

WOMEN'S ELECTRIFICATION¹

Michel Matly
Director
MARGE,
Rue Fortunière, 46240 Labastide Murat,
France
Email: mmatly@marge.fr

¹ This report is an output of the Collaborative Research Group on Gender and Energy (CRGGE) with support from the ENERGIA International Network on Gender and Sustainable Energy and the United Kingdom Department for International Development (DFID) KaR research project R8346 on “Gender as a Key Variable in Energy Interventions.” For more information and other publications of the CRGGE and the DFID project, see www.energia.org/crgge”.

‘When the man does not know where he is going, he better go back on his tracks’

Bocar Sada Sy (2004), from a wolof proverb

‘Before, when you were wooing, you spoke of love, To prove your passion, you offered your heart, Today it is not the same, it’s changed, it’s changed, To seduce your dear angel, you whisper in her ear, Ah, darling, come and kiss me, and I will give you... A frigidaire, a shiny scooter, An atomizer, and a Dunlopillo, A cooker, with a glass oven, A pile of covers, and cake pans,, An egg beater, to make vinaigrette, A beautiful extractor, to eat up odors, Warming sheets, a waffle iron, An airplane for two, and we’ll be happy.’

Boris Vian (1958) The complaint of progress



‘Change, change to ultramodern kitchen line, washing machines, refrigerators, driers, air conditioning systems, televisions, mixers, wax polishers, vacuum cleaners, radio cassettes, video recorders... Well, and when consumption society reaches consumption satiety, what?’

Quino (ed. 1998) Mafalda 10.

Table of Contents

Table of Contents	3
Abstract	4
Executive Summary	5
1 A male history: electrification in Europe	8
1.1 The development of the electricity sector	8
1.2 Public intervention	10
1.3 An all-male leadership	13
1.4 Rural electrification: the examples of France and Ireland	13
1.4.1 France	13
1.4.2 Ireland	17
2 The need for women: electrification in the USA	19
2.1 The development of the electricity sector	19
2.2 Public intervention	21
2.3 Rural electrification	23
2.4 Relying on women	27
3 Naked electrification, clothed electrification: the development of the domestic appliance market in Europe and the USA	28
3.1 The development of the domestic appliance market in Europe	28
3.1.1 Overall market	28
3.1.2 Rural market	31
3.2 The development of the domestic appliance market in the USA	33
3.2.1 Overall market	33
3.2.2 Rural market	36
4 The holy alliance between women and industry	40
4.1 Domestic science: rationalising and modernising housework	40
4.2 Women needed industry to popularise home economics ideology	42
4.3 Industry needed women to sell its products	44
5 The three conditions for successful electrification	49
5.1 Trust people	49
5.1.1 Electrification Planning is an historical nonsense	49
5.1.2 Support local initiatives	50
5.2 Target the poor, but make them pay	52
5.3 Respond to women's needs	54
5.3.1 An economic electrification	54
5.3.2 Not a world of difference	56
5.3.3 Promoting consumption	57
6 Women's electrification	61
6.1 Impact of electrification on women's empowerment	61
6.2 Home technology and development	65
6.3 Women's electrification	68
BIBLIOGRAPHY	71

Abstract

This study draws lessons from experience with rural electrification in Europe and the US, on the ideology of women's electrification and how this may apply in developing countries today. Rural electrification came 30 years later in the US than in Europe, but quickly reached urban levels. In Europe, rural electrification was used mainly for lighting, radio and some farm equipment. In the US, federal funding was used not only to develop grids but to provide access to electric productive equipment and domestic appliances. The latter quickly became the bigger success. Rural electric cooperatives were able to cut costs by 30-50% compared to the existing large private and public utilities, and showed that the poor could pay. Women's desire for home appliances drove the rural market and high load, bolstered by home economics, a ready-made ideology for the electricity industry. Electric appliances relieved women of hard burdens and allowed them to work more efficiently in their homes, and go out to paid work. Developing countries should also consider this model of "women's electrification."

Keywords: History, Europe, USA, Rural electrification, Electric services, Women empowerment

Executive Summary

When establishing a parallel overview of the development of the electricity sectors in Europe and in the USA, some consideration needs to be given to the general economic situations in the two regions. At the end of the 19th century, when electricity begins its history, the USA was globally richer than Europe, and its GDP per capita about one-third higher than the European average. Comparing the USA with the leading European industrial country of the time, Great Britain, brings one to the conclusion that, in 1900, the US economy was significantly ahead: the US stock of machinery and equipment per capita was about twice that in Britain, and the US use of energy per capita about 25% higher (Angus Madison, *Monitoring the world economy*).

In the following decades - the first half 20th century, when most Western electrification occurs - US economic growth rate overall was about double the European one: 1.7% annually in real terms on average, against 0.9% in Europe (Angus Madison). The two World Wars created major heavy traumas for European populations and economies, while they had effects ranging from slightly negative to heavily positive for the US economy. As a result, the US GDP per capita reached more than double the Western European average in the 1950s, a difference that would steadily diminish thereafter with European economy recovery.

European and US histories of electrification are quite different, both in speed and in nature. However, one should not be too quick to assume that relative wealth was the major determining factor. It certainly had an impact on the development of a large American electricity sector, expanding its influence worldwide, but clearly this cannot explain why European rural electrification was at least two decades *ahead* of the US situation. Further, the differences in wealth between the US and most advanced European countries was not so great that it can fully explain why American households had access to many electric services at least two decades before European ones.

It cannot either be argued - particularly when dealing in comparisons between the history of industrialised countries and the actuality of third world - that farmers' incomes were a major reason for the development of grids into rural areas. Rural electrification was carried out in times of impoverishment for US and European farmers. While economies were growing overall, agriculture was losing its importance: between 1900 and 1960, its share of national income fell from 20% to 7.5% in the United States, and from 35% to 12% in France. This had strong consequences for disposable rural family incomes: in the mid-1930s, after a period of relative wealth due to the First World War, North American rural economies collapsed: about one-third of farms were heavily mortgaged, and most of them were not profitable and expected to disappear. Meanwhile, in the largely rural European countries such as France, where farmers had long resisted urban migration, rural incomes in real terms in 1955 were about two-thirds of the 1914 level, and half the level of 1865-75 (Georges Duby, *Histoire de la France Rurale*).

Certainly, other factors played, and were still to play, more important roles than relative wealth in the success of rural electrification. Analysts generally consider that the direct involvement of States has been the major factor in the success, and that the private sector by itself was not eager to quickly extend electrification to rural areas with little potential profit. This argument is supported by the differential growth between highly State-supported European electrification, mostly achieved by the 1930s, and the private-sector-led American power sector largely absent from rural areas at that time, and by the following success of the American cooperative movement promoted by the Federal government. It is certainly a strong argument, but I believe that it led and still leads to

erroneous conclusions, the main one being the preference for public rather than private electrification.

The history of electrification shows a diversity of situations. In the USA, as well as in Europe, private, public and NGO utilities have proliferated and still exist. This document has neither the purpose nor desire to enter the debate between the pros and cons of these forms of property and management. It nevertheless attempts to demonstrate that the role of State was truly fundamental in speeding up the electrification process, primarily because governments used it as a lever to promote local community initiatives. Certainly, major US private companies only entered the rural market with reluctance, but American urban public companies had exactly the same attitude at that time. Europe brought success stories of rural electrification by private small and medium enterprises - as well as by local communities and NGOs - as well illustrated in a country now paradoxically best known for its centralised public electricity sector: France.

This document attempts to show that the difference between European and US electrification is one of concept. Certainly electrification has to deal with global economic politics, whose expression was totally different in the two continents. European rural electrification reflected the dominant politics of the time, shared by political leaders, mainstream capitalists as well as their radical Marxist opponents, i.e. mistaken views on colonial expansion and national markets. It delivered a widespread, but minimal - and rather uninteresting - service, two or three bulbs and at best a radio.

US politicians in the 1930s took Europe as an example to justify federal support for rural electrification. However, believing that the American cooperative movement applied the European model two decades later would be erroneous. Cooperatives instead used public funds to apply the American urban private-sector model to rural areas. A model which considered the arrival of the grid as a mere entry point to build up a market for electric services, for production if possible, and - as it quickly proved to be very efficient - for domestic services. Public money was spent not only to establish generators and lines, but also to spread refrigerators and washing machines - as a way to increase sales and consolidate cooperative utilities. Rural electrification in America reflected nothing more than the general political consensus of the existence of a large domestic market - in its two senses of national and household markets - for commodities. Rural markets may appear to be somehow more difficult, but cooperatives were tremendously successful in developing these with adequate public support.

Together with this confidence in market possibilities, came another certitude, shared by American capitalist and cooperative sectors, that women would have a crucial role to play: they were the necessary agents to modernise homes, pave the way for the dissemination of electric services and equipment, and through this make electrification more cost-effective and profitable. This has major consequences. In contrast with the 'all-male' European electrification, the American electricity sector successfully developed itself by heavily involving women, in large private utilities as well as in grassroots cooperatives, at central and regional level, in executive management as well as in field extension. American electrification was engendered not by any expression of feminist feeling, but by simple financial realism: a simple argument that any electrician understands - women power is the load factor.

Rural electrification had a very different meaning in America than in Europe. A meaning that has been lost along the way, since the general views on third world markets are very similar to the unfounded views that European politicians had of their own markets or, as the cooperatives proved, the views of American private electric companies of their rural markets. This may be the correct interpretation of electrification, and an alternative to present philosophy and trends: an

electrification where women have a large part to play, as both market prospects and developers:
women's electrification.

1 A male history: electrification in Europe

1.1 The development of the electricity sector

Based on early experiments with a lamp by the British inventor Edward Staitte in the middle of the 18th century, the first truly operative all-glass hermetically-sealed electric bulb was developed in 1879 in Britain by Joseph Swan. This paved the way for the development of electricity systems all over the world in just a matter of a few years.

The first attempt at a complete system of generation, transport and distribution, albeit still experimental, was also in Britain: the Holborn Viaduct plant in London, built by the Edison company, opened in January 1882 and ceased operating in 1884, long enough to prove such a system was feasible. Another plant entered operation the same year in Brighton.

Similar systems quickly spread into many countries in the 1880s, on a now operational scale. Italy claims to have had the first European fully operational system in 1883 in Milan, also built by an Edison company, which began its operations by illuminating the “Teatro alla Scala” for the premier of Ponchielli’s Gioconda. Switzerland had its first public lighting in 1882 (Lausanne) and its first distribution to clients in 1886 (near Lucern), while the first Spanish system was built in Barcelona in 1883. On the other side of the globe, Brisbane, in Australia, in 1882 and Reefton, in New Zealand, were, in 1887, the first cities in their countries to have electricity. The first long distance transmission line was established in Germany in 1891 between Miesbach and Munich (177km).

Until the early years of the 20th century, the development of electricity in countries such as Switzerland, the UK and Germany proceeded quicker than in France. In 1896, Switzerland had an installed capacity of 58 MW, greater than France (with a population one-tenth of that of France). In 1898, both the UK and Germany had over 100 MW of installed capacity, while France had only 70 MW. French systems were also smaller: there were 531 generation plants in France, 375 in Germany, and 135 in UK. Electrification was also more widespread than in France: Paris represented 40% of demand, while Berlin and London no more than 22%.

The first markets were for street lighting, electric traction and industry. New utilities were experimenting, on the technical as well as the commercial level: as soon as a new generation scheme became operative, producers began to seek out clients, up to the point where any new client would be more of an inconvenience than a source of benefits. There were several utilities and a still modest consumption: by 1900, Paris had six utilities and 16 000 customers using as an average of 70 KWh/month (from 30 KWh/month with the “Champs Elysées” utility - to 150 KWh/month with the “Air Comprimé” utility). Berlin had 5400 domestic and non-domestic customers using an average of 275 KWh/month.

Germany was developing electrified streetcars at a rapid pace: there were 1400 km of routes in 1899, against 490 km in France, 210 km in UK, 150 in Italy (but already 24 500 km in USA). Development of the electric sector was impressive in UK, nearly matching the US level in terms of installed power per inhabitant, while Germany and France were already far behind.

KW per1000 inhabitants	1906-1907
USA	35
UK	28
Germany	11
France	7

Different reasons may be invoked to explain these differences in the early stages of power sector development. In France these included a slow economic growth (1.8% per year between 1893 and 1913), higher price of coal, stronger resistance by gas companies (who had long-term contracts with the large cities), and a sector dominated by medium-size enterprises with rather small systems (in 1906, 791 utilities were operating with 6126 employees - an average of under eight per utility - and of these 626 had five or fewer employees). In England and Germany, the direct investment by local authorities, plus higher prices for electricity, attracted many investors encouraging rapid development.

Nevertheless, despite still sluggish French industrial growth (2.8% on average between 1896 and 1913), electricity appears quickly as a fairly dynamic sector and shares with water a 8.9% growth over this period. Systems grow: although the average generation plant is still under 1 MW (700 kW in 1910), some “big” units have been built (35 of more than 1.5 MW, of which four are larger than 7 MW and eleven between 3 MW and 7 MW). Utilities are now present in most of the 90 French départements, even if electrification is still limited to main centres. The availability of energy resources is the key factor: Northern France is more electrified due to coal resources; and in southern regions electrification develops mostly around the Alps, sustained by their large hydroelectric potential.

In 1913, Paris has more than 1000 installers/electricians who serve 130 000 clients through a now unified distribution system. France now has over 5000 grids, and utilities serve about 800 000 clients. Five years later, there are nearly two million subscribers in France. The electricity sector grows faster during the 1905-1925 period than in other, and even faster than in the USA. The first quarter of the 20th century sees European countries ending up with somewhat comparable electrification results, but trailing behind the USA which was significantly ahead in terms of power sector development as can be seen in the table below.

KW per 1000 inhabitants	1926-1927	in relation to 1906-7
USA	223	546%
UK	93	236%
Germany	73	560%
France	82	1139%

Source: Histoire de l'électrification française, Volume I

The apparently quicker development in France in this period can be explained by three factors. The first factor is the early normalisation of systems, which allowed the sector to quickly concentrate its development. As a consequence, and the second factor, there was the massive involvement of large companies and an increasing interest by private banks and financial institutions, in other words the entrance of “grand capital” into the power business. By 1919, nineteen utilities already featured in the leading 150 listed firms, and the number would continue to increase up to nationalisation. 1919-1923 saw the construction of the first large plants near Paris and in Northern France.

The third factor was the strong development of hydroelectric systems, the interest in which was greatly enhanced during World War I. In 1920, France was already using 17% of its hydroelectric potential, behind Switzerland (30%) but ahead of countries such as Canada (15%), the Nordic countries (Norway 14%, Sweden 12%) and the USA (8%). Between 1914 and 1922, French hydropower capacity increased by 50% and between 1914 and 1926 it doubled.

While a strongly capitalistic sector was developing at a fast pace, small systems were to an extent conquering rural areas. In 1920, 20% of French municipalities had access to electricity, and by 1926 there were 1500 concessionaires covering 14 000 concessions, about 35% of all French municipalities. Quite a large number of the existing utilities were still very small: of the 1095 licensed utilities (with a total of 25 670 employees, or an average of about 23), more than two-thirds (701) had five or fewer employees.

By the 1930s, some of the smaller European countries, such as Switzerland and the Netherlands, had largely completed their electrification programmes. In larger countries, such as France, there was a lot still to do, but electrification was progressing at a rapid pace. 1927 saw particularly good investment conditions (monetary stability, lower long-term interest rates down from 14%-15% to 7%), and a large investment programme was established which realised, around 1934-36, eleven new “super-centrals” (six in Paris and five in other regions delivering 20% of all electricity needs. The 1930s and 1940s saw interconnections (regional, then national in 1938) and the establishment of a distribution network which at the time was among the densest in the world (600 000 km of grid in 1946), while rural electrification received public financial support.

The 1930s economic crisis and the situation of excess equipment, due to the strong competition between thermal and hydro, led to new priorities. Domestic demand, which had been largely neglected by the utilities, slowly developed from 7% in 1927 to 13.5% in 1937. Search for new domestic customers increased, in large cities (30% of households connected in Paris by the mid 1930s), as well as in rural areas. Local hydroelectric resources were exploited: of the 70 000 watermills recorded in 1890, 4286 were already equipped by 1933 with electricity generators, most of them smaller than 200 KW. Public policy also encouraged interconnection development and the completion of rural electrification. In 1933, only 6300 municipalities (15% of the total) were still to be electrified and, by January 1937, 96% of French municipalities were connected to an electrical grid, and 90% of the population has access to electricity.

From less than two million in 1918, there were 10.7 million subscribers in 1936, and 12 million in 1945. Power consumption had risen five-fold in 20 years, from 4 billion KWh in 1919 to 22 billion KWh in 1939. In 1950, reflecting the earlier dynamism, 35 billion KWh were sold, nine times the 1919 figure. In the same period, the Gross National Product has risen only 40% over the thirty years. Of the top 150 firms on the French Stock Exchange, 19 were utilities in 1919, and 37 in 1939. Their asset value had progressed in that period from 1.6 to 19.5 billion Francs, (from 10% to 25% of the total assets of the 150 leading companies). In urban areas, electricity was a largely capitalistic sector, while in rural areas it remained largely in hands of small utilities. Electricité de France was created in 1946, and took over around 20 000 concessions, while hundreds of small private utilities that had to close their doors.

1.2 Public intervention

European electrification policies were built up in two main phases, the first one lasting until around 1925, and the second, shorter one until the beginning of World War II, by which time the richer countries were more or less fully electrified, or somewhat later for some of the poorer countries

such as Ireland. The first phase could be summarised as a somewhat organised *laissez faire*, leaving the initiative and funding to local bodies and private firms, and the second can be characterised by a more active public intervention, through the injection of public money.

The first public action in the United Kingdom was to promulgate the Electric Lighting Act, theoretically imposing the installation of one power plant in each parish, albeit without any technical specifications. This provoked the multiplication of incompatible systems and, as a result, there were 491 independent electricity grids by 1925 with different frequencies and voltages. Early attempts at integration failed (in 1917 a Reconstruction Committee proposed without success the replacement of existing dispersed generation units by large plants in 16 districts, which would have halved the cost of power) until 1926, when the British authorities created the Central Electricity Board using public funds to buy out less cost-effective systems and work towards better integration. By 1935, the number of grids had been reduced to 144, but still with 43 different voltages ranging from 100 to 480 volts. Around the same time, the public Electricity Supply Board was created in Ireland, and confronted with more than 160 power companies with numerous different technical standards.

As in the UK, the first French initiatives in the 19th century with electrification led to technical diversity. Paris was divided into six power distribution sectors, each with its own technical standards: 110 V DC in the “Eclairage and Force” sector, 220 V DC in the “Edison” sector, 440 V DC in the “Clichy” and “Air Comprimé” sectors, and single phase AC in the Champs Elysées and Rive Gauche sectors. In the country as a whole, 1413 generation stations were in operation in 1908: 1000 hydroelectric and 413 thermal (coal), although not all were functioning well, 944 produced direct current electricity, 439 alternating current, and 30 both DC and AC. The need for normalisation and regulation was rapidly apparent.

The French power sector legislation has three major landmarks: the Law of 15 June 1906 that defined the conditions for power transport and distribution; the Law of 1919 for hydroelectric generation and finally the Law of nationalisation of April 1946. The 1906 law defined the physiognomy of French electrification for the next 40 years: it gave to municipalities (or “syndicates” of municipalities) a right to firm 40-year concession contracts with local utilities. As a result, thousands of small utilities developed their own grids right across the country. Distribution in the capital was unified in 1907, and in the same year a “Comité Electrotechnique Français” was created which successfully imposed technical normalisation within the new French legislation on electrification.

The 1919 Law imposed concessions for hydro plants of more than 500 KW, authorisations for those below 500 KW, and the State gives itself the right to develop public schemes. This, added to the new development of mixed public-private hydro power companies, reflected the growing tendency to consider rivers and hydroelectricity as part of the public good. A few years later, in 1924, the French authorities decided to develop a public subsidy scheme, operative by 1926, in order to promote rural electrification and the interconnection of small systems.

Electrification in other Western European countries had rather similar stories, starting with small-scale, high-cost and low-load factor systems which were then networked into larger utilities, albeit with local differences in the speed of integration. In Sweden, low-cost hydro resources in the north led to an early determination of type of generation and the need to integrate the transmission system, but clearly not distribution since there were about 2000 distributors as of 1957 (there are still about 300). In Germany, where industrial self-generation plays an important role (in the 1960s nearly 40% of electricity was still self-generated), distribution is quite decentralised (16 000 utilities

in 1933, 3000 in 1955, and about 1000 at the end of the 20th century). In Denmark, development of electricity is inter-related with the development of heating systems using cogeneration.

There is also a major difference between France and other countries when it comes to electrification. Unlike countries such as England, Germany and Switzerland, France has few municipal companies providing services such as water and gas supply. In France, public bodies have little tradition of economic intervention and the preference has been to rely on private firms. As a result, of the 20 000 concessions existing in 1939, only 250 were municipal companies, delivering energy to 5% of the users. Meanwhile, in the UK, 60% of users were obtaining electricity from the public sector, and in Germany, public companies delivered to 50% of users, and mixed public-private companies to another 40%. Only in the USA did the public sector have such a small share, with only 6-7% of users receiving electricity from municipal companies.

This has not had a major impact on the rhythm of electrification: in Scandinavia, Germany and the Netherlands, electrification was considered primarily as a desirable political goal, and as such led by the public sector, and was largely completed by the 1930s. In France, where the private sector played the major role and public support comes only later, electrification was completed at a similar pace. In the mid-1930s, the electrification rate was about 95% in the Netherlands, 90% in Germany and France, and 85% in Denmark. By the time nationalisation takes place - 1946 in France, 1948 in Britain - electrification is almost complete.

Although the French State had early on set up a detailed framework for concessions, it did not interfere with crucial aspects such as prices, relying on private dynamics to moderate tariffs. Not without reason, in Paris the integration of the six sectors in a unique distribution system led to a sharp drop in tariffs: 0.70 F/KWh in 1907 down from 1.50 F/KWh in 1900. Power constant prices decreased by 60% over the 1919-1946 period. Electricity represented 2% of household income in 1908, 0.6% in 1938 (or equivalent to about 5% of house rent). Between 1914 and 1937, the price per KWh tripled, while the price of bread increased seven-fold, wine by a factor of five, and a metro ticket six-fold.

The first public intervention over prices was in 1935, in a time of growing separation between the electricity sector and French civil society. Companies were accused of not having made enough efforts to develop rural markets, and slowing the development of the sector in order to maintain high prices. The higher prices for electricity in rural areas as well as the fact that electricity companies still made good profits during the 1932 crisis period provoked further criticisms. Associations were set up by local politicians which successfully lobbied for lower prices in rural areas: the State promulgated a price cut of 20% in 1935, and allowed no further increase until 1937.

As it was largely concentrated in private hands, the French power sector followed general business trends in terms of investment and prices: there were four major cycles of investment in 1897, 1905, 1915 and 1927, due to monetary stability, low interest rates and relatively high prices. Between these cycles, there were more difficult times, with high interest rates and lower prices, the worst being the 1932-34 period following the March 1932 banking crisis, although this was followed by a new favourable cycle in 1937-38. The 1932 crisis had a significant impact on the sector. The assets of the three major power companies, CGE, Alstom and Thomson-Houston, fell from 2.7 billion Francs to 526 million in 1934, then rose only to 960 million in 1938. Demand in 1932 fell by 2 billion KWh compared to the previous year. Companies held back on investments, and prices rose until 1934. Due to the earlier huge investment plans, launched in the favourable 1928 period of monetary stability, coming into operation, the profits of the major companies rose by 55% between 1929 and 1932, and remained stable over the next three years despite the general crisis. This led to

the companies being reproached by the leftist Popular Front government authorities and, more generally, by French society.

1.3 An all-male leadership

Throughout its history, French electrification has been determined by the struggle of three main forces, all male-led: first the “electrical engineers”, who prevail because of their technical knowledge and have generally opposed any State intervention, have been against the generalisation of the concession system, and also against concentration through huge companies and large regional distribution systems; second the private “trusts”, that developed during the first quarter of the 20th century and were against State regulation (tariffs, taxes) except when it served to encourage interconnection and the development of huge systems. They developed alliances with senior public technocrats in a pragmatic approach towards private centralisation, particularly when times were hard, as after the 1932 crisis. Third, there have been the public “bureaucrats”, always a major and strong feature of French society: these have been in favour of restricting free enterprise in the name of rights of use (of ways, of water) and citizen security.

The political left has never held a definitive position on crucial aspects such as municipal versus private companies: the liberal faction have promoted municipal companies in order to limit tariffs, protect small users (artisans) and obtain a better status for utility workers, whereas socialists (“guédistes”) are against it, largely reflecting the French love of centralisation. Bureaucrats have shaped electricity regulation, from as early as 1906 designing the administrative details of the concession system, but consciously leaving the door open to the private sector which was largely left to its own initiatives right up to the time electrification was completed. The mobility of high-ranking executives between administration and industry (through the “Grandes Ecoles” system, from which women were excluded until the 1970s) favoured the alliance between State and the huge capitalistic sector seeking sector concentration, while the small and medium enterprises looked for profits in rural electrification.

Even if the 1930s saw growing misunderstandings between companies and civil society which left wounds, the 1946 nationalisation should not be seen as simply a condemnation of the previous system: it was part of a wider nationalisation movement, including the whole banking system and major industries, based on the then-perceived necessity to have state-owned production factors to boost a rationally-planned economy.

1.4 Rural electrification: the examples of France and Ireland

1.4.1 France

French rural electrification begins and ends with myths. Following the end of World War I, the “Agrarian” movement, influential in ministries and powerful in parliament, imposed its views on the necessary modernisation of rural areas. France’s “two-speed” development had to cease. And this reflected the first myth - that electricity was not simply a manifestation of progress but its cause. ‘Once the lines are set up, the country is no longer rural. Numerous small industries soon develop related to agricultural production and grid operation becomes an excellent business.’ wrote Victor Boret of the Fédération Nationale des Collectivités Rurales. But nothing of the kind would happen.

Here, in the field of rural electrification, the “electrical engineers”, who had quickly lost ground in the major elements of the power sector, continued to rule. They retained the scientific knowledge.

They promoted rural electrification in the name of the future and massive development through such uses as electric ploughs and harvesters. Faith in these fancy applications would last up to World War II, even as American companies were demonstrating the supremacy of the diesel engine for country mechanisation. This represents the second myth.

Electrical engineers' views on rural electrification were also strongly oriented towards stand-alone systems, and interconnection was not even considered as a long term option. A strong reason for this approach was the feeling - based on numerous examples - that rural dwellers were not seen as good customers by large urban companies: 'utilities despise rural customers, we feel more like slaves than true customers', was how one farmers association representative put it. There was a focus on "green energy" (the conversion of the 70 000 existing water mills into hydro power schemes). If history gave the reason to the advocates of interconnection, most of the first rural electrification systems relied on self-generation (hydro or coal) and more than 4000 river falls were used with hydro-power units (of which about 1200 still operate today as independent private producers, selling electricity to the grid).

There was an early and significant interest in self-generation from farmers associations and from small local and urban entrepreneurs who were interested and felt confident given the concession system: the right to exercise the concession for 40 years, and a guarantee to get the value of their assets back plus estimated benefits for the remaining period of the concession in the event of eviction. The Sociétés d'Intérêt Collectif Agricole (SICA) presented the first requests for subsidies in 1919, followed by a large number of small and medium private companies. As a result, thousands of small utilities appeared in the first quarter of the 20th century which invested and operated decentralised power systems with little or no support (none from the State, some from local bodies or private individuals eager to develop electricity in their own communities). They electrified, on their own initiative and at their own risk, about one-third of rural municipalities.

This multiplicity of initiatives can be compared to the early development of English railways, where many small and medium companies took their chances, or the recent worldwide burst of interest in internet business development. As in these cases, many of the electricity companies will soon disappear, absorbed by larger ones in a progressive move towards concentration, and most resistance was ended by the 1947 nationalisation.

Although the French State was early and strongly present in the administrative process (regulation framework, approval of projects, delegated technical supervision by weak municipalities) it did not commit itself financially until 1923-24, when a decision was taken to develop a consistent policy of subsidies. The first approved scheme, fully operative by 1926, included an initial maximum 50% subsidy, reducing to 33% up to 1930, when the maximum increased back to 40%-50%. State financial involvement reached 100 million F in 1927, 200 million in 1930, 400 million in 1931. The objective was to encourage system interconnection: for example, HV and MV systems were subsidised from 25% to 55%, but LV ones from only 10% to 22%. Access to loans was also facilitated: soft loans from "Crédit Agricole" and loans to local public bodies by the "Caisse des Dépôts", guaranteed by municipal budgets.

This meant a dramatic shift from private to public assets in the rural power sector. Beneficiaries were mainly municipalities, generally grouped in inter-municipal syndicates (covering 73% of the total). In 1932, over 12 000 municipalities were receiving electricity due to the new supporting system, and most of the rest were asking for it. In the following years, electrification progressed at a rate of 1500 to 2000 municipalities a year. The first group to have manifested their interest in joining rural electrification, the SICA farmers associations, represented only 5% of rural grids in

1932. Private management remained overwhelmingly dominant: running 93% of the systems, against 7% in municipal operation.

To electrify the remaining parts of the territories, local bodies sought greater subsidies. In 1933, a proposal for a 63.5% subsidy scheme was rejected but, in December 1936, the State created a strengthened promotion scheme through the creation of FACE (Fonds d'Amortissement des Charges d'Electrification), that took in charge 50% to 80% of the overall amortisation and financial costs, and reduced local subsidies to rural electrification by 20 to 30%. The FACE funds came equally from the existing income of electricity companies (based on LV usage) and from the public budget. Despite some difficult years, the FACE is still in operation today and still supports marginal electrification.

A typical rural electrification history: The Département of Lot (rural area, south-west of France)

1925

The city council of Labastide Murat, a village of about 880 at that time, within the Département of Lot, one of the poorest in France, examines proposals by a small Parisian firm to provide private lighting in the village. The council was informed the previous year about a project to create an inter-municipal syndicate for electrification, but does not want to wait.

Since the residents are “determined to get light in the shortest of terms”, and with “the local grid being a precious supplement to the electrification of the Département” and, above all, because the installation and operation does not require any municipal, Département or State subsidy, the council is positive about the project, and consequently asks the Préfecture to launch a public enquiry procedure, conforming to the ordinances of the 1906 Law and the 1908 decree, appointing two deputies within the municipality, with public open access to the dossier.

The enquiry proves favourable, with a positive report from the chief engineer of public works in charge of the control of electricity distribution systems. The dossier and plans presented by the private entrepreneur and established according to official public procedures (technical data, security constraints, maximal tariffs) are accepted. Two conditions are imposed: the stakeholder must constitute a corporation, for which he chooses a pompous name, the French Electrical Installation and Operation Company (Compagnie Française d'Installation et d'Exploitation Electrique - CFIEE), and the company has to electrify a neighbouring hamlet, Goudou, the inhabitants of which have been active in asking for the grid. The municipality then grants an exclusive concession for a duration of 40 years, which is approved by the State representative (Préfet).

The system is installed: it includes a coal gazogene plant with a 60 HP engine and two dynamos producing 110 V, a grid of 2.4 km providing electricity to half of the houses in the village, i.e. 144 households (two of which have 3 wires and hence 220 V) and 24 public lighting points (of few W) with a time switch.

Labastide Murat thus joins the select group of Lot cities and villages with electricity (there were 24 in 1918, and by now 66 municipalities out of 334). CFIEE adds to the seven other private utilities already present in the Département. But with an electrification rate under 30%, the rural and poor Département of Lot still lags far behind the national average, with nearly reach 70% of households, and more than one French village in three, having access to electricity.

Of the 66 electrification projects within the Département, 55 were realised on a strictly private basis; others receiving small subsidies, mostly from the municipalities themselves which are the real motors of this first wave of electrification with 630 000 F in municipal subsidies, against only 13 000F from the State. But even if the State contributes little financially, it has defined extremely detailed rules for the game which are necessary to manage the multiplicity of villages and private providers.

Lighting is available until 10 p.m. except on Saturdays, Sundays and market days, when 'lights-off' is postponed to "a quarter of an hour after the bars' legal closing hour". Operation continues for about ten years, with problems from time to time such as a dispute between the village and the utility because of a two-day interruption to service (no coal available - the firm was fined) and some electricity theft (two houses were caught with clandestine connections). Disputes were resolved locally, sometimes with State authority arbitration since the municipality had asked to be relieved of its technical control authority, citing lack of technical capacity. Administrative routines required the yearly delivery of operational statistics by the utility to the Préfecture (those for 1927 state a consumption of 5 KWh per month per household) and periodic negotiation between the utility and the municipality on tariff revisions (according to a national index based on coal and manpower prices).

1933

While the village of Labastide-Murat is electrified, the remnants of the municipality (hamlets and isolated houses) are not. The municipality has been contacted directly by some companies operating in neighbouring areas, but the city council finally decides that the municipality will join one of the neighbouring inter-municipal syndicates, the "Syndicat Intercommunal d'Electrification du Nord du Lot". The overall objective being to develop the construction and operation (through a private operator, the "Union Electrique Rurale"-UER) of a power distribution grid in the local rural areas.

Created in 1925 by some of the rural municipalities in the north of the Département, the syndicate operates as follows: it funds work through soft loans (over 30 years, at a soft rate between 5% and 6%) from a public bank, the "Caisse des Dépôts et Consignations", on the condition that municipal budgets guarantee the cost of work on their own territory. The syndicate gets the money back through electricity service tariffs (about 50% of tariffs go to payback the loan, while 50% remain with the private utility), and only in the event of client non-payment do municipalities have to compensate through local taxes. The syndicate and the Union Electrique Rurale, the private utility in charge of the system, seek out villages and clients. They also advise farmers to be cautious: in these years, a gang of specialised crooks would visit farmers in the region proposing non-existent connections, disappearing with financial advances entrusted by the credulous.

The Labastide Murat city council commits itself twice, in 1934 and 1935, to guarantee a capital sum finally set at 277 700 F, meaning an annuity of 16 469 F. As a comparison, its annual budget is around 200 000 F, and so the financial risk is about 8% of its overall budget. For neighbouring villages, usually smaller and without any existing electric infrastructure, the financial commitment is more significant (Soulomès, a small village next to Labastide-Murat and not yet electrified, commits itself to a sum of 105 800 F and an annuity of 7 121 F, while its annual budget is only 36 000 F).

The grid is purchased from CFIEE and nearly all the municipality is electrified under the responsibility of the inter-municipal syndicate. Operation is dealt with by UER which converts itself into the major utility in the Département (87 municipalities in 1940). Before World War II, the electricity sector in Lot (for a population of about 167 000) has 11 inter-municipal syndicates and one municipal syndicate; three major utilities, Union Electrique Rurale, Compagnie du Bourbonnais and Société Pyrénéenne d'Energie Electrique; two smaller utilities, Société de Gaz et d'Electricité du Limousin and Compagnie des Distributions Electriques du Midi; plus nine single village utilities, all private ... and only one municipal company.

There is thus a multiplicity of actors, but electrification progresses: 326 municipalities out of the now 335, i.e. more than 95% of the villages, are connected to a grid, and 120 000 inhabitants, 74% of the population, have access to the service. Thus Lot has rapidly caught up on much of the country, even if the national electrification rate is already close to 90%. The nine municipalities still without electricity chose to refuse: they saw the guarantee through an inter-communal loan as too much of a risk. Their refusal reflects an excess of democracy according to council members: the mayors consulted their voters, and many were not convinced of the benefits of electricity, preferring to stick with kerosene lighting.

This proved a big mistake: the war comes and with it kerosene shortages; the nine villages in Lot (including Saint Sauveur and Beaumat adjoining Labastide Murat) have to revert for several years to the old “calel”, the oil or fat lamp. They have to wait nearly ten years before they are electrified by the syndicate, still the owner of the grid all over the region, even if its operation has been conceded to the national Electricité de France utility.

From Michel Matly, 2001, “L’électrification du monde commence à Labastide-Murat, Revue de l’Energie, January 2001).

From 1924 to 1940, rural electrification, HV and MV lines and distribution grids together, represented 8 billion F of investment. Most was provided in subsidies: 42% from the State (3.4 billion) and 13% from local bodies, the rest being found by the concessionaires (8% from own funds and 37% loans, of which 8% were at low interest rates). By World War II, rural electrification was almost complete. Some communities had chosen to refuse electrification, considering it too risky to guarantee a public loan for a somewhat luxurious commodity of limited use (in fact, the guarantee generally had no impact on municipal budgets, the loans being duly repaid by operators through consumer payments). These communities were badly hit by the shortage of petroleum during World War II and had to go back to old oil or grease lamps for lighting for several years.

There were also a number of very isolated small communities (“écarts”) that were still without access. Rural consumption was generally low (LV use in 1940 was 39 KWH per household per month in rural areas, against 190 KWH per household per month in urban areas) and many rural grids were weak and could not have met any increase in demand. There was still much work to do, and the post-war French authorities would give this task to other hands. The new public utility, EDF, completed the remaining 10% of electrification between 1947 and the early 1950s, when metropolitan France can first really be considered to be fully electrified. It consolidated and modernised the overall system, preparing it for future growth in demand.

French rural electrification begun, and ends, with myths. The national company has now mostly forgotten the earlier overwhelming efforts of both large and small private electrification pioneers, who gave access to 96% of villages and 90% of the population. In EDF’s self-representation (reflecting the thinking of most of its leaders and employees) in its communications (in the difficult 2004 debate on its partial privatisation) it claims rather too quickly to have electrified France. This is not true for metropolitan France, since the earlier private and municipal sectors have a prior claim to this, and it is not true either for the overseas parts of France where rural areas have yet to be electrified (such as the Amazonian regions of French Guyana).

1.4.2 Ireland

The Irish government began to involve itself in rural electrification in 1939, asking the Electricity Board (ESB) to propose a comprehensive plan to reach poor and under-equipped rural areas on the model developed in Scandinavian countries and North America. After some delays, due to World War II, an ambitious rural electrification programme was established, with the objective of electrifying about 280 000 rural consumers (but excluding the most isolated areas) – which can be compared with the 240 000 urban households having access to electricity at the time. Electrification was heavily subsidised (50% government subsidies, initially part-funded by the Marshall plan). The public ESB was in charge of building and operating the rural grids and a specific organisation, the Rural Electrification Office (REO), was created.

Priority areas were selected based on the commitment of local inhabitants who were asked to provide individual written statements that the household would accept electricity and pay for it.

REO “area organisers”, selected from among rural dwellers, were responsible for promoting the use of electricity and convincing their peers to commit. Trying to minimise on costs (single phase distribution, local poles) and employing local workers to better involve rural populations in the process, the REO launched its programme in 1947, and after a slow start began to spread electrification more rapidly. About 2000 households were connected in 1945, and the number of rural clients had risen rapidly to 25 000 in 1950, and to nearly 250 000 ten years later in 1960. Electrification was virtually complete in 1976, with more than 500 000 customers, far more than originally envisaged. A success, since everybody had finally got access to the service, but a slow and costly one.

In the process, grass-roots organisations were an essential support to the programme, in particular young farmers’ and, to some extent, women’s organisations: Muinntir na Tire (People of the Land) and Macra na Feirme (Farming Youth) supported the REO’s efforts in the early difficult years, and later Macra na Tuaithe (Youth of the Countryside) joined the support. The Irish Countrywomen’s Association (ICA) also supported the popularisation of electrification and piped water in rural areas, and the Irish public utility, ESB, used the support of the ICA to promote “modern” houses and kitchens among farming women.

This is one of the very few examples, if not the only one, of women’s participation in the European electrification process. Where are women in the history of European electrification? Nowhere until the second World War when, with the discovery of a mass market for home appliances, women were at last considered by the industry as a valuable target for marketing and publicity, and during the later stages of electrification in the poorest countries such as Ireland. In most countries, electrification was solely a male business.

2 The need for women: electrification in the USA

2.1 The development of the electricity sector

The first commercial applications of electricity were isolated systems built by Edison: first for a steamship, the SS Columbia, in 1880 and then for the Hinds, Ketcham & Co printing company in New York. As a complete system involving generation, transport and distribution, electricity arrived in the USA with the first Thomas Edison central station on Pearl Street in New York City which began to operate on September 4, 1882, and two years later was delivering electricity to several thousand factories and 500 households. Early US power sector experience is then marked by rapid development and aggressive competition between private stakeholders. At the turn of the 20th century, according to the 1902 census, there were 3620 power stations generating a total of 1.4 GW (at a time that England and France were completing their first 100 MW).

Electrical equipment markets were dominated by two major companies, General Electric and Westinghouse. General Electric having resulted from the merger of two of the three large electrical equipment manufacturers - Edison General Electric and Thomson-Houston. As early as 1895, General Electric and Westinghouse made a patent-sharing agreement in response to anti-trust regulations that also effectively killed off external competition. They sold electrical equipment to large companies, such as lighting companies, street railways and factories, often trading for shares in these firms. In 1898, General Electric owned stocks worth about US\$ 60 billion in utilities in London, Paris, Berlin, New York, Boston, Chicago and many other American cities.

General Electric and Westinghouse also created in 1895 the “National Electric Light Association” (NELA) in Chicago that would play an important role in the development of the sector. Throughout its existence, NELA consistently tried to counteract any public initiatives, from municipal to federal level, to enter the power business, but at the same time also collaborated with public authorities over some aspects such as sector regulation. In 1905, General Electric created the “Electric Bond and Share Company” to provide capital and technical assistance to weaker utilities, a means to reinforce the concentration of power in a few hands.

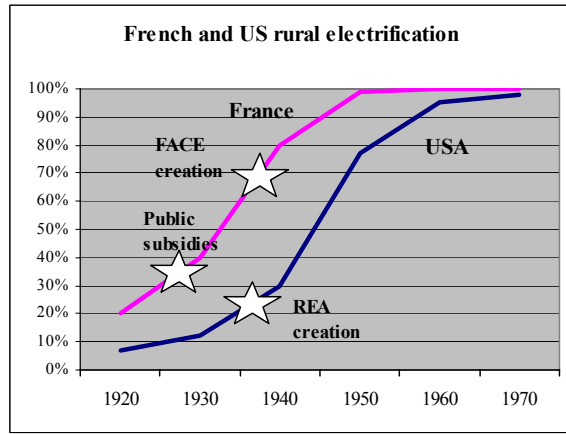
As in Europe, the first significant end-use markets were non-domestic: in the 1880s, street and commercial lighting and amusement parks; by 1888, electric traction (streetcars); by 1895, factories; and not until the 1910s, the domestic market. In the late 19th century, only well-to-do mansions had electricity, and electrification was only really spreading to regular urban homes around World War I.

General Electric and Westinghouse had become eager to develop the domestic market by 1915 and launched comprehensive programmes, through the purchase of the most promising small appliance companies, and with specific support to utilities in order to develop domestic demand. In 1923, General Electric announced that the domestic market amounted to 30% of the electricity market, but represented 50% of its gross income due to higher tariffs. The domestic market quickly proved to be the main engine of American power sector development, without the vicissitudes of other markets caused by structural changes and economic crises. Major companies recruited female marketers and NELA recommended utilities to open specific marketing units with female “utilisation experts”.

Streetcars were a profitable market in the 1890s but declined rapidly in the 1920s, During the depression, hundred of traction companies went bankrupt, and manufacturers deserted the utilities: the huge energy-consuming chemical industry bought 89% of its electricity in 1929, but only 57%

in 1939; the lumber industry 75% in 1929, 47% in 1939. This resulted in hard times for electric companies: between 1930 and 1935, General Electric's sales dropped from US\$ 376 to 233 million, and its net earnings were down by almost 50%. However, domestic energy use more than doubled (due in particular to an 80% rise in average household consumption over the period) and the power sector continued to grow (165 central stations were built in the first half of the depression).

The USA quickly outdistanced European countries: in 1905 the cumulated installed capacity of European countries was more or less the same as the US installed power (3 GW) but, by the mid-20s, US installed power had grown to 26 GW, while Europe's only to 17 GW. The US electrification rate was 8% in 1907, but this had doubled by 1912, and doubled again by 1920, reaching 35% of the overall population. Electrification progressed mainly in the urban areas where most of the population lived (70% in 1920, 75% in 1930). In 1920, 47% of urban households had access to electricity. In 1921, there were one million new customers and, by 1924, two million customers were being added annually. The prices of electricity steadily decreased over the period: the 16% of the population electrified in 1912 were paying on average 9 cents per KWh, while the 35% electrified in 1920 were paying only 7.5 cents, and the 70% electrified in 1930 only 6 cents. By the late 1930s, urban electrification was more or less complete.



This contrasts with the slow performance of the sector in rural areas: the US census of agriculture reported that in 1920 only 7% of farms had access to modern lighting (including electricity and gas, and that only 2% of rural dwellers then had access to central station service. In 1930, 13% of farms were electrified, although this figure includes individual small generators as well as electricity from the grid. In his famous “12-minute memo” pleading for State intervention in rural electrification, Cooke, the future leader of the Rural Electrification Administration, writes that, in 1933, of the more than six million farms, while over 800 000 are electrified, only 650 000 (10% of farms) receive “high line” service, the balance having individual “Delco” plants.

The situation varied significantly among regions: some, such as the North East and the Far West, had electrification rates comparable to Europe (about one-third of farms being electrified in 1930, not dissimilar to France). However, the situation was worse in the Mid West and above all in Southern rural areas (where only 4% of farms had access in 1930, and only 19% in 1940). A European visitor in the 1930s was quite surprised with the conditions of life in American rural areas, so different to what she has been told by her US urban friends, who “still believe that everything is for the best in the best of all countries”. A not-uncommon western view of a developing country (just change America to Senegal, Tennessee to Casamance, for example).

“There are districts in West Virginia, East Tennessee, Kentucky, where the mode of material existence is not different from that of the first settlers, over a century and half ago (useless to fall back upon the facile plea: “That’s the South”. The South is American, isn’t it?). Even when I visited the better-off farms, I discovered that a very large percentage of them had kitchens with ovens burning wood - the poor cooking in pots and pans over a little fire on the hearth, as in the Middle Ages; that they were lighted by dim, smoking, smelly oil lamps, that the washing of clothes was done by hand in antiquated tubs; that the water was brought into the house by the women and the children, from wells invariably situated at inconvenient and tiring distances, for it appears to be one of the milder manias of the American farmer to sink his well as far away as possible

instead of near the front door, under trees, as the European peasant does. Ordinarily, there is no icebox, so many products that may be grown to vary the horribly monotonous diet are out of the question; they could not be stored. Of the 50 MHP required by farms, 61% are still furnished by animals and only 6% by electric stations. About 90% of the citizens on farms, say the statistics, do not have the lightning and the simple comforts that have become a commonplace in most middle-class dwellings in urban communities. It is nothing to brag about, you know.”

Odette Keun (1937) *A foreigner looks at TVA*, Longmans, Green and Co, New York, page 29-31

Active State support permitted rural electricity to develop sustainably, albeit without being able to reduce the 20-year gap with Europe: rural electrification was almost completed by the end of the 1950s but not finalised until the 1960s. Besides a dominant and essentially private sector and a minor and somewhat lethargic municipal one, rural electrification cooperatives played a considerable role acquiring five million farm and non-farm clients in 25 years. Rural migration was of some help: in 1935 - the first year of the REA's creation, cooperatives originally faced a 6.8 million farm market, but finally only electrified 2.5 million: the number of rural farms had dramatically decreased to 2.7 million in 1969, and the rural population from 30 to 10 million.

2.2 Public intervention

From the beginning, the US power sector history was marked by an aggressively competitive market. Initially, unregulated competition between rival private suppliers led to financial failures and municipal takeovers, which obliged public authorities to regulate as early as 1906 with the first long-term concessions granted in Wisconsin. Standardisation was an early preoccupation of the private companies, in order to cut costs and tariffs. Standardisation was relatively easy, because the crucial patents belonged to very few firms, and industry development relied heavily on early cross-licensing, a practice imposed on firms by federal authorities if they wanted to avoid charges of monopolistic control. By 1910, electricity was generated at 60 Hertz and distributed all over the country at 120 Volts to domestic customers.

Public enterprise was also not idle: it is estimated that during the period from 1897 to 1907, 60 to 120 new municipal utilities were created each year by public referendum. In 1912, nearly one in three American utilities were municipal with a total of 1712 public power systems, against 3659 private companies. However, most of the public systems were in small cities while the large towns generally had private utilities, albeit with some exceptions such as Seattle. During the 1920s, the number of public utilities and their significance in total generation steadily dropped. Private utilities were larger, connected with more efficient grids and, by 1932, public power systems were generating only 5% of the nation's electricity.

Reasons for the dominant private sector involvement in the electricity business may be found in the earlier examples of privately-funded developments such as the railways, telephone and telegraph (unlike in Europe where the public sector was often involved), in the American decentralised administration system that made central planning difficult, and in the limited financial capacities of local public bodies. However, the major reason is probably the early development of large and powerful private companies, well organised and able to lobby against public interventionism.

Through NELA or individually, the private utilities fought against public interventionism with lawsuits, lower tariffs and public relations exercises. The three main reasons given as to why electricity should be developed by private business were that corrupt political machines would run utilities with patronage appointments, that they would keep user rates too low and so under-invest in new equipment and fail to pay high enough salaries to attract the best engineers and managers,

and that pushing out private enterprise is socialistic and thus undesirable. The first argument was rather serious: as a young politician, Theodore Roosevelt had estimated that about one-third of his colleagues in the New York State legislature were corrupt. The fear was that utilities would take advantage of this, using bribery, as in Cleveland where the utility successfully bought off the city council to avoid municipal management.

The fiercely private sector was also very enthusiastic over, and actively participated in, the creation of State Regulatory Agencies to oversee their “natural monopolies”, as a way to clearly discriminate between the roles of the private and public sectors and so prevent the latter entering the electricity business. By 1921, all States except Delaware had such regulations.

Only in the late 1920s and the 1930s did the debate between privately-driven dynamics and public intervention take a new turn, initially because of the rural crisis. American rural areas were going through hard times. The post-war prosperity was far behind, and farmers’ incomes had dropped by 40% between 1925 and 1930. 1932 was the worst year for farmers, with the average income a quarter of what it was in 1919. Even if the rural population had been steadily decreasing as a percentage of the total population, the number of farms continued to steadily increase, reaching its peak in 1935 since when it has consistently decreased. With this rural crisis, the differences in access to services and the quality of life between urban and rural areas appeared to reach unbearable levels.

American debaters also looked at how some of the neighbouring countries had been dealing with electrification. Developments in Canada were becoming a major threat to the all-private supporters, with the successful development of the Ontario Hydro project. Established in 1906, the Hydro-Electric Power Commission of Ontario had become the largest public utility in America, buying electricity from a plant at Niagara Falls (a plant it would later purchase), generating electricity and selling it to municipalities which then distributed power “at cost” to urban and rural areas. As progress was relatively slow in rural areas, the Ontario utility established a 50% subsidised programme for grid extension in 1921. This resulted in accelerated rural electrification and electricity prices far below the US average.

This “spectre of socialism”, so central in America fears, provoked a strong reaction from the NELA which, in the interests of the major US electrical industries, opposed any public involvement in developing and distributing electricity as unfair competition, as well as from the coal industry, which saw subsidised hydroelectricity as a threat to mining profits and jobs. However, dams appeared to be such a key issue, due to their multiple purposes (power, irrigation), that, in 1920, a “Water Power Act” was passed to strengthen government supervision and abolish perpetual or long-term private leases on dam sites.

In the 1930s, a new surge of interest by municipal companies led to political fights and changes. The creation of public utility districts in Washington (1930) and Nebraska (1933), the establishment of regulations as in New York State, enacted in the 1930s, guaranteeing cities the right to build their own plants and making available federal funding, reflect the growing interest of politicians and “public power engineers” in public intervention to promote rural electrification. Some financial scandals (such as that involving Samuel Insull) led to the “Public Utility Holding Company Act” of 1935, that gave public authorities the power to dissolve any holding company that could not demonstrate its usefulness, as well as regulatory control over interstate shipment of electricity and the accounting procedures of utilities.

The Canadian example stimulated various initiatives; the best know being the “Giant Power”

interconnection plan of 1925 in Pennsylvania. This was based on generating electricity at coalmines and transmitting electricity through HV links to all parts of the country and developing rural electrification. Another was the Muscle Shoals public hydropower project on the Tennessee River. However, all such projects were voted down by State legislatures. The major success of the public interventionists was the creation in May 1933 of the Tennessee Valley Authority (TVA) that was designed to develop an integrated programme for flood control, and to develop navigation and rural electrification. In the minds of some congressmen, the TVA was another dangerous step on the road to socialism.

2.3 Rural electrification

As the private power industry was only slowly entering rural areas, farmers looked for their own solutions. Around 35 rural electrical cooperatives were formed by affluent farmers in the decade following the First World War, mostly in the Midwest and Northwest. In many cases, these were small developments from other cooperatives, and generally near a source of municipal power. Some survived, other disappeared - absorbed by local utilities. A far larger number of farmers sought individual solutions from among the numerous possibilities under development. Various small and medium sized companies proposed wind power generators (such as Aeroelectric, HEBCO, Windcharger and Jacobs) and sold nearly 50 000 units between the 1930s and the 1950s.

However, most farmers bought cheaper petrol and diesel gensets, and the number of producers skyrocketed during the prosperous years around the war (from 5 in 1911 to about 100 in 1916). The most popular unit was the Delco set developed in 1913 which had sold about 40 000 units by 1918. Farmers were using the electricity primarily for domestic purposes: lighting, washing machines, irons and cream separators, and a little for other purposes such as running motors and water pumps. In total, an estimated 200 000 individual sets were sold by 1919, and 600 000 by 1929. Until the late 1920s, farmers with such equipment outnumbered those with grid access. Things changed in the 1930s, with some development of private networks, but above all with State-supported rural electrification.

The creation of the Rural Electrification Agency in May 1935, then the Rural Electrification Act of May 1936 which established it as a funding agency, led to heated debates between promoters and adversaries of State intervention in the power sector, as illustrated by the following exchange in the House of Representatives in April 1936:

Rankin: The gentleman says electric service is quite new. Of course it is no more new in this country than in Europe.

Meritt: If you compare [Europe] with the Eastern States or California, I think the results are as satisfactory here that they are there.

Rankin: I wonder if the gentleman knows that in New Zealand two-thirds of their farms are electrified, [and] in the United States 10 percent are...

Meritt: In New Zealand they deal with enormous tracts of land... Also, New Zealand is a socialistic state.

Rankin: I wonder if the gentleman knows that in France or Germany 90 percent of their farms are electrified. Those are not socialistic states.

Meritt: No, they are not socialistic, but they are imperialistic.

Rankin: I wonder if the gentleman knows that Holland and Switzerland are practically 100 percent electrified.

Meritt: But they are no larger than our New England.

Rankin: In understand that there is no state in New England that has even 25 percent of its farms electrified.

Meritt: I do not care to give this gentleman more time.

Cited in NRECA, (1984) The Next Greatest Thing

The REA initially proposed its scheme without discrimination, to private utilities, to state power districts and municipal plants, to farm cooperatives and to the federal government itself. The REA attitude towards private companies was somewhat ambiguous, between respect for their political power and technical ability, and reproach for their minimal involvement in rural electrification. In order to avoid conflicts and accusations of harming the interests of the private utilities, the future Head of the REA, Morris Cooke, wrote, "This [REA] proposal does not involve competition with private interest as is the case where municipal plants are financed. This plan calls for entering territory not occupied and not likely to be occupied to any considerable extent by private interests." In his "Electrifying the countryside" book, Cooke also pointed out the lack of interest by private utilities in rural electrification: "Private utility companies, which provide electricity to most of the nation's consumers, argue that it is too expensive to string electric lines to isolated rural farmsteads, and that most farmers are too poor to afford electricity. A convention from the National Electric Light Association, the voice of the US power private sector, agreed that rural service was practicable only where lines were being extended from one well settled community to another and farms could be picked up incidentally en route".

Some of his criticisms of the private utilities were very practical, for example on the utilities' technical standards, "Since utility company ideas as to what constituted sound rural lines have been rather fancy, such costs [are] prohibitive for most farmers"; on the conditions for farmers' access to the grid, "In addition to paying for the energy he used, the farmer [is] expected to advance to the power company most or all of the costs of construction". As an example, new rural customers of the private "Indiana General Services" utility had to pay 18% of the construction costs.

This led to well-founded criticisms over the prices for electrification announced by private utilities. The public Power Authority of the State of New York (where Cooke was working as a consulting member) showed that it was possible to considerably reduce the electrification costs claimed by the companies: a mile of line in rural areas was priced at nearly US\$ 2000, while it appeared possible to install it for US\$ 500 to 1000. In a 1935 memo, Cooke talks about US\$ 500 to 800 per mile, and actual average REA prices were about US\$ 538 (US\$ 825 with overheads) in 1939.

The private utilities first argued that they should have access to the REA credit pro-rata to their 95% presence in the sector. They quickly reacted to the creation of the REA by formulating a common proposal, in the name of the whole industry, to borrow all the REA financing, some US\$ 100

million, in order to build 78 000 miles of lines and serve 351 000 clients including 247 000 farms. At the same time, the REA could use another US\$ 124 million to lend to clients to wire their houses, install service extensions and buy appliances. This over-costed proposal, with no commitment on area coverage, was courteously rejected.

This somehow resulted in a demarcation between private utility and REA rural electrification schemes that was acceptable to both parties. The REA would build rural grids with other partners, and the industry would sell electricity to the newly established grids, with most generation left in private hands, and develop the electric commodity market. By 1936, NELA and REA were collaborating in a permanent committee in order to prepare communication material to promote the use of electricity in rural areas. General Electric and Westinghouse helped the REA to draw up wiring specifications and manufacture inexpensive appliances for farm consumers.

Some utilities continued to invest in rural electrification. "Electric World" estimated that about 20 000 miles of rural lines were built in 1935 while, the same year, the REA had approved 100 projects, representing 13 000 miles of rural distribution line and 53 000 customers, although it built only 3000 miles in its first two years. The REA welcomed the effort of utilities and took part based on merit, arguing that its own efforts were showing these companies "that there is a mine of hidden profit in rural electrification if they will operate on a comprehensive scale." However, at times, private companies built lines in the middle of areas being developed by REA cooperatives or "creamed off" their market, just to sabotage their cost-effectiveness.

Municipal companies, whose proposals would in principle be received with particular goodwill by the REA, showed a total lack of interest in rural electrification, with virtually zero participation. The REA was thus mainly left to deal with cooperatives, although some executives thought that farmers did not have the skills needed to manage local electric companies. The few existing electric cooperatives were said to have an alarmingly high failure rate, due to poor capitalisation and poor management, leading them in a number of cases to sell their lines at a loss to local power companies. Cooperative leaders were generally in favour of getting involved with the new REA, but more radical elements were worried that massive State financial and technical involvement could ruin the cooperative spirit. In spite of some defiance, the partnership between the Federal State and the cooperatives would prove to work perfectly well.

The REA considered that of the then five million non-electrified farms, one to three million could be provided with a service on an economically sound basis. Its original budget was US\$ 100 million per year, only half of which was allocated in the initial years. Demand grew quickly and soon far exceeded the REA budget. In 1937, loan requests that could not be met amounted to US\$ 90 million. The budget increased from US\$ 88 million in 1938 to a peak of US\$ 460 million in 1942. Virtually all loans were repaid to schedule and, even in the worst years of the depression, the value of assets and appliance sales rose by 20% a year.

The REA's first ten-year plan aimed to electrify about one million farms, an objective reached after only six years. 12 000 schools were also electrified in the first five years of implementation. With two systems established in the very year of its constitution (1935), it helped in establishing more than 1000 systems over its lifetime, supported the creation of over 900 cooperatives that built over 1.5 million miles of lines, and served almost five million customers, of which half were farms. In the record year of 1949, nearly 200 000 miles of lines were built and over half a million new households connected.

The REA funded wiring installations, domestic electrical and plumbing appliances and equipment, entered the telephony sector in 1949 when only 35% of farms had access to telephone, took on water and sewerage projects, and lent money to borrowers to help them invest in economic projects in their rural areas. In 1945, the renewal of the REA ten-year charter was the occasion for a new and successful political fight with the National Association of Electric Companies (NAEC), the successor to the NELA, which argued that the REA's role was complete with over 50% of farmers electrified. It was not until October 14, 1994, that Congress closed down the REA, but then created the Rural Utilities Service (RUS) to direct federal programmes for developing electricity, water and telecommunications infrastructures in rural America. To date, the RUS has provided several tens of billions of US\$ in rural electric loans to thousands of communities across rural America.

In the Southern States, where access to electricity was virtually nonexistent in 1935, cooperatives played a crucial role. As an example, in 1935, only 2% of Texan farms had access to electricity but, by 1965, the figures had reversed with only 2% of farms not having access to a service. Two generation and transmission cooperatives, 70 distribution cooperatives plus the public "Rural Electric Division of Ryan" were now operating 165 000 miles of line, and covering 80% of the State's counties. Moreover, the cooperative sector continued to grow: it covered 246 of the 256 counties, with 500 000 rural connections, in 1971. In the 1990s, when the REA closed its doors, the Texan electricity cooperative sector was made up of 76 cooperatives responsible for 257 000 miles of line, 5500 jobs and 1.1 million clients.

The REA lent money to cooperatives - or municipalities - to build up electric systems. It also lent to cooperatives in order to allow them to give loans to their members for the purchase of individual equipment (wiring installations, electrical and plumbing appliances). Loans were soft, and rates were low (for example, 2% for generation plants and transmission lines, 5% for distribution grids and 7% for municipal loans in the mid-1980s compared to an average mortgage rate of around 8% at the time), and with long duration (up to 35 years, except for loans for personal equipment which could not exceed five years).

One major difference to private utilities is that access costs to the service were kept low. The first cooperatives asked only a US\$ 5 membership fee that gave you the right to be connected. Rural subscribers then paid around US\$ 2 to 4 per month for the basic service (about 12 KWh a month). This was quite a sum, given that the net income of farms was typically only US\$ 300 to 700 a year (the minimum electric bill thus represented 5% to 10% of income). This reflects the REA's philosophy and preferences as a socially-oriented body towards making access easy, but also, as a banking institution, having high tariff rates.

The REA's loan conditions perfectly reflected its dual philosophy as a social body (reach the poor) and a banking institution (make them pay). To access credit, you had to prove that your clients have a low income, under the average for residents of your State (proving that your cooperative is reaching poor). But you also had to present high tariffs: a revenue per customer of not less than 120% of the average revenue of existing utilities in the State, and a residential tariff not less than 120% of the average residential tariff of existing utilities in the State. Alternatively, in the case of loans to municipalities, these had to sell electricity to residential clients at above the general prices (more than 15 US cents/KWh in 1987, for instance) and at a sufficient level to cover the costs of loans. Rural electrification is expensive, and rural clients, by rule, have to pay more than urban ones.

2.4 Relying on women

As early as 1938, the REA were considering women to be a key target in promoting electrification, calling for joint-membership (husbands and wives) that would bring more female voters into the cooperatives, and for the inclusion of women on cooperative boards. The new head of its development division, Winder, declared, “Frequently it is the women that are more active and enthusiastic than the men in promoting a rural electrification project. We know of several instances where the men despaired of getting an electric cooperative developed until the women went to work and sold the idea to their neighbors”. Another REA senior executive declared “Electricity in rural areas means more to women than it does to the men; they have social vision; they have community interest at heart; they are not likely to get bogged down in petty dispute as men do.”

A Pennsylvania farm man gave orders to have its electricity shut off. When workers came out to the farm, his wife replied “You take this meter and see what happens.” She went home to her mother’s leaving her husband a note and a cold supper. After a few days, he gave in and had the electricity turned back on. “By this time, she had her back up. As a price of peace, he had to buy her a new electric washing machine”.

REA annual report, quoted Ronald R. Kline (2000), “Consumers in the country”.

The REA hired quite a large number of women for its central staff (even if they were generally segregated as home economists). In 1940, it imposed a joint-membership system on farmers, most of whom were not accustomed to drawing their wives into organisation activities. At the same time, it also enforced through its pre-allotment procedures that any new project should have at least three women (out of nine members) on the incorporating board. At least two presidents and four vice-presidents of cooperative boards were women in the first half of the 1930s. Not all difficulties and petty disputes were mitigated by women’s presence, as testified by one of the female members of a cooperative board: the process of building the cooperative would improve, she wrote, only “once we get rid of all the engineers”.

3 Naked electrification, clothed electrification: the development of the domestic appliance market in Europe and the USA

3.1 The development of the domestic appliance market in Europe

3.1.1 Overall market

The early developments in electricity did not see the domestic market as an opportunity. Utilities focussed on applications such as industry, transportation (streetcars and railways), street lighting and telephone grids. Since the end of the 19th century, utopian descriptions of the electric home had given a pretty good idea of what would develop, but remained no more than science fiction dreams. At the end of the 1910s, there was an explosion of presentations on home applications of electricity: bells, sewing machines, fans, heating systems, cookers, toasters, irons, water heaters... but they were essentially seen as inventive bubbles in the then extraordinary craze for the new energy source, as thingamajigs or, at best, luxury items reserved for wealthy enthusiasts.

International fairs were then considered as the best place to introduce new domestic appliances: during the Paris 1923 household appliance fair, 130 exhibitors presented irons, vacuum cleaners and wax floor polishers, cookers, heaters, kettles, toasters, washing and dish washing machines. Twelve brands of electric machines were presented that year, and a year later there would be thirty. In 1928, the first “small” washing machine was presented by Electrolux (with manual spin-drying). However, there was almost no development a French market for such items.

Some countries developed their domestic markets more actively than others: in 1927, domestic consumption represented 8% of the total consumption in France, and in 1939 10%; while in England it had already reached 25%. In 1939, a French customer was using only 10% of the electricity used by their Swedish counterpart. As a general rule, in a large number of European countries, electric comfort would remain a luxury until after World War II and only develop widely in the 1950s and 1960s.

Electric ironing appeared in the late 19th century, and in the 1920s electric irons became affordable. However, their use was slow to spread: in 1926, only 10% of French subscribers had an electric iron, and most of these were in urban areas. In 1932, in the final years of the electrification process, only 18% of Swiss women and 6% of French ones used an electric iron.

Washing was traditionally an outside activity: wash-boats had existed in Paris since the seventeenth century, where you would pay for cold water, hot water and for drying. Sheltered wash-houses were being built in the nineteenth century in rural areas. Long after washing machines had been designed - first hand driven, then mechanical driven and then electric models, “modern” European women, although now washing inside their own houses, were still using boilers heated on top of the cooker up to the end of World War II. In 1958, only 10% of French households had a washing machine, in 1963 only 40%, and in 1970 still only 57%.

The same story goes for other appliances in France: in 1932, only 1% of women were using a vacuum cleaner, and 50% market penetration would have to wait until the 1970s. The first refrigerators appeared in 1926, but nearly ten years later, in 1935, only 25 000 units were in use in France. In 1954, shortly before mass use of home appliances really started, only 7% of French households had a fridge.

In 1928, the magazine “Mon chez soi” noted that only the “bourgeoisie” used electrical domestic appliances (but adds that “all women could become bourgeoisie”). The same sentiment was expressed by communist activists, who saw the development of domestic appliances as one more coup by the ruling class: “The Household Arts Fair was born from the distress in which bourgeois families found themselves when the human material of nurses and servants, one of the essential factors of their existence, began to rarefy due to the entrance of rural and urban proletarian daughters into factories, private administration and public services. Then, the ruling class, when it came to undertake even the slightest bit of work, discovered that household chores were done in a primitive way, and that these chores, as disdained as they were indispensable, had never benefited from the progress of industry.” writes Marthe Bigot in *La Révolution Proletarienne*, April 1927.

The mass domestic market was perceived of as no more than a long-term wish by public opinion as well as by its most fervent admirers (Paulette Bernège, the editor of “Mon chez soi”, is considered to have been the authoritative voice of the French domestic science movement). That capitalism might be a way to disseminate home comfort widely was unimaginable to the ever more influent French left wing. This view is reflected in the facts concerning the distribution of electric appliances and other domestic goods over the first half of the 20th century: in 1928, there was one car for every 5.3 people in the USA, but only one for every 44 in France. In 1954, only 6% of French households had a “comfortable” dwelling complete with WC, bathroom and central heating, while in the USA 63% of households met this standard.

Some efforts were made by European utilities in the 1920s to develop domestic uses of electricity, primarily to smooth their load curves which were then the opposite of those met nowadays: peaks during productive daytime hours and troughs at noon and at night. The efforts were not very successful: they aimed primarily to develop the use of electric cookers (but these were using too much energy and were too expensive), water-heaters and electric heating systems (but utilities were afraid of excessive winter peak demand and did not go far in promoting these equipments). This nevertheless did bring some results: in Paris, night use increased from 48% to 75% of day demand between 1926 and 1935.

Meanwhile, French industry was not totally unaware of the potential in developing electrical appliances. In 1929, it set up a “Cold Committee” to raise consciousness about the need to conserve food, at the same time as the American NELA was creating the “Electric Refrigeration Bureau” with similar purposes and using similar models. However, the French industrial apparatus did not follow, and the electrical appliance mass market would remain beyond the scope of French capitalism up to World War II. Large private industries, that had been somewhat late in entering the power market, were now involved in battles to conquer territories, with strong competition between large thermal and hydroelectric schemes. This left little capital and time to worry about domestic market development.

In other European countries, the public development of electricity left little space for the private sector. Some companies chose to enter the French power business (Swiss company and bank activities were condemned by some newspapers as the “foreign hand of international capitalism” in French affairs), or looked for profits in other directions, such as in electrical equipment (with the birth of huge companies such as the Swiss Braun Bowery). Some markets for domestic appliances did appear, but no company had sufficient capital or interest to be looking for export opportunities. This was also the case in America, where the huge national development opportunities appeared sufficient without needing to consider European markets. In many countries such as France, potential customers were largely ignored until the mid-1930s.

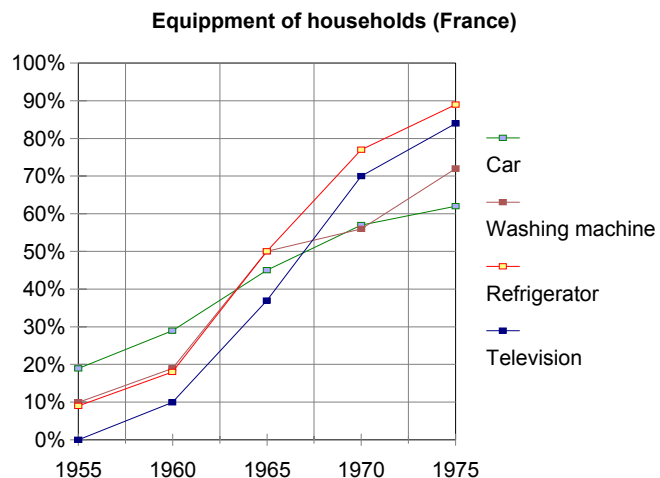
Paradoxically, significant steps in the development of the European electrical appliance market began during the period of economic depression following the 1932 crisis. European companies, often with American partners that had largely satisfied their national urban market, were looking for new opportunities and began to diversify toward radios, telephones and domestic appliances. But this was short-lived, wartime arrived and domestic market development would have to wait until after World War II.

The late and cautious development of the French domestic market for electrical appliances reflects a specificity of its power sector: electricity in France remains an essentially male business, an engineering matter, where women have no part to play. The domestic appliance business was no different, and the developments during the interwar period included marketing and publicity strategies aimed at anybody but women.

Electrical engineers were among the first to understand the importance of publicity. Nearly half of the advertisements in popular magazines such as “L’Illustration”, or more specialised ones such as “La Nature” and “La Science et la Vie” (still one of the most popular science magazines in France), dealt with electrical equipment. However, this publicity was addressed to men - potential clients were department stores and resellers, not female users. Very few women appeared in the equipment catalogues before the end of World War II. There are some modest exceptions: the charming “Suzy Calor” became the emblematic figure of the Calor company in 1925, but there were no woman in leading roles in the company, not in the firm’s general directorate (16 men) or as regional agency heads (13 men).

Slowly, however, in the late 1930s, when Europe was seeing crises that would climax in World War II, a growing recognition of women can be perceived. Advertisements begin to talk about mechanical slaves and women’s liberation, but the portrayals of women are ambivalent. Sometimes they are modern and free - possibly appearing even dangerous to some – and in others they are model wives and mothers, serving their husbands and families. Little girls are also portrayed, happy and amused by the domestic “toys” given to them by electrical engineers. Images will vary according to equipment: in the case of the vacuum cleaner - the warrior woman, the electric witch, the Amazon riding the equipment; in the case of the iron, the submissive worker bending over her linen; in the case of the washing machine, the little girl (using it is child’s play) or the modern young woman, in contrast to the older one washing her linen on her knees.

This final image will come to dominate after World War II when women, and no longer men, are considered by industry to be the vectors of modernity. Women then become the main target of communications about electrical domestic appliances. Publicity builds up an image of young, modern and affluent woman, a model essentially coming from the USA. The slogan of the “Société de Paris et du Rhone” - *Le confort dans le home* – has clear American overtones and is used to promote vacuum cleaners and wax floor polishers. However, liberation through electrical equipment is still sometimes seen as an ambivalent or even a negative goal, and even put in



these terms to the female public. One company advised the future users of its washing machine to pre-wash the linen by hand, fearing to confer an image of female leisure - or laziness - on the purchasers of the new equipment.

The French electrical appliance market lagged the US one by some thirty years. It was only really fully developed some forty years after the completion of electrification.

The market dynamics of French domestic commodities reflects the differential growth in household equipment that can be seen in most European countries: initially a more dynamic growth in cars, followed by washing machines and refrigerators, with the latter then dominating, followed by television, while the car's and the washing machine's penetrations slow.

3.1.2 Rural market

Development of the appliance market is almost non-existent in French rural areas during the electrification period. Benefits of electrification are limited to light and radio. In some of the poorest regions, such as in Vendée, the only notable consumption in the 1930s is not even in the home, but stable lighting.

In the mid-1960s, rural consumers were still cautious purchasers of electrical appliances. Market trends show that the washing machine, the usual frontrunner in equipment penetration everywhere, was significantly more common than the refrigerator in rural areas.

		Washing machine	Refrigerators
France 1965	Farmers	26%	24%
	Agricultural workers	21%	17%
Spain 1966	Centres with more than 500 000 inhabitants	63%	47%
	Between 95 and 500 000	54%	33%
	Between 10 and 95 000	39%	27%
	Between 2 and 10 000	17%	10%
Ireland 1965	Urban	35%	25%
	Rural	22%	12%

This trend is confirmed when considering the development of the Irish market: while rural electrification was in process, refrigerators and freezers had difficulties in penetrating the overall market, and especially the rural market, but would eventually achieve higher rates in the second half of the household equipment growth.

Appliance market in Ireland

Appliances		1960	1965	1970	1975	1980	1985
Urban consumers	Washing machine	15	35	47	57	70	87
	Refrigerator or freezer	9	25	51	72	98	111*
	Vacuum cleaner	33	30	50	60	75	86
	Electric kettle	37	39	46	52	68	86
	Electric cooker	25	30	36	42	50	56
Rural consumers	Washing machine	12	22	32	43	60	69
	Refrigerator or freezer	5	12	21	48	100	114*
	Vacuum cleaner	10	12	16	23	47	63
	Electric kettle	40	48	55	58	70	78
	Electric cooker	18	20	25	31	37	40

* Some consumers have both refrigerators and freezers

Source: Rural electrification in Ireland, Michael J. Shiel (World Bank, 2004)

A detailed analysis of the Spanish market is revealing in two aspects: apart from a radio, largely present in the 1960s, consumers were more interested in items that reinforced their independence from a still weak economy, such as a sewing machine, than in items that cut distances and connected rural areas to cities and to the wider world, such as cars or televisions.

Equipment rates and interests in purchasing consumers goods, Spain (percent)

City/village size (population)	> 500 000		95 000 – 500 000		10 000 – 95 000		2000 – 10 000	
	Have	Think necessary	Have	Think necessary	Have	Think necessary	Have	Think necessary
Piped water	89	99	90	100	82	98	44	99
Radio	91	80	90	77	84	74	74	78
Sewing machine	76	84	75	86	68	81	54	78
Bath or shower	59	91	57	90	47	80	18	75
Washing machine	63	83	54	85	39	70	17	50
Electric refrigerator	47	79	33	73	27	62	10	49
Ice chest	31	13	18	9	8	6	5	9
Water heater	40	82	58	75	34	68	9	42
Television	51	66	39	57	30	53	5	38
Telephone	53	83	33	65	21	47	8	33
Motorcycle	6	10	10	10	13	10	12	21
Car	16	32	15	28	13	24	5	16
Vacuum cleaner	41	32	11	26	6	20	1	12
Record player	20	24	16	18	9	14	2	7

Source: Instituto de Opinión Pública 1966.

Moreover, rather than electricity, the one commodity now seen as fundamental was piped water. This is perhaps hardly surprising: in 1966 in Spain, more than half of rural dwellers were still waiting for piped water; and water, bathrooms, showers, water heaters, washing machines were seen as essential items by rural households, far more than other electric appliances. In France, in

1962, 42% of rural dwellers had tap water in the kitchen, and 28% were connected to water grids. By 1970, 78% had piped water. In rural areas of France, Spain and Ireland, the late development of electricity and use of electrical appliances was less of an issue than water grid extension in the 1960s and 1970s: much had still to be done in that area.

Water was a very important issue for households, but primarily for women, "Many men in rural Ireland are not yet fully aware of the advantages of piped water supply. Very often they will get a water supply with the advantage of the stock in mind rather than the housewife, and very often if the stock don't want water, the housewife has to do without it also. Let your menfolk know you will not tolerate such treatment. Tell them you don't want to end up in your old age with a bad heart from dragging water over long distances." was the message of Irish ICA members in the 1960s (Shiel, 2004)

This overwhelming desire for water somehow contrasts with the cautious interest shown towards electricity at the time of its spread to rural areas. Many farmers considered electricity as a luxury item, doubtful of its real purpose, and refused to participate in public schemes. In France, most of the electrification projects that succeeded were driven by some enlightened notables, often represented on villages councils, who sold the idea of electricity to doubtful farmers as a necessary progress. A number of communities voted against the arrival of electricity. Electrification in Ireland was difficult and slow not only due to social parameters - rural poverty, dispersed housing - but also because of the reticence of farmers. ICO activities in Ireland were to persuade rural community members to get electricity, as much as to respond their demands.

Was this lack of interest in electricity really due to the stubbornness of backward-looking French and Irish farmers? The reason could be elsewhere: that electricity comes alone, naked, offering little more than light and radio. Electrification included none of the available electrical commodities, already widely disseminated elsewhere, and none of the services that electricity could bring to households, and to women in particular. Without electrical appliances, European electrification is "bare" electrification: bringing some bulbs, cutting out some old gas or paraffin lamps, but little more. No wonder it had only a limited value for farmers and, above all, for their wives.

3.2 The development of the domestic appliance market in the USA

3.2.1 Overall market

The same year as Edison was establishing its first central station in New York, it was also building up a number of companies to manufacture individual generators and light bulbs, with a virtual monopoly that would last for several years. By 1900, its generation enterprises were transformed into Consolidated Edison of New York - a major worldwide utility - and its manufacturing enterprises were merged to become General Electric. Another company, Westinghouse, had entered the sector with an alternating current motor capable of powering most electrical appliances, after buying licences from its inventors, the Italian scientist Galileo Ferraris and the Hungarian engineer Nikola Tesla.

In the 1900s, the first small electrical engines were being sold to households for the customers to connect them to existing mechanical sewing and washing machines. Shortly afterwards, by 1910, purpose-designed electrical sewing and washing machines appeared on the market, together with the first electric vacuum cleaners (an electric fan hooked up to a carpet sweeper) as well as appliances based on the electric resistance coil (irons, toasters, kettles, hair curling sets). In the 1910s, items such as electric refrigerators and dishwashers were still unreliable or very expensive,

and were no more than novelties for very rich households.

Led by the major companies, research played a dominant role in electrical appliance development. In 1900, General Electric set up the first American industrial research laboratory, shortly followed by Westinghouse. In the 1920s, two out of every three researchers were working in the electricity sector. The two companies quickly moved from electrical equipment and light bulbs to mass-market appliances: fans, heaters, irons, percolators; then later vacuum cleaners, refrigerators, water heaters and stoves; buying small appliance manufacturers and then developing their own products.

Mass production techniques enabled the prices of sewing and washing machines as well as vacuum cleaners to fall consistently throughout the 1920s. In 1921, there were 880 000 washing machines, of which 85 000 were powered by electricity. Electromechanical thermostats, introduced in the 1920s, improved the competitive position of electric stoves versus gas ones (even though the electric range would not really cut into the market of its gas competitor) and boosted sales of irons, toasters and water and space heaters. By the end of the 1930s, the automatic washing machine appeared, one that agitates and spin-dries, that will, together with the dishwasher and the clothes dryer, conquer the American domestic market during the World War II years.

Improved refrigerators began to appear in the 1920s due to successive inventions (sealed motor, Freon coolers, etc.). In 1921, the utilities estimated the number of fridges owned by their customers as follows: in Boston and Baltimore, 200; in New York, 150; in Philadelphia, 50; and 2500 in Detroit due largely to the recent involvement of the car industry in the appliance business. General Motors' newly-created Frigidaire Company was selling refrigeration units designed to fit into wooden ice chests, at prices starting from US\$ 190. By 1923, 56 companies were active in this area and 20 000 refrigerators were in use.

Major developments were seen in 1926 when, as a result of something like 15 years of research, General Electric invested US\$ 18 million in an assembly line and would go on to sell 50 000 "Monitor tops" refrigerators in the first three years. In the 1930s, refrigerator prices plunged due not only to mass production benefits but also to tough competition during the depression: in 1934, you could find refrigerators for under US\$ 100, half the 1930 minimum price. The NELA had established an "Electric Refrigeration Bureau", grouping 75 manufacturers and 4000 utilities, with the objective of spending what amounted to 10 cents per metered customer in a massive publicity campaign for the electric refrigerator, with the aim of selling one million units per year. The campaign was launched in 1931, and by May of that year 375 000 units had been sold, which represented a US\$ 20 million increase in annual energy consumption. The same year, General Electric produced its millionth unit. In 1936, there were two million electric refrigerators in use and in 1941, 3.5 million. The market was then dominated by four major companies: Kelvinator (the company credited with having sold the first domestic refrigerator, then owned by American Motors), General Electric, Westinghouse and Frigidaire. Collectively, they had opted for the electric-compression refrigerator over the gas-absorption option, the latter having been promoted by weaker companies but now marginalised.

The widespread use of such equipment would seem astonishing to a European observer of the time: a 1921 survey in Philadelphia indicated that, depending on type of housing, between 64% and 91% of households had an electric iron, between 33% and 84% a vacuum cleaner, between 5% and 32% an electric washing machine.

Another survey, conducted by the Ferry-Hanly Advertising Company in 1926, set out to determine the buying habits of small-town women. Selecting 227 upper and lower middle-class homes and

167 wealthier homes, the Company interviewed a total of 394 women from nine small towns within a 150-mile radius of Kansas City. The survey, which explored sales channels and the influence of publicity on small-town housewives' buying habits, gives an impressive image of the housing and equipment conditions of the American upper and middle classes. 84% of the surveyed families had a telephone, 80% a bathroom, 72% a car, 53% a piano and 47% a central heating system. 97% had access to electricity, with an average of about three electrical appliances: 78% had an electric iron, 57% a vacuum cleaner, 48% an electric washing machine, 47% electric curling irons, 34% a radio, 30% an electrical toaster, but only 1% an electric refrigerator (four families of the sample). On this last finding, the director of research, Mary E. Hoffman, notes, "...while it happened that the actual housewife interviews yielded only a small percentage of electrical refrigerators, the dealers interviewed were invariably enthusiastic over the market possibilities for this item. A Frigidaire dealer in a town of 2,500 inhabitants, who had had the franchise only 90 days, had made seven installations in the last 60 days and claimed his greatest drawback is being unable to fill orders on account of slow production." The same survey highlighted the importance of advertisements for selling at least two of the items: washing machines and radios.

As a final example, in 1929, a survey among Ford workers showed that 98% of the families had an electric iron and 50% an electric washing machine. Electrification never delivered only lighting, as was often the case in many European homes (with the notable exception of some countries such as Sweden). Although there were major regional differences in the US (in the late 1940s, around 70% of households in the Pacific States and the North West States had refrigerators and washing machines compared with less than 20% in Southern States), US equipment rates were on average 20 to 30 years ahead of those in France and other Southern Europe countries, and these would only catch up in the last quarter of the 20th century.

Credit played an important role in the building up of the large appliance market. Before the 1920s, people only borrowed money to buy a house or start a business because, in theory, credit had to be invested in something productive in order to make money and pay back the debt. By the 1920s this was changing, and American households began to borrow money to live more pleasantly - not to produce but to consume. With instalment plans and easy payments, the development of consumer credit was dramatic; with 60% of cars, 70% of furniture, 80% of heavy electrical appliances and radios, and 90% of sewing machines, pianos and washing machines bought on credit during that decade.

Marketing and publicity were widely used to back up the process. In 1922, General Electric integrated all of its products in a simple line under its symbol, the GE monogram. Large publicity campaigns, with impressive budgets, were designed to sell appliances: the advertising budget for electrical appliances rose from US\$ 2 million to US\$ 12 million between 1922 and 1930. Marketing and publicity were focused on a specific public: women - with campaigns such as the "Any woman" campaign to show how electrification could liberate the housewife's energy. Slogans conveyed messages such as "Any woman who does anything that a little electric motor can do is working for three cents an hour", "The wise woman delegates to electricity all electricity can do", and "The silent servant in the home" with images of Mrs Modern Woman, her Modern family (Mr Modern man, Bob the modern boy and Ann the modern girl) and their silent servant, Electricity, which does most of the household chores. Typical advertisements depicted a housewife dedicated to her home, with recurring uses of domestic science ideas concerning efficiency and progressivism.

Private utilities consistently supported the manufacturers' efforts to develop the electrical appliance mass market, because it would help them to sell more electricity. In the late-1920s, the NELA was urging each utility to establish a "home lighting department" staffed with - preferably female -

home economic specialists. NELA guidelines suggested that such specialists should be women “of good breeding” with college education, who would give lectures on lighting and other uses of electricity, collaborate with builders and architects, and work actively with any committee that gave access to other women.

The Indiana-Michigan Power Company, using door-to-door approaches, sold irons, toasters, percolators and fans in the 1920s; and in the 1930s, once these had become commonplace, the utility sold more expensive items such as electric ranges, refrigerators and water heaters. Utilities developed their market through various marketing and sales techniques: door-to-door selling, poster contests, parades, etc. Some offered inexpensive wiring services payable in monthly instalments. Utility salesmen and women regularly visited houses with new products sold at a low price. Lighting could be paid for in twelve monthly instalments. Since homeowners rarely cut back on powerful lighting or gave up using a new appliance once they had become accustomed to it, the benefits were virtually permanent and generally impressive. In 1928, market development of domestic appliances contributed US\$ 555 million to utility revenues.

3.2.2 Rural market

Built up by the private sector, the link between electrification and the domestic appliance mass market was also a major feature of cooperative rural electrification. The Tennessee Valley Authority (TVA), a forerunner of what will be the general organisation of American rural electrification, set up early on a specific agency, the Electric Home and Farm Authority (EHFA), to help farmers purchase electric appliances. The EHFA had arrangements with appliance makers to supply electric ranges, refrigerators and water heaters at reasonable prices. These appliances were sold through local companies and electric cooperatives, and a farmer could purchase them using low-cost loans provided by the EHFA.

Even before the creation of the REA, its future leader, Morris L. Cooke, was writing “... the rural line, once built, cannot vitally affect farm life unless the farmer is able to make use of the energy it brings. In the past many farmers who felt that they might scratch enough cash for an extension hesitated to do so because they could not also meet outright the expenses of wiring their house and barns and purchasing equipment. The TVA and some of the private companies of the South East have shown that the way to successful operation is through low rates inducing high consumption. But high consumption demands appliances - appliances whose cost is not a drain on but a supplement to farm income and farm comfort.” Private sector lessons were learnt: when in 1935 Cooke was describing the three-year 15 000 farm electrification plan of the private Georgia Power Company, he immediately translated it into 6000 radios, 5000 refrigerators, 1500 electric ranges and 750 electric water heaters.

Increasing the consumption of cooperative members was seen by the REA as essential to make systems cost-effective and insure loan repayment, in other words to make the overall scheme work. Preliminary studies estimated that average consumption should be in the range from 80 to 100 KWh/month in order to ensure that cooperatives could repay their loans on time. This was quite ambitious since the national average was then around 60 KWh/month, but the REA promoters believed that farmers would meet this target through using electricity not only at home but also in their agricultural activities. The figure was also comparable to the 90 KWh/month used on average in already-electrified farms (a figure later seen to have been overestimated because it included high consumption irrigation agriculture in the West).

In fact, the first cooperatives failed to meet this target, members were getting connected to obtain a light, buy a radio and an iron, and maybe one large appliance, but most kept their consumption low. In 1937, half of the cooperative members had minimum bills. Based on the early experience of the TVA, which achieved far better results in terms of energy consumption, the REA quickly reacted by building up a network of “utilisation experts”. It hired a staff of agriculture specialists (all men) and home economists (all women) that worked with local extensionists and appliance dealers to promote agricultural and domestic uses of electricity. The REA also mounted, in 1938, a “circus” named “The Demonstration Farm Equipment Tour” showing refrigerators, electric stoves, hay dryers, etc.

The REA worked with the TVA’s EHFA and established a credit network through 25 000 dealers. This provided financing for house wiring, the purchase and installation of electrical appliances and also modern plumbing equipment. Loans were limited to a period not exceeding two-thirds of the assured life of the equipment, with interest at approximately the prevailing rate for government obligations. Opening up a new and extensive market for electrical and plumbing manufacturers and trades, through farmers’ purchasing power, was also marketed by the REA as a way of giving labour and industry a large share of its programme, and this responded to a major preoccupation of the Federal government in this time of depression.

There were a few problems due to some cooperatives creating retail sale outlets for appliances, seen as unfair competition by private competitors, or because leading members of a cooperative would set up their own private business to sell appliances, and again conflict with existing local dealers. But, overall, things worked. When farmers became connected, they now tended to buy sufficient electrical appliances that they used at least as much energy as city dwellers, which helped to offset the higher costs of bringing electricity to the country.

Domestic appliances were such a priority for farmers that they were slow to use electricity to enhance their production methods. Female home economists were doing a better job - or meeting a better market demand – than the male agricultural specialists. Rural consumers were quick to buy appliances as shown in the following diary extract of a rural farm, in thirteen months (from August 1940 to September 1941, the farm acquired, in this order, lighting at home, a washing machine, a radio, lights in the barn, an iron and, finally, a refrigerator.

Diary of Elbert and Erma Cassel, Verden, Oklahoma - electric cooperative members 1939-50	
July 27, 1939	Signed up for cooperative membership
June 1, 1940	Uncle Lark wired house
August 8, 1940	Got electricity
August 26, 1940	Bought a washer
October 29, 1940	Bought a radio
January 6, 1941	Wired milk farm
July 25, 1941	Bought iron
September 19, 1941	Bought refrigerator
January 21, 1942	Wired Dutton church
December 3, 1942	Bought mixer, radio
December 31, 1948	Bought deep freezer
August 30, 1950	Bought sewing machine
Source Oklahoma Electric cooperative (2002), quoted by Wolman (2004) The new deal for electricity in the United States, 1930-1950	

Initially, reaching a 40 KWh/month target within one year of connection seemed an impossible goal, but by now it was proving easy. In 1940, twelve-months after a project had been energised, a survey showed the cooperative members had purchased the following appliances: electric irons and radios 83%, washing machines 63%, vacuum cleaners 48%, toasters 36%, electric motors 27% and electric water pumps 16%.

In one year, the consumption of these rural customers had reached the French rural 40 KWh/month average of the time. In 1942, the average REA customer was using 71 KWh/month, and this consumption would increase by at least 10% per year until the mid-1950s (with a maximum 17% growth rate in 1947, passing 100 KWh/month).

Women were present throughout the process: they were the primary target and the main beneficiaries of electrification. The REA's records have many testimonies of women enthusiastically describing these benefits. The one below is illuminating because it is so wonderfully systematic, a perfect reflection of the message the REA women were sending to the farm women.

The first benefit we received from the REA service was lights, and aren't lights grand? My little boy expressed my sentiments when he said "Mother, I did not realise how dark our house was until we got electric lights (...). Recently I read in the REA news that the radio was the most popular appliance that has been bought. So like the rest of the people, we changed our storage-battery radio into an electric radio. This was our next benefit. Next we bought an electric refrigerator. Of course, next after a refrigerator comes making ice cream in the trays. We changed our washing machine from a machine driven by gasoline to one driven by electricity as our next improvement. The machine was all right with gasoline, but, my, the noise it made. It is such a relief to do the laundry in peace and quiet. We changed our pump for the pressure tank in our bathroom and water system from a hand pump to an electric pump. I did not buy an electric iron at first, as I do not do my own ironing. I was impressed when I did, at how improved much irons were since I moved to the country. (...) The next benefit we received from the current was our electric stove. We were so anxious for the current that we wired the house many months before the current was turned on, and we wired our kitchen for an electric range. (...) Before the current was turned on, when anyone was asking me what appliance I wanted most, I always answered that I wanted a vacuum cleaner. [Before], when I finished [cleaning] I was choking with the dust, the carpet was not clean, and I was in a bad humor. Now with the vacuum cleaner, I can even dust the furniture before I clean the carpet, the carpet gets clean, and I stay in a good humor. So you see I am thoroughly enjoying the many things that electricity has made possible, and I am enjoying life more because I have more time to spend visiting my friends, studying and reading, and doing the things that make life richer and fuller.

Rose Dudley Scearce, member, Shelby (Kentucky) Rural Electric Cooperative

This leads to another interesting conclusion in comparing American electrification with the later trends in Europe which invariably show a significant differential between urban and rural area populations, with the latter being slow to purchase household equipment. In America, only five years after launching the REA programme, the cooperative members' take-up of equipment was not far from the national (urban and rural) average: 84% have irons (95% nationally), 55% have a washing machine (60% nationally) and 33% a refrigerator (56% nationally). Equipment rates were generally similar except for certain items, less popular in rural than in urban areas, such as vacuum cleaners and small cooking appliances (electric ranges, toasters, coffee makers, etc).

Home appliances in the USA, 1940

Appliance	US wired homes	REA customers
Iron	95%	84%
Radio	81% (*)	88%
Washing machine	60%	55%
Refrigerator	56%	33%
Toaster	56%	29%
Vacuum cleaner	48%	21%
Coffee maker	33%	8%
Hot plate	17%	15%
Range	10%	4%

(*) includes non-wired homes

Source: Ronald Kline, (2000) Consumers in the country

4 The holy alliance between women and industry

4.1 Domestic science: rationalising and modernising housework

The specific features of American electrification are largely due to the existence of the women-led movement, born in the late 19th century, commonly referred to as the “domestic science movement” that aimed to rationalise and modernise housework. This movement received early support from the political authorities: it was responding to major social stresses created by the industrial revolution; it was based on American well-established values and further constituted a grassroots barrier to the growing socialist ideas. It also largely fitted with the objectives of the energy, food and appliance industries, to which it will give and in return receive much.

Born in the USA in the late 19th century, the new doctrine would be referred to as scientific housekeeping, home science, progressive housekeeping and, more popularly, domestic science, then later as home economics. It was based on the view that the development of industry had created a totally new situation, sending men out to work and leaving women with household chores. Due to the industrial revolution, women had gradually lost their traditional paid activities and were left with the repetitive and low-skill household chores. This not only led women to become frustrated through being deprived of most of their productive activities, it also created a complex due to the recognition that men did things better - in a professional, scientific and mechanised way.

This led to the “separate spheres philosophy”, a fundament of the domestic science movement: the public sphere, mostly reserved for men, and the domestic sphere, the reign of women - a division comparable to the Marxist notion of productive and reproductive spheres. The mission of the domestic scientist was to make the domestic sphere as efficient and mechanised as the men’s public sphere, without attempting, as feminists do, to get a larger share of the public sphere for women.

Eliminating deadly drudgery and incoherent primitiveness from household tasks is the objective of domestic science. Modernising the home was considered possible by introducing the same principles and methods that were being used in male-led industry. Women’s daily routines could be thoroughly examined and optimised. Cooking becomes a chemical science, where proteins, calories and vitamins become a daily preoccupation. Cleaning and washing are analysed and optimised, and hygiene becomes a key word. Domestic time and space management solutions are proposed to women through courses and magazines. Specialists are also keen to encounter and then divulge technical innovations coming from laboratories and factories, such as gas lighting, hand- then gasoline- powered washing machines, iceboxes, to support their efforts to rationalise and mechanise the home.

Introducing scientific principles and mechanisation to the very working field where women are left alone, i.e. housework, is supposed not only to alleviate the hard work of daily chores, it is also to give them back their self-confidence and self-respect. “Progressive women have perceived, with a growing sense of freedom, how what seemed such endless drudgery can, by a clear understanding of underlying principles and the application of scientific methods, be changed into a beautiful harmony of law and order.” claimed one of the domestic science organisations. “That is why we plead for the right education of the housewife, not that she shall dust her house, but that she shall know how to infuse into the work that interest and enthusiasm which it has lost owing to circumstances over which she has no control.” writes Ellen Richard, one of the leading lights of the domestic science movement.

From the start, domestic science was well received by politicians and social reformers. Its ideas were based on the dominant 19th century home ethics, where the home was the “nursery of the citizen, the unit of social progress, the germ of Anglo-Saxon civilization.” and the American woman “the nation’s best educator and religious guide”. In 1841, Catherine Beecher writes in her “Treatise on domestic economy”, “The proper education of a man decides the welfare of an individual, but educate a woman, and the interests of a whole family are secured”, and Frances Willard, the Founder of the Woman’s Christian Temperance Union, argued “If I were asked the mission of the ideal woman. I would reply: it is to make the whole world homelike”. Cleaning was not only cleaning but “a fine action, a sort of religion, a step in conquering the devil, for dirt is sin.”

Domestic science also appeared as an alternative to dangerously spreading ideologies: the final decades of the 19th century saw repetitive economic stress, culminating in the 1893 crash, with wage cuts, unemployment, strikes, protests and the spectre of socialist revolution. Domestic scientists and their allies in the reform movement saw the well-run home as the most powerful guardian of civil peace: “The man who has such a home is not going to join in rash movements of any kind, or in any way jeopardise the possession of that home” (The home and the labour problem, author unknown). “If rigid instructions for food and feeding were implanted in the minds of our girls during their early school days, the labour element would not be such discontented individuals” writes Tyson Rover in “Household news” in 1893. “I am fully persuaded that by using every possible means to educate the wives and daughters of working men to be intelligent home makers, we can do more towards the solution of the labour problems than all the anarchists, the communists, the socialists or even the labour organisations have ever been able to do.” says an Omaha club-woman.

The American Federal government was easily seduced by the domestic science movement with its applications for rural women. The issue of overworked rural woman was then taken very seriously by the American authorities, due both to real facts and also some myths: in the late 19th century a commonly accepted opinion (which would later prove to be false) was that a large percentage of farm women were to be found within the insane population as a result of their overwork and isolation. In 1906, President Roosevelt created a “Country life commission” that contributed to the establishment of a vast network of rural reform public and private agencies. These included the USDA cooperative extension service, that took on an even more important role during the 1920s depression and 1930s New Deal, and the “Office of Home Economics”, in charge of modernising rural women’s lives and alleviating their workload through domestic science principles. World War I shortages also made home economics an important part of the war effort in the USA. Domestic specialists acquired legitimacy and emerged from the war as a nationally recognised profession.

In the 1920s, domestic science timidly entered Europe. France (source of the “household arts” term abhorred by US home economists because it suggested practical skills rather than scientific principles), discovered it through Paulette Barnège, the founder of the “Ligue d’organisation ménagère” (Domestic organisation league), who introduced ideas on Fordism/Taylorism in the household and the scientific organisation of housework. But it had little impact on the dominant trends of politics and industry. “Domestic economy is still largely medieval in Europe” sighed Christine Fredericks, one of the 1920s leading figures of American domestic science, after a European lecture tour.

While, for the early home economists, housewives were supposed to find self-respect in modernised housework; new dominant, and rather contradictory, models then appeared and the message had to be adapted for the new generations. Efficiency took over from moral superiority, and the domestic heroine gave way to the “courtesan” type of wife, possibly due to the pervasive influence of the

cinema, a view acknowledged by Good Housekeeping magazine in a 1935 feature entitled “What Price Beauty?”, “Most women spend more conscious effort nowadays on their appearance ... the films have had much to do with...” (quoted by Catherine Horwood, 1997). Hating housework had become acceptable - as long as it did not stop one doing it. Cooking, that has been such an important mission, such a scientific activity, now became a simple task that can be mastered in a few lessons. “Lack of the faculty for success in homemaking, while biologically abnormal, is no disgrace.” argued a female professor of home economics at Boston University. Housework now becomes a fate, concomitant with marriage: the wife “cannot abandon it for another one, no matter how difficult she finds it, not how it bores her.”

4.2 Women needed industry to popularise home economics ideology

At the turn of the 20th century, America has made quite a number of improvements in terms of gender equity, and was proud of it: better educational opportunities for women, a handful of females breaking into most of the ‘male’ professions. “These achievements had only inspired Americans of both sexes to feel complacent about the remarkable emancipation enjoyed by the ladies of the world’s most enlightened nation.” (Shapiro, 2001). Domestic scientists see their revolution as beginning where feminists leave off, and bringing about far more dramatic changes.

They share with early feminists the ideal of a woman “with a brisk, manly mind”. However, they have a quite different point of view: while feminists argue for equality or even superiority of women over men, domestic scientists believe that women have to improve quite a lot to reach men’s level. Domestic science’s first descriptions of housewives is often contemptuous, perhaps to enhance the necessity of their teaching. Drudgery, their master word, “does not only describe the endless round of housework but also somehow depreciates the lack of enlightenment of the housekeeper (syn. donkeywork)” (Shapiro, 2001). But this is to change over time, as domestic scientists learn and teach the power of women’s decisions over their households, and finally over the overall economy.

They will fight against the degrading identification of housework with servant’s work, underlining the dignity and respectability of the home and home tasks, and finally of women. The vision of the housewife they aim to project is not only the young and modern woman, but also the educated one. Their model is initially the dainty and refined lady of the late 19th century, then the house manager and engineer of the early 20th century.

While feminists fight for a share of men’s privileges, a place in a man’s world; domestic scientists worked to build up a parallel set of privileges and a female world that would mirror the male one. To domestic scientists, women should not compete in the man’s world but recreate the man’s world in their own sphere. “Our young women, ignorant of the home training, persist in fitting themselves for business rather than for household life” complained Ellen Richards, the first president of the National Household Economic Association.

But domestic scientists also wanted “a career, access to the modern world, the world of science, technology and rationality.”(Shapiro, 2001). Ellen Richards, a Vassar graduate, was the first female student to be admitted to the Massachusetts Institute of Technology in 1870, as a “special student”. Aware that she was a not-that-well-accepted experiment, she volunteered to sweep the laboratory floor and sew on buttons for her professors during her student year. She later created, in 1876, within MIT, the “Woman’s Laboratory” with the objective of developing a new branch of chemistry, household chemistry, dealing mostly with food, cooking, digestion, bacteria, sanitation, etc. Domestic science was thus to be considered as a new branch of scientific activities, the female

counterpart to industrial education.

This opened doors for women, as it had opened those of MIT to Ellen Richards, albeit in a restricted way: when women begin to significantly elbow their ways into professions such as chemistry and biology in the 1920s they often found themselves barred from teaching or working anywhere else than home economics. “Woman science” is both an opening and “a barrier set up between women’s work and the real world, a support to keep the male world male” (Shapiro, 2001)

Since change did not need revolutionary appliances, food was one of the first important areas tackled by domestic scientists. School kitchens became cooking laboratories. Cooking had become chemistry, had to respect scientific principles, with the now widely publicised notions of calories, proteins and vitamins - these marvellous “accessory food factors”. Feeding was the real goal, with taste - a somehow unscientific and probably imported concept - just an incentive to eat properly. To be nice-looking or even acceptable on a table, food had to be chopped, sliced, packed, canned. It had to be an industrialised food.

Domestic scientists had faith in proteins. They admired the way fats and sugars pack a large amount of calories into a small amount of food. They saw fruit and vegetables to be both financial and nutritional luxuries. Raw food was a disorder, due to its undisciplined shape, and it should be sliced into geometric pieces or better mashed. Even its colour had to be masked in a viscous white sauce - magic white, everywhere - or enhanced through uniform artificial colouring. For these reasons, social scientists welcomed any coming of industrial food, the generalisation of packaged brands and the disappearance of bulk sales. Industry was an indispensable ally in promoting massive changes in household kitchens, the necessary tool to implement domestic scientists’ views.

Most distinguished home economists begin to work in the food industry, appear in advertisements and packages as products’ scientific cautions. To some extent, because they are eager to build a career at a time this is so difficult for women, because they consider it necessary to spread their views widely, and because they genuinely think that industry will respond to the best interests of women, they make large concessions to industry. Their general position on the adulteration of food, as publicised through various scandals, is to never consider it as an industrial problem, but rather an educational one: learn to buy properly, and bad practices will stop. And the result is “a woman who can discriminate between canned soups but does not ask too many questions about the ingredients” (Shapiro, 2001).

Appliances also appear in domestic science theories: they are the indispensable tools to relieve women of drudgery. Highly technical, they also push housewives towards engineering and education. A female writer in the “New England Kitchen Magazine” wrote in the 1910s, “One feels a peg higher in the scale of intelligence for using even a dishwashing machine.” As expounded by Paulette Bernège: “Household management tasks constitute also a profession that is to be learnt and practised. In housework, as in any work, we have to follow the major law that tends to have all mechanical acts to be performed by machines, and thus insure to the woman’s brain a greater capacity of spirit to govern and organise.” Rephrased into David Nye’s caustic terms, “appliances in the home would literally force the housewife brain and nervous system to evolve to be the equal of her husbands.”

So domestic scientists welcomed any new appliances, including those already available before electricity: mechanical washing machines, iceboxes, floor sweepers, petrol-driven water pumps. The arrival of electricity and the mass diffusion of electrical appliances gave them a wonderful opportunity to fulfil their objectives of transforming household chores. So, when the electrical

industry, the utilities or the REA recruited home economists, they joined wholeheartedly. As in the case of food, domestic scientists did not generally serve the objectives of rationality in a sense that could lead them to be independent prescribers or to counterbalance industrial decisions.

Some however did: the Tennessee EHFA home economists attempted to develop community refrigerators, for groups of ten to twelve farms, that were simpler and cheaper (US\$ 650) than the ones designed for the retail market. But the industry only understood the economies of scale from its own side, not from the customers, and had little interest in developing collective solutions, and the tentative is a failure. Social scientists had no voice in the industrial fight between electric and gas refrigerators, when the latter could often have been a better solution. The most potent industrial forces imposed their view - and the electric refrigerator. Home economists also ignored the feminist option of considering alternative technological developments which tended - to use an early socialist term - to "separate women from women's work", such as meal delivery services, community restaurants and collective laundry centres (no matter if many of these developments proved to fail at the time). Home economists needed industry to further their views, and would support the industry's decisions, even if these were designed to best serve the industry's own interests.

Overall, in the case of electrical appliances as in the case of food, American home economists were largely successful, they widely succeeded in transforming households' cooking and eating habits. According to the remarkable Laura Shapiro, the turn of the 20th century was "the era that made American cooking American, transforming a nation of honest appetites into an obedient market for instant mashed potatoes." Home economists succeeded in making electrification a potent way to transform daily family life, to bring multiple services to women, push urban and rural households in a continuous process towards becoming a consumer society, by transforming home comforts and women's work. They heavily contributed to the successful changes they are had desired, receiving the fruits of their collaboration. Their participation can be seen in the mass diffusion of methods and products, by public opinion, by political forces and by the industry.

4.3 Industry needed women to sell its products

In the early 20th century, industry was growing but also learning. Henry Ford may have arrogantly said that "you can have any colour as long as it is black," but his competitors began to sell coloured cars, more comfortable and luxurious than the Ford T. Some publicists may have pretended that "Consumer demand is not something which already exists, but something that the producers and distributors are able to create in the minds of the consuming public", but marketers soon discovered that understanding consumers' behaviours and motivations, to quote one advertising manager of the time, would avoid "producing the wrong goods, distributing the right goods in the wrong way and making the wrong advertising appeal." American industry needed to understand its market, and home economists brought a ready-made marketing base, on which to design products and build up sales strategies.

Christine Fredericks, who referred to herself as the "spokesman for Mrs. Consumer", pointed out, in the late 1920s, in domestic science terms the importance of producers and distributors taking into account the consumer's point of view, while quite a number of industries were still to be convinced: "We can go on, mechanistically, and multiply machinery and corporations and technical skill to some end or other that does not seem clear, in a narrow search for profit; or we can advance along the lines of our new vision of increased consumption and consumer welfare as the guiding touchstone of our work, and realise what seems the new promise of great human advance."

For industry, domestic science had an evident attraction as its views could be, and generally

explicitly, translated immediately into mass consumption goods, into business activities and profits. The alliance with its domestic scientists made sense because women generally shared the home economists views and had real decision power within their households, two points that would be widely and successfully demonstrated by the domestic scientists. When domestic electricity became a major business interest, domestic science was at the peak of its influence, plugging into Federal State networks, with a recognised contribution to the World War I effort. In addition, according to domestic scientists, women were definitely a large and potent market, deserving to be carefully listened to by industry leaders.

According to Christine Fredericks, Mrs Average Consumer had a vocabulary of only about 1200 words (her stock of words may be small, but she has a rapid turnover), compared with a high school graduate's 13 000 words. Further, she had a "memory span" of only seven digits. Her education amounted to roughly that of a sixth grade school and she knew no more, intellectually, than a 14-year-old adolescent, if as much. She could not define the word "philanthropy" or even "courage". The number of illiterate women in the US at the time - the late 1920s - was close to three million, although 2.5 million other women were college graduates or had taken some college courses. Despite this claim, Christine Fredericks had by no means a deprecatory image of the American woman, and her "six criterions" description (see box below) presents a progressive and powerful consumer, one with which business will have to deal:

The Six New Criterions of American Women:

- (1) American women have arrived at a new kind of adulthood and no longer consider themselves the timid "wards" and dependents of their fathers and husbands. They consider themselves individuals, citizens and responsible persons, without trace of a sense of inferiority or fear of taboos. They are less negative and passive, and more positive and aggressive toward life.
- (2) American women have acquired a far greater degree of education and sophistication than formerly and are much less like sheep. They boldly think about their "place in the sun" of American life and their responsibilities, and initiate tendencies of their own befitting the feminine conception of "the good life."
- (3) American women as a mass have made up their minds - partly in response to scientists, medical men, experts and advertisers - that their practical dream is to abolish war, alcoholic drink, child-labor, infant mortality, bad housing, malnutrition, lack of sanitation, disease, ugliness, and ignorance. They want to have a great share in bringing about these abolitions.
- (4) American women as a mass have made up their minds that they wish to be freer from the crushing, age-old burdens of the home, which have been crushing precisely because they have not been sufficiently industrialised. They insist on more leisure and to this end have patronised the industrialisation of the tasks of the home, which, practically speaking, means doing better and cheaper everything possible outside of the home, in factories up to high scientific standards. They insist on the mechanisation of the remaining tasks of the home, with the use of electricity and gas to keep pace with the rapid increase in the use of power per worker in the factory.
- (5) American women have to a degree reached genuine cultural sophistication, and they are resolved to have more and more beauty in their surroundings; better homes, more artistic furnishings, more beautiful goods of every variety, even more colorful and decorative kitchen utensils. They have become "style conscious" in regard to everything they use and wear. Having the purchasing power to practice it, they are increasingly applying the leverage of obsolescence to move ever upward on higher planes and standards of living, which may thus keep pace with the rapid developments in science, invention and art.
- (6) American women are resolved to enjoy more of the good things of life, more kinds of food, more leisure, more athletics and sports, more education, more travel, more art, more entertainment, more music, more civic improvement, better landscaping and city planning, more literature, more social graces, more social freedom and more cosmopolitan polish and smartness. They are resolved to live more richly, remain more youthful, appear to most advantage; to have fewer children but better cared for, better educated and better fed.

Christine Fredericks (1929) Selling Mrs Consumer

At roughly the same time, but in the very different context of the post-revolution years, Alexandra Kollontai, in comparing the Great and Small Russia situations, showed the importance of the impact of monetisation, and of its corollary the shift from large to nuclear families, on the decision power of women within the household. When men entered the paid workforce and left home labour in women's hands, they also lost some crucial privileges. When large families dislocate, and leave decisions in the hands of one couple, the family's budget management lies largely in the woman's hands. Monetisation of the household economy largely means the transfer of power from men to women.

Christine Fredericks is concurring when she shows the decisive influence of women in household management in her typical mixture of respectful and teasing styles: "In general the American man, however remarkable an industrial purchasing agent he may be, is not especially competent at personal or family purchasing. It is he, not his wife, who patronises the fake oil stock salesman, who falls for the sets of books he will never read, who gambles in Wall Street and loses like other lambs, and who buys cat-and-dog stocks and various other useless appendages which sap the family patrimony (...). These men secretly realise what the situation is and permit their wives, with their more conservative point of view, to take the family financial reins out of their hands."

In the 1920s, Dr H L Hollingworth of Columbia University conducted research that ironically concluded that the only item that American men bought entirely by themselves, without consultation with women, was their own collars. The purchase of not another article of apparel was free from the cooperative purchasing influence of women; and when men moved to wearing shirts with attached collars even this little island of independence was removed.

More seriously, Christine Fredericks quoted two surveys conducted in New York that showed the importance of women's decision-making in matters of domestic purchases: the first one showed that if men seem to have the preponderant voice in buying cars, musical instruments, newspapers and pets, the decision was mainly left to women in the case not only of regular expenses (food and goods such as clothes and drugstore articles) but also of home equipment such as furniture (half is bought by women alone and half based on joint husband and wife decisions) and appliances. The second survey showed that out of the twelve retail purchase classifications, in only two were men prominent in purchasing, and the majority was not that great: hardware (51% versus 49%) and automobiles (59% versus 41%). Electrical goods purchases, for instance, were based on women's decisions in 80% of cases.

In her comments, the author was prudent enough to add: "Woman is of course powerful in buying largely because of her secondary position to man. She is not man's equal in earning and doing and building, therefore she gravitates toward the position of quartermaster rather than general in their mutual organisation. She takes charge of supplies largely for the very reason that she can't lead the forces in the field. But then we have Napoleon's word for it that "armies move on their stomachs," and it is, alas, even more true that families move on their market baskets!" Moreover, industry moved a great deal on the household baskets. Fredericks estimates that women were spending around US\$ 52 billion a year, US\$ 1 billion a week or "US\$ 6000 per second". More than half of men's payrolls were in the hands of women. A message that industry and commerce were quick to understand.

Self-interest was not the only motive that convinced industry; domestic science ideas met intimate convictions among the reform movement and business leaders, as a progressive - and inoffensive - reflection on future social and economic development. For many, these ideas constituted a vision of progress, the ideological basis on which to develop actions, services and products. In an article for

“Good Housekeeping Magazine”, Thomas Edison declares in 1913: the “woman of the future” (the article’s title) is to become “rather a domestic engineer than a domestic laborer, with the greatest of all handmaidens, electricity, at her service”. A text that reflects both the desire to please his audience and a comprehension of the fundamentals of home commodity markets. As David Nye expresses it, “electrical interests recognise the indispensable role of the home economics movement to their success. The electrified home is the vision of women reformers before than the product of corporate imagination.”

Thomas Edison, and behind him private industry, found in home economics a ready theory on which to found the development of domestic electricity and appliances. Morris Cooke, the REA and the electrification cooperative movement were greatly influenced by domestic science, and put its principles into practice. They clearly saw its potential in the development of the power sector, its consequences in terms of achievements and, as far as the companies were concerned, profit.

The domestic scientist’s “inexhaustible study of the subject” (Shapiro, 2001) constituted for appliance factories the best platform on which to understand housewives’ interests and introduce household commodities: produce the “right” goods, distribute them in the “right” way and with the “right” advertising appeal. Female home economists also constituted a well-educated taskforce, with the “right” ideas and the “right” training, eager to enter the labour market and establish careers. Their use as marketing and publicity specialists, as well as a field sales force, is for American appliance companies, utilities and the electrification cooperative movement, a logical and even imperative choice.

Domestic science disciples in Europe were too weak, and came too late, to dominate domestic changes. During the interwar period, women explored some new domestic ways of life through the development of electricity, and the electricity and appliance industry began to get interested in French female society, but their meeting will only become significant after World War II (Henri Morsel, 2000). Although European electrification was largely complete, little had been done to transform the home, apart from providing light, or bring services to women.

Domestic science is now relegated to obscurity, and the names of Ellen Richards, Christine Fredericks and the French Paulette Bernège are largely forgotten, and for some good reasons. Unlike most of the opposing views, capitalism is not fond of ideologies. Ideologies formalise then congeal ideas, and companies need permanent flexibility to adapt developments to their best interests through scientific innovation and market changes. Home economists acted on consumption, a concept instinctively - and wrongly - perceived as the passive driver of production, which leads historians to usually describe the roots of the consumer society by quoting Taylor and Ford, both producers and men. And while feminists did not oppose domestic scientists at the time, today’s female observers easily denounce their “incapacity to separate woman from woman’s work” (Shapiro, 2001), their insistence on keeping women in the domestic sphere.

Built on the philosophy of separating the domestic and public spheres, the domestic science movement eventually demonstrated that these spheres are in no way separate. As today’s feminists point out, there is no difference in nature between women’s so-called reproductive activities and productive work “Women produce clean toilets and nutritious food, but the most important thing that housework produces is people able to go out everyday into the market place and work. They are fed, they are rested, they are clothed; these workers are produced by housework. Like other economic activities, households take raw material and send something out” (Laura Carroll, 1999).

The history, and the very success, of domestic science is based on a “holy alliance” between women and industry. The domestic science movement developed the ideological base and provided the foot soldiers in the mass development of electricity and gas, industrial food and home appliances. If some of the founders of domestic science dreamt of making the whole world homelike, the home economists’ mission was to “make the whole world businesslike, and the place to begin is home” (Shapiro, 2001). Further, this very success could be another reason to forget domestic scientists: their views are now so intrinsically and practically related with our daily life that we are mostly unable to identify them as a theory. Like it or not, domestic science moulds our societies, long after it was passed over as an active ideology.

5 The three conditions for successful electrification

5.1 Trust people

5.1.1 Electrification Planning is an historical nonsense

Nowadays electrical engineers, who have generally grown up during an era of planned electrification and been trained in large utilities, have no memory of the history of rural electrification in their own country and the industrial world in general. To a large extent, they substitute a new fiction, one that is far more rational and somehow more comforting than the real one. This false story is to become the future history of the power sector in developing countries. Electrification will result from reasonable public support, adequate central planning, and sensible entrepreneurial development of large and usually public utilities. Grids will extend from the cities to rural areas until they cover all parts of the territory and deliver the service to all. If the results prove to be a disappointment, it will be because of weak market reactivity, lack of investment and external constraints.

This scenario is very different from the ones developed during the first steps of electrification in industrial countries. Public authorities did not plan rural electrification, brought little or no financial support and mainly based their policies on a “laissez-faire” approach, leaving initiatives to local communities and the private sector. This led to the development of hundreds or thousands of small and diverse systems, all decentralised and sometimes anarchic, yet quite effective. In a second phase, in order to complete an increasingly difficult and costly rural electrification, countries and states established financial support schemes, but still largely left decisions and the development of rural electrification in the hands of the communities affected.

Rural electrification development did not ride on the back of a growth in consumer income, but rather had to face, decade after decade, the progressive impoverishment of the rural population. In most Western countries, rural electrification developed at a time when farmers' incomes were steadily falling. Thus, the development of electrification in industrialised countries was not made possible by a progressive increase in rural purchasing power, but rather by comprehensive supply and marketing strategies in which the State organised, but where non-governmental and local initiatives played the major role. Local communities, cooperatives and small enterprises all played leading roles in the development of rural electrification, building up systems of their own, for themselves: thousands of small utilities appeared. No electrification of rural areas was achieved before World War II by large public or private companies. History shows, to adopt the old slogan, that “small is beautiful”, and that, beyond large utilities' efforts to develop existing grids, a lot can be achieved through local independent electrification, made up of a multiplicity of small schemes.

Small local grids did, over time, integrate into regional then nationally interconnected systems, which finally led in some cases to the creation of large public utilities, often around the era of decolonisation. As a consequence, many newly independent countries took for granted that a large public utility was the scheme best suited to protecting public interests and advancing their incipient electrification. Only a few succeeded, generally the smaller countries with a strong political will (Ireland, Costa Rica, Tunisia). The few larger countries that were the exception and chose decentralised electrification as the basis for constructing their interconnected grid (such as China) were probably right. Some analysts have claimed that the new wave of privatisation of existing utilities in the 1990s would offer a better opportunity to develop rural electrification, and few will be satisfied since private dynamics plays against the extension of existing grids. Liberalisation of

the power sector makes sense only if it promotes local initiatives - if it leaves electrification in the hands of those who have no electricity.

That references to women are found in documents about electrification in the developing world is no more than the expression of a cautious courtesy. No more women than the national norms - and often less - are to be found in public departments or companies dealing with electrification. The power sector could be yet another sector where the “neglect of women’s role is simply a corollary of the general lack of a socially informed design and implementation strategy” (Michael Cernea, 1985). But history has moved on: it gives concrete and practical evidence that women have a major role to play in making electrification quicker and more cost-effective and increasing its impact on populations.

5.1.2 Support local initiatives

There is no unique way to carry out electrification. Electrification was successfully developed in many European countries through local communities building and operating power systems. In other countries, such as France, electrification first relied solely on private dynamics, attracting a fair number of small and medium firms by setting up a secure regulation environment (municipal concessions) which provided electricity to half of the villages and one-third of rural dwellers. This was followed by a policy of further public subsidy that completed electrification through municipal investment and private operation. NGOs, who could have applied to the scheme, instead tended to adopt only a marginal role. In the US, where neither a dominant private industry nor municipal utilities played a significant role in rural electrification, NGOs did achieve this with the support of a comprehensive Federal State support scheme.

All these approaches have one thing in common: they rely on a diversity of initiatives, with multiple utilities that coexist, compete, grow and finally weave into national grids. In western history, there is no significant example of a one-company development spreading lines from cities to rural areas until electrification was complete. Moreover, major public and private urban companies played only a minor role in rural electrification when compared with small businesses, local municipal firms and cooperatives. Reducing the power sector to one major company and establishing monopolies, as has been promoted in many developing countries egged on by their clever advisers, leads not so much to electrification as a prohibition on electrification.

In both Europe as well as America, the rural electrification process became efficient when a very simple condition was met: when people without electricity were put in a position to decide on their own electrification. State and Parliament representatives in Europe since the beginning of the 20th century, and in America some 30 years later, have had the intelligence and sense to trust rural bodies and populations: rural populations that could read, but not much more; and rural municipalities and equivalent bodies with only small budgets to manage and limited technical skills. Many North European authorities took the opportunity to promote municipal enterprises. French authorities gave rights to even the smallest municipality such as over granting long-term concessions and technical control over private utilities, and letting small enterprises build on and operate the systems, according to the general wishes of local communities. American authorities based their rural electrification policy on farmers’ cooperatives, even where these were known to have little management capacity. The Irish Rural Electrification Office based its later electrification policy on parish committees, enabling decentralised decision-making over electrification.

All these governments were putting their trust in the people. However, they set up safeguards where they could - for they were not utopians – they designed proper schemes, gave technical and

managerial assistance and imposed fairly strict control over local bodies and firms. Nevertheless, at the end of the day, they left the initiative to the very people who did not have electricity, because they thought that the need, or rather the desire, for electricity was a sufficiently potent motive to overcome all the weaknesses and difficulties.

Authorities do not need to become involved with decentralised decisions: they do not need to think about whether electrification is a more urgent need than roads or water because the decision is left to the community itself. The community can be offered facilities to undertake electrification, or water projects, and then decide for themselves according to their own local priorities. Authorities do not need to pretend to plan rural electrification: there is no need, no logic required to decide who is next to have electricity. Every community may decide, in its own time, on its own initiative, according to its own design, to undertake an electrification project. Moreover, all are welcome, as long as they play the game and respect the rules. The electrification policy should consist of defining these rules and making financial resources available to fund projects. These rules should be simple and systematic, to ensure that communities can make up their own minds and decide.

If community leaders want to undertake such a project, they should know what grants and loans are available, and build their project to meet the necessary terms. French municipalities and US cooperatives had a set of standard documents such as model decision reports and letters to authorities that helped them follow the procedures. They were in charge of technical and management control, but had access to public technical and management support if they wanted this. All the electrification policy was built to meet their needs - to support them. In both cases, the State had a voluntary but active policy, played a decisive role in the electrification process and in the mobilisation of decentralised initiatives but, finally, let local communities decide to create thousands of utilities.

The route to full electrification in Europe and America is very different to the one adopted after independence in developing countries, many of which relied on public utility monopolies. It is also a very different approach to the one now adopted for rural electrification. Even if liberalisation is now the panacea, even if - in theory - new regulations open up the power sector to all kinds of initiatives, the move towards decentralisation remains slow, and often nonexistent.

Central authorities still see it as their responsibility to plan electrification and decide on the allocation of project resources. With the support of donors, they divide national territory into regional concessions and intend to reproduce, albeit on a smaller scale, the earlier monopoly systems. They set up sufficiently complicated rules – such as for competing tenders between projects - to discourage local community initiatives, favour certain large companies and keep control of projects. Only a few marginal schemes have been designed to give authority and financial support to communities or local NGO initiatives.

Evidence shows that those who have electricity (and, more often than not, air conditioning systems) are not the ones to decide on the electrification of others. Decentralised decision-making and trust in local initiatives should be the basis of new electrification policies. Such an approach will save the financial resources of public budgets, and shorten the time that rural dwellers have to wait for electricity.

5.2 Target the poor, but make them pay

Electrification means investment, and needs high prices and high revenues to attract investors (at least from the private sector) and to enable existing companies to generate enough cash to go on investing. Whatever the institutional choices may have been, the development of the power sector has always been quicker and more efficient where and when tariffs were highest. High tariffs are said to have favoured the earlier development of electrification in Britain and Germany compared to France. Tariffs were never a major issue for European public authorities until electrification was almost completed, and conflicts between firms on the one hand and local bodies and users about price rises only occurred in the 1930s. When conditions were set by the American REA on tariffs, it was a minimum not a maximum stipulated, to ensure that cooperatives would be able to meet their reimbursement obligations.

In asking for minimum tariffs, the American Federal government knew that there would be enough pressure to keep them low. This pressure would come from reasonable commercial considerations: if electricity is too expensive, people will not connect or use too little electricity; and also from the cooperative users and leaders as well as from local politicians. This can create major difficulties when a utility is both public and small: municipal companies and user associations frequently experienced difficulties in proceeding to new investments - and in more than one case in properly managing their existing assets - in no small part due to the fact that their own philosophy as well as subscriber pressure led them to concede low tariffs to their existing clients.

This is frequently also a major problem for large companies when they are both public and located in developing countries: they face strong external pressure to invest and to set low tariffs. In the period when international funding availability was at its peak (the easy money of the 1970s and the early 1980s), with strong and often incautious support from international organisations (led by the World Bank and other Development Banks), a large number of public companies in developing countries got themselves engaged in a low-rate low-tariff cycle that is largely responsible for their lack of capitalisation today. Donors push loans for huge investments, and governments press for low tariffs, either in order to protect the interests of large customers (right-wing sympathies) or please their urban middle class supporters (left-wing leaning). This all made public utilities easy prey for the 1990s' privatisation movement.

When advocating low-tariff rural electrification, top energy-sector executives in developing countries may well misjudge, by ignorance or demagoguery, the high level of capitalisation required in the process of electrification. While it is necessary to take advantage of all the possible solidarity mechanisms (such as public subsidies and cross-subsidies from urban customers), it is also necessary to take advantage, as far as possible, of the willingness-to-pay of new rural users in order to have electrification progress as far and as rapidly as possible: target the poor, but have them pay.

Nobody likes high prices but most willingness-to-pay studies in non-electrified communities in developing countries have shown that most have the capacity, and would be willing, to pay far more than the national state-controlled tariffs. The few existing informal (and illegal) electrification schemes in countries where monopolistic utilities rule show that rural dwellers will pay a lot for the precious electric service, up to US\$ 5 per bulb per month. There is a clear gap between what rural dwellers could pay and existing tariffs, a gap that offers opportunities for cost-effective electrification

The REA electrification, based on soft loans, appears to have been cost-effective, more so than the European version based on subvention. Some reasons may be advanced for this: first, its promoters

proved that the private sector is not necessarily the most efficient when it comes to costs – and the REA obtained significant cuts in line and other costs. A lesson that might apply to many utilities in developing countries, especially those that have traditionally relied on institutional loans and in particular bilateral loans, and have had to purchase equipment under conditions of limited competition between providers. A detailed analysis of equipment costs may well show that, in some countries, the price paid for a kilometre of line or a KW of installed generating capacity has been above the international market price.

Secondly, the REA policy was successfully built on the following premise: farmers have limited monetary resources but, if you do not exhaust these in high upfront expenses (one of the principles of cooperative electrification was that only a moderate fee was required to be part of the scheme) and if you provide facilities for them to buy domestic appliances and farm equipment, farmers will purchase equipment at a reasonable rate and use enough energy to make electrification globally cost-effective. Cooperatives set low access fees, provided credit schemes for home appliances and worked hard to encourage members to buy and use electrical equipment, and hence spend on electricity. This approach works: low-cost access to electrification leaves the purchasing capacity of new subscribers intact, who then quickly invest in electrical appliances with the help of instalment schemes. The Irish REO adopted the same approach: electricity was expensive (nearly 20 cents per kWh in today's prices), but connection fees low - about the equivalent of 100 kWh of consumption, the consumption of just a few months.

The condition the 1930s' American private companies set to develop into rural areas was that farmers should make a major financial contribution to the investment, exactly the way that major utilities nowadays act in developing countries. This was a very efficient way to establish financial barriers and so avoid a rapid increase in the number of not very cost-effective rural clients. As electrification generally requires a significant financial contribution from new subscribers, either rural dwellers cannot pay - which is sadly the case for many - or they pay and use up a large amount of their cash savings or become indebted, which considerably reduces their domestic investment capacity in the following years.

The view presented in the 1930s by American private utility executives is exactly the same as the one generally agreed for rural electrification in developing countries today: farmers are poor; they cannot pay for connections and equip themselves sufficiently to be decent customers. In other words, there is no rural market for electricity and electrical appliances. Let us assume that the old American and the present-day third-world utilities, both with clever staff and direct commercial interfaces with their rural populations, were and are best placed to judge. The fact is that they both have good, and somehow similar, reasons to come to this same pessimistic conclusion.

The attitude of the American sector is simple, or at least the easiest to explain. Little or no market was the best response to political pressure to extend their lines into rural areas, given that there are so many more-profitable activities to develop at the time.

The attitude of the utilities in developing countries is also quite understandable. First, they generally have a limited investment capacity, often based on sporadic access to public funding, many demands from the needs of the existing infrastructure in terms of maintenance and replacement, as well as pressure from their clients to improve service quality. They are thus in a defensive position, that gives little entrepreneurial space for developing into rural areas. Second, they have to apply such low tariffs that any new rural client becomes a financial burden. This drives them to the one approach that negates their obligation to provide a service, namely demanding a high participation fee from users who are made to pay the full costs of the line (over €1000 per 100 metres). There is

no market for new users, because the tariffs make it a non-cost-effective market, and there is no market for electricity because with the high initial costs people see it as non-essential and because there is no scheme to help or promote user-consumption. The power sector organisation effectively kills the market.

High tariffs and low access fees appear to be two major preconditions for the successful development of rural electrification. If the first appears unpopular or unacceptable to the developing country rural customer, it must be remembered that both are linked. The low tariff and high access cost approach, the *de-facto* mainstream electrification process used until now, has proved its effectiveness in restricting rural electrification, a crucial condition for large public utilities to survive. In these times of liberalisation and decentralisation, power sector policies should impose, as crucial rules, maximum access fees (equivalent to no more than a few months of consumption) and minimum tariffs (to protect small utilities from themselves and from external pressure).

5.3 Respond to women's needs

5.3.1 An economic electrification

Much has been written about the reasons for the slow development of rural electrification in America, at the very time the opportunity for public involvement was discussed (the 1930s) and long after in the writings about the success of the American cooperative electrification movement. Was this tardiness due to exceptionally large rural areas and market dispersion? Other countries fared better in similar circumstances. Among countries outside of Europe, one should mention New Zealand, where the government instituted a widespread electrification plan in 1918, dividing the country into 55 electric power districts. In 1935, 40 districts were already electrified, 39 of which were predominantly rural, and two-thirds of rural dwellers had access to the service. Was the slow pace in America due to an overemphasis on the private sector? However, public schemes were not prohibited, and quite a number of municipal initiatives were established in the early stages of the US electrification. Further, other countries, like France, chose to rely on private initiatives and achieved better results in rural areas, even before beginning with a subsidy policy.

The main reason for the slow progress in the US is the relatively earlier and more massive development of major companies that dominated the sector. These companies had other interests and other challenges than rural electrification. American private industry's attitude to rural electrification was perfectly illusional, built upon a succession of smoke curtains. The creation in the early 1930s of the Committee on the Relation of Electricity and Agriculture appeared to represent a strategy, but it was a body whose investigations and training activities did not actually achieve anything, and which built up a lobbying network, against public intervention, among trainees across the country. Private sector's repeated claims about the lack of commercial opportunities in rural electrification - too poor farmers, too expensive electrification - were quickly shown to be untrue by the REA successes, nor were they in any case convincing, and neither were private utilities' last minute and largely fancy proposals to take over the initial REA funds. All distractions to wrap up a simple fact, that they had other strategies, and other targets for their investment capital.

These strategies reveal the very nature of the American electrification and power sector development, and its fundamental difference to the European one. In electrical terms, one could say they were looking not for power, but for load; in marketing terms, not for new customers, but for new consumption. This was to be achieved by selling not only electricity, but also domestic equipment; that is selling equipment that will sell electricity. A far more profitable form of

electrification for utilities, a source of income for the electrical commodity industry, and a range of electrical services offered to households and especially women. A win-win strategy in which rural dwellers had but a small part to play.

A particular merit of the REA was to see the above approach, seen by private industry as being for its existing clients, as equally valid for the rural population and setting out to prove it. The REA's financial hypothesis was built on the belief that rural households would invest in their own houses, contribute to the development of a mass market for electric appliances and, by doing so, secure profitable conditions for electrification and power service delivery. Whatever private business may have said, the REA proved that there was a rural market. Farmers invested in their houses, massively bought appliances and, in doing so, made rural electrification possible and far more cost-effective than it had been in Europe.

A detailed comparison between public money spent on rural electrification in European countries and the USA has yet to be made, but the first European developments tended to focus on subsidies, while the USA favoured soft loans, passing on most of the cost to customers. Moreover, the customers were willing to pay, not because they were wealthier than their European counterparts, but because they were being offered something far more valuable. A kilometre of line probably costs about the same price wherever, but its value was far greater to US households: it meant access not only to light, but also to many electric services, most of which benefited women.

When the REA, following the private sector's example, called for greater female participation, in its own staff, on cooperative boards, at member meetings, it was not primarily for some ethical gender equality preoccupation, but for simple efficiency. For the cooperative movement, as for the American private sector, electrification did not end when the farm was connected, which has been the historic vision of electrification in France and remains the dominant one in developing countries. Connection is just the beginning of the story, a story where nobody can afford to ignore women because women are the first to benefit, and the main decision-makers when it comes to purchasing.

While the newly-born power sector was fully engaged in the electrification process all over the industrialised world, its "engine" was thus quite different from one country to another. In France, the engine was the development and organisation of the distribution market; in Germany and Switzerland, to sell electrical equipment; and in the USA, to sell mass appliances. Electricity in Europe inhabits a man's world; in the USA, a woman's world.

In most developing countries, the only objective of rural electrification is to provide access to anybody and everybody, to the last farm in the last village, to take the anthem of one Latin American national agency for electrification. The measurement of electrification is frequently the number of newly-electrified villages (even if few families have access within the village), at best the number of new customers. Public interest and public involvement stops when the household is electrified, and it then becomes a private affair between the customer and the appliance business. This is more or less the historic approach adopted in Europe, one that led to an early but expensive and basic electrification. In developing countries, electrification is definitely such a man's world.

5.3.2 Not a world of difference

In America, the 1920s saw a major surge in the Klu Klux Klan after its rebirth in 1915, with a peak in popular participation (several hundred thousand enrolled), political power and countrywide violence of the “invisible empire”. However, these times also saw the discovery of “Negro purchasing power”, formalised in marketing literature in the early 1930s in such as Paul Kenneth Edwards’ “The southern urban Negro as a consumer”. This book presents a picture of black households’ purchasing power as being quite impressive for the time, and argues for the need for advertisements that specifically target a black audience. These should picture “the Negro as he really is, not caricatured, degraded, or made fun of; that here the Negro [has to be] dignified and made to look as he is striving to look, and not as he looked in ante-bellum days; that here [is] the new Negro”. However, as a sign of the times, one should note that an example of appropriate publicity given by Edwards’ book is for skin whitening cream.

The 1920s also saw the development of marketing studies that both gave relevant information about purchasing and equipment patterns and testified to the growing interest in women’s purchasing power. The most emblematic is perhaps the 1929 book “Mrs Consumers” by Christine Fredericks, who estimated that women were spending around US\$ 52 billion a year, more than half the US\$ 92 million household income, and showed that women had significant control over decisions regarding expenditure, even if this usually came from a male pay-packet. American industry could not have developed its products without learning, understanding and taking into account women’s behaviours and motivations. Firms would not have sold their products without appropriate marketing and communications targeted at women.

Fredericks’ “Selling Mrs Consumer” and Edwards’ “The southern urban Negro as a consumer”, in focusing on purchasing power, can definitely claim to have given respect to women and black populations, just as will occur later for homosexuals (“the pink pound”). Fighting against racism or gender discrimination is supposed to respond to more noble motives: social and cultural changes, rather than simple commercial recognition, are required to mitigate fear of others and get rid of discrimination. However, it must be admitted that pragmatic mercantile reasons somehow build up pressure for political change in the struggle against social prejudices.

However, in developing countries there is a lack of such commercial drivers for change, the absence of a marketing culture tends instead to reinforce existing misunderstandings and prejudices. Take the case of black Africa: the analysis of African consumer attitudes is still very rudimentary, sustained neither by the universities (modern consumption being largely absent from the preoccupations of African sociologists) nor by the public sector and its international counterparts (for which the only pertinent social approach, if any, is in terms of poverty) nor by the private sector that judges marketing studies to be of little interest. African markets are considered as peripheral, or even as a dumping ground for the developed world’s outdated products.

The questions regarding the very existence of a rural market are based not so much on facts as upon attitudes. National and international decision-makers and even the local populations in developing countries are not best placed to assess the market because their references to the differences in development between Northern and Southern countries are mostly measured by the differences between the Northern better-off and the Southern poor: between Northern upper- and middle-class cities and Southern slums and rural areas. Further, the dominant urban classes in developing countries tend to share the same paternalist view of rural dwellers as do international organisations’ programme managers of their whole country. In other words, these people are poor and there is not much more to say about it.

However, there usually is: a closer look shows that rural populations do own and buy, even in a very negative environment with little access to goods and a high cost of money. Many rural dwellers have sufficient income to pretend to a far better life, if only they were offered more products and services. New access to the electric grid invariably provokes a generally slow but steady trend in acquiring domestic equipment. Is there really such a difference between 1920s' American rural customers, or even 1960s' rural European customers, and today's developing country rural customers?

Averages are probably not the best way to analyse market trends and opportunities but some ideas can be drawn from the following figures. Any developing country farmer sent back to the America of the 1930s or even the 1920s would in fact see quite a difference to his own environment today. In 1920, one-third of American farmers had a car, in 1930 two-thirds. Rural dwellers in the 1920s, due to the bulging prosperity brought to the American countryside by World War I, had several pieces of equipment, and even more in the 1930s despite farmers' net incomes being virtually halved. Equipment rates (see box below) were far ahead of any rural area in developing countries today.

Average net annual income in the 1930s	Electrical items	Average price 1936	REA farm ownership 1939
US\$ 700 per farm, (US\$ 300 to US\$ 900 depending on year)	Iron	US\$ 4	84%
	Radio	US\$ 40 (table model) and US\$ 80 (console)	82%
	Washing machine	US\$ 66 (from US\$ 40 to US\$ 500)	59%
	Refrigerator	US\$ 164 (between US\$ 75 and US\$ 600)	32%

Source: REA, quoted by Ronald Kline(2000)

It is also interesting to compare farmers' incomes and appliance prices in the 1930's USA and in today's rural areas in developing countries (conveniently ignoring that the US\$ has a different value in one period than another, which we would have to take into account in a strict economic analysis). An average 1930s' farm generated US\$ 700 in annual net income: a figure not that dissimilar to present figures in quite a number of rural areas of the third world. A farmer's gross income amounted to between US\$ 2 and US\$ 3 per person per day, not dissimilar to the present UN poverty level. Appliances were sometimes cheaper than the ones to be found today (where could one find such a thing as a US\$ 40 washing machine?), sometimes equal (you can find a basic refrigerator for US\$ 150 in developing countries), sometimes more expensive (present transistor radios being far cheaper). So while there may be differences, the two situations are not a world or an era apart.

5.3.3 Promoting consumption

Despite the little consideration it receives in the history of politics and philosophy, domestic science is probably one of the major ideologies in moulding western and other modern societies, including in the developing world. Born in the USA during the last two decades of the 19th century, it timidly spread into Europe by the 1920s and imposed itself after World War II. It is a necessary and almost hidden social side of capitalism, the indispensable companion of agricultural changes and industrial development. It departs from evidence that, as much as evidence is easily forgotten, it is impossible to develop production without developing consumption.

In the first stages of independence, increasing national production is considered the fundament on

which to build development, while consumption appears to be dangerously associated with former colonial practices: industrialised countries taking advantage of the weakness of developing countries to spread their products, with no interest in local production, and deepening external balance deficits. However, the exaggerated emphasis on production produces a number of “white elephants” that go bankrupt for lack of a market. While weak consumption impedes imports, it also discourages foreign and local investment in production.

Support for the development of poorer countries, as it may be deduced from forty years of grey literature from international and bilateral aid agencies, also appears to have been mainly built on the disconnection - or even contradiction - between views on production and consumption. While production is an undisputed magic word, consumption is somehow a fiendish one. Agricultural development is often synonymous with the preservation of the small agricultural producer, food policy with defending rural self-consumption, human resource management with fighting against rural migration, development of production with exports. While the development of production is a major rallying call, developing consumption carries negative overtones, or is at best considered as a private responsibility where public support has no part to play.

It is unrealistic to look at how to both increase people’s incomes and reduce their expenses, simply because incomes and expenditures are of the same nature (unless you think of an economy exclusively built on exports to rich countries). Rich countries’ economies are rich not because people save most of what they earn, but because they spend, and often spend a lot more than what they earn. US households, and now increasingly European ones, are becoming heavily indebted in order to keep the capitalistic machine in overdrive. Poor countries cannot become richer without indulging - and even pushing - their populations to enter further into the monetarised economy, to spend all they can and perhaps even more. This is the price that has to be paid to ensure that purchased goods and services finally reach the poor, as well as generate sufficient public resources to offer quality social services to all.

The “third world rural household as a consumer” - or even the urban one in a number of countries - is still waiting to be discovered, to be understood, and finally respected. In 2001, there were four billion people living on US\$ 5 or less per day, of which 2.7 billion were surviving on less than US\$ 2 per day. This is no doubt an expression of poverty, but it also represents an impressive market of more than ten billion dollars per day. “The idea that poor do not have money is false ... the base of the pyramid of income offers gigantic opportunities” (Coimbatore Krishnarao Prahalad, 2004). Earning money from this market does not have to mean exploitation: one can deliver products and services valued by this public, at reasonable prices and with sales conditions adapted to their circumstances.

Ample proof of this can be found, in particular in the telecommunications sector. In Bangladesh, the Grameen Bank, an emblematic and undisputed micro-credit organisation, lends money to women in order to set up small phone boutiques, where rural or slum clients pay for calls: the business is cost-effective and the average amount spent by clients on communications is US\$ 90 per month. The British private firm Vodaphone is now installing 5000 similar “phone kiosks” in South Africa, managed by independent small entrepreneurs. While some countries – such as China - have long developed low-cost products for export to poor consumers all over the world, western international firms are now targeting such “poor” markets: Procter and Gamble for nutritious drinks in Pakistan and Morocco, Unilever for sweets and Hewlett Packard with solar digital photography rural businesses in India. Cemex, one of the world’s major cement firms, is becoming involved in low-cost building in Mexico.

New “pro-poor” market policies, formalised by some international agencies, take into account the existence of a cost-effective market in the poorest segments of the population. However, in general, when applied to real programmes, these policies tend to sell international cooperation’s typical alternative products, such as intermediate technology or environmentally friendly services. Analysis may lead to some niche markets for these products and services, but also to the wider conclusion that poor households want conventional commodities and services, produced by existing and regular worldwide industries, and that they are waiting for pro-poor policies to address these desires. Telephony is one of the few examples where the real and massive expectations of poor households are actually being met. Telephone kiosks, with telephone cards sold at city crossroads, perhaps reflect the dynamism of the telecommunication sector compared to the energy sector.

The power sector’s problems are mostly the same as those faced a century ago by public decision-makers and industry: the same complaints about too low load factors, the same problems of consumption being too small to make systems cost-effective, and the same difficulties in addressing a poor rural electrification market. When dealing with problematic load profiles, utilities and public authorities generally focus on trying to reduce the peaks through comprehensive energy conservation programmes. In the domestic sector they promote the use of low-consumption devices that are used in peak hours (high efficiency bulbs, for instance), which indeed is part of the solution. However, they hardly ever consider the development of off-peak demand. When efforts are made to fill the off-peak hours in rural areas (as in some programmes in Indonesia or now Senegal), these focus mainly on productive and community social facilities, and this is certainly a first positive step. Low domestic consumption in rural areas is considered, however, as an inevitability, not a parameter to address.

Irons, fans, washing machines, refrigerators, individual water pumps and certain other electrical appliances are all apt to increase off-peak energy consumption, and their further use would enhance the financial conditions of a utility and the cost effectiveness of rural electrification. However, these domestic items are considered beyond the public scope, and their spreading is the sole responsibility of the market, of private industry. A contradictory conclusion for those who consider that there is no or very little market for “bare” rural electrification i.e. for lighting and little more. For appliances, as for electricity, there is certainly a market, but this market cannot be addressed by private initiatives alone, it needs comprehensive strategies with public support, as in the early decades of US rural electrification.

The REA’s experience shows that, in the more difficult rural electrification market, customers, utilities and the appliance industry cannot do it alone, and that it is necessary to build up a comprehensive public policy. This policy involves investing public money in loans, not only to build up grids, but to encourage people to spend on appliances and energy through public-supported credit and marketing. In a number of developing countries, the appliance industry is either non-existent (often the case in the smallest and poorest countries) or little prepared or disinclined to enter the rural market. Access to money is extremely expensive for the rural and peri-urban poor: few commodity industries have their own instalment plans that are available for the poor, and commercial banks may impose annual interest rates of up to 1000%. Micro-credit institutions, which do successfully reach the rural and peri-urban poor, often have high rates of up to 50% a year, have little liquidity and no public support to go beyond “productive” loans.

A focus on domestic equipment, with utilities, the appliance industry and micro-credit banks working together to design and disseminate lower cost products, and providing publicly-funded comprehensive instalment and advertising programmes through existing local networks may be a smarter way to consolidate rural electrification and make it more economic for public budgets.

Moreover, domestic appliance market development contributes to economic and social development, for utilities, for manufacturers and distributors and, last but not least, for users. Two good reasons for public support.

Domestic electricity has a somewhat ambivalent image, because it brings dubious benefits such as leisure and entertainment. "If we promote rural electrification, it is not in our view to encourage people to buy televisions and watch soap operas. We do it because we think that electrification brings social and economic benefits to rural populations." claimed a top French executive during a recent Johannesburg conference preparation meeting in Paris, an opinion largely shared by the development specialists in most aid organisations, whose priority is invariably electrifying productive and social facilities.

That millions of rural households buy battery-powered televisions before the arrival of the grid may be a sign of development, but it is often seen as the wrong type of development. Domestic electrical appliances can also be considered of limited interest by gender specialists because they see the benefits as the wrong type of women's empowerment; compared to the "right" one - the involvement of women in business and public affairs. Wrong development, inappropriate empowerment of women - this deserves a closer look.

6 Women's electrification

6.1 Impact of electrification on women's empowerment

As a whole, technology development in general, and electrification in particular, appears to have little positive or even negative impacts on women. Whenever women have limited access to education and technical skills, industrialisation tends to reinforce men's position and curtails women's productive activities. In a similar way, electrification seems to have brought little improvement to farm activities – especially when compared with the use of combustion engines through tractors, harvesters and other equipment. Its impact on rural migration to the cities - one of the major trends in industrialised countries during the 20th century - has been at best zero, even when, as in mid-century North America, conditions created by electrification and home equipment were not dissimilar in rural and urban areas.

While, in Europe, electrification -limited to light and little more - appears to have had little impact on the conditions of life for rural dwellers, American REA specialists repeatedly underlined, albeit with some dissatisfaction, the importance of domestic over productive aspects when dealing with electricity. The first target was, and hence which saw the greatest investments, home lighting and equipment. Somewhat neglected in the early electrification years, domestic electricity quickly became a major issue for the industry, both in terms of selling power and home equipment, and then for the promoters of rural electrification. Private industry, as well as the public REA, appointed what would then have seemed an exceptional number of women as marketing specialists and experts in the uses of electricity. Many procedures aimed at reinforcing women's participation were established in the newly-created electrification cooperatives

So domestic aspects appear to be crucial when dealing with electrification. Even if electricity is only seen as another step in home equipment development, it provides a general boost; as it did in the first half of the 20th century in America, and in the second half in Europe, through the development of large appliance industries and the mass dissemination of electrical domestic equipments. By its magnitude and its symbolism, the success of this dissemination shows both the importance of the benefits that electricity and appliances give to households, and the role that women, as the major beneficiaries, can play in the process.

Acquiring electricity amounts to an investment in one's home. While those new electric lights make a home a more pleasant and easier place in which to live, any new appliance also increases the value of the home (this is where sociologists will talk about the development of the ideology of domesticity, and economists will see capital investment). Increasing the home's value makes it worthwhile to invest in it more and to use it more. Due to both objective (comfort) as well as subjective (status) concerns, the home is engaged in a relatively new process where capitalisation trends bring positive psychological advantages, these will lead people not only to think about buying appliances, but also about painting walls, building extensions and so forth.

While households are investing in the home as a whole, they are also more specifically (and this is quite new) investing in the kitchen. Most of the new appliances in the first instance - refrigerators, stoves, grinders, kettles - were linked with the kitchen. With home investments, progress and development do indeed tend to go first in the kitchen. In turn, these investments need an appropriate kitchen and a place in which to keep these new investments safe and to protect them from children (and vice versa) and outsiders. This means a specific room, not the multipurpose room where the family cooks, sleeps and plays, as well as creating a new interest in cooking indoors and getting rid

of dirty fuels such as wood or coal.

As with any new technology, electricity and appliances - and this goes for all appliances - are not neutral objects. "Tools and technologies bought for a certain defined use develop other meanings over time as part of lived experience." (David Nye, 1992). "Objects affect what a person can do, either by expanding or restricting the scope of that person's actions and thoughts" (Milhaly Csikszentmihalyi and Eugène Rochberg-Halton, 1981). Appliances create needs as well as respond to needs. When a washing machine or a refrigerator enters a house, the family changes its eating and clothing habits for a multitude of practical and psychological reasons, and the person in charge of the work, usually a woman, will no longer wash and cook in the same way.

Electric lighting tempts dwellers to undertake home improvements and buy more pleasant furniture. Just by its presence, the refrigerator, as with all "white goods", leads to more ambitious standards of cleanliness and aesthetics. By being efficient, less tiring and labour saving, appliances also encourage greater use: having a washing machine and an electric iron leads to washing and ironing linen and clothes more often, which leads to buying more and more such goods. Lighting encourages more reading, radio and television more watching time, and thus these impose leisure. The refrigerator cannot stay empty and this leads to buying more food and drinks. The media push of food, washing powder and clothes increases the desire to purchase.

Thus home equipment, by itself, leads to more consumption, more involvement in monetary activities. Earning more now makes sense, because it can lead to new home investment, new consumption patterns, that can be seen as fair by the family, and can properly be managed by the housewife within her time and work schedules. Further, home equipment is in itself a reward, in the sense that it adds to the family status, as a potent signal of wealth and modernity.

As it also becomes easier to act efficiently in terms of caring for the family and children, these take on a new importance. Hygiene, child health and education become growing preoccupations, as more time and effort is available to dedicate to them, and the results are apparent. Not only are children no longer expected to be heavily involved in household tasks, they also benefit from the new improvements; directly – through adequate light, fresh food, clean environment - and indirectly due to the greater time that parents, and above all the mother, can devote to them. And, in a similar way, child health and education become part of the family's status.

Cleanliness, hygiene and care for children are values that come only to women when they can afford them, when they have time and power to act. When, in the 20th century, developed societies were moving mainly from rural to urban areas, these values were mainly moving in the opposite direction. These values also go from the better-off towards the poor, from the bourgeoisie to the proletariat and, in Europe as a whole, from the Netherlands to France. It is not that rural and poor women do not care about their house and their children, but rather that they cannot afford to invest and thus the results are out of their control - they simply cannot afford to care.

The retreat of women into the domestic sphere, that came as part of the industrialisation process, may be understood as an obligation placed upon women - who are now barred from education and from production - but also as a strategy for control over the home and the family business. Home technologies, electricity, appliances, all serve this strategy: they alleviate burdens, make housework a decent job. Women are able to fulfil what they consider to be their responsibility, and can respond to the results they see in front of themselves and their families, without facing impossible or painful burdens of overwork. Housework is still a burden, but satisfying results are possible; and for that reason alone, it should not be seen simply as a burden. Just like a paid job, it becomes a duty and

has a status.

19th century industrialisation certainly succeeded in making housework a “one worker” job, but it also made it into a “one manager” job. From the situation of being but one more worker in large families, women became solely responsible for home and family management; a responsibility that women were neither ready nor willing to abandon throughout the twentieth century, whatever their gains within private and public life. Because home technology mitigates the drudgery for the worker, it offers real opportunities to the manager: makes it possible to invest increasingly within the home and family circle, and finally allows women to meet other challenges without having to cede the responsibility for home management.

With the possibility of achieving better results comes an interest in quality standards that are able to reward the duty and reinforce the status such as changing clothes everyday, cooking a greater diversity of food, spending time with children. Women affirm their management capacity and impose their control over home affairs, such as purchases, and so gain a position as a decision-maker within the family: their results are concrete evidence of their power, and men must accept this evidence. Standards develop through individuals, and then become a social consensus. If conditions make it impossible for women to meet these new standards, they can react as French farm women did after World War II - they gave up their rural life and looked for one in the city that would enable them to respond.

Reducing the number of children, a major trend in industrialised countries, can be seen as responding to the same dynamics: having less children is not only a direct financial matter, it clearly responds to women’s need to keep control over the time and work assigned within the family, and to meet the better standards of care and education now expected. Women have to respond largely by themselves to the consequences of a new birth, and this is nothing new. However, now they also manage: they measure the impact on their home life, and succeed in imposing their views on men. It is an expression of their newly acquired status within the family, as well as a major step within the slow process of gaining control over their own bodies.

Over the years, the time dedicated by women to housework has not significantly reduced due to the introduction of home technologies, but this does not mean that all electric and other home appliances have had little impact on women’s chores. The duration may not have changed, but the chores have changed fundamentally, some in nature, but mostly in meaning. Chores are not the simple maintenance of an ever-repeating life, but a support of progress. Results are not only possible, but also potentially bettered by the incorporation of new technologies. Housewives use their time in an ever more productive way, and are able to face new improvements for the house and in family care: they are able to assume the labour operation costs related to further and larger family investments.

A larger dwelling, more furniture, more linen and clothes, all require more care and more maintenance, and their purchase would lead to problems if nobody could take on the extra work required. Grasping opportunities to earn more only makes sense for men if women are able to handle new family investments. Being rich used to require a number of servants to manage the wealth. Now it becomes possible for a middle class household to be better-off because the female partner is able to dedicate part of her time and work as the necessary counterpart to the new wealth. And even if the money to invest comes from only one family member, costs are shared and no decision made without discussions within the family. Women, in order to build up a status within the family, act as home managers and stakeholders while having a full time employee available to support the process – namely themselves.

When the paid labour market offers new possibilities to women, they are put in a somewhat difficult position. They have gained quite a lot in productivity, but have also reinvested much of the gain in better results, and so their margin is limited. Nevertheless, overall, home equipment has made it possible for women to work outside the home without over endangering their position as its manager. This is a strong factor in them deciding to take on outside work and putting themselves in a stronger position when bargaining with men, especially in places and at times where patriarchal attitudes tend to prevail against women's paid work. While working outside, the home manager retains her position, as well as generally that of the worker, even if only part-time. Outside work is possible for women, but not necessarily easy given the present stress levels of "working mothers". However, when women go out to work, men lose their best argument for not getting involved in housework, and usually end up having to give a hand.

Nowadays, men participate increasingly in home tasks, a phenomenon in which home technology may play a part. Electricity and electrical appliances have industrialised housework and make the life of even male bachelors easier. At the beginning of the 20th century, together with shorter factory hours, this undermined the boarding-house system housing large fractions of male and female factory workers and seen by reformers as a menace to stable family life. Later in the century, developments would support the further disintegration of the conventional nuclear family, and lead to the development of the one-person household, and a home design matched to the two-earner family. With its array of mechanical and electrical tools, home technology has eased the participation of married men in housework and made it less degrading in terms of their own status, mitigating against patriarchal and cultural prejudices.

Women take household technologies and transform them into well-being and values. Ruth Cowan, talking about her own family's experience, refers to the strength of the cleanliness value, calling it the "dictatorship of the stain". Cleanliness, as a symbol of family care, is certainly a powerful value for both yesterday's and today's women. However, these values do not have a universal content, unchanging over time and all over the world. The availability of tools allows women to invest in these values, to establish new standards, for the house, for the family, for the children, and to give these values, owing to their work, an ever more ambitious content. That it requires them to work full time, irrespective of the mechanical support they can get, seems an accepted condition. That these values are part of the ideology hammered home in the media, by the appliance, washing powder and food industry, whose sole interest is profit, is an admitted partnership. This progressive rise in standards has no other name than development, with its associated profits and constraints.

These values should not be considered so much as an expression of women's slavery but as the description of an independent and powerful role taken on by women in a partnership with men towards development. The conditions in this partnership, the gendered division of work, are defined by cultural patterns, and these cultural patterns evolve according to societies and times, with improving access for women to education, to paid work and to public affairs. Nevertheless, such values remain. These are stand-alone values, they do not engage the debate as to who has to do the work, they do not imply that women should be staying at home doing it.

Home technology plays an important part, because it gives women the possibility of tackling in fair conditions the issues of cleanliness, of hygiene and of childcare; and to be in charge, to invest, to negotiate, and finally to largely impose their views on household economic and social aspects, and then beyond the home onto the wider society. The technology has an educational power, in the sense that it helps transform housework from a burden to a responsibility, from a proletarian to an entrepreneurial activity. For women, the "filth complex" value, to adopt Morin's terms, leads to responsibility, to action, and finally to power.

6.2 Home technology and development

A major question is to what extent these arguments can be applied in developing countries for a better gendered approach to electrification. When they deal with domestic aspects of history, and not many do, historians have little experience of third world problems and rarely venture into proposing solutions. Developers in national offices and aid bureaux are rarely that interested in learning from history. Proposed solutions often copy the present state in industrialised societies, not necessarily a bad choice, but ignore the historic processes that have preceded and permitted the present situations. The more innovative solutions, generally based on “another development” theory, and again not necessarily bad options, often feel it necessary to build the future from a middle-aged perspective, avoiding the industrial age as the first step towards an alleged developed country’s doom.

In order to benefit from the historic experience of rich countries for the development of electrification in poorer ones, a reasonable approach might be based on the idea that there are no developing countries, but only poor regions of a developed world. Solutions that have previously worked well in other regions should then be applied to these, if only to save money on so many “pilot” projects erring in too many directions. This makes sense: a number of principles, such as decentralised decision-making, adaptable conditions of access and tariffs, consideration to the implications for women, should be the basis for electrification. However, these principles cannot be applied without a thorough understanding of the local situations regarding home technologies, housework and conditions for women in specific regions – be they countries or provinces - in order to determine, and to adapt, the best solution for the specific context.

Certain highlights of specific features of energy policies, electrification and gender in developing countries can be discussed here, with the objective of pointing out the differences, from household, industry and public perspectives, in situations and approaches, to those seen previously in industrialised countries. This certainly deserves further investigation, if only because contexts vary so much between countries: India cannot be compared to Rwanda, Laos with Senegal, South Africa with Bangladesh. Rural areas in developing countries have their own identity, they are different from rural areas in America and Europe in the 19th century, they have different economic constraints and different social contexts. Moreover, they are part of a modern world. Analysing situations and adapting solutions requires further research, and this is where energy, and moreover gender, specialists have a large part to play.

In existing non-electrified rural areas, where the grid is not available, it is always possible for the better-off to obtain electricity by other means: individual petrol or group diesel gensets, individual solar or wind systems. These solutions all share the downside that they are expensive and offer limited services. Even with support schemes specifically targeting renewable energy, they are still only used by a small fraction of the population. Another solution for households is to use pre-electrification solutions. Apart from lighting, for which populations have for ages found non-electric solutions, such as candles, oil and kerosene lamps, a better example is the battery-powered television that has spread widely to non-electrified areas all over the world. One of the first industries to develop in newly electrified villages is battery charging, for the clients of neighbouring localities who buy television sets and come to the electrified centre to charge their batteries. Certainly watching television is seen as one of the first advantages of electricity - according to the dwellers themselves, not developers - and gaining access to the grid generally means watching TV for more hours. Private industry products surf on this wave, as with the LG “Sampoorna” TV set, designed to operate in difficult reception conditions and responding to the increasing demand for colour TV in Indian rural areas, and the “clockwork” radio.

Historical evidence shows that electricity is not necessary for the development of new technological responses to household needs. Hand or engine-powered washing machines came before electric models. Ice-chests preceded refrigerators for fresh food conservation. These “pre-electrification” commodities succeeded in meeting a well-established market, before more expensive, but far better, electrical equipment came along and replaced them. Little such mechanical equipment can be seen in non-electrified parts of developing countries.

Is this due to the fact that washing clothes is not a burden for developing country women? Evidently not. Ready responses come to justify the fact that women continue to wash in the most uncomfortable and tiresome manners. Firstly, that the poorest are excluded from access to tap water. This is generally true, but pre-electrification models did not require tap water and there are a number of modern ones that can work perfectly well with well or river water. Secondly, that, more generally, water is not easily available. Again true, but not everywhere, in some regions many rural dwellers have individual wells, and even poor quality drinking water is suitable for washing. Thirdly, that women’s work has no value to men, that women have washed like that since time immemorial, and that no one would pay for a machine. These answers lead to the same old conclusion: there is no market.

However, there may well be a market. Has anyone investigated, and moreover has anyone come with a product for this market to think about? Can anyone pretend that women would not have a flicker of interest if they were offered a proper commodity with a realistic instalment plan? The answer might not be in the market, but in the lack of an offer. In some countries in Africa, the electric washing machine presents a difficult or even non-existent market for the industry because the better-off, who could buy one, have servants to do the job. In other countries, where servants are too expensive, products come directly from developed countries or even if they are specifically designed for specific large markets (the “made-for-India” products, for instance) they are targeted at high- or at best only middle- class households. No industrial producer is offering a hand-operated machine, or even a very low-cost electric one. Little attempt is made to address the poor, if only because the poor market, if it exists, will be a difficult one. If one looks at any of the intermediate technology catalogues, you will be lucky to find any washing machine (even if some models, such as a pedal machine, have been designed), and it would appear that no public scheme has ever been designed to disseminate any specific model. So despite the fact that washing is a large burden for many women, no adequate response has been proposed, not by industry, and not by anyone else.

Other commodities can be purchased without needing access to power grids. Water can be made available by individual hand or engine-powered pumps, without the need for electricity. Ice production was very successful in pre-electrification times in America and in Europe, even through to the second half of the 20th century. Gas refrigerators are an option where LPG is available, but electricity is not. However, little is done through private initiatives, and nothing with public support, to disseminate such solutions for a better domestic life. There is probably only one area where public money is used to back industrial development in order to promote the dissemination of existing applications (essentially lighting and radio/television) and R&D into new low consumption devices (such as domestic refrigerators) and that is solar energy. This renewable energy option has some logic, the promotion of new and better forms of energy, but little to do with responding to household and especially women’s needs.

Public support faces two problems when becoming involved with domestic equipment. The first one is market dynamics: when promoting any commodity, even devices such as low-cost efficient stoves targeted at the poor, the first clients are the better-off and more educated households. The poor only enter the market later and for a multiplicity of reasons (income, access to information,

minimisation of risks when confronted with a new product, etc.), the same reasons that produce similar trends in developed country markets. Promoting any domestic equipment using public money, whatever the public interest, will serve the middle class before the poor, and the poor before the very poor. This is seen as politically counterproductive, especially when targeting the poor, and ideally the very poor, is the overriding goal of aid and social policies in the developing world. However, this inevitability is dictated by market forces, the necessary path for building a cost-effective market. The overall market is not just the better-off and, when dealing with domestic electrical equipment, any household that cannot buy under present market conditions a refrigerator or a washing machine is effectively poor. Once the poor gain access to a product, the fact that they had to wait for the better-off to buy it first is not seen as a drawback. Further, the promotion of collective equipment – often seen as a clever way to be politically correct - generally leads to sour deceptions.

The second problem facing public support concerns the vision of a “different development”, a view largely shared by international aid practitioners. A desire driven by the present state of developed societies, which are not seen as a model to follow, and a nostalgia for the less consuming and maybe more socially friendly past. This attachment to ever remoter rural roots influences judgements on what constitutes better development, on what sort of a future should be proposed in and for developing countries: how to take the best from progress and avoid the rest. These preoccupations, while well founded, lead to some misunderstandings when confronted with people’s, and in particular women’s, feelings and desires.

The relation with rurality and rural migration is one area where misunderstandings occur. In a household survey among new migrants to the capital of Mali, Bamako (World Bank, 1990), men largely answered that life was more stressful in the city than in their former village, while a large majority of women answered that rural life was far more stressful. Women certainly play a role in rural migration, and have good reasons to see it positively. Their opinions could counteract the near-universal condemnation of rural migration, or at least provide reasons to think about how to improve rural women’s domestic conditions to discourage them leaving rural areas and looking for freedom in the cities, however difficult conditions there may be.

Another example is undoubtedly in the area of environmental concerns. Thousands of analysts justly denounce the large disequilibrium created by consumption patterns in developed countries, and there is a general feeling that a similar phenomena should be avoided in developing countries. Most development specialists agree on the fact that a wiser and less energy consuming future should be offered to others: others meaning developing countries to aid technicians, and rural populations to urban decision-makers. The perfect rural dwellers not only never think about migrating to the neighbouring city, they also ride bicycles and use solar panels. That most of these specialists, based in developed and developing country capitals, would never agree to cut down on their own energy consumption, or to give up their car or air conditioning system, certainly casts a question mark over their assertions.

The obscene conclusion, that access to cars, to washing machines, to televisions, to consumption in general, should remain the sad privilege of the happy few, is not formulated as such, but underlies the dominant development philosophies. The market will probably end bringing goods to customers, but public support feels as if it should not be held responsible, and resist it as far as it can. Developing country populations have difficulties to accept to be excluded from developed countries’ way of life only because of externalities. As shown in many evaluations, rural dwellers want the grid because it opens the door to an array of electrical services, and they resent getting only solar because it offers not much more than light. Debates, which appear to us as key factors in

electrification policies, such as the priority given to productive and social needs, environmental concerns and the development of renewable energy, and public versus private ownership, are met with great indifference in households. People do not want explanations of what they need; they just want what they desire. Environmental concerns carry little weight for them: they want electricity and services. And they are right from a global point of view: they will share the environmental concerns as soon as they share the benefits of energy, not before.

Energy programmes in developing countries are built on this ambiguity: access to energy, but with as little consumption as possible. Little energy and minimal expenses incurred, while people aspire to have more energy, more services, and are eager to spend more money achieving this. Political decision-makers focus on low tariffs, and favour existing customers over new ones. Public programmes, with endless technical imagination, focus on low-cost equipment - low-cost improved stoves, low-cost solar driers – or on collective appliances, once again in order to cut costs. If they were given the choice, most rural dwellers would opt for ready-made solutions, largely developed in industrialised countries, ones they can see on their TV sets, and not customised solutions. Moreover, many could access them with comprehensive support.

Why should this not be a public responsibility? Policies are often built on two parameters of goodwill, that also define rather well paternalism: distance and pedagogy. Distance from the population makes one feel that it is one's public responsibility to decide what is good for the people; pedagogy amounts to teaching people what is good for them through appropriate sensitisation. Welfare principles tend to simply give people what they desire. There are sound macroeconomic reasons to act over home equipment, as the paradigm designed by the incipient US power sector showed: the more electricity that is used by customers, the more financially sound become the utilities and the better their services become and, overall, electrification becomes more cost-effective. However, there are other more intimate reasons to make it a public responsibility, such as making people's lives simpler, more comfortable and more pleasant.

6.3 Women's electrification

Any survey on the subject, among electrified or non-electrified populations, will readily point out that people do not want electricity as such, but the services it can provide; and that most of these services will benefit women. They also show that, in numerous cases, women have significant decision-making power over the household and household equipment. Therefore, that understanding women's desires is useful in setting up appropriate electrification strategies and programmes is a view that nobody will oppose, either by conviction or by courtesy. However, the message to get across to energy policymakers, and to utility representatives, is that building up electrification programmes that give access to both energy and to appliances, and that involve women in all steps and at all levels of the process of electrification are two indispensable factors in creating success, for at least five major reasons.

The first one is that responding to women's desires is an efficient way to secure electrification programmes and reduce the public cost of these programmes. The more electricity that newly electrified households use, the more cost-effective become the new systems. This is particularly important in the initial years of operating new systems when the financial conditions are still precarious. Electrification should not follow the European example, where the emphasis was on connections, but the American example and integrate, as quickly as possible, efforts to disseminate domestic appliances. This means working with populations to understand the market opportunities, with industry to desophisticate some of the existing products and make them cheaper, and with microcredit institutions to work out instalment schemes.

The second reason is that developing a market for domestic appliances is in itself an act of wider development, due to its impact on production and commerce. This will have positive consequences for employment in urban areas, where most producers, importers and wholesalers are based, but also in rural areas through the development of retailers and maintenance networks. Rural activities often lack rural markets, and this would create a major one. Moreover, there is historic evidence, in developed as well as in developing countries, that spreading electricity and electrical appliances leads to the other home investments (on construction, on home improvements) that also help the development of rural production and services (wood, metal, brick, blocks, painting, etc).

The third one is that electrification and the development of appliances will help households to manage their present situation and future development when faced with the disintegration of large families and the disappearance of low-wage domesticity, two manifestations of the transformation and modernisation of economies. Household male and female teams will become able to handle new personal investments, to assume, given fair conditions, better houses, more clothes, better family care. This builds up a new attitude towards investment, towards purchases, towards a need to increase family income - the "monetising" effect of home technology. Appliances allow household development and are also in themselves a reward, a potent signal of a family's wealth and status. Children's health and education take on a new importance. This is no more than development, as seen from the household perspective.

The fourth reason is that the development of domestic services linked with electricity is a potent tool for women's empowerment within the family as well as the wider public sphere. Not only is there no contradiction, there is also synergy between the modernisation of housework through electricity and various aspects of women's empowerment. Electricity gives women the facilities to play a greater and more crucial role in increasing the family's welfare, and to contribute to their community development. In Morin's terms, home equipment leads to a process of "decolonisation" of women. In simpler terms, home equipment liberates women's energy which can sustain household investments in a better life and, if certain conditions are fulfilled, allow them to take responsibilities in paid work or public affairs.

The final, but certainly not the weakest, reason is more than simple: listening to the people, answering their requests and trying to make their lives better, when their own efforts and private market dynamics are not sufficient, are - or should be - basic principles for a public policymaker: principles to which other considerations should be subordinated. One cannot dispute that if households worldwide were consuming the same amount of energy as US consumers that this would certainly be tremendously difficult to manage in terms of resource availability and environmental risks. Nevertheless, giving households and women in developing countries the same opportunities that households and women in industrialised countries had some decades ago seems fair, as is sharing the consequences of striving for worldwide sustainable development.

In establishing electrification policies that efficiently respond to households' and women's aspirations one is expected to involve communities, and set up adequate rules that promote investment and facilitate access by the poor. However, the key factor is to involve more women, not as a general equitable measure, but of necessity. In the early 20th century, American private business was not particularly feminist, nor was the Federal government or the cooperative movement. Nevertheless, utilities, the appliance industry and the REA found it essential to recruit women to the higher ranks of their hierarchies in order to work on product design and marketing strategies. Specific directives were given to cooperatives to include women within their leaderships and to promote women's participation and voting in the project development process.

While it is now commonplace to say that, rather than electricity, households want electricity services and that women are the first to benefit from these services: this still has to be addressed, both on the ground and at the planning level. In dealing with non-electrified communities, specific rules must be set up to promote and even to enforce women's participation in preparation and follow-up meetings as well as in decision-making. Women's participation in the electrification business will be of crucial importance in designing and implementing publicity, in marketing and sales strategies, in teaching public promoters, utilities and appliance companies and micro-credit schemes how to better meet women's needs and household budgets, and in helping them to implement comprehensive dissemination policies. In regional and local agencies, female "utilisation experts" will be required to support the development of electric services among existing and new users of electricity.

Finally, gender specialists will have to face the old challenges and new responsibilities in a field that nobody has really investigated but themselves, the domestic sphere of poor households in developing countries. They alone have been studying daily life and women's household chores, understanding their main motivations for a better life and less drudgery, and proposing possible solutions and methods. However, so far, they have been given only minor roles, such as gender evaluation, just to make sure that men do not completely forget about gender aspects. It is perhaps now time for them to become important players, to take on more responsibilities, to weigh directly on public decisions, and to design and undertake specific programmes for a real women's electrification.

BIBLIOGRAPHY

- APEL (1935), Enquête pour le développement de l'électricité,, September 30, 1935
- Atallah, Paul (1991) *Of Homes and Machines: TV Technology and Fun in America*. Continuum
- Battle, John D., Executive Secretary of the National Coal Association (1935) Hearings before the Committee on military affairs, 74th cong. 1st session
- Bergère, Paulette (1925), *La méthode dans le travail et l'outillage qui simplifie, mécanise et libère*,
- Bigot, Marthe (avril 1927) in *La Révolution Proletarienne*
- Blühh, Andreas, and Limpicott, Louise (2000), *Light!* London: Thames and Hudson
- Bowden, Sue, and Avner, Offer (1994). *Household Appliances and the Use of Time*, *Economic History Review* 47
- Burton, Linda, Dittmer, Janet and Loveless, Cheri (1993) *What's a Smart Woman Like You Doing at Home?* Family & Home Network
- Campbell, Helen (1896) *Household economics* , G.P. Putnam's Sons
- Capdevila, Luc and al. (2003) *Gender in front of mutations - Male and female from the Middle Age to nowadays*
- Caron, François and Cardot, Fabienne (1991), *Histoire de l'électricité en France - Tome I: Espoirs et conquêtes, 1881-1918*, Fayard
- Carroll, Laura (1999), "Rural American Women and Directed Cultural Change",. interview courtesy of the McLean County Museum of History. The interviews were conducted as part of a temporary exhibit entitled, "Corn, the Amazing Story". Museum volunteers conducted all interviews.
- Cernea, Michael (1985), *Putting people first*, Oxford University Press
- Chartier, Anne Marie, and Hébrard, Jean (1989), *Discourses about Reading-1880-1980* Paris: BPI Centre Georges Pompidou
- Colloque international d'histoire de l'électricité (1987), *Un siècle d'électricité dans le monde, 1880-1980*, PUF
- Cooke, Morris (1934), *National plan for the advancement of rural electrification under federal leadership and control with stats and local control as a wholly public enterprise*, MLC
- Corbin, Alain (1987), *Histoire de la vie privée, Tome 4*, Paris, Le Seuil
- Corbin, Alain, and Csergo, Julia (1997), *La fatigue, le repos et la conquête du temps* Paris: Aubier Montaigne.
- Craig, Steve (2001) *From 'Married, with Children,' to 'Touched by an Angel': Politics, Economics, and the Battle Over 'Family Values' Television.*, Paper presented at the Popular Culture Association Convention, April, 2001
- Csiksentmihalyi, Mihaly and Rochberg-Halton, Eugène (1981), *The meaning of things - Domestic symbols and the self*, Cambridge University Press, Cambridge
- Davidson, Caroline (1983), *A Woman's Work is Never Done, A History of Housework in the British Isles 1650 - 1950*, London, Chatto and Windus Limited

- Dumontier, Françoise, and Pan Ké Shon, Jean Louis (1999) In Thirty Years, Less Constrained Time and More Leisure. In Conditions de vie et société, INSEE Première no. 675
- Duby, Georges et Wallon (1975), Armand, Histoire de la France Rurale, Volume IV, Le Seuil
- Duby, Georges, and Perrot, Michelle (1992), Histoire des femmes en occident; Volume IV, The 19th century. Paris: Académique Perrin Editions
- Eco, Umberto. (1979) Can Television Teach? in Screen Education 31:15-24
- Edison, Thomas (1913) "The woman of the future" Good Housekeeping magazine, October 1913
- Edwards, Paul Kenneth(1932) The southern urban Negro as a consumer, McGrath Pub. Co
- Fontanel, Béatrice (2001) Histoire des choses - La maison, Seuil
- Fraisse, Geneviève (1979), Femmes toutes mains, essai sur le travail domestique, Paris
- Fredericks, Christine (1913), The new housekeeping efficiency studies in home management
- Frederick, Christine(1929) Selling Mrs. Consumer, New York, The Business bourse
- Garet, A. et Billard, A, (1930) La résurrection du village, Librairie agricole de la maison rustique
- Godbey, G. and Graefe, A. (1993) "Rapid Growth in Rushing Americans." American Demographics (April):27-28
- Grimal, Pierre (1974), Histoire Mondiale de la Femme, Tome IV, Société moderne et contemporaine. Nouvelle Librairie de France
- Hartley, John. (1999) Uses of Television, New York, Routledge.
- Hoffman, Mary E. (1926), The buying habits of small-town women, a survey compiled and analyzed by Mary E. Hoffman, director of research, Ferry-Hanly advertising company. Kansas City, New York
- Horwood, Catherine (1997) Housewives' choice - women as consumers between the Wars - influence of Good Housekeeping magazine on women living in the era between World War I and World War II, History Today, March 1997
- Illich, Ivan (1973): Energy and equity, article in Le Monde
- INSEE, Timetable survey, 1989-99 www.insee.fr
- Jobart, Ibam (1839): Industrie française. Rapport sur l'exposition française de 1839
- Kline, Ronald (2000): Consumers in the country - Technology and social changes in rural America, The John Hopkin University Press
- Kollontaï, Alexandra (1920s): Marxisme et révolution sexuelle, texts presented by Judith Stora
- Santor (1975) François Maspéro
- Kubey, Robert and Csikszentmihalyi, Mihaly (1990): Television and the quality of life, Lea
- Labat, Guy Victor et Lallement, Jean Noël (2000): L'homme et ses métiers, Tome IV, Le travail au XX^e siècle, Nouvelle Librairie de France
- Langevin, J. 1913: Novels Review
- Lefebvre, Henri (1961): Critique de la vie quotidienne II, Fondements d'une sociologie de la quotidienneté, Paris: L'Arche
- Lévy-Leboyer, Maurice et Morsel, Henri (1994): Histoire de l'électricité en France - Tome II:

L'interconnexion et le marché, 1919-1946, Fayard

Linder, Staffan. (1970): *The Harried Leisure Class*, New York: Columbia University Press

Maddocks, Mildred (1920): *The consumer viewpoint, covering vital phases of manufacturing and selling household devices*, Good housekeeping institute, Department of household engineering

Marling, Karal Ann (1994): *The Visual Culture of Everyday Life in the 1950s*. Cambridge, Mass.: Harvard University Press

Matly Michel, (2001): *L'électrification du monde commence à Labastide-Murat*, in *La Revue de l'Energie*, Janvier 2001

Matly Michel (2003): *Rural Electrification in Indonesia and Sri Lanka: From Social Analysis to Reform of the Power Sector*, World Bank ASTAE report

National Sleep Foundation (2001) <http://www.sleepfoundation.org>

NRECA - The National Rural Electric Cooperative Association, (1984): *The next greatest thing - 50 years of rural electrification in America*

Nye, David E. (1990): *Electrifying America - Social meaning of a new technology*, MIT Press

Palacio, Manuel (2001): *Historia de la televisión en España*, Gredisa

Petersdorff, Winand von (2004), *Poor, a large and promising market*, in *Frankfurter Allgemeine Zeitung* (June 2004)

Putman, Robert (2000): *Bowling alone - The collapse and revival of American community*, Touchstone

Richards, I. A. (1924) *Principles of Literary Criticism*

Rifkin, Jeremy (2001), *President of the Economic Trends Foundation: La vida a la velocidad de la luz. ¿Estamos mejor?*, in *El País*, August 2001

Robinson, John P., and Godbey, Geoffrey (1997): *Time for Life: The Surprising Ways Americans Use Their Time*. University Park: Pennsylvania State University Press

Ross, Kristin (1994): *Fast Cars, Clean Bodies : Decolonization and the Reordering of French Culture*, MIT

Sansot, Pierre (1994): *Gens de peu*, PUF

Shama, Simon (1991): *L'embarras de richesses*, Gallimard

Shapiro, Laura (2001): *Perfection salad - Women and cooking at the turn of the century*, The modern library

Schartz, Conan Ruth (1983): *More work for mother - The ironies of household technology from the open hearth to the microwave*, Basic Books

Schartz, Cowan Ruth (1999): "Is Women liberation a myth", interview by Rebecca Coulter

Shiel, Michael J. (2004): *Rural electrification in Ireland*, World Bank report

Slazai, A. (1964): *Projet de recherche comparative relative aux budgets temps*. Centre Européen de coordination et de documentation de Vienne, 1986 and 1999: INSEE.

Société des Nations (1939): *Enquête sur l'habitation rurale en France*, Tome II

Sohn, Anne Marie (1992): "Entre-deux-guerres, les rôles féminins en France et en Angleterre." in

- Duby, Georges and Perrot, Michelle, *Histoire de la femme en Occident*, tome V
- Strasser, Susan (1982): *Never done - An history of American housework*, Owl Book, Henry Holt and Company
- Stroumiline, S. G. (1925): *Worker's Daily Life in Figures*
- Stroumiline, S. G. (1961): *Problems of Socialism and Communism in USSR*
- Thiesse, Anne-Marie (1985): *Organization of Workers' Leisure and Robbed Time, 1880-1930*
- Thuillet, G (1985): *L'imaginaire quotidien au XIX siècle*, Paris, Economica
- U.S. Economics and Statistics Administration (2001): *March current population survey*
- Vaneck, Joan (1973) : *Keeping busy: time spent in housework United States, 1920-1970*, PhD, University of Michigan
- Wolman, Paul (2004): *The new deal for electricity in the United States 1930-1950*, World Bank report
- Zeldin, Theodore (1978): *L'histoire des passions françaises 1848-1945*. Retranslation from French version. Paris: Seuil.
- Zomers, Adriaan N. (2001) *Rural electrification: utilities chafe or challenge*, Enschede, Twente University Press