

With a bit of help from my friends — the importance of networks

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Abstract

BeBo and BELOK are two national networks that serve as forums for property owners that strive for increased energy efficiency in the built environment. BeBo members are property owners of residential buildings, and BELOK members are property owners of commercial buildings. Both networks receive funding from the Swedish Energy Agency. Their goals are to:

- Strengthen relations between government, business and academia
- Stimulate development of new viable technologies, systems and methods for energy efficiency
- Disseminate, implement and create case studies

The members of the BeBo and BELOK networks have since their start developed tools and methods that increase members' awareness of energy efficient renovation and cost-benefit analysis. This paper aims to assess the impact of these two networks, specifically in terms of achieved energy efficiency. It will also discuss to what extent members differ from a reference group of non-member property owners in respect of carrying out energy efficiency measures.

Data concerning total area, energy performance (kWh/m²) and the rate of carried out energy-efficiency measures has been collected from members of the two networks and from reference groups. In order to assess the network's current and future impact on the market as a whole, the degree to which energy-

efficiency measures have been implemented by the networks' members has been compared to the efforts made by the reference groups and the effects that have taken place within the rest of Swedish building sector.

The results indicate that by 2013 BeBo had yielded a 0.5 per cent decrease of thermal energy end-use in the Swedish residential building stock (equivalent to approximately 135 GWh/a). BELOK's impact is even larger, by 2013 it had yielded approximately a 2.3 per cent decreased use of thermal energy end-use in the Swedish non-residential building stock (equivalent to approximately 430 GWh/a).¹ By 2030 these effects are calculated to have increased to 5 per cent (1,200 GWh/a) for BeBo and approximately 11 per cent (1,650 GWh/a) for BELOK. This assessment demonstrates that networks have a substantial impact on achieved energy efficiency in Sweden.

Introduction

The Swedish Energy Agency's national networks BeBo and BELOK serve as forums for property owners that strive for increased energy efficiency in the built environment. BeBo members are property owners of residential buildings, and BELOK members are property owners of commercial buildings. Both networks receive funding from the Swedish Energy Agency. The members of the BeBo and BELOK networks have since their start developed tools and methods that increase members'

1. This evaluation only includes energy for heating purposes. It should be noted that the networks' activities include development and dissemination of measures for more efficient use of electricity too, and these measures also lead to improved efficiency in the built environment.

awareness and knowledge of energy-efficient renovation and improved cost-benefit analysis.

This paper aims to assess:

1. The benefits of being a member of BeBo or BELOK.
2. The benefits of using tools and concepts developed by BeBo or BELOK.
3. Do property owners that are not members of the networks benefit from their existence?
4. What differences regarding achieved and predicted energy efficiency can be seen between network members and non-members of BeBo or BELOK?

These questions are answered by an analysis of to what extent the two networks have affected the members within the following five areas:

- The network(s) as a whole.
- Concepts and business models.
- Dissemination and research.
- Cost-benefit calculations.
- Energy end-use and energy-efficiency goals.
- Achieved rate of energy efficiency.

Methodology

The analysis presented in this paper is based on the outcome from two *focus groups*, the responses to the questionnaire, reference groups' interviews and calculations with the tool HEFTIG 2.0.

The research started with a literature review of previous evaluations of the two networks. This was then followed by two separate workshops with a selection of members from BeBo and BELOK (from here on referred to as *focus groups*). The *BeBo focus group* was attended by four BeBo members and the

BELOK focus group was attended by seven BELOK members. In both cases the participants' experiences and thoughts are assumed to be representative of the group as a whole. This is considered a fair estimate, but it may not be the case.

In order to try to compensate for the rather limited groups present at the focus groups these meetings were followed up by a questionnaire that was sent to all BeBo and BELOK members to gather supplementary information that was not covered during the workshops. The aim of the two *focus groups* and the questionnaire was to gather the members' own views and experiences from working within the networks. In BeBo's case 13 of the 26 members responded to the questionnaire, and in BELOK's case 10 of the 19 members responded.

Furthermore five in-depth telephone interviews were conducted with property owners of residential buildings that are not members of BeBo, and with five property owners of commercial buildings that are not members of BELOK. These ten interviews were carried out in order to compare the members' perceptions of the networks to the views' of non-members. These interviews are from here on referred to as *BeBo reference group* and *BELOK reference group*. The reference group interviews generated response of great value, but statistical significance is not achieved through this representativeness.

Figure 1 illustrates the methodology steps of the study.

CALCULATIONS

Calculations were carried out to assess the national networks' future impacts, and to identify whether or not the members have achieved a larger degree of energy efficiency compared to the reference group. Important calculation assumptions were based on:

- Input from the previously mentioned two workshops with the *focus groups*.
- Results from the questionnaires that were sent to all members of BeBo and BELOK.

Literature review	
BeBo <ul style="list-style-type: none"> • Workshop with 4 members of BeBo (<i>BeBo focus group</i>) • Survey to all members of BeBo (13 of 26 members responded) 	BELOK <ul style="list-style-type: none"> • Workshop with 7 members of BELOK (<i>BELOK focus group</i>) • Survey to all members of BELOK (10 of 19 members responded)
BeBo reference group <ul style="list-style-type: none"> • Individual interviews with 5 property owners of residential buildings 	BELOK reference group <ul style="list-style-type: none"> • Individual interviews with 5 property owners of commercial buildings
Comparison of results & analysis	
Discussion & conclusions	

Figure 1. Schematic illustration of the papers methodology.

- Interviews with the property owners of the *reference groups*.
- National energy statistics for the Swedish building stock.² These assessments are to be considered as well-informed estimates.

The numerical analysis was carried out using the tool HEFTIG 2.0. In these calculations data from each of the BeBo and BELOK members regarding their energy efficiency development were introduced over the time period 2002–2013. 2002 was the year when the first major members joined the networks, others have then joined successively. (The calculations are based on when the individual members joined the networks, thus their energy efficiency measures were individually allocated on the time scale 2002–2013.)

This was then compared to the overall development that has taken place in the residential and commercial building stock in Sweden during the same period of time. The analysis also included a forecast of future effects until 2030. This forecast was made with the assumption that current members of BeBo and BELOK continue with energy-efficiency measures at their individual current rate, with the exception that when a property owner reaches a 50 per cent reduction of their energy end-use compared to when joining BeBo or BELOK their energy efficiency efforts cease.

The BeBo and BELOK members' energy-efficiency measures were divided in the following three components:

1. "Autonomous" energy efficiency, which corresponds to the activity level of the average property owner.
2. Additional energy efficiency – the proportion that does not relate to the network.
3. Additional energy efficiency – the proportion that relates to the network.

Any comparisons of the numerical data presented in this paper needs to be done with caution. The representativeness of the responses received from members as well as non-members of the networks need to be viewed in light of the sources that were available for evaluation. There is always a degree of uncertainty when it comes to qualitative research, nevertheless the results are still of value.

Swedish national networks for property owners

BeBo and BELOK are two national networks that serve as forums for property owners that strive to increase energy efficiency in the built environment. The aim of both of the networks is to:

- Strengthen relations between government, business and academia.
- Stimulate development of new viable technologies, systems and methods for energy efficiency.
- Disseminate, implement and create case studies.

The members of the BeBo and BELOK networks have since the networks' start (1989 and 2001 respectively) developed tools and methods designed to increase members' awareness of energy effective renovation and profitability calculations. Through active participation in technology procurements and technology competitions network members drive development forward within their own organisation and building stock. Demonstration projects are carried out in full scale in the members' building stock. Joint network activities provide a stronger impact on suppliers and contractors in the market compared to what a single property owner can achieve. Both networks receive funding from the Swedish Energy Agency.

BEBO

BeBo is the Swedish Energy Agency's network for residential buildings property owners. The network was initiated in 1989. BeBo is a constellation of 26 of the largest property owners that own and develop residential buildings throughout Sweden. BeBo members own approximately 13 per cent of the Swedish residential building stock, in terms of area. Documentation from completed projects and BeBo tools can be downloaded at www.bebostad.se. The material is free of charge and readily available, for members as well as non-members.

BELOK

To enhance the development of more energy efficient local real estate the Swedish Energy Authority also initiated BELOK in 2001. BELOK is a constellation of 19 of the largest property owners of commercial buildings. At the time of this study the network consisted of 19 property owners. They own and develop commercial buildings throughout Sweden. The members of BELOK represent approximately 20 per cent of the Swedish commercial building stock, in terms of area. All project results, as well as tools, specifications etc. can be downloaded at www.belok.se. The material is free of charge and readily available to members as well as non-members.

Results and analysis

COMPARISON BETWEEN BEBO MEMBERS AND THE BEBO REFERENCE GROUP

The network as a whole

The participants of the *BeBo focus group* were convinced that collaboration between property owners has benefited from the existence of BeBo. The need for evaluation and assessment of the projects and methods that have been developed within the network context was also emphasized by the focus group. BeBo has an important role in developing and testing new technologies and disseminate case studies and results. On the whole the reviews of BeBo are positive. Some criticism is however directed towards the fact that the network is mainly Stockholm based, which can have a discriminating effect on property owners in other parts of Sweden. Technology procurements were less positively perceived than in earlier performed evaluations.

The participants of the *BeBo focus group* did not view BeBo as a well-known network. Their understanding was that organisations outside the BeBo network are unaware of the network and the work that has been carried out. Despite this the *BeBo*

2. HEFTIG 2.0 is a calculation tool developed by Profu and CIT on assignment by the Swedish Energy Agency. The tool enables long term calculation and visualization of energy efficiency measures.

focus group participants stressed that non-members occasionally contact them, that the network is inclusive, and the advantage that reports are available free of charge on the network's website. Contrary to what the *BeBo focus group* participants assumed, the *BeBo reference group*³ showed a large awareness of the BeBo network; they all knew of BeBo, however only few of them possessed in-depth knowledge of the network. As reason for not joining the network the *BeBo reference group* mentioned lack of insight, that they have not felt any need to join, and/or lack of time.

Concepts and business models

Two of the 13 BeBo members that answered the questionnaire indicate that their membership has impacted their business models for renovation projects. Four of these respondents use the strategic partnering, and one property owner even uses the Total Concept method⁴ that was originally developed by BE-LOK. None of the interviewed property owners in the *BeBo reference group* claimed to use any particular model for energy efficient renovations.

10 of the 13 BeBo members that answered the questionnaire indicated that they use all or most of the tools and methods developed by the network. The most popular tools were the in-deep energy efficiency renovation method and key performance indicators. Those who participated in the *BeBo focus group* spoke in positive terms of the energy-efficiency work of BeBo. None of the property owners in the *BeBo reference group* stated that they use any of the BeBo tools. Thus only a limited spillover effect is hitherto assumed to have occurred.

The *BeBo focus group* also resulted in new ideas to further support the development of energy efficiency strategies, e.g. the creation of improved systems for monitoring and evaluation of energy efficiency measures.

The results show that tools developed by BeBo are used to a much greater extent by the network members than by non-members. Whether or not a property owner is a member of BeBo only seems to have a limited effect on which business models are used for energy efficient renovations.

Dissemination and knowledge sharing

The *BeBo focus group* participants were convinced that the network's dissemination of knowledge plays an important role in raising the general property owner sector's awareness. The *BeBo focus group* participants also pointed out that cooperation with universities provide legitimacy to the network. The participants of the *BeBo focus group* were certain that BeBo collectively influences both manufacturers and policy makers.

Areas where BeBo specifically contributes are awareness raising among its members, bringing together expertise in various fields, development of methods, evaluation, procurement support, and technology procurement. This is carried out in many ways such as: courses, seminars or participation in joint development projects. The interviewed *BeBo members* also point out that the BeBo network plays an important role concerning

industry collaboration and knowledge sharing through its good climate of cooperation and expertise.

The *BeBo reference group* expressed that in their opinion, the greatest benefits of being a member seems to be to share ideas and experiences – to learn from other property owners' experiences – and that membership provides access to support with energy efficiency improvements and calculations. The *BeBo reference group* does not express any negative consequences of remaining outside the network.

Both members of BeBo and the *BeBo reference group* share the view that BeBo plays an important role by serving as a platform for exchanging ideas and experiences, and support with expertise in energy efficiency work. However, the *BeBo reference group* did not express any negative consequences of not being members, which can be interpreted that it is possible to receive interesting information from BeBo without being a member.

Cost-benefit calculations

Seven BeBo members expressed in the survey that they use a maximum of ten year payback for their energy efficiency investments. The majority of the *BeBo reference group* also stated that they use a payback period of up to ten years. No difference between the BeBo members and the *BeBo reference group* was thus seen. None of the respondents indicated that their membership in BeBo has, in any major way, affected the payback time which is used for energy efficiency investments.

Four of the interviewed network members however proclaimed in the survey that they are convinced that their membership has had an impact on what methods they use for energy efficiency investment cost-benefit calculations. Six members claimed (in the survey) to use BeBo's Cost-Benefit Analysis method.⁵ The majority also simultaneously use the Net Present Value method, Pay-off or a Cash Flow Model. None of the property owner in the *BeBo reference group* use BeBo's Cost-Benefit Analysis method. Instead they use the Net Present Value method, Pay-off or a Cash Flow model. BeBo's Cost-Benefit Analysis method is thus significantly used within the network, but not by any of the property owners in the *BeBo reference group*. For other types of profitability calculations no real difference can be seen between members and non-members of the network.

The *BeBo reference group* as well as the members of BeBo claimed to use an interest rate for energy efficiency investments in the range of 4–7 per cent. Many BeBo members as well as members of the *BeBo reference group* claimed to have a specific budget allocated for energy efficiency measures, thus no clear distinction could be seen between members and non-members.

Energy end-use and goals

All of the BeBo members that responded to the questionnaire stated that they have specific and well-known energy goals; and the situation was similar for the *BeBo reference group*. As for the magnitude of the energy goals little difference can be seen between the members of BeBo and the *BeBo reference group*. It should however be noted that the *BeBo focus group* claimed that

3. Consisting of five residential property owners that are not members of BeBo.

4. Carrying out packages of energy efficiency measures that are meeting the property owner's profitability requirements as a package instead of assessed measure by measure.

5. Web-based tool that can be used at an early stage to calculate the profitability of a number of steps or a package of measures.

their participation in BeBo has influenced the development of their organizations' energy goals.

No clear differences between members and non-members have been identified with regards to how far into the future energy-efficiency measures are being planned (here on referred to as the planning horizon). This was reinforced by the fact that only a few of the BeBo members perceive that their membership has actually affected this parameter.

The average energy end-use for heating, among the responding members of BeBo is 146 kWh/m² per annum. This is slightly lower than the national average for residential buildings in Sweden, which was 149 kWh/m² in 2012. BeBo members' slightly better energy performance can depend on a number of reasons, related to better energy management or quite different circumstances. A better way to assess the energy management is to look at the annual *rate of improved energy performance* (kWh/m²) for BeBo members compared to the average building stock. This tells us more of how the various property owners relate to one another, regardless of the original status of their building stock, and was therefore applied in the assessment, as described below.

Rate of energy efficiency

For each of the analysed BeBo members it has been assumed, that 1.2 per cent of the annual energy efficiency improvement (which is the average rate of all the residential buildings in the country) is an "autonomous" improvement, not a result of the network. The additional energy efficiency improvement cannot entirely be attributed to the network – member companies might well be more ambitious than the average for other reasons than being a member of BeBo. The BeBo members that responded to the questionnaire have therefore been asked to provide their own assessment of to what extent their energy efficiency measures can be contributed to their membership in BeBo. Their responses varied – some say that it is impossible to tell, other vary between "some" up to "50 per cent". Our analysis suggests that about 25 per cent can be attributed to BeBo and has therefore been used in our calculations.

The network has several means to disseminate information on their tools and methods. None of the property owners in the *BeBo reference group* claimed to use neither tools nor methods developed by BeBo – hence no *spillover effect* has been taken into account.⁶ In the long run however the work that the members of BeBo have carried out is judged to lead to that non-members use their tools and methods (as is the case for BELOK, see next chapter). It is however assumed that the proportion of residential buildings owners that use "package calculation methods" for energy-efficiency measures will gradually increase from zero to 20 per cent in 2030.⁷ This method usually gives about 50 per cent more energy savings, and this additional effect has been allocated to the existence of BeBo.⁸

It is reasonable to expect *new recruitment* to BeBo, i.e. that more property owners will join, when forecasting the networks' future effects. Our assumption is that today's 13 per cent cover-

age of the total residential building stock will gradually increase to 25 per cent by 2030. These additional BeBo members' energy efficiency is credited to the degree it is expected to increase through participation in the network.

Figure 2 shows the overall estimate of BeBo's effects compared to a "base case" without the network. The forecast for 2030 is based on the Swedish Energy Agency's long-term forecast, which was used as input in HEFTIG 2.0. Components include:

- Decreased thermal energy end-use by current members of BeBo as a result of their participation in the network.
- Corresponding decrease of thermal energy end-use for future recruits to BeBo years 2014–2030.
- Spillover effect to other property owners.

Figure 3 gives an overview of all the components described and for the sake of completeness also of all the measures of the current BeBo companies, even if they have not been included as "due to the existence of the network".

The overall assessment is that BeBo by 2013 has yielded approximately 0.5 per cent lower use of thermal energy end-use in all Swedish residential buildings compared to if the network did not exist (equivalent to approximately 135 GWh/a). By 2030 the effect is expected to have increased by another 5 per cent (approximately 1.2 TWh/a). This evaluation only includes energy for heating purposes. It should be noted that the networks' activities include development and dissemination of measures for more efficient use of electricity too, and these measures also lead to improved efficiency in the built environment.

COMPARISON BETWEEN BELOK MEMBERS AND THE BELOK REFERENCE GROUP

The network as a whole

The network members that participated in this evaluation emphasized that it is the network as a whole that makes BELOK important: the possibility to exchange both positive and negative experiences, to initiate and monitor research projects for the development of tools. Members can decide in which direction that BELOK will develop.

The *BELOK focus group* emphasized that within BELOK they regard each other as partners, not competitors. BELOK originally consisted of a small group which then slowly grew. This was addressed by the *BELOK focus group* as a contributing factor to the culture of collaboration and trust – members benefit from each other within the network. The BELOK network has gained legitimacy with regards to requirement specifications and software development within the real-estate sector.

The *BELOK reference group*⁹ saw potential benefits of being part of the BELOK network as opposed to only utilizing the network's tools. The biggest benefits of being a member were perceived to have access to a better network, meet like-minded, gaining access to deeper knowledge of actions of other property owners, greater knowledge of energy efficiency and

6. Spillover effect: the effect that occurs unintentionally because of something else.

7. E.g. as the BeBo method Rekorderlig Renovering.

8. Utvärdering av BeBos arbetsmetod Rekorderlig Renovering (Evaluation of the BeBo method In Deep Renovation, in Swedish), Persson A et al, 2014.

9. Consisting of five property owners of commercial buildings that are not members of BELOK.

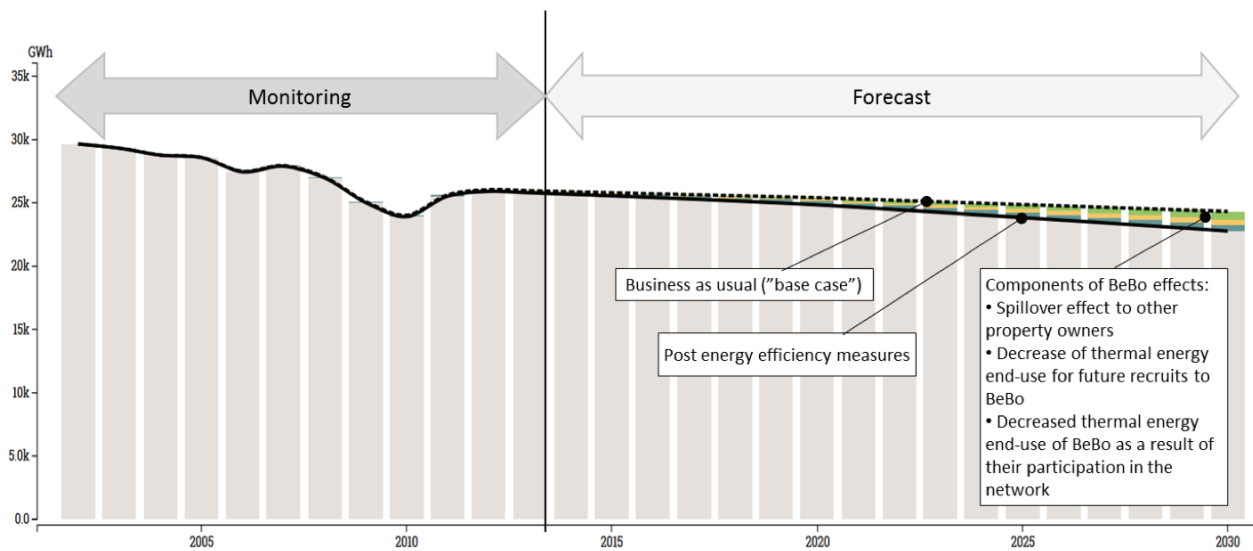


Figure 2. Calculation of BeBo effects compared to the base case without the network (energy end-use for heating purposes, GWh).

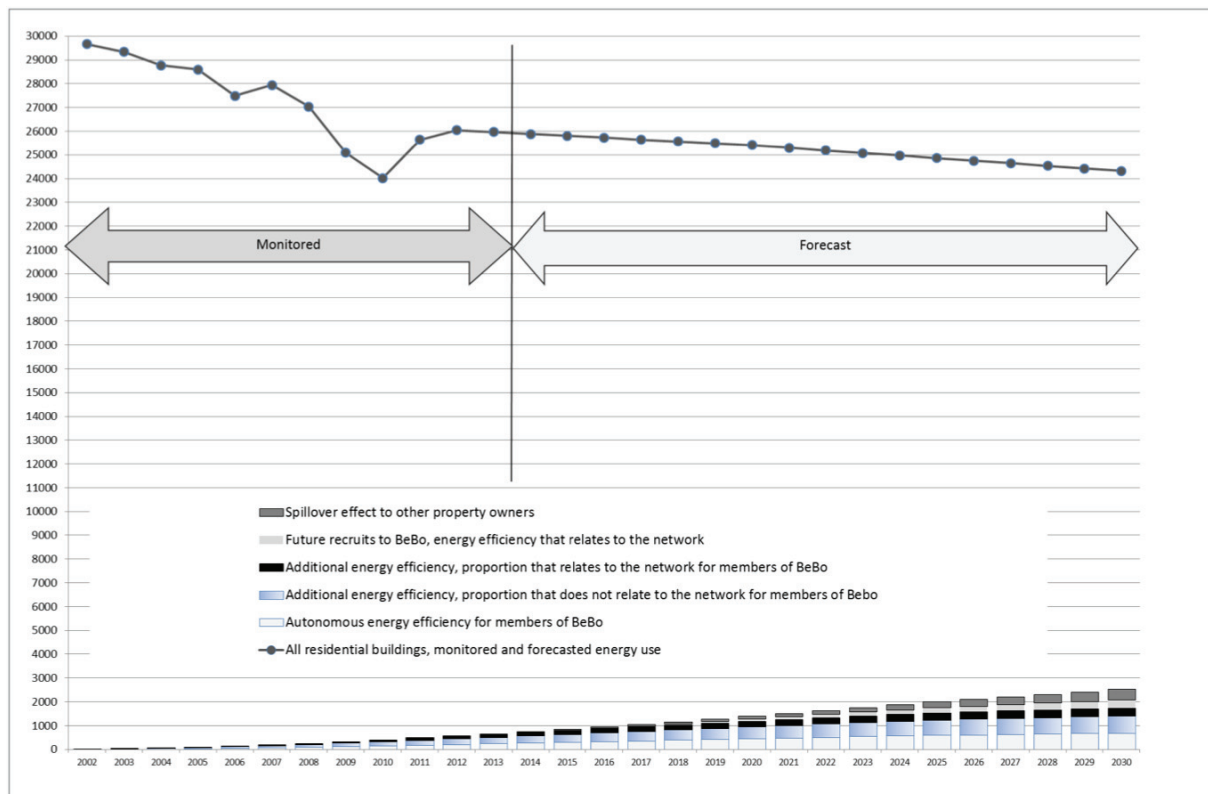


Figure 3. Estimated accumulated impact, thermal energy end-use, of the BeBo members' energy efficiency measures compared to the total thermal energy end-use in all residential buildings in Sweden.

transparency in development projects. This is similar to the reasons members indicate for participating in the network, thus the picture of the benefits of being a BELOK member is essentially perceived to be the same between members and non-members.

Reasons mentioned by the BELOK reference group for not being members of BELOK include that they were not aware of the network and that they had not been invited. One interviewee

representing a property owner with all of its building stock situated in the Öresund region expressed that it is difficult to justify participation in a "Stockholm-based" network. Similar opinions were aired concerning BeBo.

The BELOK reference group did not see any serious negative consequences of remaining non-members. One of the interviewees, however, perceived consequences of not being a network member in connection with future environmental certifi-

cations. Three of the five representatives of the *BELOK reference group* are involved in other energy related networks, which may indicate that they have chosen other networks before BELOK or simply do not have time to be involved in several.

Concepts and business models

The *BELOK focus group* concluded that BELOK plays an important role for the network members. In the questionnaire seven of the 10 members that responded claimed that they use all of BELOK's tools. Two of the five members in the *BELOK reference group* said they use some BELOK tools. The Total Concept method and BELOK life cycle cost calculation (LCC) are the two BELOK tools that are most popular within as well as outside of the network.¹⁰ The fact that many of the BELOK members use the tools developed by BELOK is seen as a good rating of the tools. Furthermore these tools seem to be both easily accessible and highly appreciated outside of the network; however dissemination is less successful among non-members than among members.

The *BELOK focus group* expressed an interest in further development of areas such as green leases, tools relating to the indoor climate, energy requirements and specifications for the procurement of operating staff.

Three of 10 members that answered the survey claim that they use BELOK's Total Concept method as a business model for energy efficiency renovation projects. The same three member representatives state that their BELOK membership has impacted the business models used in their organisations. Other members of the survey indicated that they use Energy Performance Contracting (EPC), strategic partnering or other solutions in-house. Two members of the *BELOK reference group* said that they use the Total Concept method. Thus the proportion of property owners who use the Total Concept method does not significantly differ between BELOK members and the *BELOK reference group*, suggesting that knowledge of the method is well spread outside of BELOK.

Dissemination and knowledge sharing

The *BELOK focus group* claimed that BELOK's work has meant that they have a better overview and understanding of the real-estate sector, have easier access to information on new technologies and interesting research projects and opportunities of valuable collaborations. Participants also perceived BELOK as a good source of reference on energy goals, requirements, models et cetera.

Members of BELOK claimed that the network has contributed to each network member's internal knowledge, through a deepening of knowledge on energy and through specific projects that raise competence and increase awareness.

Reports by the network provide a knowledge base that is accessible to all stakeholders. The BELOK network disseminates examples of good property management. Members involved in this evaluation are convinced that many small property owners utilize BELOK's tools.

The representatives in the *BELOK reference group* have good knowledge of the BELOK network and its tools – only one of

the *BELOK reference group* interviewees was not aware of the network's existence. Another interviewee stated that BELOK has developed several useful tools, is a "well-reputed name" and stands for reliability and quality. One of the member of the *BELOK reference group* mentioned that he often visit BELOK's website. This supports the thesis that BELOK's resources are also used by non-members.

Cost-benefit calculations

Seven of the ten BELOK members that responded to the questionnaire had a special budget allocated for energy efficiency measures. This proportion is higher than in the reference group, where only two of five companies had a separate energy-efficiency budget. This might indicate a greater awareness and prioritization of issues in the property owners that are currently members.

The payback time that is used for energy efficiency investments differ both within the network and within the *BELOK reference group*. Generally, it can be deduced that payback requirement of 3 to 10 years is used by both groups. Only one of the respondents said that their membership in BELOK has impacted their cost-benefit calculation for energy efficiency investments. It is not possible to deduce any difference between members and non-members with regards to payback requirements of energy-efficiency measures.

The interest rate that BELOK members use ranged between 4 and 8 per cent and the same was found for the reference group. No clear difference could be noted. According to the *BELOK focus group* however the Total Concept method has had a significant impact on how profitability is calculated and discussed among the members. Five of the 10 members who answered the questionnaire claimed that BELOK has impacted how they carry out their calculations. Three of them stated that they always use BELOK's Total Concept method. Only one property owner in the *BELOK reference group* claimed to use BELOK's Total Concept method. It thus appears that the membership of BELOK effects how profitability calculations for energy efficiency investments are executed within the network.

Energy end-use and goals

All of the interviewed members of BELOK said they have specific energy goals, the same goes for the *BELOK reference group*. The magnitudes of these energy goals are also more or less the same for both the members of BELOK and the *BELOK reference group*.

According to the members of BELOK that participated in the focus group, the network does play an important role in their approach to energy efficiency. The members believe that the work that has been carried out within BELOK has resulted in more stringent energy goals and that BELOK's Requirement Specifications has helped push property owners, contractors and consultants to a higher degree of energy efficiency. Shared experiences between BELOK members have had an important role in raising energy goals. The *BELOK focus group* was convinced that the BELOK work has strengthened their ability to motivate energy efficiency efforts within their respective organisations.

Two of the members of BELOK stated in the survey that their membership has impacted the planning horizon used for en-

10. Web-based life cycle cost tool for comparing cost of various investments with specific input for pump, fans, air filters, lighting and windows.

ergy efficiency investments and work.¹¹ However, no distinct difference in the planning horizon between members and non-members could be detected in this evaluation.

The average energy end-use for heating, among the BELOK members in this study was 105 kWh/m² per annum in 2012. The same year the overall average for commercial buildings in Sweden was 138 kWh/m². The BELOK members' high energy performance can have a number of reasons, related to better energy management or quite other circumstances. A better way to assess the energy management is to look at the annual rate of improved energy performance (kWh/m²) for BELOK members compared to the average building stock. This tells us more of how the various property owners relate to one another, regardless of the original status of their building stock, and was therefore applied in the assessment, as described below.

Rate of energy efficiency

For each of the analysed BELOK members it has been assumed that 1.0 per cent of the annual energy efficiency improvement (which is the average rate of all the commercial buildings in Sweden) is an "autonomous" improvement, not a result of the network. The additional energy efficiency improvement, which is 2.1 per cent in total, cannot entirely be attributed to the network – member companies might well be more ambitious than the average property owner for other reasons than their membership in BELOK. The BELOK members that responded to the survey were therefore requested to provide their own assessment of to what extent their energy efficiency work can be contributed to their membership in BELOK. These responses vary, but our analysis suggests that about 30 per cent can be attributed to BELOK and has therefore been used in our calculations.

Close to one quarter of the *BELOK reference group* were aware of the Total Concept method, and used it in whole or in part. In our calculations a *spillover effect* of approximately 15 per cent has been assumed of the Total Concept method to property owner that are not members of the network. This methodology usually renders approximately 50 per cent larger energy savings, and this additional effect has been included as depending on the BELOK network. The proportion is assumed to have gradually increased from 0 per cent in 2002. After 2013 a steady growth rate has been assumed until 2030.

Our forecast assumes that it is reasonable to anticipate future *recruitments* to BELOK. The network's current market coverage of 19 per cent is assumed to gradually increase to 30 per cent by 2030, and these additional BELOK members increased efficiency is also credited.

Figure 4 shows the calculation of BELOK's effects compared to a "business as usual case" without the network. The forecast for 2030 is based on the Swedish Energy Agency's long-term forecast, which was used as input in HEFTIG 2.0. Components include:

- Decreased thermal energy demand by current members of BELOK as a result of their participation in the network.
- Corresponding decrease of thermal energy demand for future recruits to BELOK years 2014–2030.

- Spillover effect to other property owners.

Figure 5 gives an overview of all the described components, and for the sake of completeness also all the energy efficiency measures carried out by BELOK members, even if they have not been included as due to the existence of the network.

The overall assessment is that BELOK by 2013 has yielded an approximately 2.3 per cent lower thermal energy end-use in all Swedish commercial buildings compared to if the network did not exist (equivalent to approximately 430 GWh/a). By 2030 the effect is expected to be approximately five times larger (approximately 1.6 TWh/a).

This evaluation only includes energy for heating purposes. It should be noted that the networks' activities include development and dissemination of measures for more efficient use of electricity too, and these measures also lead to improved efficiency in the built environment.

Discussion and Conclusions

This chapter describes the findings regarding the previously stipulated research questions:

1. The benefits of being a member of BeBo or BELOK.
2. The benefits of using tools and concepts developed by BeBo or BELOK.
3. Do property owners that are not members of the networks benefit from their existence?
4. What differences regarding achieved and predicted energy efficiency can be seen between network members and non-members of BeBo or BELOK?

Following this description of the findings some reflections are presented on the study's reliability.

THE BENEFITS OF BEING A MEMBER OF BEBO OR BELOK

Participants in both *focus groups* have expressed that they benefit from their memberships. Both networks have contributed to the individual members' own energy efficiency work, trade collaboration, and knowledge and experience sharing. This was most clearly expressed by the *BELOK focus group*, which brought together a larger number of and more senior members. The *BELOK focus group* gave a very positive picture of their memberships – there is a truly trusting atmosphere within the network which results in valuable contacts. Other members' contributions are used as "leverage" to start individual projects within the separate organisations. The proximity of network projects and tool development plays a major role. The network plays an important role in raising members' awareness and professional knowledge on energy related issues.

THE BENEFITS OF NETWORK TOOLS AND OTHER BEBO OR BELOK ACTIVITIES

A majority of the members that participated in this evaluation use the tools that have been developed within the networks. Seven of the 13 BeBo members that participated in the evaluation process use the BeBo developed tool for energy efficient renovation (Rekorderlig Renovering) and five of the 13 use BeBo's Key Performance Indicators. Seven of the ten members

11. How far into the future that energy efficiency measures are planned.

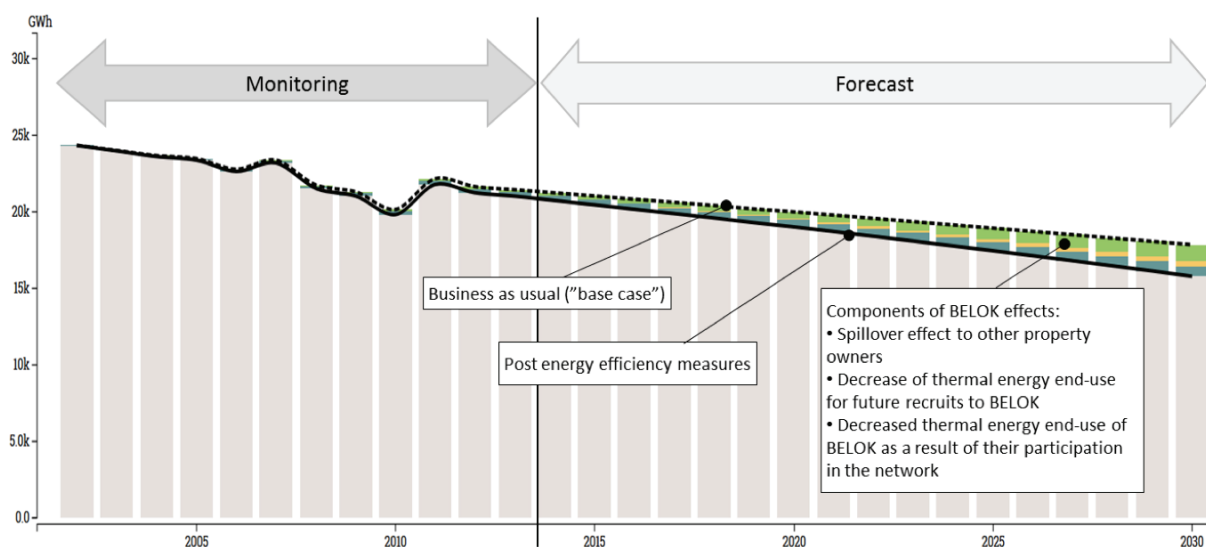


Figure 4. Estimation of BELOK effects compared to the base case without the network (GWh, total thermal energy end-use).

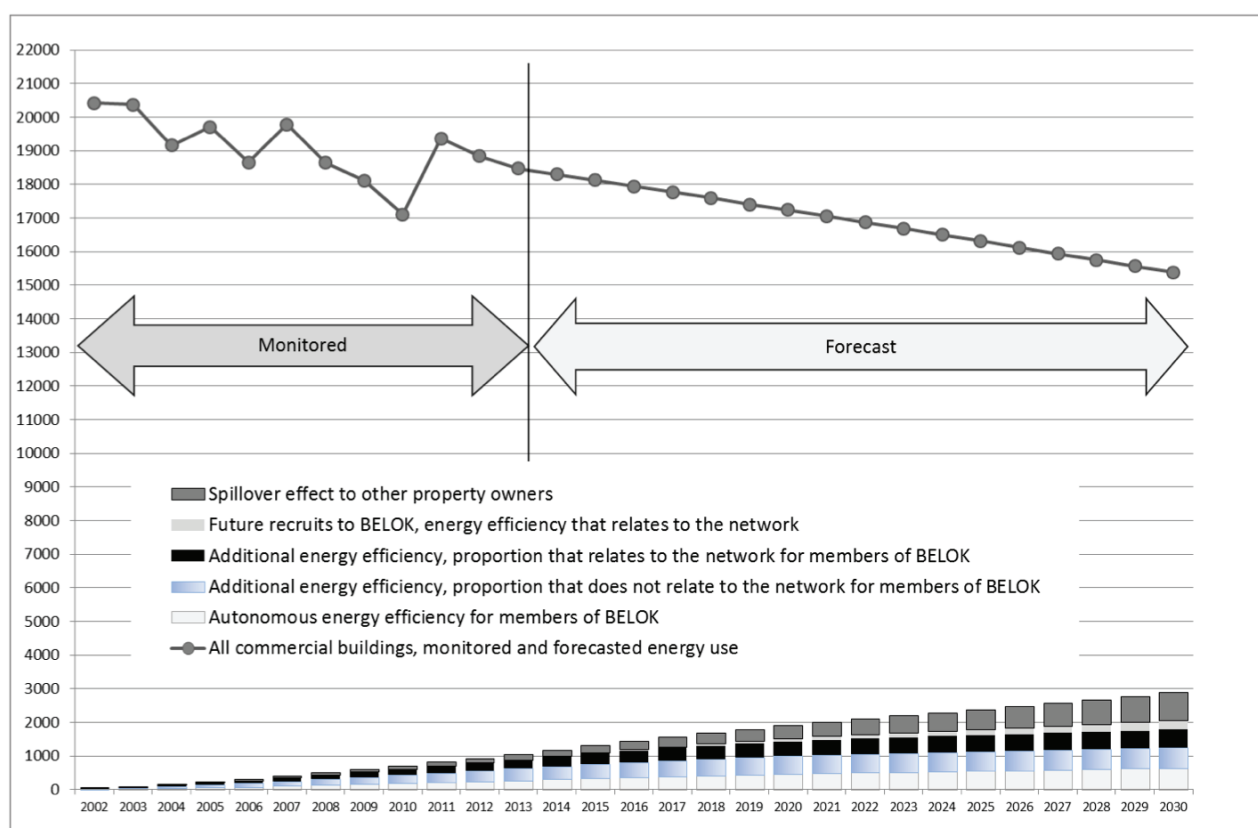


Figure 5. Estimated accumulated impact, thermal energy end-use, of the BELOK members' energy efficiency measures compared to the total thermal energy end-use in all commercial buildings in Sweden.

of BELOK that participated in the evaluation use all of the network's tools – the Total Concept method is the most widely used. In total roughly half of the participants from both networks are convinced that their membership has impacted their energy efficiency cost-benefit analysis methods.

NON-MEMBERS BENEFIT FROM THE NETWORKS

Both BeBo and BELOK are known among non-members of the *reference groups*. Knowledge of BeBo appears to be less spread than awareness of BELOK's existence. Only one of the representative in the *BeBo reference group* stated that they use the networks materials. BELOK seems to have a slightly stronger position – several non-members regularly visit the website, and two of the five in the reference group have used all or parts of the Total Concept method.

DIFFERENCES REGARDING ACHIEVED AND PREDICTED ENERGY EFFICIENCY

The results indicate that by 2013 BeBo had yielded a 0.5 per cent decrease of thermal energy end-use in the Swedish residential building stock (equivalent to approximately 135 GWh/a). By 2030 this effect is estimated to have increased to 5 per cent (1,200 GWh/a). The impact made by BELOK is even greater. By 2013 BELOK had yielded approximately a 2.3 per cent decreased use of thermal energy end-use in the Swedish commercial building stock (equivalent to approximately 430 GWh/a). By 2030 this impact is estimated to be approximately 11 per cent (1,650 GWh/a). Calculations have only been made on thermal energy demand. The authors of this paper do however consider that both BeBo and BELOK also have had and will continue to have an efficiency enhancing effect on electricity demand.

REFLECTION OF RELIABILITY

There may be reason to reflect on the reliability of the data obtained by the chosen methodology. For example, it is natural that members have a positive attitude to a network that they have chosen to participate in, otherwise they would not have remained as a member. It is also easy to agree with others at a focus group, and the result may therefore be affected by “group thinking”. It was clear, especially during the *BELOK focus group*, that many of the participants have a fairly similar and positive view of the network. Although there may be some risk that this positive picture leads to overestimation, we are confident that the network members who participated in the *focus groups* are very satisfied with their network partici-

pation. The image that was pervaded at the *focus groups* was consistent with that in the survey results and previous studies.

References

REPORTS

- Evaluation of BeBo (Beställargruppen Bostäder), 2010, Gottlieb, S.C. & Haugbølle, K, Horsholm, Denmark.
- Long term forecast (Långsiktsprogno), 2012, Swedish Energy Agency, Stockholm, Sweden.

INTERVIEWS

BeBo members

- BRF Lingonet (Birgitta Nilsson), Eskilstuna Kommun-fastigheter AB (Helen Aristondo Magnusson), AB Familjebostäder (Helena Ulfsparré), Helsingborgshem (Britt Bengtsson), Kopparstaden AB (Kenneth Ahlström), AB Landskronahem (Thomas Sjöholm), PiteBo AB (Robert Johansson), Riksbyggen (Lars-Johan Lindberg, Kjell Berndtsson), Signalisten (Erik Lindfors), AB Sigtunahem (Göran Björklund), AB Stockholms hem (Olof Sjöberg), Stena Fastigheter (Bo Matsson), AB Svenska Bostäder (Yngve Green), Uppsalahem AB (Katarina Härner)

BELOK members

- Akademiska Hus (Göran Åhling, Tomas Hallén), Castellum (Mats Strid), Diligentia (Lars Pellmark), Fabège (Mikael Wester), Hufvudstaden (Karl-Johan Wall), Locum (Mattias Milinger, Erik Dunkars), Malmö stad Serviceförvaltningen (Lennart Andersson), Midroc (Rikard Sjöqvist), SISAB (Per Thunman, Niklas Dalgrip), Specialfastigheter (Petra Kinnerberg), Swedavia (Anna-Märta Jander, Kent Arvidsson), Vasakronan (Lennart Lifvenhjelms), Västfastigheter (Hans Bjurbäck)

Reference group BeBo

- AB Bostäder i Borås (Josefine Jorlöv), MKB (Jenny Holmquist, Ulla Jansson), Stångåstaden (Peter Alfredsson), Wallenstam (Bo Strandberg), Willhem (Stefan Martinsson)

Reference group BELOK

- Coop Fastigheter (Tord Lissel), Diös Fastigheter (Lars-Göran Andersson Bang), Ikano Fastigheter (Fredrik Åkesson), Norrporten (Robert Carlsson), Wihlborgs (Hanna Claesson)