

ZEW
Zentrum für Europäische
Wirtschaftsforschung GmbH
Centre for European
Economic Research

 **Fraunhofer**
Institut
System- und
Innovationsforschung

 **Öko-Institut e.V.**
Institut für angewandte Ökologie
Institute for Applied Ecology

 **DIW** Berlin

 **Universität St. Gallen**

Intertwined practices of gender and technology: the case of sustainable home heating

**Working Paper No. 11 within the project:
Soziale, ökologische und ökonomische
Dimensionen eines nachhaltigen Energiekonsums in Wohngebäuden
Funded under the BMBF Programme „Vom Wissen zum Handeln - Neue Wege zum nachhaltigen Konsum“**

**Authors:
Ursula Offenberger (Uni St Gallen)
Julia Nentwich (Uni St. Gallen)**

**St. Gallen
September 2010**

Intertwined practices of gender and technology: the case of sustainable home heating

Structure of the paper:

1. Introduction: Gender scripts of home heating.....	1
2. Institutional reflexivity: Gender and technology as institution and practice	4
3. Interview sample and method of analysis.....	7
4. Results: gendering processes of heat energy consumption	9
Doing technical competence: Re-establishing the binary between technology and aesthetics	9
Interacting with experts and making firewood.....	10
Paradoxes of gender-technology relations	11
5. Discussion.....	15
6. Works cited	17

1. Introduction: Gender scripts of home heating

Since the decades after World War II, central heating has developed as the standard of domestic heat energy supply in Germany: In 2008, 77 % of all private households used central heating or self-contained central heating (Statistisches Bundesamt 2009). Among others, this development resulted in two consequences: First, heating units disappeared from the living area into furnace or mechanical rooms. Second, with regards to oil and gas being the standard heat energy sources in Germany¹, the daily practices of home heating have become highly automated. As a matter of fact, the daily practices of heating a home have turned into processes. The everyday routines formerly involved in home heating were reduced to a minimum and nowadays only consist in turning up or down the thermostatic valve of radiators, setting up the electronic control of the heating unit (if not done by experts) and (if at all) having fuel tanks filled once a year. Thus, both the physical and the bodily resources needed to turn a house into a comfortable and enjoyable warm home have become invisible and negligible in users' everyday practices of energy consumption. Similar to other standard features of modern living, home heating has become a matter of comfort, cleanliness and convenience (Shove 2003) as well as technical rationality and control.

Besides these modern (i.e., centralized and automated) forms of home heating, more traditional forms have not disappeared and rather coexist with the modern forms. However, single room heating units placed in the living area have changed from being the standard form of heating in the early days to serving as an additional source of warmth. Additional stoves have developed into popular objects used in the living area of houses. Associated with nostalgia and traditional forms of heating and allowing for multi-sensual experiences of fire (smell, noise, light and warmth), these objects embody emotional aspects of heat energy consumption. Furthermore, single room stoves usually are fuelled manually so that the process of heating is attached to significant bodily practices. Heating with single room heating units is therefore associated with home decoration and emotional aspects like well-being and care for the self and others.

Over the last decades, the development and diffusion of both energy-efficient and renewable energy technologies have assumed greater importance. Technology based on the use of renewable energy, such as solar or geothermal energy as well as biomass, is considered sustainable technology and has become important both politically and economically. In national policy measures aiming at sustainable development, the diffusion of technologies considered sustainable plays a crucial role in order to reduce greenhouse gas emissions and securing energy supply (Nitsch 2008; Scheffknecht, Schuster and Struschka 2010; Schmidt and Jinchang 2010). At the same time, renewable energy has become a major area of economic growth in Germany in the last decades, providing new job opportunities and em-

¹ 86 % of German households used oil or gas as fuel in 2008, see Statistisches Bundesamt 2009.

bodying a prestigious area of research and development (Umweltbundesamt 2007; Röhr and Ruggieri 2008; Agentur für erneuerbare Energien 2010). However, despite these fundamental changes in heat energy sources, the standards of technical control and automation have remained the same.

As with regards to modern and more traditional forms of home heating, our analysis of marketing material of renewable heat technologies (Offenberger and Nentwich 2009) shows that these different types of heat energy supply for private households can be interpreted as embodying different gender scripts (cf. Akrich 1992; Berg and Lie 1995; Oudshoorn and Pinch 2003; van Oost 2003). Depending on the location of the heating unit within the home, symbolic gender binaries (Douglas 1986; Faulkner 2000a; Fausto-Sterling 2000) are inscribed into the technological objects. Home heating is either configured as “facility management” or as “home making”. Home heating as facility management is reduced to rather technology related objects such as boilers and associated with symbolically masculine values like technical rationality, control, and abstract understanding of heat energy. Home heating as “home making” is related to the use of stoves and associated with symbolically feminine values of aesthetics, care and well-being as well as emotional, concrete and holistic experience of heat energy. Furthermore, the gendered spatial order of family homes (Wajcman 1991: 106f) differentiating between symbolically feminine areas of living and symbolically masculine areas of technical supply infrastructure is reproduced and mirrored in differences in design, highlighting the technical or aesthetical aspects of the heating technology respectively. As with regards to current standards, facility management is the dominant form of heat energy consumption in Germany, and thus a hierarchical relation is established positioning home heating with single stoves as only secondary.

Hence, what we find with regard to home heating are gender scripts evolving in a complex interplay of spatial ordering, the historic development of technological standards, the premises of object design, and a gendered division of labour. However, it remains an open question how the described gender scripts influence relations between people (for instance users) and technologies. Neither technologies nor users are determined entities, and the use of technologies opens up for interpretative flexibility (Bijker, Hughes and Pinch 1987). At the same time, gender scripts of technologies “*invite or inhibit specific performances of gender identities and relations*” (Oudshoorn and Pinch 2003: 10) thereby delimiting the interpretative flexibility of technologies.

This paper investigates ways in which user-technology relations turn into scenes for the performance of masculinities and femininities. Knowing how the technological artefacts at stake are gendered is an important interpretation matrix in order to analyze how this gendering can “*rub off*” (Cockburn 1985: 169) to possible users, and how technologies can turn into resources for the performances and practices of gendered identities. The paper is structured as follows: In the next section, we deploy the theoretical framework and conceptualize our approach to gender as a social practice. We draw on Goffman’s notion of “institutional reflexivity” which very well captures the tension between (materialized) institutions and social practices. In the following methods section we describe the interview sam-

ple used for our analysis of gendering processes in user-technology interactions. We then present our results. Concluding, we critically discuss the relevance of our findings for understandings of sustainable energy consumption.

2. Institutional reflexivity: Gender and technology as institution and practice

Gender has been theorized as both a social practice and an institution (Martin 2004). West and Zimmerman (1987) and many other scholars have suggested to theorize gender as a *doing* instead of a *being*. Ethnomethodologists (Kessler and McKenna 1978) and interactionists (Goffman 1967) have approached gender as an *ongoing accomplishment* (Garfinkel 1967), achieved in interactions. However, gender scholars have also highlighted the importance of social institutions for everyday practices (Martin 2004). Everyday life practices are controlled by routines, conventions, norms, and also materialized objectifications such as the gendered body and other artefacts. It is "*the practices and interactions of 'real' people with bodies that talk and act (which) constitute social institutions, gender included.*" (Martin 2004: 1251). Gender as an institution can be inscribed into artefacts and mobilized in multiple settings. Focusing on gender as an institution emphasizes history and the development of conventions over a rather long time span, while gender as a social practice emphasizes the fluidity and flexibility of everyday practices. Only recently, Martin (2004) emphasized the tension of gender as stable (institution) and fluid (practice). Drawing on Giddens she points out that the binary is a false one: gender as an institution is constantly stabilized, resisted and transformed through practice. Although institutions develop over a long time span, change is incremental to them.

This tension between gender as an institution and as a practice is very well captured by Goffman's notion of *institutional reflexivity* (Goffman 1977). It is depicting the "... *deep-seated institutional practices (which) have the effect of transforming social situations into scenes for the performance of genderisms by both sexes...*" (Goffman 1977: 325). Goffman gives the example of sex segregated public rest rooms being "*presented as a natural consequence of the differences between the sex-classes, when in fact it is rather a means of honouring, if not producing, this difference*" (Goffman 1977: 316). The embodiment of gender in material artefacts, here the arrangement of public rest rooms, codifies gender as an institution. Hence, practicing gender through inscribing it into the materiality of public toilets, public spaces, private homes, technology, etc. supports the perception of gender as natural, unhistorical, stable and not for change. And - and this is where the reflexivity comes in - it provides the powerful resource of gender as a symbolic representation painting everything in either pink or blue.

When a technological artefact is designed, assumptions of future users and their gender are inscribed into the design of the object. This inscription will be de-inscribed later when for instance users are making sense of the object by using it

(Akrich 1992). The concept of gender scripts captures both the practices of inscribing and of deinscribing "*representations of masculinities and femininities in technological artifacts. Technologies are represented as objects of identity projects – objects that may stabilize or de-stabilize hegemonic representations of gender.*" (Oudshoorn and Pinch 2003: 10). In her illuminating study on shavers, Ellen van Oost (2003) for instance showed how Philip's design culture contributes to the stabilization of hegemonic representations of gender. The 'Philishave' device, intended for men, is characterized by its technical features, while the 'Lady-shave' design renders shaving an aspect of cosmetics. The premise for the design philosophy is that women dislike the association with technology, in contrast to men. Thus, femininity is inscribed into the design of the shaver thereby constructing technological disinterest or incompetence as feminine. Both femininity as technophobe and the shaver as a technological artefact are constructed at the same time.

However, research on doing gender has also been criticized as essentializing gender and taking the binary gender order for granted (Fournier and Smith 2006; Nentwich and Kelan 2007). Assuming gender as a binary construction, this binary is reified by the research itself. Both scholars in the fields of gender and organization (Gherardi 1995; Martin 2003; Martin 2004; Bruni, Gherardi and Poggio 2005; Martin 2006; Gherardi and Poggio 2007) and gender and technology (Faulkner 2000a; Lohan 2000; Faulkner 2001; Wajcman 2002; Lohan and Faulkner 2004; Mellström 2004) therefore developed the concept of doing gender further. Although gender is "*conceptualized as social and cultural constructions, shaped by historical circumstances and socio-political processes, and functioning as regulatory mechanisms or norms of discourse*" (Henwood, Parkhill and Pidgeon 2008: 664, citing Wetherell and Potter 1988), and therefore qualifies as an institution, these institutionalized norms are not as clear-cut in everyday practices as the earlier research cited would suggest (Faulkner 2000a; Faulkner 2000b). Also social psychological research focusing on the practices of enacting institutionalized norms shows very clearly that the doing of gender is much more complex and contradicting than the symbolic gender order of hierarchical binaries (Potter and Wetherell 1987; Wetherell and Potter 1988; Gill 1993; Gill 1996; Edley and Wetherell 1999; Gill 2000; Edley and Wetherell 2001). What counts as masculine or feminine is shifting with the respective contexts (Johansson 1998; Lohan 2000; Kelan 2008).

In research on gender and technology, Faulkner (2000a) realized that while the traditional stereotype of engineering and technology as 'masculine culture' (see also Wajcman 1991; Faulkner 2000a) is true on a symbolic level, this is not always the case in practice. Everyday life practices are more complex (cf. Henwood, Parkhill et al. 2008: 669). Drawing on the concept of hegemonic masculinity, Faulkner is highlighting the relevance of different masculinities in the field of engineering and technology. What has been depicted as 'masculine culture' seems to be a white, heterosexual, 'successful' in terms of the capitalist marketplace form of masculinity. In concluding from her research, Faulkner suggests a double perspective focusing on both possible binary constructions on the symbolic level and on

multiple forms of masculinity and femininity when investigating the social practices. In her research on engineering, she identified a number of "highly gendered dichotomies" on the symbolic level; such as a) an orientation in the world as "people focused" vs. "machine focused", b) hard vs. soft and c) objectivist rationality, emotional detachment and abstract theory vs. subjective rationality, emotional connectedness and concrete and holistic approaches. Faulkner states that the popular images of science and technology are closely associated with the masculine sides of these polarities, and that both sides of the binary are in a hierarchical relationship. However, in her ethnographic work on engineering practices, Faulkner could not observe gender differences in job performances by female and male engineers. This observation leads her to the conclusion that "*real women and men do not fit dichotomous assumptions any more readily than do real engineers or real engineering practice*" (Faulkner 2000a: 786). Rather, the binary stereotypes became relevant as a resource of sense-making, for instance when engineers told stories about their jobs and interpreted their actions.

Theorizing gender as institution *and* practice in the sense of Goffman's institutional reflexivity, research on doing gender has to become more context-sensitive and reflexive to its own concepts. Empirical studies have to acknowledge the tension between stability and fluidity, between persistence and change. While gender can be done in repetitive ways, always supporting the same dualisms, it can also be troubled, undone or done differently (Butler 2004; Deutsch 2007). The research focus has shifted 1) from a single perspective on doing gender to a double perspective of doing and undoing, 2) from gender as a binary construction to multiple femininities and masculinities (cf. Collinson and Hearn 1994; Lorber 1996) and from 3) a fixed meaning to gender as shifting and fluid (Nentwich and Kelan 2007). These three prepositions have several consequences for empirical research projects not essentializing gender and reifying a binary. In our analysis we will therefore try to develop some answers to Linstead and Brewis' (2004: 360) question: "... *how can we write about gender and acknowledge the importance of gender, without reproducing the problematic aspects of the gender binary?*"

3. Interview sample and method of analysis

In order to explore the gendered practices of user-technology relations in the context of domestic heat energy consumption, semi-structured interviews in eight households were conducted by the first author. Interviewees were sampled according to 1) the amount of personal involvement in terms of everyday practices involved in heat generation, 2) the heat energy technology applied and 3) the timing of the acquisition decision respectively.

As the relevant technology should be facilitated by the interview partners themselves, we focused on private house owners. Thus, all interviewees lived in privately owned homes (houses or flats in joint building ventures). Since the majority within this population consists of heterosexual couples and family households, interviews were conducted with heterosexual couples with and without children and aged between 30 and 60 years. While some of the interviewed couples lived in rural areas, others lived in medium-sized towns of ca. 60-80,000 inhabitants.

We were mainly interested in the acquisition decisions involved in domestic heating technologies based on renewable energy sources as this was the main research focus of the larger research initiative. We mainly tackled solid biofuels (such as wood or wood pellets), solar thermal and geothermal energy. The heating systems installed in the interviewees' homes consisted of either one or a combination of these energy sources, in single cases other resources like oil or air-source heat pumps also being part of the solutions. In two cases, stoves placed in the living area were part of the heating system, connected to the warm water central heating via a thermal storing unit.

As the research question focused on the details of the decision process, it seemed important to us that the acquisition decision was rather fresh and did not date back more than one year. However, even then the data collection heavily relies on an ex-post sensemaking procedure that interviewees undergo during the interview process. We therefore mainly focused on narratives about the couples' everyday routines and the work division practiced in relation to the technology as well as the values and assumptions accordingly. By choosing households with a relatively new heating system, we could also learn more about the interface between consumption and market distribution of technologies, and how households interact with experts like marketing and sales people or craftsmen.

Although interviews have only limited value when it comes to the material and bodily aspects of everyday routines and interactions between people or between people and artefacts, we consider them a useful source of analysis for several reasons: first, observing everyday practices of technology use (and acquisition) poses practical research problems since these processes are distributed between different

actors, places and moments, and they take place within the private sphere.² The second reason why we consider interviews a valuable data source is that interviewing couples turned the interviews into a social situation where the relation between the partners was enacted and performed (Behnke and Meuser 2004). Thus, interaction dynamics like responding behaviour, for instance, who answers (first) on a question posed, or how the partners react towards each other and the topic, became an additional source of analysis.

The interviews lasted about an hour and were conducted in the interviewees' homes except for two cases where the interviewer came to the office of the interviewees. All interviews opened with a question asking for the interviewees' associations with heating and heating technologies before further inquiring the interviewees' experiences and the everyday routines involved in using the new home heating technology. During the course of the interview they also had to recall the acquisition process and describe counseling or selling interactions with craftsmen and other experts.

Analyzing the data, we followed the general suggestions of a grounded theory research process (Strauss and Corbin 1990): the material was coded and theoretical concepts were assigned to interview passages. Analytical memos were written mainly applying the constant comparative method (Strauss and Corbin 1990). From the beginning and in particular with regard to "the gender-technology relation" (Grint and Gill 1995) we allowed theoretical sensitivity (Strauss and Corbin 1990) to become a source of inspiration in the further development of theoretical concepts from the data.

² In search of public places where technologies meet their future users, we have been doing participatory observation on trade fairs where home heating technologies are exhibited. However, technologies are usually not sold during those events, and interactions between future users and experts (craftsmen or salespeople) mainly serve to non-committal information gathering and to build first contacts. Participatory observation of buying resp. selling interactions between future users and experts is part of our future research plan.

4. Results: gendering processes of heat energy consumption

Analyzing the interviews we were primarily interested in the intertwined practices of doing gender and technology. Our results show several aspects closely related to the production and reproduction of the gender order in the context of home heating technology. While the first examples show how the gender binary is being reproduced in a very traditional sense, we will later also discuss the striking examples that do not fit this frame and therefore have to be discussed as examples of fluidity, flexibility and paradox (Nentwich and Kelan, 2007).

Doing technical competence: Re-establishing the binary between technology and aesthetics

As pointed out earlier, the gender script of home heating as “facility management” analyzed in our previous analysis of observational data and marketing booklets (Offenberger and Nentwich 2009) leads to a dominant perception of heat energy consumption centered around symbolic masculinity. Topics such as technical infrastructure, abstract and functional understandings of heat as well as technical expertise are highlighted here. Similarly in the interviews, interviewees attach considerable importance to interest in and knowledge of technology in order to being able to find “the right” decision. Also, in most cases interviewees consider the male partners as more competent with regards to the topic. As a matter of fact, also the main responsibility for information gathering and going into details of decision-making as well as looking after the heating unit in everyday life is usually ascribed to men. This clear attribution of competence to men is also mirrored by the fact that the majority of the male interview partners talk more about the heating system and use technical vocabulary more often than the female interviewees. Some of the men also heavily engage in explaining the technical functioning of the system, even if they were not asked to do so. In some cases, female interviewees even create a stage for their partners’ performances of technical competence, for instance by asking them specific questions. Both partners cooperate here in constructing the male partner as the technical expert while positioning the female partner as not interested or lacking this competence. Hence, technical competence as masculine and in a binary opposition to femininity is constructed here.

In a similar vein, couples seem to organize their internal division of labour within the realms of the technical-aesthetical binary. While the central heating unit

is clearly associated with "technology", the design of the stove in the living area or the choice of colours and the design of the kitchen furniture qualifies as "aesthetics" throughout the interviews. In several interviews, both partners agree on the aesthetic domain being assigned to women, which also corresponds with the feminine gender script of heating as "home making". Hence, on a discursive level, interviewees reinscribe the dominant meanings inscribed into the different artefacts thereby stabilizing their own gender identities as two different parts of a heterosexual couple.

However, interaction dynamics between heterosexual couples are not the only form relevant for doing gender in the context of domestic heat energy consumption. In the following, two examples from our data analysis are presented where interactions between different male actors and technologies are used for male bonding and for the performance of masculinities.

Interacting with experts and making firewood

Consumption of and supply with heat energy in modern private households are embedded in technological systems constituted by such different factors as resources, material artefacts, and knowledge. Professional experts have become key actors here, developing, selling, installing, setting up and repairing heat energy technologies. Hence, professional experts, such as engineers, craftsmen or energy consultants, are also deeply involved in both defining and developing the transitions towards more sustainable ways of heat energy supply and consumption which were described in the introduction to this paper. These professions are with no exception male-dominated in terms of numbers. As a consequence, private households acquiring a new home heating technology will most probably come in contact with a male person acting as an expert (for instance, a salesperson, a craftsman or an engineer). Not only does this re-establish the powerful equation of masculinity and technology (Wajcman 1991; Lie 1995; Oldenziel 1999; Faulkner 2001; Mellström 2004). This equation can also turn formal interaction situations between experts and heterosexual couples (which make up for the majority of owner-occupier households in Germany) into informal scenes of male bonding where the common object of interest – technology – allows both experts and male partners to interactively reassure their masculinity. The homosocial relationship established in these moments results in the exclusion of interaction members perceived as different, for instance women: "*Within these informal relationships men are often concerned to identify with other men within the ,in-group', while simultaneously differentiating themselves from other groups of men and from women*" (Collinson and Hearn 1994: 14). Hence, female distance towards technology can be a consequence of those mechanisms of male in-group building and exclusion being practiced here.

Another example of male bonding in our data relates to the use of firewood as fuel for stoves or boilers. Cutting down and chopping firewood provides men with the opportunity to enact hegemonic forms of masculinity related to traditional

male homosociality, heroism, physical power, and specialized skill. Two of the male interviewees described cutting down and chopping wood as a challenge, requiring both special tools like protective clothing, trailers or motor saws and special skills for handling these tools. These skills are said to be passed on from fathers to sons who gather in the forest, forming homosocial groups in which the use of physical power becomes central. Being a traditionally masculine domain, the interview partners view the lack of women during these rituals as self-evident and legitimate.

However, practices surrounding the making and the use of firewood not only become scenes for the performance of masculinity. It is when wood enters the home and is turned into a resource of heat energy that women enter the scene again. For instance, one couple with two children describes the firing of their tile stove as “feeding the stove”, a task which all of the family members like to do. In this case, the stove serves as an object around which family life is centred on cold winter days. Furthermore, both partners seem to have put considerable effort in choosing the perfect stove design allowing the couple to demonstrate their individuality through specific choices of style. Hence, the stove as an object, its acquisition and everyday use are all contributing in several ways to the formation of the family’s identity and their concerted activities of home-making.

The interaction dynamics focused on so far all contribute to the reproduction of the binary assumptions on men and women as being in control of technology and technologically interested on the one hand and as being technologically incompetent and interested in aesthetics on the other. Furthermore, the powerful equation of masculinity and technology is stabilized in situations of male bonding where both the use of machines and the demonstration of technical expert knowledge gain central status. The interviewees’ narratives reproduce the gender scripts of “female home-making” and “masculine facility management” in a distinctive classic and untroubled way. The heterosexual couple, which Goffman (1977: 313) denotes as a prominent example of institutional reflexivity, thereby serves as a central motor in producing these differences between users and their relations with technology.

Paradoxes of gender-technology relations

However, with regards to the fluidity of practicing gender our analysis also revealed several paradoxes. They result from contradictions in relation to the binary relationship between technology and masculinity and femininity and aesthetics respectively described above.

There are several examples in our material where the distinction between "technology" and "aesthetics" did not hold as they rather seem to be intertwined, such as in the following example: One of the interviewees explains why LED lights despite their energy-saving qualities have not been used in the staircase of his home. Pointing out their insufficient lighting power resulting in a too dimly illuminated staircase, he draws on both technological and aesthetic aspects and also

shows concern and interest in both. However, he nevertheless emphasizes the LED lights as an example of his technical interest, thereby downplaying and dissociating the obvious aspects of aesthetics provided.

Mann: ... Bei so Sachen wie den technischen Dingen, da war es dann so, dass ich mich halt sozusagen ein bisschen informiert habe und dadurch eher argumentiert habe oder so.

Interviewerin: Haben Sie da noch Beispiele?

Mann: Ja gut, äh was war es, gut die Heizung allgemein. Die Sache mit der Solarvorbereitungsanlage, dass wir so was machen in diesem Falle dann, dann im Prinzip (.) ja im Treppenhaus haben wir so Lichter. Es ging um die Thematik LED-Lichter, weil LED

sozusagen eine Thematik ist, wo man sagt man spart eigentlich Energie, aber das war bis

jetzt eigentlich noch nicht umsetzen, weil die Farbe von der LED, das heisst die Leuchtkraft

ist noch nicht ausreichend, dass das Treppenhaus nur mit LED/ das wäre ein bisschen

pfunzelig geworden.

Male interviewee: ... With regards to the technical stuff, well, it was rather me who got the information and was hence more likely to get into the discussion.

Interviewer: Could you give an example?

Male interviewee: Well, yes, eeh, what is there, well, the heating in general. Then the case of preparing the installation of solar panels, and then also, well, we have those lights in our staircase. It was about LED lights, because LED is so to say a topic where people say that one can save energy, but, it was impossible to yet realize that, because the colour of the LED, I mean the lighting power does is not yet sufficient, to light a staircase only with LED, this would have resulted in a bit of a miserable light.

The distinction between technology and aesthetics seems to rather result from an association with masculinity and femininity and not the other way round. Hence, the binary is made relevant here although the empirical example would allow for different interpretations. Another example provided in the material shows that what is associated with femininity cannot be interpreted as technological at the same time: Recalling the acquisition process of the new kitchen, the couple emphasizes the relevance of the binary between technology and aesthetics as the organizing principle for their internal work division: What falls under technology is part of his duties, while aesthetics is assigned as her field. However, when asked about the decision-making process for buying the new kitchen, the male interviewee did not show any interest in the technical appliances, while the female interview partner emphasized a great interest in energy-saving appliances. The

kitchen as the area where housework labelled as female is done seems to hide the technological aspects of its infrastructure.

Interviewerin: Aber dann war es ja da genau umgekehrt, weil Sie gesagt haben für das Technische wären Sie zuständig und für Farben Sie, [aber in dem Fall war es aber gerade anders rum. In der Küche gibt es auch viel technisches.]

Mann: [Das ist richtig. Aber da ist mein Interesse nicht ganz so tief gewesen.]

Frau: [Ja also da habe ich] da habe ich, also bei den Sachen habe ich geguckt, dass die

Energie sparen muss, das war für mich das A und O.

Mann: Ne stimmt. Also da muss man eine Ausnahme machen. Also da war es wirklich fast klassisch.

Frau: Ja da hast du nach der Farbe geguckt, und ich habe die Anordnung der elektrischen

Geräte entschieden. Das stimmt.

Interviewer: But then [with regards to the kitchen] it was exactly the other way round, because you said that the technical stuff would be your [husband] responsibility and colours would be yours [wife], [but in this case it was the other way round. There is a lot of technology in a kitchen.]

Male interviewee: [That's right. But my interest has not been that deep here]

Female interviewee: [Yes, here I did] here I did, well in these cases I focused on the energy saving properties, this was the most important thing for me.

Male interviewee: No, right. Well, you have to make an exception in this case. In this case, it was really almost classical.

Female interviewee: Yes, you have been looking for the colours and I took decisions about the placement of the electric appliances. That's right.

The example shows very well that the symbolic associations of masculinity and technology referred to earlier do not always correspond to the practices of “real women and men” (Faulkner 2000a). However, this does not challenge the binary but rather hides the competent use of technology practiced by women. This is also made clear by the following example of a couple with a wood-fuelled boiler: when they were asked about whom of them would be more knowledgeable about the daily practices of serving the boiler (e.g., know the exact amount of wood needed at what time in order to reach the desired temperature), the male interview partner introduced his wife as what can be framed as the “everyday expert” of the heating system. However, reacting on her husband's positioning attempt, the woman first rejects this labelling, but slowly and hesitantly agrees on viewing her own everyday practices as skill and technical competence.

Interviewerin: Und wer kennt sich da jetzt alles aus damit, wie voll man machen muss, und wann, und so, und worauf man achten muss?

Mann: Also da ist jetzt meine Frau drin bewandert.

Interviewerin: Ok.

Frau: So bewandert [HÖRBARES AUSATMEN]

Mann: Ah doch, schon eher.

Frau: Ja eher, klar.

Mann: Du bist ja schon/ du kannst dann schon sagen, wenn du jetzt am, am

Brauchwasserkessel guckst: „es hat 40 Grad“, dann kannst du genau sagen: „da langt jetzt eine halbe Füllung“, oder „man muss ganz voll machen, um die Grade zu erreichen“.

Frau: Genau.

Interviewer: And who are the ones knowing what to do and when and where to focus on?

Male Interviewee: Well, that is actually my wife, she is experienced in that.

Interviewer: Ok.

Female Interviewee: Well, experienced [BREATHES OUT LOUDLY]

Male Interviewee: Ahh, yes, yet rather.

Female Interviewee: Yes rather, sure.

Male Interviewee: You are, you can obviously say, if you have a look at the water boiler: “it is 40 degrees” then you can exactly tell: “half a filling will be enough” or “a full filling will be necessary to reach those grades”.

Female Interviewee: Exactly.

The three examples all point to inconsistencies and logical paradoxes of an all too simple distinction between what counts as a technological or an aesthetic object or as technological competence or incompetence. Hence, we can ask if the discursive construction of gender differences which is enabled through these binary distinctions serves another purpose than “just telling the truth” about male and female use of home heating technologies and other energy-consuming domestic appliances. It rather seems as if the interviewees’ emphasis on gender differences in user-technology relations predominantly serves to stabilize the norm of the heterosexual couple as being composed by two different and unequal subjects (Rubin 1975 talks about a “sameness taboo” between women and men). Referring to and interacting with technology seem to form a well-suited stage for this discursive production of difference as symbolic binaries are inscribed into technologies in a way that prioritizes certain kinds of de-inscription. Hence, technologies appear as “*objects of identity projects - objects that may stabilize or de-stabilize hegemonic representations of gender*” (Oudshoorn and Pinch 2003: 10).

5. Discussion

The socio-technical field of home heating technologies considered sustainable is not gender neutral. Investigating user-technology relations in the context of domestic heat energy consumption, we found the production and reproduction of gender relations as being central for an understanding of interaction dynamics. Home heating with renewable energy today is mostly enabled by technologies with masculine gender scripts of “facility management” highlighting technical control, expertise and abstract understandings of heat energy. The empirical analysis shows that this facilitates the doing of masculinity as notions of technical competence are gendered masculine during the construction of user-technology relations. Furthermore, the male domination in the professional fields of expert knowledge enables male bonding, again contributing to the stabilization and reproduction of the analogy between masculinity and technology. Both aspects contribute to the construction of gender differences with regard to the competent use of home heating technologies. The gender inscribed into the respective material artefacts is thus turned into a powerful resource for reproducing binary and heterosexual gender relations.

However, the different gendering of domestic activities, spaces, material artefacts, and symbolic associations also leads to the perception of possibly identical behaviours of men and women as different (cf. Martin 2001). As our empirical examples have shown, contradictions in what is perceived as properly gendered behaviour are hidden and similarities between the daily practices of women and men are reinterpreted as differences. These paradoxes and contradictions with regard to the symbolic gender order referred to on a discursive level reveal the interactive construction work needed for conserving the stability of the gender binary as well as the stability of the equation between masculinity and technology. At the same time, the paradoxes show how gender as a practice is fluid and shifting, and how it is made stable by referring to institutionalized forms of gender, such as technologies.

From this perspective, home heating technologies are understood as examples of institutional reflexivity (Goffman 1977): The interplay between different dimensions and factors, such as artefacts, spatial and symbolic structures, and modes of gendered work division creates an arrangement providing both material and symbolic resources for actors to produce and reproduce gender difference. At the same time, dominant understandings of heat energy and of energy consumption evolve which also influence what is considered as “sustainable energy consumption”.

“Sustainable energy consumption” is usually associated with energy efficiency as well as the use of renewable energy sources. Hence, technology and innovation play a crucial role for those understandings of sustainability. Both problem framing and problem solution are thereby turned into issues of traditional male-dominated areas of technical professionals, while other possible aspects of sustainability, such as social or behavioural aspects, are marginalized and downplayed. In her article highlighting the importance of feminist social research on climate change, Sherilyn MacGregor (2010: 133) points to the ambivalences of such an understanding of ecological modernization:

“While many green techno-scientific innovations will no doubt be important for a sustainable future, it is also true that ecological modernization amounts to more searching for the new rather than improving the old; more omnipotence rather than humble reflection on the benefits and the costs of male-dominated scientific ingenuity to date. It is arguably masculine risk-taking and the quest for progress that got us into our ecological mess.”

This article has shown ways in which home heating with renewable energy is turned into a scene for the performance of masculinities by reproducing and constructing the equation of masculinity and technology. This powerful equation forms an ideology which also delimits dominant understandings of sustainable energy consumption and at the same time narrows the horizon of problem solution. Our analysis suggests that further research should focus in greater detail on the intersections of masculinity and sustainability as technological fixes.

6. Works cited

- Agentur für erneuerbare Energien. (2010). "Fakten. Die wichtigsten Daten zu den Erneuerbaren Energien." from http://www.unendlich-viel-energie.de/uploads/media/TalkingCards2008_02_2010.pdf.
- Akrich, M. (1992). The De-Description of Technical Objects. *Shaping Technology/Building Society*. W. E. Bijker and J. Law. Cambridge/MA, MIT Press: 205-224.
- Behnke, C. and M. Meuser (2004). "Immer nur alles am Laufen haben". Arrangements von Doppelkarrierepaaren zwischen Beruf und Familie. Arbeitsbericht des Projekts "Doppelkarrierepaare". Dortmund.
- Berg, A.-J. and M. Lie (1995). "Feminism and Constructivism: Do Artifacts Have Gender?" *Science, Technology, & Human Values* **20**(3): 332-351.
- Bijker, W. E., T. P. Hughes, et al., Eds. (1987). *The Social Construction of Technological Systems. New Directions in the Sociology and History of Technology*. Cambridge, MA/London.
- Bruni, A., S. Gherardi, et al. (2005). *Gender and entrepreneurship: an ethnographic approach*. London, Routledge.
- Butler, J. (2004). *Undoing gender*. New York, Routledge.
- Collinson, D. and J. Hearn (1994). "Naming Men as Men: Implications for Work, Organization and Management." *Gender, Work and Organization* **1**: 2-22.
- Deutsch, F. (2007). "Undoing Gender." *Gender & Society* **21**(1): 106-127.
- Douglas, M. (1986). *How institutions think*. Syracuse, Syracuse University Press.
- Edley, N. and M. Wetherell (1999). "Imagined futures: Young men't talk about fatherhood and domestic life." *British Journal of Social Psychology* **38**: 181-194.
- Edley, N. and M. Wetherell (2001). "Jekyll and Hyde: Men's constructions of feminism and feminists." *Feminism and Psychology* **11**(4): 439-457.
- Faulkner, W. (2000a). "Dualisms, Hierarchies and Gender in Engineering." *Social Studies of Science* **30**(5): 759-792.
- Faulkner, W. (2000b). "The Power and the Pleasure? A Research Agenda for "Making Gender Stick" to Engineers." *Science, Technology, & Human Values* **25**(1): 87-119.
- Faulkner, W. (2001). "The technology question in feminism: A view from Feminist Technology Studies." *Women's Studies Int. Forum* **24**(1): 79-95.
- Fausto-Sterling, A. (2000). *Sexing the body. gender politics and the construction of sexuality*. New York, Basic Books.
- Fournier, V. and W. Smith (2006). "Scripting masculinity." *Ephemera* www.ephemeraweb.org **6**(2): 141-162.

-
- Garfinkel, H. (1967). Studies in ethnomethodology. Englewood Cliffs, New Jersey, Prentice Hall.
- Gherardi, S. (1995). Gender, symbolism and organizational cultures. London, Sage.
- Gherardi, S. and B. Poggio (2007). Gendertelling in organizations. Narratives from male-dominated environments. Fredriksberg, Liber: Copenhagen Business School Press.
- Gill, R. (1993). Justifying injustice: broadcasters' accounts of inequality in radio. Discourse analytic research: Repertoires and readings of texts in action. E. Burman and I. Parker. London, Routledge.
- Gill, R. (1996). Discourse Analysis: Practical Implementation. Handbook of Qualitative Research Methods for Psychology and the Social Sciences. J. T. E. Richardson. Leicester, BPS: 141-156.
- Gill, R. (2000). Discourse Analysis. Qualitative Researching with Text, Image and Sound : A Practical Handbook for Social Research. M. W. Bauer and G. D. Gaskell. London, Sage: 172-190.
- Goffman, E. (1967). Interaction Ritual. New York, Pantheon Books.
- Goffman, E. (1977). "The arrangement between the sexes." Theory and Society(4): 301-331.
- Grint, K. and R. Gill, Eds. (1995). The Gender-Technology Relation. Contemporary Theory and Research. London, Taylor&Francis.
- Henwood, K. L., K. A. Parkhill, et al. (2008). "Science, technology and risk perception. From gender differences to the effects made by gender." Equal Opportunities International **28**(8): 662-676.
- Johansson, U. (1998). "The transformation of gendered work: dualistic stereotypes and paradoxical reality." Gender, Work and Organization **5**(1): 43-58.
- Kelan, E. (2008). "Emotions in a rational profession: The gendering of skills in ict work." Gender, Work & Organization **15**(1): 49-71.
- Kessler, S. J. and W. McKenna (1978). Gender. An ethnomethodological approach. Chicago, The University of Chicago Press.
- Lie, M. (1995). "Technology and Masculinity: The Case of the Computer." European Journal of Women's Studies, Special Issue on Technology **2**(3): 379-394.
- Linstead, A. and J. Brewis (2004). "Editorial: Beyond Boundaries: Towards fluidity in theorizing and practice." Gender, Work and Organization **11**(4): 355-362.
- Lohan, M. (2000). "Constructive Tensions in Feminist Technology Studies." Social Studies of Science **30**(6): 895-916.
- Lohan, M. and W. Faulkner (2004). "Masculinities and Technologies." Men and Masculinities **6**: 319-329.
- Lorber, J. (1996). "Beyond the binaries: Depolarizing the categories of sex, sexuality and gender." Sociological Inquiry **66**(2): 143-159.
- MacGregor, S. (2010). "A stranger silence still: the need for feminist social research on climate change." Sociological Review **57**(2): 124-140.

-
- Martin, P. (2001). "Mobilizing masculinities: women's experiences of men at work." Organization **8**: 587-618.
- Martin, P. (2003). "'Said and done' versus 'saying and doing'. Gendering practices, practicing gender at work." Gender & Society **17**(3): 342-366.
- Martin, P. (2004). "Gender as social institution." Social Forces **82**(4): 1249-1273.
- Martin, P. (2006). "Practising gender at work: Further thoughts on reflexivity." Gender, Work and Organization **13**(3): 254-276.
- Mellström, U. (2004). "Machines and Masculine Subjectivity: Technology as an Integral Part of Men's Life Experiences." Men and Masculinities **6**(4): 368-382.
- Nentwich, J. C. and E. Kelan (2007). All said and done? The understanding of 'doing gender' and its discontents. 5th international conference "Gender, Work and Organization", Keele University, UK.
- Nitsch, J. (2008). Leitstudie 2008: Weiterentwicklung der "Ausbaustrategie Erneuerbare Energien" vor dem Hintergrund der aktuellen Klimaschutzziele Deutschlands und Europas. Untersuchung im Auftrag des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit. Berlin.
- Offenberger, U. and J. C. Nentwich (2009). "Home Heating and the Co-construction of Gender, Technology and Sustainability." Women, Gender and Research **18**(3-4, Special Issue: Gendering Climate Change): 83-91.
- Oldenziel, R. (1999). Making Technology Masculine. Men, Women and Modern Machines in America 1870 - 1945. Amsterdam, Amsterdam University Press.
- Oudshoorn, N. and T. Pinch (2003). Introduction: How Users and Non-Users Matter. How Users Matter: the Co-Construction of Users and Technologies. N. Oudshoorn and T. Pinch. Cambridge/MA, London, the MIT Press: 1-25.
- Potter, J. and M. Wetherell (1987). Discourse and social psychology: Beyond attitudes and behaviour. London, Sage.
- Röhr, U. and D. Ruggieri (2008). Erneuerbare Energien – ein Arbeitsmarkt für Frauen! L. e.V. Berlin.
- Rubin, G. (1975). The traffic in women: Notes on the political economy of sex. Toward an Anthropology of Women. R. Reiter. New York, Monthly Review Press: 157-210.
- Scheffknecht, G., A. Schuster, et al. (2010). "Bioenergie. Ihr Beitrag zur nachhaltigen Energieversorgung." Themenheft Forschung - Erneuerbare Energien. Universität Stuttgart **6**: 46-53.
- Schmidt, M. and N. Jinchang (2010). "Potentiale erneuerbarer Energien in der Gebäudetechnik." Themenheft Forschung - Erneuerbare Energien. Universität Stuttgart **6**: 76-83.
- Shove, E. (2003). Comfort, cleanliness and convenience. The social organization of normality. New York, BERG.
- Statistisches Bundesamt (2009). Zuhause in Deutschland. Ausstattung und Wohnsituation privater Haushalte. Ausgabe 2009. Wiesbaden.

-
- Strauss, A. and J. Corbin (1990). Basics of Qualitative Research. Grounded Theory Procedures and Techniques. Newbury Park, London, New Delhi, Sage.
- Umweltbundesamt (2007). Nachhaltige Wärmeversorgung. Sachstandsbericht. Berlin.
- van Oost, E. (2003). Materialized Gender: How Shavers Configure the Users' Femininity and Masculinity. How Users Matter. The Co-Construction of Users and Technologies. N. Oudshoorn and T. Pinch. Cambridge/MA, The MIT Press: 193-208.
- Wajcman, J. (1991). Feminism confronts technology. Cambridge, Polity Press.
- Wajcman, J. (2002). "Addressing technological change: The challenge to social theory." Current Sociology 50(3): 347-363.
- West, C. and D. H. Zimmerman (1987). "Doing Gender." Gender & Society 1(2): 125-151.
- Wetherell, M. and J. Potter (1988). Discourse analysis and the identification of interpretative repertoires. Analysing everyday explanation. C. Antaki. London, Sage: 168-183.