

Abstract

Many people believe that electricity development has been and continues to be beneficial to women. Early proponents of electrification of the United States, who included feminist visionaries, home economists, utility and transportation companies, and politicians, claimed that electrification would positively change the lives of women. While the vast majority of the United States is already electrified, many of the less developed countries (referred to collectively as the South in this paper) are not. Proponents of electrification of the South often use the same arguments that were used during the electrification of the United States. This paper shows that women in the United States have not significantly benefitted from electrification. The arguments are then extended to women in the South, where the negative impacts of electrification are often more severe. It is argued that women in the South are far less likely than women in the United States to realize benefits from electrification, and that, since they often rely directly on the local environment for their family's subsistence, they will likely suffer from the negative effects of electrification far more severely and directly than have women in the United States.

About the Author

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Women and Large-Scale Electricity Development

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WOMEN AND LARGE-SCALE ELECTRICITY DEVELOPMENT

Introduction

I have often encountered the opinion, typically from men, that electrification has been good for women. As an energy engineer, a large portion of my work has been to advise on the importance of and the methods of reducing energy consumption. The nay-sayers to this reduction philosophy often proffer the "woman argument." According to the argument, electric appliances have liberated women from household duties, which has *allowed* us to join the paid labor force and gain equality with men. They claim that women (usually referring directly to their wives) will never surrender their appliances, even if the wholesale destruction of the environment is at stake. Backs go up when I say that large-scale electrification of the now un-electrified regions of the world has the potential to result in environmental doom. I am often berated for even suggesting that the women who live in these regions of the world be denied the "liberating" technologies made possible through electrification. I began to question myself; who am I--an engineer sitting at a computer, under an electric light, liberated to do so by my vacuum cleaner and my food processor--to suggest that the United States significantly reduce electricity consumption and that the now un-electrified regions of the world should not follow our electrification pattern? This paper is an attempt to address this issue of women and electrification. Has it been positive, negative, or neutral for us?

The argument that electrification is good for women is not a new one. Women played an important role in the many strategies to "sell" electrification in the United States. By the mid-19th century, when electrification of the United States was still decades away, both home economists and feminist utopian visionaries--although their visions were quite different--saw electrification as a positive force for changing the nature of women's work in the home. Home economists believed that electrification would allow women the opportunity to run the home like an efficient industry, thereby freeing their energies for a consumer lifestyle (Nye 1990). Feminist utopian visionaries saw electricity as a tool for redesigning domestic life based on communal services, and even for the complete removal of housework from the home (Nye 1990). According to Nye (1990), by the early 20th century, utility companies and appliance manufacturers awoke to the potential profit in exploiting the domestic market and campaigned heavily to women, espousing the benefits originally expressed by the home economists. Marketing to women included mass advertising, door-to-door selling, parades, and public relations to women's clubs, schools, and organizations, with promises of increased personal freedom and threats of being an unsuccessful parent if too much time were spent on housework. The early 20th century also saw the inception of political and popular campaigns for rural electrification, which claimed that electricity would reduce the heavy labor burden of rural women, as well as raise their standard of living to equal that of urban women. Electric rails and the electrification of industry were determinants in the development of suburbs, which proponents of the Victorian ideology of the home saw as a more appropriate environment for women than the city (Wajcman 1991).

Today, after electrification has reached the vast majority of homes in all areas of the United States, electricity is still touted as a blessing to women. According to some, electrification of the home has freed women from the drudgery of housework, which in turn, has freed women to work outside of the home. Hopes are hung on electrification of industry, which will offer women entry into typically male-dominated professions, now made less physically demanding by electrified processes (Wajcman 1991). Several of my colleagues hope that the electronics and communications age will offer women a larger role in the technical and skilled labor force. As mentioned above, some of my colleagues believe that electricity is so important to women that it is we who prevent society from reducing electricity use and moving towards a more environmentally benign energy lifestyle.

The belief that electrification is positive for women goes far beyond the border of the United States, often with detrimental results. The United States, through numerous development and lending agencies, funds many large-scale electricity developments in the un-electrified regions of the world. The claimed benefits of these development projects contain promises to women similar to those seen during our own electrification process. Typical sentiments include that electrification will improve the overall economy, and by extension the standard of living of women, that electric appliances will free women from household drudgery, and that electric lights improve women's literacy rates and play a role in the reduction of child-bearing (Adams and Solomon 1985; Munasinghe 1987).

In this paper, I question whether electrification has been truly beneficial to women in the United States. It will become clear that the promises made during the electrification process were barely fulfilled, if at all. Furthermore, it is questionable that the benefits touted today are truly benefits or that they really have anything to do with electrification or electricity. With this in mind, I then discuss the way negative aspects of electrification affect women. It is a fact that electricity generation is one of the main causes of our emerging global environmental crises, as well as localized environmental degradation and its attendant negative societal implications. I will discuss the ideology presented by the growing eco-feminism movement, which suggests that women hold a greater stake in ending this destruction than do men, as well as discuss surveys and studies that have shown that women are more likely than men to oppose developments that cause local environmental degradation, increased danger, or related actions (each of which can be associated with large-scale energy developments). Furthermore, several studies have shown that poor and minority communities suffer more local pollution than the rest of society. I will show that the feminization of poverty, combined with lack of political clout of poor or minority women, reveals that women may bear more of the negative environmental effects of the electricity industry than men.

The situation for women in the South is even more critical than for women in the United States. These women, except the minority elites, are far less likely than women in the United States to realize benefits from electrification. With development projects aimed specifically at men, and with women of the South having far fewer educational opportunities and legal rights than women in the United States, as well as the vast majority of

responsibility for meeting family needs, women of the South can expect to receive few benefits from electrification. In fact, I will argue that rural poor women of the South, who often rely directly on the local environment for their family's subsistence, suffer the negative effects of electrification far more severely and directly than women in the United States. The environmental degradation, as well as the new technologies that come with electrification, often lead to a reduction in the resource base available to women as well as to an increase in their workload and a decrease in their social status.

Finally, I will make some recommendations for approaching electrification, taking into account these issues. I will argue that electrification in itself is not a means to equality or even significant improvement of women's lives in the United States or the South. Considering this and the negative environmental impacts of electrification on women, it is suggested that women in the United States consider alternatives to our current energy hungry society and look for new more environmentally benign approaches to electrification and that we consider alternatives to large-scale electrification of the South.

Brief History of Electrification in the United States

Although by the mid-1880s electric lights were a sure route to box office success in theatrical productions, it was not until the invention of Edison's incandescent light, centralized power generation, and the large-scale marketing of electrified services, that electricity began its transformation from a tool to create theatrical spectacles to a feature in every home (Nye 1990). The electric utility industry, which centrally generated electric power for distribution to clients, was born in 1882. The industry initially consisted of small electric utility companies with varying products for sale--AC or DC power, and several different frequencies and voltages (Fenn 1984; Nye 1990). In the first decades of electrification, many electricity generating plants were built to serve a particular need. Individual towns, street car lines, and factories had their own plants. At the turn of the century, the electric utility companies began organizing into large holding companies, supplying predominantly AC power. By the early 1930s, central station utility companies provided 80 percent of the country's electricity, with 16 holding companies controlling 75 percent of the electricity generation (Nye 1990).

By the last two decades of the 19th century, sporadic displays of electric lighting could be seen in theaters, shop windows, on streets, and in homes of the rich. It was at the world's fairs and exhibitions, however, that thousands of people were first exposed to the "wonders" of electricity. Electrical corporations exhibited their products and advised on the planning of the fairs, where electricity, displayed through lighting, transportation, and special effects, became the symbol of progress and modernization for the thousands of visitors. At these fairs, electricity was also portrayed as a symbol of racial superiority, as electrical displays were juxtaposed with exhibits of "primitive" cultures (Nye 1990).

By the 20th century, electric lights were used commonly in advertising signs and for street lighting. Merchants used lights in streets and signs to attract customers. City

managers and politicians promoted street lighting to deter crime, to improve safety for transportation, and to boost civic pride. Street lighting was viewed as a sign of local progress. By the late 19th century, many cities, crowded with traffic, began to consider the electric rail. By 1890, 200 cities had built or ordered electric streetcar systems. Also in the first decades of the 20th century, inter-urban trolley lines displaced many railroads as the main carriers of local passengers. By 1919, the trolley served as the main link between rural and urban areas, providing rural dwellers access to markets, entertainment, and centralized schools (Nye 1990).

After 1900, electricity also contributed to changes in the factory. Electricity provided flexibility in factory location by removing the necessity of a water power source, and electric motors and technologies replaced many previously human labor jobs. According to Henry Ford, electricity was required to perfect the assembly line (Nye 1990).

By 1910, the electric utilities started pursuing the residential market and, by 1930, 85 percent of urban and suburban homes were electrified. In the early 20th century the demand for rural electrification began to grow, and by the 1930s rural electrification was viewed in terms of rights and minimal standards. In 1933 the Rural Electrification Administration was formed to bring electricity to rural America. By 1940, the electrical grid covered virtually the entire United States (Nye 1990). (See Table 1 for a summary of the timeline of United States electrification.)

Today, grid-supplied electricity reaches almost every home, industry, and office in the United States. The electric utility industry consists of about 3,400 companies and supplies electricity to more than 92 million customers (IEA 1992). Utility companies can be investor-owned corporations, public systems owned by the federal government, public systems owned by states, municipalities, or utility districts, or cooperatives. Investor-owned utilities account for about 77 percent of the generating capacity of the entire system, federal systems, 9.6 percent, cooperatives, 3.3 percent and state and municipal systems, 10.3 percent (IEA 1992). Electric utilities are granted monopoly franchises to provide power to specific areas within a state and are required to meet all power requirements of customers in that area. Regulatory agencies control the rates that can be charged customers and the amount of profit the utility company can make (Fenn 1984). The entire electrical system in the United State has a capacity of 684 GW and in 1993, customers used 2.88 Trillion kWh of electricity. (See Table 2 for the breakdown of primary energy used for generating electricity in the United States.)

Since the invention of the incandescent light and the creation of the electric utility company, electrification of the United States has been largely a centralized and private venture. By 1930, before social and political plans for centralized rural electrification materialized, many farms were electrified by self-contained electricity generating plants. Today, although some individuals in remote locations, or others making individual choices continue to use independently generated electricity, the vast majority of electricity serving people in the United States is supplied through the central grid (Lee 1989). Although

electrification was the source of many social visions, and privatization did not go unchallenged, to its suppliers electrification was seen as an instrument for profit and electricity as a commodity (Nye 1990). The social, political, and economic context of the United States was ripe for the idea of progress through electrification. As described in the next section, women fit perfectly into the "sale" of this idea of progress and, with it, the profit schemes of the electric industry.

The Role of Women in the Electrification of the United States

As stated above, women were included in the societal "selling" of electrification. Feminist visionaries, home economists, the utility and appliance companies, the transportation industry, and the politicians all included women in their designs for electricity.

During the 19th century, American feminists wrote several treatises envisioning utopian communities and housing that were aimed at addressing inequalities caused by men's exploitation of women's domestic labor. Visions included communal kitchens, laundries, dining facilities, and child care, either as cooperative ventures or as a professionalized system based in socialist ideology (Wajcman 1991). This new system was going to free women from the oppression caused by the exploitation of their unpaid work and allow them the time and energy to pursue other interests outside of the home and, in some visions, to become economically independent. Just before the turn of the century, electricity became an integral part of these housing and community designs (Nye 1990). With electricity came visions of new technologies that would facilitate the complete redesign of domestic life.

At the same time, women of the domestic science movement saw the connection between electricity and housework entirely differently, yet they also believed electricity would be beneficial to women. They perceived the new electric technologies as the key to personal freedom, but focused on the all-electric private, rather than communal, kitchen. The home was to function like an industry managed by a woman, who, with electric appliances, could free herself from drudgery and raise the quality of her family's life (Nye 1990). Home economists proposed that scientific management of the household could add dignity to household labor, as well as help the middle-class housewife deal with the rapid decrease in the availability of domestic servants (Rothschild 1983). Finally, home economists envisioned, and many social theorists adopted, the idea that with the aid of electric appliances the home would become a place of consumption rather than production (Nye 1990). Although quite different from those supplied by the feminist movement, home economists also had visions of electricity facilitating a positively changed household.

Previously seen as a profitless sector, the utility companies discovered the untapped domestic market in the first decade of the twentieth century. The domestic market suddenly appeared to be profitable by offering a nighttime load to balance the heavy daytime loads of industrial and transportation company clients, while taking advantage of the power lines and generating capacity already strung throughout most cities. Marketing to women

followed quickly in the line of the home economists. It was aimed at the single-family household and the lone housewife. Although the feminist domestic reform movement was already foundering, the profit opportunity of encouraging the individual household must have occurred to the electricity industry. Individual households require more appliances and use more electricity than efficient centralized communal or cooperative services (Rothschild 1983). To this end utility companies organized and contributed money for demonstrations of model homes equipped with every imaginable electric device and promoted better kitchen lighting to increase electricity use. Traveling appliance demonstrations, aimed at women, were sent to fairs and conventions, pushing the idea that electricity was essential to modernity (McKay 1983). Thomas Edison explained in a 1913 *Good Housekeeping* interview that the "woman of the future" would be "rather a domestic engineer than a domestic laborer, with the greatest of all the handmaidens, electricity at her service" (Nye 1990). Critics, however, claimed that the utility companies hired home economists and displayed new technologies to gain control over the domestic sphere of production as they had in the factories (Nye 1990).

After many homes had already been electrified, the appliance manufacturers and distributors joined and heightened the marketing schemes of the utility companies. Appliances were "pushed" through mass advertising, door-to-door selling, contests, and parades. Public relations by large appliance manufacturers involved women's clubs, schools, local governments, and home economics organizations. In the 1920s, large campaigns aimed at women were launched in mass circulation magazines. The typical consumer was depicted as the lone housewife who focused all her energies on the home (Nye 1990). The General Electric "Any Woman" campaign was designed to show how electrification liberated the energies of the housewife. The campaign repeated the idea that any woman who does the work by hand that could be done electrically is working for three cents an hour (Nye 1990). Many ad campaigns and articles presented electric appliances as replacements for servants. One slogan proclaimed that electricity provided the housewife with ten home servants. The advertisements later suggested that with electric appliances women could find emotional satisfaction in routine household tasks. Housework was no longer portrayed as a chore, but as an emotional experience and an expression of loyalty and affection for one's family; however, women who failed at these new household tasks should feel guilty about their failure (Cowan 1979). This common theme is presented in a 1925 General Electric ad that claimed that the "successful" mother would not "give to sweeping the time that belongs to her children" (Nye 1990). Advertisers pushed the idea that the "index of civilization" of a home was based on the extent to which a woman no longer did physical work but relied on electric appliances (Nye 1990). Although the electric industry did not initiate the idea that electricity and the appliances it powered were beneficial to women, their marketing schemes conspired to change the idea from "beneficial" to "indispensable."

Some viewed electricity as positive for its role in the creation of suburbia. Beginning in the mid-nineteenth century, the Victorian ideal of the home was portrayed as the antithesis of the factory--a haven from the immoral and alienating environment of business and industry. This sanctuary of a home was seen as the most appropriate setting for

women's lives and was epitomized by the Victorian villa in a garden suburb (Wajcman 1991). Twentieth century suburbia is the replication of this ideal, where women, who, according to this ideology, were especially close to nature and unable to withstand the corrupt influences and harsh conditions of city life, could live safely and raise children successfully. Widespread electrification, which provided better and more comfortable transportation, facilitated the relocation of industry to rural areas, and provided domestic services outside of city cores, brought the possibility of suburban life into the reach of millions.

Electric trolleys were one of the first wide-spread users of electricity. By the beginning of the 20th century hundreds of cities had built or ordered streetcar systems, many developed out of old horsecar lines and were built by investor groups who also specialized in real estate speculation (Nye 1990). After 1900, inter-urban trolley lines displaced some railroads as main carriers of passengers by providing more frequent service, more stops, and cheaper fares than the railroads. These inter-urban lines provided a link from rural areas to nearby urban areas, offering rural, and later suburban, people access to markets, entertainment, schools, and employment. Women were included in the list of supposed beneficiaries of this new access. The rails facilitated men's commutes from their suburban homes to their city factories or offices, thus enabling women and children to live an ideal lifestyle close to nature. This faster, more comfortable, transportation also allowed women who lived in rural areas, and later in suburbs, to more easily visit friends and to shop in distant places (Nye 1990).

Furthermore, until electrification, a factory's location was dependent on its proximity to a power source, which was typically a fast-moving stream that powered a water wheel. Electrification provided the flexibility to move industry closer to rural areas, thereby producing easier access to suburban life. Similarly, the spread of the electric grid to outer areas of cities made suburban life more attractive to women who had been indoctrinated in the necessities of electric appliances. Through the electrification of transportation, industry, and non-urban homes, women could live comfortability in the supposedly more ideal setting of the suburbs.

Finally, women were included on the list of beneficiaries of rural electrification in the political battles of the 1920s and 1930s. Beginning in the early 20th century, farm spokesmen brought up electrification as the solution to the lack of modernization in rural America (Nye 1990). The proponents of rural electrification battled the private utilities, which refused to serve the seemingly profitless rural sector but also opposed the development of public power companies (Brown 1980). Eliminating the drudgery of home life, along with improved sanitation and greater agricultural yields, was a plank in the rural electrification political platform. By 1920, the plight of rural women doing domestic labor without the aid of electric appliances so enjoyed by their urban counterparts was a political cause. In the battles for rural electrification a politician from Nebraska lamented the thousands of women "growing old prematurely, dying before their time, conscious of the great gap between their lives and the lives of those who the accident of birth or choice

placed in the towns or cities" (Brown 1980:21, quoting Senator George Norris). Time consuming laborious chores were promised to disappear for rural women, just as they supposedly had for urban women. Rural electrification was also professed as a measure to stop the migration from country to city, which would allow women to remain in their "appropriate" homes near nature. In the 1930s, after years of political battles, rural electrification became a social program based on rights and standards for rural Americans. The Tennessee Valley Authority was created in 1933 as the experimental cooperative to establish the possibility of publicly developed rural electrification. Also in 1933 the Electrical Home and Farm Authority was created to enable rural residents to finance home appliances (and use more electricity) (Brown 1980). With improvements for women as a significant part of its *raison d'être*, the Rural Electrification Administration (REA) was formed in 1935, demonstrating a federal commitment to bring electrification to the rural areas of the United States (Brown 1980).

Electricity and Women Today

Today, fifty years after the majority of the United States was electrified or in the process of electrification, it is still believed that women benefit significantly from electricity. The portrayal that electric appliances would free women from household labor or make household labor enjoyable has been accepted as fact by many. Furthermore, electrification has been awarded some credit for women's access to the labor force, economic independence, and equality with men. Changes to industry and professions brought about by electrification have also been deemed beneficial to women. Finally, in my work as an energy engineer, I have encountered the suggestion that women, so enthralled with electric services, are the roadblock to our ability to reduce our energy consumptive lifestyles.

As described above, hopes that electric appliances would free women from the drudgery of household labor--or, in the eyes of feminists, from their exploitation by men--were frequently expressed during the period of United States electrification. Today, these hopes are viewed as facts--that modern technology has eliminated or made less arduous almost all of women's former household tasks (Wajcman 1991). The image of the housewife sitting at home watching soap operas or frivolously spending money on shopping sprees is pervasive in popular media. Beyond the image of the lazy housewife, electrified household technology has been given credit for freeing women to enter the labor force. It is believed that, free of household duties, women have the time and energy to hold jobs outside the home, providing them with a means for economic independence and giving them greater equality with men.

Electrification has also been viewed as a force that has changed industry and some professions in such a way as to allow women access to jobs for which they were deemed ineligible or from which they were barred. Technological developments, many predicated on electrification, have been credited with enabling women to enter fields that had been deemed too physically demanding before the replacement of physical work with technology (Wajcman 1991). For example, the shift of engineering from the dirty physical work of the

past to the clean, computerized office of the present is popularly credited with attracting more women to the profession.

The Fallacy of Electrification's Benefits for United States Women

After more than a century of hopes and promises surrounding women and electricity, it is important to examine whether electrification has indeed benefitted women and, if so, in what ways. First it is necessary to address issues of race and class, as the "women" who were supposedly going to receive the benefits of electricity were typically white, middle- and upper-class women. The term "women" rarely refers to a unified group, and the hopes and promises for "women" often excluded the experiences of non-white, poor, or working-class women. It must be questioned whether the supposed benefits to even middle- and upper-class white women have been achieved.

It is clear from the marketing of home appliances as replacements for servants that only privileged women were targeted for electricity's benefits. Middle-class women with appliances could now do without their domestic servants. The disappearance of the paid and unpaid servant was a significant change in the middle-class lifestyle, but the effect of home technologies on the former servants is rarely mentioned. The decrease in available servants stimulated the home mechanization, but home mechanization may also have hastened the disappearance of servants (Wajcman 1991).

Furthermore, the idea that domestic technologies would free women to pursue other interests outside of the home had no relevance to poor and working-class women, who had always worked outside of the home. The Victorian ideal of the home in the rural setting, away from the corruption of the working world, also had little relevance to the lives of poor or non-white women, although the ideal held hegemony over the way many working-class women interpreted their experiences (Cockburn 1985). Finally, although domestic technology is now widespread, reaching across class and racial boundaries, during the early days of electrification it is unlikely that poor women could afford the electric appliances that middle- or upper-class women could, which would have made their experiences quite disparate. With these race and class issues in mind, the next sections examine whether the many supposed benefits of electrification to women even benefitted middle- and upper-class white women.

It is obvious from today's lifestyle that the communal housework ideas of feminist visionaries did not have a lasting effect on women's domestic labor. These ideas were perceived as radical changes to the family structure, eliciting satirical writing describing a world without families and anti-Communist responses. In 1887, one satirical response "described a world where the family had disappeared, because housework was performed by machinery and took only two hours a day" (Nye 1990:247). Some attempts to realize communal service were made through apartment hotels that offered central kitchens and laundry services. These efforts, however, were accused of "robb[ing] the family of intimacy and individuality, and strip[ping] women of their 'normal' role" (Nye 1990:248). It was also

argued that apartment houses could encourage promiscuous sexuality and female rebelliousness and were a danger to "American domesticity" (Nye 1990:249). Specific drawbacks that accompany dense living (e.g., lack of space and noise) and a likely class bias that associated dense living and communal amenities with impoverished conditions combined with these public attacks and criticisms to prevent the feminist vision of a redesigned home and housework from being realized in any lasting and widespread way (Wajcman 1991).

The success of the home economist vision of the electrified household has also been questioned. Research over the past 30 years documenting the effect of domestic appliances of women's work in the home has debunked the myths that these appliances would reduce, if not eliminate, women's work in home. Early studies during electrification showed that housewives with electric appliances were spending as much time on household duties as those without (Cowan 1979). Although electric appliances have eased some of the heaviest physical burdens of household labor, it has been found that women today spend as much, if not more, time on housework than did their grandmothers. The loss of domestic servants, new tasks relating to the new technologies, such as repairs and assembly, combined with a remodeled ideology of housewifery that includes higher expectations of cleanliness, more requirements for child care, and fewer domestic responsibilities for men, has not decreased time spent doing housework, even for middle-class women. Individual tasks were perhaps made easier, but their number, frequency, and complexity increased (Nye 1990). Although electricity alleviated some of the physical drudgery of household tasks, and perhaps it helped middle-class women deal with the loss of servants, it clearly did not provide the key to personal freedom. The more outlandish claims of emotional fulfillment, were, and still are, clearly marketing schemes. The majority of married women are still full-time unpaid household servants, regardless of electric appliances.

Not only did the promise of free time go unfulfilled, but some have argued that the increased dependence on electric home appliances has had a negative effect on women's domestic labor situation. Rothschild (1983) argues that dependence on this household technology, designed and marketed to reinforce, not challenge, the existing family structure, has further reinforced the gender division of labor, locking women more firmly into their traditional roles in the home. 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 women, became solely the responsibility of the woman (Wajcman 1991). Housework was thus defined more strictly as "women's work." Many housewives are now dependent on typically male experts to fix malfunctioning machinery. They also must rely on the whims of generally male engineers and scientists, who often design foremost for commercial, industrial, and defense purposes, and many are dependent on their husbands for financing the appliances and the electricity (Rothschild 1983; Wajcman 1991). Furthermore, the domestic division of labor which consumes women's time and interferes with their full participation in the paid labor force, has been implicated in the feminization of poverty (Gimenez 1990). Rather than freeing women to pursue other interests or paid

labor, household technology has locked women more firmly into the patriarchal gender division of labor and increased our dependence on men.

The notion that increased accessibility of suburban life, aided by electrification, was a positive change for women has also been questioned. Betty Friedan was perhaps the first to point out the emptiness in the life of the middle-class, suburban housewife in her 1963 book, *The Feminine Mystique* (Tong 1989). Friedan (1963:15) described this "problem that has no name" as a "strange stirring, a sense of dissatisfaction" that "each suburban woman struggled with" alone. The unhappiness of the suburban housewife became a subject of numerous magazine articles and reports by the mid-1960s. The close-to-nature, "appropriate" home for women and children also removed women from the economy, as well as public and social aspects of life. Furthermore, the many door-to-door traders, such as icemen, laundry servicers, milkmen, knife sharpeners, fruit and vegetable dealers, and fish peddlers, began to disappear with suburbia, thereby increasing women's tasks and further isolating the home (Nye 1990). Suburban zoning has also served to separate different types of housing developments, and has been central to segregation by class and race, leaving non-white and poor women with inferior community services, as well as isolating women of different race and economic status from one another (Wajcman 1991). In light of this isolation, segregation, and increased workload, electrification's role in suburbanization cannot be considered positive for women.

Furthermore, the promises made to rural women regarding electrification were only partially fulfilled. It is true that much of the heavy physical domestic labor has been alleviated for the farm housewife through electric appliances and that rural households generally have the same electric services as urban households. The purchase of domestic appliances even took priority over the purchase of electric agricultural technologies in most rural homes (Nye 1990). Nevertheless, rural women face a situation similar to that described above for urban women: no reduction in time spent in domestic labor, new standards of household cleanliness, and a further entrenchment of the gender division of labor. A study in 1928, before rural electrification, showed that urban women with electric appliances worked the same number of hours as rural women without appliances (Cowan 1979). Lighting has been shown to increase farm productivity by extending work hours, but electricity is yet another expense for the farm family, which increases their dependency on larger farm yields (Nye 1990). Electrification has raised the material standard of living of rural families, but has not liberated women from the hours of household labor or from the role of housewife.

Considering the fact that domestic technology has not reduced the time women spend doing housework, the widespread notion that electric appliances have freed women to enter the workforce is clearly false. Domestic technology has not freed any of women's time for other pursuits. Studies such as these have also shown little correlation between improved household technology and women's labor force participation (Cowan 1979). Women's labor force participation is based on economic need, as it has always been for poor, working-class, and single women who have had no choice but to work for pay (Rothschild 1983). Middle-

class women who did not historically work in the paid labor force now hold two jobs, one outside the home and one inside. Studies such as these have also shown that women employed outside the home spend only slightly less time on housework than women who do not work outside the home, and that they remain responsible for almost all of the housework. The fact that many women work outside the home is an economic reality, made possible by women enduring a "second shift," not by the fallacy of free time resulting from electric appliances.

Women's entry into the industrial and manufacturing labor force may have been facilitated by electrification, but this entrance has been controlled by men and has hardly encouraged equality in industrial employment. The electrification of industry resulted in the de-skilling and routinization of many industrial jobs which were historically a point of entry for women, who, denied better opportunities, work at repetitious, boring jobs for low pay. Although the electrification of industry may have resulted in some earning power for women, the creation of low paid, low skill jobs, defined by employers seeking to reduce labor costs, should not be hailed as a great achievement of electrification for women. Men's control over women's labor force participation is exemplified in the expulsion of women from the industrial workforce after World War II. Women were allowed to enter industrial jobs when they were desperately needed by the patriarchal society, but when the crisis subsided, many women were forced by husbands, companies, and government policy to retire (Faludi 1991). Women's equality and economic independence is clearly not at issue when pay is low and opportunities are limited. In actuality, electrification has helped capitalistic industry take advantage of women's low paid labor.

Finally, the hope that new electronic office technology will improve women's access to some professions is being only somewhat realized. Women have not flocked to the engineering profession, for example, even though an engineer today can work predominantly at a computer terminal in an office. In fact, the percentage of women in engineering school has dropped slightly over the last few years (Wajcman 1991). As in industry, the introduction of new office technologies has tended to be followed by a process of de-skilling of jobs rather than improved work conditions. Studies have shown that when new technologies are introduced to a field, or when new fields are created, women have an opportunity to enter the newly formed stratas or hierarchies (Wajcman 1991). Wajcman (1991), however, found that these opportunities tend to be conditioned by existing gender relations in which men have ultimate power, and that even when women do break into the male stronghold of a profession, they tend to be paid less than men and segregated into positions at the bottom of the hierarchy. Although it is true that women can gain new opportunities by a changing work environment, including one that changes due to the introduction and use of electronic technologies, these opportunities are typically defined by men and are not generally equal opportunities in terms of pay or status.

Electricity has clearly fallen short of its promised benefits to women in the United States. Radical changes to domestic labor, as proposed by feminist visionaries, foundered in the light of social criticisms and popular disfavor. Domestic appliances have failed to

result in free time or the advertised emotional satisfaction for even middle-class women. Rather, electric appliances have reinforced the gender division of labor and fostered women's dependence on men. The development of suburbia, facilitated by electrification, resulted in the isolation of individual women and the segregation of poor and non-white women. The idea that electric appliances have freed women to work outside the home is a myth, as women now work both outside the home and as unpaid domestic laborers. Finally, changes in industry and in the professions resulting from electrification have done little to truly improve women's access to or treatment in the labor force.

The Negative Environmental Effects of Large-Scale Electrification

Beyond the touted benefits of large-scale centralized electrification are a host of negative environmental impacts. The industries surrounding electrification and an electricity intensive society are major contributors to local air and water pollution, toxic waste generation, and global environmental destruction such as acid rain and the greenhouse effect. Many studies, including a report by the U.S. Environmental Protection Agency (EPA), have linked exposure to the magnetic fields given off by electric power lines with the development of cancer (Brodeur 1992). The growing eco-feminist movement suggests that women have more at stake in stopping environmental destruction than do men. Women have, in fact, been found to be more concerned about local environmental problems than men. Furthermore, the continuing feminization of poverty, combined with the tendency of government and industry to locate environmentally hazardous materials and environmentally destructive industry in the "backyards" of the poor, suggests that women and children may bear a disproportionate cost of the negative effects of the electricity industries.

Although many see electrification as a symbol of progress and modern society, an electricity-intensive lifestyle takes a heavy toll of the environment. Almost 70 percent of the electricity used in the United States is generated using non-renewable fossil fuels. Burning fossil fuels results in local air pollution from sulfur dioxide, nitrogen oxide, hydrocarbons, ozone, and particulate emissions. On the regional and international scale, these pollutants can cause acidification of soils and lakes, which damages trees and crops, kills fish, and destroys entire ecosystems, often in countries other than the country that emits the pollution (Goldemberg et al. 1985). The majority of sulfur dioxide, one of the main culprits in this acid pollution, is released from burning coal for electricity generation (Goldemberg et al. 1988). A significant portion of nitrogen oxide emissions can also be attributed to fossil fuel electric power plants, as can some of the hydrocarbons and ozone (Goldemberg et al. 1988).

Burning fossil fuels for electricity generation is also implicated in the accumulation of "greenhouse" gases in the atmosphere, which many scientists have predicted will eventually alter the global climate. The potential catastrophic repercussions of climate change include flooding, droughts, crop failure, and famines. The chief source of greenhouse gas emissions is the combustion of fossil fuels (Brower 1992). Although the United States is home to only five percent of the world's population, the country contributes about 24 percent of the world's carbon dioxide emissions by burning fossil fuels, and the

majority of this occurs during electricity generation (Brower 1992). Mining fossil fuels also results in local destruction of ecosystems and pollution of ground water and air. Fossil fuels are cause for international disagreements and wars over resources, as witnessed in Iraq in 1990, and their transport has resulted in environmentally catastrophic accidents such as the Valdez oil spill in Alaska.

Another 20 percent of U.S. electricity is generated by nuclear fission processes. An accident or meltdown at a nuclear power plant could potentially release catastrophic amounts of radioactive material into the environment, rendering the local environment uninhabitable for thousands of years. Unusually high cancer rates in humans working at or living near nuclear facilities suggest that the slow leakage of radioactivity during normal operation is environmentally destructive. In addition, all nuclear power plants generate radioactive waste that must be isolated from the environment for thousands of years to prevent severe contamination of the soil, water, and air. As satisfactory long-term storage has yet to be developed, the likelihood of eventual contamination is very high. In addition, nuclear energy generation also results in the availability of plutonium, a material used in nuclear weapons, making nuclear energy unquestionably linked to nuclear weapons proliferation (Goldemberg et al. 1988).

The 9.5 percent of United States annual electricity production generated using hydro power is implicated as well. Although hydro dams in the United States are generally considered renewable energy sources, their construction typically includes the flooding of entire ecosystems. Although environmental and social activism have put the project on hold, a recent Hydro Quebec (Canada) dam project was planned to flood an area larger than Connecticut and Rhode Island together, destroying a fragile and unique ecosystem and the livelihood of the James Bay Cree and other neighboring Indians (Webster 1992; Turner and Nachowitz 1991). (See Table 3 for a summary of the environmental effects of electricity generation.)

Once generated, electricity is distributed to customers over a grid of power lines. These power lines produce magnetic fields that have been implicated as cancer-producing agents. According to the EPA, five of six case studies published in medical literature showed that cancer, was more frequent in children who lived near power lines giving off strong magnetic fields than it was among children living elsewhere. Statistical results from studies of workers exposed to such fields supported the results of the childhood studies (Brodeur 1992).

The United States and Electrification's Environmental Destruction

Although such environmental destruction will eventually affect all people, the eco-feminist movement suggests that women have a particular interest in ending this affront to nature. Eco-feminism makes connections between the domination and oppression of women and the domination and exploitation of nature, because patriarchal thought identifies women with nature. It is argued that, because the domination of women and nature occurred

together, women have a particular interest in ending the domination of nature, and that the environmental and the feminist movements should evolve a common fight, because they both stand for egalitarian, non-hierarchical systems (Argarwal 1992). According to this logic, women, by association, suffer from the domination of nature; therefore, it can be argued that the environmental destruction caused by the electricity industries is more harmful to women than it is to men and that women have a larger stake in ending this destruction than do men.

Although it is questionable that an argument such as that offered by eco-feminism will be accepted by a wide audience, the history of women's association with nature is clear. The ideology associated with the Scientific Revolution of the sixteenth and seventeenth centuries stated that nature should be dominated by and controlled to serve men (Merchant 1983). Women, with their close association to nature, were also to be dominated. Contemporary science and technology preserve the ideological roots of the Scientific Revolution, including the control of nature, and women are still considered closer to nature than men, with ideas of "mother nature" and women's "instincts and intuition" still firmly intact. In our high tech, materialistic, environmentally destructive society I doubt that the majority of women retain a special relationship with nature; however, this connection is deeply ingrained in patriarchal thought and may, indeed, affect women's response to environmental destruction.

Women oppose environmental destruction more often than do men (Agarwal 1992). Women also express greater concern for local environmental issues than do men, often expressing fears about threats to health and safety. Researchers have theorized that women, who are likely to be family nurturers and caregivers, are more concerned for the well-being of their family than are men, who tend to give priority to economic growth and accept pollution as a natural tradeoff (Mohai 1992). For example, in a 1983 study of attitudes toward new energy development in an Appalachian coal area, Stouth-Wiegand and Trent (1983) found significantly greater opposition among women than among men: 66 percent of the women versus 44 percent of the men favored the environment over more energy development. Stouth-Wiegand and Trent theorized that women were more likely than men to be concerned with the potential negative effects, such as pollution, and less concerned with the potential positive effects, such as jobs. Their findings also suggested that women are not likely to share equally in the economic growth brought about by rural industrial growth, and that they may suffer more acutely than men the negative effects of industrial growth, such as poor housing and inadequate community services (Stouth-Wiegand and Trent 1983).

Similarly, women are more likely than men to oppose nuclear energy development. A study by Solomon et al. (1989) of opinions on a local nuclear development addressed the claim that women reject these developments because they are less likely than men to understand technical and environmental issues. They found that this argument did not provide a significant explanation for the gender gap, although their findings about concerns for safety issues were, significant. In their view, women's position as the guardian and

caretaker of family health played a role in this gender difference (Solomon et al. 1989). Baxter (1987) in contrast, found that women's less favorable attitudes toward nuclear energy could be partially explained by their greater concern for the environment. Although the environmental gender gap has yet to be completely explained, and perhaps the ideas posited by eco-feminist theories play a role, it is clear that local environmental destruction is cause for more concern among women than among men.

Finally, the combination of two current trends may result in women's disproportionate suffering due to the effects of environmental destruction. First, a trend of locating environmentally destructive industry or waste dumps in poor or minority communities has recently been documented (Arrandale 1993). Since almost nobody wants a source of pollution or toxic material in their neighborhood, government and industry have artfully focused on communities that do not have political clout. Brown (1993) revealed that socioeconomic status and, more significantly, race, provided the strongest correlation with the location of hazardous waste sites. The second trend is the feminization of poverty, which, has arguably been exacerbated by the increased division of domestic labor caused by appliances. In 1988, 54 percent of the poor adults in the United States were women (Gimenez 1990). The fastest growing segment of the homeless population is families with children, the majority headed by women, and 60 percent of people who lived in sustained poverty from 1982 to 1990 were members of households headed by women (Rowe 1991). While 10 percent of total American families lived in poverty, 32 percent of female-headed families and 49 percent of black female-headed households lived in poverty (Hoffman 1992). Additionally, women's poverty incidence is higher in non-metro areas, where waste sites and other environmentally destructive businesses are typically located (McLaughlin and Sachs 1988). This impoverishment of women, especially minority women, combined with the tendency to locate environmentally destructive industry in minority and poor communities suggests that women, and especially minority women, may bear more than their share of local environmental destruction.

Whether based in the logic of eco-feminism, theories surrounding women's role as family caretaker, or statistical trends, women in the United States appear to be affected more by environmental destruction than men. As the electricity industries are arguably the most significant single contributors to environmental destruction, this suggests that women suffer the negative effects of electrification more than men.

Electrification of the "South"

While the United States has been fully electrified for several decades, many areas of the South--made up of those countries that are the target of United States "development" dollars--are still un-electrified. In fact, energy use patterns in the South are extremely different from those in the United States and other so-called developed countries. With only 30 percent of the world's population, "developed" countries account for 70 percent of global energy consumption (Goldemberg et al. 1988). People in the South use one-ninth as much commercial energy on average as those in the North. About 60 percent of the 3.5

billion people in the South do not have electricity and about the same number depend almost exclusively on biomass (e.g., wood, crop wastes, or animal dung) for energy (Lenssen 1993).

As energy consumption is often used as an indicator of progress or development, lending agencies of the North, such as the World Bank, frequently fund electrification projects in the South. In the last 30 years, energy projects have received more foreign funding than any other projects, with the result that about 25 percent of the dollars that governments in the South paid to foreign creditors in the 1980s went to pay off past energy projects, and many government-owned power companies in the South are deeply in debt from electric power construction programs (Adams and Solomon 1985; Lenssen 1993). Aided by such programs, countries in the South have more than quadrupled their energy use since 1960, but they have been left "reeling from oil shocks, struggling under foreign debt, and suffering from serious environmental problems" (Lenssen 1993:10). Nevertheless, electrification projects are in high demand, and the World Bank projects that \$1 trillion dollars in loans will be needed for electricity generation projects in the 1990s (Lovejoy 1992).

The Role of Women in Electrification Development Schemes

As in the United States, improvement to women's lives is used as a selling point for electrification in the South. Development schemes claim that rural women benefit from electrification in many ways, including an increased standard of living, reduction in time spent on domestic tasks, less heavy labor, increased literacy, and decreased birthrates. Since the 1950s, rural electrification has been promoted as the driving force for development of the South (Munasinghe 1987).

Just as the term "women" does not encompass all women in the United States, neither does it in the South. As most of the benefits of electrification were aimed at one group of women in the United States--middle-class white women--many of the claims regarding the benefits of electrification are aimed at rural low-income women in the South. About ten percent of the population of the South are elites, who typically aspire to and often have goods and services similar to those available in the North. These elites are politically powerful; they control virtually all decision-making processes and reap the vast majority of the economic benefits of their countries. The remaining politically weak 90 percent live in the villages of the countryside and slums of the metropolises (Goldemberg et al. 1988). Many development agencies focus, or at least feign to focus, on improving the lot of the rural poor, who live a lifestyle that is deemed in need of "modernization." The majority of claims for women and electrification focus on rural women, who, according to mainstream development arguments, should be brought out of poverty and eventually up to the standards of their urban counterparts, a claim similar to that made for rural women in the United States.

In general, electrification is touted as a means to stimulate economic growth, which is assumed by mainstream development thought to be gender blind (Jacobson 1992). Until recently, per capita energy use was positively correlated with Gross Domestic Product, an indicator of a country's economic prosperity (Goldemberg et al. 1988). Although the last few decades have shown that energy efficiency can distort this correlation, increased energy use is still seen as a requirement for economic growth. The mainstream development agencies of the North believe that access to a reliable energy source is required to stimulate the industry that will lead to economic growth. Development agencies typically assume that women will benefit from this economic growth and that the increased wealth of a household will be distributed equally among household members (Jacobson 1992).

Electrification is assumed to relieve the drudgery of work for and reduce the hours spent on domestic labor by rural women in the South. During the UN International Decade for Women (1975-1985) it was finally pointed out to the world that women are the "workhorses" of the South, expending 53 percent of total human energy, compared to 31 percent for men and 16 percent for children (Adams and Solomon 1985). Women work longer hours, as well as perform physically heavier work, than do men. They provide by far the largest share of a family's basic needs, securing the food, fuel, fodder, and water for its sustenance. In dry, steep areas of East Africa, carrying water can use up to 27 percent of a woman's daily calorie intake. Collecting fuel, which in many countries is increasingly becoming more difficult because of deforestation, may take up to five hours per day (Dankelman and Davidson 1988). Household tasks, such as food preparation, are also the responsibility of women. Electrification is assumed to ease these work burdens in both indirect and direct ways: improving the overall economy will provide families with income to buy commercial fuel, thereby relieving women of their fuel gathering tasks; electricity can also be used for cooking or heating, electric pumps can relieve women's water collection duties, and electrified irrigation systems can increase agricultural yields, thereby increasing income and reducing the time women spend on food production and gathering (Foley and Van Buren 1981; Koenig 1986).

Electrification has been promoted as a force to improve equality between men and women as well. Reading skills and literacy levels have been positively correlated with electrification (Munasinghe 1987). It is assumed that lighting allows women to read at night when their other duties are fulfilled thereby enabling those who do not have access to formal education to achieve literacy and equality with men (Munasinghe 1987). Declines in fertility have also been found to be associated with electrification. Hoque (1988) found that couples who lived in electrified households in Bangladesh practiced family planning and had fewer children than did those living in non-electrified households, and assumed that having fewer children was a liberating force for women.

The Fallacy of Electrification's Benefits to Women in the South

Many of the claimed benefits of electrification for women hark back to the electrification of the United States, although some, such as the correlation between

electricity and reduced birthrates, are specific to a western interpretation of women's situation in the South. As shown above, however, women in the U.S. realized few, if any, of the espoused benefits. Unfortunately, women in the South may be even less likely to receive the touted benefits of electrification than were women in the United States.

During the UN International Decade for Women, researchers and activists made clear to development agencies that projects, typically designed and implemented by men, tended to ignore and even harm women. Although many international development agencies now have policies to integrate women as participants in projects, progress in this area has been meager (Staudt 1990). Development projects designed only with men in mind deny women access to land, create work for women, and increase women's dependence on men (Ferguson 1990). Development schemes rarely seek technologies that directly suit the needs of women. As Ester Boserup (1970) observed more than two decades ago, new technology is typically commandeered by men, thereby disturbing existing gender divisions of labor. New technologies, also tend to decrease women's status by widening the gap between their levels of knowledge and skill and those of the men (Boserup 1970).

Assumptions about family structure embedded in claims of electricity's benefits to women are often incorrect. The idea that economic growth is gender blind and that family members work toward common interests and goals is based on western ideals that often do not apply in entirely different cultures. In many countries women family members continue to be responsible for family sustenance regardless of the income of male members. While women toil to provide food, water, and fuel for their family, the income of male family members may be used to buy non-essential consumer products for their own use (Jacobson 1992). A connection has been found between malnutrition and the diversion of male income for personal use in Belize, Guatemala, Mexico, Africa, and the Indian subcontinent (Jacobson 1992). In many countries, including the United States, family resources are distributed according to status. In the South, men and boys generally have higher status than women and girls; therefore as material wealth increases, it likely increases more slowly among women than men (Jacobson 1992). Even if electrification improves the material standard of living in a country or a region, women may not share in this gain. There is no basis for assuming that family money will be spent to buy technology or electricity that will decrease the workload of women.

Electrification development schemes also erroneously assume that electricity will reach a large number of the rural poor and that the rural poor can afford electricity or appliances. It is doubtful that electrification projects truly have the fate of the rural poor in mind because "electric power . . . almost never benefits the local people but is transported to industrial centers . . . primarily for the benefit of the state industries and multinational corporations that are situated there" (Adams and Solomon 1985:20). Lending agencies, such as the World Bank, want to be sure that their debtors can repay loans, and they often require proof that contracts which provide a guaranteed source of income have been signed before loans are made. As a result, energy aid funds are generally used to satisfy commercial interests, and energy intensive multinational industries often pay electricity

prices as low as one-tenth the world rate (Adams and Solomon 1985). Typically utility companies connect only two to three percent of unserved rural families per year to the grid (Lenssen 1993). In addition, only an estimated 10 to 15 percent of homes in electrified villages can afford domestic connections (Goldemberg et al. 1988). In fact, benefits of rural electrification tend to accrue mainly to the wealthy and influential people of the region electrified (Munasinghe 1987; Saunders et al. 1978). Clearly, access to electricity does not mean that people can afford to use it or that it will result in social equity.

The rights and opportunities for women in the South are also typically different from those that women, or at least white women, had during the electrification of the United States. By the late 18th century in the U.S., several women's colleges were graduating women with degrees in many fields, including medicine and natural sciences. In the late 19th century, the U.S. saw the growth of a women's movement, which included struggles for education, jobs, marital and property rights, and health and dress reform. By the early 20th century, women were campaigning for an equal rights amendment and founding women's labor unions (Faludi 1991). In 1920, white women gained the federal right to vote. Nevertheless, in non-feminist, paternalistic visions, the middle-class white ideology common in the late nineteenth and early twentieth centuries elevated the role of the wife to "Angel of the House" and gave men the role of "breadwinner" for the family.

The breadwinner role does not hold in the South, because women are generally responsible for family maintenance. There, gender bias prevents millions of women from obtaining education, training, health services, or legal status, and in most countries of the South women have few legal rights to land or resources and little control over family income (Jacobson 1992). Finally, the U.S. was a financially solvent, technology-oriented society, and consumerism was on the rise during electrification. The countries of the South, on the other hand, are debt-ridden and individual incomes are low. These facts combine to make it unlikely that women in the South will have even as much chance to benefit from electrification as did white women in the U.S.

The claimed benefits for women of electrification and literacy and childbearing have not been proven. The direction of causality between electrification and literacy and childbearing is unknown. Literacy levels have been positively correlated with lighting, but it is not clear whether the more ambitious and educated people are the first to get lights or whether lights help people become more ambitious and educated (Munasinghe 1987). The evidence that birthrates drop with electrification is also slight. Rather, electricity is typically used by the most affluent, and affluence is correlated with low birth rates (Adams and Solomon 1985).

Women of the South and Electrification's Negative Environmental Effects

While women in the South are even less likely than U.S. women to reap benefits from electrification, they may suffer the negative impacts far more severely than women in

the U.S. Because they rely on local resources to satisfy their family's basic needs, environmental destruction or degradation strongly affects their lives. Economic growth, spurred by electrification, often removes resources from women, making subsistence more difficult and increasing their workload. Industrial growth draws men away from villages, leaving women to perform their share of the domestic work in addition to their own. Further exacerbating these problems, women are often forced to respond to this additional workload by having more children, entrenching them in a cycle of population growth and environmental destruction.

Large-scale electricity industries are a direct cause of environmental destruction. The most common electricity development projects in the South are hydroelectric dams, which currently provide one-third of the electricity in these countries (Adams and Solomon 1985; Lenssen 1993). Nuclear power provides only six percent of the total, and imported oil or coal provides the majority of the remainder. The environmental effects of fossil fuel and nuclear electricity generation were described above, but hydroelectric dams, which typically flood fertile river valleys from which thousands of people gain sustenance, deserve further mention. When hydro dams are built, commercial interests gain cheap electricity, but often many rural people are relocated to infertile areas with limited water supplies and they are unable to survive by their traditional agricultural lifestyles. A few get jobs with the industries that benefit from the electricity, some try to continue to pursue agriculture on marginal land, and others are forced to move to urban areas. One study of such a hydro project in Ghana revealed that, of 80,000 people who lost their land and livelihood as a result of flooding, only 2,000 were employed by the aluminum industries that benefitted from the cheap power (Adams and Solomon 1985). Those who lose their livelihood to such "development" are often forced to cultivate forest land, thus adding to the cycle of deforestation and erosion prevalent in many Southern countries (Adams and Solomon 1985).

In addition to the dislocation of people and the loss of livelihood, hydro dams in many Southern countries are neither everlasting nor renewable sources of electricity. The climate, relief, and geology, as well as some human-induced factors from cattle ranching, agriculture, and logging, result in high levels of runoff into river systems. This has caused hydro dams to become clogged with silt in many countries, including the Philippines, Kenya, Haiti, and Colombia (Adams and Solomon 1985). Not only does silting reduce a dam's electricity-producing life span, it also reduces the availability of water for irrigation and cripples flood control efforts (Adams and Solomon 1985).

The long-term environmental destruction caused by electrification and an electricity-consuming society also negatively affects women's ability to satisfy the basic needs of the family. Operating outside of the wage economy, rural low-income women in the South often rely directly on the local environment for provision of fuel, food, and water for their families. Destruction of nature destroys women's sources of livelihood (Argarwal 1992). Because women are often the sole family providers, regardless of their husband's incomes, pollution of a water source or destruction of trees or cropland could result in a crisis for family sustenance. Not surprisingly, women in the South have been found to have a greater

interest in preserving the environment than men, who are more concerned with earning cash. Because of this dependence on local natural resources, women have also been found to be more effective at protecting and regenerating the environment than are the management approaches undertaken by the state or private landowners (Jacobson 1992).

The economic development that comes with electrification can also be harmful to women. The market economy, espoused by mainstream western development practitioners, is forced by creditors requiring debt repayment, to "compete with the survival economy" (Shiva 1988:11). Privatization of land, cash cropping, and commercial logging are typical strategies for the production of profit and the accumulation of material goods that result in the removal of natural resources from the subsistence economy and, therefore, from women. Common lands, or "the commons," are indispensable to land-poor women in many subsistence economies. For example, in semi-arid districts of India, 66 to 84 percent of total domestic fuel for the land-poor and landless is derived from common areas (Jacobson 1992). Although mainstream development thought tends to blame the "tragedy of commons" or degradation of common land, on "careless" women, it is the transfer of these lands to government and private cash crop and timber enterprises that forces women to overuse the few areas that remain "common" (Foley and Van Buren 1981). Land clearing for agriculture and logging creates the fuel crisis that forces women to travel farther and spend longer hours searching for wood than earlier (Jacobson 1992). This cash cropping and commercial enterprising is facilitated by energy development schemes that service the energy-intensive fertilizer and pesticide industries, provide electricity for irrigation, and fuel industries that use raw natural resources such as wood. The claim that women in the South need electricity to alleviate the fuelwood scarcity is misdirected in many cases. Rather, it is development, especially energy development, that stimulates the economic growth that results in the wood scarcity that women face (Adams and Solomon 1985).

The shift to cash cropping and industrial employment has also tended to negatively affect women. Typically male family members are given the training and access to technologies that enable cash cropping. When male family members switch to cash cropping, they often relinquish their tasks in family sustenance agriculture, leaving women with even more of a workload than they had previously. Mechanization of agriculture has reduced or replaced the labor typically done by men but increased that done by women (Jacobson 1992). Women often have to work in the men's cash crop fields as well as produce sustenance crops for the family (Jacobson 1992). This reality contradicts the ideas proffered by electrification proponents that improving agricultural yields with technologies and fertilizers will reduce the labor women spend on providing their families with food.

Furthermore, the spread of technologies, such as electrified irrigation, and the development of industry has increased male migration to industrial jobs and urban areas, again leaving women to perform domestic tasks which were previously at least partially shared. In areas where the labor force is abundant, the spread of agricultural technology has made millions of traditionally male jobs obsolete, forcing men to migrate to towns and cities in search of work. Women are then left to care for children and the elderly. As in

the United States, female-headed households in the South make up a growing proportion of the poor. For example, the number of female-headed households in the Dominican Republic, 96 percent of whom live below the poverty line, has doubled to 21 percent in the last decade, and in some parts of sub-Saharan Africa, more than half of all households are headed by women for all or most of the year (Jacobson 1992). Again, contradicting the claims of electrification supporters, industrialization and technologies brought by electrification often result in increased labor and poverty for women.

Increases in population often accompany women's increased labor load. As tasks and time requirements for women's work increase because of removal of common land, environmental degradation, cash cropping, and male migration to urban areas, women are often forced to increase their reliance on the labor contribution of children (Jacobson 1992). Further destroying the status of women, girls are often kept out of schools to help with these tasks (Jacobson 1992). This is essentially a population trap, where fewer resources require more children to help with labor, eventually requiring more resources for survival of additional people. Lighting may be correlated with declining birthrates, but often development schemes result in factors that increase birthrates.

Recommendations

Although I have concluded that it is not likely that women in the South will benefit in a significant way from large-scale electrification, this paper is not intended to suggest that no attempts be made to directly relieve the work burden of women in the South with technology. At a panel discussion in 1991, women representatives from several countries in the South stated that women do want appropriate technologies to reduce their workload (Jacobson 1992). Women involved in a study on domestic work in Mali expressed similar desires (Koenig 1986). Some of these technologies may best be powered by electricity, such as an electric pump, which for example, can relieve some of the heavy labor associated with securing water. Unless women have the rights and autonomy to use a technology for their purposes, however, it is likely to be commandeered to relieve the work duties of men.

If an electric technology is requested by women, and a plan is implemented that gives them the right to that technology, the electricity can be generated locally, in a small-scale, less environmentally destructive way than typically large-scale electrification projects. Photovoltaics, which convert solar energy directly into electricity, wind turbines, small-scale hydro, and ethanol- or methanol-driven, engines can provide electricity. Selection of the most energy efficient end-use equipment, whether lights, refrigerators, or pumps, ensures that any electricity generated can be put to maximum use. These small-scale electricity generating installments, based on renewable energy, are far less environmentally destructive than the typical fossil fuel or large-scale hydro projects. They also directly help local people, as multinational corporations do not, and, therefore, are not likely to alter the economy in such a way that women are negatively affected. Without programs specifically designed to train and empower women to use and control sources of electricity to relieve their workload, they can easily end up in the hands of men. Further, unless local organizations can provide

hardware and maintenance, technologies are fated to fall into disrepair and go unused (Lovejoy 1992).

Although the United States is already completely electrified, I believe that American women should question our electricity intensive lifestyle. Because it has not significantly benefitted us, we should reevaluate whether the alleged increase in standard of living brought to our patriarchal society by electrification is worth the environmental destruction that it continues to cause. Whether we accept the tenets of the eco-feminist movement or simply fear for our own and our children's health, we should seriously question the value of destroying the environment for appliances and technologies that have done little to improve our overall status or move us toward equity with men.

If we do decide that our electricity intensive lifestyle is not worth the environmental destruction it causes, numerous possibilities for change exist. The least imposing measures are efficiency improvements. When the efficiency of a technology is improved, the same service can be provided with less energy. For example, the most efficient refrigerator on the market today uses about one-eighth the electricity, but keeps the food just as cold, as a typical refrigerator. In our personal lives, we can select the most efficient appliances and we will typically see any additional cost paid back through electricity savings over their lifespans. One study revealed that the United States could reduce residential electricity use by 30 percent over 1980 levels by the year 2020 simply by using only the most efficient technologies commercially available at the time of the study (Goldemberg et al. 1988). Electricity use in the commercial and industrial sectors can similarly be reduced through use of efficient technologies.

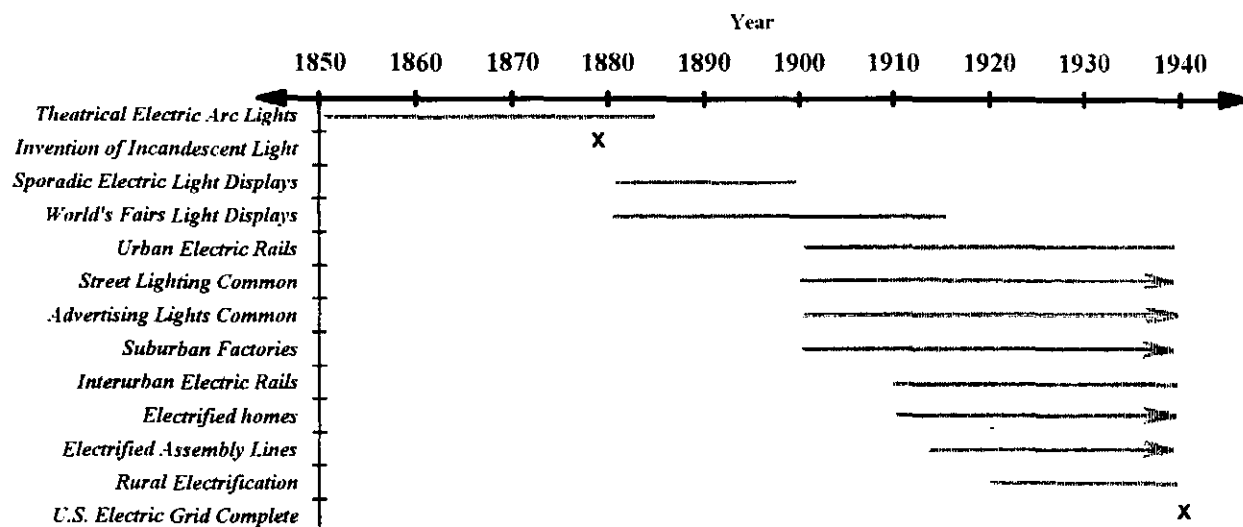
These efficiency scenarios, however, are based on the continued growth of the economy and the maintenance of our current lifestyles. Although it is taboo among engineers, utility companies, as well as mainstream environmental groups, I believe that we should also change our electricity-consuming lifestyles. The per capita energy use in the United States is over two times that of Western Europe and Japan, and ten times that of the average person in the South (Goldemberg et al. 1988). We do not need all the electrical appliances and technologies that we have at our fingertips. Nor do we need to live in an excessively consuming society. I believe it would be racist and arrogant to suggest that women in the South can be satisfied with the electricity from wind, solar, biogas, and small-scale hydro while we continue to be electricity "junkies" in the United States.

The renewable energy potential of the United States is far greater than our over-consuming energy use today. The annual wind energy of just North Dakota, Montana, and Wyoming is equal to all of the electricity used in the United States in 1990, and solar collectors covering less than one percent of the United States could make more energy than the United States consumes in a year (Brower 1992). Even such renewable energy scenarios negatively impact the environment, however. For example, photovoltaics' manufacturing requires the use of hazardous materials, such as arsenic and cadmium as well as large amounts of energy. Wind turbines require open land and have been implicated in the

deaths of many birds. Although the negative environmental impacts of such technologies are far less severe than those of fossil fuel and nuclear technologies, the belief that this technical-fix vision of large-scale, renewable-based electricity plants, feeding into a massive electrical grid to transport the wind and solar energy across the country so that we can continue our prodigal lifestyle is an illusion. Only when our efficiency levels are high and our unnecessary consumption has ceased, will renewable based energy sources be able to provide us with adequate electricity to meet our needs, while remaining environmentally benign.

I am not proposing a vision of returning to the "old days," where women stay home and make bread by hand. Rather, I am suggesting a future in which women have the right and power to influence the direction of our energy resource development and consumption. I am hopeful that with this power will come the insight that electricity has not been a windfall for women, and that our electricity gluttonous lifestyle is not worth the environmental destruction that it causes.

Table 1: Timeline for Major Electric Services During U.S. Electrification



Adapted from (Nye 1990)

Table 2: Source of U.S. Electrical Energy

Primary Energy	Percent of Total
Coal	56.8%
Oil	3.4%
Gas	9.0%
Nuclear	21.2%
Hydro	9.3%
Geothermal/Solar	0.3%

Adapted From (Energy Information Administration 1994).

Table 3: Summary of Environmental Impacts of Electricity Generation

Primary Energy	Percent of Total	Major environmental impacts
Fossil Fuels (Coal, Gas, Oil)	69.2%	Local pollution Global environmental problems such as acid rain and greenhouse effect Mining pollution, Resource wars, Catastrophic accidents
Nuclear	21.2%	Catastrophic potential, Radiation contamination from plant operation, mining, and waste
Hydro	9.3%	Flooding destroys ecosystems, displaces people

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