

Solar Heating: Like Having a Nuclear Power Plant in the Wardrobe? An Analysis of How People Living with an Alternative Energy System Experience this New Technology

Erica Löfström, Linköping University, Department of Technology and Social Change

ABSTRACT

This paper deals with a Swedish pilot project where solar collectors are being combined with a new technology that stores the sun's heat in bedrock to provide wintertime solar heating. With this system, solar energy produces both hot water and space heating. In addition to data collection, it is also important to understand how a heating system technology is used by people in their everyday lives and how users of a new technology understand the technology experienced in order to ensure that it works in practice. This paper presents a view of how the inhabitants of the residential area where this bedrock solar heating system is being used are experiencing this new technology. A modified version of 'The moral economy of the household' by Silverstone et. al., is used as an analytical tool in order to understand the domestication of technology, i.e., the new kind of heating system, as a way of structuring the empirical material.

The main result of this study is that high tolerance amongst the residents, concerning function and comfort, can be expected when implementing a new kind of technology if the technology itself is associated with positive connotations, like for example "natural" or "clean" energy. This result is encouraging for the building and planning of future pilot projects with alternative energy systems.

Introduction

Despite the fact that interesting studies concerning both energy use and energy-efficient technology have been conducted, studies on how new technology is implemented in people's everyday lives are relatively rare. Energy use in buildings, which contributes to the increasing amount of greenhouse gases in the atmosphere, is constantly increasing (the Swedish Department of Energy, 2003, p 37, p 45). Traditionally, energy use for heating new buildings is reduced by increasing the insulation and sealing air leaks. Another alternative for new buildings is to convert from one type of energy source with a higher environmental impact to one with less impact. One possibility is to make use of the sun. However, a problem with using solar energy in Sweden, as well as in other parts of the world, is that the largest amount of energy reaches us during the summer, while the need for heating is at its peak during the winter. Therefore, it is necessary to be able to store the sun's energy during the summer for winter heating. Dependable technologies for storing heat are, for example, water tanks, the ground, or bedrock (Jonsson et. al., 2005).

This paper is derived from a case study of a solar heating pilot project in the residential area of Anneberg outside of Stockholm, where solar collectors are being combined with a bedrock storage system. (Jonsson et. al., 2005). In this residential area, hot water as well as houses are heated by means of solar energy. There is a mix of semi-detached and terraced houses in this area; all have had both solar hot water and radiant floors installed. The solar heating is designed to cover approximately 70% of total heating demand. An electrical back up system was also installed to cover the remaining 30%.

The reason for using a new kind of heating system in this residential area is the search for an environmentally sustainable system, where renewable energy is an important element. Hence, the residential area has a clearly stated environmental profile. The residential area was built by HSB, The National Association of Tenant Savings and Building Societies, and then sold as tenant-ownerships (tenant-ownership implies that the residents own their own apartments and have collective responsibility for the building and its surroundings). The total amount of households in the area is 50¹. The aim with the project in Anneberg is, according to HSB, to show that the combination of two well known and dependable technologies will ensure that a system is both reliable and easy to maintain (Lundin et. al., 1998 and Jonsson et. al. 2005).

Purpose and Methodology

This paper presents a view on how the inhabitants of the residential area are experiencing the environmental solution, how the new technology is being received, and how the interaction between the technology and the residents functions. The purpose is to investigate how an alternative, small-scale heating system is implemented, or domesticated, in people's everyday life. Domestication is used as an analytical tool for describing how technology is gradually becoming a natural part of the everyday life of the domestic sphere; a process that takes place whenever a technical commodity is bought and owned by a person or persons (Silverstone et. al. 1992a). The main point of this theory is, in this context, that a technology is not a ready-made product when it enters the domestic sphere, its meaning is not stated, but rather that it is—through four different phases which are described later in this paper—continually being redefined and renegotiated within the household. *In other words, phases of domestication must take place before a new technology is properly domesticated.*

In this study, the new solar heating system, including its different technical artefacts and the human actors involved in its maintenance and operation, is analysed as a *sociotechnical system*. A sociotechnical system consists of both human and nonhuman actors. Hence, I will talk about the domestication of “*technology*” throughout the paper even though more than one technology is involved (Hughes 1983 and Summerton 1992).

Using the residential area of Anneberg as an example, much can be learned when constructing future energy-efficient systems for heating residential areas. In-depth interviews with eight² of the area's 50 households have been carried out. Altogether, 13 persons were interviewed. The interviewees were given assumed names in the text beginning with the same letter as the households' alias letter. The interviews were recorded using an MP3 player and were transcribed in their entirety; hence, the quotations do not only show *what* the informants said, but *how* they said it.

The Domestication of Technology – Results from the Case Study

The “domestication of technology” has been successfully used as a theoretical framework where studying the process of a new technology entering and gradually becoming a natural part of the private sphere (see, for instance, Aune 1997, Silverstone et. al., 1992a and Silverstone et. al. 1992b). This theory offers a concrete and accessible tool when handling large amounts of (interview) data. In this study, “the moral economy of the household” has been used as an

¹ 18 semi-detached houses and two rows of terraced houses with 7 households in each.

² In this paper material from five of these households is presented.

analytical tool when analysing the interviews. Silverstone et. al. (1992) primarily use “the moral economy of the household” to analyse the domestication of information technology, but they have also expanded this framework to analyse different kinds of technology.

Silverstone et. al. describe the domestication of technology as a process consisting of four phases. In this study, the concepts of domestication are used to elucidate different angles of approach on the domestication of technology. Four nondiscrete elements or phases are identified—*appropriation*, *objectification*, *incorporation* and *conversion*—in the dynamics of the households’ moral economy and that constitute an analytical model (Silverstone et. al. 1992, p 20 f). I will first describe the four phases of domestication as used in this study; *Appropriation* is the process through which the commodity, i.e., the heating system, is made physically and mentally accessible for the household. This phase takes place when the object is bought and owned; hence, it is given meaning by the buyer. This phase is followed by *Objectification*, which concerns how the different households talk about the heating system amongst themselves, thereby negotiating its meaning. Third comes *Incorporation*, which is the process through which the object is incorporated into the routines of daily life, i.e., how it is being used in the household. Finally, the last phase of domestication, *Conversion*, takes place in the boundary between the public and the private within the household. This phase includes the daily conversations and the exchange of information about the heating system. In this phase, the heating system’s meaning is renegotiated, this time not only within the household, but with other people in the residential area.

Below I have structured my analysis after the four phases of conception. I also explain further the meaning of the four phases and discuss them in relation to the results of my interviews.

The Appropriation Phase

When a technology leaves the world of commodity it is *appropriated*. It is taken by an individual or a household and owned. Hence, the artefact is given meaning when it is being bought and owned by the household. In this case, the commodity is the tenant-ownership in Anneberg including a new kind of heating system, which is our main subject of interest. In the Appropriation phase, we can see which meaning the interviewed households put into the purchase, what they have bought and why. Although all of the interviewees said that HSB, (the nonprofit, nongovernmental, national housing organization that built the tenant-ownership) promised that the cost for heating the residential area would be low using the new technology, not all households state that they used this as an actual argument for buying the tenant-ownership. HSB is also responsible for the area’s heating system during the guarantee period (five years), including operation costs and controls. Those who used the expected low heating costs as an argument, Households A, B and C, have used this as an *ecological* argument as well as an *economical* one. In these households economical and ecological reasons worked together as arguments, without antagonism, as noted in the interview statements below.

That’s (the new technology) what’s going to reduce the heating cost by at least 60%. At least, they’ve promised. (Carl)

Since we are very interested in ecology we thought that this new way to use solar energy was something positive. (Carolina)

It (the areas' environmental profile)³ became a positive incitement. (Boel)

One of the households emphasized that, even though they have stated both economical as well as ecological reasons for buying the tenant-ownership, their decision to buy was not based on the area's environmental profile.

Actually, we had no idea about that at first. I think we realized that later. (Boel)

During the interview, when the households were asked to place economy, ecology, and comfort in order of precedence concerning the heating system, comfort was ranked the highest while economy and ecology were ranked equally.

Table 1. The Households Ranking of the Factors Economy, Ecology, and Comfort

Household	Ecology	Economy	Comfort
A	3	1	2
B	2	3	1
C	2	3	1
D	3	2	1
E	1	2	3

Table 1 shows the households' ranking of the factors economy, ecology, and comfort, where a ranking of 1 means that this factor is of the greatest importance when choosing a heating system; a ranking of 3 means that this factor is of least importance for this household. Three households ranked comfort as most important, 1 ranked economics as most important, and only one household ranked ecological concerns the highest. So in fact, since ecology and economy got exactly the same ranking, only comfort stands out as something important overall to the group. This shows that, indeed, comfort is a highly important factor for the interviewees. However, this does not mean that these factors need to be conflicting in the daily life of the interviewees. They may well work together, as long as the interviewees are not forced to choose between these factors. Instead, this ranking shows that comfort stands out as the most important factor of the heating system.

Furthermore, the best heating system is, according to Households A, B and D, a system that will in fact work. This comes as no surprise since it is a factor highly related to the functionality of the heating system. This factor may also be accentuated because the heating system in Anneberg has yet to live up to expectations concerning its functionality. Despite this, most households seem to have been inspired by the heating system in Anneberg and think that solar energy is the best possible solution.

The residents' opinions of their level of involvement in the heating system vary widely. While some of the households expected a certain amount of extra work because the area was a pilot project, others saw the accommodation as a way to reduce the amount of maintenance work. This can be put in context with the households' previous living environments. Household C, which moved from a larger detached house, believes that the new heating system will require less maintenance work on their part. On the other hand, Household D, which moved from a

³ Consisting of environmental goals set up by HSB.

rented flat, is of opposite opinion, meaning that they were willing to be inconvenienced for the sake of testing the pilot project.

Discussion. Even though all of the households, when buying the tenant-ownership, actually also bought the special heating system (solar collectors combined with a bedrock storage system) perceptions about what kind of heating system owners bought varies. Therefore, the expectations on the heating system are disparate. While some households see the system as an ecological pilot project, expecting some initial problems concerning its function, others state that they have bought a system that is to be foremost economically profitable. Although all of the households included in the study state that they had been promised by HSB that the cost for heating would be low, the interviewees are also of the perception that the area has been an ecological investment with a pronounced environmental profile. Different households seem to have let different reasons concerning the heating system carry different weight when buying the tenant-ownership. Those with a more pronounced ecological interest have taken note of arguments concerning environmental issues, while households which are mainly interested in economy seem to have taken note of arguments concerning the expected reduction in heating costs. There is also a noticeable difference between the households concerning the amount of expected maintenance work. Although some believe that they have bought an accommodation that will reduce their amount of maintenance work, others have expected a certain amount of extra work because the area is a pilot project. These perceptions are connected to the households' previous living environments. Those people who moved from a larger detached house believed the heating system would demand a minimum of maintenance work, while those who moved from a rented flat are of opposite opinion. The latter were expecting, and also willing to accept, a lack of function because the heating system was a pilot project.

The Objectification Phase

Objectification phase concerns how the different households talk about the heating system in their everyday life, thereby giving it meaning. It is hereby being made accessible, both mentally and physically, for the household. Based on the interviews, we established that the solar heating technology is rather complicated to understand in detail for the households.

I understand what's happening, I think, and the purpose and so on, but I don't know so much about solar collectors. (Emma)

Furthermore, several of the informants view the solar panels as objects that are just there. The fact that they are attached to the roof does not bother them. They are self-evident and their purpose is associated with their appearance.

Once you know it's solar panels up there, then you will accept the shape of it. (Carl)

Well, I have no (opinion), really, well, it's neither ugly nor beautiful, it just is... I think you get used to it a bit. (David)

The solar radiant floor heating is aesthetically pleasing to households D and E. Households A, C and D, however, comment that it feels different than regular heating from radiators, which they have previously used. The heating system is also understood to be unreliable and difficult to regulate, which gives rise to a feeling of powerlessness.

Yes, though I don't think it's low (the temperature⁴). I think that it's rather that the air feels different... it's damper. (Disa)

I'm mostly used to radiators; then I can feel the heat. ...Here, you can't feel it since it's not working properly. (Anton)

If you're walking barefoot on that, you like don't actually feel it's floor heating (Carl)

The so-called *technology room* that stores and regulates the heating system is likened to a nuclear power plant under the stairs with different experts coming and going.

But we were aware that it was a different system, of course, when we moved in, but I could never imagine that it would look the way it does in that wardrobe. I mean, I think it looks like a nuclear power plant. (Carolina) Yes, it actually does. (Carl)

Household D also feels that the heating system is unreliable. They describe an incident that occurred on the day before Christmas in the technology room, resulting in the heating system breaking down and leaving them with a very cold indoor climate. They are convinced that such an incident would never have happened with a normal, traditional heating system.

If you were to build a house today, you would surely make sure you got a modern heating system with some kind of floor heating and maybe even some kind of ground source heating system. But I don't think that it would be as complicated as this, since we get our heat from another place and it's more centralized here. (David)

Household A even provides the floor heating with some kind of personality, referring to it as “that bastard.” He is angry and disappointed with the floor heating.

... and then it's the floor heating and that bastard doesn't work, you know. You have to have your shoes on almost in winter time you know.... that fucking bastard. (Anton)

The smart windows⁵ installed generally do not seem to give rise to emotions to the same extent as the solar collectors and the floor heating technologies. Instead, they are conceived as being “normal”.

⁴ My comment.

⁵ Windows with good insulation capacity, the U-value of the windows in Anneberg is 1.3 W/m²°C

Discussion. Objectification concerns how the different households talk about the heating system, thereby giving it meaning. We can establish that the solar heating technology is rather complicated to understand in detail, even though the households seem to have an overall understanding of the underlying principles of the technology. Furthermore, many of the interviewees view the solar panels as objects that are just there. They have become self-evident and their purpose is associated with their appearance. The solar radiant floor heating is aesthetically pleasing to some of the households, but it feels different to regular heating from radiators, which they have been used to previously. This might be because the households had expected the solar radiant floor heating to work as electrical floor heating; where the floors feel warm. Both these aspects may have been contributing to the fact that some consider the indoor temperature as being too low.

The heating system and mainly the floor heating, is considered by some residents as being unreliable and difficult to control, and gives rise to a feeling of powerlessness. The technology room for the solar heating system is likened to a nuclear power plant with different experts coming and going. In this case, we might speculate about whether this is associated with some form of fear of having a heating system but being unable to fully understand or control it. A fear of future catastrophes is close at hand. One household even provides the floor heating with some kind of personality, referring to it as "that bastard," bearing witness to the feeling that the heating system does not perform as expected.

One conclusion is that what differs the most from previous living environments concerning the heating system gives rise to the largest amount of reactions and sometimes also strong emotions. The areas that differ most are the technology room, the floor heating, and to a certain extent, the solar collectors. Interesting to note is that the windows in general do not give rise to the same amount of feelings. Instead, these are considered to be normal and something that the residents do not take notice of or reflect about. This could be explained by a number of factors. One is that they have, in fact, bought a ready-made package consisting of a semi-detached house including a heating system, which, in turn, includes parts that visually deviate a lot from "normal" heating systems, i.e., the solar collectors. The windows, however, look like ordinary windows found on other residential buildings. Generally, in Sweden, we have windows with a very good insulating capacity, therefore, the smart windows look like Swedish standard windows. Further more, the windows were not promoted in the sales brochures in the same way as other parts of the heating system.

The Incorporation Phase

Incorporation deals with how the technology, or the acquired object, is used in the household. Here, it is being *incorporated* into the everyday routines of the household. The interaction between the heating system, with its control panels and different functionalities, and the household members are at the center of this analysis.

On the whole, the heating system turned out to be complicated to understand. None of the households tactically use water at special hours in order to use the solar heat to its maximum. For instance, if a household member takes a shower in the evening, when the solar collectors have been heating the water during the whole day, the solar heat can be used before it is lead down to the bedrock storage, hence using the "free heat" from the system. This turns out to be something that the households were previously unaware of and the question gives rise to a certain amount of curiosity among the interviewees.

Are there certain points of time when you can use hot water? I mean, what is in the solar collector? I don't know that. (Boel)

The technology room, mentioned above, is mainly perceived as for the experts; the households themselves use it as a storage space for shoes as well as for wood. Using the regulators to control the heating system is considered to be more or less meaningless, since the possibility to have any effect on the system is almost nonexistent. Many of the interviewees also consider themselves as insufficiently qualified for using the system.

You could say it's a bit too complicated for ordinary mortals...one should not have to, we should not have to be star technicians in order to live in a place like this. It's ridiculous really. It's not supposed to be like that. (Carolina)

The interviewed households did not experience any need to change their own activity patterns in order to save energy:

I don't think my consumption is very high today, really. I think I am at a level of consumption that, well, maybe you could reduce it a bit further, but I think it simply is what I actually need. (Emma)

However, they do feel that the use of electricity has been too excessive as a result of the system not living up to the expectations.

What happened last year was that this didn't work at all, you've probably heard about this. So my electricity bill was⁶\$ 1281 last year. It was a bit juicy, you might say, I almost fainted. (Emma)

Discussion. Incorporation deals with how the technology is used in the household. On the whole, the heating system has turned out to be complicated to understand. None of the households tactically use water at special hours in order to use the solar heat to its maximum. In general, it is obvious that the households do not have knowledge of how to use the heating system in an optimal way.

The technology room for example is perceived as something for the experts to use and the households themselves use it for well known everyday purposes. One possible interpretation for it being used as a storage space for shoes as well as for wood is that this is the residents' way of making some kind of protest against the technology. Although some residents have used the regulators to control the heating system, they stopped using them after they discovered they had no effect on the system. This lack of interaction might also be seen as a silent protest against the technology. Many of the interviewees also consider themselves as being insufficiently qualified for using the system.

It is also noticeable that the households do not experience any need to change their own activity patterns in order to save energy. However, they do feel that the use of electricity has been too excessive as a result of the system not living up to the expectations. The amount of energy used is strongly associated with the technology in use, with the result that the energy use in the household to a certain extent is being neglected. However, this does not mean that the

⁶9300 SEK = 1281 US Dollar (USD), <http://www.oanda.com/convert/classic>, 2006-04-19

households are lacking in awareness of the connection between the amount of energy used and their own behavior. Many of the households are showing a considerable degree of consciousness concerning this issue. The residents have received information, both in the form of brochures and at information meetings, on how the heating system works and how to use it in an optimal way, but some of this information does not seem to have been taken in by the residents. However, one could also question how much the residents really need to understand about the system in order to use it in a sustainable way.

The Conversion Phase

Conversion takes place in this case in the boundary between the public and the private within the household. “Public” in this context means the committee dealing with the ongoing dispute with HSB over high electricity bills caused by the new heating system. This phase includes the daily conversations and the exchange of information about the new technology. Included in the discussion is also the households’ possible engagement in anything concerning the heating system. Through the process of conversion, we can also say something about the household’s *moral economy*, i.e., its values and cultural preferences becomes discernible.

In this phase, which includes the daily conversations and the exchange with the committee concerning the heating system, we see that the households who are not *in* the committee of the tenant-owner’s association get their information from the Anneberg News Letter as well as from neighbors who are members of the board.

Gossip, that’s the truth of the day, actually. ... if you only want information, I would go via the board, which means our chairman. (David)

The fact that the minutes of the tenant-owners’ associations’ meetings are secret even for its own members has been questioned.

I have asked to have them made official, but the answer was that since there are families who have teenage children and parties and such...then they don’t want to expose them in the minutes. I don’t know if I think that it’s an acceptable explanation, but yes, that’s the way it is. (Emma)

The different households’ engagements in, as well as their interest in the tenant-owners’ association, vary to a great extent. The ongoing dispute between the association and HSB is seen as an important, mainly economic, question, but the future function of the heating system is also an important issue for the households.

The most important issues right now, well, it’s the solar collectors and the bedrock storage that doesn’t work... (Anton)

Discussion. Conversion includes the daily conversations and the exchange with the surroundings concerning the heating system; we can see that the households who are not themselves in the committee of the tenant-owner’s association get their information from the Anneberg Newsletter as well as from neighbors who are members of the board.

The different households' involvement in the tenant-owners' association vary to a great extent. Some households work several hours a week with the tenant-owners' association while others only read the newsletter. Nevertheless, the ongoing dispute with HSB seems to be an important issue for all the interviewees. The dispute is something the households talk about, hence, creating an important object in their everyday lives.

The dispute itself is seen as mainly an economical one, but the heating system and its future function is also considered to be an important aspect. It would be interesting in future studies to follow up on the legal process and also to investigate the consequences of and reasons behind the fact that the minutes from the tenant-owners' board meetings are kept secret even from its own members. This is not, however, a part of this study. A significant source of irritation towards HSB and PEAB⁷, apart from economical and functionality related issues, seems to be that a number of experts have been making home calls in the area, trying to regulate the heating system.

Conclusion

Households' perceptions of what kind of heating system they have bought and own varies as well as their expectations of the new technology. Some see the system as an ecological pilot project, while others emphasize economical benefits. However, there seems to be no conflict between these two factors. Instead, they seem to have worked well *together*, without antagonism. Also, there was a noticeable difference between the households concerning involvement with the technological system. Some expected to do extra work, while others had not planned for that. Interesting to note is that the expectations concerning the amount of responsibility have been fulfilled while the expectations of low heating costs concerning the electrical back up system have not yet been fulfilled.

Another conclusion is that the solar radiant floor heating is aesthetically pleasing to some of the households, but it *feels different* than regular heating from radiators and several households complained that the indoor temperature was too low. The heating system is also perceived as unreliable and difficult to control, which contributes to the feeling of powerlessness by the households. On the whole, the heating system has turned out to be complicated to understand, and the households lack knowledge on how to use the system properly to save energy. Households that actually had tried to use the control panels in the technology room have also stopped since they did not see that their actions had any effect on the system.

A notable result is that the households did not experience any need to change their own activity patterns in order to save energy. However, they did feel that the use of electricity has been too excessive as a result of the system not living up to the expectations. It is interesting that the amount of energy used was so strongly associated with the technology in use.

Even when the engagement in the tenant-owners' association varies, the ongoing dispute with HSB seems to be an important issue with all the tenant-owners. The HSB dispute is important for economical reasons, but this conflict can be assumed to spill over and have consequences for how the households perceive the technological system and the whole project.

The interviewed households present a wide array of reasons concerning the choices of, the use of, and the values and attitudes concerning the heating system of Anneberg. Even though economic issues together with ecological ones are important factors, it is still its *functionality*

⁷ PEAB is the construction contractor responsible for the Anneberg residential area.

and *comfort* that are of greatest importance to the households, e.g., three out of five households ranked “comfort” the highest of the factors economy, ecology, and comfort. Furthermore, insufficient functionality gives rise to the strongest reactions. The technology that visibly seems to differ the most from previous accommodations also gives rise to the strongest set of emotions, i.e., the floor heating and the solar collectors. Disappointment as well as anger is becoming discernible. However, even though *function* and *comfort* of the heating system are stated to be highly important, the residents remain positive toward the overall concept of the heating system they have with solar heating in combination with a bedrock storage system. This attitude is remarkable considering the fact that the heating system has not yet been proven to be effective. The residents have had both considerable *discomfort* with too low indoor climate and high electricity costs due to the *nonfunctioning* of the heating system. The electrical back-up heating system has, in practice, been the main heating system of the area so far⁸. This could at least partly be explained by the overall positive view amongst the residents concerning what they describe as “natural energy,” a view that is so strong that even a nonfunctioning system is a positive one. The households remain positive to the overall concept of the heating system and remain confident that it will work, eventually.

It is important to note that the strongest set of emotions does not seem to be connected to high heating costs, but rather to the lack of functionality of the heating system. Even though the indignance among the interviewees is obvious, the attitudes toward the overall *concept* of the new heating system are overall positive. Solar heating is being described as a “clean technology” and its positive environmental aspects are accentuated. The windows, which do not visibly deviate so much from earlier technical solutions, do not give rise to any strong emotions.

The interview data shows that the heating system of Anneberg is not living up to the expectations. HSB’s aim to show that the combination of two well known and dependable technologies will ensure that a system is both reliable and easy to maintain, has not yet been fulfilled. This problem has also been shown by a recent technical evaluation study (Dalenbeck et. al. 2005). Recent studies of other projects where high environmental goals concerning energy demand have been set indicate that the calculated energy demand for residential buildings has been unrealistically low. The actual energy used in this kind of projects is generally higher than expected. Also, the “breaking in” period for the heating system needs to be taken into consideration. Sometimes it takes longer than expected to make the different parts of the system work well together (see, for instance, Green 2006; Svane et. al. 2002; and Elmroth et.al. 2003).

However, it is necessary that pilot projects like Anneberg are built and tested in practice and that these technical projects are followed by studies of how the technology is perceived in the daily life of the users if we are to learn from these projects in our quest to find sustainable alternatives for our future heat demand. The users are important in the development and creation of long-term sustainable energy systems because such systems acquire significance only when they are put into use. Furthermore, the fact that the heating system in Anneberg has not yet lived up to expectations does not mean that it may not work well eventually. After all, this study has shown that at least the residents remain positive towards the overall concept of the heating system itself. Since any technology needs to be properly adapted to its users’ everyday life for it to work in practice, the prognosis for Anneberg is not as bad as it could have been.

⁸ 2006-04-18

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