

Energy as a key variable in promoting gender equality and empowering women:

A gender and energy perspective on MDG #3,"

Discussion Paper

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Introduction

The third Millennium Development Goal –to promote gender equality and empower women- has as its target to eliminate gender disparity in education. Looking at the existing literature and the connections made there between this Goal and the energy sector, it is seen that a number of linkages can be, and have been made (see box).

Linkages from existing literature between gender and energy and MDG 3 (Gender Equality):

- Electricity enables access to educational information and information communication. Women are more likely than men to be illiterate;
- Street-lighting improves the safety of women and girls at night, allowing them to attend night schools and participate in community activities. Women are less likely than men to have access to information and be included in political and community life;
- Energy, by allowing progress to be made in terms of health, education and poverty, gives women more chance of having the opportunities traditionally reserved for men. In this way, it allows the living conditions of women to be improved; and
- Access to means of training and information, education of the young female generation, the fact that women have an income and can work outside the household provokes a change in mentality and changes the image and treatment of women.

Source: Havet (2003); GVEP (2003)

This paper will explore whether these linkages really exist and whether the energy sector has a contribution to make to this MDG. It does that by looking at empirical evidence from studies done into the subject and presenting an overview of the results in the main text, but with more detailed findings given in tables in the annexes to the paper. Intended mainly as an advocacy tool, the groups mainly targeted by this paper are policy makers, academics, and people working as professionals in the energy sector.

We specifically researched whether there is any evidence to sustain and answer the following assumptions and questions:

1. expanded access to energy services enables women to follow literacy and numeracy classes, and, related to this, electricity will increase the time women spend reading;
2. with access to better energy services, women will have more leisure time available;
3. electrification will give women more access to information through radio and TV, making them more aware and empowered;
4. do women suffer from violence and harassment in the energy sector? If so, there can never be true gender equality;
5. improved energy services will change the gendered division of labour in the household, as men will take up more domestic responsibilities;
6. women develop more confidence through training by energy projects, or through an increase in income, which will give them a greater voice in the household, or even the community they live in;
7. do women partake in the decision-making, paying for, and control over an energy technology or electrical equipment? If women's needs are to be met, it is important that they also have a say in these issues; and
8. what is the status of women professionals in the energy sector?

Energy, Gender and Literacy

Studies into impacts of energy programmes on women's literacy and numeracy skills show mixed results (see Annex 2). There is not a lot of proof that shows that women benefit from energy programmes through improved literacy, while other studies have actually found that women benefit in no such way at all. In the Gambia, for example, Barrett and Browne (1994) found that the diverse nature of household organisation is a constraint to women participating in literacy classes. Women do not necessarily save time every day, or on the same day every week, which makes it difficult for them to participate in such classes.

Rural electrification in Ghana ensured that all schools have electricity. Though adult education classes are now given using electric lights, rather than the lanterns that were used before, men still outnumber women in these classes. The reason for this being that women use the extended day to generate income or to undertake household chores (Mensah-Kutin, 2002).

Some examples can be given, however, of energy projects that have had a positive impact on women's literacy. Malmberg-Calvo (1994) is citing a number of them, including a UNICEF initiative in Kenya, where women allocated the time they saved from improved access to water to income-generating craft work. The earnings from the craft work were invested in a grinding mill. This saved the women even more time, which they spent on literacy classes (Kwaho in Malmber-Calvo, 1994). In Cameroon also, the introduction of maize mills led to time savings, which a number of women used to engage in attending literacy classes (O'Kelly in Malmberg-Calvo, 1994).

Al-Habeel village in Southern Yemen saw, along with the introduction of biogas plants, an extension programme that was also especially targeting women. About 50 women from the village were thus introduced to reading, writing and other basic skills. This resulted in women acquiring new values and a general improvement of family conditions, which was also appreciated by the male household heads – see also the case study presented in Annex 1 (Obaid and Saleh, 1997).

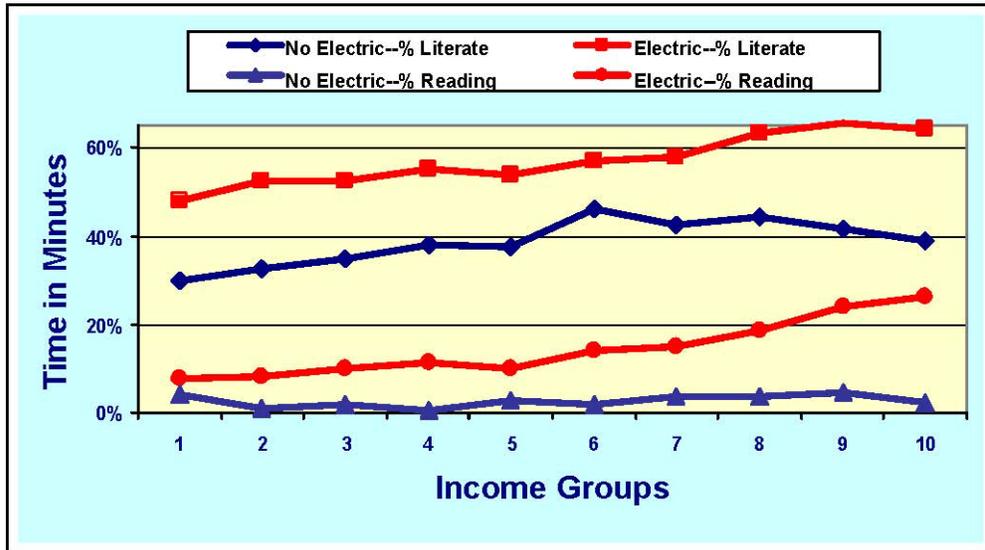
Similarly, women managers of the Multifunctional Platforms in Mali have received training by the project in some essential management skills, such as basic accounting, functional reading and writing in their local language, and filling out the monitoring tools. As of June 2001, about 862 women had been trained, which comes to six women per installed platform on average (Brew-Hammond and Crole-Rees, 2004).

Barkat et al (2002) in their study into rural electrification in Bangladesh found that the overall literacy rates in electrified households is significantly higher (by 22 percent) and with much less gender inequity (female literacy rates being 31 percent higher in electrified than in non-electrified villages), than households in non-electrified villages. These significant rises in overall literacy can be attributed to the availability of electricity, as electricity has contributed much in raising awareness about the value of education.

Closely linked to improved literacy, is the question whether women will start reading more upon the introduction of electricity in households. An ESMAP energy survey in India in 1996 found that electricity has particularly impacted on the time women spend reading and watching TV. Of all the women who do some reading on a typical

day, it was seen that 90% are from households with electricity, compared to only 2% from households without (ESMAP, 2003 and 2004; Sen and Barnes, 2004). Figure 1 shows the impact electricity may have on women's reading and further education. Similarly, Bryce and Soo (2004) found that the Bulelevata women in the Solomon Islands appreciate to be able to read at night.

Figure 1 Electricity, Women's Reading and Household Level of Literacy, 1996



Source: ESMAP Energy Survey, 1996

Gender, Energy and Leisure

Looking at how men and women spend the time they save by having access to modern energy services, clear gender differences can be discerned. Increased leisure and resting time for women could effect greater gender equality. Oftentimes, however, it is seen that women spend this extra time first on performing other household duties, and only then on leisure, if at all. Annex 3 presents a table with empirical evidence found on how women and men spend time that they save with improved energy services.

Looking at the United States of America at the time of rural electrification, it was found that housewives with electric appliances were spending as much time on household duties as those without. Individual tasks were perhaps made easier, but their number, frequency, and complexity increased. The reasons for this were the loss of domestic servants, new tasks that the new technologies brought about, a remodeled ideology of housewifery, and fewer domestic responsibilities for men (Hawthorne, 1996).

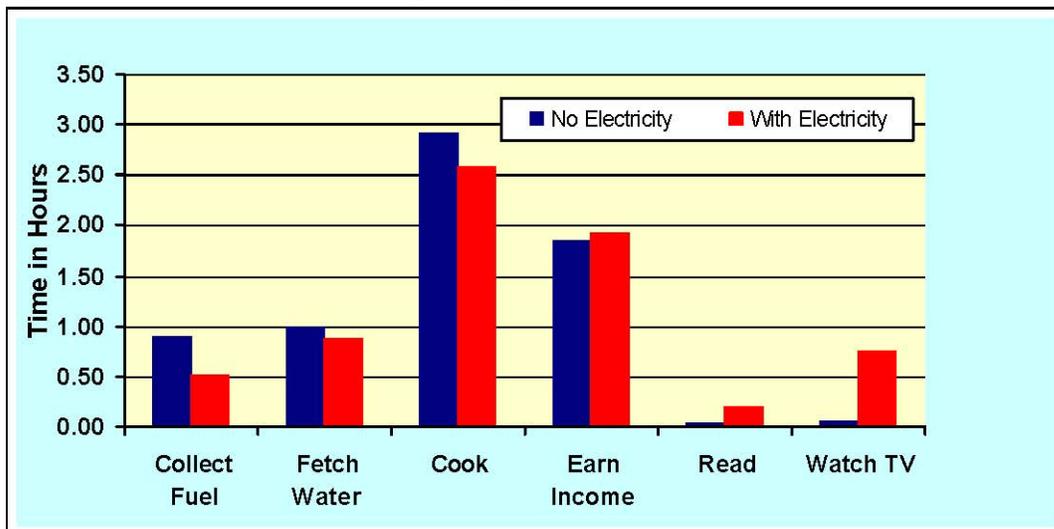
This extension of the working day through rural electrification, can also be noted from a number of studies in developing countries. In Ghana, rural electrification only led to a negligible increase in women's leisure time and in men's participation in domestic work. Similar results were found in a number of other studies, both in Asia and in Latin America (see Annex 3).

Even where women, before getting access to improved energy services, indicated to use freed-up time towards rest, socialising and spending more time with the children, in actual fact they ended up using the extra time to cultivate, collect firewood and wild vegetables, travel for grinding, and do housework (Malmberg-Calvo, 1994).

The ESMAP study in Central America and Hoogervorst found that women do value the time savings positively, even if it means that they are still performing other duties. To quote from Hoogervorst, women thought “life had become easier” (Hoogervorst, 2004).

There are also a number of studies that do report an increase in leisure time for women with access to modern energy services. The ESMAP survey in India found that in households with access to LPG, women enjoy a more balanced life between arduous tasks and leisure compared to women who use biomass. Also in households with electricity it is seen that women have a better balance between work and leisure. Compared to households without electricity women spend less time collecting fuels, fetching water, and cooking and instead spend more time on especially reading and watching TV. A little more time is also spent on doing other household work, and income-generating activities – see Figure 2. (ESMAP, 2003)

Figure 2 Women’s Time Use during Waking Hours in Households with and without Electricity



Source: ESMAP Energy Survey 1996

A number of other studies also found that time savings may lead to more time spent on resting and socialising. In South Africa, Green (2003) found that women benefited from having more time to do what they enjoyed doing. They preferred not to spend the time saved on taking on new, or other activities. This resulted in women being less tired and harassed. In Mali as well, the most important impacts that the multifunctional platform has brought to women is the time to rest (Brew-Hammond and Crole-Rees, 2004) and in the ENSIGN project, the time savings were mostly used for childcare, recreation, and partaking in social activities (Ramani, 2002).

Increased Access to Information through TV and Radio

Though some studies indicate that especially men benefit from electricity by gaining more leisure time, which is very often spent on socialising, watching TV, listening to the radio, and drinking (Mensah, 2001; Mensah-Kutin, 2002), other studies show that women also have increased access to TV and radio with the arrival of electricity (see Annex 4). Where that is the case, these media may improve women's situation by providing useful information. Halim (2004), for example found that women's knowledge of gender equality issues is much higher in households with electricity than in households without, and Massé (2003) as well found that both men and women felt that watching TV is a way to get information to improve women's situation. Clancy, Skutsch and Batchelor (2003) are citing from a study in Nepal where women's empowerment was enhanced when they could see pictures on TV showing that they "don't have to remain as second class citizens".

In Bangladesh, rural electrification also influences the knowledge women gain through listening to the radio and watching TV. Although the data on the average time that is spent on listening to the radio was not found to differ much in either electrified or non-electrified villages (23-27 minutes per day), a consistent knowledge pattern was found in that women in electrified households gained much more knowledge through radio-listening than those in the non-electrified households. (Barkat et al, 2002)

The same study revealed that the time spent per day on watching TV for women in electrified households is 65 minutes on average. In non-electrified households, women only watch between 13-18 minutes TV daily. TV watching was further reported by 70% respondents in electrified households, 30% in the non-electrified households of electrified villages, and only 17% in the households of non-electrified villages. Subsequently, women in the electrified households were reported to gain much more knowledge through watching TV than those in the non-electrified households. It was further found that this gain in knowledge increased women's empowerment in terms of making decisions to spend their own earnings. (Barkat et al, 2002)

Women and Violence in the Energy Sector

There is some evidence available that women in the energy sector (either working as professionals, or being energy users) suffer from violence and harassment (see Annex 5). For example, news reports from Darfur, Sudan have recently informed us of women being systematically raped while moving out of their villages looking for firewood, water and food. A typical militia strategy is to set up camps around a village in the weeks before the main attack, not allowing villagers to fetch water or firewood. Men who venture out are killed, so fathers have to send the girls and women to the well outside the village, knowing they face rape but not death (Dixon, 2004).

In situations where firewood has become a scarce commodity and the collection of firewood is restricted, women are also more vulnerable to sexual harassment, or being caught and fined for illegal firewood collection. It is especially the poor women, who cannot afford to pay for their firewood, who suffer (see for example Fuuna, 1997). The Women Fuelwood Carriers (WFC) in Addis Ababa, Ethiopia, have also been found to be exposed to harassment from forest guards and having to pay

bribes to be able to bring their loads of up to 45 kg of branches, leaves and twigs to the markets. They are even risking sexual assault, placing them under a high HIV/AIDS risk (World Bank, 2004; Tadesse, 2002).

Report of a Former Women Fuelwood Carrier

Etenesh Ayele is leading the Association of Former Women Fuelwood Carriers (AFWFC). Now 33, Ms Ayele began her working life at 14, picking leaves and cutting twigs on Entoto Mountain, high above Addis Ababa. She says: "It was a degrading life full of humiliation and shame. We were often victims of rape and beatings by hoodlums who hid themselves in the forest." Another hazard was confiscation by forest rangers of the hard-earned goods from their scavenging efforts. "There was no law to protect us because what we were doing was illegal."

Source: Tadesse, 2002

It is not only the women collecting firewood, who are subject to sexual and other harassment. Women professionals in the energy sector also have to deal with various forms of harassment. Dorothy Lele shows that women professionals in the Pakistan oil and gas sector face all sorts of harassment. There are women without access to a women's washroom, a doctor who cannot be promoted solely because she is a woman, a mechanical engineer whose work was sabotaged and others facing different forms of harassment. It resulted in the formation of the Gender Equity in the Oil and Gas Sector – Pakistan Petroleum Women's Network (PPWN), a group of professional women now meeting regularly to share concerns and to work for improvements (Lele, 1998). A study into the Bangladesh Rural Electrification Board (REB) and PBSs also found that the few women employed in the REB and PBSs are living with sexual harassment at the workplace. It is a generally unspoken but serious problem for the women employed there (Clancy et al, 2004).

Impact of Improved Energy Services on the Gender Division of Labour in the Household

The empirical evidence, presented in the table in Annex 6, shows that improved energy services do in some cases lead to a change in the gender division of labour within households. This is not always the case, however, as a number of other studies also indicate.

Hawthorne (1996) for example found that with the acquisition of new household appliances in the United States, men have actually reduced the time they spend in housework, and that certain tasks, previously shared between a man and woman, became solely the responsibility of the woman. Others also found that the prevailing gendered division of labour in households has not changed with the introduction of improved energy services (see for example Halim, 2004 and Opdam, 1997).

Other studies show a more diverse picture, like Palmer-Jones and Jackson (1997) in their study into treadle pumping in India. There, a number of women asserted that men did not acknowledge the effort involved in pumping and made no compensating allowances for their wives' increased workloads. Other women stated to the contrary that their husbands did acknowledge the extra efforts and would themselves operate

the treadle pump, or would take up domestic labour 'that they could do' such as sweeping, washing and feeding children in order to give them time to pump.

Yet other studies show a positive change in the division of household work. For example when women start earning an income and so become co-providers of the family, it is seen that men become more involved in domestic tasks, or start helping women out in their business (Berthaud, 2004; LWU-GRID, 2001; Prathoumvanh, 2000; Muchiri and Gitonga, 2000).

In Bangladesh, husbands have also been reported to share household duties so the women are able to work outside the home. This shift in traditional gender roles has given the women greater confidence and improved their status in the community (ESMAP-Bangladesh). Introduction of microhydro in Nepal has also seen a change in gender roles. Both Mahat (2004) and Rana-Deuba (2001) found that men are more involved in household duties, such as carrying grain to the nearest mill, or by looking after the babies while women are being trained by the project as managers. Massé (2003) in Sri Lanka found that increased sharing of household chores has become acceptable. It is not rare for men to say they are now able to share ironing activities with women.

A Greater Voice for Women

The facts presented in the table in Annex 7 strongly support the assumption that energy projects can lead to increased confidence in women. Either through training, and thus increasing women's skills, or by actively involving women in the project, women take up a different role than they used to, get more of a say in the household, or the community and may even take up leadership positions, as is seen in a number of studies (for example Bryce and Soo, 2004; Khuller, 2002; Khamati-Njenga, 2001 a; Oliveros, 1998). This has a positive effect on women's position, status and role in society, ultimately resulting in women's empowerment.

A particularly telling story is that of the Bulelavata women on the Solomon Islands, which is also more closely described in Annex 1. Here, women were trained in microhydro technology, which gave them a feeling of pride to know how electricity was generated and distributed. From observing and participating in the establishment and operation of the Village Hydro Management Committee (VHMC) women gained experience and confidence. It is the Bulelavata Women's Committee which is now, at the request of the community, collecting and banking the monthly electricity tariff charges from all village households. Women's roles in their own households and community are now acknowledged and women have gained the village men's respect and encouragement to take up initiatives like above-mentioned responsibility (Bryce and Soo, 2004).

Interestingly, all three EnPoGen studies into the impact of electrification on gender in Sri Lanka, China, and Indonesia on the contrary show that the electrification did not result in to greater empowerment of women, or women gaining a stronger voice, or becoming more participative in community affairs (IDS, 2003; Madon, 2003; Massé, 2003). In China, for example, the study found that women still lack a voice at village level. Even though each village committee was to have a women's representative, this post was not subject to the payments or allowances that were given to the other three committee members: the chairman, secretary, and party representative (IDS, 2003). In Sri Lanka the EnPoGen study found that electrification did not result in

women's greater empowerment or heightened participation in community groups (Massé, 2003).

Control to and Access over Improved Energy Services

At the time of rural electrification in Ireland, the Irish Countrywomen's Association (ICA) proved to be one of the powerful voluntary organisations whose help was vital in the rural electrification program. The influence of the ICA was such that rural housewives were usually far ahead of their husbands in appreciating the benefits of electrification. By 1960, when almost 250,000 rural houses had been connected to the electricity supply, only 50,000 had piped water. The ICA was extremely dissatisfied with progress and set up a Campaign for Rural Water Supplies which promoted and coordinated efforts to bring water to farming families. ICA's energetic campaign had the desired effect of boosting demand for water on tap over the 1960s (Shiel).

That women play such a driving role in electrification, or in the dissemination of other improved energy services, is not always the case. Very often decisions on, access to, and control over new technologies remains the prerogative of men, as can be seen from the evidence presented in the tables in Annex 8. There it is seen that mostly men take the decision about acquiring a certain technology, or electrical equipment, that mostly men pay for this and also exercise control over it. Thus, women's needs remain largely ignored or unmet.

A good example is given by Mathee and de Wet (2001) for South Africa. When asked which electrical appliance they would like to acquire first upon electrification, the majority of the women respondents (63%) said they would buy an electric cooker. This was in great contrast with the reality of a nearby village which had been electrified for the past three and a half years. Cooking apparatus were among the last electrical appliances to be purchased there. The likely reason for this was the more dominant economic decision-making power, and preferences of men at household level. Likewise, in India the use of appliances that would reduce the drudgery of women is almost nonexistent (Sen and Barnes, 2004).

In Nepal, this divide in decision-making, makes women feel distanced from the improved energy services introduced in their households. Men were also more involved in the construction of improved cookstoves and women were not given the chance to address any technical problems concerning their use. Sometimes women destroyed the stoves because they did not find them convenient (Mahat, 2003).

In female headed households, the situation may be different. Madon (2003) in his study found that when women head a household, more importance is given to the purchase of domestic appliances than in male-headed households and similarly that the decision for getting electricity connection is essentially a male responsibility (80-90% of the electrified households are headed by men), but when households are headed by a woman, it was the woman's responsibility for 25-30% of the respondents. In Ghana also, it was seen that women in female-headed households do exercise autonomy in the purchase of appliances. Frequently, however, they will seek advice from male relations or friends (Mensah-Kutin, 2002).

In some cases, though, men only have the appearance of decision-making. In the EnPoGen study in China, generally men were said to make the decisions about

building improved stoves. However, it really was the women who persuaded their husbands in acquiring an improved stove, after having heard about the stoves from relatives in their mothers' villages (IDS, 2003).

Women Professionals in the Energy Sector

The share of women in the energy economy is very modest. The reasons generally given for this are that there are only few women in technical professions, that the energy sector is a male dominated area and that there is often risk technology involved. Very little gender disaggregated data is available, and most of it refers to the North (see Annex 9).

Data, representative for OECD countries in general, can be found in statistics for Australia where women make up 20% of the work force in the electricity, gas and water sector, but occupy less than 5% of technical posts. This share is even smaller in certain areas and at certain levels within the electricity economy. In Germany, the share of female technical staff in the electricity economy is around 6%, in decision-making positions 4%, and in top management less than 1% (Hoppenstedt-Analyse in: Clancy, Oparaocha and Roehr, 2004) It is further seen that women who do work in the energy industry, mainly work in administration, sales, finance, catering, and personnel.

The effects of the liberalisation of the European electricity market and the associated planned efficiency on the employment of women in this sector have been investigated in a study commissioned by the European federation Eurelectric. The findings of the study indicated that the opening of the market does not have positive effects on the employment of women. On the contrary, in the countries where the reorganisation is already advanced, it must be noted that the share of women falls outstandingly.

There are initiatives to improve the situation. One of the recent ones is the ENEQO project within the electricity industry in Europe, which aims to advance equal opportunities by promoting the positive benefits employing women brings to the work place. In Canada, the oil and gas sector is promoting a diverse workforce and adopting the approach of recognising the contributions people make as capable individuals rather than as members of designated groups.

For many women the experience of being part of a small minority working in the energy sector can create a sense of isolation. Sometimes this leads them to abandoning their careers; sometimes they leave to set up businesses with other women (see for example the Windfang case study presented in Annex 1).

In the South as well, women professionals in the energy sector are in the minority and suffer from disadvantages. The development of a comprehensive Gender Equity Strategy and Action Plan for integration into the Bangladesh Rural Electrification Board (REB), showed that the number of women professionals in the REB and the rural electricity cooperative (PBSs) is very small (Clancy et al, 2004). For example, as of mid-2003, within the REB, only five Deputy Directors, out of a total of 25, were female. Only one Assistant Engineer out of 152 was female. In the PBSs, only one Class I officer (Senior Management) out of 591 officers was a woman. Such a small representation at senior levels gives women negligible opportunities for making inputs and influencing outcomes at the policy, institutional and implementation

levels, thus creating considerable gender imbalance in decision-making and outcomes.

In Tunisia, the Tunisian Electricity and Gas Company (STEG – Société Tunisienne de l'Électricité et de Gaz), has a hiring policy that does not differentiate between the two genders. An overview of female employment in STEG shows that over the past three years, the total number of women employed by the company has remained stable. It is interesting to note, however, that there is a growth of female representation in executive positions, against a reduction of their representation in the implementing jobs. Two main reasons can be stated for this reduction:

- The total number of implementing officers is on the decline; and
- Implementing jobs consist of dangerous tasks which are not highly appreciated by women, like working at construction sites and climbing electricity posts.

It was seen that management positions are most appreciated by women. Women are represented in all categories of executive positions, except for the top two ones. It is expected that the representation of women in these positions will only grow in the years to come (STEG, 2005).

Underrepresentation of women in the energy sector is also reflected in the corresponding decision making and consulting bodies. Recent years have shown an increase in the number of women in high-level policy-making positions though. A number of countries, including South Africa, Uganda, and Brazil have women ministers of Energy. Women are also more strongly heard at important policy events like the WSSD that was held in Johannesburg, South Africa in 2002. A number of women ministers of the environment have further organised themselves to make sure gender issues are raised in dealing with environmental issues globally. This group of women environment ministers have identified energy as one of the priority issues for 2004-2005.

Conclusions and recommendations

The evidence presented above shows a rather mixed picture of the impact improved energy services can have on greater gender equality and women's empowerment. Some of the subject areas treated here in this paper have also not been very well researched and empirical evidence for these areas is thus hard to find, making it hard to draw binding conclusions there.

A conclusion that can be made is that electrification or other improved energy services does not immediately lead to increased leisure time for women. By far in most studies it was seen that women first spend the time that was saved by the introduction of the energy technology on other household duties before spending it on rest or leisure, if at all. Women in electrified households do spend more time on watching TV and listening to the radio. This improved access to information increases women's knowledge and in several studies it was found that it has resulted in empowerment of women.

Where energy programmes provide training to women and place them in an environment out of the household, it is seen that women's confidence grows and that they dare speak up more within the household, but also in the community they live in. Women's role, status and position in society changes, mostly with men's support. In some cases it was even seen that women start taking up leadership positions.

The picture for a positive change in the gendered division of labour in the household is not so clear. Though some studies do see an improvement in that men start taking on more household activities after an energy intervention, there are also studies that have found quite the opposite results. Likewise it is hard to draw any conclusions when it comes to the impact energy interventions have on women's literacy skills, or reading time. Too little research into the subject has been done to make it possible to say much about this linkage.

Looking at the evidence for women's control over energy technologies and equipment, it can be seen that very often decisions on, access to, and control over new technologies remains the domain of men. It is mostly men who take the decision about acquiring a certain technology, or electrical equipment, that mostly men pay for this and also exercise control over it. Thus, women's needs remain largely ignored or unmet.

With regards to women and violence in the energy sector, there are reports of violence and harassment against women, both as energy users, and as professionals in the energy sector. Here also, though, not much information could be found and only a few incidental reports mention the positive impact that energy interventions have had on either gambling or drinking habits of men.

Women professionals in the energy sector is another area that needs more research to be able to draw stronger conclusions than that women are greatly outnumbered by men in this sector and that it is mostly men who take up the management and leadership positions. This situation exists both in the North and South.

Overall, it may be concluded that energy interventions can contribute to women's empowerment and to achieving greater gender equality.

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Annex 1: Case Studies Linking Improved Energy Services with Greater Gender Equality (MDG 3)

Introducing Biogas in a Village in Southern Yemen – Gender, Energy and Literacy

From: Obaid & Saleh, 1997

The implementation of a pilot project, undertaken by UN ESCWA, introducing biogas into the village of Al-Habeel in Southern Yemen, shows how the participatory approach adopted by the project, and the special attention to women from the onset of the project, has led to improved lives of the men, but especially the women in the village. Female beneficiaries participated with commitment in the extension programme provided by the project. Thus, about 50 women from the village were introduced for the first time to basic life skills as literacy, health education, home economics, sewing, child care, poultry raising, vegetable gardening and the operation and simple maintenance of the biogas equipment inside the house.

A baseline survey of the village, undertaken to assess the impact of the biogas technology on the village community revealed that women were ready to acquire these new skills and knowledge that would improve their lives and that of their families. The study also found that the male heads of the households also welcomed the freeing up of time for women through the introduction of biogas in the village, and the subsequent acquired new skills and knowledge by women that led to a further improvement of family conditions.

Windfang: women making energy for themselves

From: Delfs, 2000

A company (Windfang) owned by 200 women working on co-operative principles operates a 450 kW wind turbine, which is feeding into the national grid to the north of Hamburg in northern Germany. The company grew out of an initiative by three women who had grown disillusioned with the unsupportive male-dominated working environment they had encountered in the energy sector. Although most of the founding members were technically-oriented, the group is now multidisciplinary and has members of all ages, from students to women professionals, and from a broad range of disciplines such as theatre and economics. Of importance to most of the members is the peer support gained from working within a group of women. Not all of the women work in the company but those who don't have provided some of the finance for the company and derive satisfaction from pragmatically working towards a cleaner environment. In addition, the way in which decision-making is carried out within the company is an important principle. The women opted for a democratic structure which allows all members to elect the steering committee and board, while major decisions are taken at a general assembly. One of Windfang's objectives is to increase the work experience of women in energy projects and thus improve their chance of a good job in the energy sector. Having gained confidence while working in a supportive environment, several of the founding members have now moved on to set up their own businesses or have found jobs in the renewable energy industries.

Ethiopian Women Fuelwood Carriers

From: Tadesse, 2002

In and around the city of Addis Ababa an estimated 15,000 women and children earn a living by illegally cutting stems and branches from trees in forests just outside the city. The work is backbreaking and forces the women and children to walk about 12 kilometres every day carrying bundles of wood on their backs that weigh as much as 35 kilogrammes or more. Local authorities estimate that these women fuelwood carriers provide over one-third of the woodfuel supply of Addis Ababa. With this work, the women earn about two Birr (equals US\$.25 cents) per day, while being exposed to violence and harassment by hoodlums and forest guards.

The Association of Former Women Fuelwood Carriers (AFWFC), an advocacy association of over 750 members, is helping out these women by providing training in fields like weaving, basket making and dairy farming. Women have thus risen out of misery to a level of dignity and self-worth.

Telling is the tale of Meshet Yesu, age 25, who began carrying fuelwood at the age of nine, together with her mother. When her mother died, Meshet became responsible to take care of her three younger sisters along with her day labourer father. Meshet was trained by the AFWFC in weaving and now earns a good income. It enabled her to send her three sisters to school and at the same time take care of her father.

Bulelavata Women Speak

From: Bryce and Soo, 2004

Under a microhydro project in the village of Bulelavata, the Solomon Islands, women received training about the microhydro technology: how the electricity is generated and distributed. Women began to feel a sense of pride that they now had technical know-how that they never had before. Further, women gained experience and confidence from observing and participating in the establishment and operation of the Village Hydro Management Committee.

The women formalised their own Bulelavata Women's Committee (BWC) in which the women work together to support other village women in times of crisis, organise income-generating and community welfare projects, help each other with transport for marketing and stocking stalls at the markets. The women own and manage their community money. The BWC's work is carried out with an acknowledgement of the women's roles in their own families and in their community, and with the respect and encouragement of the village men. The BWC, at the community request, has taken over the responsibility, from the VHMC, for collecting and banking the monthly electricity tariff charges from all the village households.

Two members of the BWC have been chosen to become members of the APACE Village First Electrification Team that is facilitating a Village Women's Energy Workshop in another province. The BWC has selected women to attend the Solomon Islands' Village Electrification Council 2004 Annual General Meeting and the National Planning Seminar. It has also participated in the general community appointment of two other village representatives. Women have previously attended these seminars, but this is the first time that women have been appointed to represent their village.

Annex 2: Energy and improved literacy in women – Empirical evidence

Reference	Location	Sample Size	Energy Intervention	Results	Notes
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electrification	Schools all have electricity. Adult education classes which used to be held by the light of a lantern are now occurring under electric lights. Male participation continues to be higher than that of women	Women use the extended day to generate income or undertake household chores.
Barrett and Browne, 1994	The Gambia		Coos mills	The diverse nature of household organisation means women do not necessarily save time every day or on the same day every week. This makes it difficult for women to participate in activities such as literacy classes.	
Malmberg Calvo, 1994	Kenya		Improved water supply	Women allocated their time savings to income-generating craft work. The earnings were invested in a grinding mill, which saved them more time, which they used to enroll in literacy classes.	
Rana-Deuba, 2001 b	Nepal		Rural Energy Development Program	Women are empowered through their involvement in COs, literacy classes, leadership training, skills training; and by gaining access to credit and markets, time-saving technologies, and even to TV in some areas.	
Malmberg Calvo, 1994	Cameroon		Maize mills	Introduction of maize mills led to time savings. Among other activities, women attended literacy classes.	
Barrett and Browne, 1994	The Gambia		Coos mills	The study found that in only two of the villages visited did women keep the mill accounts (due to rural women's insufficient literacy and numeracy skills). This situation was compounded by the fact that donors neglected to build a training component into these coos mill projects. This is a constraining factor in women taking full	Milling machines in rural areas of The Gambia are managed by village committees with a woman president and predominantly female members. All donors were found to have a policy of recruiting women where possible.

				control over the mill.	
Obaid and Saleh, 1997	Yemen		Biogas	Through the extension programme women began to read and write, acquire new values and skills regarding cleanliness, home management, nutrition, child care, personal care, in addition to productive skills of poultry raising and home gardening.	
Barkat et al, 2002	Bangladesh		Electrification	Overall literacy rates in electrified households is significantly higher (by 22 percent) and with much less gender inequity (female literacy rates being 31 percent higher in electrified than in non-electrified villages), than households in non-electrified villages.	
Sen and Barnes, 2004	India	5,000 women	Electrification	High-quality lighting through electricity makes it more likely that women will read in the evening regardless of their income class although the amount of time spent reading does seem to increase with income.	
ESMAP, 2004	India		Electrification	Irrespective of the literacy level in the family, non-electrified households perform hardly any reading. This in contrast to electrified households, where at all income levels, more reading is going on than in non-electrified households.	See Figure 1 above
Berthaud, 2004	Bangladesh		Fluorescent lamps that use direct current and rechargeable batteries.	Among the positive effects are increased reading hours for the children and adults, and increased time spent helping children with homework.	Another positive effect is increased security (kerosene lamps are prone to causing fires).
Bryce and Soo, 2004	Bulelavata, Solomon Islands		Microhydro	We really like to read things but we never had an opportunity to read because in the daytime we are too busy with gardening and housework. Now we can read at night time and soon we hope that we will have some books.	

Annex 3: Gender, Energy, and Leisure – Empirical Evidence

HC = Household Chores
 AW = Agricultural Work
 R = Reading
 TVR = Watching TV/Listening to Radio
 S/R = Socialising/Resting
 IG = Income-Generation
 L = Learning Activities

Reference	Location	Energy Intervention	Gender	HC	AW	R	TVR	S/R	IG	LA	Comments
Hawthorne, 1996	USA	Electricity	Women	X							Individual tasks were perhaps made easier, but their number, frequency, and complexity increased. Reasons: loss of domestic servants, new tasks relating to new technologies; remodeled ideology of housewifery; fewer domestic responsibilities for men.
ESMAP, 2003	Central America	Improved Stoves	Women	X							In particular they mentioned how they can now cook simultaneously two different meals and carry on with other household chores while cooking
Madon, 2003	Indonesia	Electricity	Women	X			X	X			The additional time is devoted first to housework in the morning, and socialization in the evening, and second to entertainment.
			Men & Children				X				Men and children, however, use their lengthened mornings for listening to the radio and watch television.
Massé, 2002	Sri Lanka	Electricity	Women	X							29% of the female household members said that the time they saved was spent on extra housework, while less than 5% reported using it for productive activities.
Wamukonya & Davis, 1999 in: Clancy et al, 2003	Namibia	Electricity	Women					X			A study into the socioeconomic impacts of rural electrification in Namibia showed that women did stay up later than men, not working but socialising.
Feachem et al, 1978 in: Malmberg-Calvo, 1994	Lesotho	Improved access to water	Women					X			
Cairncross, S in: Malmberg-	Lesotho	Improved access to	Women		X						This study shows that women who had access to more land increased their time in the fields when

Calvo, 1994		water									they spent less time on water collaboration
Malmberg-Calvo, 1994	Singida, Tanzania	Improved access to water	Women	X	X						Women said they were going to allocate freed-up time towards rest (71%), visiting neighbours (8%) and spending more time with children(3%) In practice most women used their extra hours to cultivate, collect firewood and wild vegetables, travel for grinding, and do housework.
UNIFEM in: Malmberg-Calvo, 1994	Kenya	Improved access to water	Women						X	X	Women allocated their time savings to income-generating craft work. The earnings were invested in a grinding mill, which saved them more time, which they used to enroll in literacy classes.
O'Kelly (1973) in: Malmberg-Calvo, 1994	Cameroon	Maize mills	Women		X			X	X	X	Women improved the roads so that their produce could be sold to motor vehicle-borne traders; they piped water from small streams into tanks to provide for water in the dry season; built communities houses for their gatherings; engaged in soap making; attended literacy classes; fenced their farms; set up cooperative shops; spent more time with children.
American Friends Service Committee (1987) in: Malmberg-Calvo, 1994	Guinea-Bissau	Rice husking machines	Women		X					X	Women initially helped their husbands with the cash crops, but eventually reallocated their freed-up time to health and nutrition classes, midwife training courses, and to learning practical income-generating skills.
ILO/Government of the Netherlands(1985) in: Malmberg-Calvo, 1994	Ghana	Improved ovens for fish smoking	Women	X					X		The ovens reduced smoking time by one third. Thus, women were able to do three smoking cycles in a day instead of one. Most women preferred to reinvest their time in the smoking activity and consequently increase their income. The improved smoking technology also required less tending and the women were able to simultaneously perform various activities around their homes.
Green, 2003	South Africa	Several RETS, like SHS, biogas, solar ovens and driers, water pumps	Women					X			The women perceived that the benefits from technology mostly lay in having more time to do what they enjoyed doing, rather than taking on new activities. As a result they are less tired and harassed.
			Men				X	X			Men's benefits lie in leisure activities: watching sport on tv and socialising with friends.
Mahat, 2004	Nepal	Microhydro	Women	X					X		In most cases time saved is spent on other

											household chores. With access to light, women were able to do more work early morning and at night. A few women have been involved in incense making and soap production at night with the help of lights.
Halim, 2004	Bangladesh	Electrification	Women						X		Supply of electricity in rural areas has increased opportunities for employment of women in households with electricity. Industrial activity has increased and led to increased employment and growth of skilled female labour force.
Ramani, 2002	Several countries in Asia	Microloans for energy-intensive microenterprises	Women					X			This enhanced time available for childcare, recreation, and social interaction.
Mensah, 2000	Ghana	Biogas	Women						X		Women use the power at night for income generation activities and night-time cooking. The sale of food and other commodities takes place under the streetlights.
			Men				X	X			Men have benefited from the electricity mainly through socialising, watching TV, listening to the radio and music, and drinking.
Branco, 2002	Brazil	Pumped water	Women	X					X	X	The project helped women to free up time to engage in productive activities, household care, education, and also improved health and sanitation.
IDS, 2003	China	Electrification	Women		X			X			Women's resting time increased substantially. However this was partly offset by an increase in the time spent working in the fields.
ESMAP, 2004	India	Electrification	Women	X		X	X		X		Of all activities, electrification seems to most strongly affect their time devoted to collecting fuel, reading, and watching TV.
Chakrabarti and Chakrabarti, 2000	India	Electrification	Women	X							About 38% have reported that, on an average, the use of power has helped to save cooking time at night by 1.5h which they can now use for other household work.
Barrett and Browne, 1994	The Gambia	Coos mills	Women	X	X						Most said they either spent longer in their ricefields, thus increasing food production, or had more time to spend on other household jobs.
Brew-Hammond & Crole-Rees, 2004	Mali	Multifunctional Platform	Women						X		The platform allows additional income-generating activities for women in general and for the women actively involved in the management of the multifunctional platform in particular. Estimates based on the available data in one village

											(Sampara) indicate average increased earnings of 100 FCFA/hour for each operator of the multifunctional platform.
Hoogervorst, 2004	Benin	Boreholes	Women		X						A follow-up survey showed that women did indeed spend more time on their husbands' fields, while quite a few men had increased the size of their fields. Although some women had increased the size of their own plots, their number was relatively small. Despite the fact that one heavy task had been partially replaced by another, all the women said that life had become easier.
Barkat et al, 2002	Bangladesh	Electrification and mechanised mills	Women		X				X		The supply of electricity in rural areas has increased the working hours of women. Women in electrified households are involving themselves in various types of income-generating activities enhancing their income. the existence of mechanized mills have reduced the workload of women in the electrified households, and these women have now started involving themselves in other income-generating activities.
			Men				X	X	X		The most dominant activities are watching TV, gossiping, etc. Also male heads of households spend more time on average for income generating activities, compared to non-electrified households.
Lumampao, 2005	Philippines	PV-Battery charging station	Women	X					X		Women can now do more weaving, sewing and other activities at nighttime rather than sleeping early. The lighting project did not alleviate the workload of women but rather reduce idle time for women. Some go into blanket making in the evening after finishing with household chores.

Annex 4: Improved access to information and empowerment

Reference	Location	Sample Size	Energy Intervention	Results	Notes
Halim, 2004	Bangladesh	3700 households and establishments, residential, industrial, commercial, and agricultural, evenly dispersed throughout rural Bangladesh.	Electrification	In households with electricity, women have more leisure to watch TV and listen to the radio, which contributes to the widening of their horizons. Women's knowledge of gender equality issues is much higher in households with electricity than in households without.	
Bryce and Soo, 2004	Bulelavata, Solomon Islands		Microhydro	We were concerned about the rise of the salt water that we could see on our beach but now we understand about the world environment and how we are little bit helping by using renewable energy. We are able to tell all our neighbours about world greenhouse problems and how renewable energy can help everyone.	Women are quoted.
Madon, 2003	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400 unelectrified households and 100 small-business users.	Electrification	The survey also asked what people watched and what value they gained from television. The overall benefit was almost equally divided between entertainment and information (table 20). There was also little difference in views between women and the family as a whole.	
Massé, 2003	Sri Lanka	A total of 1,573 households of which: 1,028 grid-connected; 1,177 electrified; 396 not electrified; and 275 unelectrified in electrified villages	Electrification	Increased gender equity with regard to access to information: Interviewed men (54%) and women (50%) feel that watching TV is a way to get information to improve the women's situation.	
Massé, 2003	Sri Lanka	A total of 1,573 households of	Electrification	Increased social relationship and respect within the family: Interviewed	

		which: 1,028 grid-connected; 1,177 electrified; 396 not electrified; and 275 unelectrified in electrified villages		women feel TV has a very positive (8%) or positive (61%) impact on the respect between men and women, and that it contributes to better relationships.	
Clancy, Skutsch and Batchelor, 2003	Nepal		Electrification	In Nepal, women's empowerment was enhanced when they could see pictures on TV showing that they "don't have to remain as second class citizens".	
Chaieb and Ounalli, 2001	Tunisia		Electrification	Installation of TV in their homes means that women have become much more aware of political events and know much more about what is going on in the world than their husbands, thus giving them the confidence to speak up and defend themselves and take on more leadership roles.	
Chaieb and Ounalli, 2001	Tunisia		Electrification	Rural women and children –especially girls- are becoming more demanding about personal hygiene and more fashion conscious, following the latest TV advertisements and fashions.	
Barkat et al, 2002	Bangladesh		Electrification	Women in electrified households gain more knowledge from listening to the radio and watching TV than do women in non-electrified households.	
Barkat et al, 2002	Bangladesh		Electrification	The percentage of women who spend their own earnings is 22.8% in electrified households, and only 14.8% in the non-electrified villages. Thus, it can be said that women in the electrified households (influenced by various radio and TV programs) and their neighbours compared to those in the non-electrified villages are more empowered in terms of scope for making decisions to spend their own earnings.	

Annex 5: Gender, Energy, and Violence – Empirical Evidence

Reference	Location	Sample Size	Type of activity	Results	Notes
Dixon, 2004	Darfur, Sudan		Collecting water and firewood	"A typical militia strategy is to set up camps around a village in the weeks before the main attack, not allowing villagers to fetch water or firewood. Men who venture out are killed, so fathers have to make the terrible decision to send the girls and women to the well outside the village, knowing they face rape but not death"	Newspaper clipping on young women rape victims of militia fighters.
AFP, 2004	Darfur, Sudan		Collecting food and firewood	"A 43-year-old woman told ... that she was one of many women who had been raped when she went out of Masteri for food and firewood. She said women are being raped every day, but they continue to go out because the men will be killed if they venture out."	Newspaper clipping on young women rape victims of militia fighters.
Clancy et al, 2004	Bangladesh		Women professionally employed in the energy sector	Sexual harrasment is a generally unspoken but serious problem for the women employed in the REB and the PBSs.	
Lele, 1998	Pakistan		Women professionally employed in the energy sector	There are women without access to a women's washroom, a doctor who cannot be promoted solely because she is a woman, a mechanical engineer whose work was sabotaged and others facing different forms of harassment.	It resulted in the formation of the Gender Equity in the Oil and Gas Sector – Pakistan Petroleum Women's Network (PPWN), a group of professional women now meeting regularly to share concerns and to work for improvements.
Fuuna, 1997	Uganda		Collecting firewood	In poor households, sometimes women have to resort to sneaking into a neighbour's plantation to collect firewood. This has the danger of being caught by a ruthless owner who either fines her on the spot or takes her to the local court.	
World Bank, 2004	Addis Ababa, Ethiopia		Collecting firewood	Women Fuelwood Carriers have to walk long distances on stiff terrains with heavy loads, often barefoot; being subjected to harassment from forest guards and having to pay bribes to be able to bring the firewood to the	close to 15,000 Women Fuelwood Carriers (WFC), who walk up to 15 km out-and-back daily to collect and bring loads of up to 45 kg of branches, leaves and twigs (BLT) to the markets. The WFC include girls

				market; being exposed to all weather conditions without adequate clothing and protection; and even being exposed to sexual assault, placing them under high HIV/AIDS risk.	and women, ranging in age from 16 to 63. While the WFC perform an essential service within the urban energy sector, they average a daily income of less than US\$0.50 cent
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Annex 6: Gender, Energy and Division of Labour in the Household – Empirical Evidence

Reference	Location	Sample Size	Energy Intervention	Results
Prathoumvanh, 2000	Lao PDR	Qualitative research in 4 villages, about 100 out of 3000 people were included in research, 70 of whom were women.	Study into the relationship between fuelwood and people's livelihoods	The survey showed that when women became more active contributors to the family income through activities such as weaving and sewing, the division and pattern of family labour between husband and wife changed. Men became more involved in domestic tasks such as cooking, collecting firewood and collecting water, tasks that were traditionally the reserve of women.
LWU-GRID, 2001	Lao PDR	Qualitative research in 4 villages, about 100 out of 3000 people were included in research, 70 of whom were women.	Study into the relationship between fuelwood and people's livelihoods	Men are more likely to get involved in wood collection when they have modern transport (hand carts or trucks) available.
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electrification	Nature of change in women's household duties: electrification is leading to only a negligible increase in women's leisure time and in male participation in household's domestic or women's work.
Hawthorne, 1996	USA		Electrification	It has been documented that new household appliances have actually reduced the time men spend in housework, and that certain tasks, previously shared between a man and woman, became solely the responsibility of the woman.
Mahat, 2004	Nepal		Microhydro	There has been a change in gendered division of labour associated with the power mill. Men now sometimes carry the grain to the nearest mill, which was rarely the case with the traditional water mill.
Halim, 2004	Bangladesh	Lengthy interviews in 3700 households and establishments, residential, industrial, commercial, and agricultural, evenly dispersed throughout rural Bangladesh.	Electrification	The prevailing gendered division of labour has not changed with electrification.
Opdam, 1997	Nepal		Biogas	The programme has not had a noticeable impact on the balance of power between men and women, and it has not changed gender relationships.
Muchiri and Gitonga, 2000	Kenya		Improved stoves production	Earnings from stove sales can place women in the role of co-provider for the family. Men are mainly involved in the manufacture of the metal cladding and in marketing the products. Having realised that stoves can be profitable, some men now assist women with clay and sand collection for stove production. Men also assist with stove transportation, using bicycles, and in kiln construction.

Branco, 2002	Brazil		PV Pump Project	By promoting gender equity, the project has actually empowered both the local women and the men. The women especially have benefited significantly in terms of empowerment as they have had the opportunity to be involved in activities which were previously open to only men.
Rana-Deuba, 2001 b	Nepal		Microhydro	An indicator of change is the fact that during training conducted for women managers, husbands look after their babies for the duration of the programme.
Massé, 2002	Sri Lanka	A total of 1,573 households of which: 1,028 grid-connected; 1,177 electrified; 396 not electrified; and 275 unelectrified in electrified villages	Electrification	Increased sharing of household chores has become acceptable. For example, 2.0% of the males interviewed say they use extra time for ironing.
Berthaud, 2004	Bangladesh		Fluorescent lamps that use direct current and rechargeable batteries.	As service providers, women now bring income to their families. As a result, gender relations within the household appear to have changed. Within households, some husbands now share housework responsibilities and acknowledge that housework is, indeed, work.
Bryceson and Howe, 1993	Sub-Sahara Africa		Rural household transport	Despite impediments to women's adoption of improved means of transport, it has been observed that in some cases men who adopt a transport innovation take on functions that were previously shouldered by women.
Palmer-Jones and Jackson, 1997	Bangladesh		Treadle pump	Some women stated that their husbands would themselves operate the treadle pump, or would take up domestic labour 'that they could do' such as sweeping, washing and feeding children in order to give them time to pump.
ESMAP, 2004	Bangladesh		Fluorescent lamps that use direct current and rechargeable batteries.	Their husbands share household duties so the women are able to work outside the home. This shift in traditional gender roles has given the women greater confidence and improved their status in the community.
Barkat et al, 2002	Bangladesh		Electrification	The prevailing gender based division of labour is yet to be eliminated.

Annex 7: Women Gaining a Stronger Voice – Empirical Evidence

Reference	Location	Sample Size	Energy Intervention	Results	Notes
ESMAP, 2003	Nicaragua		Pilot project improved stoves. Women participated in stove training (traditionally a male-dominated business) and three women trained as mechanics.	Through this training and exchange of experiences, women improved communication skills and are willing to voice their opinion in public, which enhances the sense of empowerment.	
Mahat, 2004	Nepal		The awareness program supported by REDP	The program resulted in a positive change in women's and men's attitudes towards women's mobility and participation in development activities. It also enabled women to control gambling habits of men. Women's involvement in community organisations provides women with a voice for their social and economic independence.	
Halim, 2004	Bangladesh	3,700 households and establishments, residential, industrial, commercial, and agricultural, evenly dispersed throughout rural Bangladesh	Electrification	Supply of electricity has enhanced women's mobility. There is greater participation in income generating activities, better utilisation of NGO-sponsored credit, and increased awareness of fundamental rights and gender inequality issues. The supply of electricity has given men more opportunities than women.	Only providing electricity and involving women in income-generating activities will not bring change in their status if women's powerlessness to avail themselves of the various opportunities prevent them from changing their situations.
Ramani, 2002	India, Indonesia, Mongolia, Myanmar, Nepal, Philippines, Sri Lanka, and Vietnam		Microloans to poor households/communities for energy-intensive microenterprises.	It raised women's self-confidence as a result of their new or improved abilities to contribute to the household income and their greater control over self-generated finances.	
Bryce and Soo, 2004	Bulelavata, Solomon Islands		Microhydro	The Bulelavata Women's Committee's (BWC), at the community request, has taken over the responsibility for collecting and banking the monthly	

				electricity tariff charges from all the village households. Members of the BWC have been selected to attend meetings outside their own village.	
Oliveros, 1998	Peru		Energy system, microhydro plant, grain mill, 2 battery chargers, 70 posts for public lighting and initial lighting of 45 houses.	Although there was no specific effort made to further the situation of women during this project, nevertheless their participation was active and continuously promoted, since there was a strong current favouring women. As a result, during the period of the project, a woman was elected as the first female mayor in this region. The president of the Cooperative at the time of the article was also a woman.	
Khuller, 2002	Pavur village, India		Solar Basket Fund to be used to finance PV systems on a commercial credit basis.	Women's leadership became the key factor in the project's success. Women speak out most strongly about the benefits, and they take on a leadership role in popularising the technology.	
Khan, 2001 b	Bangladesh		Fluorescent lamps that use direct current and rechargeable batteries.	Women who are involved in lamp construction are being heard more by their community. As a result the project has been successful in removing some of the social and cultural discrimination experienced by rural women. Participation in the project requires women to regularly spend time outside the homes, helping to overcome a traditional social barrier.	
Khamati-Njenga, 2001 a	Kenya		Improved stoves project, as an income generating activity for women	With increased confidence and social status, several women have since become active in community development committees.	
Rana-Deuba, 2001 b	Nepal		Rural Energy Development Program	The women in COs have a distinct voice in local affairs and their self-confidence has increased, as has their capability for independent and collective action. The women in the COs are emerging as leaders and decision-makers within	

				the programme, in the community, and within their households.	
Burn and Coche, 2001	Mali		Multifunctional Platform	Involvement with the platform enterprise increases the ability of women to bargain and negotiate within existing norms, since an available energy supply reduces the time and energy intensity of women's obligations and also increases the possibility of income generation.	
IDS, 2003	China		Electrification	The studies all strongly emphasize the lack of women's voices at village level. Although in principle each village committee should have included a women's representative, this post was not subject to the payments or allowances that were provided for the other three office holders: the chairman, secretary, and party representative.	
Madon, 2003	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400 unelectrified households and 100 small-business users.	Electrification	Electricity has not resulted in a change in women's bargaining position within the household or the community.	
Massé, 2003	Sri Lanka	A total of 1,573 households of which: 1,028 grid-connected; 1,177 electrified; 396 not electrified; and 275 unelectrified in electrified villages	Electrification	Electrification has not yet resulted in greater empowerment or heightened participation in local societies.	
Massé, 2003	Sri Lanka	A total of 1,573 households of which: 1,028 grid-connected;	Electrification	It seems that extra time may not be used to participate in community responsibility (empowerment). Less than 1% of women use the extra time	

		1,177 electrified; 396 not electrified; and 275 unelectrified in electrified villages		to go to women's societies, and they also don't participate in any other community groups.	
Smith, 2000	Dominican Republic, Honduras		Electrification	The conscious-raising campaign has been successful with women representing 33% of loan recipients since 1996 in the Dominican Rep. Women gain confidence by being responsible for the system's payment and the accomplishment made by women who ultimately achieve full ownership of the system at loan end.	
Smith, 2000	Dominican Republic, Honduras		Electrification	Enersol has found that women in the Dom. Rep. play an even greater role in the procurement, installation and upkeep of decentralised energy for water pumping than they do with household PV systems. Women emerge as the natural leaders of community water associations and take assertive action in approaching NGOs and microenterprises to find out how to acquire such systems. Evidence also indicates that women take key responsibility for enforcing the proper use of the water system and ensuring that all community members make finance payments.	
Mahat, 2003	Nepal		Rural Energy Development Program (REDP)	There was a positive change in women's and men's attitude towards women's mobility and participation through the awareness raising implemented by REDP.	
Berthaud, 2004	Bangladesh		Fluorescent lamps that use direct current and rechargeable batteries.	In the community, the production and marketing of a useful good by women has modified gender roles. The island community was at first reluctant to accept women working outside the home. However, the village as a whole and stakeholders became more	

				supportive after reaping the benefits of improved lighting in houses and such public spaces as the mosque and the market. Even more encouraging, women are now able to have a voice in the community and participate in village meetings and decisions.	
Sinha, 2003	Puriras, Chattisgarh, India		Women's self-help group (SHG) trying to get electricity in their village	The SHG provided the women with the opportunity to put together the money they earn to improve their income and status, and also time gave them courage to collectively demand something that they feel is rightfully theirs. The women themselves set the agenda of what problems to solve and how to solve them.	
Brew-Hammond and Crole-Rees, 2004	Mali		Multifunctional Platform	The 'invisible' time and energy spent on repetitive work is made visible for all group members, as women re-organise their allocation of time and gain social as well as economic recognition for the work they do.	
Sulpya, 2004	Cambodia		Improved stove production	Women involved in stove production have gained confidence in the business, and are more self-assured in dealing with the ICS middlemen, NGOs and raw material suppliers. Decision-making in stove production and acquiring raw material is done by the women themselves. The men play mainly supportive roles by delivering stoves to middlemen, storing stoves, collecting fodder and fuel for cooking.	CFSP provided improved stoves training to men and women. The first year only one woman attended, who became a successful stove producer. Recently 11 women attended the training. CFSP also provides support in terms of promotion, education and quality control.
Denton, 2005	Senegal		Multifunctional Platform	The multifunctional platform has also helped create this social mobilisation since the platform is managed by women and considered as a community property. It has provided many women with a sense of purpose and a voice not only to identify their needs but to take on board more societal roles.	

Annex 8: Control over Energy Services – Empirical Evidence

Table 1: Decision-making on acquiring energy services

Reference	Location	Sample Size	Energy Intervention	F	M	N	Notes
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity		X		Men seem to take the final decision about what appliance to buy.
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity	X			Women in female-headed households do exercise autonomy in the purchase of appliances. Frequently they seek advice from male relations or friends.
Madon, 2002	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400 unelectrified households and 100 small-business users.	Domestic electrical appliances			X	When women head a household, more importance is given to the purchase of domestic appliances than in male-headed households.
Madon, 2002	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400 unelectrified households and	Electricity		X		The idea for as well as taking steps to apply for electricity connection appear to be essentially the male adult's responsibility and 80–90 percent of electrified households are headed by men (1,154). However, it is the wife's responsibility for 25–30 percent of respondents when the households are headed by women (146)

		100 small-business users.				
Makan (1995) in: Clancy, Skutsch and Batchelor (2003)	South Africa		Batteries and equipment		X	female members of the household had no access to the equipment and no control over battery purchase. Decisions about what to buy and who owns it were made by the male members of the household.
Muneer and Mohamed, 2003	Khartoum State, Sudan		Improved cookstoves		X	Failure to recognise women as the decision-makers regarding adoption of improved cookstoves, resulted in a situation where they were not targeted by the dissemination and adoption efforts and activities. Also, the fact that improved cookstoves are purchased from the very meager proportion of the household's financial resources that the wife controls, was not taken into consideration when setting its marketing and pricing policy.
Sengendo, 2005	Uganda		Solar home systems		X	While 53% of the respondents reported that men made the decision without involving women, only 13% had made the household solar installation decision solely. On another keynote, the proportion of the male respondents who considered the views of their wives during the household solar installation process (73%) was much higher than that of males putting into consideration females' views (40%) before the final household decision. However, no female was reported to have solely made a decision within the household on significant issues without first consulting a male counterpart.
Sen and Barnes, 2004	India	5,000 women surveyed	Domestic appliances		X	Since household decision-making remains largely the prerogative of men, the needs of women remain largely ignored or unmet. The use of those appliances that directly reduce energy and effort required of women is almost nonexistent in rural India.
Opdam, 1997	Nepal		Biogas		X	It was the men's and not the women's decision to adopt the technology.
IDS, 2003	China		Improved cookstoves		X	Although in general men were said to make the decisions on stove design and building, most women with these stoves had heard about them from relatives in their mothers' villages and persuaded their husbands to get one of the same design.

Table 2: Who pays for the improved energy service by gender

Reference	Location	Sample Size	Type of energy service	F	M	N	Notes
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity		X		In some instances women buy appliances with their own incomes and bear the brunt of their husband's displeasure. After the initial disagreement, men turn round to utilise the appliance and try to exercise control over it.
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity			X	When we look at information about meeting the cost of wiring, women's interest in having access is demonstrated by their contribution to the cost of wiring.
Hawthorne, 1996	USA		Electricity		X		Many women are dependent on their husbands for financing the appliances and the electricity.
Fernando and Keter (1996) in: Starkey, 1998	Kenya		Donkey transport	X			An existing merry-go-round savings and loan scheme was used to enable a women's group to acquire donkeys. Loan repayment was possible through income generation from hiring to others and from the trading of transported goods.
Madon, 2002	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400 unelectrified households and 100 small-business users.	Electricity			X	The responsibility for paying electricity bill falls to the head of household, that is, a female or male according to the cases.
Mahat, 2003	Nepal		Biogas		X		Male members of the household mainly made the decision on the location and installation of biogas plants, while women often had to operate the plants. Women were not fully aware of the full potential of biogas plants.

Mahat, 2003	Nepal		Improved cookstoves		X		More men than women were involved in the construction of ICS and women were not given a chance to address any technical problems concernign their use. Sometimes women destroyed the stoves because they did not find them convenient.
Berthaud, 2004	Bangladesh		Solar home systems		X		In the SHS project, the poorest clients of the microfinance institutions are still unable to purchase an SHS. Grameen, for example, has sold 12,303 SHSs, but only 1,046 have been sold to women.
Wamukonya, 1999	Namibia		Solar home systems		X		Ministry of Mines and Energy established a revolving fund for dissemination of SHS. Selection of loan applicants does not necessarily target women. Rather, the selection is income dependent. Qualifying applicants must have a minimum annual income of N\$15,000 (27% of the loan beneficiaries are women). As such, the poor, most of whom are women, are excluded.
Barrett and Browne, 1994	The Gambia		Use of coos mills	X			Women meet the charge of the mills from their own income (51%) or a combination of their own and their husbands' income (49%).
Sengendo, 2005	Uganda		Solar home systems			X	60% and 40% of the female and male respondents respectively reported that though credit was available, they never had enough income to make the 30% downpayment for the solar energy credit installation loan. Rather, together with their spouses, they pooled the downpayment funds and together worked hard for the completion of the loan repayment.
Smith, 2000	Dominican Republic and Honduras		Solar home systems			X	The conscious-raising campaign has been successful with women representing 33% of loan recipients since 1996 in the Dominican Republic. Women gain confidence by being responsible for the system's payment and the accomplishment made by women who ultimately achieve full ownership of the system at loan end.

Table 3: Control over improved energy services

Reference	Location	Sample Size	Type of energy service	F	M	N	Notes
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity		X		91.7% of respondents say men control access to electrical appliances within household.
Mensah-Kutin, 2002	Ghana	Sample population: 300; 55% male. 110 participated in in-depth interviews and 4 focus group discussions were held in each location.	Electricity	X			Women exercise greater control over a number of appliances for commercial purposes. But if a man pays for them, he is usually interested in their functioning and how much income they generate.
Hawthorne, 1996	USA		Electricity		X		Many housewives are dependent on mostly male experts to fix malfunctioning machinery
Mahat, 2004	Nepal		Microhydro		X		Women received no training in even minor repairs. If power failed, they had to rely on the male village technician, or male members of the family for repairs. The technology was controlled by men.
SOS (1995) in: Starkey, 1998	Mali		Improved transportation		X		Women used to headload goods between isolated villages and regional towns. As roads developed, the owners of animal-drawn carts and motor vehicles (usually men) became able to dominate marketing channels. Unless they had access to road transport women traders became restricted to within-village transactions. While this reduced transport drudgery, it also reduced women's incomes and independence.
Madon, 2002	Indonesia	Total of 1,800 respondents; 1,300 electrified households along with 400	Electricity			X	There is little or no discrimination in access to electricity between male- and female-headed households. Even though women operate and manage home systems, male service providers tend to communicate with other men as the consumers of their services. Women are

		unelectrified households and 100 small-business users.				usually left out of the direct information chain, notably on use and maintenance. Taking care of anything that relates to electricity is mainly the male adult's responsibility.
Berthaud, 2004	Bangladesh		Electricity		X	The members of the PBS cooperatives (rural electricity cooperatives) are predominantly male. Consequently, women's concerns, suggestions, and input regarding PBS service are not accounted for. Within the PBS, members elect a board of 15 advisers. Because elected members invariably are male, an additional appointment of 3 lady advisers is made to each board. These advisers are intended to represent women's interests in PBS activities. They are, however, nonvoting members, and it is unclear how much influence they actually have on predominantly male boards.
Bryceson and Howe, 1993	Eastern Uganda		Bicycles		X	Very few women ride bicycles and those that do are considered 'too liberated' and 'acting like men'. Male bicycles with crossbars are almost exclusively available which exacerbates the fact that African women's normal clothing does not make it easy for them to ride a bicycle.
Goe in: Bryceson and Howe, 1993	Zimbabwe		Animal carts		X	Zimbabwean men with animal carts, when given a choice between conserving the energy of their animals or their womenfolk favoured the animals. In the men's eyes, women were not only a means of transport on a par with draught animals, they were a comparatively free means of transport, considered to be more enduring and hence more exploitable.
ESMAP, 2004	Bangladesh		battery-operated direct current (DC) lamps, batteries, battery-charging facilities, diesel-operated microgrid electrification, and solar home systems.	X		This project has trained 33 professional women from 18 different government organisations and NGOs in the principles of RETs. As a result, these women have formed a network to share knowledge and disseminate information. It is envisaged that these women's network, with proper technical assistance could assume leadership roles in developing and implementing future RET use.
Overton (1996) in: Peters, 2001	Mozambique		Bicycles		X	Bicycles that were distributed to poor village women to alleviate their extreme transport burdens were taken from them by their husbands or other male relatives, who often only used them for recreational and status purposes.
Sengendo, 2005	Uganda				X	There existed a conflict of interest at the time of switching off the solar power light at night. Whereas the wife, husband or children could switch on the solar panel, as long as night befalls (7:00-8:00 pm), switching it off was

							reported to be a man's decision and sometimes elapsed into family quarrels. By the time the women would be through with kitchen work, the men would be tired and in need of retiring to bed. Yet, this is the time when women also wanted to sit down and watch TV if the household had any. The man normally ordered the children to switch off the lights so as to go to bed. This type of conflict was reported by half of the female and 40% of the male respondents.
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Annex 9: Women Professionals in the Energy Sector – Empirical Evidence

Reference	Location	Type of institution	Women's representation	Notes
Eneqo in: Roehr, 2001	Europe-wide	Energy economy	Below 20%	There is a wide variation between countries
OSW (1999) in: Clancy and Roehr, 2003	Australia	Electricity, Gas and Water Sector	Women make up 20% of the work force, but occupy less than 5% of the technical posts.	This share is even smaller in certain areas and at certain levels within the electricity economy.
Hoppenstedt- Analyse in: Clancy, Oparaocha and Roehr, 2004	Germany	Electricity economy	The share of female technical staff is around 6%, in decision-making positions 4% and in top management less than 1%.	
Eurelectric et al (1999) in: Roehr, 2001	Europe	European electricity market	The findings of the study indicated that the opening of the market does not have positive effects on the employment of women. On the contrary, in the countries where the reorganisation is already advanced, it must be noted that the share of women falls outstandingly.	The effects of the liberalisation of the European electricity market and the associated planned efficiency on the employment of women in this sector have been investigated in a study commissioned by the European federation Eurelectric.
Clancy et al, 2004	Bangladesh	Rural Electrification Board (REB)	As of mid-2003, within the REB, only five Deputy Directors, out of a total of 25, were female. Only one Assistant Engineer out of 152 was female. In the PBSs, only one Class I officer (Senior Management) out of 591 officers was a woman.	
Smith, 2000	Dominican Republic and Honduras	Microenterprises in solar home systems	Of the approximately 30 active businesses currently developed with Enersol support, two have women in significant leadership positions and one relies on a female technician for system installation and maintenance.	These numbers fail to reflect the concerted effort Enersol has made to recruit women at all stages of microenterprise development. Reasons: social norms and preconceived notions.
STEG, 2005	Tunisia	Tunisian Electricity and Gas Company	The share of women working in executive positions rose from 16,0% to 16,6%. The share of women working in management positions rose from 13,0% to 13,4%. The share of women working in implementing positions dropped from 7,6% to 6,5%.	STEG has an equal hiring policy in terms of gender

