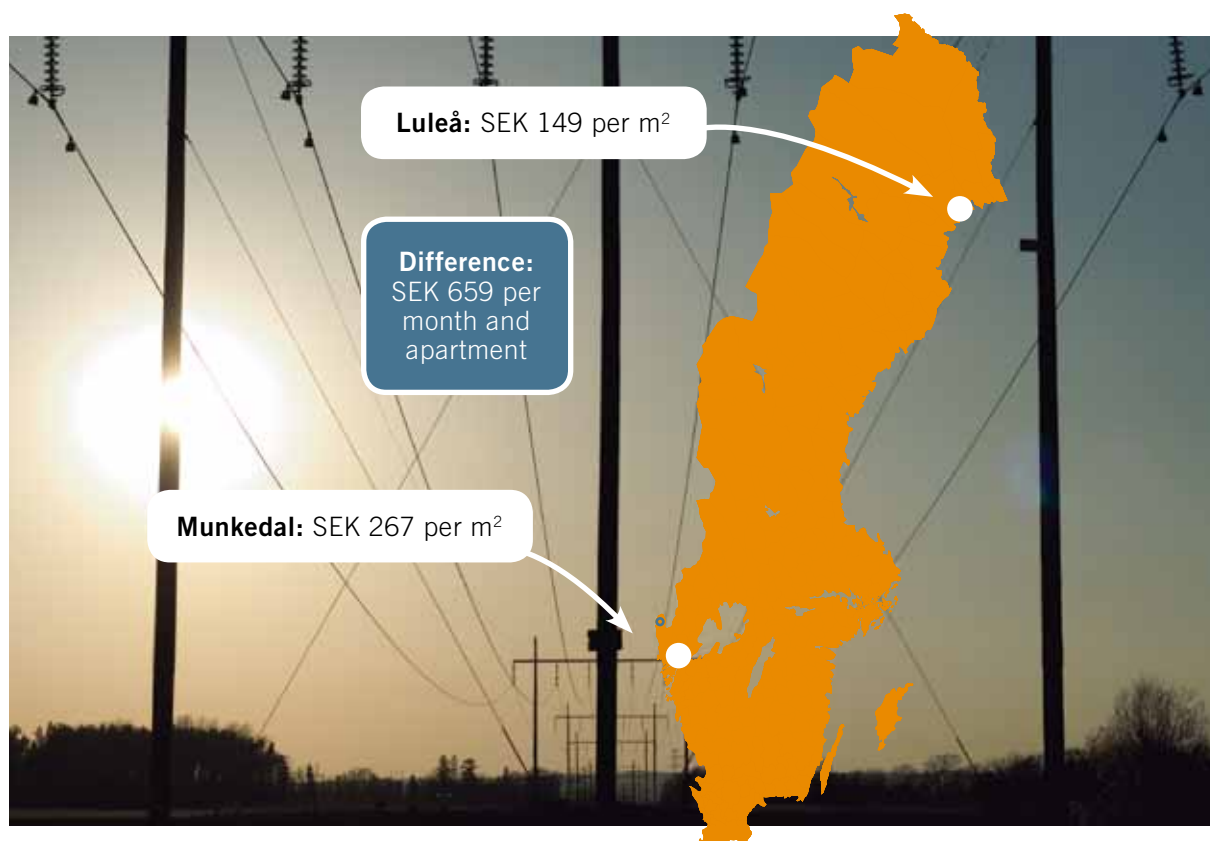
In this case, the measures to improve energy efficiency would thus lead to large one-off costs that could never be covered by reduced operating costs in respect of the properties where measures have been taken. This would lead to a negative trend for the company's result and return. It is consequently not possible to retain such high level of ambition for the improvement project without agreeing on significant rent increases for both of the properties in question and also for the company's other properties in order to compensate for these losses.

Increase in value mainly favourable at time of sale

If the value of a property increases, this would primarily benefit a property owner who is thinking of selling the property in the near future. A long-term owner would

obviously be interested in the value of its property increasing, as this would improve opportunities to borrow; this affects the property's total return and avoids large one-off costs. An increase in value benefits all property owners, although the long-term owner has to consider more aspects than the short-term gain in Swedish kronor, as the property must pay its way in terms of results throughout the entire period of ownership.

The conclusion drawn is that it is important for property owners to evaluate how the measures will affect the value of the property prior to initiating these measures. This should also be combined with an analysis of the company's forecast result and cash flow as a result of the investment. It would be very obtuse just to proceed on the basis of the methods presented by energy consultants, as they sometimes do not consider the company's increased capital costs nor explain how the measures will affect the company's result or the value of the property.



2. HOW MUCH DO ENERGY EFFICIENCY IMPROVEMENTS REDUCE ENERGY COSTS?

The local energy price and the property's energy use affects the amount of money that can be saved through a measure to improve energy efficiency. It is likely that companies with properties that use a small amount of energy in a market where the price of energy is relatively low will not be able to save as much money and vice versa.

According to the Nils Holgersson survey³ in 2010, Luleå has the lowest total costs for electricity, district

heating and alternative forms of heating: SEK 149 per m² including VAT. The Municipality of Munkedal has the highest total cost of SEK 267 per m² including VAT. According to the survey, the cost of electricity, district heating (see page 12) and alternative forms of heating in Munkedal is 79 per cent higher than in Luleå, representing a difference of SEK 659 per month and apartment. Measures to reduce energy use in Luleå thus have a significantly lower savings potential in SEK than measures in Munkedal.

³ In the Nils Holgersson survey, a residential property is 'moved' through each of Sweden's 290 municipalities to compare the cost of refuse collection, water and sewerage, electricity and heating. It shows the costs for a 67 m² apartment. See www.nilsholgersson.nu.



The economic savings also depend on how the local energy price is structured. A separate Nils Holgersson survey⁴ studied prices and tariff structures in 30 municipal authorities and their significance to profitability when improving efficiency. The study shows that if district heating reduces by 25 per cent, costs reduce by on average 24 per cent in the municipalities studied.

The value of improving efficiency differs

Even if the situation in percentage terms appears to be quite similar across Sweden's municipalities, the value of improving efficiency differs in pure SEK terms. A 25 per cent reduction for district heating in Karlskrona is valued at SEK 41,250 kronor per year in the Nils Holgersson property, while it is only valued at SEK 21,270 per year in Luleå. The reason for this is primarily because district heating is much cheaper in Luleå but also that the completely variable price in Karlskrona is more favourable to efficiency improvements.

The study also showed that if electricity use reduces by 25 per cent, the price of electricity only reduces by between 15 and 20 per cent. A 25 per cent reduction in electricity use in, for example, Malmö is valued at SEK

18,740 per year in a Nils Holgersson property, while in Luleå it is valued at only SEK 12,200 per year. The average value of the gains from reduced electricity use for the municipalities studied is around SEK 15,860 per year.

Lack of confidence in energy suppliers

Customers currently lack confidence in the energy suppliers' tariff structures and price trends. This was observed from the responses to the questionnaire sent by SABO to its member companies in 2009. They were required by the questionnaire, for example, to adopt a position on the following statements: "Investments to improve energy efficiency are uncertain as energy companies may increase tariffs if energy use reduces". No less than 76 per cent said that they completely, largely or somewhat agreed that energy investments were uncertain for that very reason.

The tariffs become an important factor in the work to calculate energy efficiency improvements. Tariff structures and price levels, as well as assumptions relating to price trends, have an enormous impact in terms of what it is profitable to make investments in.

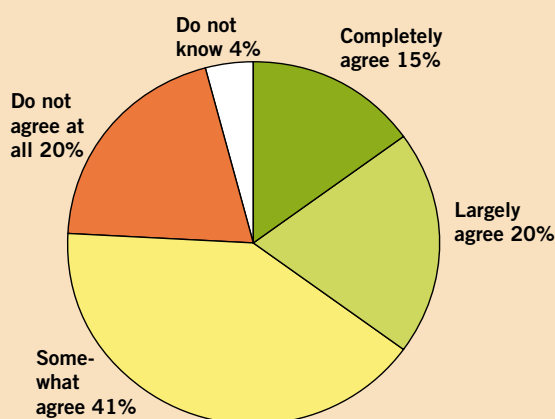
This demonstrates the complexity of energy saving work. The suppliers' price structures counteract the measures taken by housing companies to improve efficiency and reduce costs. What may appear to be good from a financial perspective at the time of calculation may result in a loss when tariffs change. One example is when Botkyrkabyggen started to install exhaust air heat pumps. The energy company then chose to change the tariff. The variable component of the district heating tariff fell in respect of the time of year when the pumps were most effective, and conversely the variable component was at its highest when the pumps were least effective.

The calculations that housing companies make before taking a measure to improve efficiency are often reasonably secure for the first year.

Tariffs can then change and with that the financial calculations.

The following question was also asked in the questionnaire for Swedish Association of Public Housing

Investments to improve energy efficiency are uncertain as energy companies may raise the tariff if energy use decreases



⁴ Report "Lönsamhet vid effektivisering - en studie om en effektivare Nils Holgersson fastighet, 2011" [Profitability when improving efficiency – a study of an efficient Nils Holgersson property, 2011]

Companies' member companies in 2009: "What assumptions do you apply in respect of any future energy price calculations?" The responses were broken down as shown in the diagram on the right.

Most member companies thus believe that energy prices will rise slightly more than inflation. It is also not easy to predict how, for instance, the price of district heating and electricity will develop. Both electricity and district heating prices have increased significantly in recent years, but it is uncertain how they will develop.

SABO has started to work together with Riksbyggen and Svensk Fjärrvärme on reviewing price changes for district heating, which may also have an impact on price trends in the long run. This cooperation has been called *Godkänd Nivå* [Approved Level]. The introduction of third party entrants to district heating networks in the form proposed in the Third Party Access Inquiry (TPA Inquiry), which was presented in the spring of 2011, may also affect price formation in the long run, both upwards and downwards.

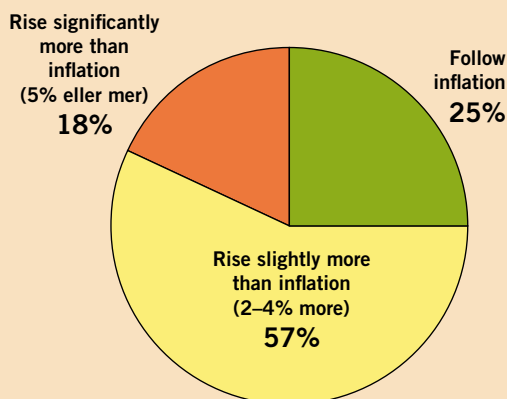
One important conclusion is that it is very important to proceed on the basis of the local preconditions and the property's consumption when evaluating the financial impact of various methods to improve efficiency. There is great uncertainty about the size of savings that could really be achieved. This is also one of the explanations for why housing companies have chosen to limit their measures and have sought solutions that pay for themselves within a short period of time.

3. THE WILLINGNESS AND CAPACITY OF TENANTS TO PAY

Improvement work often results in housing companies having to increase rents to make projects economically viable. It is reasonable that an increased level of quality should have an impact on rent, given that the changes are regarded as an improvement for residents. Energy efficiency measures may also improve the indoor climate, which should be considered when negotiating rents.

However, the amount by which the rent can be increased depends on the market to which the property belongs. Companies operating in districts where increased rents result in vacant apartments must adapt

What assumptions do you apply in respect of any future energy price calculations?



"The importance of reducing energy use is discussed in all contexts – international, national and municipal. But is this everyone's goal? Reduced energy consumption affects the revenues of energy companies. If we cannot deal with this, it will have a negative impact on the impetus for the housing undertakings to make rapid energy adjustments."

Karl-Erik Käck, Technical Manager, Botkyrkabyggen

the scope of the input resources so that lower operating costs finance the energy savings measures. The economic situation of residents and their capacity to pay obviously play a key role in the scope of improvement works and the amount by which rent can increase. According to Statistics Sweden (SCB), 47 per cent of all tenants in the Million Programme in Sweden have low purchasing power⁵. 76 per cent have low or medium low purchasing power.

Those tenants who will be paying for the improvement work and for improving energy efficiency in the Million Programme thus generally account for the sector of the population with the lowest purchasing power.

District heating

Instead of every building having its own boiler, district heating is supplied from a central plant which can use advanced methods to run on many different fuels, so benefiting both households and the environment. Utilising biofuels from the district and other local resources, district heating makes the most of energy that would otherwise have been lost, such as waste heat from industry, waste from forest felling and other waste.

92 per cent of SABO's members houses and 90 per cent of the total stock in multifamily dwellings (flerfamiljshus) in Sweden are heated by district heating.

⁵ Purchasing power is calculated as disposable income per consumption unit. This makes it possible to compare the purchasing power of families and considers different family compositions. Low purchasing power = SEK 0-128,272. Medium-low purchasing power = SEK 128,273-182,203. Medium-high purchasing power = SEK 182,204-250,271. High purchasing power > SEK 250,271).



DIFFERENT PROPOSALS FOR THE SAME PROPERTY

PRECONDITIONS FOR INVESTIGATING A REAL CASE

Improving energy efficiency is high on the agenda for AB Botkyrkabyggen, which is located south of Stockholm and a member of the SABO companies' Skåne Initiative. The maintenance needs for the Million Programme present major challenges, as a large proportion of its stock was built during this period.

In order to describe the actuality for a housing company, SABO asked Botkyrkabyggen to make one of its Million Programme properties available for an energy study. Two energy consulting firms, WSP and ÅF, were each asked to analyse the property and each propose measures to achieve energy savings of 20 and alternatively 50 per cent. The consulting firms were also asked to assess whether or not these measures would be profitable.

The preconditions for the property in question are shown in the following table:

Basic data for Vårdshusvägen 6, Fittja, Botkyrka	
Type of building	Tower house
Number of storeys	10 excluding cellar
Number of apartments	57
Year of construction	1974
Habitable area + non-residential area	4,259 m ² + 160 m ²
Temperate area	5,524 m ²
Energy use in 2009 (energy for heating, hot water and electricity, incl. electricity for laundry room)	156 kWh/m ² and yr

The property is connected to district heating and is mainly ventilated by exhaust air ventilation, where supply air is taken in through the apartments' ventilation windows and air inlets and also through pre-heated fresh air in the stairwell. The property's energy use (energy purchased) was 156 kilowatt hours per square metre (kWh/m²) per year in 2009. Hot water represents 41 per cent of the thermal energy (58 kWh/m² per year according to ÅF's short-term measurement). Electricity for the property (including electricity for the laundry room) represents eleven per cent of energy use; that is, 17 kWh/m² per year.

One important precondition for what can be done in the building in question is that the planning authority rejected any external changes to the façade element considering the special design and location of the building.

FORMER MEASURES AT THE PROPERTY

The property had previously had great difficulties with constant heating problems. Attempts were made to rectify this by, for example:

- replacing radiator valves and adjusting the heating,
- using eGain forecasting.

In addition, Botkyrkabyggen implemented a programme to fit supplemental glazing in the 1990s, so windows are in a relatively good condition. Two sets of water saving measures have been taken: water-saving devices have been installed in taps and WCs and measures taken to repair any leaks at the property.

An energy consultant proposed the following measures in a previous energy declaration for the property; some have been implemented while Botkyrkabyggen considered others to be unreasonable to implement:

- Converting the windows on the two upper storeys

with new sealed insulating glass units using energy film (*not economically viable based on a reasonable pay-off period*)

- Supplementary insulation of framing room beams (*technically difficult owing to current roof construction*)
- Optimising running costs, control of rotational frequency and coordination of fans and radiator circuits (*implemented*)
- Reducing the current for lighting in the stairwell or alternatively replacing it with automated lighting fittings (*implemented*)
- The electricity for the operation can be reduced, a more efficient laundry room in terms of electricity, investigate heat recovery from driers, cut down on the operating time for block heaters and reduce the current for outdoor lighting (*investigation underway in respect of laundry room*)

Botkyrkabyggen considers a maximum pay-off period of ten years to be reasonable. However, this period must be adapted to the estimated life of the investment. A short life means a short repayment period. Really large investments may have a longer pay-off period, for example renovating the façade, including supplementary insulation.

The full energy declaration is available at www.sabo.se.

"We can do what our tenants can afford to have and pay for – however we will never, in the current financial situation, be able to afford to carry out massive maintenance and extensive renovation work for our entire Million Programme."

Karl-Erik Käck, Botkyrkabyggen

1. ÅFS'S ENERGY INVESTIGATION

To achieve an energy saving of twenty per cent, ÅF proposes to preheat the hot water using a wastewater heat exchanger (as hot water usage according to short-term measurements transpired to be high in the property in question). The reason for ÅF not proposing individual metering and billing for hot water was because this is a politically sensitive area and is therefore difficult to implement.

ÅF also proposes that Botkyrkabyggen should turn off the supply fan for the stairwells and adjust air flow to the apartments. ÅF estimates that the total cost of these measures would be SEK 455,000 (excl. VAT) and would reduce energy use from 148⁷ kWh/m²

per year down to 113 kWh/ m². If these measures are implemented as a package, the repayment period would be four years. The internal rate of return is estimated to be almost 28 per cent, with a life of 20 years.

In order to halve energy use, ÅF also proposes, besides the above measures, the installation of highly efficient ESX ventilation, switching to resource efficient water outlets and adjusting the radiator circuits. The total cost of these measures is estimated to be SEK 3,575,000 (excl. VAT) and would reduce energy use from 148 kWh/m² per year to 73 kWh/ m². If these measures are taken as a package, the repayment period would be twelve years. The internal rate of return is estimated to be just over five per cent with a life of 25 years.

⁶ ÅF has excluded electricity for the laundry room from its investigation (by having metering on a monthly basis, this is now 8 kWh/m² per year)

2. WSP'S ENERGY INVESTIGATION

To achieve an energy saving of twenty per cent, WSP proposes electricity savings in the form of “demand control for lighting, fans and pumps” and “The elements running for long periods should be replaced with more energy efficient ones”. WSP also proposes the installation of a wastewater heat exchanger. The third measure proposed is metering via a temperature sensor in apartments and water metering. WSP estimates that these measures will jointly cost SEK 1,462,000 in total (excl. VAT) and would reduce energy use from 145⁷ kWh/m² per year to 110 kWh/m². Two assumptions have been made in these calculations: first that the energy price follows inflation; and second that it increases by two per cent above inflation. This results in pay-off periods of 10.6 and 7.2 years respectively.

In order to halve energy use, WSP also proposes, besides the above measures, the installation of an

exhaust air heat pump and replacement windows.

The total cost of these measures is estimated to be SEK 4,572,000 (excl. VAT) and would reduce energy use from 145 kWh/m² per year to 70 kWh/m². WSP presents this reasoning on the basis of carrying out the most profitable measures first, and that the energy savings achieved through deploying these resources will therefore subsequently be lower than if these resources had been deployed from the outset. This reasoning relating to the ESX ventilation is that such an investment would have a pay-off period of 55.2 and 103 years respectively depending on anticipated energy price trends. As regards the replacement windows, WSP states that “replacement entails a major expense and may be justified provided the existing windows are in need of renovation”. They make the assessment that the measures to halve energy use are not profitable.

In order to study the full energy investigations, see www.sabo.se

3. BOTKYRKABYGGEN'S COMMENTS ON THE INVESTIGATIONS AND ENERGY DECLARATION

The company considers that the measures proposed by ÅF are of interest and that it would be realistic to implement the proposals that would result in savings within 20 years. Other major measures must be planned in conjunction with, for example, major maintenance and extensive renovation projects. Botkyrkabyggen considers that the most realistic measures are: reducing air flows; investigating whether it is possible to turn of supply air considering fire regulations; replacing thermostats; adjusting the heating system and pre-warming hot water using a wastewater heat exchange, which was proposed by both ÅF and WSP.

WSP also proposes electricity savings measures of SEK 400,000 but does not specify which measures should be taken. Botkyrkabyggen has itself studied what the replacement of, for example, a circulation

pump would entail. This would save around 2,500 kWh per pump, which would represent an annual saving of approximately SEK 3,000. A pump costs around SEK 25,000, which makes it difficult to replace a pump that was only replaced a few years ago. Botkyrkabyggen estimates that a pump should last 20–25 years and that the pump's power would not change significantly over time. However, advances are being made in the development of motors.

Botkyrkabyggen considers that there is also a security issue as regards lighting. Energy consumption is not the only aspect to consider as regards such measures. WSP also proposes individual metering and billing for the temperature and hot water in the apartments. Botkyrkabyggen normally introduces the individual metering of water and electricity when building new properties. Locally, however, the Tenants' Association has so far not welcomed the introduction of individual metering and billing for its existing stock.

“We have taken water savings measures on several occasions. It only took a few years before the municipal authority increased the tariffs and the financial saving was eaten up. What we do in terms of energy savings can be seen in kilowatt hours but unfortunately does not have any substantial effect on the net operating result in the long term.”

Ulf Nyqvist, MD, Botkyrkabyggen

⁷ WSP has excluded electricity for the laundry room from its investigation (estimated at 11 kWh/m² per year)

CONCLUSIONS FROM THE PROPOSALS MADE BY THE ENERGY CONSULTANTS

It is interesting that the two energy consultants have come up with such different proposals for measures. One considers that it would be feasible to make energy savings of 50 per cent whereas the other considers that this would not be profitable. However, both agree that an energy saving of 20 per cent can be made profitably even if they have different ways of achieving this.

The following shows how the result is affected by the input resources that ÅF considered as being profitable in order to improve efficiency by 50 per cent. The financial savings are assumed to remain at the first year level as it is assumed that the energy companies will compensate any further loss of income by adjusting their tariffs upwards in future years. This assumption is based on the company financing the measure with a five-year loan at an interest rate of 4.5 per cent⁸ and that the life of the investment corresponds to depreciation, assessed as being 20 years. The initial investment amounts to almost SEK 4.5 million (incl. VAT).

We will start by making a rough present value calculation of how much the value of the property will rise based on the net operating result improving. The market's dividend yield requirement for the property is around six per cent. This shows that the value of the property would increase by an amount corresponding to the initial investment. From this perspective the resources deployed may be deemed to be profitable. This means that the company avoids bearing some of the expenditure as a cost in Year 1. Instead, the initial investment can be spread over 20 years. Botkyrkabyggen would need to take out loan to implement the investment, resulting in increased interest expense. The effects of these measures are reported below:

Fittja Gård 1			
	Yr 1	Yr 2	Yr 3
Reduction in operating expenses	365,725	365,725	365,725
One-off cost	-	-	-
Interest expense	-201,094	-191,042	-180,990
Depreciation, 20 yrs	-223,380	-223,380	-223,380
Effect of the measure on the company's result	-58,749	-48,697	-38,645

Although the measures are deemed to be profitable on the basis of various models, the company must increase its rent to fully cover the cost of its measures to improve energy efficiency.

The pay-off period (i.e. the repayment period) is always significant for investments. If it is unlikely that the company will get back the money spent within the

expected life of the measures, this is not an 'investment' but a 'cost'. The method used by ÅF (BELOK's Total Project) does not consider any capital costs for packages of measures, but looks at the change in the net operating result in relation to the expenditure for the input of the resources. They consider, based on this model, that the measures as a package will have paid for themselves within twelve years and yield a sufficiently high internal rate of return for them to be classed as profitable by a long-term manager. The pay-off period would be 18 years if we choose to look at the company's actual cash flow instead.

WSP assumes that the measures would be implemented in order of profitability. This means that the first input of resources would be really profitable, but also that it would be extremely difficult to justify the further measures required to achieve energy savings of 50 per cent energy. Pay-off periods of 55 to 103 years are unrealistic.

High one-off costs

This shows that the different ways of assessing profitability are relevant per se. Companies that have a major need of improvement work will need to discount any measures that do not yield a very quick positive financial contribution, as the improvement work itself may result in high one-off costs. Synergy for the initial investment arises if future improvement work still comprises measures to structural elements that reduce consumption through, for instance, a choice of more energy efficient material. The saving then only needs to finance the additional costs.

What becomes very clear is that the assumptions made as regards the amount of the initial investment, the breakdown between cost and investment and the life of the measure, the gains from improving efficiency, and also the development of tariffs directly determine the decision recommended.

The fact that the resources will help to reduce environmental impact is in itself very important. However, the financial calculations are very uncertain due to the difficulties in assessing the effect of a measure and how electricity and heating costs will develop in the future. WSP also highlights the uncertainty in implementing complicated measures such as installing heat pumps and ESX. "It is possible that the estimated cost is likely to differ by +/- 20 per cent from the actual cost". This creates a serious dilemma for the housing company.

The model that the company chooses to use to assess profitability will never be sufficient as a decision guidance document. It needs to be supplemented with analyses of the effects that the investment has on the company's finances.

⁸ Comparison housing bond on 23 May 2011 plus margin



CONCLUDING DISCUSSION

The Riksdag (Swedish Parliament) has set a target of halving energy use in Swedish homes by 50 per cent by 2050. This basically means that all of Sweden's existing buildings must halve their energy use compared with their consumption in 1995. This target is very important, both from a resource and climate perspective. The ambition and wish to assume environmental responsibility is very high among SABO's member companies. The vast majority will also do what is economically viable for the individual company.

We have identified a number of key factors that the housing companies will have to deal with and adopt a position on; factors where there are currently some aspects of great uncertainty.

PROFITABILITY AND MEASURES

We can conclude that there is a risk and uncertainty in terms of investments in and decisions concerning more extensive measures to improve energy efficiency. The financial calculations are not only affected by how extensive the measures are, but also increasingly by the chosen definition of profitability. The assessments of profitability made by the energy consultants did not consider the value of the resources deployed to the company, but provided a more standardised picture. One common definition of profitability is to see how much the value of the property has increased following the measures. This provides better guidance for public housing companies, despite being obtuse. They often retain their properties and it is therefore not only the

increase in value that is significant. The property must pay its way in terms of results and satisfy depreciation and interest expense.

Measures in conjunction with improvement work may include supplementary insulation for façades, replacement windows, installing ESX ventilation or introducing individual metering and billing for hot water. These measures often entail a major investment and are therefore most appropriate when carrying out other extensive work to the property that involves these structural components. It is not economically viable to replace windows just to save energy unless this is being done because the windows were going to be replaced anyway. The same applies to supplementary insulation: an individual measure cannot be justified financially if the property owner did not intend to change the façade, but minor renovation work would have been sufficient. The saving that ensues from a measure must consequently be sufficient to finance the additional cost of the measure.

Is it possible to take energy efficiency measures or must the focus be placed entirely on those measures that are technically most pressing? Even if it were to be profitable according to some definitions of profitability, the pay-off period may be too long and it may be difficult for the company to generate enough cash flow to cover expenses for staff, suppliers, interest, etc.

Another important issue is what reasonable and business-like risk compensation would entail and how much this should differ depending on the market situation and technical status of the property. The



prospects of generating a surplus are significantly worse in a declining market than in a rising market with a high demand for homes. A stakeholder that is considering investing in properties therefore requires a higher return in a declining market, where the risk is higher.

POTENTIAL FOR SAVINGS

The amount of the energy saving in Swedish kronor depends on the property's potential for savings prior to improvement work and energy costs in the municipality in question. Opportunities to reduce costs following improvement work are also affected by future energy prices and tariff structures. It remains to be seen how the energy companies will react when energy use is halved in the property stock. Will they be happy with a reduction in their turnover or will the proportion of fixed charges increase? This is a problem that several of the public housing companies are aware of. It is becoming more difficult to justify improvements to energy efficiency from a financial perspective if cost reductions are not achieved owing to an increase in the proportion of fixed charges.

RESIDENTS' WILLINGNESS/CAPACITY TO PAY

In the vast majority of cases, halving energy in the Million Programme cannot be solely financed by reducing operating costs; rents must be increased. Residents must then contribute and pay through higher rents. However, purchasing power in these areas is low and the improvement work must be adapted to the level at which residents are able to pay; that is, less extensive improvement work that will not include all of those measures required to halve energy use.

A significant increase in rents is particularly sensitive for companies with weaker finances, which are often at risk of finding more vacant apartments when rents increase. Furthermore, not all measures result in noticeable improvements to the tenants' immediate housing conditions. This naturally affects how much,

and for what, tenants are willing to pay.

Housing companies and tenants should also jointly discuss the possibility of introducing individual metering and billing to thereby provide an incentive for a change in behaviour that reduces both energy use and costs.

DIFFERING ADVICE CREATES UNCERTAINTY

It is not always obvious which measure a property owner should go for. Botkyrkabyggen was given very different proposals for measures in two quite extensive energy analyses and an energy declaration. This issue is very complicated and uncertainty prevails both in respect of the measures and their actual savings potential. Consultants bear no responsibility for their proposals. It is the property owners that have to bear the consequences of measures yielding poorer results than the theoretical calculation. It is not always easy to follow the guidance on the right choice – the question is also whether there is any given choice that is 'right'.

The fact that the different energy consultants in our study also consider profitability in different ways makes it even more difficult for the property owner to make a decision about what should be done. When major investments are involved, the housing company obviously wants to feel certain that they are backing the right horse.

Nor are property owners always able to take the best energy saving measures, for instance owing to the cultural value of the property. Sometimes, as in the case of Botkyrkabyggen, it may be that the external façade or windows cannot be changed, which may impede energy efficiency work. It is also common for property owners to replace and repair structural components on an ongoing basis. This makes it more difficult to justify total improvements, as the technical life of all components will not be at an end. When carrying out improvement work, the property owner must consider the total need of the property for improvement and not, of course, just the energy efficiency improvement measures. This often limits the degree of flexibility.

SUMMING UP

To conclude, we can establish that using a company's funds to get the most out of each Swedish kronor invested and assuming responsibility for successfully tackling the need for improvement work, energy savings and the company's finances should be considered as business-like behaviour. This justifies the company implementing measures that are certain to yield both a good return and improve energy efficiency.

As regards the measures that should be taken to improve efficiency in conjunction with improvement work, there is no solution that suits all properties in all parts of Sweden. Not everything is profitable and even if a lot is profitable, the repayment period may be too long. This will of course affect the opportunities for housing companies to implement various measures.

The preconditions that currently prevail are making it difficult for housing companies to achieve the halving target and it will also be difficult for some of them to cope with this financially. When assessing which measures should be finally implemented, environmental objectives may clash with finances. The apparently simple 'truth' that it is often profitable to carry out energy efficiency improvements in conjunction with other improvement work, a view which politicians and the construction and energy sector are keen to promote, is not universally valid. As we are facing major and important challenges — we have to reduce energy use in Sweden's residential areas — we cannot afford to adopt ideas that are far too simplistic and optimistic. If we are going to manage to achieve our environmental objectives, we must be realistic and venture to grasp the harsh reality that things are much more complex than as presented in the public debate.

This is precisely what SABO seeks to achieve through this study. Only the preconditions for the actual situation can lead to solutions that are economically and environmentally sustainable for the specific property being improved in the particular market in question. There are no universal solutions.

It is extremely important for politicians – at both a municipal and national level – the construction industry, energy consultants, municipal and private energy suppliers and property owners to meet up to jointly discuss sustainable solutions.

What is the position of your housing company to the national objective that energy use in homes should reduce by 50 per cent by 2050 (compared with 1995)? Can you meet this target under the current preconditions?



"Major changes are needed"

"We will find it very difficult to meet this target.

Major changes will be needed to be made to our stock. At this time, I consider that we will either be forced to demolish half of our stock to build new properties and carry out major maintenance and extensive renovation work on the remaining half. This means that current tenants will not be able to afford to stay there and we will have to increase our investment budget tenfold.

Another alternative is for us to carry out major maintenance and extensive renovation work on 60 per cent, sell the other 40 per cent, and reinvest this amount in new housing corresponding to ten per cent of the current stock. This is based on us finding purchasers and the market growing by a further ten per cent. However, this will only provide us with better figures; society will gain nothing overall."

Patrik Sundberg, Energy Manager, Skebo AB



"Signalisten has already taken the inexpensive measures that are easily come by"

"It will be difficult. As the cost of halving energy use is quite high and it is difficult to get the rent required to finance the additional costs on top of the measures to improve standards that are being carried out as part of our major maintenance and extensive renovation projects, measures to improve energy efficiency usually end up at the bottom of the list for the total calculation. We have also regularly maintained buildings in our stock. For example, windows have been upgraded, which means that we would not want to replace windows with new ones when the existing windows are in good condition.

Signalisten has already done a great deal in the past, so we have already taken the inexpensive measures that are easily come by, which yield an immediate high pay back. Those energy efficiency improvement measures with the quickest repayment periods are incorporated into projects, but those with long repayment periods are passed over owing to among other things, for example, the good condition of the windows."

Rikard Lindegren, Property Manager (Acting), Signalisten i Solna



"The project would be profitable if there were a rent increase of 45 per cent"

"As a pilot project at Bostads AB Poseidon we have rebuilt a Million Programme building where energy use reduced by 66 per cent. Energy rebuilding work is not profitable with the market's (owner's) dividend yield required and current energy prices. The rent increased by 34 per cent in total. However, the project would be profitable if there were a rent increase of 45 per cent. We have learnt from this that in order to recover the cost of energy rebuilding work, the building needs to be in major need of improvement work.

It is difficult to achieve profitability through energy rebuilding in properties with few apartments and it is an advantage from a profitability perspective if a new apartment area can be created in conjunction with energy rebuilding."

Mattias Westher, Energy Strategist, Bostads AB Poseidon

PROFITABLE ENERGY EFFICIENCY IMPROVEMENTS – MYTH OR OPPORTUNITY

Improving homes in Sweden's Million Programme remains a great challenge. In parallel with this, there has been an increase in the demand to improve energy efficiency in Sweden's homes. Energy use is to be halved by 2050. Expectations have consequently now been raised on the part of politicians, housing undertakings, the construction and energy industry and residents for the introduction of measures to save energy in conjunction with improvement work. Some paint the picture that the measures will finance themselves or may even save large amounts for the companies. Unfortunately, reality is more complex than this.

Our study shows that the preconditions that currently prevail are making it difficult for housing companies to achieve the halving target and it will also be difficult for some of them to cope with this financially. SABO therefore wants to in this way provide a supporting document for the future and very important discussions between the interested parties. We need solutions that are financially and environmentally sustainable for the specific property being improved in the particular market to which it belongs.

