Social anthropological and interdisciplinary research on the conversion of electrically heated single family houses to heating by combined pellet–solar systems

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Abstract

The social anthropological research presented here is part of the interdisciplinary research project PESTO, which focuses on the (partial or complete) conversion of single family houses from electric heating to heating by combined pellet–solar heating systems. Basic to this research is the assumption that it is more likely that energy conversions are carried through, and that they are successful on a long-term basis, if the new products are designed to fit as well as possible into the everyday lives of people. The anthropological interest in the project can be divided into two parts; motives for or against a conversion among men and women in Swedish households, and product design and placement in (previously) electrically heated single-family houses. Literature studies and semi-structured qualitative interviews are the main methods used in the anthropological part of the project. During the next 3-year project period, these investigations will be used to support information and marketing, and to formulate recommendations for conversion practice of electrically heated single-family houses to combined pellet–solar heating.

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1. Introduction

The social anthropological research, which is presented here, is part of an interdisciplinary research project focusing on the (partial or complete) conversion of single family houses from

electric heating to heating by combined pellet–solar heating systems.

Basic to the research presented below is the assumption that it is more likely that energy conversions are carried through, and that they are successful on a long-term basis, if the new products are designed to fit as well as possible into the everyday lives of people.

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2. Background

2.1. Government policy

The Government wishes to reduce the amount of electrically heated houses. The goal of the interdisciplinary research project “PESTO”; to lay the basis for a conversion of our homes from electrical heating to a combination of pellets and solar heating, is part of this policy.

2.2. Responsible consumption of bio-fuel resources

One of the most challenging tasks for the global research community today is to find out how we can reduce greenhouse gases and, at the same time cut down the production of long-life radioactive waste. As bio-fuel is often mentioned today as a replacement for oil, coal and nuclear energy, it is important, in the long run, that we use the world's bio-fuel resources in a responsible way.

When electrical heating is replaced by pellet stoves or pellet burners in combination with solar heating, both electricity and different forms of bio-fuels can be saved for the occasions when, and the areas where, they are best needed. Combinations of pellet stoves/pellet burners and solar heating systems also means that emissions of flue gases from combustion of bio-fuel in dwellings can be reduced.

2.3. Market introduction advantages

Earlier research on cultural aspects of the use of solar heating in Sweden [1] point at several advantages that may be achieved by a common pellet–solar marketing.

Well-established socio-technical energy systems tend to have a large number of collaborating organizations and companies that all work in the same direction. The Swedish electricity system is a good example of this. Collaboration between organizations and companies dealing with pellet heating and solar heating would probably substantially increase their respective marketing strength. Collaboration could also be a way of solving installation impediments.

Today, “the wood burner” is an important category of solar heating customer. There are reasons to suspect that “the pellet burner” could also become one, as a combined system would mean that he/she would not have to feed the burner or stove during summer (late spring and early autumn).

Solar heating systems are rejected by many people who believe that the sun only gives energy during times when this energy is not needed. With combined pellet–solar systems it is enough for people to know that this system provides them with all the heat and hot tap water they need. Thereby, it becomes less necessary to convince people that solar heating systems are particularly suitable for the Scandinavian area during spring and autumn, periods with both solar insolation and a need to heat buildings.

A combined pellet–solar system seems to be particularly suitable for being marketed as an environmentally friendly heating system. As solar collectors are extremely visible on the very top of the house roofs, each solar collector that could be recognized as a “pelletsolar collector” would, in itself, function as an advertisement, huge in size and free of charge. The pellet stove/burner would contribute to a positive image through its mental connection with the recognizable, safe and cozy wood burning stove/boiler, thereby reducing the slightly negative connotations of the environmental concept that is sometimes linked to the solar collector.

2.4. The PESTO project

The acronyms “PESTO I” and “PESTO II” stand for “Pellets och sol-tvårvetenskapligt organiserad forskning kring elkönvertering” or, in English, “Pellets and Solar, interdisciplinary research on the conversion of electrically heated single-family houses”. The project includes researchers with a wide range of social/cultural and technical/scientific specialities.

So far, the basic research task of the project as a whole has been to investigate the possibilities of converting Swedish single-family houses from electric heating to combined pellet–solar heating, and to suggest feasible solutions for such

conversions. The task has also been to build up a competence centre for further studies in this field. During a first 3-year period, seven sub-projects are being carried out. These include lab testing, computer simulations, literature studies, interviews and interdisciplinary collaboration. The present sub-projects deal with household habits, pellet burners and stoves, the heating system, the building as a system, distribution and handling of pellets and ashes (to and from the house), social policy, and research dissemination.

The continuing project (PESTO II) is basically organized around a technical core, which includes test conversions, but has a social anthropological theoretical framework. One main aim of the six sub-projects in this new three-year project period (starting in 2003 if funding is granted) is to formulate recommendations for conversion practice of electrically heated single-family houses (that are to be converted from electricity to pellet and solar). Another aim is to support information and marketing through investigations of male and female motives for or against such a conversion.

3. Theoretical approach

The anthropological interest in the PESTO project can be divided into two parts; product design and placement in (previously) electrically heated single-family houses, and motives for or against a conversion among men and women in Swedish households.

3.1. *Questions at issue*

In order to find out more about how the pellet-solar products should be designed and placed, the interviews include rather specific questions concerning fire/light/sound, heat comfort, ashes/smoke/smell, aesthetics/other questions of design, space/placement and the system as a whole.

In order to find out more about conversion motives we investigate whether, why and in what sense the different members of these households consider themselves as having enough time, space, money, knowledge and interest to invest in a pellet-solar heating system.

In more general terms, these two research interests mean that we need to know more about how men and women, respectively, themselves use and look upon their heating systems and the various spaces of their homes. We need to know how they perceive comfort and temperature variations, we need to know how they divide household tasks between them, and we need to know how they handle larger purchases to the household. We also want to know more about their respective experiences, emotions and modes of thought towards home and “hearth”.

3.2. *Theories*

Mainly, anthropological tools (analytical and theoretical) are used for the analysis of interviews and a possible coming anthropological fieldwork. However, theories are also borrowed from science and technology studies and from social scientific studies of energy. Literature studies have a certain emphasis on anthropological and ethnological research, but includes texts by architects, sociologists, historians and authors of other disciplines.

4. Methodological approach

4.1. *Literature studies and interviews*

Sub-projects using anthropological methods focus on households and are based on literature studies and semi-structured qualitative interviews. These two methods support one another. Literature studies give a broad base of knowledge concerning habits and modes of thought in Scandinavian households, while household interviews supply the research group with empirical examples of the specific areas of interest to the present research. These examples clarify preliminary assumptions (that is, conclusions drawn from literature studies alone), verify them or put them into question, add some new perspectives to them and, often, make them more complex.

4.2. *Interdisciplinary collaboration*

The interdisciplinary understanding and collaboration has mainly been built up through

meetings every other week, by taking turns in feeding and cleaning the pellet burners and stoves in the lab, and by participating in interview visits to households.

4.3. *State of the art*

During the PESTO I project period (mainly 2000–2002), 20 interviews were made in ten households, all in the region of Dalarna, but with a variety of household structure, house type and heating system. All adults were asked to participate on those occasions. On the second visit to the household, a researcher with technical training accompanied the anthropologist.

The aim has not been to present a statistically representative selection of the Swedish population, but to present detailed descriptions of relevant habits, experiences and modes of thought in a number of households. The aim has also been to produce knowledge and experience on which to base the following research period.

The analysis of these interviews has only been started upon. Therefore, the text presented below is primarily based on literature studies and earlier research on solar heating [1].

4.4. *Research plans*

As stated in the introduction, the basic research plan is to gain some knowledge concerning habits, experiences and wishes of people before the final suggestions on heating system design, placement, marketing and conversion practice are formulated.

Results from PESTO I and preliminary results from two new interview studies of households living in houses that have, already, been converted to pellets or solar heating, will be used for product selection and other preparations for conversion of five test houses (PESTO II). Also added to the project, is a third (fourth, if PESTO I is included) interview study of discussions and negotiations in households in which a change of heating system is contemplated.

5. Can people afford it?

Whether Swedish households can afford a change of heating system, or whether they can

afford a specific kind of heating system, cannot in some objective way be measured in terms of price or size of household budget.

Neither is the question of whether it is the man or the woman in the household who has the power to decide whether to buy a new heating system simple to answer. Larger household purchasing decisions are often preceded by complex processes where various motives are formed, lists of priorities are made up [1], and discussions are held within the household.

5.1. *Why solar collectors are expensive ...*

As the energy put into a solar heating system is free of charge, many presumptive Scandinavian customers also expect the user equipment to be cheap. “The sun is free”, as they say. On top of this, there is for other reasons an over emphasis on price calculations when contemplating a solar collector purchase:

In many contexts, the value of having a solar heating system installed is seriously put into doubt (for reasons extensively explained in Henning, 2000 [1]). Owing to this uncertain cultural status of solar collectors, customers are forced to defend their purchase in front of friends and neighbours to a higher degree than they have to do when purchasing other kind of goods. Many people who wish to prove that their investment in a solar heating system was a good decision, not only try to convince their listeners that their economic calculations were correct, but that the purchase actually has been a way of saving money.

The reason why it is primarily economic calculations and words (rather than other arguments and motives) that are used in order to have the purchase socially accepted, is that economy is perceived as something objective and neutral, free from subjective judgements and feelings [1].

The expected low costs for solar heating systems (as the energy is free of charge), plus the strong need among customers to prove to others that the costs are low (evoked through the ambiguous cultural position of solar collectors), makes the fixing of prices into the most important means of competition for solar heating companies. This, in turn, is problematic for several reasons, one being

the fact that the primary competitors of the solar heating business are oil companies and electricity producers, both extremely strong social actors with large possibilities for tactical price setting [1].

When the PESTO project first started up in 2000, we asked ourselves how these conditions would be modified through heating systems that combined solar heating with the burning of pellets. The following conclusions concerning pellet stoves are drawn from literature studies. They will later be compared with results from ongoing interviews.

5.2. ... and why pellet stoves are not

With pellet stoves, the price expectations and cost acceptance could be very different, at least if they are marketed as furniture rather than a heating system.

The authors of a Norwegian Government report (“Forbrukerrapporten”) complained about the tendency among people to change entire kitchen furnishings rather than being satisfied with new paint or an extra cupboard. Each year, 30.000 fully functioning kitchens were thrown away to a cost of around 500 million NKR, plus the work that people themselves would put in [2]. There are several reasons why many people in Scandinavia, Northern Europe and North America put so much time and money into their homes. The following are two of them:

With a larger supply of goods than ever before, the possibilities to choose among them, and thereby to express oneself through them, has also increased [2,3]. People fill their homes with furniture, wall decorations and other objects that confirm and display values and ideas, and that help creating themselves as individuals and families. The home is a rich and flexible environment with lots of possibilities to manifest different life styles [2].

Another explanation to the increasing importance of home and home decoration is, according to Daun [4], the fact that identity and status in Sweden are not as self-evident as earlier. To a larger extent than earlier these are formed through many different factors, such as salary, title through education or work, car model, number of rooms, furniture, or summer cottage. It is through a

combination of each of these objects and phenomena that people today both grade themselves and are graded by others (*ibid.*). One of the questions we have to ask here is in what sense pellet stoves fit into this pattern of expressing life style and identity, and of grading and being graded.

5.3. Who controls the household economy?

The, without comparison, most common way of organizing the household economy in Swedish households is the “common pool” or “partial common pool” [5]. Generally this means that man and wife both administer and have full access to all their money.

Nevertheless, in families where the man is, for example, a civil servant or is highly educated, it is more common that he administers the household economy than in families where he is a worker or poorly educated (in that case it is more common that the woman handles the economy). The way families handle their money does not vary with the occupation and education of the woman [5].

However, from this we can not draw too many conclusions on who would make the decision to purchase a pellet-solar heating system, as it is not necessarily the person who administers the household economy who has the strategic control over the money. While one of the spouses handles the daily economic errands, the other may make bigger and more important economic decisions [5,6]. A common pool, in which all money goes, may also conceal an uneven distribution of money, as it is often not so obvious who has contributed with what or spent more [6,7].

Different parts of the household economy may also be used in different ways. In spite of the fact that the lower incomes of women often is more or less an active choice (as they often search for part time jobs) [8,9], there is, in Scandinavia, a tension or conflict built into the spouses’ different income levels [10,6]. With different incomes, it is not possible to support the family to the same extent. The basic cultural idea of the man as main supporter is well in line with this situation.

At the same time, however, the man may be perceived as more important than the woman because of this situation. Thereby, the different

incomes are also a serious threat to the values saying that man and wife are equal and create their home and family together. The unequal salaries express an unsolved conflict between individuality and sharing (“gemenskap”), between similarity and complementary responsibility. The spouses see their salaries as both “my money” and “our money”, and they see paid work as both “his responsibility” and “shared responsibility” [10,6].

One way for the woman to restore her self esteem, and to make the couple at least seem more equal, is to strengthen the importance of her salary through her way of counting and consuming, and by giving these money a special meaning and higher value. She can do this by using part of the money she earns on consumption that symbolizes the work of the couple more than daily expenditures does, like, for example, on a pellet–solar heating system. To handle her salary in this way may also be a way to declare her work something extra, something over and above the family support that is carried out by her husband.

6. Do people have the time?

People who live in electrically heated buildings, have not had to spend much time on their heating systems. One question now is whether these households are willing to start spending more time and attention on the heating of their houses.

6.1. *Leisure time or duty?*

The way people conceive time has a lot to do with how they conceive different activities. The interview studies will eventually give some answers as to whether people tend to look upon their new tasks of clearing ashes and feeding pellets as heavy duties or more like recreational activities.

Activities outside the paid job are normally talked of as leisure time. However, simultaneously, people tend to perceive tasks like cooking, cleaning, dish-washing, laundering and child-minding as intruding on their spare time. “Real leisure time”, as people perceive it [11], is time when they can choose freely what they want to do. People consider it important to be active with gardening,

re-decoration of the home, summer cottage maintenance or berry picking, for example, during this “real leisure time” [12,13]. Essential, however, is that such activities are experienced as fun and stimulating, and as something free from duties.

We will investigate how people tend to perceive the pellet stove (and burner), and the tasks connected to it. Many studies show a very positive conceptual link between the open fire, the summer cottage, and the old red farm houses in the countryside [14–18,31]. However, we still do not know whether this connection makes people perceive the handling of a pellet–solar heating system as leisure time or duty. Several authors mean that values that are associated with the summer cottage and the little red wooden house only work because of their contrast to the permanent home or life in town [17,19,31]. Thus, for many people it seems to be the very oscillation between two kinds of living and life styles that is of importance [16–18].

6.2. *Examples from interviews (proceeding analysis)*

Generally the men and women in three houses, one with a pellet stove and two with pellet burners, do not clear out the ashes every week. They do, however, seem pleased when they describe the tasks of handling pellets and ashes:

In one of these households, the man says that the burner should be cleaned once a week, but that he has some difficulties with living up to that. A couple of weeks run so fast, he says, but he does clean the burner maybe once or twice a month. His wife describes how she shuffles the pellets with a spade when they have sunk to a certain level: “But it is not much. No, a few shuffles only”.

In the other household, the ashes are taken out of the pellet burner every fortnight. Husband and wife do that together as “the door needs to be fitted back, and it is good if someone is there to steer a little”. Usually the woman is the one who sends a fax for someone to come and fill up pellets. They are both of the opinion that turf briquettes, which they had for a while, took a lot more work and were more difficult to handle. Compared to electricity, they see the handling of pellets as

“a little more job, but you are sort of paid for it. Compared to electricity, the hourly wage is really good. So this is nothing you hesitate to do”. This couple is not so interested in getting a pellet stove. They already have an open fireplace, which they think is enough. Besides; “it would be so dusty and untidy if you would have to fill it up in the room”.

The third household, that has a pellet stove, uses a vacuum cleaner to clear out the ashes. They believe it is very practical to keep an old vacuum cleaner by the stove (except at Christmas, when they want the room “extra nice”): “I vacuum clean that which is inside the door”, the man tells us. “But when it is very little, I don’t bother about that. I usually vacuum clean the bottom if I am sure that the fire has gone out properly. At one time I did this too early, so it started to smoke from the vacuum cleaner”. In this household, there are no routines for which days the stove is to be cleaned. They say that usually some days go by between the cleanings. Small bags of pellets are kept on the veranda, as they do not want to walk too far to fetch a new bag. Compared to the kitchen wood stove, the pellet stove is easier to handle, they say: “It is easier to go and fetch a bag of pellets than to fetch wood. And it burns for 15 or 16 h before you have to fill it again, while the kitchen wood stove you have to feed every 30 min”.

In these interviews both men and women are in various ways involved in the handling of pellets and ashes. Studies of male and female roles and tasks in Scandinavian households show that the most gender neutral tasks are those that do not have to be done on a daily basis, but could be done more seldom, such as gardening or thorough house-cleaning [12]. Pellet purchase and stove cleaning might fit in here, as the interviews also give a hint about. Chopping wood and lighting a fire are household tasks mainly perceived as male tasks in the Scandinavian culture area. According to a study of, so called, ecological households, fetching firewood and lighting a fire in a boiler or stove in order to heat the whole house seemed to be a predominantly male task. However, this was not the case when the task was to light a fire in the kitchen wood stove [20].

7. Discussion

7.1. Research results put into practice

An important aim of the next PESTO research period (starting in 2003) is to work out some specific practical recommendations on technical appliances and conversion practices for inhabitants of electrically heated single-family houses. The suggested pellet-solar heating systems should not only be technically satisfactory. They should also be able to work in ways that agree with the habits and notions of household members. Before the recommendations are finally formed, the conversions of five test houses will be followed closely by engineers and anthropologists. Thorough evaluations of these test conversions will be made.

During a first phase of this test conversion sub-project, the task is to concretize research results from preceding research, to translate descriptions of common Scandinavian household habits and interview results to specific components of pellet-solar heating systems. The task is to specify advantages and disadvantages with different combinations of solar heating, pellet burners and pellet stoves for particular houses and household habits. When this is achieved, a smorgasbord of possible heating system solutions will be presented to the five test conversion households. The following are only examples of what is included in these tasks:

First example: Literature studies tell us that bedrooms (particularly parent bedrooms) are the most private parts of Scandinavian homes, and that, consequently, bedroom doors are often kept closed. Computer simulations, on the other hand, show the need of an open door for the heat distribution in the house. This contradiction needs to be discussed with household members.

Second example: From literature studies, we know that the idea of “the home” is growing heavily in importance in the Scandinavian area, and that many people spend an increasing amount of time and money on furniture and other decorations of the home. We also know that the fireplace has a special place in the heart of many people. We know that the living room is a place where the family socializes with friends, and also that it for that reason is a place to keep clean.

These facts, put together, seem to point towards an aesthetic looking, quiet (and expensive?) pellet stove that does not produce a lot of dust and dirt. Are there technical solutions to these requirements?

Third example: Preliminary lab tests show a clear relation between the contents of the smoke emission and the frequency with which the ashes accumulated in the pellet burner are cleared. At the same time, preliminary interview results seem to show that people often wait more than a week before taking the ashes out. The question here is whether to search for a technical or a social/cultural solution.

7.2. Household habits before final design

Many technically good products have failed in their market introduction due to lack of knowledge about the habits of the target population, and due to lack of understanding of in what sense the everyday lives of these particular people would change if they were to buy this product.

Recent studies among social anthropologists and architects, who study the relation between buildings and dwellers, support the assumption that knowledge of household habits and modes of thought need to be accumulated before attempts are made to change these [21–24]. The approach of the PESTO project, including the mentioned assumption as well as the emphasis on process and family negotiations, cultural context, everyday life and broader constructions of meaning, are also well in line with recent discussions among social scientists within the fields of energy [25–29].

The aim of the anthropological research presented here is not the reduction of energy consumption in the first place, as with many “life style analyses”. Rather, the aim is to increase knowledge of factors that affect human consumption of certain specific technical products, as well as to better understand how these products should be designed in order to suit people.

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