34538

Energy, Poverty, and Gender

Rural Electrification in Indonesia and Sri Lanka: From Social Analysis to Reform of the Power Sector

Michel Matly

MARGE, France

1818 H Street, N.W.
Washington, D.C. 20433, USA

Manufactured in the United States of America
First printing April 2003

Contents

List of Figures

List of Tables

Preface

This work, based on field studies in Indonesia and Sri Lanka, intends to reflect the voices of rural populations about the power sector and the electrification process. These voices are not very positive, and sometimes frankly negative. People are critical, and this report also intends (and probably succeeds) in being rather critical. However, it does not mean to be, and definitely is not, critical of national utilities or alternative programs conducted in these countries. In Sri Lanka, the Ceylon Electricity Board (CEB), and in Indonesia, the Perusahaan Listrik Negara (PLN), are undisputedly doing their best to meet both political wills and the expectations of rural population. Taking advantage of exceptional economic growth, Indonesia has even completed an extraordinary effort at electrification in the 1990s, which covered a large part of the territory. Design and execution of microhydro village schemes, for example, ITDG projects in Sri Lanka or dual solar-diesel schemes, such as Total projects in Indonesia, suffer little criticisms. Solar dissemination schemes have been designed for the best. If the Indonesian program proves to be a failure, the reason will be that it came at the worst moment of the Southeast Asian economic crisis.

Acknowledgments

This contribution report was based on two field studies in Indonesia and Sri Lanka that were completed by MARGE between September 2000 and October 2001 in association with Insan Hitawasana Sejahtera (IHS) for Indonesia and the Institute for Participatory Interaction in Development (IPID) in Sri Lanka. The main participants for Indonesia were Gérard Madon (team leader), Mayling Oey (social scientist), Evelyn Suleeman (poverty and gender specialist), and Peter Gardiner (social survey specialist); and for Sri Lanka René Massé (team leader), S. W. K. J. Samaranayake, Chamindra Weerackody, and Mallika R. Samaranayake (social scientists), and Joséphine Arpaillange and Sunith Fernando (survey specialists).

Acronyms and Abbreviations

ASTAE	Asia Alternative Energy Program
CEB	Ceylon Electricity Board (Sri Lanka)
CFL	Compact fluorescent lighting
DIAL	Day-in-a-life
ECS	Electricity consumer society
EnPoGen	Energy-Poverty-Gender
EPGA	Energy, poverty, and gender assessment
ESD	Energy for Sustainable Development Ltd.
FYD VI	Sixth Five-Year Development Program
GEF	Global Environment Fund
HV	High voltage
IFC	International Finance Corporation
IDA	International Development Association
IHS	Insan Hitawasana Sejahtera (Indonesia)
IMF	International Monetary Fund
IPD	Independent power distributor
IPID	Institute for Participatory Interaction in Development (Sri Lanka)
IPP	Independent power provider
km	Kilometer
KUD	Koperasi Unit Desa (Indonesia)
KWh	Kilowatt-hour
LPG	Liquefied petroleum gas
LSMS	Living Standards Measurement Survey
LV	Low voltage
m	Meter
MV	Medium voltage
MWp	Megawatt peak
NGO	Nongovernmental organization
PLN	Perusahaan Listrik Negara (public utility in Indonesia)
PTA	Parent-teach association
PV	Photovoltaic
RBS	Rural Business Services
SHS	Solar home system
Wp	Watt peak

1 Summary

Energy, poverty, and gender evaluations were conducted in Indonesia and Sri Lanka from September 2000 to September 2001. Team experience and a literature review of past and present rural electrification issues in industrial and developing countries are incorporated. The field investigations were conducted in two phases: a qualitative phase with participatory surveys and interviews, and a quantitative phase with structured surveys among 3,600 households and firms engaged in small-scale productive activities (1,800 in each country). Unelectrified, and long-time or more recently electrified rural communities were included in the sample.

This report focuses on two determinant aspects of electrification with regard to poverty and gender: (a) the benefits realized by rural households and by communities as a whole, with special emphasis on the poor and women, and (b) the conditions of access to electrification for all, including the poorest of society. This report also makes recommendations for a more poor-friendly electrification process, and for a more comprehensive evaluation of quantified benefits.

The chapter 2 analysis of the conditions of rural electrification in industrial countries shows that a large number of poor communities decided to take the electrification initiatives in their own hands, and they developed solutions of their own. Electrification or, more specifically, rural electrification has been mostly based on the results of accrued local community initiatives and the intervention of sometimes very small private service providers. Governments were generally late to intervene, usually by the time community and market dynamics began to run out of steam. By that time it also made sense to interconnect many of these small local initiatives and finally become cost-effective so as to build up large national grids. This past picture reveals a dynamic process that is the reverse of what has been observed in most developing countries during the past 40 years or so: the development of one main electricity grid reaching out from major cities to smaller towns, and from smaller towns to rural areas.

Studies on the impact of rural electrification in developing countries generally show the following consensus: rural electrification has a strongly positive impact on the living conditions of the population, and a more modest and longer-term impact on economic development of communities. Through access to better lighting and electric appliances, the arrival of electricity brings a new quality of life to the whole family, and in particular to women through relieving house chores. There are also important impacts on health, education and safety. The development of productive activities attributed only to electrification, however, is more difficult to recognize, and its effects are generally late and sometimes disappointing.

This builds up an image of rural electrification primarily associated with social welfare. A significant number of rural areas, most of them poor, do not get access to the main grid. Even in electrified areas, a significant number of households, mostly poor, are not connected. Utilities perceive rural electrification as a social obligation and an economic constraint that they are not able to face alone anymore. Populations and politicians consider access to electricity a social right that must be dealt with. Electrification is a priority, and insufficient electrification rates are seen as a social injustice, or a failure of energy policy and national utilities. This alone would justify including electrification more prominently in poverty reduction strategies.

There is, however, another interpretation proposed in the present report that more closely links rural electrification with productive development and reinforces its character of priority, not only for social, but also for economic, reasons. If rural populations realize a better life through access to electricity, they do not get it for free. They will pay for access and consumption to the best of their ability, and that in itself could be the major economic impact of electrification. Electricity is a market and value builder, pulling rural dwellers into the consumption world. There are clear direct impacts linked to payment of electricity bills and investments in electrical equipment and appliances. Qualitative evaluations and surveys suggest that there is also an indirect impact on nonproductive household investments (such as investing in home improvements) and deeper consumption pattern changes. Economic development relies on contributions from the community to the overall economy, and to a lesser extent on contributions from surrounding areas to the community, in a process that mainly drains financial resources from rural to urban areas.

There might be some biases in the previous analysis, however: easy conclusions should not always be considered the main conclusions. Most visible and shorter-term impacts, such as immediate benefits provided by the services from electricity, could not be so important as other ones that are slower and more difficult to detect and measure, such as changes in the consuming habits of rural dwellers and the dynamics of informal markets. Access to electricity would not mean by itself any benefit to villagers, if not complemented by a series of investment decisions (for the connection, as well as for a light bulb, a refrigerator, or a mill). Understanding the mechanisms of these micro-decisions is fundamental to evaluating the impact of electrification on people's lives and the economy. It is more fundamental yet when considering the impacts on the poor and the gender ramifications, because of particular purchase power limitations, specific family investments, and consumption strategies. In turn, these investment decisions will react on a more global level, not just on the village, but also on the overall economy.

Chapter 3 gives a global scope on the situation of electrification, poverty, and gender in Indonesia and Sri Lanka, as well as a general description of the two phases of the evaluation processes: the qualitative phase, undoubtedly the most important one, based on the premise that the best way to have answers is to avoid having with a "shopping list"

of ready-made questions and to freely let people express their feelings, frustrations, and satisfactions about electrification and electrical services. Then and only then were priority topics and key questions aroused and investigated during the second phase of the surveys, and built up to confirm and validate answers. Chapter 4 describes the conclusions of this first qualitative phase and enhances what appears to be the key aspects for respondents. It brings a slightly different image of the impact of electrification on rural areas of developing countries. It proposes an interpretation that more closely links electrification of the poor with productive development and that reinforces its character of priority, not only for social, but also for economic, reasons.

Investments and consumption will have impacts more external than internal to the community. Market development rather than increased energy availability will also be responsible for collateral emergence of village activities, such as development of paid housework, mainly among women, cottage industries, and small commerce. The transformation of the rural economy will in turn have social consequences, not all of them positive, as new, concentrated modern activities will suppress more traditional ones (such as handicraft and part-time farm activities). Electrification monetizes village economies; the downside is that it also monetizes poverty.

Impacts

Impacts on electrification are grouped in three chapters (5–7). Chapter 5 describes the significant changes that are introduced into family routines due to the arrival of electricity. Lighting, not so much for reasons of better quality, but because of convenience and ease of use, is no longer a constraint, but a resource. Together with television, it pushes back night and bedtime, while appliances facilitate tedious house chores. Women, who traditionally suffer from "time famine," tend to have longer and busier days than men. They are the first to take advantage of this extra available time. They invest this gift foremost in housework and family care, but also in socializing and entertaining, and sometimes in paid activities. They gain better control over their schedules. Children also take advantage of the extra time to read, watch television, and study. If there is no direct relationship between electrification and community action, more available time also leads to more socializing within the family and among friends and relatives, which helps build up informal social networks and platforms for more ambitious undertakings.

Chapter 6 deals with the benefits associated with the value of the home: the presence of electricity and in particular the use of two appliances, the television and the refrigerator, that tends to build the concept of "home sweet home." This enhances family and home values, and translates into concrete changes in home investments and consumption patterns. The refrigerator does not correspond to a well-established previous need for food conservation, but its development is inseparable from important changes in

food consumption patterns and increased commercial activities. Television, for which markets are larger than for all other appliances, does not even need to wait for electrification to occur: millions of television sets around the world already operate on car batteries. Television is associated with a strong image of education and family gatherings among people. It effectively teaches rural dwellers the "manners of the time," introduces them to the modern world that urban dwellers are already used to, and pulls them toward new consumption patterns.

Chapter 7 deals with the benefits of positivism and investments. Electricity builds mental capital, reinforces people's self-esteem, and mitigates feelings of risk. While attracting households through the services it enables, electricity creates a positive attitude toward investments, consumption, and monetization. Electrification builds rural markets and also creates value in the sense that rural consumers shift their spending from low added value to higher added value products. It also makes rural areas more dependent on outside markets, unless they are able to develop some activity of their own and take advantage of the trends. Better even would be to build up export activities that could reverse financial flows: access to "export" markets is probably a key issue for electrified communities. Although electricity provides better living conditions in the village, it also makes the poor more fragile and more exposed to rural migration.

Toward Independent Distribution

Chapter 8 points out that in spite of their significant efforts, national utilities face misunderstanding and bad perception on the part of the population about the electrification process. Chapter 9 suggests that even fair application of theoretically equitable present rules result in inequity and poor exclusion. Lack of investment capacity perverts "public service" solidarity mechanisms, central development planning is locally felt as arbitrary, and low uniform tariffs benefit only the better-off and exclude the poor, while rural distribution and extension is an ever heavier burden for utilities. Comparing policies and results leads to the conclusion that the present electrification marketing has far to go to be adequate and is nothing but discriminatory.

Most consumers and even most of the poor are able to pay for grid electricity under present tariff conditions in Indonesia and Sri Lanka. The middle-income and better-off consumers can even afford significant tariff increases. Present conditions of electrification, however, are all but poor-friendly. Development programs connect—at utilities' costs—only very few rural dwellers, and generally only the better-located and wealthier ones. Utilities, facing investment limitations and political pressure for grid extension toward new areas, leave a large and growing part of connection investment costs on clients' shoulders, either by charging high connection fees to households as soon as these are at some distance from the grid (Sri Lanka) or leaving a significant part of connections (30–40 percent) to informal and illegal practices (Indonesia).

Asking for financial user participation in electrification is normal, but it should be governed through tariffs and not through investments. A large up-front financial burden should not be imposed on the less capitalized part of the economy (rural households). It is also bad company practice for utilities, because households react through lower consumption. Estimated private investments in informal connections in Indonesia in the 1990s are at the same level as World Bank power sector lending. Fair access to electricity relies on the availability of low-priced connections, but utilities do not have the investment capacity to provide them at a sufficiently large scale in electrified villages to cover all households. Access to electricity is then sold as a private individual commodity in a process that necessarily introduces spatial and social inequity and that excludes remote and poor families.

In reference to European electrification history, chapter 10 proposes to reconsider the possibility of electrification through independent power distribution, based on one hand being on local private investment and management and the other hand being on community decisions and tariff solidarity. The investment capacity of utilities is a key factor that is not influenced much by better utility management or tariff increases. There simply is an investment threshold that no company can exceed, and if it does, further investments only push it along the path of unsustainability. Access for the poor is inseparable to a greater investment capacity of the power sector that must be found external to the utilities. This means not increasing, but rather refocusing utilities' intervention in electrification, as well as separating transmission and distribution, and concentrating the utility's investments on transmission (that is, connecting communities). Distribution should be left to independent power distributors (IPDs), in charge of investing in low-cost connections (connecting households) paid back through tariffs and distributing energy within the community. As shown in a schematic example, such a system allows the connection of more households and above all more poor households without significant extra costs to the overall village. It simply means a shift from individual to collective electrification at the community level.

Community-scale operations allow for social concerns that are lost in normal electrification efforts to be efficiently addressed. Distribution services should be placed under the responsibility of local governments, which are, whatever their drawbacks and weaknesses, in the best position to express community concern in electrification. IPD schemes might develop either within interconnection (wherein bulk electricity is bought from the grid) or in a decentralized mode (wherein community systems are built with independent generation), thereby providing electricity long before the arrival of the grid. Power demand density is low in rural areas, but only when seen as a whole. Villages are higher-density spots that deserve a quicker response, just like photovoltaic (PV) system purchasers at the individual level. Community electrification should also give renewables

a new market push.[1] They can be used either as a relatively cheap source of energy sometimes associated with diesel to power small grids or, as in individual solar home systems (SHSs), to reach clients where grid extension is not cost-effective.

Renewables

Renewables have simultaneously earned credibility and a relatively bad image among consumers. Although almost no one contests their technical capabilities, renewables are reproached for their limitations of service. Once electrified, grid users begin a sometimes slow, but continuous process of capitalization, thereby increasing their consumption steadily over time. Some appliances, such as electric irons or fans, are low-cost but highly valued equipment, either because they consistently lighten women's housework or they improve the quality of household life. All this is not easily possible with renewables because of project design (microhydropower schemes) or because of price constraints (SHSs).

Micro-grids with microhydro or hybrid renewables—diesel schemes have been able to demonstrate the effectiveness of another type of electrification than through the national utility grid. They have often been built as a matter of exception, in the margin of present regulations and have promoted the feeling that two separate markets exist: one for the main grid and in remoter areas another for renewables. This separate market is an illusion, and will be so more and more, as some renewable energy stakeholders have experienced because of the unexpected early arrival of the main grid. Similarly, part of the present PV market is artificially protected by existing regulation and could be endangered by the development of community schemes in a deregulated power sector.

Rural electrification deserves a specific, detailed regulatory environment, in order to fully protect stakeholders' and consumers' interests, develop community distribution systems, and ensure harmonious concentration of the sector—that is, companies taking over smaller ones and interconnecting several villages or systems—in the future, in which renewables should find their place. It also deserves a renewed long-term system of "analytical and cash" subsidies, transparent and equitable for all actors in and modes of electrification. Financing of the main power sector should logically go toward developing market conditions further. Subsidies, if any, should be attached to results, such as the number of new households with service, possibly consumption. Subsidies for renewables should logically fall within this general framework, with additional specific support for global concern for the environment.

Renewables suffer from being too technology-oriented in their project design and financing, which does not allow them respond to clients' expectations: microhydro schemes are poor-friendly schemes with low connection fees. Although they initially

---

[1] *Renewables* is used throughout the report to refer solar equipment (photovoltaics) and pico- or microhydroelectric equipment.

brought a real service to all customers, soon thereafter a significant part complained about not being in a position to increase service levels. In addition, excluded populations cannot enter the scheme because it is a static mode of electrification, sharing limited hydro resources. The same scheme in a hybrid mode of operation would bring services adapted to all clients, repay itself through tariffs, and generate resources for further electrification. However, the projects or programs often did not provide—or even plan for—financing for complementary diesel generation. Hydroelectricity is not so much a concept to build on, but more simply a chance for adding low-cost electricity supply to the generation blend.

SHSs are not a poor-friendly technology, because their market is mainly for the better-off and middle-income households. This should not to be seen as a drawback; they may offer a limited service, but they nevertheless have a solid market because they are quickly competitive in relation to decentralized grid solutions. Within community schemes, they should have an important role to play, responding to remoter households' needs, bringing solvent clients to operators in order to improve systems cost-effectiveness, allow for more flexibility in relation to possible cross-subsidized tariffs for the poorest and generate financial resources for grid extension. Competition is at the right level, that is, local, and constraints appear transparent to clients who see solar energy in the perspective of a future grid connection.

Development of the dealer sales mode of dissemination of SHSs, which is an efficient way to establish a market bridgehead, could prove more difficult because of ever-increasing intermediation costs with a growing market. Development of community schemes partially using SHSs could allow a reduction of intermediation costs and establish a larger customer base, because of long-term credit (tariffs), and could even enable consumers with larger systems (for example, with a refrigerator). Concerning specifically dealer sales, some adaptations could be made by introducing equipment more focused on television (a big market issue) and promoting the availability of lower-capacity lamps than the ones presently disseminated.

Evaluation of Future Rural Electrification Activities

The Indonesia and Sri Lanka evaluations show that current mechanisms pursued toward electrification of the rural population generally lead to an exclusion of the poor. Long before designing better social monitoring systems, it will be necessary to design better rural electrification mechanisms that are much more based on local and community initiatives. Social monitoring begins to make sense as soon as it is a condition of the success of the projects: when the design of the projects has sufficient flexibility to offer different alternatives to villagers, in terms of access of the poor to the service and community solidarity through tariffs; and when the communities have the opportunity and the power to decide on their electrification.

A key parameter for access to electric service of rural dwellers and specifically the poor is the balance of revenues from tariffs and up-front investments (connection fees) for the utility in rural distribution projects. The first public concern involves the level of investments in rural electrification programs. The level of investments will primarily condition development of the system and thus determine how easily people can access the service. Moderate tariffs, also an evident public preoccupation, are of considerable concern to users and utilities alike. Utilities need appropriate tariffs as a condition to make their business sustainable, and users need moderate tariffs to satisfy all their needs. Different ways of evaluating households' willingness-to-pay are proposed, using substituted pre-electrification costs, solar equipment prices, and actual "real" expenses in electrified villages (including real connection fees and monthly budgets), in order to guide views from both users' and utilities on tariffs. Finally, suggestions are made to allow public local and national decisionmakers to evaluate investments and their consequences with regard to access—and possible exclusion—of community members concerning future electrification.

The quantitative evaluation of electrification focuses on benefits for the national economy and the community, using the following parameters:

Avoided costs of pre-electrification solutions and associated mitigation of greenhouse gases (two parameters currently used in electrification project assessments).

Investments in electrical equipment (wiring and appliances).

Development of local activities through the availability of additional time (paid housework).

Investments (new workshops and commerce).

The importance of social impacts is not discarded. Rather, we show in a language for economists the reverse side of these impacts in relation to consumption and investments. These parameters have a double interest: measuring the general economic impact, and the specific impact for the community that can be enhanced through specific supporting actions. They also tend to emphasize that electrification, far from being the only social service to rural populations, is a resource that should be exploited for faster overall and local economic development.

Social evaluations, as carried out in Sri Lanka and Indonesia, appear important and necessary where and whenever there is a political will to reform the power sector in a more efficient and truly poor-friendly way. In a scaled-down version, however, energy, poverty, and gender assessments (EPGAs) integrated in the preparation of new rural power distribution programs could promote better access to electricity for most of the poor. EPGAs could also assess and optimize the impacts for all, as well as for the most fragile groups of the target populations.

2 Early Lessons

> It is obvious, therefore, that light—or the absence of it after dark—was a most important fact in social history. It is, however, one that has been completely ignored. This is no doubt due to the scarcity of references to lighting in both literature and art, and the fact that most of the references that do exist are to the unusual rather than the ordinary.
>
> William T. O'Dea—Darkness into daylight: an account of the past, present and future of a man-made illumination, 1948.

Artificial Light

It may appear dangerous or confusing to compare the history of industrial countries to the present and future of developing countries. However, socioeconomic analysis on the effects of modern technologies on traditional ways of living in the developing world should benefit from such comparisons.

First Days of Artificial Light

Historic information on the impacts of technology on households' daily life in industrial countries is not so abundant. The two last centuries witnessed such a large number of innovations, which went from laboratories to daily life in less than a generation (among which electricity), that one would expect to find abundant material on the subject. This has not been the case, however. The "consequences of scientific and technical progress on daily life" have not drawn much attention. The history of science is written from the point of view of the scientist with a perspective of knowledge development. The consumer still waits for historians to take up this topic (Zeldin 1978). The history of electricity follows this general scheme: most existing studies—and they are not so numerous—focus on scientific discovery and industrial adventure, leaving little space for their consequences on the economy and their impact on daily life.

Another reason is that electricity's first steps in the world form part of the history of artificial light, and as such caused a change of lower significance compared to the introduction of gaslight. The revolution of artificial light began with gas, provoking enormous cultural changes, whereas the introduction of electricity in cities invoked more of a commercial and technical competition than a drastic change. Specific major changes will come later on, with the multiplication of electric applications (domestic electric

devices, such as the iron, washing machine, and television, only develop large markets quite late after the introduction of electricity) and with the development of electricity in rural areas (where access to gas was excluded).

Gaslight was known as early as the 17th century (Jean Tardin, 1618), but its general use was made possible by the engineering progress in transporting steam and water through pipeline systems. Moving up from oil to gas involved changing from individual freestanding systems (the oil lamp with its own fuel supply) to a large distribution infrastructure requiring major investments. This development began in Great Britain in early decades of the 19th century, to be followed later on in other Western countries (1840–50).

Electric lighting, once developed in 1878, underwent a spectacular development, with installation as soon as 1881 of streetlighting systems in New York (Wall Street) and London. Gas had its time to significantly settle down and initially made life difficult for the new competitor. In 1896 Paris counted only 9,000 electricity subscribers against 350,000 for gas. Being simpler and less dangerous, electricity quickly took over and consumption developed rapidly with growth levels never under 10 percent per year between 1880 and 1914 in Western industrial countries.

First Socioeconomic Impacts

"With the invention of the Argand lamp (1783) through the introduction of gas (1800) and electricity (1880), night gradually acquired its modern identity as a time of additional work, public entertainment and education." (Blühm and Limpicott 2000)

Public Life

Major impacts of modern lighting are primarily found in the economy and public life. Gas, and later electricity, found an immediate application in streetlighting. Unlit streets in towns and the countryside were considered dangerous, and staying at home was a necessity. Streetlighting slowly began in the 17th century in some of the major and most progressive European cities, with candle-lit lamps in strategic crossroads, avenues, or squares. In the 18th century, private streetlighting companies were competing in London, while Paris was developing modern "Ami Argand" hollow oil lamps. The golden age of streetlighting really began in the 19th century with the development of gas distribution networks followed by the introduction of electricity.

The earliest and biggest private investors in artificial light have been factory owners. As early as 1805 gaslighting was introduced in cotton mills and large textile factories for safety reasons (to eliminate fire hazards from candles and oil lamps), as well as for improved productivity (through the introduction of night shifts). Then came urban merchants using artificial lights in their shop windows as a strong marketing argument and to encourage pedestrian traffic at night. Much later came entertainment, with new possibilities for visual display because of electricity (lighting cabarets and bars, and

popularizing moving pictures), and education. Gaslighting installed in schools, coffee houses, and clubs allowed workers and students to read and study at night.

Private Life

Lighting also occupied a major place in domestic life. The few market studies available have mentioned that international fairs were among the events that played a major role in the diffusion of modern technologies in the 19th and early 20th centuries. At the 1839 World's Fair in Paris, for instance, individual visitors expressed major interest in finding concrete solutions for two main problems: defective heating systems ("smoke is our home's plague," as expressed by Jobart (1839)) and insufficient lighting.

If gas and electricity were deeply transforming public and economic life, their effect on households seems to have been far less because lighting levels in homes did not improve much. In the 18th century architecture and furniture were primarily designed to attract and reflect light, whereas in the 19th century, designers tried to restrain the abundance of new artificial light: electric lamps of 20 W or less were considered "dangerously bright," and households answered to brighter lights with heavier curtains against streetlighting and denser lampshades to keep home lighting at dim levels.

Well-off families tended to restrict gaslighting to hallways and to servants' quarters and workspace, while continuing to light their own rooms with outmoded, labor-intensive but high-status candle or oil lamps. Middle-class families, where women had no servants for safeguarding hygienic conditions, may have had different views. Old lights may have been sufficient for storytelling, conversation, reading, sewing, mending, and card games, but they were the curse of every housewife's existence, associated with perpetual dirtiness (dripping tallow and greasy smoke), difficult and dangerous use, and laborious cleaning.

Most old lamps—oil, kerosene, and gas lamps—fell out of use not so much because they were giving dim and flickering light, but because they were difficult and dangerous to operate. One needed great patience and skill to keep them going, and social customs and manual skills dedicated to maintaining them were being lost with the arrival of electricity.

Rural Electrification

The history of rural electrification in industrial countries is not much more described than the history of lighting. Most electricians, generally grown up during the era of planning for electrification and trained as workers in large utilities, have lost the memory of it and in large part substituted a new history that is fictitious, but far more rational. This was to be the future history of the power sector in developing countries. Electrification was due to come from reasonable public support, adequate central planning, and sensible entrepreneurial development of public utilities. Grids would extend from cities to rural areas until they covered all parts of the territory and delivered the service to all. And if

results were deceiving, it was because of weak market reactivity, lack of investment means, and external constraints.

This is a picture of a very different scheme from the ones developed during the first steps of electrification in industrial countries. Public authorities often did not plan for rural electrification, brought little or no financial support, and mainly based their policy on "laissez-faire," leaving initiatives to local communities and the private sector. This led to the development of hundreds or thousands of small different systems, all decentralized and quite anarchic, yet quite effective.

Market conditions in those days were not good for propagating rural electrification. Its development did not surf on consumer income growth, but rather had to face, decade after decade, progressive impoverishment of the rural population. In most Western countries, rural electrification developed in times when farmers' incomes continued to decrease. The first half of the 20th century witnessed agriculture's loss of importance in economies: between 1900 and 1960, its share in national income went from 20 percent to 7.5 percent in the United States, from 35 percent to 12 percent in France. This brought strong consequences for disposable rural family income. In the mid-1930s, when rural electrification really began to spread, about one-third of North American farms were heavily mortgaged, and most of them were not profitable and meant to disappear. In countries such as France where farmers long resisted urban migration, rural income in real terms in 1955 represented two-thirds of its level in 1914 and half its level in 1865–75.

So the development of electrification was not made possible by a progressive increase of rural purchasing power, but rather by a comprehensive supply and marketing strategies, mostly left by public authorities to the private sector. Electricity was considered a commodity, and private investors, jealous of their independence it imparted to people, would not accept public intervention in the process. States actually began to interfere only when large investors began to fancy the necessity to integrate markets and make their large investments profitable (as shown in the two European examples in England and France) or when private dynamics proved insufficient to respond to proper system development (as shown in the U.S. example).

European History

The United Kingdom promulgated the Electric Lighting Act, theoretically imposing the installation of one power plant per parish, without any technical specifications, which provoked the multiplication of systems that were unfortunately generally incompatible. As a result, there were 491 independent electricity grids in 1925, with differences of cycles and voltages. Early attempts at integration failed (in 1917 a Reconstruction Committee proposed without success the replacement of existing dispersed generation by large plants in 16 districts, which would have halved the cost of power; Newbery 1995) until 1926, when the British authorities created the Central Electricity Board with public funds to buy less cost-effective systems and to proceed with better integration: in 1935,

the number of grids was reduced to 144, but still showed 43 voltages ranging from 100 to 480 volts (Debeir, Deléage, and Hemery 1986).

French private stakeholders at first did not want any public intervention for the development of this new commodity market. Conforming to well-established bureaucratic traditions, in 1903 French authorities built a detailed framework within which to develop rural electrification, along with a whole set of administrative and technical regulations. This framework, however, was basically designed to leave initiatives and responsibilities to private stakeholders and municipalities under a regime of a 40-year concession. Private operators were designing, investing in, and operating the systems; municipalities were fully in charge of decision and control; and nearly no public money was invested in electrification until the 1930s. This gave large utilities the freedom to develop most profitable businesses in heavily populated areas, but it also allowed a large number of local stakeholders to build their own small businesses in rural areas. At the national level, electrification rates grew to 70 percent, but once again this led to a proliferation of small disconnected systems: for example, a poor and rural department of France, Le Lot, counted up to 15 utilities for a population of 160,000 (Matly 2001).

With the worldwide economic crisis came new interests in interconnection, in good part because the profitability of huge generation investments was hampered by a stagnation of demand, and large private utilities asked for public support. In 1934 French authorities set up a centralized soft loan system with a system of municipal guaranty to promote village interconnections. Distribution grids were the property of municipalities (generally through intermunicipal syndicates), but operation remained in the hands of private companies. Some communities refused electrification, considering it too dangerous to guarantee the public loan (in fact, this guaranty generally had no impact on municipal budgets, loans being reimbursed by operators with consumer payments). These communities were hardly struck by the shortage of petroleum during World War II and had to go back to old oil or grease lamps for lighting. At that time, however, more than 90 percent were electrified, and the newborn public utility EDF finalized electrification with the remaining municipalities between 1947 and the early 1950s.

Electrification of other Western European countries had rather similar stories, going from small-scale, high-cost, and low–load factor systems to progressive networking into larger utilities, even if local differences might have existed in the speed of integration. In Sweden, where low-cost hydro resources in the north early determined the generation and integration of transmission, but not distribution, because there were about 2,000 distributors in 1957 (there are 300 now). In Germany, where industrial self-generation played a large part (in the 1960s nearly 40 percent of electricity supply was still self-generated) and distribution remained long and is still quite decentralized (16,000 utilities in 1933, 3,000 in 1955, about 1,000 at the end of the century).

American History

The first U.S. power sector experience was marked by an aggressively competitive market. Competition between rival private suppliers sometimes led to financial failures and municipal takeover, which led to the necessity to regulate by 1906, with the first long-term concessions in Wisconsin.

The history of rural electrification, however, has been much more publicly driven than in Europe. Because of several factors—such as earlier capitalization and integration of the electricity sector, large companies without interest to enter unprofitable rural markets, large territory extension and habitat dispersion—rural electrification was relatively below European standards. The creation in the mid-1930s of the Rural Electrification Administration, along with further development of cooperatives with subsidized public loans, boosted rural electrification and allowed for the gap to be filled in during wartime.

U.S. cooperation took advantage of its experience to promote rural electrification in developing countries and gave the cooperative association NRECA a major role in electrification programs with mixed results for different reasons, one of them being that their approach was marginalized by growing sector centralization. On the contrary, European and in particular French cooperation agencies turned their backs on their own history and imposed a worldwide vision of modern electrification based on large public authorities in charge of extending grids from cities to rural areas: international agencies, among them the World Bank, born with the Marshall Plan, took the model and promoted electric sector nationalizations.

Lessons

Different readings can be made of the brief electrification history presented here. The most common feature is the lack of rationality in the approach and its inefficiency. Some lessons can be learned. The first one, dear to liberalization proponents, is the role played by private firms that risked their money without public support. They gave a significant push to electrification, even if public intervention proved necessary to complete it until the last village and the last house were included. In smaller villages, private investors were often small entrepreneurs who started up a utility as a form of commerce, both as a service to the community and as a prospect for future profits. And when sector integration times came, adequate rules were generally set, which established fair conditions for decentralized systems to be connected to the grid and for smaller entrepreneurs to give up their businesses.

The second one was the considerable role played by poor rural communities in the electrification process. They were in charge of their own electrification, and they had to find an industrial partner to invest and operate the small systems. Rural communities were really committed to controlling this activity and service quality. Their desire for

electricity did not become diluted into a mere petition in some administrative office, but rather it was an effective motor for self-electrification, often with little or no external support. Adequate regulations empowered a large number of villages—some of them with not more than 100 families and most of them with very weak administration and little financial means—to successfully take charge of their own electrification.

The state also played a considerable role, because it provided detailed regulations and administrative support and allowed villages to build their own electrification through simple long-term concessions to private providers (in the French case, by 1903). The state also allowed local, long-term concessions (franchises) to prevent unfair competition that could be harmful to further private sector initiatives (in the U.S. case, around 1906). In addition, the state supported logical progressive integration of the sector, for the benefit of customers, through adequate regulatory and public financial support (in the French and British cases, the 1930s); financed specific public efforts to electrify very low-density areas (in the U.S. case, the 1930s).

3 Investigating Impacts

This chapter gives an overview of the situation of poverty and gender in both countries, as well as a brief description of the present situation of their power sector and rural electrification. It also presents the research scheme set up by MARGE to investigate issues related to energy, poverty alleviation, and gender in these two countries.

If electrification of industrial countries was completed in the mid-20th century, today a lot remains to be done in the developing world. About one-third of the world population—more than 2 billion people—have no access to electricity, among which 1.2 billion are found in Asia alone. In Indonesia and Sri Lanka, the two countries studied by the MARGE contribution to the overall Asia Alternative Energy Program (ASTAE) Energy-Poverty-Gender (EnPoGen) study, a large number of households are still excluded from electrification: one-third of the rural dwellers in Indonesia and more than 40 percent of the overall population in Sri Lanka.

Country Background

The following overview gives some indication about poverty, aspects of gender issues, and electrification in both countries.

Poverty

Recent comprehensive works give information on the situation of poverty in Indonesia and Sri Lanka.

Indonesia

Until the East Asian economic crisis in 1997, Indonesia was recognized as a success story of rapid economic growth (7 percent annual economic growth rate from 1979 to 1996), steadily rising development indicators, and impressive achievements in poverty reduction. Since 1976 nearly 30 percent of the Indonesian population were lifted out of poverty, lowering the rate of those in poverty to 11 percent in 1996. The current economic crisis has temporarily reversed this trend. Estimates indicate that during the peak of the crisis (late 1998 and early 1999), the population below the poverty line doubled from its precrisis level. Despite a beginning of recovery since rice prices have fallen and real wages have recovered, the number of people below the line of poverty was estimated at 37.5 million in 1999, that is, 18 percent of total population, which approximates conditions of the mid-1980s. However, including all the dimensions of human well-being—adequate consumption, reduced vulnerability, education, health, access to basic infrastructure, and a chance to participate in social and political life as equals—poverty concerns likely half of all Indonesians.

Poverty reduction is considered the most important challenge facing Indonesia. The government of Indonesia, with World Bank assistance, is currently in the process of designing a new strategy for poverty reduction. The new strategy should take into account a broader definition of poverty, considering all of its dimensions. Two broad areas of action are considered:

Creation of a policy environment for raising incomes of the poor through (a) resumption of rapid sustainable growth, (b) economic empowerment of the poor, and (c) poverty-focused public expenditures.

Effective provision of core public services through (a) improving local governance, (b) ensuring basic health and education services, (c) providing needed infrastructure, and (d) maintaining safety nets for the poorest to cope with shocks.

A recently signed agreement between the government of Indonesia and the International Monetary Fund (IMF) has notably put emphasis on boosting the development of micro, small, and medium-scale businesses and increasing the people's welfare in rural areas to strengthen sociopolitical stability by accelerating infrastructure projects at the district (*kecamatan*) and rural subdistrict (*pedesaan*) level.

Sri Lanka

Sri Lanka is a low-income country with a per capita income of about US$820. The incidence of poverty has been reduced over the past four decades. During the period 1996–97, between a fifth and a third of the population (representing 3.3–4.5 million out of 17.5 million people, excluding the population of the North Western Province) could have been classified as poor, depending on whether poverty is measured with a low poverty line at Rs. 860 per person per month or a slightly higher poverty line at Rs.1,032 per person per month (the poverty line is defined to reflect the diet prevailing among poor households). With its strong human resource base and natural endowments, Sri Lanka could have achieved substantially higher growth rates and poverty reduction had it not been for a history of ethnic conflicts, political unrest, and insufficiently sound economic policies.

According to a World Bank assessment of the rural sector in Sri Lanka, poverty is a predominantly rural phenomenon. Approximately 85 percent of poor households are located in rural areas, whereas the total rural population is around 75 percent of the total. A little less than half of the poor depend on agriculture for their livelihood, whereas another 30 percent depend on other rural nonagricultural activities. The poorest households are not the landless, but rather the subsistence farmers who receive more than half of their incomes from the value of food consumed from their own production. Sharp disparities in poverty levels exist among and within the different provinces (from Uva, the worst, to Western Province, the best), as well as among districts of the same province.

Gender

Less specific information is available on aspects of gender in Indonesia and Sri Lanka. Some elements are presented below.

Indonesia

The World Bank study, "Consultations with the Poor in Indonesia," gives some important clues on the gender situation in Indonesia:

- Indonesian women shoulder a heavier and more diverse workload than men, particularly in rural areas. They manage the housework; take care of the children; nurse the sick and the old; collect water, fodder, and fuelwood; take care of smaller livestock; work on crop fields; and handle manual postharvest operations. In addition, they shoulder an important share of voluntary work required by community development programs (social net, health, and hygiene programs), and often develop earning activities to increase family income.
- Men are still the real decisionmakers at home. They often decide about matters—such as children's schooling; housing repairs and building; buying and selling assets; and agriculture inputs and produce—whereas women generally manage the current budget and decisions on daily activities. Decisionmaking may be somehow changing to the benefit of women, who are increasing their share in decisionmaking as soon as they earn a more substantial part of the family income by working outside or developing commercial activities at home.
- Women are also still largely excluded from community decisionmaking. In some areas, they developed associative activities of their own, such as savings and credit schemes.
- Together with a certain decrease of violence against women (in their families or communities), it seems generally agreed that women have gained power and are better off compared to previous decades.

Sri Lanka

In Sri Lanka, as in many countries, gender discrimination exists, associated with gender stereotyping in the labor force, wage discrimination, gender ideologies that view women as homemakers, biases in state support for the poor toward programs that involve men, and the adverse effects of alcoholism and spousal abuse on women.

Sri Lanka, however, is unique in South Asia in that there is no significant gender inequality either in access to health or education services. Nevertheless, in spite of this equal access, only 40 percent of the girls are continuing secondary education, against 80 percent for boys.

Electrification

Indonesia and Sri Lanka have mainly based their electrification efforts on the development of major national and public utilities—Perusahaan Listrik Negara (PLN) in

the case of Indonesia and the Ceylon Electricity Board (CEB) for Sri Lanka. The arrival of renewables has somehow broken through this monolithic electrification, although on a small scale. Both countries have realized important programs of electrification, with the support of external, and in particular World Bank, support, but they still face relatively low rates of rural electrification and look for new or complementary approaches to conventional grid extension.

Indonesia

In Indonesia the rates of rural electrification vary significantly from one province to another. The highest rates are encountered in Yogyakarta (94 percent), Bali (81 percent), East Kalimantan (79 percent), and West Java (70 percent), whereas the lowest are in East Nusa Tenggara (13 percent), South East Sulawesi (21 percent), Irian Jaya (21 percent), and Lampung (22 percent).

A significant effort to electrify rural areas of Indonesia is still in progress and has already accomplished much. At the end of the Sixth Five-Year Development Program (FYD VI) in March 1999, 48,000 villages were electrified, that is, 82 percent of the total existing villages in Indonesia, serving nearly 18 million customers and officially 49 percent (in fact, about 65 percent because of illegal connections) of the total rural households. During the FYD VI, rural electrification expanded at an average pace of about 3,300 new villages and more than 1.8 million new customers per year. The PLN's strategy for rural electrification is now moving toward the following principles: (a) empowerment of rural people in rural electrification management on a self-supporting basis; (b) use of local energy alternatives, especially renewable energy; and (c) increased participation of the private sector and cooperatives in the electricity supply.

In addition to PLN activities, others institutions or NGOs have contributed to rural electrification, notably by the dissemination of SHSs. About 48,300 SHSs have been installed in Indonesia since 1979, representing an installed capacity totaling nearly 2 MWp.

Sri Lanka

Some 53 percent of Sri Lanka households enjoy the benefits of electricity. In rural areas, little more than one-third of the villages are connected to the grid—about 14,000 out of a total of 38,000 villages.

Established in 1969 by an act of Parliament, the CEB was made responsible for the generation, transmission, and distribution of electricity in Sri Lanka. Although the private sector is involved in electricity generation, it is not allowed to distribute electricity to end users on a commercial basis; electricity that is produced must be for an entity's needs or sold to the CEB. Because of this regulation, no private entrepreneurs currently want to invest in or be involved in rural electrification schemes in Sri Lanka.

However, the CEB alone has difficulties in shouldering the entire responsibility of providing electricity to villages. Therefore, the government of Sri Lanka initiated several schemes to support the CEB in its efforts to electrify more rural areas. These schemes

include the provision of funds through external assistance, government grants, and decentralized budgets. Some new concepts are now being developed, such as electricity consumer societies (ECSs) that own and manage hydro schemes, and that distribute electricity to their members. This is allowed only because it was felt that ECSs would provide specific services to their members, not just the distribution of electricity.

Evaluation Process

In order to evaluate the primary issues related to energy and gender, a two-phase investigation process has been built using the following principles, techniques, and completion.

Principles

The EnPoGen evaluation had the following objectives:

To identify the linkages between access to energy and electricity, poverty alleviation, and gender equity in general and specifically in Indonesia and Sri Lanka.

To quantify the impacts of access to modern energy on poverty alleviation, development, and gender equity in Indonesia and Sri Lanka.

To draw lessons learned that may improve the impact of projects of the World Bank and ASTAE on poverty alleviation and gender equity in Indonesia and Sri Lanka, and possibly in other countries.

To develop a methodology for the monitoring of impact of energy projects.

We based the analysis on two principles: the bottom-up, listen-to-the-people approach, an evaluation using as far as possible for participative evaluation techniques and the "talk-Bank" approach, an economic impact evaluation. These two principles are necessary not only to characterize the impacts (as the usual list of more or less important ones) on poverty and gender, but also to open as far as possible the dialogue with respondents to let them express their own ranking of issues and priorities, regardless (as far as possible) of the point of view of the investigators and developers. The principles are also necessary to use economic criteria and develop a methodology to rank and quantify these impacts, in conformance with current Bank methods.

The investigation was developed as follows:

- A first, open qualitative phase, designed to let people freely express their opinions and concerns through one-on-one interviews and group meetings.
- A second, quantitative phase through conventional surveys to validate and quantify the main findings.
- A third phase of conclusions and economic analysis of impacts.

Techniques

The work team, composed of a group of economists, sociologists, and survey specialists, based its investigation on different econometric and participative techniques, among which may be quoted the following:

- Social mapping, to compare findings in visited and surveyed communities with national data and to map the community, subgroup, and/or individual households within the national or regional living standard using living standards–compatible questionnaires and comparing results with the most recent Living Standards Measurement Surveys (LSMSs).
- Fractal analysis, to identify differentiating parameters among groups within the community (who are the poor, the middle-income, and better-off, and where are they going beyond the classical "we more or less live in similar conditions"?), social differences within the communities, through income, assets, activities, and attitudes.
- "Day in a life" tests, to describe villagers' daily routines, in order to understand which parameters are susceptible to evolving or being modified with the arrival of electricity, in particular in a gender perspective, to appreciate the different consequences of electrification for men, women, and children. Complementary of the day-in-a-life (DIAL) test and in a more collective perspective, the village nightlife analysis intends to describe villagers' activities at night and during the early and late hours of the day, focusing on potential or actual changes caused by proper artificial lighting.
- Analysis of local socioeconomic trends: what is bought and sold by villagers, market barriers and opportunities, and access to services in relation to differentiation within the family and within the community by gender and by internal group (who wins, who loses?).

Measurement of the impacts of electrification on poverty has been tentatively addressed using four complementary approaches:

- "Money metric:" Impact in relation to income improvement or expense cost reduction.
- "Basic services:" Impact in relation to better access to some basic services, such as education and health.
- "Gender:" Impact in relation to redistribution of roles within communities and households.
- "Social capital" (the most volatile): Social integration and participation, and access to basic human rights.

The age of electrification is considered a priori a key parameter. Identification of trends has been approached by exploring long-time or more recently electrified communities of rather similar socioeconomic characteristics.

Completion

The investigation was conducted as follows:

- September 2000: First site visits, meeting with local counterparts, joint definition of approach, and selection of focus activities.
- November 2000 to April 2001: Participative evaluation through focus group meetings and in-depth interviews.
- May–June 2001: Consolidation of qualitative results and preparation of validation surveys.
- August–September 2001: Realization of surveys.
- October–November 2001: Validation of issues and synthesis of results.

In Indonesia, participative investigations were conducted in 16 villages and surrounding areas, whereas surveys covered 19 villages in 4 districts of Java and South Sulawesi. During the first qualitative investigation, social scientists performed 100 in-depth interviews and 6 focus group meetings (of which 3 were with women and 3 were with men). Surveys were performed among 1,800 users or prospective users: 1,700 households, among which 1,300 were with electricity and 400 without access, and 100 were small businesses.

In Sri Lanka, the qualitative study was conducted in four areas:

- Three villages of the Asmadala-Wakirigala rural electrification scheme for conventional grid electrification.
- Oluwela and Berennawa (in the Kegalle District of Sabaragamuwa Province) for ESD microhydro schemes.
- Five villages in the Moneragala District of Uva Province for SHSs.
- Poojitaya in the Kandy District of Central Province for compact fluorescent lamps.

In total, surveys were conducted in 10 villages and surrounding areas (177 in-depth interviews and group meetings). Surveys were also performed among 1,800 users in 35 villages, of which 1,573 were households (of which 1,177 were with electricity and 396 without access), and 277 were nondomestic consumers.

In both countries, investigators also gathered complementary information among key informers during the initial qualitative phase from institutions, local communities, and NGOs involved in energy programs. Participative investigations and surveys were conducted among long-time or more recently electrified communities, as well as among communities still awaiting electrification.

The investigation principally focused on the following activities:

- In Indonesia:
  - SHS dissemination: Koperasi Unit Desa (KUD) program in the Banten Province of Java (Lebak Regency) and more recent World Bank–supported activities in South Sulawesi (Majumu area).
  - Hybrid diesel-solar electrification with local grid, the "Total Energie" project in transmigration villages (Mamuju, South Sulawesi).
  - Microhydro plants with local grid (recent E7-IBEKA projects in the north-central area of South Sulawesi).
  - Conventional grid electrification (different locations, through PLN connections and illegal hook-ups).
  - National Rural Business Services (RBS) program, specifically designed by the PLN and executed by NGOs to promote productive investments using electricity in recently connected areas (West Java).
- In Sri Lanka:
  - CEB conventional grid electrification within the Asmadala-Wakirigala rural electrification scheme (Sabaragamuwa Province).
  - Microhydro plants with local distribution grids, also in the Kegalle District (Sabaragamuwa Province).
  - SHS dissemination in the Moneragala District (Uva Province).
  - Use of low energy-consuming compact fluorescent lamps in the District of Kandy (Central Province).

4 From Qualitative to Quantitative

> As recently as a decade ago, rural electrification was perceived almost as a magical force which would transform poor areas into highly productive regions.... The early optimism has been clouded by more recent reports indicating that the effect of rural electrification has been very slow in materializing.
>
> Douglas Barnes (1988)

Research Challenges

Five questions appeared determinant when considering links between electrification and poverty:

- Does conventional electrification reach the poor?
- Are alternative programs using renewable energy in a position to improve the poor's access to electricity?
- When the poorest obtain access, do they limit themselves to lighting? Up to what point do they get the alleged advantages linked to electrical appliance ownership, or are these advantages limited to the better-off part of the population?
- Do electric lighting and possible other advantages related to electricity really affect their situation, and in which sense does it alleviate their poverty?
- When the poorest remain without individual access to electricity, do they get significant indirect advantages related to better-off household electrification, streetlighting, and electrification of public facilities?

Qualitative investigations were designed to contact rural dwellers in different situations:

- Diversity of situations regarding access to service: (a) electrified households in electrified communities; (b) unelectrified households in these same communities; and (c) households in unelectrified communities, generally without access to service, unless they have an SHS.
- Diversity of service provided: conventional electricity and renewables (with power and energy limitations), to compare customers behaviors and perceptions.
- Age of electrification to identify possible trends and longer-term effects.

They could freely express their concerns and preoccupations about electrification: the desire of electricity and the expectations of those still waiting; the main effects of electrification on everyday family life, quality of service, social benefits, and impact on productive activities for those having access; consideration of the poor in the electrification process; gender aspects of electricity (concerning their implications within the electrification process, as well as their share within the impacts of electricity); and people's perceptions of renewable energy, compared with conventional electrification. This first qualitative phase of investigation gave a set of issues, which are summarized in the following discussion.

First Qualitative Findings

Qualitative investigation, leaving respondents free to develop topics according to their own ranking of importance and point of view, gave a first set of conclusions about the impacts of electrification on poverty and gender and the poor's access to electricity. These conclusions are summarized as follows.

Impacts

Getting electricity is considered first a significant way to save money: costs of traditional solutions (kerosene lighting, dry batteries for sound equipment, and car batteries for televisions) are higher (with the exception of solar power), and newly electrified households in Sri Lanka may cut their monthly energy bills in half, and in Indonesia up to 70 percent.

Electricity is also seen as a way to make life easier, because it significantly reduces the burden of daily domestic chores. If electric lighting is considered a major benefit, it is first described as a way to get rid of traditional solutions. Not having to take the Petromax lamp from the ceiling anymore or pump it up regularly, but simply to turn on a switch to get light during nighttime, or not having to draw water from the well anymore is considered important progress in every day life. Among those who have grid electricity, quite a large number of households do not limit their consumption to lighting and their own appliances: refrigerators, water pumps among the better-off, televisions in many houses, and cheaper devices, such as irons (both countries), water heaters (Sri Lanka), and fans (Indonesia) among even the most modest families.

Television appears as a top priority by unelectrified and electrified households. Television and radio, both of which have been in many households long before electricity, are considered not only as a means of entertainment, but also of information and, in some cases, education. It is said to reinforce social relations within families and between neighboring families (collective watching of important events). It gives equal access to entertainment and information for all family members and, in particular for women, offers broader information and educational material, with a positive impact on

children's schooling. It also gives rural dwellers a feeling of equality with other national and even international community members.

Lighting substantially modifies daily routines, once again specially for women who shoulder a heavier and more diverse workload than men. They get up earlier and are awake for 16 hours or more, of which (excluding food and rest time) they spend more than 13 hours working, to be compared with 10 hours of work for men (Sri Lanka). Women manage the housework; take care of the children; nurse the sick and the old; collect water, fodder, and fuelwood; take care of smaller livestock; work on crop fields; handle manual postharvest operations; and sometimes develop cash-earning activities to increase family income. In Sri Lanka, women consider that lighting gives them about two extra hours of useful time, which are invested not only in better housework and care of the children, but also in time to rest, socialize, and watch television, and sometimes to develop income-generating activities. For the first time, women get full control of part of their daily schedule.

If education is frequently mentioned as a potential benefit of electrification by unelectrified households, it seems that, especially in poor families, electricity is as often used by children to do schoolwork. Numerous informants claim that children study during the day (with difficult time constraints among the poorest because they are most likely to help the family with production tasks or house chores) and at night use electricity for learning and reciting the Koran (Indonesia) or watching television (both countries). Electrification has an apparently limited effect on schools, but could significantly improve the operating conditions of rural health centers (Sri Lanka). Security aspects outside have also been mentioned because of streetlighting, as well as inside: people feel more secure to work at night with electric light, and believe that television helps keep children at home far from the possible outside dangers.

Electricity is generally believed to make the villages more attractive and prosperous. In Sri Lanka, electric fencing appears to be of major interest to farmers, so as to reduce crop damage by animals, including elephants. Nonagricultural activities in the village that take advantage of electricity are generally carpentry, and agricultural processing for local markets and services (such as repair centers, battery charging centers, restaurants, and shops). Its impact on productive activity, however, does not seem to lead quickly to significant investments, but rather favors the development of home activities in particular (but not only) for women:

Handicrafts and textiles, embroidery and garments, food processing, such as *tahu* (bean cakes), and wooden sandals in Indonesia.

Clove nut processing, wrapping local cigarettes (beedies), making joysticks ("magic" candles made locally for children's birthdays), and weaving in Sri Lanka.

Gender Aspects

Women are said to be the major beneficiaries of electrification, far more than men, in different fields. Electricity alleviates the chores in a significant proportion of households.

It also brings benefits for topics considered extremely important by women, such as health, schooling, and safety. Additional time allows women to get fairer access to relaxation and information for the first time. Also, electricity gives new opportunities for women to develop income-generating activities and thus improve their status within the family and community.

As family budget administrators, women are greatly concerned with energy investments and uses: they are in charge, and when they have access to electricity, they generally pay the bills and manage energy use. They are also the main beneficiaries of electrification, because this alleviates house chores and gives them new availability of time. This time availability is extremely important because, between agricultural activities, house chores, and family care, women generally have a significant work overload compared with men. It gives them new opportunities to address better the social needs of the household (in hygiene and education, for instance) and develop income-earning activities to improve their status within the family and community.

They are not, however, considered relevant spokespersons either by utilities or by alternative energy programs which, because they often consider them unable to handle the technical aspects of electrification, provide information mainly to men, as head of the household. There is undoubtedly a gender bias in productive investment. When electricity generates new productive activities requiring even a small amount of initial investment, these activities are generally led by men. Even if there is no explicit discrimination, income-generating activities led by women are mainly ignored; being small and of low capital intensity, the activities are given hardly any importance.

Access

Populations tend to consider electricity a basic service, a right for everyone, and not a real commodity. Local politicians believe that obtaining electricity for their community is one of their major missions. Getting electricity appears to be a long-lasting struggle, where villagers feel helpless against incomprehensible and arbitrary rules, and where politics might play an important catalyzing role.

Villagers address many criticisms to the electrification process:

- In Sri Lanka, where 24,000 villages are still to be electrified, access to electricity is felt as discriminatory and tends to accentuate social differences between communities, favoring better-off ones, and leaving out the poorer ones, while in Indonesia, where the utility has realized a large effort to connect villages, people complain heavily about the quality of the service and the utility's lack of concern for small rural customers.

- In both countries, people mention discrimination against the poorest households within electrified communities, which are often further from roads and village centers, in the form of higher connection fees. They also have to pay for grid extension. The arrival of electricity provokes land price hikes along the lines and makes it even more difficult for the poor to settle down where they have access to electricity. One-time connection fee conditions penalize the poor; they have the greatest financial difficulties in meeting those fees. As a consequence, they are excluded from electrification as soon as more than one pole is required (Sri Lanka) or as soon as they have to choose informal hook-ups (Indonesia).
- Subsidies are said to rarely reach the poor. In the case of the main grid, subsidies linked to the productive use of power go to better-off employers, who "put out" work to poorer families who require electricity, but pay full price for their connections (Indonesia). Although rather equitable in their conception, microhydro schemes favor immediate clients and segregate those that come afterward, mainly the poor. The CEB compact fluorescent light bulb dissemination scheme is limited to bigger domestic energy consumers (Sri Lanka).

Renewables

Conventional electrification remains the standard for most people. Renewable electrification is often considered a lesser alternative for two main reasons: (a) state intervention appears more logical and reliable than private sector or NGO involvement because for historical reasons electricity is often considered a social service rather than a commodity; and (b) renewable service limitations are often quoted (such as the availability of little energy and dependence on the weather). The alternative energy schemes (microhydro schemes and SHSs) are considered by many villagers to be expensive (solar power), low-quality, and transitory solutions. The conventional grid (no matter its access limitations) not only offers cheaper and more effective present services, but also better perspectives for the future. Some quote the absence of protection for renewable electrification, as well as hazardous grid development planning, that often leads to unfair local competition, ruining involved renewable energy stakeholders, and discouraging further private sector involvement.

Developing Surveys with Key Questions

Feedback from individual and group discussions in the villages during the qualitative phase and from in-depth interviews suggested the following first conclusions on the key issues:

- Seen globally—at the national level—rural electrification appears to be an effort toward greater equity. On the local level, however, there seems to be discrimination between the better-off and middle-income populations with good access rates in electrified villages, and the poorest with much lower electrification rates. In many villages in Sri Lanka, electricity reaches mostly all better-off households, a fair percentage of middle-income households, and only a few of the poor households. The poorest Indonesian villagers claim that they cannot access the recently installed grid. Is this conclusion widely valid? And if so, is this a "natural trend" (poor last served?) of service development or the results of a lack of concern for the poorest in electrification policies? Is there any concern and specific action from public authorities and utilities to counterbalance this trend?
- Alternative energy programs do not seem to reverse these trends for different reasons. Solar programs, despite subsidies, apparently reach primarily better-off households; community hydro schemes are not able to evolve beyond initial—externally funded—investments. Is this conclusion also widely valid? Once again, is this an economic fatality or the results of project design?
- In both countries people, irrespective of their income level, claim that grid electricity allows them to save money under current tariff conditions, compared to traditional pre-electrification solutions, and that, when the grid is available, the access barrier is mainly the connection fee. When poor people are connected, do they save money, or do they reinvest these savings in electric devices, spending the same amount or more on electric services, going beyond mere lighting? Which conclusions can be drawn out in relation to willingness-to-pay and tariffs?
- Women are said to be the most important beneficiaries of electrification in different ways: first by alleviating their overworked daily routine, then by reducing the difficulty of house chores, giving them free time for home care and some leisure (Sri Lanka), and allowing them develop (often home-based) productive activities. What is the validity of this, and does electrification indeed lead to significant changes in women's positions within the family and society?
- From all services provided by electricity, television seems to hold one of the most controversial and important places in people's minds—and in households' equipment rates. Is television so important and why? More generally, which psychological benefits can be identified in relation to electrification, in the form of self-esteem, or in relation to one's own future?

- People tend to consider electrification a social right, which this reduces their interest for possible impacts. Access is the major issue. Is this the reason why qualitative findings about impacts of electrification on education and health are somewhat limited? Some social problems—such as in-door pollution and heavy respiratory diseases, one of the most widespread evils in the developing world—with an estimated 2 million deaths per year—have not been mentioned in relation to the use of traditional lighting. Is this generally true?
- Conclusions on the impacts of electrification tend to join the general consensus given by similar qualitative evaluations: a strong and immediate impact on people's quality of life, and less evident links with short-term development of economic activities. Does surveying populations with different ages of electrification allow for better identification of relations between electrification and production? Also, who gains and who loses within economic mutations caused by electricity between the better-off and the poor, and between the local and global economy?

Validation

The second phase of quantitative review (1,800 surveys in each country) aimed to validate qualitative findings and deepen the knowledge of the aforementioned issues. Results of both phases are described extensively in the Indonesia and Sri Lanka final country reports. The issues may be summarized as follows:

- Much discrimination against the poor exists in the electrification process. The poorest communities tend to be the last served, and in electrified villages the poor are electrified "by accident," when they have the chance to be located near local distribution grids that are mainly designed to serve the better-off. The present electrification process certainly does lead to more inequitable development.
- There is no specific concern or policies for electrification of the poor. That electrification promotes inequity is unknown by local authorities or is considered the logical result of economic dynamics where connection is left to a user's charge on a cash basis (legally in Sri Lanka and often through illegal hook-up in Indonesia).
- Solar programs are not designed to target the poor. Hydropower and hybrid solar-diesel village schemes appear more poor-friendly, at least in theory because of the absence of the development potential for strictly hydro schemes, and the deliberate choice of better-off clientele or low tariffs for the evaluated present hybrid scheme.

- Electrification is the first step in a continuous process of investment, even among low-income groups. People save money when newly electrified, but they quickly tend to spend more and more on electrical services. Some equipment, such as the iron, immersion water heater (in Sri Lanka), or fan (in Indonesia) is widely used among the poorest customers.
- Among the widely used equipment that is more expensive comes the television. It is confirmed by households to be the most important acquisition, far before the refrigerator. The television has introduced the most powerful changes in daily life.
- Changes in daily routine were confirmed as a major fact, but not to such an extent as suggested by the qualitative analysis (from more than one hour less of sleep to some tens of minutes). As for household investment in home electric equipment or the development of productive village activities, the age of electrification is a major parameter for daily routine changes.
- Women are confirmed as the major beneficiaries of electrification, but within the clear limits of their traditional role of housekeeping and family care, and they gain little or nothing in empowerment, except the right to enjoy leisure time, which is used for socializing or watching television.
- Surveys did not extinguish polemics about the positive or negative impacts of electrification on education. With regard to health, people focused on in-house benefits, mainly on the mitigation of risks related to fires and burns from candles or kerosene lamps.
- Surveys also confirmed the importance of safety and security among the benefits of electricity, and pointed out significant positive effects on the population's estimation of risks and the future.
- Compared to the qualitative hypothesis, surveys tend to accord to electrification a more limited impact on women-led housework than on village-scale productive activities, growing in importance with the length of time of electrification.

The surveys yielded at least one unexpected finding (Indonesia): electric lighting is no doubt a key issue for most people, but rural Indonesian families buy low-power (and low-efficiency) bulbs, suggesting that the importance of electric lighting is not so much the quality of lighting, but rather the switch.

Contribution

This contribution report constitutes a tentative in-depth analysis of key issues considered to be determinants in the evaluation of electrification concerning poverty alleviation and gender aspects. Based primarily on issues and conclusions drawn in Indonesia and Sri Lanka, it sometimes makes comparisons with other countries, based on the writer's experience and relevant bibliography (see appendix 1).

The following chapters describe the main results of the MARGE investigations grouped into two main parts: The three following chapters (5, 6, and 7) deal with the impact of electrification:

- The gift of time, or the consequences of electrification on families and particularly on women's daily routines.
- The value of the home, or the transformation of traditional houses into modern homes because of electricity and electric appliances.
- Hopes for a better life and economic impacts related to electrification.

Chapters 8–11 deal with access problems:

- Access, or how and why the poor meet difficulties in gaining access to electricity service.
- Policy tools and policy concern, or how best-will policies ignore and exclude the poor.
- "Knitting electrification" or looking for alternatives to address the poor's electrification better.
- Renewables and specifics of alternative renewable energy programs.

And chapter 12, Evaluation, discusses better practices for the design of electrification projects and impact monitoring.

5 The Gift of Time

> Because before becoming a woman, she became a farmer's wife, whose life is swept as in a current, between the hay getting wet and the bellowing cows. Old in her thirties, dragging her clogs, numb with work....[2]
>
> Gaston Couté, "Le gas qu'a mal tourné," around 1900

Because electricity introduces important changes in family routine by giving extra time to family members, it may be considered to have a major impact on rural households. This foremost benefits women, who are often overworked with family care, house chores, and participation in family productive activities. For the first time, women can gain control over their schedules. If they invest the newly gained time in better family care, alleviating chores, and sometimes in paid housework, part of the benefits will go into socialization (a step toward empowerment) and entertainment.

Time Famine

The Swedish economist Staffan Linder believes that development leads to "time famine." He even proposes an urban time, famine-scale model for countries, ranging from time surplus (for developing countries) and intermediate (roughly for European countries) to those already experiencing time famine (with the United States and Japan as representatives of high time-famine cultures). Greater levels of consumption cannot be treated as instantaneous; it requires time to purchase, transport, use, maintain, and finally discard things (what you own, owns you). As a result, time becomes a scarcer item in industrial societies, and market analysts consider it now to be a key parameter, with major consequences in consumption patterns, waste production, and so forth (Linder 1970).

Some Times

When analyzing daily household routines in mainly urban industrial societies, one can distinguish five different categories of times: (a) physiological (sleep, hygiene, food); (b)

---

[2] "Parce qu'auparavant que d'être devenue femme, elle est devenue femme de paysan, dont la vie est prise comme dans un courant, entre le foin qui mouille et les vaches qui breugnent. Vieille à trente ans, trainant les sabiots, abêtée de travail...."

work and education; (c) domestic work (housework, garden, children's care); (d) leisure (watching television, reading, participating in sports); and (e) socialization (conversations, receptions, visits). In addition, there is possibly a sixth that is difficult to qualify: transport (excluding commuting). Thus, a fundamental distinction exists between constrained time (physiological requirements, work, house chores) and free time (leisure, socialization).

Basic data and figures in industrial countries (see appendix 2) show that development has contributed to the following:

- A reduction of time dedicated to sleep, in proportion sometimes judged as alarming by analysts.
- A significant reduction of time dedicated to work and house chores (mainly from the incorporation of women in paid labor markets).
- A substantial increase in time dedicated to leisure.
- A general increase in stress, the feeling of being rushed, especially for family mothers.

Rural Time

Developing time analysis, based on the same segmentation as for urban areas in industrial countries, is not as easy for rural areas of developing countries. The relation to work in traditional rural areas may be described thus:

- Work is perceived as a vital necessity: bad or insufficient work means a meager harvest and insecure livelihood.
- Work time constraints appear to be more important for peasants: there is nearly no free time, and the whole workforce (from young to old) is needed.
- Work is not generally felt as an alienation: many farmers own their means of production, work is not so repetitive, and all are free to adapt activities to their own rhythm and schedules.
- Work time is "porous," including pauses, and there is little separation between work and free time.
- Free time tends to have primarily a utilitarian sense: time for repetitive activities, such as spinning, mending, manufacturing small tools, and making handicrafts.
- There is little entertainment, and what is available is sporadic and mainly collective, through village festivities.

In Indonesian and Sri Lankan rural areas, adult male members of the family (that is, excluding youth and elders) are awake about 15 hours (they get about 9 hours of sleep) and work about 10 hours in the homestead every day. Considering that the physiological time for food and hygiene is approximately two to three hours, most of them undoubtedly dedicate more time to work and have less free time than most men in the industrial world. They spend more time on work, but also in a sense, less time on work than their

counterparts in industrial countries or urban areas. They adapt their productivity to the course of the day, sometimes work hard and sometimes work less, and enjoy pauses. Newly available time has little value and, as it seems in the case when electric light becomes available, is mostly dedicated to leisure. In that sense, one can mention time surplus.

This holds for men, but not for women. The rural working mother is subject to the following pattern: she both works on the homestead and manages the house. Women generally have a longer working day than men. They generally work in the house and garden, then join the men on the homestead; they sometimes (but not always) come back earlier to collect firewood and take care of the house, children, garden, and small animals. They get up earlier than men (in both Indonesia and Sri Lanka), and they may be up about 16 hours, of which more than 13 hours is spent getting through a tight work schedule, which means virtually little or no free time and time famine. Hence, newly available time has a high value for women, because it allows them to mitigate their time constraints. Such time will be used in different ways: for housework, paid activities, social activities, or leisure.

Before examining different ways to use the newly available time provided by electricity, along with their social consequences, two aspects are considered. Similar to working mothers in industrial countries and probably even more so, rural women have a hard life. In a survey in Mali among new periurban settlements around Bamako (Matly and others 1989), male migrants responded in a large proportion that life was harder in the city than in the village, and female responded that village life was far harder. Human desertion of poor French rural areas in the mid-20th century (when electricity was already present, but with very few electrical appliances available) was primarily a female one: many farmers remained single because very few women were ready to spend their lives under these conditions. Rural women cannot do all the work by themselves; children contribute, as well as other female members of the family. Mitigating women's time constraints may have different consequences. It may excuse children from at least some of the tasks (for the homestead or for the house) and up to a certain point loosen ties of the extended family.

It would be going too far to pretend that electrification, with the extra time it brings, has a direct impact on rural migration trends or family structural shifts from extended to nucleus. Economic parameters, such as employment and income, are likely determinant. Sociocultural factors and traditional family patterns affect such trends. Some extra time may not be such a big gift, but certainly the present conditions of women's routines and their working conditions before electrification are certainly good reason for them to bear more easily extended family constraints or accept a move towards cities.

Time of Electricity

When talking about the impacts of electricity, the major answer rates (nearly unanimous answers) in Indonesia, as in Sri Lanka, go to "better home life" and "women's work

relief." When trying to understand better the reasons for this, time and modifications of daily routines caused by electricity could prove to be an important issue.

Electrification changes daily routines, and households now have more time available. In Sri Lanka, a majority of households estimate that they have gained from 1 to 3 hours per day since they got electricity, and that women have gained slightly more time than men. In Indonesia 40 percent of households also believe they have a longer day because of electrification. Part of the gain comes from extension of the day: television, in particular, tends to make people go to bed later. Qualitative analysis in Sri Lanka shows that this extension may be important in some families (1 to 2 hours less of sleep). The surveys show limited results (an average of between a quarter and half an hour in both countries), but confirm progressive extension with years of electrification. As with most changes caused by electrification, time changes do not occur overnight.

A portion of the gains also come from better and more efficient use of time. This is first from changes in lighting conditions that derive not so much quality as the distribution of lighting spots over the house and ease of use. Results show that, just as it was not a priority for households that shifted from traditional energy sources to gas and then to electricity in industrial countries (see chapter 2), better lighting is not a priority for rural dwellers. They opt, when they can, to use low power lamps, not only for evident budgetary concerns, but also because they consider such lamps sufficient for daily life. Some may have had better lighting, such as Petromax kerosene pressure lamps or rather similar lighting, such as wick lamps, before electrification. The major benefit of electric lighting is not better lighting, but the switch. The switch reduced all the time necessary for operating and maintaining lamps, from the purchase of kerosene to pumping and cleaning. It allowed family members to make more efficient and flexible use of it. Formerly a constraint, lighting has become a facility.

Other factors linked with electrification also tend to modify time constraints for the better: the disappearance of tedious constraints of use and maintenance of traditional lighting systems, reduced dirtiness, and the availability of appliances, such as electric heaters (which allows for boiling water in a shorter time), electric cookers, and grinders. The development of collective food processing workshops (mills) may also alleviate food preparation tasks. Avoiding and the need to go out to buy kerosene and reducing fuelwood collection are once again a gain of time.

Time gains are gender discriminated. Adult males tend to use time gains primarily as free time—for entertainment and socialization (even if Sri Lankan men declare using it partly for housework). Children also invest it in free time, reading, watching television or socializing, but women mostly invest it first in constrained time—housework and children care—before entertainment and socializing. (See table 1.)

Development of home activities linked to electricity concerns only a small minority of households. It is important to note that in Indonesia, these activities are mainly developed by women, far more than men, whereas in Sri Lanka, the impact is less and

without gender difference. Also, the development of activities does not depend on the type of electrification (individual solar power, as well as grid), that is, the type of energy for power. The link between electrification and paid home production is basically the availability of labor, that is, a time gain.

Table 1: Daily Routines

Gender	Time	Indonesia	Sri Lanka
Adult male	Morning	Watch TV Listen to radio	Watch TV Carry housework Spend time with family
	Evening	Talk with family Watch TV Talk with friends Listen to the radio	
Adult female	Morning	Prepare food Clean house Do other housework Watch TV	Carry housework Watch TV Spend time with family
	Evening	Talk with family Watch TV Prepare food for tomorrow Spend time with children Clean house Talk with friends Listen to radio	
Children	Morning	Watch TV Read Listen to radio	Study Watch TV
	Evening	Read Watch TV Talk with family Listen to radio Spend time with other children	

That an important part of the time gain goes to constrained time in the case of women (house chores, sometimes paid work) does not come as a surprise. Poor women in developing countries have such a tight schedule that their first concern is to reorganize it using the few extra hours given by electricity. They may shift house tasks to night time in order to respond better to the labor exigencies of the family's agropastoral activities. They also may face such survival risks that they will use part of the time in nonagricultural activities, in order to complement income and mitigate family risks.

Constrained Time

Women reinvest a significant portion of the time they gain because of electricity into constrained time—mostly in house chores and family care, and some in paid work.

House Chores

Among the benefits of electrification, easier housework for women is the second best benefit quoted by Indonesian respondents, just after a more convenient home life. A large majority of Sri Lankan respondents believe that electricity has eased women's housework and also, although on a minor scale, that female members of the family save time on their household activities. If electricity and appliances undoubtedly facilitate housework and save time for each specific chore, it is not certain that women spend less time overall on housework.

Georges Duby and Michelle Perrot (1997) note that, over the first decades of the 20th century, "the main result of the application of technological progress to housework was in better housekeeping. The use of domestic electric appliances had developed order, and cleanliness more than helped to gain time. Gas cookers, electric lights, and irons, commonly used in the twenties, had helped to develop comfort and efficiency of housework, but this nevertheless remained a full-time job. If women were evidently gaining time with domestic appliances, they were investing it in the care of their children, going shopping or managing their households, in order to better their working conditions and be more efficient." In conclusion, whatever may be their impact in terms of chores, electricity and appliances seem to have had little historic impact on the time and effort dedicated to housework.

This is confirmed by more recent time studies dedicated to house chores, showing (see appendix 2) that the development of home technologies and presence of appliances have little effect on the time dedicated by women to house chores. Similar findings may be encountered among households of developing countries: women in newly electrified rural areas use part of the gained time to be better, more efficient housewives, according to what they believe to be proper. Being a better housewife may be considered a limited improvement, but it brings substantial improvements in house and family care: better cleanliness and hygiene, not so much resulting from new attitudes as from new circumstances because they have now some spare time. Having electricity is also easier: Have you had to suffer insects on your plate while eating in the glow of a woodfire? Have you changed a baby at night in candlelight? They now have more interest in children's education and health which, although not taken into account in current statistics, is of relevant importance.

And what about men and housework? Male participation in house chores is weak, but not nonexistent. Men may collect wood and, in some rarer cases, draw water for the family. Some of them answer that, with electricity, they increased their participation in housework, particularly in Sri Lanka. They had the same justification: it is easier, and

they have time. Are these isolated and insignificant cases, or the promise of some long-term changes? The primary sociological studies on the subject point out that fundamental changes in housework handling are more the evolution of cultural patterns than a direct impact of the introduction of modern technologies, and electrification should not change gender roles much in relation to house chores.

Paid Work

Part of the gained time may be used for productive activities. The survey shows that a small, but nevertheless existing, part of households use night time for agricultural product processing, and that a limited part of women take advantage of this time to develop paid activities.

Women's time constraints are supposed to inhibit "household supply responses to market incentives." (N. Kabber and S. Joekes, "Researching the Household: Methodological and Empirical Issues, 1991, quoted in Crawford Cousins 1998) In other words, household tasks (work in the homestead, house chores) directly compete with paid activities. When dealing with full-time jobs, there is no doubt that identity stereotypes (women are not to work outside), as well as few employment opportunities, are more likely to play a bigger role than time constraints. Female home activities, such as commerce, handicrafts, and tailoring are socially more often accepted (because they are home-based activities). For such activities, time availability is logically a constraint. As soon as working outside is concerned, however, sociological constraints weigh more than time availability.

The case studies in Indonesia and Sri Lanka, as well as other similar works, give some examples of new, paid home activities made possible by the access to electricity, whether from grid or alternative sources: processing clove nuts, wrapping local cigarettes, making joysticks, weaving. Not that electricity had created a new phenomenon—a number of poor women were already engaged in informal paid activities to supplement the family budgets—but greater availability of time has had an undeniable effect on the development of such activities, as soon a there was a market available in which to sell their products.

The extra time made available by electricity will not necessarily be used for paid work for two main reasons: (a) the first one, internal, is that women use it at least partly to compensate for their deficit of housework, socialization, and leisure; (b) the second, external, is that even if they are willing to invest part of this time in paid work, women do not necessarily have access to markets or capital, such that most cannot enter new activities. As a result, if some women develop a self-managed activity using electricity (such as commerce), they are likely to belong to a better-off segment of society. In Indonesia, more better-off than poor women dedicate part of their available extra time to small business. If poorer women find opportunities for paid activities, conditions are likely to be hard.

Paid work is a double-edged phenomenon. On one hand, women's earning power increases their decisionmaking power (Mukherjee 1999): income generated by women's new activities leads to an improved status within the family and the community. On the other hand, however, it does not necessarily mean an overall improvement in women's conditions. Examples drawn from our investigations show that local entrepreneurs quickly raid the extra hours gained by poor women, finding there a new opportunity for using cheap labor. As a result, hard and underpaid housework may generate some additional income, but scarcely improves or possibly even worsens living conditions.

Based on examples given by Cecelski (1996) and James (1997), Crawford Cousins (1998) also mentions that "development" initiatives led by projects or NGOs sometimes yield marginal profits, but they are extremely time-consuming (such as school uniform–sewing projects). Such work may, in conjunction with electricity, lower the quality of rural life by increasing the length of the working day and decreasing the time for social interaction, rest and recreation, childcare, and cooking without improving the material conditions of life.

In that sense, this may not mean poverty alleviation (there is a better income for the family, but not necessarily better conditions of life) or poverty feminization (because there is no creation of women's overexploitation, but rather a transfer of this overexploitation from the family circle to the economy). Electrification leads to an externalization (from the family to the economy) or better said, monetization of female poverty. This in turn has consequences, however. Electrification promotes further insertion of rural households and women in monetary activities, injects money into the village, favors the development of monetary exchanges, and sets up the market conditions for the establishment of more microindustrial and commercial activities.

If women's paid housework is a monetization of poverty, it can also be interpreted as a strategy of a household's defense against monetization. Households are using its underlings (women) at home in the battle, not to engage the main workforce (men) in more drastic and risky moves toward monetization of the primary agricultural activity.

Free Time

All the time gains from electricity do not convert into new constrained time. Women (often for the first time in their lives) invest part of it in daily free time—sometimes for socialization, more often for entertainment.

Socialization and Empowerment

Electrification may have an impact on community life and empowerment in three important areas: (a) improving villagers' perception of the future and risks, (b) involving people with outsiders through the development of nonhome production and consumption activities (in particular, nonagricultural paid activities), and (c) mitigating time

constraints, basically for women. The relation between time availability on one hand, however, and socialization and empowerment on the other must also be analyzed thoroughly. Analyses of industrial societies (see appendix 2) show that this relation may be described as follows: when you have spare time, more time does not necessarily allow you to indulge in more socialization or community volunteering. If you have very little free time available, however, your involvement in socialization or volunteering will be necessarily limited.

Bad self-esteem and high valorization of risks are basic ingredients of poverty. The impact of electrification on these aspects is more thoroughly analyzed in chapter 7, but can be summarized as follows: electrification brings a positive attitude toward the future, fosters people's self-esteem, and reduces perceived risks, or in other words, it creates—even if it may be temporary—better conditions for empowerment. When electrification promotes new village or paid home activities, it also creates new connections between people, and may at least partly fill the deficit of socialization and favor empowerment.. This may not be true if new activities are so time-consuming that tight schedules kill opportunities for contact and exchange. In addition, the involvement of women in paid activities has a direct impact on empowerment. Mitigation of time constraints gives women at least an opportunity to improve socialization and participation in community groups, such as women's groups and the parent-teacher association (PTA).

In Indonesia and Sri Lanka, results confirm that electrification seems to have a strong impact on socialization and first of all on socialization between family members. Electrification thus reinforces family links and opens new spaces for family conversation and exchanges. Sri Lankan respondents point out that with the arrival of electricity, more activities are possible with all family members together. Even television (see chapter 6) is considered a way to strengthen family cohesion by keeping family members at home.

Villagers consider increased social life a moderate effect of electrification. However, the arrival of electricity has had an impact on informal socialization: as frequently quoted by Indonesian and Sri Lankan respondents, evenings are primarily used for entertainment and family, talking with friends (male and female adults), and playing with other children (children) .There is no doubt that community building begins with these informal friendship links, even if electrification seems to have no significant direct impact on participation in community groups (such as women organizations) or community activities.

Women and Leisure

If national authorities and international experts always recognized that adequate leisure is necessary for working men (to escape social diseases, such as alcoholism), it has long been an institutional consensus to believe that women have no other activities than house and children care. Most domestic economy manuals written in the first half of the century gave a rational daily schedule of tasks from dawn to sunset. No time is ever considered for leisure, as if any vacancy would lead to laziness and its subsequent vices. This is still

a dominant thinking in many cultures: for women as for men, a good wife is a working one.

Most household surveys in developing countries show nothing different. A typical good wife for both is a hard worker who cares for children.[3] Hard work is one of the most common features of the female stereotype, and reality mainly fits with the stereotype. Work overload, task segmentation, limited itineraries from home to field and back are not propitious to socialization and empowerment. The part of the house chores that are performed together with other women, such as collecting wood, drawing water, and washing clothes, are primarily opportunities to socialize. This clearly illustrates rural women's deficit of, and lack of time for, socialization.

When women are said to be more anxious to socialize than men, one must understand that they are more alone, because of less external connections and the lack of to fully dedicate to socialization. The few projects that investigated the use of benefits among women (concerning money or, more rarely, time) generally point out how little has been invested in new productive activities, and how much in socialization and leisure. This may be attributed to the difficulty met by women in developing paid activities, and it also points out where huge deficits are.

Entertainment (television, radio) and socialization are mentioned after—but just after—housework in the use of the time gained by women. And women apparently do not watch television less than men, in terms of time spent in front of the screen. This shows that, beyond legitimate preoccupations of providing better home conditions to their family and children, beyond cultural patterns that require them to be good housewives, women are taking hold of a significant share of this time for themselves. Electrification establishes the right of leisure for women, facilitated by two factors: (a) using part of the extra time available because of electric lighting, leisure does not appear to be a direct competitor with the previous "legitimate" occupations of women (participation in production, house chores); and (b) leisure is mostly dedicated to watching television, an activity of social recognition and a tool of progress and a status within the community.

Electricity, Cheese, and Cosmetics

To conclude, the arrival of electricity thus does not appear to have provoked (in industrial countries) or to provoke (in developing countries) a major change in women's position in the household or society. House chores still constitute a full-time job, but electricity gave women a new control over their timetable and a totally new opportunity to invest spare time for themselves. They may not invest much—in such a range and on such a rhythm that it can be noticed at once—in self-empowerment, because they were responding to their own schemes and those of society. They were and are, however, given the choice, which makes a great difference, because of newly available time.

---

[3] And the good husband is the one who stays home after work and bring back its pay to the family. Question asked in different MARGE household surveys (Ethiopia, Mali, Nicaragua).

In households, as well as in the economy, investment is a key parameter. As with women at the beginning of the century in the industrial world, modern women of the developing world make choices of the same nature: they invest in their house and household, they invest in their family and children, they sometimes invest in work, and finally they invest in themselves.

In their *History of Women*, Georges Duby and Michelle Perrot (1997) mention (and this could be taken as a joke on French clichés) that early 20th century decades have witnessed a strong parallel development of the electric, cheese, and cosmetic industries in France. Women's time could be the missing link. Electricity and modern appliances gave them new opportunities of time, most of which may have been invested in the house and childcare. Major changes in the daily diet with the development of raw vegetable salads and cheese as a substitute for cooked food also helped in consistently reducing women's time spent on cooking. And the development of cosmetics shows that women were not ready to limit themselves to being only a housewife. Rather, they invested part of their gained time into socialization and leisure because having time, and being able to choose how to invest and use it, is by itself empowerment.

6 The Value of Home

We have a TV now, and I am happy.

Daniel Kombong, farmer, Bokin, Tana Toraja, South Sulawesi, Indonesia

Analysis of the process of acquiring electric household equipment shows an enormous dynamism, even for the poorest customers. As soon as they are equipped with lighting systems (the cheapest is the best, regardless of the quality of lighting), households start to invest in electric appliances at a rather fast pace. The television and the refrigerator are probably the two appliances that transform households daily habits the most and that universalize the ideology of domesticity. These two appliances meet very different markets, however. Because of the current conditions of food trade and consumption, there is still little interest in fresh food conservation, and the refrigerator is limited to a reduced better-off clientele. On the contrary, the television is the most popular electric appliance everywhere and its spread is undoubtedly a major factor in the transformation of rural societies.

Home Appliances

As soon as they have access to electricity, all households are engaged in a continuous process of investment in lighting and other electric appliances. This could have other significance or importance than the one we tend to give them, however. Good quality lighting may not be such an issue, and the light bulb is not as important as the switch. Modest appliances, such as irons or water heaters, are also very popular and have a great impact on women's daily lives.

Lighting

When asked about better services provided by electricity, respondents generally mention lighting first. As soon as they have access to electricity, people equip themselves with electric lamps, and they generally buy cheap, low-power incandescent bulbs (fluorescent lamps are cheaper, considering their energy consumption and longer life, but more expensive at initial purchase) and low-power bulbs:

- In Indonesia, most households (and this is rather independent of income level, equip themselves with about 4 lamps, generally incandescent bulbs of 5 or 10 W, which gives a lighting quality very near to the one they had before electric lighting (a 5 W lamp has the same luminous flux as a kerosene wick lamp).
- In Sri Lanka, the number is around 5 lamps for the poorest to 8 for the better off, also generally incandescent; between 10 percent and 20 percent are fluorescent, mainly for higher-income levels.

Analysis in Indonesia seems to show that quality of lighting is not a primary concern for most customers, when we always thought it was, and that access to good lighting could only be the result of local market insufficiencies (that only propose good lighting, but expensive-to-operate products). As soon as low-consumption (and low-efficiency) bulbs are available, rural customers prefer them. Households express a high interest for electric lighting, but not necessarily because it provides better quality lighting. They simply want more flexible and handier lighting systems than traditional solutions. The major change and benefit is this little magical device screwed in the wall that allows anybody turning the light on or off a simple and safe gesture: the switch.

Appliances

Analysis of surveys among recently electrified households show that only very few, even among the poorest, use electricity only for lighting; most households invest in appliances to make their living conditions easier or more comfortable. Any savings from electrification and reduction of traditional energy solutions are quickly reinvested in new services made possible from access to electricity.

- In Indonesia, where electrification developed at a fast pace in the 1990s, 50 percent of the households use electricity only for lighting 2 years after electrification, and this is reduced to only 20 percent when they obtained access more than 7 years ago.
- Equipment rates are progressing at a fast pace (see table 2).

Table 2: Equipment Rate According to Electrification Age in Indonesia (percent)

Appliance	< 2 years	2–7 years	> 7 years
Television	37	44	66
Iron	16	25	52
Fan	2	7	9
Refrigerator	2	4	7

- The equipment rate is, not surprisingly, related to income (we will show that this relation is based on electrification time more than income level itself), as shown in table 3. The differences by income level for televisions (as well as sound equipment), irons, and water heaters (for Sri Lanka only) are not so pronounced; these types of equipment are undoubtedly mass market appliances that all households will eventually acquire. The refrigerator, however, is mostly bought by the better-off, as can be seen in tables 3 and 4.

Table 3: Equipment Rate According to Income Level in Indonesia (percent)

Appliance	All income levels	Poorest 20%	Better-off 20%
Television	41%	29%	43%
Electric iron	25%	10%	29%
Fan	5%	2%	9%
Refrigerator	4%	0.4%	9%

Table 4: Equipment Rate According to Income Level in Sri Lanka (percent)

Appliance	All income levels	Poorest 25%	Better-off 25%
Television (no electricity)	40	22	54*
Television (grid)	85	63	92
Electric iron	n.a.	44	95
Water heater	n.a.	36	64
Refrigerator	n.a.	0	74

* Better-off 50%, last quartile being too small for statistical evidence.
n.a. Not applicable.

These figures raise some important issues:

- Households face important new monetary needs, both for investments in these appliances and for their operational costs. This has consequences for the transformation and monetization of the economy at the local household level and the village level.
- The huge interest of households in certain low-cost, mass-market appliances (electric iron, water heater) points out an important difference between grid electrification (which allows using them) and renewables (which do not, when dealing with SHSs or solely hydropower schemes sharing little amounts of energy between subscribers).

- Electric water heaters and irons displace little quantity of wood or charcoal-substituting traditional devices, but they provide great benefits to women in terms of comfort and reduced time of use.
- The difference in market development of two important appliances—the undisputed refrigerator and the controversial television—raises a number of questions that are addressed in the next section.

The Refrigerator

The refrigerator by itself is a paradox. Uncriticizably the most popular appliance during the late period of European rural electrification, it meets no more than a marginal market in the rural areas of developing countries. The spreading of this apparently innocent appliance, however, could lead to powerful changes in traditional rural economies.

Market Trends

In many industrial countries, telephones began significant penetration at the beginning of the 20th century. The vacuum cleaner, radio, and refrigerator came with the first waves of electrification (second and third decade of the 20th century), but television and air conditioning began only considerable dissemination by the second half of the century (end of the 1940s in the United States) when most people in industrial countries were already benefiting from electrification. The technical and industrial development of appliances timed the development of the market, and more recent appliances, such as television, certainly had no role in the electrification process.

Because Western Europe, and in particular the southern part of it, was late in becoming equipped with appliances, it had provided some interesting market trends. Manuel Palacio (2001) quotes a survey realized by the Spanish Institute of Public Opinion in 1966, in a period when Spain was far from its present state of industrialization in terms of public infrastructure or domestic equipment. The majority of villagers did not have access to tap water, and a small minority (10 percent or less) owned a television, car, or electrical refrigerator (a situation not so different from that in the rural areas of developing countries now).

When asked about the state of their equipment and the items they considered necessary for modern life (see appendix 2), rural households gave the following answers:

Of electrical equipment, the radio comes first (74 percent), then the sewing machine (54 percent, part of the machine probably nonelectrical), the washing machine (17 percent), the refrigerator (10 percent electrical plus 5 percent ice chests), and finally the television (5 percent).

In order of perceived necessity, they unanimously responded tap water. For a majority, the sewing machine, radio, bath, refrigerator and washing machine are

important, after which comes television, a necessity for only 38 percent of the respondents, and the telephone (33 percent).

The two developing countries in this study give a rather different perspective:

In unelectrified areas, television has already made a significant entrance, with car batteries being used to power them (several hundred thousand in Sri Lanka, probably more in Indonesia) whereas refrigerators are largely unknown (1 percent of households, generally engaged in commercial activities).

The penetration rate of televisions is far higher than that of refrigerators in areas electrified by the grid, where both types of appliances can be used by households.

Although in 1960s Spain the refrigerator was far ahead of the television among rural dwellers' appliances and intention to purchase, it is now far behind the television in rural markets in developing countries. Relative prices may partly explain the failure of refrigerators to enter the domestic market compared to televisions in unelectrified areas (a black and white television costs less than a quarter of the price of a kerosene refrigerator). Relative prices, however, do not give by themselves a comprehensive explanation for a lower rate of development of the refrigerator than the television in electrified areas (a refrigerator does not cost more than a color television).

In-Home

Electrification consistently shakes up the relationship between the "inner circle" (the home) and the outer circle (the economy and society). On one hand, electrification allows the development of collective services (mills, workshops, commerce) that tend to promote a more monetized village economy and that tend to foster distinctions between the home (as a place of consumption) and outside (as a place of production). Men will have their tools repaired in the neighborhood workshop instead of repairing them at home. Women will have their grain milled outside instead of grinding it at home.

On the other hand, electrification allows the development of electric stoves, grinders, and pumps, as well as sewing machines (electric or not), which, while alleviating house chores, also has other effects for women, both positive and negative:

Keeping or consolidating activities in the house circle (they look for less wood, have no need to draw water, and have their cereals ground outside).

Reinforcing their house as an autarkic production center, making home a place to invest in, which is a rather new concept.

Losing some socialization opportunities (chatting with other women, millers, or tailors) or even economic links (millers have traditionally been women's bankers in some countries).

Having electricity implies investing in one's home. In the same way that new electric lights make a home a more pleasant and easier place in which to live, any new appliance increases the home value (this is where sociologists will talk about development of the ideology of domesticity, and economists will see capital investment). Increasing the home's value makes it worth investing in more and using it more. Because of objective

(comfort) as well as subjective (status) concerns, home is engaged in a relatively new process where capitalization trends bring positive psychological advantages, and where people will not only think about buying appliances, but also about painting walls, building extensions, and so forth. Most respondents associate electrification with social status, and the type of equipment now defines further status. The purchase of a refrigerator certainly responds to patterns of the better-off.

Villagers are investing in the home as a whole, but also more specifically (and this is quite new) in the kitchen. Most of the new appliances—refrigerators, stoves, grinders, kettles—are linked with the kitchen. For home investments, progress and valorization indeed tend to go first to the kitchen. In turn, however, these investments need an appropriate kitchen and a place in which to keep these new investments safe and to protect them from children or outsiders. This means a specific room, not a single room where the family cooks, sleeps, and plays, as well as a new interest for cooking indoors and getting rid of the wood.

The refrigerator is seen as "marker of the value of the private sphere" (Atallah 1991), "icon and enabler of the ideology of domesticity (Hartley 1999), and symbol of new materialistic values ("people no longer have an opinion, they have a refrigerator"; German critic quoted in Marling 1994). As such, it undoubtedly plays an important role in the construction of the home and the kitchen as a place of private investment. The refrigerator needs a better house than the electric meter does; preferably it needs a specific room (even if it is not always possible), whereas the television can go anywhere. In that sense, the refrigerator, more than electricity and the television, affects house design and ways of life.

Another aspect of the impact of the refrigerator on people's lives is its cleanliness. It sets up a standard for cleanliness and hygiene within the house, which is another major parameter in the ideology of domesticity. This affects most aspects of domestic life in always larger circles: kitchen cleanliness, then food and drink hygiene, house cleanliness, body hygiene, and childcare—all aspects in which women are able to invest part of the newly acquired time provided by electric lighting. Individual reactions will be more important with proper education, and television acts as a trainer and accelerator of the process.

Outside the Home

Although car battery–powered televisions actively enter the domestic market in unelectrified areas, refrigerators are scarce and generally located in shops and bars. It basically is a commercial appliance, not for domestic use, and primarily used for cooling drinks, not for conserving fresh food. Fresh food conservation is not considered sufficiently important to create a significant market for early substitutes, such as ice chests and ice block delivery chains, as those created in industrial countries before the massive entry of electric refrigerators. Ice has its market, but only in small cubes and mainly, once again, to cool drinks.

Development of commercial refrigerators should not be taken lightly, because they steadily introduce commercial soft drinks into rural people's diet. Coca-Cola, for instance, is disseminating free refrigerators among rural shops in a number of unelectrified areas in developing countries, provided they are solely used for the company's products. Rural people conserve self-produced food mainly by drying. Cold provided by refrigerators or ice chests does not conserve foods in the long term—unless they are already transformed or dried. The refrigerator is used as a storage space. It is also used for short-term conservation of fresh food, to cool drinks and provide ice cubes, or at best to prolong conservation time.

With a cow, there is no need for a refrigerator—the cow provides fresh milk on a daily basis and, unless it is used for commercial purposes, there is no need to conserve it. Without a cow, one could use a refrigerator to conserve milk, unless daily needs can be found through a nearby store. With chickens or vegetables, one takes according to one's needs without a refrigerator. Without homegrown chickens or vegetables, one could use a refrigerator, unless there is access to a daily supply source. A refrigerator could be useful for self production (one can keep milk to produce cheese every week instead of every day, one can store vegetables and preserve them for a few days. The refrigerator is primarily an element of food commerce, and this could be the reason for the difference in market trends between industrial and developing countries: diet self-sufficiency, limited and very local fresh food commerce in many rural areas reduces household interest in cold conservation and slow down the refrigerator's market development. In turn, however, this market development, as slow as it may be, has consequences for agricultural developments.

As with food habits, food conservation cannot be considered only from the point of view of households without considering food supply chains. One cannot transform food habits without the development of alternative food supply chains. One cannot develop an alternative food supply without changes in food habits. There could be an interest in food conservation if fresh food were not available at acceptable costs. One cannot build up a longer fresh food circuit than what the nearby market supplies if consumers have no refrigerators. The supply of specialized fresh food extended markets in early electrification times in Europe, as a result of the interest in cold and the market dynamism of electrical refrigerators. In turn, the industrialization and widespread commerce of fresh foods extended the general use of domestic refrigerators.

In other words, the refrigerator shares an important characteristic with television (Hartley 1999): both are broadcasting machines. The refrigerator is not only a place to keep food, it is the last link in a chain that has been developing and will continue to develop, from local to ever wider markets and finally to agribusinesses, each being able to develop their food activities because of the existence of multiple receptors. With a refrigerator, households are part of the food network.

Food is also an important part of television advertising. By targeting the already equipped part of urban markets, food industries build up a generation of new consumers who will be motivated to buy a refrigerator. The refrigerator introduces major changes to consumers' habits (new uses of time, space, food, and symbols), as well as in production systems (the food chain). Food purchases can be less frequent—once a week rather than daily. Diet may be diversified, with effects on standards of nutrition. Weekly purchases are of another nature than daily ones (they may involve more deciders who are males or children, and it paves the way to purchases other than food). Shoppers may buy larger quantities at more economic prices. The wholesale commerce of agricultural products may emerge and develop, and other commercial commodities develop into rural areas.

The refrigerator has a function, very specific and different from other food-related appliances. Those are not in contradiction with, and sometimes even confirm households in their traditional independence on the external economy. The refrigerator is far more than the pleasant and innocent appliance with the benefits of hygiene and current food conservation. It is a tool for agriculture and agroindustrial transformation, and an incentive for rural dwellers to change their food habits and enter further into the commercial economy. Effects on diets will provide more opportunities and more risks. Development of fresh food markets, access to different and even counterseasonal products, and less pressure on immediate use once the refrigerator is bought offer more opportunities, but dependence on monetary resources brings associated risks.

Fresh food (meat, vegetables, dairy products), as part of the self-sufficient farm, traditionally belongs to women. Animals, poultry, and orchards are their domain. The development of refrigerators will have an impact on this domain. Either it will become more important if farms take up commercial trends and evolve into specialized production, after which all production forces will be led by men, or it will become less important as soon as a commercial supply of fresh food and method of conservation are available. It appears more effective to earn money and buy food than to continue to produce it. In both cases, there is a shift from farm diversification to specialization and a shift from self-sufficiency to commerce. And in both cases, there is a decline in women's responsibility in the area of self-sufficiency and a corresponding availability of time for leisure or other activities.

The production of fresh food as a specialized activity also changes the relationship between agricultural production factors. It requires less land and more inputs of another type. On one hand, access to required capital is more difficult for the poorer households, but on the other hand, increasing transport infrastructure is a way for small farmers to successfully resist land speculation practices and prevent their own elimination.

The Television

The television is another sort of paradox. Although controversial among developers and moralists, this appliance is largely praised by rural populations, who associate it with highly positive family and community values.

People's Perception of Television

The television is a popular appliance, and both market figures and respondents' answers in Indonesia and Sri Lanka show that a majority of households already have one. Just as in industrial countries, every electrified household will eventually be equipped. Television is a basic service just like lighting, which is made possible by the use of electricity. Television also has an outstanding image among rural dwellers and even key respondents in villages: teachers name it the rural encyclopedia, doctors tend to praise it for its influence on hygiene and self-care practices. This is a very different image from the rather negative view of television among opinion makers and even among the "half-guilty" audiences of popular programs in industrial countries. If having a television is based on people's desire, who are we to deny them this choice?

Rural dwellers undoubtedly get the best of their television. They watch television about 5 hours per day in Indonesia and a little less in Sri Lanka, around 3 hours per day on average for men and women, and between 2 and 3 hours for children. These figures are comparable with similar ones in industrial countries: adults watch from 3 to 4 hours in the United States, and about 2 hours in France. There is little difference between men and women in terms of watching television, but decisions over programs is gender-oriented. Men will choose information and sports, whereas women will choose entertainment (movies, soap operas) and features. News is the most watched program, followed by music and films, whereas weather broadcasting, as well as technical information and popularization programs, draws the least interest and smallest audience.

Indonesian and Sri Lankan rural populations do not see the role of television exclusively as entertainment. For Sri Lankan households, it is first a way to get information and improve one's life. For Indonesian households, television first provides entertainment and helps forget day-to-day problems; it is followed closely thereafter as a way to obtain information and improve one's life. Sri Lankan households responded in the same way, and a majority also felt that television teaches respect and contributes to a better relationship between men and women.

There is undoubtedly a primary reason for television's popularity. Unlike academic education, television programming does not require a particular level of proficiency, credential, class, or money—which is also part of the common reproach for it: "Television is the cheapest and least demanding way of averting boredom. Studies of television find that of all household activities, television requires the lowest level of concentration, alertness, challenge and skill." (Bowden and Offer 1994) In other words, it is an undemanding medium, easily accessed by everyone, from the lowest educated, the

poorest, and the youngest to the best-off and most educated. This goes far in explaining its impressive popularity among rural dwellers in developing countries.

The Home

Television enters the home without much trouble, and find its place in slums, barracks, and single rooms, as well as in villas—and this could be another reason for its rapid spread. Like the refrigerator, however, it contributes to the valorization of home and domesticity.

One of the best definitions of the role of television was given in the 1960s: because it is a major source of "people-watching," television teaches manners, evidently not table manners, but manners of the time. "Television can be an important primary educator. In a much wider sense, it will be an important general educator, an educator in manners, a way of transmitting...attitudes and assumptions different from those many of its audience have previously held. In any society a medium so intimate and pervasive will do this; it is bound to be putting before people other ways of shaking hands, of sitting down, of wearing clothes, of reacting to strangers, of carrying on conversations; it is bound constantly to be setting in motion numerous slight but widespread reactions." (Richard Hoggart 1960, quoted in Hartley 1999)

This manipulation of people is particularly evident in home-related topics, such as food and hygiene. Entertainment features images of domestic modernity that viewers are able to relate to their present conditions of life. Publicity is mainly focused on food and cleaning products, ads contribute to persistent images of would-be perfect homes, kitchens, food, and hygiene habits. In that sense, television is the inseparable companion of the refrigerator, because both project a common image of domesticity that will lead people to profoundly change their habits and progressively convert their dwellings into "homes." Televisions and refrigerators mark the increasing fracture between home, as a place of consumption, and outside, as a production and supply source, and they push households toward the monetary economy.

A frequent criticism of television is that it "locks people in." "It is a medium of entertainment which permits million of persons to listen to the same joke at the same time, and yet remain lonesome." (T. S. Eliot, *New York Post*, 1963, quoted in Putman 2000) The home-outside paradigm, however, is rather different in industrial compared with developing societies. Indonesian and Sri Lankan respondents say that staying at home does not make you a couch potato, but a more dedicated family member. And that television keeps men and children at home is often perceived as progress, not a drawback. By locking people in, television undoubtedly and (once again) makes home a place worthier to be, and reinforces family links.

Television is a shared experience, and for many it is the main family entertainment. Everyone—women, men, elders, children, adults—has the same rank. Television breaks the traditional barrier between genders, where men and women sometimes share little more than homestead work. All family members watch television together. Those who

have a television invite other people, friends or relatives. Although television may become a tool of loneliness in other cultures, it is a tool of socialization in Indonesia and Sri Lanka.

Outside the Home

What about cultural and political values and empowerment? Robert Putman considered television to be one of the major causes of the decline of socialization in the United States. Television, as a time-consuming addiction, is progressively locking people in and making them disengage themselves from social contacts and participation in the community. Television watching and socialization times in France are presently both growing, but some analysts predict that trends may reverse in the near future and that television will grow to the detriment of other leisure activities.

In the developing rural world, television does not grow to the detriment of other leisure activities. Unlike radio, it is an exclusive medium, forcing people to abandon their activities. Television sentences people (and in particular women) to spend time on leisure and to cut out a slice of the day for forced leisure. This is a triple novelty for villagers. Time was porous, with work mixing with socialization and rest: television introduces a clear daytime segmentation. When villagers dedicated themselves exclusively to leisure, it was generally in collective entertainment (village festivals): television means individual leisure. Entertainment was mostly endogenous: television introduces the outside world.

Television deliberately carries values that are, in different order according to countries, those of the public authorities, mass commodities commerce, and media business. The message is "Be the kind of citizen we think you should, be a good consumer, stick to your TV set." Whatever the negative effects of this deliberate teaching may be, there is quite a number of positive ones for the construction of a civic identity, in all aspects considered detrimental to society and business: hygiene, family violence, alcoholism. (Governments have long used television for development purposes. Some historic solar programs have been developed to promote community television, such as in Niger in the 1970s, and the Indian government presently considers promoting massive television dissemination in poorer states, such as Uttar Pradesh, Bihar, or Rajasthan, for family planning purposes). Even if only pursuing its own objectives of audience, because it is mostly issued from an urban, extroverted bourgeoisie, the media often reflect in entertainment programs more progressive views of societal values than does the establishment in developing countries.

Once again, however, television carries more. One may give two meaningful examples of indirect ways television "teaches manners" and slowly builds new civic identities, in the case of environmental and gender concerns (Hartley 1999). Long before the environment became a political cause, for no more reason than entertainment, television presented programs on nature discovery and increased, for many unaware people, interest and a growing feeling of valuing the environment. Also, if little space is given for activist and feminist groups, even if the representation of women in television

may appear rather unsatisfactory, television has made women, their issues, and culture "visible" and gradually eliminated men's unacceptable points of view and behaviors.

Both proponents and detractors of television at least agree on one thing: television is a powerful primary educator. However, they differ on the kind of education television provides: good or bad—encyclopedia of modernity for some, infantilization and bad influence among most vulnerable people for others. Should this lead to careful cross-examination of television programs' contents (quite a task for the developing world)? Umberto Eco (1979) writes, "I think that the first duty of a teacher is, if not to say 'don't trust me,' at least to say 'only trust me within reason.' I think this attitude is one that every reasonable person takes when watching television. Television is the school book of modern adults, as much it is the only authoritative school book for our children. Education, the real education, does not mean teaching young people to trust school. On the contrary, it consists of training young people to criticize school books and write their own books." (Eco 1979) The most important point is not so much the content of television broadcasting, but the way people use it.

If it were only for time competition, television might exclude opportunities for participation in local community affairs. If it were only because it comes from outside, it would promote external values and break through local cultural identities. Even if it is built for leveling, however, it provides elements for a do-it-yourself citizenship, which does not lead to ineluctable standardization, but rather to cultural diversity. Watching events such as the Challenger explosion or the World Trade Center destruction reinforces community links, within and beyond the U.S. population, and consensus with leaders. Just like the media played an amplifying role in the 1968 student protest movement in France, television is considered to have been a major factor in mobilizing rural indigenous communities in a recent and large protest movement (Bolivia in 2000). Not because channels were promoting protest—far of it—but because they showed it. Villagers saw demonstrations, briefly listened to protest leaders and more extensively to authorities calling for calm and proposing arrangements, and finally chose sides. They just knew how to use television.

7 Hopes for a Better Life

> Is your village electrified now? is one of the first questions asked when two friends meet in the market.
>
> Daniel Tulak, Tana Toraja, South Sulawesi, Indonesia

Electrification betters villagers' self esteem, estimation of risks, and perception of future, but also pushes the local economy forward toward monetization and externalization. A better life from electricity is something that must be paid for. Positive economic impacts appear to go first to the global economy, then to the village, in a process that drains financial resources from surrounding areas to the village and from the village to the national economy. In spite of the new opportunities generated, the poorest are more likely to be weakened or penalized in the process, with electrification resulting more in the monetization of poverty than in economic development.

Values

The arrival of electricity has an unmistakable psychological effect on villagers. It brings them optimism—the feeling that a better future is at hand. This in turn has concrete consequences on their investment behavior.

Psychological Economy

Psychological states are very important parameters in the short term, but less so in the long term. Stock exchanges values, consumption behavior, and investment strategies heavily depend on the estimation of risks and perception of future, based on facts as well as on moods, and react to economic growth or recession for periods that may last several years. Long-term links appear less evident (see appendix 2). Between 1967 and 1997, real per capita income in United States grew by 77 percent (U.S. Economics and Statistics Administration 2001). Meanwhile, people's responses about general happiness did not change so much between 1974 and 1994: about 35 percent consider themselves happy, 55 percent average, and 10 percent unhappy (National Center for Public Opinion Research 2001).

The psychological impacts linked to the arrival of electricity could prove to be a determinant factor in building self-esteem and improving the future attitude toward investment. They are related to social benefits, as well as the perception people have of these benefits. This also leads to economic benefits, as mental capital leads to domestic

investment and consumption, and finally to productive investment. Their effects are strong, but tend to fade after some years when electricity becomes a transparent routine.

Family and Community

Analyses in Indonesia and Sri Lanka show that individual and family values prevail as far as electrification is concerned. Electrification increases status—foremost, status for individuals. The impacts considered most important affect family or family members. In Sri Lanka, gender analysis of values shows that education tends to be a typical feminine value (little importance given by men, first priority for women), whereas the home appears to be more a male than feminine value (see table 5).

Table 5: Most Important Values by Gender, Sri Lanka, 2001

Men	Women
Wealth	Education
Peace	Wealth
Health	Peace
House	Health
	House

For Indonesia, the social analysis of values shows that the poor and better-off give an outstanding priority to food (showing that even the better-off feel that they are not that far from survival conditions), whereas education and health have a different ranking: health gains importance with income, whereas education is more important for the poor (see table 6).

Table 6: Most Important Values by Income Level, Indonesia, 2001

Poorer	Better-off
Food	Food
House	House
Clothes	Clothes
Education	Health
Health	Education

Community values are expressed in a different mode according to electrification type (see table 7). Although in Sri Lanka all groups focus on the importance of streetlighting (a safer village), grid users will emphasize the importance of community development, hydro grid scheme users focus more on community facilities, and solar power users focus

more on the current gaps in their electrification mode: neighbors with electricity and a social life.

Table 7: Community Values Bettered with Electrification, Sri Lanka and Indonesia, 2001

Unelectrified	Grid	Hydro	Solar
Safe village	Safe village	Religious buildings	Safe village
Community feasts	Community development	School	Neighbors with electricity
Religious buildings	School	Safe village	Increase of social life

The Future

Electrification provokes changes within the community: better maintenance, investments in housing, better social life, development of productive activities (see table 8). Changes in the community do not occur at once, as shown by the evolution of Indonesian villagers' perceptions (in a percentage of positive answers among respondents).

Table 8: Community Impact of Electrification, Indonesia, 2001
(percent of respondents in relevant electrified communities according to age of electrification)

Electrification since	Less than 2 years	2–7 years	More than 7 years
Better village maintenance	19	28	39
More brick and concrete in construction	15	25	37
More shops	7	8	26
Improved social life	9	23	28

These psychological changes probably go beyond the electrified household group within the community. The households that do not yet have access to the service (a large part generally being the poor) have the feeling that some time they will get it, which tends to improve their general confidence in the future.

Villages are also in a permanent struggle to obtain public or private facilities on their territory, which consolidates their presence and influence within the area. The presence of electricity appears to be a determinant argument for developing markets, welcoming public facilities, and favoring the installment of private facilities (NGOs, offices, productive activities).

Although Indonesian respondents believe that electrification could have a modest impact on rural migration (fewer youth migrate to cities, fewer newcomers), Sri Lankan

responses show that a large majority feels that grid electrification (and this goes only for grid electrification, neither for hydro nor solar power) provides the basis for a better future in the village for their youth.

The same difference between main grid electrification and other modes appears in Sri Lanka in relation to trust in the national authorities. Grid electrification generates a strong feeling of trust in national authorities, whereas solar power users express resentment, and hydro scheme users appear rather indifferent. Last and for both countries, electricity also appears as a link to the world community: although it is not considered an important parameter by populations, it is recognized by a large majority of respondents.

Mental Capital

The arrival of electricity also acts on two meaningful aspects of poverty—self esteem (generally low among the poor) and estimation of risks (generally high among the poor).

Self-Esteem

The perception of poverty is relative to the context: a farmer may be considered "rich" because he has a cow or a car when others around him do not. Households will rate poverty in line with the situation in their village, the near-by town, or even the national or world community, according to the information they are able to get. The most informed are not always the best informed: television introduces distortions in ranking, because it shows advantages that others in cities or industrial countries have, but conceals the constraints to earning these advantages. Nevertheless, in most societies, comparing what you have to what others have is the first way to measure one's own poverty and happiness.

In that aspect, electricity has an impact that goes beyond simple improvement of comfort, and the link to the world community it provides, beyond the simple window opened by the media. In any ranking, people feel that they get the absolute best: the electricity, refrigerator, or television they are at last able to get, is not all that different from those the urban cousin or the "rich" foreigner has. In many aspects they are discriminated against, and they feel this discrimination. With electricity, however, they feel as if they are touching the roof of development. Now they do not have less than urban dwellers. They have the same as households in industrial countries, and they can see it on television. They, too, now have the switch, the television set, and the refrigerator. Electricity has made them citizens of the world. Among groups that were more discriminated against, it made them nothing less than human. During participative meetings among indigenous Latin American communities, several respondents from different villages mentioned that the connection to the grid changed them from animals into human beings. This image expresses both their feelings of discrimination within the national community, as well as the symbolic power of electrification.

Education is an important pillar of self-esteem (escape from ignorance) and risk mitigation (children are better prepared for life challenges), and electricity brings substantial support in that field. Electricity is generally believed to bring a significant improvement in education by respondents in both countries. Improvement comes at two levels. First, and in both countries, electricity contributes to children's education, although studying at home during the night is a generally admitted consequence. Getting information through television is also considered a positive factor for children. Households are not unanimous, however, because a quarter of Sri Lankan respondents believe that children tend to study less with electricity, probably because of television. Second, electricity gives better life and working conditions to school teachers, which are supposed to affect the quality of education (school teachers do not try to leave school as soon as possible; they can properly prepare school materials).

Estimation of Risk

Risk (actual risk, but also estimation of risk) is a major component of the poor's life, and the arrival of electricity builds new actual and psychological safety nets on different grounds (health, safety, production).

People generally mention that electricity has an effect on health, even if considered moderate. Sri Lankan respondents, however, focus more than Indonesians on the limitation of accidents from traditional lighting than on health or health service improvements. Health risks are linked to the use of traditional lighting, mentioned by a few, and are mainly related to accidents (burning) more than to respiratory diseases (from smoke or soot). Unless some medical evidence appears—and no evidence of the kind was drawn out of interviews with local health professionals—it seems that in-door pollution problems linked to lighting are very limited and of little social and economic impact for electrification.

The presence of electricity does not fundamentally alter the conditions of operation of health centers, which already solved most of their immediate needs using pre-electrification systems (refrigerators, car battery–powered telecommunication). Electricity secures their conditions of operation and prepares them for new improvements (use of more sophisticated medical equipment). Electricity also changes the life of civil servants with important consequences for the whole community, because the best ones are not likely to move as fast as possible to electrified areas where they can find better life and working conditions.

These civil servants in turn, build better conditions for home attendance, on occasions such as birth or medical care, for themselves and for family members. As for education, most health benefits occur at home, because women are more readily available for their children and other members of the family, and they are able to improve house care and hygienic conditions. Women have more time to dedicate to the young, and this affects family health. The ideology of domesticity enhances the values of hygiene and associates it with higher social status and greater consumption. For the better-off, electrical water

pumping also constitutes real progress, because it reduces pollution risks as it draws and stores water, and promotes better-quality drinking water.

Rural dwellers strongly associate electrification with better safety in the house and, where grid electrification is concerned, in the village, too. Not that electrification contributes to releasing community tensions (this was denied by Indonesian as well as Sri Lankan villagers), but it gives a feeling of safety against possible prowlers and thieves, as well as animals (snakes and others). Safety proves to be a strong demand of unelectrified households and an important benefit for electrified ones (including solar power users, considering home safety), even if, after years, safety tend to be less associated with electricity, now that it has become part of village routines.

In some aspects, electrification will also mitigate agricultural risks: it may be the least-cost choice for irrigation (no cases found in the areas of studies), and may also be used for electric fencing, to protect crops from animals (elephants are a real plague for farmers in Sri Lanka).

Investment

Living standards change, improvements are no longer a luxury, but a necessity, and the effects of competition and imitation among community members accelerate the process.

Nonproductive Investments

Some of the above-mentioned psychological aspects have economic foundations. The presence of electricity gives more value to the village in financial terms: prices tend to increase where grid electricity is available. Because of extension costs, people living far from the grid tend to move closer to it, in a habitat concentration trend (in village cores, along the grid), reinforcing real estate inflation in already or easily electrified zones. Better-off households, which are often already better situated in the village (in the village core or along roads), are also better able to acquire properties near the grid, in spite of price increases, and the process tends to push the poor forward.

Houses with electricity fetch higher prices, simply because service is available. Also (see chapter 6), however, electrification quickly induces people to invest in appliances, which are somewhat costly in proportion with their income level, such as refrigerators and televisions. People do not take advantage of savings from electricity, compared to previous pre-electrification solutions. On the contrary, they begin a significant and continuous process of increasing investments and consumption. Indonesian figures show that if about 50 percent use electricity only for lighting, this percentage goes down to 20 percent when they have received electricity for more than 7 years. People pay more money than before electrification. They pay not only for better services, but also for time and work savings (because pre-electrification solutions are not only costly in strictly financial terms, but also in time and work).

The new importance given to the home, along with increased home values, provokes new trends. People tend to repair and improve their houses, increase their real estate assets, and improve their kitchen and furniture. Living standards change, which causes these improvements to be integrated with the effects of competition and imitation among community members. Improvements also come at the community level, with better maintenance of public building and spaces, because the village is a place worth investing in for local authorities, as well as for outsiders, such as state authorities. Electrification brings significant unproductive investment that will develop with time. This investment, along with its patent results within house and community, is also bringing positive psychological consequences to villagers.

Productive Activities

Time is also necessary to see productive development in electrified communities, for at least three reasons:

- Energy, money, and optimism are necessary inputs to productive investments. A limiting factor is the market.
- The direct and massive consequences of electrification are found in the purchase of goods and appliances linked to electricity use. If this provokes important consequences in relation to market development, they are first outside the community: urban manufacturing, even imports, and the village itself will get little advantage of these market opportunities.
- The slow ability or inclination to react of informal businesses developed in rural communities makes them unable to capture market opportunities because of limited capital.

As a consequence, village activities will harvest little from the first wave of benefits linked to electricity development: some labor from the presence of power distribution (local commercial management) and the development of some maintenance activities (electrician and appliance after-sales services). As soon as home consumption and investments go beyond electricity and electrical appliances, more opportunities become possible at the village level and generate the creation of new commerce and workshops. Some activities will also develop according to external market opportunities and existing capacities inside or outside the community, which will take advantage of and use the village labor force for such activities as embroidery, cloth, or shoe production.

Markets are the link between electrification and production: market dispersion is a huge constraint to developing any productive and commercial activity. Grid electrification tends to encourage villagers to move closer to the power lines. Through the increased interest in one's home, activities linked to construction and furniture are stimulated, giving new opportunities for semi-industrial and industrial activities. New habits of purchase of commercial food and domestic hardware appear, and there are new interests to externalize a portion of domestic tasks, such as grinding. More night life

becomes available because of electricity, and activity is generated, such as shopping and consuming more food and drink.

The availability of electricity also has an effect on surrounding markets: Car battery charging is another best-practice example of market creation or development. The existence of electricity allows for the development of pre-electrification: people in surrounding areas, who had no opportunity or faced high costs to charge batteries for television, are able to come nearer. More people consider the possibility to buy battery-powered televisions. The opportunities may also be similar for other products and services. As soon as productive activities develop in the electrified village, it constitutes a new pole of attraction for surrounding communities, which are likely to come and purchase.

If electrification creates markets, it also creates values: changes in consumption and investment patterns all go in the same direction, from relatively low value-added products to higher value-added ones. This holds not only for electricity and electrical appliances, but also for all new investments and consumption when they substitute former monetary exchanges, and more so when they substitute self-consumption practices.

Inequities

New market opportunities will not be available for all because the presence of electricity gives a comparative advantage to electrified households. Electric light in workshops may allow extending workers' labor time, which, in addition to the possibility of using motors, notably increases the relative cost-effectiveness, compared to unelectrified handcrafters. Electric light is also a potent instrument for shopkeepers, because customers can shop later. And so is the existence of a refrigerator, to provide ice cold drinks in food-service establishments. In that sense, the creation of activities is both caused by the presence of electricity and discriminatory access: those who have electricity have a chance to undercut the market of those who have no electricity. Those who have the possibility to invest (for example, in an engine or refrigerator) and pay for a higher energy bill have a comparative advantage over unelectrified competitors.

As soon as the electrified village develops its own productive potential, it may also capture new better-off residents from surrounding areas who are attracted by electricity. The development of productive activities, commerce, and services in the village also tends to eliminate lower productive and less attractive activities in the surrounding villages.

Concentration and capitalization of activities make economic life more visible. Where there were only manual sawyers, no wood activities were noticed. When even a small sawmill with its electric equipment and its workers is established, however, it is noticed, and it creates surrounding side businesses. Externalization of consumption also makes it more visible, because it means itineraries, exchanges, stalls. As in the case of paid home activities, the emergence of village workshops or shops because of electrification cannot be interpreted as signals of alleviation, but rather of monetization of poverty. Social

conditions from this monetization will depend on local contexts, but it is generally caused by an increase in local differences between the better-off and poorer.

This also represents a significant evolution in village economies. The externalization of consumption makes villagers more dependent on outside and monetary income, which will impose a further move toward commercial agricultural and nonagricultural activities. Development of paid women's activities is a move toward, but also a resistance against monetization. The appearance and diversification of village activities is a significant happening, with the involvement and professionalization of men in the newly created businesses. An increasing number of households engaged in permanent nonagricultural activities with lives that depend exclusively on monetary exchanges. Links with the economy external to the village become tighter, both from consumption needs and the necessary inputs of production for local markets.

Electrification creates monetary flows that go primarily from the village to the outside economy, and in a lesser extent from surrounding areas to the village. It integrates rural areas as new markets for the overall economy, but favors first the accumulation of value in cities. The economic impact on rural areas mainly depends on the capacity of the cities to take a significant share of this value or to develop export-oriented activities that somehow invert the flows.

Rural Migration

There are many similarities between monetization and rural migration. Both may be interpreted in two ways: one of progress and the other of despair. Going toward monetization may mean taking advantage of economic opportunities and improving living conditions. It may also mean, however, recognizing the failure of traditional ways of living and having no more choice than to sell the labor force in order to maintain minimum living standards. Both are a rejection of the "poverty accommodation" (Galbraith 1979) as a search for a better life or a refuge against the unbearable.

Analyses of rural migration tend to be built mostly on the same model: rural migration has rural causes and urban consequences. Bad causes (unbearable rural conditions) and bad consequences (slums, urban poverty) make rural migration a plague against which most development strategies have reacted, generally unsuccessfully. Rural development strategies, and even the poverty reduction strategy, still make the reduction of rural migration an important basis for their priorities.

Monetization and migration respond to similar causes (looking for a better life, dealing with unbearable conditions), but also bring similar consequences for rural areas: mutation toward a more productive and competitive rural economy, through capitalization and technical modernization. Monetization and rural migration are engines of economic growth, but they come with built-in inequality.

It is an open debate whether economic growth has a systematic impact on inequality. Some cross-country analyses tend to conclude that growth has no systematic impact on inequality in the long term (Bruno, Ravallion, and Squire 1995). Without denying these overall macroeconomic conclusions, the debate could find its origins in a confusion between micro- and macroeconomics. Observations of strictly private sector dynamics or even development projects show that under any specific economic and social environment, economic growth produces inequality.

When a new dairy factory establishes itself in a rural area, creating a large market for local cattle breeders, it naturally generates a process of consolidation among producers who are bigger and more prepared, and who tend to invest in their own operations and progressively eliminate smaller producers. This process toward inequality will be stronger in a zone where inequality is already high (with the bigger ones easily defeating the poorer ones) and social capital is low (with few opportunities for small producers). However poverty-focused they may be, most rural economic development projects face the fact that the better-off and more prepared portion of their target get the most and best of it. This nearly universal bias will more or less emphasize existing inequality because public development projects are mostly designed to target the poor and often low social capital zones.

Good policies could reinforce equity by developing better human and social capital, and by having a positive impact on growth, which would result in better development impacts. The impact will be more pronounced for higher levels of existing growth, because it is easier to create more opportunities for human resources to invest in economic development. In simple words, growth generates inequity, and equity generates growth, in both accumulative processes. This explains why cross-country global economic and social data analysis cannot provide intrinsic tradeoffs between growth and equality.

Electrification illustrates this well. It brings better living conditions to rural areas, it eases women's working conditions, and it reduces their interest in moving into better city life. It mitigates gender dynamics toward migration. Electrification also creates economic dynamics, and generates local markets and nonagricultural employment. The longer the village is electrified, people feel these improvements, and even judge that there is a positive effect on migration as youth are more likely to have a future in the village.

To whom it brings these advantages is no small issue. The present failure of electrification policies limits the impact to just a portion of rural areas, leaving aside the more isolated and in general poorer households. Obtaining general village coverage, using all available grid and off-grid solutions possible, should be the first priority. Even once this is achieved, however, the question remains. In grid-connected villages, a minority of the poor may have access to service, whereas solar dissemination programs reach primarily the better-off. As developed in chapter 8, electrification rules rely heavily on economic discrimination, preventing social capital from exerting much positive effect

on the poor. The poorest, the most exposed to rural migration, are likely not to benefit from the possible positive effects of electrification.

When successfully reaching whole populations, electricity does not have a leveling effect, at least for as far as the grid is concerned. If everyone obtains better service than before, the poor get it at a higher price than pre-electrification solutions, whereas the better-off save money to invest in more consumption. Electrification also catalyzes a process of transformation of the rural economy, with greater dependency on monetary exchanges, development of markets, and accelerated effects of capitalization, which in due time will modernize these rural economies. It also threatens the very existence of many of the smallest and poorest farmers. Externalization of consumption has important consequences for farmers. Where a few acres were previously enough for self-sufficiency, they may not be any more once farmers have to respond to both basic food needs and to the desire to consume commercial goods. Renewable energy electrification does not reverse this trend or propose better alternatives; it means more integration and dependence on the monetary market.

In conclusion, whatever its conception and success rate may be, electrification is bound to accelerate rural migration in zones with fragile local economies and among the most fragile population, where and when there is no specific policy to mitigate inequity, and where there is little local social capital. The positive effects of electrification will then consolidate and improve the lives of those who are the most likely to stay.

8 Access

> We are poor, but because we want to have access to electricity. We have to provide for all connection requirements.
>
> Ajengan Ade, Tasik Malaya, West Java, Indonesia

Electrification policies are discriminatory and generate a persistent misunderstanding between utilities, which do their best under difficult conditions to provide rural access to electricity. Villagers feel denied of a right to buy a service they are able to pay for. Once electricity arrives in a village, connections are sold as commodities. The distribution grid configuration essentially reaches better-located households (that is, close to the village center and grid, where the better-off households happen to be), whereas the poor are left out (or, de jure and de facto, are connected through illegal hook-ups). The poor are electrified only if they are lucky enough to be within the grid.

Electrification of the Poor

If the electrification process is considered part of the march toward equity (giving the entire population the same access to electric service), the conditions of its realization appear to be rather discriminatory. This is illustrated for Sri Lanka in table 9. Two villages are shown that were investigated during the qualitative phase. In the left column global statistics are presented as they could appear in a utility report, with satisfactory results of electrification—the grid has reached the village, and electrification rates are not too bad. In the right column, a social screening, as performed by a survey team on the same villages, shows a significant exclusion of the poor.

Table 9: Statistics and Social Facts, Sri Lanka

Village	General statistics on electrification	Social screening
Asmadala	Electrified village; about 200 households; more than 85% electrified	100% of better-off and middle-income electrified; 50% of poor without access
Wakirigala	Electrified village; about 280 households; more than 35% electrified	90% of better-off and 35% of middle-income electrified; 90% of poor without access

The survey results in table 10 show a strong linkage between income level and access to electricity for Sri Lanka.

Table 10: Electrification Rate by Social Level in Sri Lanka
(percent)

Social level	Electrification rate in grid-connected villages
Very poor	15
Moderately poor	71
Average	94
Above average	100

The case of Indonesia yielding the following findings:

- Data on all regions but one (Tana Toraja, where social differences are smaller than in the other regions) show that unelectrified households are poorer than electrified ones.
- In electrified villages, social discrimination is mitigated by the phenomenon of illegal hook-ups (survey data show as much as 35 percent of rural PLN connections are illegal). Poor users connect themselves to after-meter installation of neighboring official subscribers, who in turn resell them the energy. They often have to pay a higher price to their neighbors, but at least they have access to the service which, to a certain extent, mitigates social differences.
- Legal electrification first and foremost reaches the better-off: Considering only legal connections with meters, results are shown in table 11 in the percentage of people who have access.

Table 11: Legal Electrification Rate by Social Level in Indonesia
(percent)

Social level	Legal electrification in grid connected villages
Very poor	52
Poor	58
Near poor	67
Middle-income	67
Better-off	84

In Indonesia villagers pay a mean monthly bill of about US$1.00–1.50, according to how long ago they obtained access, whereas in Sri Lanka poor customers pay a median monthly bill of about US$1.00, and average customers pay around US$1.50, compared with a minimum payment of US$2.00 per month for kerosene lighting before they obtained access to electricity (even for the poorest households).

A normal electricity connection in Sri Lanka requires a minimum fee of US$120, representing nearly 4–5 years of household budget for traditional lighting, whereas in Indonesia, where the official connection fees are far lower (minimum fee of US$15). Because the Indonesian fees are below the real costs of connection, the PLN makes available only a few such connections. Therefore, many households hook up illegally, generally at a higher price than the US$15 for formal connections.

Contradictions

Electrification leads to contradictions. It is an expression of solidarity for politicians, but a burden for utilities. It is a gift for better-off rural households, but a mechanism of exclusion for poor.

Utilities

For the utility, rural electrification is a burden. Not only does the process require huge investments, sometimes to the detriment of the existing system's modernization, it also increases management headaches. Rural electrification brings mostly microconsumers that not only use little electricity, but also use it at peak load, mostly at night for lighting or watching television, where daytime consumption is negligible. This increases peak demand, peak generation capacity, and thus worsens the load factor (the ratio between power requirement and its effective use: many typical rural systems have less than a 30 percent load factor). Extension of the grid provokes higher transportation and distribution

technical losses, which partly explains difficulties in maintaining a supply of sufficient quality to users at the end of the line. High operating costs result from small numbers of consumers and low consumption over extended areas, as well as labor rules designed for normal urban operation (low ratios of consumers or sales to technical and management staff), which may reach extremes in the case of small decentralized systems.

Utilities face three pressures. Two are top-down: the political constraint on tariffs (not to displease populations) and the political urge to electrify new communities (as the most visible expression of the electrification, no matter how many users have access in each of these communities). The third is bottom-up: people's willingness to be connected as soon as the grid comes to the neighborhood. Tariff constraints are based on three social principles: promoting equity among consumers, maintaining tariffs as low as possible for everybody, and having more affordable tariffs for the poor. The urge to develop rural electrification means extension of the geographical coverage (the number of villages with access) and the filling-in or densification of electrified villages (the number of households with access). People's willingness-to-pay, as soon as electricity arrives in a community, can be summarized as follows: now that the grid has arrived, you set the rules; we have the money; connect us or else we will do it our way.

Connection fees and monthly rates produce tariff constraints. Pressure over monthly bills (tariffs) is politically sensitive because it links rural and urban tariffs. Urban masses react more quickly and violently to tariff increases. Subsidized connection fees aim to correct spatial inequity—not to penalize rural versus urban dwellers, or remote versus nearby rural households. Urban pressure on tariff issues make it difficult or impossible to reach cost-effectiveness in rural areas, where may be found higher amortization, management, and technical operation costs per unit of sale. Utilities find in rural electricity the costliest and the structurally loss-making part of their activity. This, if for no other reason, explains the utilities' reticence toward developing new areas and also the slowness to connect poor customers.

Utilities buy an important part of rural electrification on credit. They get funds to extend the transportation (high voltage (HV) and medium voltage (MV)) grid and intensify (MV and low voltage (LV)) distribution. They establish maximum cost-per-user thresholds for connections, which are by obligation restrictive and socially discriminating. Thresholds are restrictive because extension competes with intensification within the utilities' policies and budget: they have to choose between extending the grid to new localities or providing facilities for new consumers of presently electrified communities. This choice goes generally to extension out of political concern. ("How many villages did we contribute to for electrification?" It is better to announce 1,000 villages with only 10 users in each than 10 villages with 1,000 users). Thresholds are also discriminatory spatially, if only according to economic rules (the nearest is the cheapest; more expensive for the poor living a bit far from the center), as well as socially (threshold levels depend on the users' future consumption).

Indonesia launched a spectacularly extensive and quick electrification program in the golden 1990s, which could have reached national coverage in a few more years if economic crisis had not struck. Official connection fees are also low and equitable, but the utility is unable to afford more than a limited number of connections. As a result, people have no choice but sometimes to reach an unofficial agreement with utility local offices (corruption) or to build up rudimentary connections to their neighbors' houses: illegal hook-up represent about one third of the overall new connections to the PLN grid.

Connection fees are more expensive in Sri Lanka, where rural electrification extension programs are also less ambitious and costly than in Indonesia. The utility also has more possibilities to intensify local distribution in electrified villages. For households, it is generally not worth hooking up illegally, because you can have a legal connection more or less at the same price. Although subsidized, fees reflect economic costs (a fixed portion for the connection to the house and a variable portion proportional to distance to the grid). The result is more or less the same as in Indonesia, but under more strict legal and technically controlled conditions: the better-off and middle-income connect when they are at a reasonable distance, the poor only if they are close to the grid, with constraints of time and minimum fee levels.

Rural electrification, as the expression of national solidarity and social concern for its rural population, leads to more national equity. With all good intentions, Indonesian and Sri Lankan utilities face national equity rules plus economic constraints that leave them without the resources and capacity to express social concerns at the local level. In the Sri Lankan case, rural dwellers get electricity for a fee that reflects a substantial part of the connection cost. In Indonesia, the incapacity to provide connections causes the connections to be left to the informal market. In both cases, electrification has become a commodity, with its local development depending on households' financial resources. Markets have their merits, but they also have their drawbacks, and exclusion of the poorest is one of them.

The Indonesian PLN optimistically thought it feasible to connect approximately 23,000 villages between 1995 and 2000, or about 7.7 million households and probably 4 million more through illegal connections. Village electrification means that about 80 percent of households are connected, and the overall electrification rate—including illegal—is about 60 percent. The Asian crisis struck, however, and the past rhythm will be difficult to maintain until complete village electrification has been reached. The Sri Lankan CEB so far has electrified 14,000 villages, and the overall electrification rate is 53 percent. This leaves more than 2 out of 5 households without access to electricity.

Utilities begin to think that they might have difficulties to complete 100 percent electrification by themselves and are asking their traditional partners, the state governments, to find complementary solutions. As an example, the Sri Lankan utility stated, "Construction of rural electrification schemes has its own share of problems, some of which are enumerated below: high investment costs, inadequate financial returns, low

density of population, increased losses and operational costs, longer distance to existing distribution network. CEB alone is unable to shoulder the entire responsibility of providing electricity to villages, as the recovery of the costs is obligatory and the recovery only from the rural beneficiary is not adequate." (Ceylon Electricity Board, Sri Lanka 1999)

Households

In large urban areas, where most people have access to the service, electricity bills and levels of appliances are an easy way to construct a poverty map as used by social scientists or urban planners. Most everyone has electricity and pays their bills. As soon as electricity enters a new district, however slum-like it may be, most people, as poor as they may be, get themselves connect to the grid. Without denying extreme poverty specifics and all sorts of problems in the relationship between utilities and poor customers, being connected to the grid is not a good indicator in itself for poverty mapping.

This is not different in rural areas. Under the present conditions of grid tariffs, almost everyone can pay the bill. For mostly the same reason as urban dwellers, alternatives are as or more expensive, yielding a worse service. One or two kerosene lamps will cost a household more than a minimum electricity bill. When a better-off household gets a television set powered by car batteries (and there are hundreds of thousands in each studied country), the cost will be far more than he would have paid if he had grid electricity. Pre-electrification costs are higher in pure financial terms, and far higher considering the time, work, and trouble required to have them operating. And they are far higher for the better-off than for the poor, for a simple reason: the price build-up of electricity incorporates such a share of fixed costs that the amount of energy used represents very little, and—even with social cross-subsidies—the better-off save more, in absolute and relative terms.

In an analysis, three typical households are considered "better-off," "middle-income," and "poor," as representative of the social structure within a rural community, as derived from field surveys. A better-off person is likely to be poor at the national level. His monthly bill will be substantially lower than the median bill in U.S. dollars paid by the utility's urban clients.

Rural families generally spend US$1.00 or more per month on kerosene lighting. Utility minimum bills are roughly in the same range, US$0.01 per day per person for an average four-person household. A median household that already spends several U.S. dollars per month would save about 33 percent on its lighting costs; this may be more than 50 percent for the better-off families that easily spend US$10 per month or more on pre-electrification solutions. Savings are more important for well-off households, for an easily understood reason: pre-electrification solutions include primarily energy, but little fixed costs, whereas grid electricity mainly includes infrastructure (fixed costs) and some energy costs.

It is important to state that these savings are theoretical, assuming that households stick to the same level of service. This does not mean that households will spend less money: the survey results tend to show that the portion of the budget spent on energy does not shrink with grid electrification. On the contrary, it tends to increase. This means that the current conditions of tariffs give households the possibility to improve home conditions (through lighting and the purchase of appliances) and reach the previous budgetary level. Money spent before electrification provides no more than a minimum willingness-to-pay indication.

These prices are nominal; they do not incorporate (a) for traditional solutions the required investments (lamps, car batteries), or (b) for electricity the connection costs that may be more or less important according to distance and utility rules. For traditional solutions, the investments represent an additional 10 percent or so of the leveled price, which can be ignored in the analysis. For electricity, a "minimum" connection fee near economic cost is considered, such as the one used in Sri Lanka of US$120, to go from nominal to real cost. To give an idea of equivalences, with a discount rate of 10 percent, an initial investment of US$100 gives an increase of monthly leveled cost equivalent of US$0.80.

Shifting to the grid, the consumers will see that their energy bills (for all services except cooking) will evolve "instantly", as shown in table 12.

Table 12: Willingness-to-Pay According to Social Level: Approach by Avoided Costs

(U.S. dollars per month per family)

Social level	Before electrification	Nominal monthly budget (excluding connection fee)	Real monthly budget with significant connection fee
Better-off	6	3	4
Middle-income	3	2	3
Poor	1	1	2

The nominal monthly amount billed for grid electricity is more or less at the same level as pre-electrification costs for the poor, and cheaper for all others. Integrating near economic minimum initial fees (such as in Sri Lanka's conditions for new subscribers living close to the grid line) increase the real energy budget for the poor. Survey results tend to prove that such levels of fees may be a problem for the poorest who actually have difficulties paying this amount, even if most who are near the grid get connected after several years. With a lower fee, they do not spend much beyond monthly nominal payments of about US$2.00. That is to say, the poor's willingness-to-pay should be around US$2.00 per month, but not much beyond.

The better-off still save money, and middle-income households are in the same range before and after electrification, if close to the grid line. Things may change as soon as they are at some distance from the grid and have to face, legally or illegally, important connection costs.

In the case of dealer sales, the dissemination of solar equipment is relatively simple as people pay the same price for the same service; there are no spatial constraints, people will pay several hundred U.S. dollars (depending on service and subsidy level) to get their equipment. This price, which may go down in the future as a result of enlarging world markets, will remain in the range of several hundred U.S. dollars. Including the initial subsidized investment, unsubsidized replacement parts (batteries, regulators), but excluding maintenance (often incorporated in the initial price), the monthly leveled prices of solar equipment for average consumers are shown in table 13.

Table 13: Willingness-to-Pay According to Social Level: Approach by Alternative Electrification

(U.S. dollars per month per family)

Social level	Before electrification	Solar
Better-off	6.00	10.00
Middle-income	3.00	6.50
Poor	1.00	4.00

Comparing these prices with the willingness-to-pay for grid service should not lead to the conclusion that solar power is too expensive for everybody. For the poor however, this leads to an unquestionable conclusion. Although the willingness-to-pay of the poor rarely exceeds US$2.00, they often do not meet the solar cost requirements. Presently disseminated solar systems are not for the poor.

Considering the current situation with subsidies, solar equipment is best suited for the better-off and middle-income household markets—and sales are not negligible. Solar energy, then, constitutes another way to estimate the willingness-to-pay for electricity. A very simple and schematic simulation may give levels of willingness-to-pay not only for solar power, but also grid electricity, using the following principles, based on local market reactions: (a) relative interest for grid compared to traditional solutions is more for the better-off than for middle-income households, because they are able to invest in more appliances and save more money on cost-ineffective pre-electrification solutions; (b) the relative interest for solar energy compared to traditional solutions is more for the middle-income than for the better-off because it responds to most to their needs—principally lighting; and (c) grid electricity is preferred over solar power by all (if only because of fewer service limitations).

Considering that solar energy market prospects are good among the rural better-off and middle-income households, the approximate conclusions shown in table 14 can be drawn in relation to willingness-to-pay.

Table 14: Willingness-to-Pay According to Social Level: Grid and Nongrid (U.S. dollars per month per family)

		Solar price meets only better-off WTP		Solar price meets better-off and middle-income WTP	
Social level	**Solar price**	**WTP for solar**	**WTP for grid**	**WTP for solar**	**WTP for grid**
Better-off	10.00	10.00	12.50	Better-off	10.00
Middle-income	6.50	5.00	6.00	Middle-income	6.50
Poor	4.00	< 2.00	2.00	Poor	4.00

Note: WTP stands for willingness-to-pay.

The above table is meaningful in terms of relation with grid tariffs and willingness-to-pay. The willingness-to-pay of better-off and middle-income households is far higher than present tariff and minimum fee conditions. What is logical is that either legally or illegally, most of the better-off and middle-income villagers are connected when they live at some distance from the grid, meaning that they have the willingness-to-pay. Analysis of nominal bill levels also shows that the Indonesian better-off and middle-income electrified households will spend more than twice the amount of their energy budget before electrification, which is consistent with the above figures.

It would not be reasonable to focus exclusively on figures because they depend on the conditions of costs and poverty lines within countries. Some preliminary conclusions, however, could be the following, first about the poor. If connection fees are low and equitable (no spatial discrimination), the poor can easily handle the energy bill with the present tariffs; they could even bear significant tariff raises, but this would cut any perspective for them to get more from electricity than what they had with pre-electrification solutions. If connections are not available, with the present tariffs, they can also use their margin of willingness-to-pay to illegally connect at some distance. If connection fees are near economic cost, they can still pay for electricity, but will require close proximity to the grid. They will also be spatially dependent on the utility or other better-off users.

The relationship between initial investments and monthly payments is not so neatly linked as in current leveled cost calculations using the standard discount rate (the average "cost of money" for medium-term loans in the country). In some specific cases (emigration of family members), initial investments are easier made than expected. In general, difficult access to money for poorer households generates high discount rates and will reinforce their difficulty to meet connection costs and their dependence on proximity to the grid.

For middle-income and better-off customers (and once again relatively better-off and middle-income households at the village level), current tariffs are consistently lower than their willingness-to-pay. In the case of low and equitable connection fees, or if they live near the existing grid, the arrival of electricity is a real gift to them and will open a consistent space for acquisition of appliances and energy consumption (part of it, at least for the better-off, stems from savings on pre-electrification costs). If connections are not available or are billed at a high cost, it will provide opportunities to spend on illegal connections—or legal connections at rather long distances, although in this case they will have less flexibility to pay for larger monthly bills.

This important difference between the electricity price and rural willingness-to-pay reflects for a good part the frustrations of unelectrified populations. The right to have electricity is comparable to a consumer who is able to pay for a product, but no one is willing to sell it to him, although others were able to buy it.

Dynamics

Whatever the discourse and policies, electrification is finally sold as a commodity, with subsidies going to benefit first of all the better-off. This is honest and transparent in the case of SHSs and more hypocritical in the case of the grid. Only one electrification, with all its limitations, proves to be poor-friendly: the microhydropower grid village electrification.

Renewable Electrification

Hydro and microgrid schemes are generally a "flash" electrification. Because of energy limitations, the customer base and the grid are defined once and forever. The initial investment is heavily subsidized (often with some local participation in labor), and households are asked for tariffs comparable to national utilities' minima for small customers. This erases most social discrimination between beneficiaries, although those among the poorer who are not ready in time for initial payment will definitely be excluded because of the incapacity of the system to evolve.

In the case of individual solar systems (whatever may be the scheme to disseminate them), access has a definite price, according to service level, and customers decide to join or not. Matters dealing with the specificity of each scheme, and how they deal with initial investments, are discussed in following sections.

Grid Electrification

For the grid, things are more complicated because of spatial constraints. If the connection fees are low and connections are available, everyone is connected, and the poor and the better-off get access. However, this is not the case in both analyzed countries, because the utilities cannot face the investments required for the connections from their own

resources. Utilities provided the financing in accordance with the plan, and as the grid reached or crossed a village, a limited number of villagers were electrified while many other remained unconnected. These then must invest, and they now face an electrification world of pure market laws. Connection fees are in the range of several 10s of U.S. dollars when the future subscriber is at minimum distance from the existing grid. As soon as the house is located at a certain distance from the grid, the connection cost, which the future user will bear, quickly rises into the range of several hundred U.S dollars.

Even if all villages are different, some general rules can be drawn up. First, grid electrification reproduces spatial inequity. It follows roads and reaches villages centers where the better-off, more so than the poor, tend to be located. The part electrified at the utility's cost is likely to reach the better-off, not necessarily by choice, but because of proximity. This discrimination will be reproduced in the future development of the grid, because better-off and middle-income dwellers are generally better located than the poor.

Second, connecting the better-off in more remote locations will be quicker, not only because they can afford the investment, but also because of their financial interest: those who are able to save US$40 a year consider the same investment in a different way than the poor (or even middle-income households) who will not easily have such an amount available. The under-the-line poor may take years before joining because the connection fee is too high for their budget.

Third, by developing the local network, the poorer segments of the population will be benefited. This reduces the connection costs to several 10s of U.S. dollars if they have the chance to be under the new line, and at least substantially reduces it when they live near a newly connected house.

Fourth, the grid reaches a steady state (no significant further connections) as soon as most better-off and middle-income households are connected. New dynamics may appear, with some existing or new families tending to install themselves closer to the existing grid .Barriers arise from the increase in land prices in these locations.

This can be illustrated by figures, using the previous estimate of willingness-to-pay for grid electricity. Taking Sri Lanka prices—with about US$120 for nearby connections plus further extensions sold for about US$1,000 per kilometer—the better-off have an interest in investing until they are about 900 meters from the grid, and the middle-income interest extends to about 200 meters. The low-income are not able to invest at any distance. In Indonesia, no entrance fee and a somewhat lower cost of connection (if estimated at US$700–800 per kilometer) would allow illegal users to build extensions, respectively, to about 1.3 and 0.3 kilometers according to income levels, providing they pay the official tariff (which is not the case because official customers charge for use, in a resale more than "sharing" process).

So, the length of extension could be a fourth way to evaluate willingness-to-pay (expressing it in monthly leveled cost) associated with the consumption level, but it would need special inquiries (local utility offices archives for legal electrification, field

measurement, and survey for illegal connections), different from pure household surveys. Because for rural dwellers (as for anyone), initial investment costs fade away, only the monthly bill remains.

The initial configuration of the grid, as laid out by the utility, favors the better-off, because they happen to be near the grid, along the roads, and in the village center, and because they are the best customers. The "final loop," the distribution grid that begins when the utility's investment stops, is also defined by the better-off and, to a lesser extent, by the middle-income (with shorter extensions). The poor connect as soon as they happen to be near to the so-defined grid. The better-off build the loop for their own needs; the poor, with luck, use it.

And the typical steady state loop, after all the people have made their move, reaches all the better-off, most or all the middle-income households, and part of the poor. Some still go on connecting, however, through illegal practices, such as informal connections to the next customer, or hook-ups, but a significant proportion remains without electricity. So there are wheels within wheels: within the electrification problem of the rural community lies a rural poor electrification problem.

9 Policy Tools and Poverty Concern

> Mass dissatisfaction does not depend on economic deprivations, but on a feeling of impotence. Their fundamental goal is not an increase of their living standards but greater social power.
>
> Vulcan III computer, in Vulcan's Hammer, Philip K. Dick, 1960[4]

The equation between tariffs and connection fees has somehow been wrongly worked out. Villagers and above all the poorest, cannot—and should not—pay for the full initial electrification investment costs all at once. This is valid for grid connections and for renewable energy equipment. Until now, no credit or subsidy scheme has been able to solve the exclusion problem of the poor. Utility constraints on tariffs, as well as insufficient capitalization in the power sector, are the main roots of de facto discriminative electrification policies. Moreover, in the name of fate where the poor necessarily are the last to be served, the present conditions of grid extension, as well as alternative programs, tend to destroy the community's social capital, which in industrial countries has fueled most of the electrification dynamics.

Tools

It would be misleading to proceed as if rural electrification were limited and inequitable results were caused by the mismanagement of utilities. Power sector regulations and policy tools are primarily built upon models of already-electrified countries, whereas utilities face specific constraints, such as limited national coverage and insufficient financing capacity, that convert most of its theoretical social safety nets into frauds and leave no hope to the poor but to be the last served.

Tariffs

In Indonesia and Sri Lanka, grid tariffs for rural subscribers are designed to reflect national solidarity. They are supposed to mitigate the differences between urban and rural areas and between the different regions of the country. They are also intended to reflect social concerns through cross-subsidies and lower tariffs for poor customers. This is still a small-circle solidarity, which benefits only the rural dwellers that have access to the

[4] Retranslation from French edition.

service, whereas the unelectrified poor pay a high price for mediocre preelectrification solutions (see table 15). If existing customers are asked to pay a very low amount for energy, very few financial resources will be available to extend the circle to include currently unelectrified populations.

Table 15: The Myth of Tariff Equity: Nominal and Real Tariffs (U.S. dollars per month per family)

Social level	Minimum connection	With 100 m extension	With 200 m extension	Before electrification	WTP
Better-off	4.00	4.80	5.60	6.00	12.50
	Increase	*20%*	*41%*	n.a.	n.a.
Middle-income	3.00	3.60	4.60	3.00	6.00
	Increase	*27%*	*54%*	n.a.	n.a.
Poor	2.00	2.80	3.60	1.00	2.00
	Increase	*41%*	*82%*	n.a.	n.a.

n.a. Not applicable.
Note: WTP stands for willingness-to-pay.

This is also a very theoretical solidarity, because the nominal and real prices of electricity are very different, because of important extension costs paid by rural users. At the village level, access is socially and spatially discriminating, because it excludes the poor when they do not live near the grid. Often being better located, the better-off also pay lower prices than the poor. As soon as an extension is required, however, the better-off and middle-income pay much higher real tariffs than the best-off consumers in towns. At the national level, there is also a spatial discrimination—and finally a social one—because most of the rural well-off and middle-income are on the low side of the national poverty scale. The national principle of equity of consumers relative to tariffs is denied by the facts.

As rough as the previous figures may be, they certainly show that present grid tariffs are low compared to the willingness-to-pay of an important part of the rural population. Most electrified households (and not only the better-off) express their relief to pay less than before electricity, and nobody complains about tariffs,(in part because they consider only their monthly bill and not the one-time connection costs). Those who pay for minimum connection have no reason to complain, because they are paying the same price as urban relatives, and because electricity is probably the only commodity coming from outside in that case. Everything is more expensive in the village—but electricity.

Present monthly electricity tariffs are more or less convenient for the poor and very attractive for the better-off. Nominal or minimum real electricity prices have been elected as soft ones, even when related to the poverty limits: for a four-person family, when they

are less than 1 percent of the poverty limit income of US$1.00 per day per capita, meaning some percentage for the poorest close to the grid line. Lower tariffs for the poor, through further cost subsidies, would have no or little effect on their connection rates or consumption patterns. On the other hand, energy consumption of the rural poor is likely to be affected by tariff increases: the difficulty shown for paying the initial connection cost suggests that, as shown in previous tables, their willingness-to-pay and capacity-to-pay for electricity is not much higher than the price they are facing now.

Having low tariffs, once again, is a political choice for public authorities. This choice has implication, however,. Low tariffs mean either a capacity to maintain a high level of subsidy for the electricity sector, something that most countries cannot do, or low investments, low service quality, and a low penetration rate for new consumers because they cannot "have their cake and eat it, too." As far as domestic energy consumption is concerned, most people, even in rural areas, can pay higher tariffs. Present tariffs are adapted for the real poor; there must be some who cannot pay them (there will always be some in any country with any tariff). From the point of view of national community, it would be more cost-effective to raise nominal tariffs and focus on specific poor clientele through subsidies (a higher cross-subsidy for the smallest consumers or an external poverty net for the poorest).

The problem is not so much the overall price of electricity, including connection fees and monthly nominal tariffs, but rather the breakdown between both. Connection fees are the price of electrification, and tariffs are the price of electricity, a simple fact that is sometimes forgotten because of the flexibility of cross-subsidies. The poor (and the poorer with some difficulty) are only able to pay for connection when they are located close to the grid line. They rely entirely on the external development of the grid, by the utility or by better-off customers. Neither can the middle-income and better-off pay for the economic costs when connection involves great distances, in relation to the poles needed.

Having low connection fees and not connecting people for lack of investment capacity or asking for connections at real economic cost would have more or less the same impact. It would generate illegal practices because the costs of informal connections are lower. Tariffs that are near real economic cost for nearby connections and slightly above informal economic cost for longer extensions is probably the best way to direct users' funding into legal connections, as well as to minimize the utility's investments in densification and skim the market. Informal connections do not generate a more extensive legal network and do not offer more possibilities for the poor to find themselves near the line. In any case, however, both formulas are discriminatory: low connection fees are the only possible solution to get the poor connected, provided that low-fee connections are really available.

Present constraints on tariffs are definitely the major problem leading to discrimination and the poor's exclusion. Because utilities are asked to extend their tariff

solidarity to new consumers, that is, apply relatively low tariffs to ever costlier clients, they cannot but avoid their current practices: elimination as far as possible of small isolated systems, selection of better-off communities and better-off clients for grid extension, and exclusion or transfer of full connection costs on others. The low-and-equitable tariff policy applied in almost every country systematically slows down the electrification process and gives advantages to a minority of better-off rural clients. This means that it is necessary to build up new solidarities that take advantage of the higher willingness-to-pay of well-off and middle-income clients and that offer both low-cost connections and reasonable tariffs to the poorer. If only for reasons of equity of access, national constraints on tariffs must be eliminated and new solidarities built considering a new level, which is the community.

Considerations on connections, tariffs, and willingness-to-pay take on another meaning when analyzed from the point of view of the community, not only from the utility or individual clients. In both countries, most of the better-off and middle-income households eventually obtain access, with real tariffs within their willingness-to-pay. Some of the poor have no access because, although they could pay for energy, they could not pay for the initial connection. This is a classical Pareto case where part of the community's population gains and part loses, and where a collective solution would be preferable to multiple individual decisions. In other terms, pooling financial resources could allow for connecting more people, and even generate surplus that can be used upstream to better conditions of service. This, however, would also mean a different type of electrification, where the community as a whole would be involved, as will be seen further on.

Subsidies

That utilities have huge difficulties in facing densification costs and making low-fee connections available has little to do with their management capacity. Better management and compression of costs certainly have a positive impact, but this impact is not to be overestimated. Investment and operation costs are not so reducible, and tariff constraints remain.

Pretending that the difficulties of companies to assume electrification investments are caused by tariff subsidies is also certainly wrong. If subsidies were a curb to investment, their contrary, taxes, would facilitate investments, and all private firms would besiege governments to get a higher tax level. The problem is not so much the subsidy level as the capacity of the economy, through taxes, to support this level in a sustainable way. In that sense, a subsidy to investment is the most dangerous one because it is, literally, subsidy on credit.

Subsidy levels are a political choice, on a good or a service to be supported by the consumer and the public budget, just like the tax level is a political choice of a similar nature, which links consumption to the consumer's participation in the national budget. Whatever justifications or criticisms may be addressed to both, subsidies and taxes define

an external environment in which utilities, as other businesses or institutions (such as oil companies or health departments), develop their activities. The problem is not which part of the costs should be paid by consumers, by the company, or by the society—the public budget—but up to which point together they can face costs. This also goes for cross-subsidies, be it a political call or a business decision. What is important is not so much the breakdown of income between consumers' groups, but whether their payments together may face costs.

The electricity business in developing countries has two important characteristics: (a) it is a dynamic business, as is evidenced by the permanent increase in demand from demographic and economic growth, and (b) it has to invest, if only to respond to the needs of its existing clientele, which is valid for all utilities in the world. It also has to develop toward rural areas, which translates into a highly capital-intensive part of its activity, as well as pay for a considerable and ever-growing part of the infrastructure and obtain a decreasing part of energy revenues within tariffs. Unlike other businesses, utilities are lucky enough to have a captive clientele, but they are also compelled to develop toward an ever costlier and less income-generating one among rural areas. In a fully economic and competitive world, there is a break-even point between investments and turnover that any well-managed company should be able to overcome. Market distortions or questionable management styles may move the break-even point up or down.

Infrastructure costs are what they are. Utilities make efforts to cut management costs (as in Indonesia where they use local counterparts as cooperatives). In any case, however, tariffs, not only for political but for sensible marketing reasons, have limits, as do subsidies, and these limits impose a cap to investments. These limits have nothing to do with funding availability. Easy access to international money markets in the late 1970s and early 1980s has contributed to the failure of some national utilities around the world more than bad management, because overly fast development brought consequences that neither consumers, through tariffs, nor the overall local economy as a whole, through subsidies, were able to face. The Indonesian utility had some good reasons to accelerate the rhythm of rural electrification in the golden part of the 1990s, but is now faces harder times. French authorities began to inject public money into rural electrification only after the 1929 economic crisis, mainly to interconnect thousands of small existing grids with the big and then oversized private generation facilities because the biggest utilities had exceeded the break-even point and needed the smaller utilities' clientele and public support to develop the links.

Investment from public participation, external grants, and soft loans are total or partial subsidies, but they are not only subsidies—they are financial commitments—and they are not only a facility, they are a risk. They are money to spend in addition to the funds generated by own resources, which pushes utilities toward the break-even point, and sometimes make them exceed it. Without needing financial figures, the Indonesian

utility, PLN, has all the symptoms of going too fast. Witness the considerable rate of illegal connections and an abnormal volume of protests about the quality of service among rural subscribers. Both the CEB and the PLN may be considered as having passed the line, because they require users to pay for the service and invest in connections, in spite of negative economic and social consequences.

If for sensible reasons—dealing with economic, territorial equity, or social concerns—governments want to subsidize the power sector, the best way is to subsidize consumers and separate the means of investment (such as access to credit) from subsidy schemes. This does not mean concretely giving money to consumers, but rather having "analytical" subsidies given to providers, according to their results: a system used for SHS distribution (subsidy link to sales) that should be extended to the whole sector.

Subsidizing customers can be considered a cash subsidy, meaning that it influences the yearly budget and is likely to be maintained at a reasonable level. Such subsidization depends on the actual operation parameters (connections, sales), promotes transparency within a sector that tends to diversify actors (new operators), as well as electrification modes (conventional, renewable), and is a focused way to support public economic and social concerns. If rural electrification is of public concern, as it is, it is far preferable to have a utility investing in market conditions and to subsidize consumers' access than to subsidize the utility's investment. In other words, it is preferable to use IFC-like terms (market rates) instead of IDA-like terms (subsidized terms) for external loans to the utility, but to support a consistent connection subsidy schemes for consumers.

A truly equitable electrification policy should not plan electrification (who is doing the planning?); rather, it should set up an open subsidy scheme allowing any community or stakeholder to enter the process in cost-effective conditions and with reasonable tariffs. This scheme should be based on analytical subsidies, that is, using the number of connections (the simplest) or equipment (for example, kilometers of line or solar panels), and expressing the different aspects of public concern and economic return for the community (for example, building future interconnections or giving preference to renewables).

Investment

If utilities are actively investing in connecting households in already connected areas, this limits their possibilities to develop the grid toward new villages. If they actively develop transportation lines toward new villages, they cannot face investing too much in connecting households in electrified villages. Other reasons may be given, but primarily because it would be irresponsible management to go at a faster pace because of their own constraints on income and possible access to subsidies. Investment priorities are undoubtedly given to extension over densification, for political reasons and also because there are alternatives to utility's own investment for densification, although there are none for extension. Even if they try to balance as much as possible their effort between

grid extension and densification, they have to face customers' pressure for connections in electrified areas.

Because of their own investment limitations, utilities have no more choice for densification than to ask for future users' participation and to let hooking up develop or leave people in the dark. One can estimate that a minimum of 3 million households have been hooked up in Indonesia during the last five years of the 20th century, meaning that probably more than US$100 million was invested by rural dwellers in distribution, as compared with total public investment (US$650 million, of which World Bank contributed US$250 million) in the rural electrification process over the same period. Amounts in Sri Lanka are lower, but the relative proportion between public and users' investments in the grid probably is comparable.

That users contribute in the financing is not shocking, but that they do it through investment certainly is. This leads to decapitalization of the lowest capitalized part of the economy, because these amounts would have been used in investment or consumption with much more effect to the overall economy.

Second, it is a bad business practice for the utility itself, because this is not joint capital investment but rather access to expensive short-term credit, the worst way to fund infrastructure that is amortized over a long period. Utilities get a loan. Households invest because they cannot avoid doing it, but they get their money back through nonconsumption. Because money is expensive for rural dwellers, the loans are short-term and at expensive interest rates. They lose immediate investment capacity in electrical appliances, reduce their energy consumption growth, and significantly reduce the utility's income among newly gained clientele. For the same price, the utility could even borrow money through expensive loans, at a lower cost, and it would finance it through sales increases, whereas consumers would get better living conditions. The utility, however, cannot behave like poor customers; it pays a higher price because it cannot buy in quantity. Leaving investment in connections to consumers is bad marketing—and a worse one when it comes to illegal connections—because the debt does not lead to the constitution of valuable assets for the company.

Third, this leads to the sale of electrification (the connection, not the energy) as a commodity and thus considerably affects the conditions of equity between customers. The requirement for a large, initial investment creates important spatial tariff inequities and leaves out a significant portion of poor customers in Sri Lanka. A low nominal requirement on initial connection fees is a fake promise when supply cannot respond to demand. If informal responses are given, this generates detrimental illegal practices, as in Indonesia. In both cases, a significant portion of the poor is still excluded because both systems finally lead to the same problem: as initial investments are paid by users, the poor can just make it legally only if they live near the line, and not much further if illegally.

Utilities' lack of investment capacity is thus another major reason for the slowness and inequity of electrification. Two answers may be imagined: one is to accept transferring part of the investment charges to consumers, thereby alleviating constraints through credit schemes; the other is to look for other investment sources.

Credit

Would credit at least solve part of the problem, limit customers' equity capital requirements and facilitate access for the poorest? The initial investment problem is linked to access to money. Rural dwellers claim that they would invest in electrification (line extension or alternatives) if adequate credit schemes existed. Utilities, however, because of their financial limitations, cannot provide these schemes. Market analysis on solar energy often shows that periodic payments more than triple potential sales. People are ready to pay more, on the condition that they can pay on credit. The immediate answer should be to make sure that appropriate credit schemes are available.

Opportunity for credit schemes, however, is not so evident for different reasons. The price of money in rural areas is, as with the price of any other goods and services, the result of market constraints. Breaking up several hundred U.S. dollars' worth of credit into 10 or so payments (short- or medium-term credit) is of little effect for most of the poorer customers, and the longer it is, the costlier. Breaking it into smaller payments (US$1.00 or so—long-term credit) leads to unbearable intermediation and management costs, an important risk level, and usurious rates, which is just how the money market presently is in rural areas.

Conventional banking has little interest in and flexibility for even lending to most better-off rural customers. When they have been able to do it, some utilities have had to develop their own schemes of credit to develop distribution grids at users' cost among better-off and middle-income clientele. In the current state, most utilities—and certainly the Indonesia and Sri Lanka ones—have little or no capacity to do this. An original approach may be mentioned, because it also brings a form of solidarity. In Minas Gerais, Brazil, the utility has developed a tontine system—a very common practice there for selling commodities—to promote connections. The systems is based on clusters of prospective customers, who pay together one forth of the connection costs in four six-month payments, and on a drawing system, in which the winning clusters are connected first.

Does microcredit have a role to play in the electrification of the poor? It could be used for mitigating the impact of minimum connection costs. It could also have a role to play in the dissemination of very small individual solar systems.[5] In both cases, this means breaking an investment of several 10s of U.S. dollars into monthly installments of US$10 or so. A number of new electrification projects in deregulated sectors have

[5] Several ten thousand systems sold every year in Kenya and Zimbabwe.

considered the possibility of helping customers prefinance moderate standard connections among the poor with the support of microcredit institutions. However, the experience is not so good in Sri Lanka, where such a scheme was led by the local utility with a local financing institution (Popular Bank), but definitively stopped because of a failure in reimbursements.

For bigger investments, for instance in the case of grid with significant extension or conventional dealer sales solar electrification, subsidies do not change the range of the initial payment. Reducing the initial payment from US$600 to US$500 or even US$300 may appeal to better-off clients (this is the purpose anyway), but it cannot break the barrier for the poor. Microcredit, then, has a role to play in higher connection prices (distances leading to the investment of several hundred U.S. dollars) and in solar equipment, which is presently disseminated (down to 20–25 Wp, meaning a minimum of US$200–300 including significant subsidies), as far as better-off and middle-income are concerned, because this means breaking several hundred U.S. dollars' worth of investment into monthly installments of US$1.00 or so with, which is affordable to them.

In this case the poor are likely to be excluded, because breaking the cost into monthly installments of a few U.S. dollars would mean long-term, micropayment schemes, for which microcredit has no satisfactory responses. As far as extension costs are concerned, the best, most logical, and least-cost solution remains to incorporate the costs into monthly tariffs of a long-term business, such as power. That is what utilities do when they ask only for a modest connection fee, whatever the distance may be, and what they cannot do after the first investments in a village, for lack of capacity.

In that sense renewables schemes bring interesting lessons. Microhydro schemes successfully solved the problems of access for the poor, but transferred investment costs mostly to the national (and international) community, in unsustainable conditions on a broad national scale. By keeping the dealer sales model, but "cutting the panel into pieces" to break through the initial investment barrier, solar dissemination has proved able to reach more popular markets in countries such as Kenya or Zimbabwe, but people there buy very small equipment and most get no more than a pre-electrification-like service.

Pay-for-service solar schemes are also self-sustainable businesses that reach a wider market by breaking through the initial investment barrier, because the operator finances it and asks only for monthly fees (EDF-Nuon "Société de Services Décentralisés" for 20 villages in Mali). The cost is likely to be a bit more expensive for consumers (if only for the provider's management cost), but experience shows that customers have easier access to it, because the monthly flat rate ranges within their willingness-to-pay—a system that a Dutch-French joint venture for rural electrification is also planning to use for diesel microgrid and solar systems (EDF-Nuon "Société de Services Décentralisés" for 20 villages in Mali).

All this may be summarized in table 16, which shows different credit and marketing schemes and highlights the more socially efficient schemes.

Table 16: Possible and Impossible Marketing and Credit Schemes

Electrification type	Use	Financial product	Provider	Market
Grid	Minimum connection	Medium term (several 10s of US$ to several US$)	Microcredit	The poor located near the grid
	Higher connection costs	Medium term (several hundred US$ to US$10 or so)	Microcredit	Better-off, middle-income
		Long term (several hundred US$ to US$1 or so)	Grid power provider through tariffs	All, including all the poor
Individual solar	Down to 20 Wp	Medium term (several hundred US$ to US$10 or so)	Microcredit	Better-off, middle-income
	All systems	Long term (several hundred US$ to several US$)	Solar pay-for-service provider through flat tariffs	Better-off, middle-income, some of the poor
	Under 20 Wp	Medium term (less than US$200 to several US$)	Microcredit	Better-off, middle-income, some of the poor

Note: Shaded cells of table indicate possible marketing and credit schemes.

In other terms, as far as electrification is concerned, credit as such is only likely to have an impact on the poor if it is long-term credit (with an exception for very small pre-electrification solar systems). And the only long-term credit applicable for the power sector is the one long used by utilities: selling the service on a monthly basis (with energy sales in the case of grid, flat-tariff systems for unconventional energy schemes). Initial capitalization does not have to be placed, with or without credit schemes, on customers' shoulders, who should have access to low-price connections. Microcredit may play a part, then, for the poorest, to face even these modest costs.

Capital

In consequence, the power sector requires equity capital to generate new investment capacities. Development of electrification is not related to more investment capacity of the present system, but rather to more equity that makes investments possible under

sustainable conditions. There is thus an intrinsic relationship between access of the poor to electricity and the injection of capital in the power sector. This is the conclusion that utilities draw when they say that they need partners to achieve electrification. Capital and investment means cannot come just from the public budget; other contributions need to be obtained.

Capital can come from private enterprises or, to a probably lesser extent, from community initiatives. If private capital can find easy financial returns in the electrification business, why then is it so tense and difficult for utilities? Deregulation shows that private investors enter developing countries' power businesses with perspectives and proofs of profit. Independent power provider (IPP) schemes show that private capital could successfully be inserted into sectors dominated by a major public utility. Rural electrification may be the most difficult and least rewarding task for utilities, but there is room for cost-effective activities that can be developed without cost to the overall community and the public budget, and that can give a far better access for the poor.

Opportunities for cost-effective activities exist for four main reasons. First, the utility provides cheap energy. Second, a significant number of clients have a much greater willingness-to-pay than the price they are asked to pay. Third, rural electrification costs are high partly because of the structure of the utilities—not because they are badly managed (even if it is probably possible to improve their management), but because they are not in a position to address small villages and build their clientele without high intermediation costs, whereas local businesses could do better at a lower cost. Four, demand density is lower in rural areas in comparison with the urban context as a reference. Because remote, better-off consumers, however, have a sufficiently high demand density, they are more likely to purchase an SHS. A village, or part of it, may also be a high-density demand spot. There are opportunities, but not for traditional utilities facing the present tariff constraints.

Solidarities

If electricity penury builds up local solidarities between community members, these are spoiled before electrification in sterile approaches toward utility and bureaucracy and definitely ruined when access becomes available in the village.

Penury Builds Social Capital

Analysis of internal (the state of the community) and external (its relation with outside, for example, existing public social facilities, markets) economic and social parameters of village society cannot be described in a simple rich-poor dichotomy, so much as by the links and convergence between community members. The smaller the community is, the more links are important in comparison to differences. The poorer the community, and

the worse its external conditions are, the greater are convergences between the better-off and the poor. Absence of markets is a prejudice even for the better-off, who have few opportunities to make good use of their advantages. Penury of services by nature has a leveling effect. If there is no nearby health or drinking water facility, things are difficult for everybody, not only for poor. If the grid does not reach the village, nobody has access.

Better-off households may have individual responses to the lack of services. For example, if they own a car, they will drive to the health facility far away. They will install an individual pump to get tap water. They will get a car battery–powered television, a small individual electric generator, or a solar panel. These answers, however, are highly antieconomic compared to collective solutions. Similar to the poor, they have a huge interest in having collective facilities—even more than the poor—because they will be in a better position to draw out the benefits of these collective facilities, and because they will save money.

The lack of services unites communities around a common concern and creates social capital. In some cases, this capital leads to action. This is the "little island electrification"[6]—a place mostly abandoned by the state, far from its regulation, with a poor village economy, but with some means because of a significant proportion of migrants abroad. Nobody has electricity. Some rare families then get small individual gasoline or diesel generators (often because of the support of migrant members of the family). They begin to connect friends, relatives, and neighbors on sometimes an informally operating cost-sharing arrangement (fuel cost, contributions in case of failure), or even provide energy to some collective facility (temple or mosque, for instance). The foreign migrants play a major part, and the shared interest between people living locally and migrants abroad brings new initiatives, such as wells, dispensaries, and electricity. After all, the migrants envision retiring in their native villages, but under what they now consider a normal, decent standard of living. A more or less organized group of better-off households buys a second-hand generator, the less well-off provide labor, and a rather rudimentary power distribution system is established.

The existence of electricity cooperatives, because of public support, as well as the incapacity of the utility to quickly reach its community, is also an emanation of local social capital, even if development of the cooperatives, which are dependent on access to public funding, is often quickly driven by central authorities. In Indonesia, the KUD program is involved in electricity distribution and renewable energy development. In Argentina there are about 600 electricity cooperatives, born in small towns where the national utility was unable to reach. They often have multiple activities (for example, telephone, water, liquefied petroleum gas (LPG), ambulances, libraries, and funeral

---

[6] Small island context, such as in Cape Verde (migrants to the United States) or Comoros (migrants to the Middle East or France), or zones with important migration toward Europe (regions of North or black Africa).

homes), face lax management and bill recovery problems, and are threatened by national utility privatized heirs. They have, however, about 1 million clients, generate 25,000 direct jobs, and deliver 75 percent of the rural electricity, that is, 10 percent of the total national power demand (FACE 2001b).

Impotence may also convert this social capital into aggressive action: "blood was even spilt to obtain light" reports a Bolivian farmer on demonstrations to get electricity (FACE 2001a). In a Panamanian village, farmers threw the utility's generator, together with the utility's visiting engineers, into the river because repeated breakdowns constantly deprived them of electricity and drinking water (OEA-France regional energy project in Central America, 1983–85). The general meaning is that social capital has no possibility of being converted into action other than trekking among administrations (that is, going from one office to another), searching for political support, or recriminating (from complaining to demonstrating).

Electrification Spoils Social Capital

If the lack of electricity is a collective concern for the village, if bringing electricity to villages is a collective concern for the national community, electrification spoils the local social capital. Electricity draws the social map of communities, with a clear distinction between those who have electricity and those who do not, which makes it easier for new social science analysis: electrification becomes a parameter of poverty within the village community.

Rural electrification solidarity stops at the community's gate. Each household must confront its willingness-to-pay to standard price tables, and must decide for itself. Connections and constitution of the final loop are the fruit of individual decisions; that some of the poor get access is the fruit of spatial coincidence.

Illegal sharing of electricity (a household making an illegal extension and connecting it to another house) is not really a form of solidarity. Rather, it is fundamentally a business decision. The newcomer pays more than his share of the connection and bill to use the other's facility, and indeed, more than a regular customer. This is the exact expression of the poor's economy: when you cannot pay a lot at once (for regular extension), you pay more.

That electricity, as any commodity, marks poverty is not shocking. The level of the electricity bill is a parameter by which to evaluate income differences in urban areas. Grid electrification, however, is a different matter. It segregates those who can pay for it with cash from those who can pay for it with credit, and from those who cannot pay full cost connection in any case, but can pay for electricity. The current electrification does not call for solidarity. No regulation mechanism is designed to promote links between the better-off and the poorer. Social capital built upon the absence and the desire results in fraud when only a few can get the service.

Market Solidarity

Renewables, such as solar programs, break spatial frontiers, not social frontiers. They bring a solution to the better-off in a form that leaves no opportunity for energy or cost-sharing. Community interest for grid electrification may fade (as the better-off are served), but generally remains intact: the poor look forward to minimum service (the service the better-off now have) and the better-off for more service (powering an iron or refrigerator). Development of solar energy relies on another form of solidarity—"market solidarity,"—in which the better-off pay market development costs (although they are at least partly addressed by national solidarity through subsidies), which allows for setting up a good commercial and after-sales logistic and for penetrating more deeply into new market segments with fewer financial possibilities. This solidarity, however, makes sense for the poor only if there are proposed affordable products (smaller systems); it will be a long process before solar power finally reaches the poorest.

Grid electrification itself is based on this market solidarity. This is what is left after eliminating any cross-subsidies and any public financial support to rural electrification. The power distribution business in urban towns, when managed properly, generates a surplus that can be dedicated to the development of its clientele in rural areas. Although country studies have mostly been focused on rural electrification, a similar "market solidarity" may be established on energy conservation and demand-side management. Programs undoubtedly benefit first and largely to modern sectors of the economy and better-off households. They indirectly benefit the poor, however, through the consolidation of utility systems and the reduction of technical and management costs, with positive consequences for service quality and tariffs for all customers, as well as extension investments for those still awaiting electrification. They generate market dynamics that eventually will cause electricity to reach the poor (such as the availability of more affordably priced low-consumption lamps and appliances).

The Poor's Turn Will Come

Although these market dynamics and their effects must not be underestimated, they cannot be used to justify that, for electrification as for most other things, the better-off will get access first and the poor's turn will eventually come. Justifying that it is only necessary to accelerate the present electrification process, with more funds, with better management tools—this has been the thrust of all-public rural electrification, and it remains the thrust of new power sector politics (that aim to fuel the process with more investment capacities—better-managed utilities, more external public funding, private capital). It cannot be justified that many rural households remain without access, not just the poor, which are the most difficult and costly clientele to address. How can one justify electrifying only one poor household if one could electrify two others, whatever their income may be, with the same budget? Finally, it is necessary to consider the existence of a specific group—the poor—who are naturally excluded from private dynamics. The

electrification of this specific group can only be addressed at a high cost—with soft money—with some social external funds, provided that these funds do not compete with the real electrification budgets.

Not only do solar firms market electrification as a commodity to final users, logically, but also conventional utilities. This kind of marketing results in the better-off getting it sooner, and the poor having to wait their turn. There is no collective concern to oppose the current marketing of electrification, and public responsibility for universal access remains wishful thinking. This just means that it is necessary to reconsider how to market electrification, because if electricity is without a doubt a commodity, electrification definitely should not be one.

10 Knitting Electricity

> The new Law gives municipalities the ability to authorize a power distribution monopoly by concession.
>
> Minister of Civil works, France, circular to Prefectures, 1908

Rural electrification policies should not (only) consider electrification a one-way phenomenon of grid extension from large centers to villages, and from villages to hamlets. It would be better if they saw it as the multiplication of local initiatives that may progressively knit together into larger systems, in line with the historic example of rural areas in a large number of industrial countries. This would require reformulation of power policies and regulations, with a clear distinction between transport (connecting communities) and distribution (connecting individuals), the former developed by large utilities and the latter by new promoters (IPDs) who invest new resources for electrification. This would relieve political and financial pressure on the main utilities. It would also promote a more poor-friendly electrification because the rural community appears to be the only place where public social concern may apply toward a fair and equitable access for the poor.

Marketing

In Indonesia, Sri Lanka, or in any developing country, the power sector' vision of the future and general objective is unique: overall system interconnection (nationally or at least by island, in the case of archipelagos, such as in Indonesia). This objective makes sense. What is open to criticism is to think that there is only one way to achieve it.

Waiting for the White Liner

Better access for the poor requires a comprehensive electrification policy, that is, a long-term vision of completion of electrification. Deregulation and privatization may appear necessary to improve the power sector efficiency and may, although in a limited way, better the conditions of rural electrification by main utilities. Deregulation and privatization, however, do not break through the vision of a grid developing from cities to villages and from villages to hamlets in a progressive extension from denser to weaker demand areas.

This is the dominant vision among electricity specialists and politicians of developing countries, comparing their incomplete systems with fully interconnected systems in industrial countries. This wishful thinking is easy to understand, and the dynamics is linear: extend the grid each year a bit more. This also is the dominant thinking among the unelectrified population, who patiently wait for the arrival of electricity without being able to exercise influence on this process.

Alternatives to grid schemes have been able to shake this perspective, but they do not fundamentally challenge the long-term vision of grid extension. Part of their future is simply seen as new ways to generate grid electricity, such as wind farms, for instance. Individual systems are perceived to be a transitory solution (waiting for the arrival of the grid), to prepare for more permanent territorial marking (the solution for remote regions, where the grid will prove to be too expensive) or, for more ideologists, the after-grid solution.

Is the ultimate objective of electrification to complete all interconnections in a country? Technological development already offers individual renewable energy alternatives, and it may offer even more in the future. Development of cogeneration, with electrification a subproduct of heat or industrial energy, may break through the natural monopoly of utilities and push modern power sectors to fragmentation, as it already occurs in some industrial countries.

Although interconnection appears to be the most reasonable objective for a large part of countries' territory, there could be confusion between the ultimate objective and the process followed. Considering the present state of modern interconnected systems in the industrial world, electricians should not forget that many of these systems were built not by extension, but by knitting together thousands of microgrids. The French power sector has often been considered by utilities a typical example of a successful publicly run central utility with regard to adapting an existing sector to economic growth and demand patterns in the second half of the 20th century. Most electricity sectors in the industrial world have been built primarily on local community empowerment and private initiatives.

As painful and costly the process may be, progress is made and village after village is connected. The percentage of total villages connected—national coverage—is increasing. Is the debate on the conditions of rural electrification over, or is it a rearguard debate that will soon be without object because all communities will have access? This is not so, for three main reasons. The first reason is that this progress is at the cost of forgetting to provide service to a large percentage of poor households, or households connected in disputable conditions (informal hook-up). The second reason is that even if national coverage is progressing, the remaining unelectrified areas and villages are more remote, more expensive to reach, and more deceiving in terms of expected energy consumption and income for the utility. The third reason is that once village electrification is

completed, a large part of the population will remain without access—those living in remote hamlets or dispersed housing.

Economic Rationality

Economic rationality is another main reason that justified an early centralization of the power sector in developing countries. Small isolated energy systems are expensive, and most utilities have developed their grids in such a way as to eliminate these systems as soon as possible. Interconnection has considerably reduced electricity tariffs, and it would have been unfair to deprive all consumers of this immediate benefit.

In the context of the present deregulation belief, planners prefer that rural electrification be done through large concessions for big private operators, generally from foreign utilities or similar large water or telecommunication companies. This appears sensible: a larger investment capacity, lower tariffs for consumers, better and more general access, and increased technical and management efficiencies

This economic rationale goes against local market realities, however: commodity mass markets are built on a low-investment, high-price principle. Take, for example, kerosene. Because of income limitations, customers are not able to buy kerosene by the gallon at low prices, although they are willing to pay a consistently high price associated with very small quantities, such as by the glass or half liter. In view of this decentralized and low-intensity demand, a widely decentralized network of small retailers exists, each with limited resources (a few bottles). The turnover is quick enough to minimize capital investments, and resources are shared, if necessary, between different levels of wholesale and retail, with each level increasing the final price to the customer.

Intermediaries are often considered a pest, and with prices for basic needs commodities of public concern, laws sometimes impose the same price per liter irrespective of the volume in which it is sold. Independent retailers are totally prohibited, and one distributor is appointed to sell kerosene, because he already has a successful business selling it at the pump to better-off consumers. He continues selling to better-off customers and develops some sales in small volumes at the same price per liter. He does not put in much effort, because margins are small, and sales do not compensate for immobilization and decentralized commercialization costs. Many poor households cannot invest in a gallon at a time, so they shift from kerosene to wood. Because this is of public concern, the wholesaler is invited to develop retail shops. Even if he does, he will lose money on this part of the activity, and it will become cost-ineffective. He goes on developing a retail network, but now with public subsidies; kerosene prices are likely to go up in the process and reach the level at which it would have been with independent retailers. In spite of these efforts, the kerosene usage rate remains too low.

Economic rationality does not only mean least-cost for clients, but also the adaptation of the overall supply chain to the conditions of low-density demand and minimum capital investment supply. The concept of national utilities as large systems spreading among scattered clients with a distribution grid of about 10 meters and a monthly bill of a couple

of U.S. dollars (for about 20 kWh per month) is not feasible. Low-density demand leads to decentralized supply, as is found in the handicraft or cottage industry, if production can be split, and in the wholesale-retail chain if production is centralized, because large producers need clients to buy in large quantities. Small clients bear the final costs, because this is the price to pay for access.

Would clients bear extra costs induced by intermediaries selling electricity at the village level without fixed-tariff constraints? Let us take an example of a model village called Communityville (figures were taken from the model in appendix 3), which comprises 100 households, that is about to be reached by the grid.

Communityville grid (1)

Utility

A breakdown of consumers by social ranking (to include the better-off, middle-income, and poor types) and extension distance to what would be the climax distribution grid is supposed, as shown in table C1.

Table C1: Distribution of Households by Social Level and Distance from the Grid

Social level	Distance to the grid			Total number of households
	Near	Moderate	Far	
Better-off	60%	30%	10%	20
Middle-income	50%	40%	10%	50
Poor	30%	50%	10%	30
Total	42	48	14	100

Extension distances are arbitrarily taken at 100 m for "moderate" and 200 m for "far," meaning a total extension network of 7.6 km if everybody were connected, that is, 76 m per house (plus the admitted distance covered by the connection cost). The utility comes, people make their choices for connection according to their possibilities and the dynamics described in the chapter 9 and, after some years, the results are as shown in table C2.

It may have taken some time (say, 12 years, to give time for everybody to decide and fund the extension and connection costs), but the result appears satisfactory as a whole: 79 percent of the village electrified. The result is less satisfactory for the poor who can only assume connection, but not extension costs: only 30 percent of the poor have access.

Including extension fees (US$1.00 per meter) and monthly energy bills, household budgets for electricity are as shown in table C3 (prices for the poor located at moderate and far distances are mostly theoretical, because they cannot afford to pay for it).

Table C2: Number of Connections after Some Years, by Social Level

Social level	Distance to the grid			Total
	Near	Moderate	Far	
Better-off	12	6	2	20 (100%)
Middle-income	25	20	5	50 (100%)
Poor	9	0	0	9 (30%)
Total	41	24	14	79 (79%)

Table C3: Average Monthly Costs of Electricity, by Distance from Grid and Social Level

(U.S. dollars per month per family)

Social level	Near	Moderate	Far
Better-off	4.00	4.80	5.60
Middle-income	3.00	3.80	4.60
Poor	2.00	2.80	3.60

Independent operation

Let's imagine now that the utility brings electricity to the village's gate. An operator may distribute electricity to the village on three conditions: first, he will assume responsibility over initial investments of the local loop; second, he is required to connect everyone in the village (universal access); and third, he gets the benefit of national solidarity, which translates into the possible difference between connection fees and actual connection prices (through investment subsidy), purchase of energy at present cost (final user's former price minus utility's local management costs).

The operator invests in the extension and connections in order to have all 100 households connected. To make things simple, he sets up a moderate connection fee of US$20 (he could also ask 4–5 months' worth of consumption as an advance—this would give more benefits to the poorest) and doubles the nominal tariff of the main utility, in order to get a minimum 15 percent rate of return on his business, with the hypothesis of zero demand growth. Consumers will now pay a real monthly cost, as shown in table C4.

Households do not pay for investments (for simplification, good management would require them at least a modest entrance fee, but this does not change anything to the results), so there is no investment barrier, and climax electrification is reached in 1 year, not 12. Conditions of electrification are the same (metering). In spite of the 100 percent nominal tariff raise, the bill remains within the willingness-to-pay. This rate, however, is theoretical and only valid for those who do not have to pay for extension. As soon as extension is required (for more remote clients), consumers pay the same or even less in the new formula.

Table C4: Average Monthly Costs of Electricity, According to Electrification Mode (U.S. dollars per month per family)

Social level	Monthly bill (main utility)	Monthly bill (new operator)	Before electrification	WTP
Better-off	4.0	6.10	6.00	12.50
Middle-income	3.0	4.10	3.00	6.00
Poor	2.0	2.10	1.00	2.00

Note: WTP stands for willingness-to-pay.

As a whole, this represents for the whole community a raise of less than 3 percent of the cost of electricity, because the formula first corrects spatial inequalities. Whatever people's situation in relation to the village grid, they pay the same price. So the formerly lucky ones, among them a good share of the better-off, now pay more to have the remoter ones pay less.

The poor are among those who benefit the most, even though their tariffs are higher than under the normal scenario. This is the price to pay for all to connect, but even for the poor the tariff remains within their willingness-to-pay. And nothing impedes further internal social cross-subsidy between consumers. The better-off, for instance, are still widely benefiting under this formula compared to their new budget with pre-electrification and willingness-to-pay. Tariff scaling could lead to budgets of US$6.50, US$4.50, and US$1.00 instead of US$6.00, US$4.00, and US$2.00 yields more or less the same cost-effectiveness to operator.

No further subsidies than the existing ones are required, because final loop extension is funded through tariffs. This means that 21 percent of the village population (our 21 poor households excluded in the present formula) have been connected to the grid only by regulatory changes and at no extra cost to the national community. Our example is a best buy and is not fully reproducible, because in reality, part of the clientele is too far from the lines to be electrified in economic conditions acceptable only through tariff leveling. It does allow, however, for the elimination of the existing disparities in a given radius, and electrification of all the poor in this affordable area, which translates into considerable progress in regard to the current social conditions of electrification.

No preference is given at this stage about the nature of the local operator (such as private community association or cooperative, or NGO) because all options are possible for reasons of cost-effectiveness. The operator invests about US$17,000; his return will be more than 15 percent—and higher as demand grows (some new appliances, some productive activities). He creates a local business, and the employment balance within the village is similar to or better than the previous formula. He may invest in new users, providing distances do not disturb the overall equilibrium. If this is an isolated operation within a main operator area—on a bigger scale than in the given example—possible (but rare) major technical failures may be dealt with through a maintenance contract with the operator (just like those in many countries, between community-managed grids and main energy supplier).

The previous example shows that an independent producer, relieved of the utility constraints, with own means of investment, may do better at similar cost for himself and for customers. But why create new businesses? Why can't the main utility, with all its technical capacity and experience, do it—and do it better? It cannot because, first of all, tariff constraints impede any local flexibility. Second, the investment required to

complete universal access in the village unsuccessfully competes with other requirements to draw the line further toward other communities. Under the new formula, the main utility is far from losing. It gets rid of the necessity to be responsible for, organize, finance, and control the development of the final loop; it saves on heavily decentralized distribution management costs (as soon as there are not one but several similar operations); and it still gets the same income from sales but with lower collection costs because it only deals with one client, the operator, and not with all the individual clients.

The largest winner is the public, because it can now apply the missing collective concern to electrification. Grid electrification means transportation of electricity to communities and distribution to users. Separating the two functions, leaving the first one to the main utility (or to specialized energy transporters in deregulated power sectors), and creating IPDs allows public authorities to dictate conditions for equitable electrification, with regard to spatial and social equity. The same concern has always underlined electrification policies and resulted de facto in unusable practices at the national level because of market and economic conditions. It is, however, possible at the community level in a cost-effective way, as described above. This also liberates the utility's financial, technical, and management capacity, and it can concentrate on what it does best: generate and transport power and energy, and progress toward villages at a faster pace.

The utility has all the competence to develop and manage a distribution grid, but the community does not. Does this lead to overly complicated task for the community, one that it cannot properly handle? This is a matter of choice—between looking for a community-based operator (such as a local cooperative) and relying on an external (but not necessarily foreign to the village) private operator.

All this is summarized in table 17.

Table 17: Comparison between Main Utility and Independent Power Distributor Solutions

Actors	Effects	Distribution by main utility	Distribution by local operator
Consumers	Winners	All better-off and middle-income connected. Those located near and at moderate distance from the grid get cheap electricity.	Electrification rate 100%. Poor all connected.
	Losers	Middle-income located far from the grid. Seventy percent of poor without access.	Better-off. Middle-income subscribers located near and at moderate distance from the grid.
Main utility	Pro	Social prestige.	Liberates investment resources for village connection. Less cost, better income.
	Contra	High investment, costly and low return part of activity.	Loss of social prestige.
Local operator	Pro		Cost-effective activity.
	Contra		New business, no operator with experience.
Community	Pro	Experienced provider.	Everybody connected. Local business in village. Quality control possible.
	Contra	No control over electrification rate or service quality.	Three percent increase in global cost of electricity. New responsibility, no experience.

Unelectrified Poor in Already Electrified Communities

What about unelectrified households in already electrified communities? There are once again two answers. The first answer is to keep the present scheme of the main utility-managed distribution grids: (a) When credit is not already available, use microcredit institutions to assist the poor located near the line who do not connect because they

cannot meet the connection fee. (b) Offer the possibility to households to connect in proper legal conditions for a price not so far above informal ones (US$1,000 per kilometer is not so bad) and at their own costs. None of these measures would have any effect on the poor, but at least they would reduce illegal hook-ups, and ensure that the utility constitutes viable assets. (c) Find solutions to electrify the poor at a moderate distance (where the grid is still competitive with other solutions) on specific community funding after a certain number of years of demand-driven electrification. This ultimate solution is used in industrial countries to complete networks when demand-driven and economic dynamics are saturated, and where there are still holes. For instance, in order to reduce spatial inequity and promote sustainable development, the French local communities are now allowed by law[7] to build their own cellular phone or high-speed communication infrastructure in zones left out by economic dynamics, and lend this infrastructure to private operators. All this is possible, although costly, to users and national community.

The second answer is to transfer power distribution to the community level. An operator may apply own tariffs on the condition that he completes the electrification of the remaining households in an acceptable area. When electrification has been conducted under legal conditions, this is easy, in the sense that the investment will address only a small percentage of newly electrified households, with a moderate impact on tariffs. Things are slightly more complicated in a village with a substantial percentage of informal connections, but the situation may be handled as follows: connections of new households and progressive upgrading of informal—but now recognized as transitorily legal and operative—connections.

Decentralized Electrification

Establishing by regulation the existence of IPDs has another major consequence: it liberates distribution from the grid constraint, allowing the building of similar decentralized distribution schemes where interconnection is still a ways away for some years or is really expensive. The village is an "island" of relatively concentrated demand that does not have to wait for the interconnection to materialize. Let's take again the example of Communityville, but now without access to the main grid.

[7] Law of June, 1999. In the case of cellular phone, "near-completed" national coverage still leaves 1,500 municipalities without access out of 36,000. High-speed telecommunication is expected to be durably cost-ineffective for about 30,000 municipalities (except for satellite, which is a lower-quality solution), meaning 24 percent of the population, but 80 percent of the municipalities, all rural.

Communityville electrification (2)

Sticking with our example, an operator is in charge of electrifying the village of 100 households—but now without the availability of the national grid energy. He may contemplate solar or grid electrification with or without low-consumption devices, or a mix of all these solutions based on two main criteria. The first and most important one is to know what his future clients want. The second is the impact it will have on his investment and cost-effectiveness.

General feedback from qualitative and quantitative evaluations show that people, when asked for their preference, would not easily choose to have solar power. This may change when the solar market consolidates. In our village, where houses are rather concentrated, the grid appears to be the least-cost solution. Because of the existence of at least a dense village core, it is a cost-effective solution and, for the same return, a smaller investment for the operator, who then chooses the grid solution. What are his margins of action now?

He cannot cut the cost of distribution grid or microgrid, because he has been asked to ensure compatibility with the overall system for future interconnection. It is in the operator's own interest, because arrival of the main grid would mean a cheaper source of energy. He can play a bit more with tariffs than when the grid is already in place, within the estimated limits of willingness-to-pay. With regard to production, the figures are simple: the smaller the better and the less fuel-consuming the better, which justifies investing in indoor connections and compact fluorescent lighting, and saving on meters when only lights and television are concerned. Refrigerators, irons, and engines are possible, but only with meters and a special tariff to cover the power and energy consequences. With these parameters and associated generation costs, the operator concludes that it is impossible to connect all villagers under the existing economic conditions—too much investment and too little return. He then faces a choice between different options.

The first option is to build a denser microgrid, keep the good and potentially better consumers (the better-off), and drop the more expensive extensions. The consequence of this option is that a portion of the poor and middle-income households that would have been close to the grid line are now farther from the reduced grid and not worth connecting. The microgrid now meets the clientele listed in table C5.

Table C5: Clients of Decentralized Grid

Social level	Near	Moderate	Far	Total
Better-off	12	6	2	20 (100%)
Middle-income	20	25		45 (90%)
Poor	4	7		11 (37%)
Total	36	38	2	76 (76%)

Because the operator has been taking distance, not willingness-to-pay, as a selection factor, discrimination is more spatial than social, although the results are more or less the same. He connects a few more houses than the main utility would have done in the case of the grid (76 against 79) and somewhat fewer houses for the poor (11 against 9). The reduction of the microgrid is a wise entrepreneurial decision, because he now gets an acceptable return on his investment. A quarter of the villagers, however, and two-thirds of the poor still remain in the dark.

If by law the operator needs to electrify everybody in the village, including the poor, he should be allowed to claim subsidies. He also has another option: to find other good customers to make the overall activity cost-effective while including the poorer. Extending the grid out of the village is impossible because it is too costly, although he could disseminate individual solar systems as the next best option (compact fluorescent lighting and television service is similar to the service he provides to basic microgrid customers, with similar flat rates). If he can skim in the surrounding 100 solar customers—half better-off and half middle-income households—he can get an acceptable return on his global investment. And, because electricity is a dynamic business, he will progressively extend the grid toward a portion of these clients, connect them, and encounter new clients to reallocate the panels.

People's Choice

The entire process of electrification is presently built on the principle of technical immanence, planning infallibility, and the irresponsibility of rural populations.

Clients

People's choice would be a revolutionary concept in electrification. Rural dwellers are supposed to wait for the grid. Nobody can begin distributing energy to neighbors with a diesel generator without incurring the wrath of the law or, at a minimum, asking for permission from a ministry. Neither have renewable energy schemes changed the situation: if distributors may act more freely, programs will be technology-oriented and leave no choice to people.

Grid developers are convinced that they pursue the best electrification possible. What is the use of knowing the people's choice—if they have a choice? There is no doubt that the grid provides the best, most flexible, and potent service, but the grid is built at the price of uselessly exhausting public efforts, and grid electrification is delivered in an

inequitable way, leaving many of the poor behind as if it was an inevitability. Why? Because people are not asked which grid electrification would be more useful, suitable, or socially acceptable for them, and how they could participate to obtain it.

Most decentralized energy programs are built and funded in such a way that other alternatives are excluded. The diesel microgrid is mostly discarded, because programs are fundamentally technology oriented, and most of the time cannot attract interest for the technologies and interest of the communities. Because solar energy is suitable for immediate markets, it is developing among communities for which diesel microgrid could be a more cost-effective, socially sound, or even acceptable-to-pay solution. Microhydro programs are built exclusively on the availability of the renewable resource, not on the search of the best long-term electrification for the community, which would probably require a mix of hydro and diesel generation.

Renewables now use outdated power regulations as a global protection barrier and specific funding to discard alternatives. Because they could provide a chance for people to get access to service, they should find a place in community electrification. This is particularly the case when and where they prove cost-effective locally, without or with specific subsidies because of their environmental benefits.

It is logical for energy providers to sell their specific solutions. As far as electrification is concerned, however, there should be a way for clients to choose the best solution from among all that are available according to their economic, social, and environmental concerns and their willingness-to-pay. There presently is no such choice, and rural dwellers are not clients, but rather beneficiaries, a term that belongs more to charity than the business world. If there is a negotiation process within energy programs, it is never between program managers and clients; it is always between program managers and funding sources. Once this is done, the game is over, and people are supposed to be happy to receive what they get. Through rules—a unique operator for rural grid electrification—and through money—subsidies going only to grid or renewables—people are left with no choice.

Communities

This leads to another point: the authorities merely consider the frustration and criticism expressed by villagers over access and service (on decisions, quality, and prices) to be irresponsible. Rural electrification is a product of national solidarity and a financial burden for the utilities and the overall economy. Service quality is partly caused by technical constraints, and renewable energy, whatever its limitations may be, is better than no electricity at all. Prices are already subsidized and cannot be substantially more subsidized. Villagers may have some good reasons to complain, but some of their complaints are irresponsible.

Common villagers, as well as community leaders, depend on the national utility's planning and goodwill. They have no course of action and no influence on the electrification process apart claiming their right. They transmit repeated and generally

unsuccessful administrative requests or look for some political support (with all sorts of suspicions about others' practices). When finally getting grid electricity, they depend on a huge monopoly, which has little means—and sometimes little will—for public relations. With regard to access to renewable energy schemes, their margin of decision is somewhat larger, but often none. When coming to villages, alternatives have already been defined, based on national planning, technology choices, and funding constraints, even if in their execution they offer more flexibility (see chapter 11).

Irresponsibility is fundamentally the price to pay for deliberate choices in the subsidiarity chain. The principle of subsidiarity applied in the case of electrification has led decisionmakers to skip all levels up to the highest, the state, because it was based on a monolithic vision of a national grid progressively expanding its branches until the last village, and because no other decision level exists to take charge of this national challenge. Deregulation does not necessarily break through this approach when electrification responsibility is transferred from utilities to energy departments (or even decentralized provincial government bodies) that are in charge of setting up authorizations or concessions for new operators. In spite of some community-based projects, most alternative programs, based on an overall vision of national complementarity of renewables and grid electricity (alternatives go where the grid does not or will not for some time) also confirm the state as the primary decisionmaker. The community's responsibility is still to build.

Is the transfer of responsibility to rural communities realistic? No community is perfect—and the local ones no more than the national ones. Let us only quote the coming report of *Voices of the Poor*: "There is increasing evidence that, whether in forestry, irrigation, rural roads, urban toilets, sewage, credit or drinking water" (and let us add electrification), "poor people make wise decisions and able partners, and they protect their communal and private investments with care and vigilance that far surpass those of any government security watchmen."

Knitting Electrification

There is another possible choice, that refers to the history of electrification in Europe: to give back local community control and initiative over their own electrification, and to progress toward interconnection not only through grid extension but also through the multiplication of small local systems.

Power Sector

Large utilities meet important difficulties in their rural electrification efforts, and they face structural "frontier" problems and limitations (costly development and management of new rural clientele). People's desire for electricity is poorly valorized, which often leads to frustration. Private capacity for investing is poorly exploited. Many reasons to

think over the knitting approach for developing power systems, or an electrification that (a) gives more freedom to the primary utilities to develop the transportation system and reaches more villages more quickly, separating transportation and distribution functions; (b) gives to unelectrified communities the right to choose their electrification and their provider through relevant regulation; (c) promotes the development of decentralized systems in a technically neutral approach (people and stakeholder choice); (d) keeps overall rural interconnection as an dynamic option and a final objective for most of the territory—economics will logically lead the sector toward more and more interconnected systems—and (e) supports renewable development where it really belongs, when and where it is locally the best solution, according to local people's and stakeholders' choices and constraints.

The Knitting Principle

Capacity of investment and cost-effectiveness are key aspects in the development of electrification and are the two major constraints for quick extension of the grid. Solar energy successfully shows that at the individual level, a solution may be effective in absence of the grid. The better-off family that buys a system is an island of sufficiently concentrated demand to justify the equipment in the midst of a low-density demand. Decentralized IPD electrification is built on the same model, but at a collective level. The community is an island of sufficiently concentrated demand to justify the presence of an operator and a system.

This does not necessarily mean "one community—one system." If conditions of investment capacity and cost-effectiveness are met, one system may serve different communities. It is in the interest of both operators and customers to build the largest systems when distances and interconnection costs allow it. As mentioned in the kerosene example, however, intermediation and management costs quickly soar when dealing with large distances and small quantities, and large companies have difficulty progressing (ask utilities about this!). Small investments are more within the range of local stakeholders. Proximity may be a critical parameter for an IPD, since it is sometimes because of independent power producers (IPPs) that stakeholders feel more secure to invest in their own or their family's community. Small size often means more concentrated demand, which in turn means a better return and feasibility. Knitting begins mostly through the multiplication of small stitches.

Once the smaller "stitches" are established, they take on more value for bigger operators, and as systems are built, clientele is established. Growth of demand in nearby stitches make interconnection more attractive, because investment on interconnection may be paid by lower generation, and up to a certain point, lower management costs. Clients find their interest in dealing with a larger company (lower tariffs, better technical capacity), as do nearby unelectrified populations (better investment capacity, possibly nearer grid due to interconnection). If rules are properly set, merges and takeovers are realized in good conditions for the new company and possibly the former owner, who

gets a profit from the sale that remunerates its past efforts. Knitting goes from stitches to decentralized rows.

Some of the stitches may remain small and perfectly adequate, but get cheaper costs and provide better tariffs to its people if they are not so far from a cheap source of energy: hydro IPP, for instance, the main grid, or another bigger stitch. As soon as demand grows, local operators begin to have a financial interest in getting this cheaper energy and investing in connections. Bigger systems are now possible and, from stitches and rows, interconnection builds itself on private capitalization and the income of local rural subscribers, in complement with the effort of the main grid extension, which relies on urban subscribers' income and public efforts. Knitting is not an alternative, but rather a complement to the primary grid extension. It builds up local systems, paves the way to local interconnections, and finally leads to their connection with the main grid.

Knitting electrification relies on people's choice to pay a slightly higher cost in order to obtain electricity now. It is a deflationary process, because as demand goes up, tariffs go down. It relies on private or community investment, and relieves the public budget. It relies on sound economics, since it does not need to build extensive and costly links with low demand spots; rather, it builds demand to make these links progressively cost-effective. It also provides quicker and more socially equitable access to rural dwellers, because public concern can now be applied.

Community Empowerment

Knitting electrification is the missing link between grid extension and individual solutions, and it is community-based. In the example given of the creation of an IPD buying bulk electricity from the grid, the better-off near the grid pay for the remote poor's electrification. If a choice is given, they may be somewhat reluctant, because nobody likes to pay twice for the same service. Social concern is the expression of a community wish, although it also leads to individual constraints. It is public responsibility to translate it into rules and facts. If the national level has to build rules, only the community level can apply it properly.

Villages are not 100 family packages separated by walls. Each one has its population number, density, spatial configuration, economic dynamics, and social composition. Conditions of electrification will be rather different from one to another. The example given was small and compact enough to warrant consideration of immediate electrification for all, from the better-off to the poor, and the result cannot be taken as an absolute rule: the creation of an IPD is not to electrify everybody at once; rather, it only allows for more people, and particularly more poor people, to be provided electricity.

Who is in a position to judge the pertinence of the basis of the clientele and the choices for progression, of the territorial constraints (density, localization of needs for power) and social parameters better than those at the local level? Who is able to play the role of a responsible consumer and evaluate service quality and contract compliance more than those at the local level?

Even if equity is a national concern, communities and their representative local governments are in the best and possibly even the only place to translate this concern into reality. It is their first interest, because they are the ones who get the service, to define the conditions of their electrification and lead negotiations with operators. And it is their responsibility within the subsidiarity chain, because it cannot be left in the hands of individuals or private groups, and because national level cannot appreciate all local realities. The best subsidiarity level may be the community itself, when electrification concerns one village. It may be an intercommunity body through which several communities consider a common electrification scheme.

Whatever their weakness and institutional fragility may be, even if they need comparisons and guidelines, the communities are perfectly able to judge the service and tariff proposed because they are the ones who will get the service, and the ones to put their money in. Some local governments may want to a develop community-based managed service, provided that they can find the required investments and local management capacity. Others, probably a majority, would prefer to be just customers, once the conditions of service and prices are defined on a community basis.

Making rural communities responsible of their own electrification would help them understand better the constraints and costs. New solutions, new actors, and new local solidarities could emerge, not only to protest the absence of electricity, but to design it and make sure it works. Women, who appear to be major energy actors—because many are responsible for family budgets and manage energy expenses—could express their concerns and choices better. If villagers are still worried about renewables, they could learn more about the possibilities they offer, and their bias-free choices on the technology would have positive consequences concerning image and market development.

Knitting must be built up on the full responsibility of local communities, giving them, through regulation, long-term concession rights over their electrification. They should be entitled to sign concessions with operators, to control the execution of concessions, and to fulfill commitments and service quality. Rules must be defined, for which support is certainly required—both of which are state responsibilities—but community empowerment is a condition for knitting development.

Operators' Investment

Another condition is to find operators who will take charge of the activity. Experience shows that it is far better to avoid any confusion between local governments and the power distributor's administration and budget. Once said, operators may be either private or community-based (a cooperative or the equivalent). Both formulas have pros and cons. Private operators are logically expected to consider their own interests before the community's. Cooperatives are community-based, may be smoother on payment difficulties (which is a dangerous practice) and are reputed to have loose management, but they may also be less efficient than private operators.

Private and community-based distributors are finally not so different, as soon as the private operator has exact specifications of the contract for its activity development, and as soon as the cooperative has a private-like management. Subsidiarity, however, suggests looking first for private operators and, if not possible for local reasons, looking for a community-based solution; in any case, support and conditions should be the same for all: why deprive a community of getting some private stakeholder to assume the investment and business risk in its place?

Electricity is a long-term and high-capital business. Hydropower plants and distribution grids have a long service life and should be amortized over a long period (30 or 40 years). To undertake the activity and to assume the risks of investing, operators need protection, that is, long-term concessions. Long-term concessions are not a constraint, neither for communities nor for competition and interconnection, as soon as early termination or takeover is defined within concession terms in a way that is not to the detriment any of the parts. Unfair competition kills business, as some local, now nearly broken, solar businessmen have experienced, when the grid unexpectedly popped up in the midst of their clientele.

Electricity is a low-technology business. Power distribution has more than a century of experience, and rural distribution is the most rudimentary part of it. Even renewables are not new anymore, and the most sophisticated technology, such as solar energy, is in fact a simple one to handle. Hundreds of thousands of battery-powered televisions are spreading over rural areas, and maintenance capabilities have followed. No operator with minimum skills or skilled staff would have any technical difficulty.

Is capital a constraint to finding operators? For a minimum size, let's say for our 100-household village with 100 periurban households equipped with solar power, the investment and initial turnover that are required would be less than US$150,000. A stakeholder could handle it with US$50,000, provided that he can get proper access to long-term credit. This could be a bottleneck, although access to credit in that range is far easier than for smaller sums and smaller borrowers.

As operations are likely to be of a greater size, activities may require equity capital in the range of several hundred thousand U.S. dollars. Not a big deal whenever cost-effectiveness is assured, which depends on local conditions, electrification objectives, and subsidies. A general answer can be given. It is always possible to electrify a village core under economic conditions; it is just a question of limited ambitions. In one of the poorest regions of France, with a low-density rural population (fewer than 200,000 inhabitants), 66 village electrification schemes surged spontaneously in the beginning of the century, 55 of which had no external support. The others had primarily local community support and nearly none from the state. After some consolidation, 16 utilities were operating in the 1930s, of which 15 were private and 1 was community-based.

State Supervision

The knitting approach does not deny, but rather enhances the role of the state in electrification. Local empowerment, as well as business initiative, requires a comprehensive and detailed set of regulations for system compatibility for future interconnections and to protect stakeholders investments, as well as consumers interests.

Too many technical constraints are detrimental to the development of community electrification. Norms applicable to primary utility are not necessarily able to be transferred to small distribution schemes. Schemes, however, should be compatible, with possible upgrading and with interconnection (with other schemes or with the primary one), which has to be defined at the national level.

Definition of the conditions of community empowerment, as well as of contracts between local government and operators, and of competition among operators, is also the state's responsibility. Numerous ready-made regulatory, administrative, and contract text models exist historically and currently of electrification in industrial countries, even for the smallest village and the weakest local administration.

Allocation of public funds is also to be properly regulated: there is an ongoing debate on the appropriate level of subsidies for grid, community, and individual solar electrification. As far as electrification is a public concern, equity of treatment between consumers (even not in different types of electrification, if only for environmental concern) and long-term commitment are the best principles. Unfair competition is not unknown when external donors are involved, and two neighboring schemes getting two very different levels of subsidy is not conducive for extending operations to new villages (why should I pay more while others get significant lower tariffs?) and for operators (how can I justify my higher prices?). Long-term commitment for subsidies helps both communities to define their options and stakeholders to take their chances to invest in a particular village system.

The Poor's Access

The "knitting" approach of electrification is community empowerment. It allows the community to make its choices and choose its mode of electrification and its provider. Because this approach deals with domestic problems and family budgets, as well as with community concern for women (in the form of safety, security, education, health, and so forth), those involved, directly or indirectly, are likely to be willing to participate in the decisions.

IPD development is also an approach where social concerns may apply concretely, as shown in the examples, to promote more equity in the electrification process, more spatial equity (more rural areas being involved in the process), and more social equity (more poor getting the service for the same public financial support).

This is not to eliminate all discrimination, because economics will always favor financial results over social concern and because electrification will still go first to the

better off, wherever it goes. It would be significant progress, however, compared to the present situation, which once again paves the way for better-focused and more cost-effective social action, when no other solution than paying for the poor is left to the whole national community.

11 Renewables

Just to have some light...

Mrs. Samirah, SHS user of Cipadang, Banten, Indonesia

Even though no one consistently criticizes their technical maturity, renewables face multiple constraints. Once a privilege, their development at the margin of local power regulations is now converting into a real problem, with unfair competition with the grid, and sometimes resulting in the bankruptcy of promoters; SHSs, even with subsidies, mainly reach the better-off who would expect more services that are definitely not affordable by the poor. Community microhydro schemes are more poor-friendly, but their rigidity impedes their ability to respond correctly to users' demands after some years. Power and energy limitations cause users to invest in more equipment and services fairly soon. Renewable energy development, and in particular community schemes, have nevertheless paved the way for development of the proposed alternative of "knitted" electrification, in which they could play a significant role, in association with conventional energy generation means.

Waiting for the Main Grid

Renewables are environment-friendly, they are energy for the future, and they are suitable for decentralization. Only for these reasons do they deserve and receive external aid and special support from governments. Unfortunately, these reasons do not count much for rural consumers in developing countries who just want electricity and still wait for the grid.

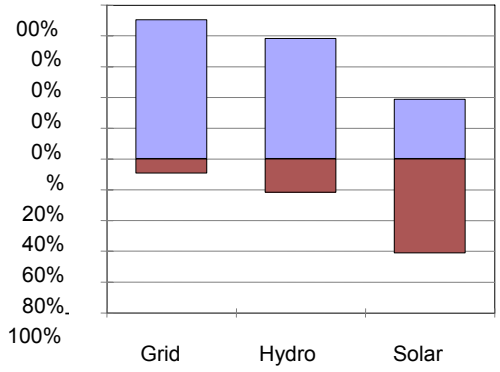
Criticisms

People are not always happy with renewable energy sources (renewables). Participatory interviews and surveys revealed abnormally high negative feedback. By the time they reach their clientele, renewables are considered a way for the state to evade its responsibility, or (at least in the case of SHSs) to strengthen the desire for "real" electrification.

This may be illustrated by opinions given by users of grid, microhydro grid and SHS electricity in Sri Lanka. Figures 1–4 present positive and negative opinions for each

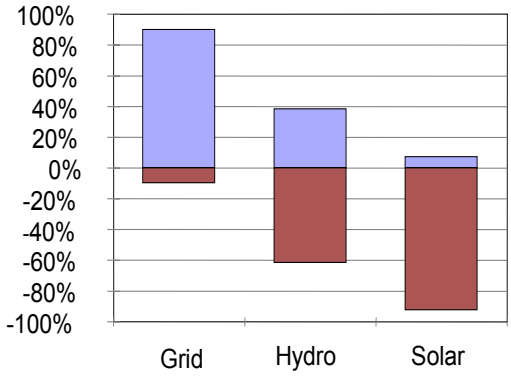
system, as well as positive and negative answers concerning coverage of their energy needs:

Figure 1: Satisfaction, Sri Lanka



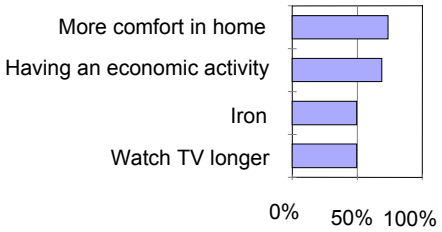
Source: Massé 2003.

Figure 2: Need Coverage, Sri Lanka



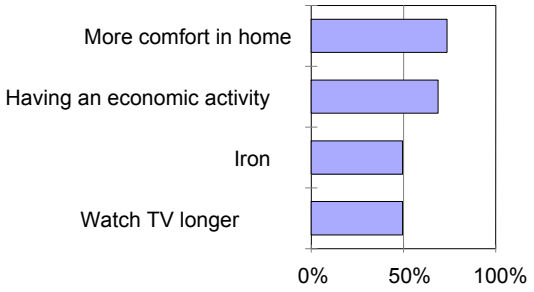
Source: Massé 2003.

Figure 3: Solar: Other Needs, Sri Lanka



Source: Massé 2003.

Figure 4: Hydro: Other Needs, Sri Lanka



Source: Massé 2003.

More precisely, SHS users (whose income is representative of the better-off population) and microhydro grid users (whose income is representative of the overall population) express their feelings about their primary needs that are presently unfulfilled:

Similar data may be drawn out from the Indonesia survey, where 72 percent of SHS users claim that they should require more power, against 14 percent in the case of the PLN's main grid.

SHS schemes mostly reach the better-off and middle-income groups. Some of the systems have been sold in Indonesia to households belonging to the two lower-income quintiles (very poor and poor). This is encouraging, although most have benefited from a first generation of highly subsidized dissemination schemes that are not replicable. That clients are mainly in the better-off category is neither surprising nor a sign that SHSs could not get a more popular clientele. Programs managers and distributors have focused on better-off rural areas (such as Mamuju region in Indonesia) in order to assure initial market penetration. The first buyers are generally the better-off. The first signs of tension appear when interviewing SHS users about payments, which suggests that market extension possibilities toward poorer clients are likely to be limited. Most users declare that they are dissatisfied.

Microhydro grid schemes, on the contrary, reach all types of households, and even poorer groups than average. This is not surprising, because microhydro grids are a resource constraint, and they tend to be preferred over lower-income areas. All consumers pay the equivalent of the bill of a normal grid user (smallest users), because service is limited. A significant portion of the users, less than solar power users, however, also show their dissatisfaction. Hybrid solar-diesel grid schemes have a socially discriminated clientele: most of the poor are excluded. It uses a pay-for-service system, with a system of prepayment that apparently satisfies everyone (in Indonesia 86 percent are satisfied with the pay-per-service system used for hybrid solar energy, against 37 percent for the dealer-sales system used for SHSs).

The voiced criticisms toward renewables should not be misunderstood. People generally do not protest against the technology as such, or against the quality of provided services. There is a normal level of complaints about failure, maintenance problems, and scheme management. Generally speaking, it appears that renewables are more reliable than grid service, especially in Indonesia where most of the rural respondents complain about the utility's service quality—about brown-outs and voltage fluctuations. Solar energy, which is apparently the most criticized, is thought to provide a fairly good quality of service, as is shown in table 18.

Table 18: Respondents with Maintenance Difficulties, Indonesia (percent)

Indonesian survey	Grid	Hydro	SHS	Hybrid solar
Respondents with maintenance difficulties	60	22	13	5

The complaints have a different sense: SHS users do not complain about the quality of service, but rather about the high cost of the limited service. Complaints are less for the hydro grid schemes, basically because of their wider clientele basis: only the better-off complain because they want to invest immediately in electrical appliances, yet suffer from service limitations. Voiced protests about grid electricity are just the opposite: everyone likes it, whether poor or better-off, but they complain about low service quality.

When asked for an analysis of the market reaction to the different electrification products, a utility's marketing department would probably send a table such as table 19 to management.

Service Limitations

Service limitations might not appear to be such a problem because most dwellers have little means to acquire electric appliances and pay for higher energy bills. Renewables give access to lighting, sound equipment, and television, which already represents a good standard of living for most villagers. The comparison between grid and renewables, however, cannot be fully understood without the perspective of time. Soon after obtaining access to grid electricity, many households invest in electrical appliances, which increases their purchase of energy at a quicker rate. The better-off invest immediately because they have the necessary savings or they can access other sources of funds. Middle-income households will take more time because they do not have the required savings. For the poor it can take quite a long time, but they will also invest, albeit modestly. Such appliances as water heaters, irons (considered a major improvement by—and for—women), rice cookers, and fans are not so expensive, and they have a popular market and reach the poorest, but they are mostly unusable with renewables. The power limitations of SHSs and microhydro schemes do not allow the use of such high-powered appliances. Although refrigerators do not correspond much to conservation needs, they do spread among the better-off whenever there is no limitation to the power supply, if only as a sign of social status. Hence, people quite strongly feel the service limitations linked to the use of renewables.

Although both the grid and renewables initially offer a decent service, the grid offers more: perspectives for a better life in the near future. With the spread of modern telecommunication and television equipment, villagers began to build a common system of reference, specifying the outlines of their poverty. They compare it with an evolving standard image of wealth, specifying distances and frontiers between themselves and the

urban or well-off households in their country, as well as in the industrial world. The distance is the path they need to cover to become equal with this image. Frontiers correspond to the impotence and lack of means—impotence, because overwhelming obstacles prevent progress whatever the efforts may be, and lack of means because at least a door is left open to individual initiatives—and thus to a better tomorrow.

Table 19: Marketing Assessment of Renewables

Electrification type	Clientele basis	Price	Perception of service quality by clients	Service evolution	Perception of service by clients	Market targeting
Solar	Better-off, some of middle-income	Too expensive	Good	None	Bad	Bad: reassess product line and/or marketing.
Hydro grid	Wide	Too low, adapted for poor clients	Good	None	Good, except for better-off, bad	Good for middle-income and poor. New services to propose to better-off.
Hybrid-solar grid	Better-off	Too low, adapted to poorer than present clients	Good	Good	Good	Market basis wider than the one targeted: increase prices and invest toward lower income clientele.
Main grid	Better-off, middle-income, some of poor	Too low, adapted for poor clients	Quality problems according to countries	Good	Good	Good. Increase prices for better-off and middle-income, widen clientele through low-price connection to poor, improve service quality, invest in other areas.

In this self-representation of poverty, electricity appears as a shortcut: as soon as it is available, rural household will switch on the light and over time purchase electrical appliances. They enjoy the same benefits, or appearance, as the wealthier do in any part of the world. In that sense, there is a difference between conventional grid electrification and renewables. Most renewables only give the best response possible, with little hope for further developments and few dreams for the future. The arrival of the grid, however, breaks the impotence frontier, empowers people, and gives them the possibility to invest

in their house or for productive means. Renewable energy projects need to include this perspective of progress.

Institutional Incertitude

From the point of view of national utilities, the public power sector cannot provide electrification access by itself; it needs external support and other providers of service. A recent CEB document, in commenting on difficulties encountered by the utility, concludes the following: "Therefore, Government...has come with several schemes to support the CEB in its efforts to electrify more rural areas." These are the renewable energy schemes. Many countries—among which Indonesia and Sri Lanka—are in a transitory period, where a public monopoly (through national utility or state cooperatives) coexists with infringements and pilot projects, and where no consequent alternative or complement to public electrification has been codified. Because of regulatory constraints and because they do not fit utility rules, renewable energy projects presently rely on the private sector or community management schemes.

These schemes are hardly legitimated by public rules and are not assigned a clear place in the electrification strategy. By consequence, people have difficulty recognizing them as trustworthy and long-term options. When people complain about renewables, some of their complaints come from their feeling of being left in the hands of illegitimate and dubious interlocutors, and being deprived of their—at least theoretical—tutelary public protection. Through private or community schemes, for people, the state is evading its responsibility. And when these schemes in addition bring limited services and higher prices, people feel cheated and feel like second-class citizens. When asked if their level of trust in authorities has changed since the arrival of electricity, Sri Lankan grid users manifest a higher level of trust, and members of hydro schemes appear relatively indifferent, but a large majority SHS users express resentment against the authorities (table 20). So renewables also need a better institutional legitimacy, through regulation and communication.

Table 20: Confidence in Authorities, Sri Lanka (percent of users)

Sri Lankan users	Grid	Hydro	Solar
Confidence in authorities (balance positive-negative)	61	15	-42

Community Values

If interest for values is to be measured by levels of answers (both positive and negative), people place far more importance on individual and family values than to community ones with regard to electrification, whatever this electrification may be (grid extension,

renewables). In their answers about electrification benefits, Sri Lankan respondents express themselves twice more and Indonesian respondents two and a half times more on individual values than on community values. If interest in community values is expressed on a minor mode, however, there are significant differences according to the type of electrification, as shown in the results in Sri Lanka in table 21.

Table 21: Community Benefits of Electrification, Sri Lanka (percent of respondents)

Community benefits of electrification	Unelectri-fied	Grid	Hydro	SHS
Safe villages	53	80	46	75
Religious buildings	30	10	61	12
Community feasts	25	22	44	25
Neighbors with electricity	22	3	19	44
Increase in social life	19	25	21	40
Schools	15	27	47	4
Community development	5	45	20	0
Total answers on community benefits	24	30	37	29

Note: SHS stands for solar home system.
Source: Massé 2003.

Safety in villages is—as shown in most surveys—considered the main community benefit of electrification. This result, drawn out from most similar surveys, is not surprising: in terms of community facilities, villagers first want streetlighting, and developers give them first electrification of public facilities (schools, health centers).

Further analysis of answers on the community benefits of electrification is well worth it in the case of respondents involved in renewable energy programs. People involved in village schemes (microhydro) may sometimes express criticisms against the community process (bribery, undue privileges, exclusion of newcomers are quoted). They are the ones who give more community value to their electrification and more importance to the electrification of facilities (religious facilities, schools) and the powering community of feasts. They may feel deprived of part of the individual benefits of electrification (personal investment in more appliances and consumption), but streetlighting and electrification of community facilities give them the feeling of being electrified.

On the contrary, SHS owners undoubtedly do not respond about their own electrification, but about the desired grid electrification. They undoubtedly have the feeling of not being electrified, and they point out community values toward electricity

that their mode of electrification does not provide. For them, the primary community benefits of electricity are, not surprisingly, safety for the village (streetlighting), as well as neighbors with electricity and an increase in their social life. Up to a certain point, frustration related to SHSs is not only caused by service limitations, but also by the increased isolation users feel from their community.

Unfair Competition

The promoters of renewables play a somewhat dangerous game: their products target artificially protected and ultimately fragile markets. Some renewables businesses have already collapsed from the unexpected arrival of the grid, and more would in a really open electrification market.

Finite Market

Renewables have conquered respectability. Their technical maturity is confirmed by clients. This, plus environmental arguments, gives renewables an indisputable place even for the most traditional electrician. Conventional power sector and renewables specialists have now built a consensual sharing of their respective markets. Renewable energy may sometimes blend in with other energy sources (in the case of wind generators or minihydro) to support grid generation. It should prove reasonably cost-effective when including all possibilities for subsidies; more generally, renewables "fill the holes" left by the main electrification effort, and they are limited to areas the grid will not be able to reach for years or decades.

So promoters think that renewables live in a separate world, and they have some historic reason to believe it. Renewables have been left to others than the public utility. They do not deserve more than a benevolent goodwill mention in power sector legislation. They may use any convenient institutional or organizational system, and bypass existing monopolies or regulations. They may come within global energy projects, but on separate budget lines and with different funding sources. Renewables have their own specific funding sources, because of environmental concerns, that make them relatively independent of the overall power sector financing the constraints.

There is little or no competition between the main grid and renewables. The grid is geographically tied down, renewables are not. Where renewables schemes are developed, rural dwellers have no alternative other than traditional ineffective solutions. They are also misplaced to reproach renewable service limitations, because they have no better alternative. Costs may be greater, and service may be more limited, but potential consumers have no choice: they already pay a high cost for traditional lighting, dry cell batteries for radio and sound equipment, and car batteries for television. Individual conventional small gasoline or diesel generators are accessible to few, and they also

appear as an expensive and little-adapted option. Whatever the villagers' preference may be for national grid electrification, the grid will not come.

The Main Grid

It would be, however, and will be more and more a mistake to assume that the main grid and renewables live in separate worlds without competition. Villagers compare services. Renewables pilot projects give way to more ambitious programs. National grid progression is sometimes boosted, and grid electricity comes sooner than expected. In their present conception, promoters of renewable energy projects need to secure schemes with a decent local nucleus of solvent clients. Even if the solutions proposed offer decentralized energy, management and maintenance constraints prevent the spread of clients over too large a territory. Cost-effectiveness leads to criteria close to regular utility criteria, for location as well as for clientele profiles. With different constraints, stakeholders—utilities and promoters of renewables—look for very close markets, seeking reasonably concentrated and well-off consumers.

In the context of a public distribution monopoly, the only security for renewables stakeholders is the utility's planning. The grid is not to come soon, maybe because distances appear insurmountable, but certainly because the planning says so. If for some reason, financial (new availability of investment funds), technical or political, the planning priorities change, the grid unexpectedly arrives into the hart of the renewables market, ruining the stakeholders' efforts. The newly important progression of the grid in Indonesia has ruined some unfortunate small businessmen involved in microhydro or SHS dissemination. This is a problem not only attributable to the monopolistic public power sector: deregulation or decentralization of the electrification process still rarely provide adequate mechanisms of legal protection for renewables stakeholders, which also face the threat of having their businesses ruined by some grid extension decided at the national or now local level—or even by other renewables programs that happen to obtain external funding.

So being outside of sector rules, without any mechanisms of protection or takeover condition, is likely to be a growing problem for renewable energy projects. They will continue to face increasingly unfair competition from more attractive and highly subsidized grid extensions (always in the case of small subscribers, often for all subscribers). The consequences of this unfair competition are not so much for customers—who will resell their systems in the case of SHSs—but for private promoters involved in renewables market development, as well as for the public whose money has been invested to support them.

The Missing Competitor

This unfair competition should not be so dramatic. People benefit from the arrival of the grid. Grid projects—such as hydro and hybrid—should integrate in a fairly easy way into the main grid, providing energy if their source is cheaper, and getting lower-cost energy

if the main grid's is cheaper. As far as ownership is involved, new conditions (sale of energy or take over) should be defined through adequate commercial or concession regulation. It is thus just a matter of designing proper sectoral regulation, which will include existing decentralized distribution systems.

This competition can also be imagined for solar development: solar concessions with a territorial protection, because some are presently developing in some deregulated power sectors. This leads to important questions, however. It is justifiable to protect an area through concession only if the proposed solution offers services at least-cost and social discrimination conditions, although this is not always the case.

The current validity of solar marketing is fragile, because it relies on the fact that no other solution is available. This is a fact only guaranteed—and not always—by the durable absence of the grid, as well as by the current power sector regulation. The present solar market is protected, and solar companies build a clientele that would shift to other solutions as soon as they are made available. In fact, the market separation concept relies on the denial of a missing competitor—the decentralized diesel-powered microgrid.

Part of the present SHS market is an artificial market, with protection barriers caused by a sectoral monopoly (or near-monopoly). The most desired customers are the better-off, in well-off communities of isolated areas. They would probably also be prime candidates for microgrid electrification. This is not true for all present buyers, because not only do SHSs reach households with financial means, but they reach scattered inhabited areas that cannot be reached by microgrids.

The current protection is a profitable situation for providers that just sell the equipment, in particular, wholesalers and their local partners. Skimming the market allows for not being locally present, and for covering large areas. Market progression, however, means the decentralization of retail sales and repair and installation services to get more difficult clients. Local distributors are then more dependent on the stability of their market to make their business sustainable and more sensitive to risks related to the artificial state of the market.

People's Choice, Again

The only people who can have solar power by choice are the ones who have access to the grid. Elsewhere, the choice is between solar and nothing, and hydro and nothing—not by choice or even by economic rationality, but because programs are conceived this way. Renewables give only the freedom not to buy, just as you could refuse to connect when the grid comes. Has a community ever been offered a choice between the microgrid and solar power only? Have communities been proposed an alternative between a hydro scheme only and a hydro-diesel scheme only? Renewables programs are technology oriented, and funding systems are technology oriented. Technology and environmental concerns have their importance, but so do the needs and desires of villagers.

Villagers want electricity; global environmental concerns have little weight in their daily lives. Renewable energy undoubtedly provides an opportunity for them, but is it a

real choice? They are offered a new solution, with a number of supporting actions (subsidies, technical support), but they do not really have an alternative. Are these solutions second best, after the "real thing" brought by the main utility, or even third best? It is probable that, if households were free to choose, with comparable support, they would prefer another type of electrification than the one proposed. Let's be clear; they would not reject renewables, but they would set them up in their rightful place better than project designers do.

If they were offered the choice, instead of the sole microhydro scheme, villagers would probably prefer a diesel-hydro hybrid to overcome problems with power limitations, if an alternative was proposed and financed. Instead of SHSs only, they would also prefer a diesel microgrid-powered system for the village center. Such a system would provide better opportunities for the better-off, allow workshops to be held, and permit the use of solar panels for remote households as they await their turn to be connected. This would also improve conditions in the village as they wait to get cheaper energy through interconnection. If they are not likely to be well-off enough to invest in their own choice—and this should not be their role—they would be able, in many cases, to sustain this choice through tariffs.

Fossil fuel microgrid electrification is undoubtedly less environmentally friendly, although it has different advantages in peoples' (and political deciders') minds over renewable solutions. The practical advantages include fewer limitations and the possibility to power local engines. Other advantages more psychological in nature include the grid presence in the village being perceived as a sign of modernity, along with the promise of future connection to the main system. It may also offer more flexibility with regard to local solidarity. For instance, the better-off may decide, as a gift to the community, to invest in or pay through tariffs more than their share for streetlighting or community facilities.

Whatever their legitimacy and validity may be, criticisms against renewable energy must be understood and correctly addressed. Villagers do not easily accept being excluded from the grid extension (the perception that electricity is a right given to few), nor do they understand and trust a planning process that they have no way to influence. In this context, renewables schemes are perceived not so much as immediate solutions as delays to answers, so renewable energy programs make sense in people's minds—if only because they understand what they are buying and they understand its place within their progression toward electrification. Electrification for people is never a steady state, but rather a dynamic process that sustains and illustrates the progress of their living conditions.

Marketing Renewables

Community schemes offer new perspectives of the market to renewables promoters, based on real local competition terms with fossil fuels. Pay-for-service systems should boost the demand, and small utilities that buy by the tens or hundreds of systems are to be new profitable clients for renewables businesses.

Dealer Sales Limits

In the present situation, the dealer sales model (for SHSs), where the users have to buy the equipment, is probably the best solution for all categories of actors but one. First, it is the best solution to bypass existing regulation. Hydro or diesel-solar grid power has successfully bypassed these regulations, too, even though they are built on the model of regular distribution. Second, it is the best way to skim the market, because the best clients are likely to be scattered over all unelectrified areas. Third, it is the only option available for solar providers, with utilities unable to provide similar services (they often cannot even invest in cheaper connections) and no other firm in sight ready and able (this is a capital-intensive activity) to distribute solar energy on a pay-for-service basis. This is a good start for a first phase of market penetration. It helps create a commercial bridgehead by building a local technical and after-sales infrastructure. Some subsidies, short term credit schemes, and guaranties for after-sales services build a first clientele among the better-off. In general, market consolidation should lead to lower prices and open perspectives for lower income market segments, but on which marketing conditions?

SHS development faces several constraints. The first one is the price of the provided service. SHSs are expensive—a market penetration constraint—and they are expensive for what they give—a competition risk. The second one is the repartition of the market, which is decentralized by nature. Building a mass market—such as figures normally mentioned in project documents or even in private business objectives—under these conditions is not easy. High price constraints and a long product service life preclude a deep penetration rate into a specific location that would allow the promoter to establish a sustainable market base before radiating toward other areas. It is necessary to skim the market.

Skimming on a wide scale toward individual clients is a costly business. First, buyers are not only the better-off, they are also the best customers. As commercial action is required to broaden, the service becomes more costly for customers. If the providers do this by themselves, they quickly face large commercial and decentralization costs. If they build up a network of retailers, the retailers will face similar problems, although on a minor scale, the retailers will have to skim the market on still large areas, with obvious costs, which will add to the necessary margins of the different links in the chain and increase the price to the final consumer.

In other words, as the sales objective becomes bigger, the marginal cost could become more expensive, as well as the cost to the final user. Something that is easy to

understand for both utilities and kerosene consumers is that mass distribution in rural areas through solar dealer sales could mean price increases, which is difficult to compensate by scale savings at the equipment purchase or central management level. And higher prices would likely narrow the market perspective, make the business unprofitable, and bring a more elitist and poor-unfriendly image to the technology. Add to this changes in power sector regulation that would lead better-off clients to prefer microgrid solutions, which would effectively cut off easier solar market segments and could seriously put in doubt the credibility of massive solar sales development through normally employed dissemination schemes.

Some Marketing Issues

There are nevertheless two methods that could be considered for expanding the market. The first, sticking to the dealer sale model, is to divide the equipment into essential pieces and sell piecemeal. Small 10–15 Wp panels do not provide much lighting, yet they are a cost-effective solution to substitute charging car batteries, which proves to be an important segment of the market (several hundred thousand users in Sri Lanka and probably more than 1 million in Indonesia, for example). This would provide a solid market base. Being cheaper (in absolute terms, because it is smaller), it also allows for the development of a more decentralized distribution network, and for the equipment to more easily satisfy its market. This kind of dealer sales model has proved to be successful in countries such as Kenya or Zimbabwe, where tens of thousands of systems are sold every year, reaching the poorest segments of the rural population. Services provided are undoubtedly more of the type of pre-electrification rather than electrification, and costs are high, but households can afford to pay for it incrementally and build larger equipment over time until they reach the equivalence of the system presently proposed. Microcredit could also help in accelerating the buildup of a larger system. Even if experience has led to problems in supporting energy investment through credit among smaller customers (Sri Lanka), this does not necessarily mean that credit schemes should systematically be discarded in the future. Instead, they should be adapted, using the lessons of community microcredit (targeting women, using coresponsibility schemes).

The second one is selling solar energy by the "gallon," selling it to large clients who are able to buy not one, but several tens or hundreds of units, with the intention that these clients will make the equipment available to final users through long-term credit. This is a good way to avoid overly high end user costs (although credit has a cost) and obtain a wider market basis. Also, long term credit for solar equipment is only possible selling solar services. This is the pay-for-service system: a provider invests in systems, installs them, and asks for monthly payment (flat rate according to service level).

This pay-for-service system requires significant capacity of investment on the behalf of the local utility, but not at a very different scale than conventional grid distribution. In both cases, it relieves consumers of the initial investment and let them financial resources to quickly buy electrical appliances. It also concentrates the market of renewable

systems: dealers no longer face thousands of prospects for one system, but rather only tens or hundreds, which will require tens or hundreds of systems. This market concentration should largely weigh down price evolutions in the systems.

The Future of Renewables Could Be Electrification

Grid renewables schemes, such as hydro grid, have demonstrated all over the world that distribution other than from the main grid is possible. Even if financing conditions and specific social concerns led to poor early project designs, with too much emphasis on community management and not enough on commercial operation, this has contributed to giving the first generation an image of exception that is not replicable on a wider level. New project designs target operation under economic conditions. Diesel begins to appear, to confer flexibility and satisfy better-off clients. Tariff scaling begins to reflect a bit more willingness-to-pay. Renewables contribute to build the knitting concept.

Within this concept, from national and artificial, conditions of competition between renewable and fossil fuel solutions have to become local and natural. Renewables have to lose their specific privileges and become one means of generation, among others, with advantages and drawbacks in costs, access, service, and environmental consequences. They must accept being submitted to people's choices and distributors' constraints. Natural competition does not mean solely economic competition, because the sector does not obey sole economic rules. This means that renewables should be treated fairly, on par with other solutions. The environmental concern could be expressed through specific subsidies, moving up the threshold of its local cost effectiveness. Local competition means that the renewables market is not where the main grid or fossil alternative funding cannot go, but rather where locally no other solution is better at least cost.

In local competition, individual solar energy is not in such a good position as a grid renewable system. It is expensive and is likely to stay expensive even with a subsidy. The current products provide insufficient services for the better-off. It is not poor-friendly, and it has little capacity for easy cross-subsidy (what would a potential client for 50 Wp do if getting 2 units of 25 Wp was far cheaper?), whereas grids are perfectly apt to express any spatial or social cross-subsidy. As soon as there is a sizable concentration of decent clients (village center), service through diesel generation will be less expensive than solar power and more flexible and thus better appreciated by clients.

Alternatives, however, and the first local diesel-powered distribution are not in such a brilliant terms for competition either. As soon as demand density decreases, grid cost becomes unbearable, and villages' surroundings belong to solar energy, not to the grid. There are zones where the habitat is mainly composed of scattered houses where solar energy is definitely the best solution. Local competition is not bad for solar power, and there is undoubtedly a market, as there is one in industrial countries, but a much more extended one because grid distribution costs are higher.

Hydro energy projects could also use diesel as a way to deliver the energy to fulfill people's needs—not to decide people's need as a function of hydro energy availability.

Also, projects should not presume that all that people want is to pay as little as possible. This is not true. Everybody wants to pay less for the same service, and that is what renewables, among other things, are meant for, but people pay the price for the service they choose, as long as they have all the elements and the opportunity to decide. This has nothing to do with the beneficiary's thanks, but rather just with the consumer's choice.

12 Evaluation

> Surely enough is known about the effects of electrification for it to stand on its own merits. Comparative analyses of electrified areas vs. unelectrified areas may be a boon for statistical researchers, but in the viewpoint of those of us who have spent thirty years in the development of rural electrification, it is a tremendous waste of human resources.
>
> Gilbert Moon, NRECA report to the World Bank, 1974, quoted by Douglas Barnes (1988)

Social evaluation must respond in the following ways to fundamentally three objectives:

Give relevant information to national decisionmakers on the power sector to help them establish a proper policy and regulatory framework that expresses the public social concern with equity in regard to local electrification.

Assess the economic and financial benefits of rural electrification better, in order to measure the public financial support that is needed.

Determine participative methods of local electrification projects design to ensure an effective community decision process and control by the population, as well as financial sustainability.

Conditions of access of households to electricity prove to be determinant for social and economic benefits, far more than specific actions aiming to power social facilities or companies. Evaluation of access conditions may be expressed in an easy way: it depends on the density of electrification, and this density is in turn a function of the level of the electrical investment within the community and another related parameter, the willingness-to-pay of users. Equity concerns may be exercised on community electrification through relevant ex ante project control procedures, the balancing of a proposed investment, and tariffs and electrification rates in order to minimize exclusion without endangering financial viability.

Benefits assessment, monitoring, and evaluation should be carried out beyond the classical parameters of savings on pre-electrification and global environmental impact. Three new parameters are proposed that deal with the consequences for (a) electrical equipment and appliances (added value and fiscal impacts) at the national level and the development of local productive activities through (b) time investment (paid housework, mainly women-led) and (c) financial investment (village workshops and shops).

Interest in and Objectives of Evaluation

An evaluation with statistical work, surveys, and the involvement of social scientists and economists is a rather difficult and expensive matter. When electrification rules are so rigidly tied up that no alternative is possible, it would be unwisely spent money and considered of little use (see Gilbert Moon's comments in the quotation above). This has been mostly the case up to now: building interconnection mainly though grid extension and denying other types of electrification to off-grid regions, except for dissemination of renewables among better-off clients. However, it is not a useless exercise as soon as it is accepted that (a) there are more ways to develop rural electrification and promote renewables and (b) poor people need not necessarily be served last, as is mostly the case now.

The current frameworks for the power sector in Indonesia and Sri Lanka do not offer much more choice to people than grid extension by public utilities and some renewable dissemination, either heavily subsidized (such as microhydro) or sold according to market rules (renewables) with some subsidy and credit schemes. Few countries offer more, even after deregulation. Whatever their new status may be (public or private), existing utilities are given large regional concessions that prevent any other initiatives, but that face the same constraints (tariffs, investment capacities) as previous public monopolies. Renewables programs generally obey technological imperatives that exclude any joint development with fossil fuels. Real power sector liberalization and free development of renewables would mean a real opportunity for the population to choose their mode of electrification and a fair policy to support this choice, which is generally not the case. Other methods of electrification should offer a free choice of tariffs, free choice of utility, and free choice of system and energy supply, which is never the case. The justification for inequity, as well as justification for renewables, is that people do not have the choice. This is often untrue: it is not that they do not have the choice—it is that they are not left with a choice, which is quite different:

- In the Communityville example, it has been shown that villagers could choose between having conventional extension through the utility (with electricity delivered mainly to the better-off) and a local distributor that buys bulk energy from the utility and delivers electricity to all. In this case, tariffs double, but between connection costs and monthly payments, it is not more expensive for the whole community. This choice was theoretical, although it is presently impossible anyway.

- In a large number of off-grid cases, people have a choice beyond individual solar systems left to better-off clientele, which is typical of village electrification, including small grid and individual solar systems. Unfortunately, they are denied this choice, as they are denied the possibility for them to pay more, either for a better service or a more equitable one, which would provide access to a greater number of covillagers.

Reaching the Poor

Making sure that electrification schemes give access to the poor is, or at least should be, a major public concern for three possible reasons. The first one is obvious: the poor, as others, deserve getting access to service as soon as possible. Two other reasons given in the present evaluation, which are less evident, tend to link better access conditions with greater social and economic impact. The first of these two is that, with regard to social impacts, electrification of social facilities does not appear as important as household electrification, which gives people ways to complement (or fill gaps) in public social policies on topics as hygiene and health, education, and safety. The second of these two reasons, also drawn from this report's conclusions, is that the economic impact of electrification heavily depends on its capacity to build local markets, and that this market development depends on the number of households getting access within the community. In other words, electrifying 100 households in 1 community has a greater economic impact than electrifying 20 in 5 communities.

The density of electrification—the percentage of households getting access in a community—is thus an important parameter in evaluating electrification projects. Most electrification policies, however, are built the reverse way: the primary grid development goes first toward extension more than densification (which is logical, because no viable solution is considered for off-grid). As for a solar dealer-sales system, it means skimming the better-off market, leading to low-density electrification, and low-density electrification logically excludes the weakest and poorest.

Electrification density means investment density, and it means capitalization. Two projects for the same village with different levels of investment will reach different numbers of households, and the more limited the investment is, the more discriminatory against the poor. Social concern expresses itself through the level of investment. Reaching the poor does not mean looking for specifics, but rather for capital investment. And the more equitable electrification policy is not the one that sets up equitable rules on tariffs, but the policy that succeeds to attract more capital.

Evaluating projects with these concerns in mind is not so easy from a central point of view (the state, donor). Statistical data on local populations do not reflect local constraints in local topography, habitat concentration or dispersion, or users' willingness-to-pay—all criteria that will heavily affect project costs and cost-effectiveness. This is

why a local community's estimation and decision are important. Because of this, one of the criteria of evaluation should be the level of participation in project design.

At the central level, this leads to some recommendations:

- Set rules to limit connection fees, so as not to create a barrier for the poorest.
- Define subsidy policy mechanisms that encourage electrification density (the simplest being the number of subscribers as one of the parameters—for subsidy attribution).
- Ask project promoters to provide topographic maps with an indication of existing households that are included—or not—in the electrification scheme.

Whoever is poor or not will immediately appear in the projects' design. Electricity introduces a social ranking—households will equip themselves and use energy according to their financial capacities. This characterizes the electrified poor easily: the power subscribed and monthly bill give a fair description of social ranking, which may be completed by surveys on equipment rates.

Project Viability

Present electrification modes are built on the following premises:

- Subsidized investments and low tariffs for new users (mainly the better-off) for grid extension, using national cross-subsidy.
- Highly subsidized village electrification schemes (such as village hydro schemes) with low tariffs, generally covering only operating costs.
- Subsidized but still high costs for the dissemination of solar systems.

These schemes rely on a different approach of consumers' willingness-to-pay. Grid extension (and marginal village projects) is built up on a minimum willingness-to-pay, and it makes sure that tariff levels allow the poorest to pay the bill (because of urban consumers' political weight). In rural areas, however, only the better-off benefit from these tariffs. SHS dissemination is sensibly based on the fact that part of the rural population has a much higher willingness-to-pay, and that it is possible to take advantage of it. The main concern is to see up to which point it is possible to use this higher willingness-to-pay (for most people and not only for better-off) to build up collective electrification projects that benefit all (and even the better-off, with a higher-service level) and may be viable with reasonable subsidy rates. It is also important to see on which conditions local tariff solidarity may give the poor and isolated consumers access to SHSs.

It has been mentioned that the level of investment in one community conditions the access of subscribers, and in particular poor subscribers, to the scheme. In turn, however, the level of investment is linked to tariff levels and scaling. The more ambitious the connection rate within the community, the higher will be the risk for the promoter who

will face higher costs to connect remoter clients and will also probably serve poorer clients with less return in consumption and payments. This means logically higher tariffs for everybody.

Once again, this should result in a debate at the local level, between a stakeholder (who may face investment constraints and will undoubtedly look for a decent return on the investment) and the community (that is interested in connecting a maximum of users). Neither of the two has interest in overly high or low levels of tariffs—the stakeholder because he has to capture his clientele in good conditions, build a sustainable activity, and look for the best compromise between cost-effectiveness and clients' willingness-to-pay and the public concern because if high tariffs penalize consumers, low tariffs will penalize the connection rate.

Nevertheless, rural consumers' willingness-to-pay is also a national concern, in order to appreciate the global level of subsidy necessary to open sufficient space for negotiations between stakeholders and communities and to make sure that the result is viable, that is, that there is an acceptable return on investment on one side, and an acceptable connection rate and tariffs on the other.

Measuring Willingness-to-Pay

The different approaches of the willingness-to-pay may be summarized as shown in table 22.

The first mode of evaluation, often used in project evaluation, will be detailed further on in the report (as one of the benefits of electrification; savings on pre-electrification costs is one of the immediate benefits of electrification, relatively easy to quantify).

The second mode of evaluation depends on the estimation of individual solar market development in rural areas, but it also gives an interesting estimation of what the better-off and middle-income households are willing to pay for access to some of the services made possible by electricity. Results are high, but they concern only a limited portion of the potential consumers.

Table 22: Some Techniques to Evaluate Willingness-to-Pay

Willingness-to-pay	Use	Evaluation
Expenses on pre-electrification systems	Already in use for project economic evaluations	Useful first approach, although with two drawbacks: Generally only the monetary costs are evaluated People quickly spend more on electricity than on traditional solutions
Expenses on solar systems	Not used	Useful to evaluate conventional electrification willingness-to-pay of better-off and middle-income groups
Expenses on electricity in electrified villages	Not used	Because of present conditions of connection at user's cost, household expenses on connections could be used to reassess tariff scaling, building correlations between energy consumption and distance to the grid

The third mode could prove to be the most interesting: some of the consumers not only pay their electricity bill at current tariffs, but they have quite significantly invested in their connection, which gives an exact idea of their willingness-to-pay. Utility statistics are certainly an excellent and underused source of information for market analysis and project design of rural electrification. Most of the relevant information remains in the utility's local management units and is not available at the national level. This means working within utilities' regional offices. Part of this information—connection quotes and actual prices paid by subscribers to get connected in relation to their following consumption series—should yield important information on the actual prices of electricity supported by rural households, and should provide clues for tariff adaptation or readjustment in the main grid, as well as decentralized electrification.

Throughout this report all examples given concerning avoided costs and "real" tariffs (including household investment in connections) show that users' willingness-to-pay is well above the deciders' intuitive perception. Examples of spontaneous and illegal minigrids set up in other countries also tend to prove it, for example, people using up to US$4 per month per bulb,[8] and being happy with it (see appendix 2).

[8] Case of Mali, cotton zone. Small grid powered by local workshops, with 20 to 50 consumers.

Quantifying Benefits

Because quantifying benefits is both difficult and expensive, conventional electrification projects often skip benefits evaluation and define their objectives primarily on the basis of cost thresholds (for example, we are in position to electrify up to *x* U.S. dollars per connection). Renewable energy project managers often build their cost-effectiveness using savings on pre-electrification costs and global environmental benefits, and are satisfied with decent rates of return. Some parameters, measurable at a reasonable cost, could help evaluating the socioeconomic impact of conventional or alternative electrification.

Choice of Parameters

Although they are of major importance, many of the social benefits of electrification related to health, education, n safety, and housework alleviation are among the most difficult to quantify. They often deal with qualitative aspects, require estimates for several end parameters, and require the building of complex and disputable causality chains. How should the effect of electrification on reading, of reading on education, and of education on well-being and development be measured? What are the other parameters that influence the causality chain? Results are subject to endless debates on data credibility between sociologists and economists and among economists. Even purely economic benefits are not so easy to quantify and, as soon as the economy is used for what it is meant—reproducing people's behavior—it requires costly field investigations and surveys. Is it really necessary to go this far? Do the benefits of such evaluations justify their costs? It is necessary to focus on a few parameters and not to propose a long shopping list with items that no one will buy.

Looking for the most immediate and least costly ways of investigating the economic benefits of rural electrification leads to the conclusions shown in table 23.

Two benefits are currently already being used in project assessments:

A reduction in the use of traditional pre-electrification systems.

The consequent greenhouse mitigation from this reduction and the use of electricity (in tons of CO_2 and monetary terms).

Table 23: Economic and Financial Impacts

Dynamics	Economic and financial impact
Electrification displaces use of traditional devices and fuels (kerosene lamps and fuel, TV batteries and charging; on a minor mode other kerosene, LPG or woodfuel uses)	Reduction of costs related to pre-electrification uses
Consequences in terms of reduction of greenhouse gas emissions	Valorization of emission savings, either valorizing CO_2 abatement at market cost or deducing a cost from economic analysis, making it apt for specific financial GEF-like support
Electrification provokes a continuous process of home investment in electrical equipment and appliances	Consequences in terms of added value and fiscal impact, in equipment and appliances production and trade
Electrification leads to substantial changes in household daily routines	Consequences in terms of productive activity through time investment (mainly paid home activity, often women-led)
Electrification induces development of village economic activities	Consequences in terms of productive activity through financial investment (village workshops and shops)

Three new benefits are proposed—the first regarding the global economy (national as far as items are locally produced, or international if items are imported) and the last two dealing with local production:

The positive impact on markets for electrical equipment, for example, wiring, bulbs, and appliances.

The increased availability of time and its beneficial consequences on paid home production.

Investment in productive activities.

Quantifying these benefits is possible using the guidelines shown in table 24.

Table 24: Quantifying Economic Benefits of Electrification

Benefit	Quantifying	Quantifying basis
Reduction of use of traditional pre-electrification systems	In use—evaluation limited to monetary costs	Based on surveys in unelectrified households Estimation of nonmonetary costs
Abatement of greenhouse gases	In use—limited to renewables	Based on surveys in unelectrified households and power consumption series in electrified villages Balance of emission between pre-electrification and electrification, using hypothesis of evolution of pre-electrification systems
Investment in electrical appliances	New	Equipment surveys and power series in electrified and unelectrified villages Price breakdown analysis of electrical appliances' production and trade
Availability of time	New	Similar work on pre-electrification devices and fuels, for differential Comparisons between unelectrified and electrified households
Development of small businesses	New	Estimation of added value due to paid housework Evaluation in electrified villages - time series. Specific prospective analysis for to-be-electrified villages

Savings on Pre-Electrification

Rural dwellers spend an important part of their budget on cost-ineffective services, such as traditional lighting (kerosene or oil lamps, candles), car batteries to power televisions, and drycell batteries for radio and sound equipment. Part of budgeted cost will be saved after electrification (not necessarily all, though, because people go on using their former systems (for example, lamps for outside use and equipment that will be used until

broken). To be comprehensive, costs should comprise monetary costs (prices actually paid by rural dwellers for equipment, maintenance, and operation) and nonmonetary costs (for example, time spent on equipment maintenance, fuel purchase, and battery charging). The latter will prove to be quite important, with a significant portion of the costs borne by women. Data collection came from in-site surveys.

Mitigating Greenhouse Gases

Environmental aspects of electrification are generally analyzed only in the case of renewable electrification. Some analysts believe that electrification through extension of the grid, or even through diesel microgrids, has a positive impact on the environment, because it reduces the individual use of fossil fuels (mainly kerosene, 2.4 kg of CO_2 per liter) and does not generate important new emissions from diesel generation (1.7 kg of CO_2 per liter). The limited power use by rural dwellers makes the electrification–CO_2 balance positive. This should be carefully reassessed by taking into account the dynamics of equipment and energy use growth, which is considerable, in order to establish a clear ranking of environmental benefits, according to local specificity (energy mix in generation, consumption growth).

Data come from local surveys (solutions in use before electrification) and utility statistics (standard evolution of equipment and consumption)

Purchase of Electrical Equipment

The use of electrical equipment—internal installation, electric lighting, appliances—will depend on how long ago clients obtained access to electricity. Households' investments are progressive—and should be analyzed according to subscribed power (a way to apprehend the social level of households). The analysis, both of electrical appliances and pre-electrification equipment and fuels, should provide financial (tax income) and economic consequences (added value), providing details on existing equipment and fuels supply chains in the country.

Data collection on equipment rates and trends come from the following:

- The utility's local statistical offices, if any information is available on equipment (utilities normally should perform this kind of inquiry because it is very useful for interface with clientele; some do it).
- From specific inquiries in electrified villages (with special attention to the earliest date of electrification).
- From an analysis and simple modeling of equipment price buildup (whether imported or locally produced), through inquiries in production and commercialization chains.

Time for Work

Availability of time is a major benefit of electrification, and part of it is reinvested in productive activities, which is a direct economic benefit for concerned areas. This is also a parameter susceptible to evolution over time, because reorganization of households' routines may take time and may change depending on the equipment used. In line with studies on the quantitative aspects of domestic life (income, expenses, quantity of fuel used for cooking), the approach through surveys is not the best possible. Analysis of daily routines should go through specific longitudinal investigations using notebooks where participating households indicate their different activities and schedules during the day. This should lead to identifying the availability of time and the portion of this time dedicated, as an average per sample, to paid activities, according to social and gender categories.

Data were collected from the following sources:

- Careful analysis of community potentiality; hypothesis based on comparisons with already electrified communities with similar market opportunities.
- For valorization of time, through local information on wages or through using macroeconomic methods (see labor opportunity cost or added value).

Productive Activities

Development of productive activities is also a direct economic benefit for concerned areas, with the age of electrification an important parameter. Surveys allow the sequences of creation and development of productive activities to be determined, giving an indication of the economic impact of rural electrification (number of activities, nature, turnover, labor), the category of beneficiaries (social, gender), and the possible activities substituted (once again, according to social, gender, and even geographic categories—from outside national, in-village, or surrounding rural areas).

Application of this analysis to new assessments of new electrification projects should be based on a careful analysis of local opportunities (conditions of local markets, access to external markets). This type of analysis presents a double interest. First, it allows for determination of the possible economic impacts of electrification on the creation of enterprises, employment, and so forth. Second, it gives crucial indications—if any supporting action is possible—on the way to maximize these impacts and promote local economic life, in particular in regard to access to external markets.

Data were collected come from the following sources:

- Careful analysis of the community potentiality for village exports: The hypothesis was based on comparisons with already electrified communities with similar market opportunities.
- For local market development, the hypothesis was based on comparisons with already electrified communities of similar characteristics (local income, size).

Further Investigation of Benefits

Some additional economic benefits can be investigated, without the certitude whether it will be at all possible to design pertinent and easily quantified parameters. Among the benefits that could be specifically investigated are the following:

The correlation between nonproductive home investments (construction, repairs, upgrading) and electrification.

Perceptible changes in diet and food commerce caused by development of the refrigerator market and its consequences for family health and agricultural practices and commerce.

Accelerating the Impacts

Some actions—although not under the responsibility of the power sector and electrification program—may have a positive effect on maximizing and accelerating the impacts of electricity on village economic mutations. Electrification leads (see chapter 7) that electrification leads to a progressive but constant monetization of the village economy, which induces increased dependency of the village on exchanges with the national economy, and that the poor may benefit from these mutations, although they are in a more fragile position because of their lack of assets (land, financial capital).

These aforementioned effects are probably common in all electrified areas. Rural electrification projects generally do not engage in an analysis of the economic strengths and weaknesses of communities they aim to connect. Other types of programs (projects) sometimes do, such as a load factor improvement project led by the Indonesian utility and executed by NGOs. Its primary objective was to promote the day-time use of electricity among rural businesses through local productive activities by providing technical assistance and subsidies for higher-power connections. Although the results were not so good, mainly because of the NGO's performance (according to the utility), the principle of associating electrification and support for economic development through opportunities provided by electricity is a good one because (a) electrification creates an appropriate climate for investments, and (b) results should have an impact not only on the community but on the overall economy, with electrification creating accelerated spots of consumption.

Promotion of Village Exports

The development of local markets has its own dynamics, and should not be a priority. Access to outside markets is a priority, but it also is a more difficult challenge for villagers. This could be supported by public aid. Markets can often be identified easily, and bringing specific support is possible, both to develop activities and ensure a more equitable participation of the poor and women in particular, through the identification of those of the activities that do not need a considerable amount of land or initial capital.

Development of Communication

Within the search for better access to markets, communication should logically play an important part, with regard to knowledge of markets, prices for products, and the identification of markets available for the development of new local activities. When not already available, rural telephony—possibly including Internet access—will be excellent tools for rural communities to manage possible external markets.

Addressing Poverty and Gender

Addressing poverty and gender in rural electrification does not require so much a comprehensive system of evaluation as a radical reform of power sector regulations concerning rural electrification. Country energy, poverty, and gender assessment could support these reforms, giving proper information for public decisionmakers to promote more socially sustainable and poor-friendly electrification.

From EnPoGen Evaluation to Sector Reform Proposals

Social evaluations of electrification—the work that was carried out in Indonesia and Sri Lanka—have been useful because they identified a real discrimination problem against the poor. They also pointed out problems related to present grid and alternative electrification schemes, and raised a few important issues. One of these major issues is that, before designing a better social monitoring system for rural electrification, it is necessary to design better electrification approaches, based much more on local and community initiatives, where monitoring begins to make sense and can be part of the conditions of success of projects. Designing a better electrification approach begins with a new regulatory framework that opens the sector to new stakeholders, organizes cooperation and competition between the main grid and decentralized operators, clearly defines a place for both the grid and renewable energy development, and finally reinforces the public role at the community and state levels. It also requires the development of a set of financial tools, such as subsidies and loans, adapted to the new policy.

The work realized in Indonesia and Sri Lanka gives national decisionmakers more than sufficient qualitative and quantitative information on the social aspects of electrification to redefine regulations and paves the way for development of a community electrification that is complementary to the present effort of national grid extension. Similar experiences in other countries could also be used to show policymakers how to take this into account in their sector reforms.

Country Energy, Poverty, and Gender Assessments

The work performed in the framework of the EnPoGen study suggests what should be an energy, poverty, and gender assessment (EPGA) to be carried out in the framework of

designing a new electrification program. As mentioned before, the EPGA could have a national scope—and in that sense be sized in a larger way, whenever important decisions are to be taken in power sector reform. However, it should be used, scaled down, to evaluate existing programs and prepare new ones.

Evaluation should serve the following objectives:

- To analyze the real conditions of access of the poor in past electrification trends and to alert national decisionmakers of necessary changes. Conclusions on Indonesia and Sri Lanka, as well as a few available results in other countries, also tend to confirm that global electrification rates often hide high levels of social discrimination, with significantly worse rates for the poor (and, when pertinent, indigenous populations).
- To have a better understanding of social parameters of unelectrified populations and their financial capacity to participate through tariffs in electrification schemes and to build up local solidarities to open access to poorer. Previous analyses show that many villagers are willing to pay more than what is asked by the utilities, but the question is up to which point, according to their income level?
- To better identify, quantify, and compare the socioeconomic benefits of the different possibilities of rural electrification beyond the mere avoided cost and environmental analysis currently used in project assessments, in order to compare and evaluate public interest in supporting one or another such schemes and give reference benefits (to adapt according local contexts) for specific programs.
- To determine subsidy levels and mechanisms and other public supporting schemes necessary to (a) open financial cost-effectiveness "zones," which define ranges of projects that may altogether be attractive for stakeholders and provide equitable access and acceptable tariffs to villagers; and (b) to reflect public priorities, such as the building of interconnections and their preference for renewables.
- To evaluate the sociopolitical context of local communities, in order to define mechanisms that ensure both an effective community decision process and local deciders' control by population, so as to maximize access without endangering project financial viability.

Terms of reference should include, as they did for the Indonesian and Sri Lankan work, an evaluation of the experience in and impact on electrified communities depending on how long they have been electrified (in zones and communities with characteristics similar to the ones dealt with in the new electrification program) and on unelectrified villages in the proposed zone. The evaluation should respect the "qualitative-quantitative" sequence, with participative investigations before conventional surveys, because people generally know more about themselves than investigators or project designers.

Appendix 1: Impacts of Rural Electrification on Poverty and Gender—Elements of Bibliography

Table A1-1: Impacts of Rural Electrification on Poverty and Gender—Elements of Bibliography

1. Impact on agriculture and cattle breeding			
Impact	**Doc**	**Page**	**Main issues**
Irrigation	1	61	Due to the TV weather forecast: If rain is announced, there is no need to water the fields.
	1	61	Use a water pump to irrigate their fields during summer time. The use of the pump reduces human labor and time input.
			Additionally the independent water supply by the pump secures food production at times when rains are irregular
	3	13	Very few irrigation pumps that used electricity. They mostly use small diesel-powered pumps
	7	19	If in the absence of electric power, bullocks are considered to be the motive power for lift irrigation, electricity would confer great benefit in terms of addition to irrigated area by making available hitherto unavailable ground water form greater depths
	7	19	An electric pump can give more hours of service in a year as compared to a diesel engine.
	7	19	350 acre inches of water/year for an electric pump as compared to 650 acre inches of water/year for a diesel engine. Therefore, wells which might be considered uneconomic for purposes of dieselization may be considered suitable for electrification due to the lower investment and operation costs of electric motors.
	7	19	In cases where water has to be explored from depths exceeding 500 ft, irrigation becomes efficient only after electrification.
	7	21	As far as cropping intensity is concerned, "energization" of wells with electric power does not seem to confer any benefit on its users in the study area.
	7	22	Use of electricity appears to be encouraging increase in net irrigated area by providing irrigation to additional cropped area.
	8	9	Irrigation was projected to play an important role in project benefits, representing between 15-30% of benefit flows in the cost-benefit

			analyses, no plans were made in the project, nor funds included, that would increase the probability that the irrigation potential would materialize.
	10	9	The installation of electric irrigation pumps appears to be too costly for small paddy farmers whose fields tend to be far from distribution lines and in many instances are scattered
	13	62	Rural electrification has a positive impact on agricultural pumping and use of agricultural innovations in India, because of a good coordination with other public supported programs, less in Colombia and Indonesia
Agricultural production	3	13	Electricity had little or no substantial impact en agricultural production. In general the costs of both equipment using electricity and compatible farming techniques were beyond the means of most farmers
	3	32	Electricity had an important indirect role in agriculture through its use in industries servicing farmers (equipment repair) or processing farm crops (rice milling)
	7	25	In terms of physical output per hectare (yield), the users of electrified and diesel pump-sets did not have appreciable differences between them. However, in terms of value of output per hectare (for all crops), electricity users had an edge over diesel users, through shifts towards higher value crops
Livestock	1	5, 60	Due to the TV weather forecast, risks in herd management are reduced: if storm and rain are announced, the herdsmen can protect their cattle by bringing them home to prevent losses, rain or snow, wind direction herdsmen know where to look for lost cattle, etc.
	1	57	Light in the "baby sheep room": sheep and goats need special attention and treatment to survive at temperatures 15-20º below zero
Products	5	100	For farmers, at a higher economic level, electricity is almost essential for refrigeration and pasteurization of milk. Electric milking machines increase production by up to a third
	14	63	When adequate market and investment means are already present, electrification may boost production (milk through refrigeration, cereal production or cattle breeding, through pumping)
2. Impact on industry and commerce			
Impact	**Doc**	**Page**	**Main issues**
Increase of knowledge by TV	1	56	A repair shop owner, mentioned technical and scientific programs on TV as a helpful source of information for his job
Marketing strategies	1	61	Market information from TV concerning prices of wool, cashmere and meat helps herdsmen adapt their marketing strategies to suit the situation
Developme nt of market and services centers	3	12	Richer countries (e.g., Ecuador): The rural electrification contributed to the development of market towns and service centers Poorer countries (e.g., Bolivia): Providing electricity was neither a catalyst for economic development of rural areas nor a precondition to it
Tourist	3	17	Electricity was crucial to the development of a tourist industry.

industry			
Local industries	5	100	Garages, workshops and agro-industries are able to stay open later, increase their output and carry out a wide variety of tasks which were previously impossible or prohibitively expensive.
	7	37	As regards annual income (total receipts minus operating expenses including taxes, if any) establishments using electricity received higher income per establishment than the unelectrified ones in their respective categories
	7	60	The nature of business activity was dominated by services and trade and commerce establishments. There was very little manufacturing activity in rural areas. There is no link between electrification and setting up of rural establishments; its impact on establishments could at best be termed as positive but weak.
	9	37	...if we look at the projects which some of the inhabitants are planning, within the next few years there will be a noticeable increase in the activities of carpentry, milling, metal mechanics and welding.
	10	6	The critical factor in determining the extent to which electricity is exploited for industry appears to be access to start-up capital: the availability of capital is critical to determining the industrial response to rural electrification
	10	8	Beyond the provision of capital, the reliability of electricity appears to be a critical factor in encouraging investment in electricity-based production activities.
	11	37	There are generally several alternatives to electric power for productive use in rural areas.
	13	89	Significant impact of electrification on rural industry and commerce
	13	91	Needs to encourage additional rural business development programs (capital, education)
	14	57	Informal activities requires time to develop. No short term effects on industry and commerce may be expected from electrification
	14	57	Investment needs market, capital, attitude: electricity brings the attitude.
	14	24	Bundle programs, aiming to secure markets and bring credit to investment, help maximizing electrification impact on production.
3. Impact on social changes			
Impact	**Doc**	**Page**	**Main issues**
Lifestyle changes	1	7	50% of all households have access to information and entertainment by TV
	1	59	Cold drinks, fresh vegetables and ice cream.
	1	59	Discotheques and dancing halls with karaoke systems (la participation or the population in these activities has increased by 20%).
	1	59	Work with tape recorders, videos and special lighting effects
	1	59	The barber uses different electric hair cutters and hair dyers with cab.
	3	9	Lighted basketball courts provided teenagers with recreation in the

			evening.
	9	35	Radio and TV may be the channels which formulate new concepts about the local reality, life and the world. In medium-range terms, this will result in the consciousness of being Peruvian as opposed to being e.g. Huarinians of Cusquenians, and in the long run of forming part of an even wider community.
Quality of life	1	54	Light at night makes it easier for old people to get up an go to the toilet which is always located outside the house
	1	54	With lighting the family can get up earlier in the morning when there is a lot of work to do
	1	54	People can watch TV in cold wintertime, thus life is not as boring as before
	1	54	We have lighting in all rooms and it is possible to watch TV whenever any household member has time and likes to watch
	3	7	Security from a well-lit. You don't wake up in the morning with soot in your nose.
	3	7	Used for lighting, electricity extended the day, usually allowing more time for socializing
	3	9	The public lighting function to be very important to rural residents who valued the security it provides.
	5	93	The benefits of rural electrification, including the social benefits, tend to be over-estimated ant the cost understated
	5	100	Street lighting is the most frequently quoted because it increases security.
	5	100	The range of entertainment facilities is widened, be it playing cards under a street light or going to a disco-bar
	6	119	Electricity has become an instrument of conviviality in the villages: decorating light in weddings an festivals, sitting together ant talking to friends and relatives at night
	8	4	With longer waking hours, people socialized more and some pursued productive activities, such as weaving or repairing agriculture equipment
	9	21	Fewer expenses, better quality of lighting, comfort, security, no contamination, convenience for students to study, possibility of using domestic electrical appliances.
	14	46	Getting rid of the "mechero", safety, security, going out at night, in house improvement, television for better and worse
Migration	1	62	A village with a reliable electricity supply probably attracts some households who until now have lived without electricity
	3	8	Contradictory results about effects on migrations: In Bolivia, it seems that electrification promotes migration from cities to electrified market towns. Costa Rica electricity had indirectly accelerates migration from electrified poor areas
	5	96	Insofar as rural electrification contributes to increased productivity and wealth generation, it will tend to reinforce the trend towards rural depopulation

	11	49	Is no evidence for a direct link between electrification and migration. A probable effect of electrification on seasonal migration: It is indeed conceivable that
			that irrigation with electric pumps leads to year-round cultivation of a greater variety of crops, which in turn would even out seasonal fluctuations in demand for labor. We have found no data however, to show that this has happened anywhere.
	13	111	Rather than diminishing migration, electrification may increase out-migration
	14	59	Little effect on rural migration, but reorganization of rural habitat
Education/ general culture	1	7	20% of the people interviewed have an understanding of Internet, computers, mobile phones, product brands and labels.
	1	7	20% of the persons interviewed can remember recent important news from TV.
	1	54	The children can study in the evening (if the don't watch TV!)
	1	55	Watching TV is broadening the horizon of the people: they can learn about their own country, different life styles and living standard, as well as modem trends. TV also creates new ideas, new activities and new consumption needs.
	3	9	Costa Rica. Schools were seldom used at night for adult education and made minimal use of electrical equipment.
	6	119	Reading newspapers and books at night
	10	9	Many schools are electrified: few were used at night ant then mostly for occasional meetings. Only one school which conducts night vocational classes.
	13	122	Strong relation between electrification and literacy
	14	52	Multiple effects on education: children studying at night, night courses for adults in school, TV as rural encyclopedia
Health	1	56	A local doctor uses TV information for a better selection of medicine, which he can buy from the market or from mobile businessmen. As there are also medicines on the market which are not really useful, TV information helps to prevent false medication
	1	59	Doctors use a heating tube to treat their patients
	1	61	An x-ray facility can give better services because they can base their diagnosis and treatment on x-ray examination
	3	8	In Nicaragua, household refrigeration improved nutrition (increase 9-10% of international standards for protein and vitamin A)
	5	100	The survey in Malaysia mentioned above found that 72% of the respondents felt their health had improved because of refrigerated food and the greater ease in boiling water.
	8	6	Health clinics functioned without refrigerators because they broke down and spare parts were not available, even though electricity was available.
	10	9	Health centers have been electrified, but none are used at night. One

			has a sterilizer, but it is broken. None have refrigerators for preserving medicine. None have been reequipped as part of a program to take advantage or power.
	14	54	Main effects on home hygiene as well as house attendance by medical staff. Less effect on basic health infrastructures.
Communi-cation	11	48	Amplified calls for prayer
	14	54	TV link to community and world
Women	1	7, 56	80% of the interviewed persons stated that women in their households are using time and labor saving appliances after the installation of the system; the electricity has made house work easier for woman: food preparation and conservation, and prolongation of working time into the evening
	3	7	Many women could work more on handicrafts in the evening
	5	99	For woman, having light at night enables them to sew, spin, knit, separate seeds, etc activities which only have been accomplished earlier with great effort under the light of kerosene lamp or a candle
	5	100	Domestic appliances such as irons, kettles and hotplates help eliminate at least some of the drudgery of work which women do
	5	100	In Tanzania, electricity has also allowed for the operation of a number of flour mills which, for a modest price, relieve the woman or her children from a monotonous and tiring task.
	8	4	The rural woman used light in the evening to sort seeds and clean agricultural produce, to spin wool, to make and repair clothing and to weave blankets activities that were previously undertaken in the daylight hours. She no longer had to worry about the small children being burned (with kerosene lamps and candles)
	11	49	Rural electricity is often presented as something of particular interest to rural woman: household light affected the life of the rural woman, the most since many of her activities revolve around the home.
	11	50	A result of electrification women may work even longer hours; that "they can take day time jobs because they can do chores at night" that "they can work at night and thereby double their production"
	14	43	A longer working day for women
Birth rate	11	51	The introduction of electricity has helped in reducing the growth rate of population. Socio-economic change and declining birth rates could certainly come together, and there may be links between consuming electricity from the grids and rural development. If is difficult, if not impossible however, to determine a causal relationship between rural electrification and declining birth rates.
Public services	9	23	A gradual improvement can be seen in the public services of the populated centers recently electrified. Projects are being carried out involving the installation of drinking water and drainage, municipal libraries are beginning to function and a new medical center is being established.
4. Impact on economic changes			

Impact	Doc	Page	Main issues
Household wealth increase	1	7	80% of adult community members listen to the weather forecast for productive purposes
	1	7	Less than 5% of the households are disconnected from the energy supply system because they cannot pay the electricity bill
	1	7	5% of all households use electrical appliances for productive an income generating purposes
	3	7	Home refrigerators enabled women to make extra money by selling iced candies and drinks to neighborhood children
	9	19	Before, a family spent approximately I/30 for its monthly consumption of candles and kerosene. Now, after electrification and in the case of the minimum consumption, the monthly expense approaches I/6. In other word, there is a net monetary saving in energy for lighting
Community economic activity	1	59	Services providers using electric appliance for income generation: doctor, restaurant shop, disco, video cinema, barber shop, repair shop
	8	9	The provision of rural electric power did not seem to play a catalytic role in the economic development of these areas or to be precondition for it: the central systems electric power was more a response to economic growth than the cause of it.
	9	27	Increase in the prices of land after the electrification, as well as of an increment in the rental of houses or flats.
Household income decrease	1	62	The payment for electricity fees in an unproductive loss of cash for poor families
	1	62	A certain level of investment capacity is needed to start an income generating business . This investment capital has to be earned from other income sources like selling of livestock or agricultural products. In case money is available from other income sources and invested in electrical appliances, the capacity limit of the village systems will be reached very fast: only a small group of already well off households may earn additional income through electricity.
Unemploy-ment	3	32	No evidence of electricity - caused unemployment was found
	7	30	For agriculture-irrigation: Overall employment is about 10% lower in the case of electricity users but about 32% lower in the case of diesel users as compared to the users of traditional lifts
	11	40	No substantive evidence that increased employment was the direct result of rural electrification projects as these projects have been designed to date.
5. Impact on inequity			
Impact	**Doc**	**Page**	**Main issues**
Regional inequity	9	31	The electrification has created intense interest and expectations among the neighboring localities in also being able to accomplish their

	14	39	electrification through equally advantageous conditions. Difference due to existence or not of electrification projects with small connection costs: those who do not have supporting projects have to pay a lot to get electricity Electrification gives more power to communities in rural competition for infrastructures
Increasing differences between households	3	17	A number of upwardly mobile families using electricity to assist their rise into the middle classes
6. Impact on environment			
Impact	**Doc**	**Page**	**Main issues**
Biomass substitution	1	62	Today, biomass fuel and coal is mainly used for cooking, boiling water and heating. These energy sources, however, cannot be sufficiently substituted by the energy supply of the RE systems.
	3	98	Even if the consumption of fuelwood were to cease completely, the mayor pressure for clearing forest, which is the need to expand the area of farming land, would remain. In practice, the use of electricity for cooking is usually low in the rural areas.
Deforestation	9	33	The most evident ecological impact will result from the fact that some communities have had to give up parts of their forests in order to finance the electrification. By passing into private hands, these forests are felled for the commercial use of its wood.
Architec-tural degradation	9	35	From the architectural and esthetical view, the way in which the electrical installation was accomplished has created damages in reference to the dwellings as well as to the populate centers. For the populated center as a whole, one of the details which is in contradiction with the architectural harmony, with the aggregate of elements used in the construction, is the use of metal lamps in public lighting.
7. Psychological impact			
Impact	**Doc**	**Page**	**Main issues**
	3	8	Isolated poor areas felt less isolated and less poor with the coming of this symbol of modernity (TV, radios,)
	3	8	Electricity as a sign of their town coming of age or of the attention paid to them by the political leadership.
	5	101	The availability of an electricity supply tends to provide rural communities with a psychological boost, improving the morale and increasing the civic pride of local people.
	5	101	When the supply arrives in an area, the switch-on ceremony is usually one of considerable communal rejoicing and optimism about better things to come
	8	3	...the importance that rural people attach to electric power. They often ranked it as important as potable water, education and health care.
	11	43	Electricity if nothing more is an important symbol of progress which carried with it psychological momentum for self-improvement on both

	11	48	the individual and community levels. Not only do they give people a sense of additional security and comfort, they tell them that their government cares about them.
	14	36	Indignity in the electrification process, when unelectrified communities are not associated
	14	38	Dignity when electricity has come, feeling of being a community

Note: Page numbers refer to the analyzed document.

References of documents quoted in table

1 **We have light, we watch TV, now we are connected to the outside world!**

1997-1999. China. Wind, PV, hydro systems

CONTEXT: People living in high pasture lands of Mongolia. Principal source of income: cashmere wool. Zone with drastic temperature changes.

ANECDOTAL EVIDENCES: see pages 22, 57

IMPORTANCE OF METEOROLOGICAL PREDICTION: see pages 60, 61

ELECTRIFICATION ALONE IS NOT ENOUGH TO ALLEVIATE POVERTY:

The provision of electricity in remote rural areas is only one factor to support rural development.

Decentralized RE supply does not substantially alleviate poverty. page 61

2 **Annual report 1998-99. Ministry of Non-conventional energy sources**

1998-1999. India. Renewable Energy

Not much on poverty alleviation

3 **Power to the People. Rural Electrification Sector. US AID**

1983. Bolivia, Costa Rica, Ecuador y Philippines. Rural electrification

CONTEXT: Evaluation of 4 rural electrification projects funded by US AID

ELECTRIFICATION ALONE IS NOT ENOUGH TO ALLEVIATE POVERTY:

Clinics needed refrigerators along with spare parts and provision for their repair when they broke down. Night schools needed a separate adult education program and teachers willing to teach at night. Usually the costs of these complementary inputs were far higher and more difficult to attain than was the electricity itself. Page 10

With electricity poor remain poor, rich remain rich: see pages 11,12,13

4 **Energy for rural development in China. ESMAP**

1996. China. Rural Energy

Not much on poverty alleviation

5	**Electricity for rural people. Gerald Foley**
	1990

ELECTRICITY SUPPLY IS NOT SUFFICIENT TO CAUSE DEVELOPMENT

It is evident that a rise in living standards and increased economic activity can occur in a rural area in the absence of any rural electrification program. Once economic conditions begin to improve, for whatever reason, people find the technical means to meet their rising needs and aspirations. Gas and kerosene can be used to provide lighting for homes and businesses, and to power refrigerators. Motion power for irrigation or machinery can be supplied by diesel motors, or by water power in areas where it is available. Batteries provide power for radios, cassette players ant TVs. Development of this kind has happened in the past and continues to do so today in rural areas where there has never been any question of a public electricity supply being provided (Page 92). Rather than electrification causing development, it may be the other way round, with development creating the conditions under which rural electrification programs can be successfully implemented. Page 94

6	**The socio-economic implications of micro hydro power systems in India**
	1982

ELECTRIFICATION ALONE IS NOT ENOUGH TO ALLEVIATE POVERTY:

The experience of the areas studied suggests that merely the availability of electricity does not constitute a sufficient condition for industrialization of a backward area and creation of more jobs outside the traditional agricultural sector. Electricity can, at best , be a necessary condition, but the potential created by its availability can only be utilized if other conditions also change.

CONCLUSIONS: The availability of electricity cannot be considered a cause of the better economic conditions of the electrified households, primarily because it is hardly being used for any productive purposes. The main impact of electrification has been social rather than economic

7	**Socio-economic impact of rural electrification in India**
	1986

CONTEXT: The study was based on comparisons of the villages with and without electricity

8	**Bolivia: rural electrification**
	AID Project, 1980

Lack of linkage between the installation of electrification systems and social service usages: The public agencies responsible for health, education and potable water are typically among the weakest in terms of bureaucratic power and financing. Electric power entities, in contrast, are usually among the strongest. Electricity was not as essential an input into the social service usages. (page 6)

PROVIDING ELECTRICITY WAS NEITHER A CATALYST FOR ECONOMIC DEVELOPMENT OF RURAL AREAS NOR A PRECONDITION TO IT

9	**Electrification and rural development.**
	1987. rural Cuzco, Peru

Considers that rural electrification has fair positive impact on development

10	**The Philippines: Rural electrification**
	1980

The impact of electrification seen by the team in each area depended on the level of development of the area. Not surprisingly, power-based development was more apparent in populations of market towns than in rural districts. Page 6

Lighting the homes of the poor does not have much impact on their lives. They are certainly more comfortable and their lives are more pleasant, but even the poor do not view this as an adequate incentive to choose electricity over other basic needs. Page 14

11	**The socio-economic impact of rural electrification in developing countries: a review of evidence**
	1983

In spite of the universal belief that electrification means progress, none of the electrified sites visited could report any positive economic impact attributable to the installation of electric power.

12	**Rural electrification and distribution. Nepal**
	1999

Not much on poverty alleviation

13	**Electric power for rural growth, Douglas Barnes**
	1988

CONTEXT: The study was based on surveys in India, Colombia and Indonesia

CONCLUSIONS: Primary impact of electrification is the expansion of irrigation and agriculture, less on industry. Some effects on migration and on households living patterns.

14	**Impact of energy projects on poverty alleviation**
	2001

CONTEXT: Evaluation of 7 case studies, among which rural electrification in five areas. Analysis on unelectrified, recent and long electrified rural communities.

CONCLUSIONS: Electricity brings community dignity, longer day, better life, has effects on education and health but little impact by itself on economic development without adequate support actions.

Appendix 2: Some Facts and Data on Industrial Countries

The Gift of Time

About time

Regarding time, trends appear to be as follows: (a) even if there are discrepancies between economists about recent trends, it is unquestionable that work time has substantially decreased over a long period: in France, work represented an average of 70 percent of the awoken life in the mid-19th century, compared to less than 20 percent nowadays (Corbin and Csergo 1997); (b) time dedicated to house chores also has substantially decreased: in the United States, women dedicated an average of 2 h 30 to housework, against nearly 4 hours in the mid-1960s, too large a decrease to be compensated by male implication in chores; (c) leisure time tends to steadily progress: U.S. figures show a substantial progression of the time dedicated to leisure (about one hour more since the mid-1960s), as the French ones (average of half an hour more between 1986 and 1999).

Less time for work and house chores, more time for leisure: is this time famine? Unhappily, things are more complex. People tend to sleep less: Jeremy Rifkin (2001) considers that in Western countries, around 1910, adults were sleeping an average of about 9–10 hours. At the present time with an average of about 7 hours of sleep, people are awake about 500 hours more per year: a burden difficult to bear for biological watches, with consequences in terms of serious diseases such as diabetes, cancer, cerebral hemorrhage, nervous breakdown. This is true for America (according to the National Sleep Foundation), less for Southern Europe: if French data also confirm a slight decrease in sleep time, averages contradict Rifkin estimates as it still turns around 9 hours.

The generalization of the urban model to the whole of society led to obviously compacted work schedule (with the progressive disappearance of the long but porous rural work time, but increased work load pressure. Expanded participation of women into the paid labor force (from less than one third in the 1950s to nearly two third in the 1990s in the United States, for instance) is the major cause for the less time dedicated to house

work: American and French women dedicate respectively 4 and 5 hours to house work when being housewives, but only 2 and 4 hours when working outside the home.

Life expectancy increase and longer retirement period also distort up to a certain point leisure figures; leisure characteristics are also evolving in the same fashion as work: socialization (at least in the United States; Putnam 2000) and time consuming activities tend to be replaced by less time consuming substitutes and multiactivities, in a process called by Geoffrey Godbey as "time-deepening." As a result, pressure on time increases and leads to time famine: U.S. surveys on household routine (Godbey and Graefe 1993) show that the percentage of people "always" feeling rushed has been nearly doubling in the last twenty years (from 22 percent in 1971 to 38 percent in 1992). In Canada, a similar study shows that 34 percent of the population "always" now feel "always" rushed.

Whatever may be progresses in this matter, time analysis still reflects a deep gender bias. Women work more at home, have less free time, are more likely to always feel rushed. The most affected group being family mothers working outside, being facing both professional activities and a key role in household management. In the 1992 U.S. survey, they appear are the most stressed group, with 62 percent feeling "always" rushed. At one point only, the bias seems to reverse: sleep. French women sleep more or less as working men when they are working outside (with even an average ten minutes more), but substantially more (nearly one hour) when being a housewife (roughly 9 h 15 against 8 h 15).

About house chores

Statistics show a relative decrease in time spent for house chores in industrial societies. Up to which point this may be due to the spreading of electricity and modern electrical appliances? The latter, device by device, undoubtedly save women's time. An electric grinder, a vacuum cleaner, a laundry or washing machine do save time and work. One of the most famous slogans of a French appliances firm has long been "Moulinex frees women." However and in spite of the widespread use of electric appliances, housework still is a full time job for housewives. In 2001, the French Bureau of Statistics abandoned the famous and abusive terminology "active-inactive" which assimilated the housewife even with numerous children to an "inactive" person. An average French full-time housewife works 45 hours and 9 minutes per week on house chores, that is, more than the legal work duration (recently reduced from 39 to 35 hours per week; INSEE 1998–99).

To a large extent, a reduction of average time dedicated to housework is due to the larger implication of women into the paid labor force. When getting married, the average American woman spend one hour more on house work. When getting children, house chores may take up to 4 h 30 when taking care of more than three. While employed, the time she dedicates to house chores drops from 3 h 50 to about 2 h 00. Similar figures may be found in present France (women working outside dedicate one hour less in house

chores). Older data in former communist Eastern Europe are interesting, as women entered earlier in a large proportion into paid work, in times when electrical appliances where not or little spread. As a result, in the former Soviet Union (Stroumiline 1925 and 1961), time dedicated to household chores by women was 4 h 48 in 1924 and 2 h 55 in 1959, a 2 hour drastic decrease.

Housework time decrease is nevertheless clearly perceptible in western societies both among full time housewives and working women populations. Wider availability of electric appliances could then be a significant parameter. Once again, statistics tend to prove the contrary: women with more appliances appear to spend more time doing housework than those with fewer appliances 6. Appliances make women more efficient, alleviating the hardness of chores, but time gained in the process is mainly reinvested in house chores. Housework time decline among housewives tends to be attributed primarily to cultural devaluation of housework activities and in any case, not to modernization and technological changes.

In industrial societies, employed women have less time for leisure than men, and far less than full-time housewives: in the United States, employed women have about three quarters of an hour less leisure time than employed men, and more than one hour and a half less than full-time housewives. Comparable figures for France show less free time and more gender differences: Women have about three quarters of an hour less free time (leisure and socialization) than working men when they work outside, but one hour and a quarter more when being housewife (5 h 01 per day). Even recent investigations show that gender task division is still interiorized in women's as well as men's minds. In the United States, single men spend an average of 1 hour per day in household work, against 2 hours per day for single women (1995). In France single men spend 40 percent less for cooking, 50 percent less for house and clothes cleaning than single women (1999), and French women also tend to be far less in considering these tasks as chores (as constraints) (Dumontier and Pan Ké Shon (1999). A typical case study for marketing and advertisement schools is a publicity for washing machines in the 1950s. Advertisers had to erase any allusion to time and work saving when they found the ad counterproductive: women felt guilty to get spare time using the washing machine; thus the ads insisted on whiter linen (to satisfy all family members) and even presented a housewife prewashing stained parts by hand, to show her still busy even with the new appliance.

Electrification times had no impact on former Soviet Union men participation in house work (about 1 h 40 in 1959 as in 1924). In the United States, men have doubled their participation (from 0 h 42 to 1 h 25) between 1965 and 1995), and now do one third of the housework. In France, while women spent less time in housework, men participation did not appear to increase in the last fifteen years. They spend an average of 2 h 24 per day in house chores, against 4 h 23 for women, and so do about one third of the chores. But it is only one fourth when considering only house cleaning, laundry,

cooking and purchases, as women still dedicate about two hours more per day than men to housework when working outside, four hours more when being housewife.

About socialization and empowerment

F. Engels considers that more time availability (basically through work time reduction) would increase people's participation in political and community life. But even in a society where political pressure strongly promotes activities, this participation continuously decreased (109 hours per year in 1924, 17 hours in 1959 for a urban soviet worker), while free time increased by three over the same period (Stroumiline 1925 and 1961). In 1964, participation to political and union activities among French workers was considered to represent about 0 h 30 per day: it drastically fell and is not even recorded anymore as a significant category in leisure statistics.

There is an undoubted link between participation in associations and more informal groups, and empowerment. "Without access to an association that is able to speak up for our views and value, we have a very limited ability to be heard by other people or to influence the political process, unless we happen to be rich or famous." (Amy Gutman, "Freedom of Association, an Introductory Essay, 1998, quoted in Putman 2000.) But analysts point out a sharp erosion of the "social capital" in United States: the U.S. Department of Labor's Current population survey points out a one sixth decline of "regular" volunteering between 1973 and 1991; Robert D. Putnam (2000) gives multiple examples of this decline in informal social connections as well in voluntary organizations: time dedicated to informal socializing cut by one third over the last forty years, Parents and Teachers Associations membership from 12 million in 1964 to only 7 million today, Red Cross volunteering or Women Voters membership decreasing respectively by 61 percent and 42 percent since 1970.

Tentative analysis of the causes of this decline may be described as such, in order of importance: (a) generational changes: decreasing interest for volunteering, from war generation to baby boomers, from baby boomers to the "X generation," (b) technology: while telephones seems to have little effect on personal links and attendance to communities, television, as a large time consumers, seems to play an important role in the decline; it is still early to determine if the Internet, not a cause for the decline, may yield substitutes to conventional forms of community actions; (c) insertion of women in paid labor: traditional "mommies" being the cement and workforce of many associations; (d) availability of time: work, entertainment cutting off availability for socialization and volunteering.

Among factors that may influence generational differentiation, with a growing tendency toward materialism and individualism, may be quoted confidence (or despair) regarding the future and estimation of risks. Loss of confidence in the economy and society due to the 1929 crisis, for instance, has deeply disturbed most existing associations in the 1930s, from Parents and teachers associations to women's voters or women club, from masonry to professional associations (such as the electrical engineer

association). As the baby boomer generation grows and reaches adult age in a flourishing economy, it experiences distrust of existing formal institutions. X generation grows and reaches adult age in harder economic times, and face labor competition with an elder plethoric and already well installed boomer generation.

Insertion of women in the labor force appears to be a double-edged sword. On one hand, working creates far more opportunities for meeting outsiders and developing new networks. Working women belong to slightly more voluntary associations than housewives who are more likely to be socially isolated. , and gender difference has somehow faded regarding public life. A decline in volunteering has been more pronounced among full time housewives than among working women. Tighter schedules are spoiling a number of these opportunities. When comparing two women of the same socioeconomic status, the one working outside cuts club and church attendance by roughly 15 percent, informal visiting by 25 percent and volunteering by 50 percent. (See tables A2-1– A2-8.)

Table A2-1: Percentage of People "Always" Feeling Rushed, United States

Year	% "always" feeling rushed
1971	22
1985	32
1992	38
Of which working mothers	64

Source: Godbey and Graefe 1993.

Table A2-2: Daily Sleep Time, United States (hours per day)

Marital and work status	Daily sleep time
Married couple with children under 18	6 h 40
Married, no children	7 h 10
Single	7 h 05
People clocking more than 60 hours of work per week	6 h 30
People clocking less than 40 hours of work per week	7 h 05

Source: National Sleep Foundation 2001.

Table A2-3: Time Dedicated to House Chores by Women, United States (hours per day)

Year	Time dedicated to house chores by women
1965	3 h 51
1975	3 h 00
1985	2 h 42
1995 (estimated)	2 h 34

Source: Robinson and Godbey 1997.

Table A2-4: Leisure Time, United States (hours per day)

	Leisure time	
Year	**Men**	**Women**
1965	4 h 55	4 h 55
1975	5 h 31	5 h 28
1985	5 h 52	5 h 39
1995 (estimated)	5 h 59	5 h 46

Source: Robinson and Godbey 1997.

Table A2-5: Working Time, France

Year	Work yearly duration (hours)	Global work duration in life cycle (hours)	Global waking time (based on 16 h/day and life expectation)	% of work time compared with waking time
1,850	5,000	185,000	262,800	70%
1,900	3,200	121,600	292,000	42%
1,980	1,650	77,500	420,480	18%

Source: Corbin and Csergo 1997.

Table A2-6: Daily Time Use, France

	Men				Women			
	Working*		Nonworking		Working*		Nonworking	
Hours/day	**1986**	**1999**	**1986**	**1999**	**1986**	**1999**	**1986**	**1999**
Physiological time	11 h 22	11 h 22	11 h 51	11 h 39	11 h 32	11 h 35	12 h 42	12 h 37
Of which sleep	8 h 31	8 h 23	9 h 53	9 h 34	8 h 46	8 h 37	9 h 47	9 h 32
Work and training**	6 h 33	6 h 22	1 h 54	1 h 32	5 h 15	5 h 01	0 h 59	0 h 59
Domestic work	1 h 51	1 h 59	2 h 45	2 h 55	3 h 49	3 h 48	5 h 16	4 h 47
Leisure	2 h 46	2 h 57	4 h 38	5 h 06	2 h 00	2 h 19	3 h 15	3 h 57
Of which television	1 h 35	1 h 47	2 h 22	2 h 44	1 h 09	1 h 24	1 h 59	2 h 28
Other	1 h 15	1 h 10	2 h 16	2 h 12	0 h 51	0 h 55	1 h 16	1 h 29
Socializing	0 h 51	0 h 47	1 h 04	1 h 10	0 h 48	0 h 43	1 h 09	1 h 04
Free time***	3 h 36	3 h 44	5 h 38	6 h 15	2 h 48	3 h 02	4 h 24	5 h 01

* Work for pay (excluding own domestic work).
** These figures, like the others, show an average for 7 days, including weekends.
*** Leisure plus socializing.
Source: INSEE 1998–99.

Table A2-7: Free Time by Gender, France

Free time (*) (hours/day)	**Men**	**Women**
1999	4 h 52	4 h 12

* Free time: leisure, socialization.
Source: INSEE 1998–99.

Table A2-8: Free Time of Working Adults by Gender, France (hours per day)

	Free time	
Year	**Working men***	**Working women***
1964	3 h 39	2 h 42
1986	3 h 36	2 h 48
1999	3 h 44	3 h 02

* Working for pay.
Source: Slazai 1964 and INSEE 1998–99.

The Value of Home

Leisure control

Leisure has been considered as an important national and international responsibility: after the first world war, the newly created International Labour Organization considered it as a primary objective and established successive action plans to "offer popular masses means to use healthily, sensibly and freely their leisure time" (Thiesse 1985). Most planned economies (as well as capitalistic countries, although on a lighter tone) also considered the development of "positive" activities during leisure time as very important.

This desire of control over urban workers leisure time undoubtedly responded to political objectives as well as to fear of development of social plagues such as alcoholism and debauchery, incompatible with work force preservation. But it also fundamentally expresses a still valid duality and confrontation between two conceptions of leisure: one, positive, belonging fundamentally to an upper cultural class and responding to moral norms expected from masses, and another one, negative, built on doubtful popular tastes and encouraged by commercial dynamics. Demography plays against the first: "With the increase in population, the problem presented by the gulf between what is accepted as excellent by the most qualified opinion has become more serious and appears more threatening in the near future." (Richards 1924)

In rural areas, leisure as such is mostly nonexistent, apart of some episodic and collective events, such as out season evening story telling or parties. Individual entertainment, historically mostly nonexistent, began late, first with the development of reading due to alphabetization, later with television. In that trend, arrival of electricity coincides with the development of individualism: transfer of parties from day to night time (offering less opportunities for parental control), development of individual entertainment, such as reading at the beginning of the 20th century, and television by the mid century.

Popular reading quickly finds vigorous political opponents: "In the country, nearly everybody reads. In the cities, everybody reads...and it is a shame to see the freshness of this voice being used as a vehicle for impiousness and impurity. Because nearly always, reading is bad." (Gibier 1913, as quoted in Chartier and Hébrard 1989) The problem of reading is even considered worse, because it affects women. "Whoever deals with the masses knows that serials cause to women's brains a similar or maybe worse damage than alcohol in men's brains" (Langevin 1913).

If reading has acquired a positive status (while it lost much of its popular entertainment power), and radio seems to have developed without much criticism, television has inherited a dual image. Meeting an overwhelming interest from the population's side, it is undoubtedly a powerful—and historically new—engine for

electrification. But the perception of television spreading and influence over the world, from industrial cities to developing rural areas is far to be unanimously positive.

The poor perception of television comes, at least partly, from a fear of democratization, "of a popular culture which is beyond control of established agencies of surveillance and discipline"4. This appears to be comparable to the 19th century fear of urbanization, industrialization and population explosion (philanthropists being equally motivated by the plight and the threat of the uncontrolled urban poor), a fear of spreading the influence of books on popular classes, a fear of the impact of fiction on women. (See tables A2-9–A2-10 and figure A2.1.)

Table A2-9: Pace of Introduction of Consumer Goods

Consumer good	Year penetration begins: 1% of households	Year of large penetration: 75% of households	Years to reach 75% of households
Telephone	1890	1957	67
Automobile	1908	1960	52
Vacuum cleaner	1913	1961	48
Radio	1923	1937	14
Refrigerator	1925	1948	23
Television	1948	1955	7
Air conditioner	1952	1990	48
VCR	1980	1992	12

Source: Putman 2000.

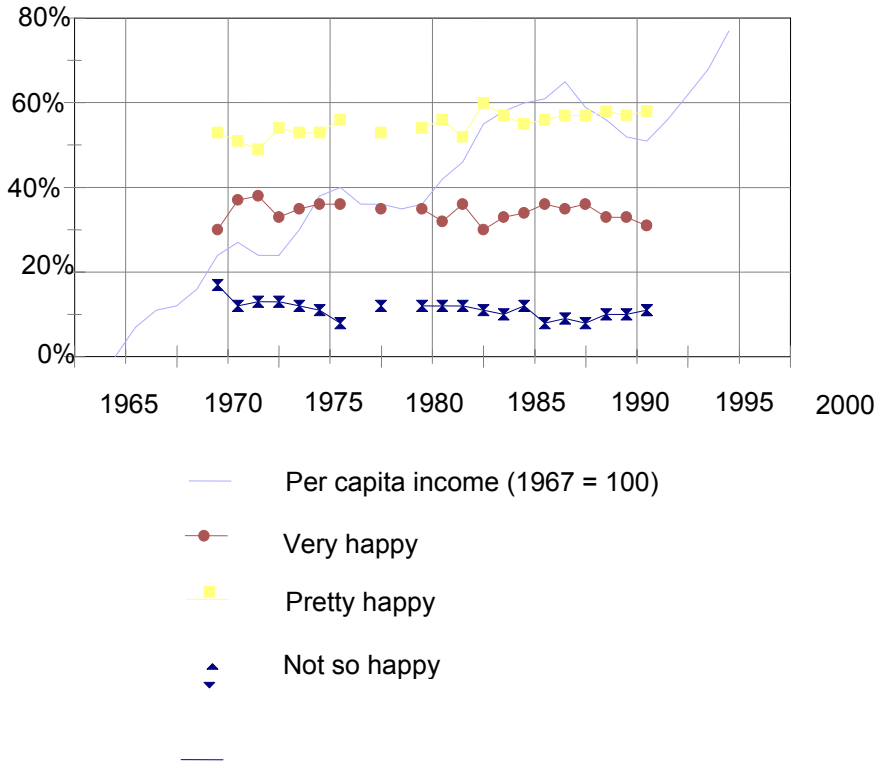
Table A2-10: Equipment Rates and Intentions of Purchase of Consumers Goods, Spain

(percent)

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

Source: Instituto de Opinión Pública 1966.

Figure A2-1: Income and Happiness in the United States



Source: U.S. Economics and Statistics Administration (2000) and National Center for Public Opinion Research (2001).

Appendix 3: Communityville Electrification

Discount rate *10%*

1. COSTS

US$/month	Before electricity	Nominal tariff	*Nominal Saving*	Minimum tariff	Grid WTP 0	Solar payment
Big	6,0	3,0	*50%*	4,0	6,0	10,0
Medium	3,0	2,0	*33%*	3,0	3,0	6,5
Small	1,0	1,0	*0%*	2,0	2,0	4,0

Grid cost

Connection minimum cost *120* *US$*

id

Big *till 30*

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	*120*									
Yearly payment	*36*	*36*	*36*	*36*	*36*	*36*	*36*	*36*	*36*	*36*
Total	*156*	*36*	*36*	*36*	*36*	*36*	*36*	*36*	*36*	*36*
NPV	*448*									
Monthly leveled cost	*4,0*									

Medium

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	*120*									
Yearly payment	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*
Total	*144*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*
NPV	*335*									
Monthly leveled cost	*3,0*									

Small

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	*120*									

Yearly payment	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*
Total	*132*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*	*12*
NPV	*222*									
Monthly leveled cost	*2,0*									

Solar cost

Big

Price	*920*
Monthly leveled cost (20 years)	*9,0*
Spare parts replacement	*1,0*
Total	*10,0*

Medium

Price	*560*
Monthly leveled cost (20 years)	*5,5*
Spare parts replacement	*1,0*
Total	*6,5*

Small

Price	*310*
Monthly leveled cost (20 years)	*3,0*
Spare parts replacement	*1,0*
Total	*4,0*

2. WILLINGNESS TO PAY

						Central hypothesis		Optimistic one	
	Before electricity	Nominal tariff	Minimum tariff	Solar payment	WTP0	Solar WTP 1	Grid WTP 1	Solar WTP 2	Grid WTP 2
Big	6,0	3,0	4,0	10,0	6,0	10,0	12,5	10,0	13,0
Medium	3,0	2,0	3,0	6,5	3,0	5,0	6,0	6,5	7,8
Small	1,0	1,0	2,0	4,0	2,0	none	2,0	none	2,0

Hypothesis

ALL POOR CONSUMERS MEET MINIMUM GRID COST WITH DIFFICULTY

	fact grid wtp =	*2,0*	*for small*
conclusion	*solar wtp =*	*none*	*for small*

RELATIVE INTEREST FOR GRID VERSUS TRADITIONAL IS MORE FOR BIG THAN FOR MEDIUM

RELATIVE INTEREST FOR SOLAR VERSUS TRADITIONAL IS MORE FOR MEDIUM THAN FOR BIG

RELATIVE INTEREST FOR GRID VERSUS SOLAR IS MORE FOR BIG THAN FOR MEDIUM

CENTRAL hypothesis: ALL BIG CONSUMERS MEET SOLAR COST, WITH DIFFICULTY

Most big consumers meet solar costs	*hypothesis*	*solar wtp =*	*10 for big*
Solar better than traditional	*conclusion*	*by*	*67% for big*
More for medium	*conclusion*	*by minimum*	*67% for medium*
	conclusion	*solar wtp >*	*5,0 for medium*

Grid better than solar	*conclusion*	*grid wtp >*	*5,0 for medium*
Part of medium consumers do not meet solar costs	*hypothesis*	*solar wtp <*	*6,5 for medium*
Grid better than solar	*conclusion*	*by maximum*	*30% for medium*
	conclusion	*grid wtp <*	*6,5 for medium*
Grid better than solar	*hypothesis*	*by*	*20% for medium*
	conclusion	*grid wtp =*	*6,0 for medium*
More for big	*hypothesis*	*by*	*25% for big*
	conclusion	*grid wtp =*	*12,5f or big*

MORE OPTIMISTIC ALTERNATIVE: BOTH BIG AND MEDIUM CONSUMERS MEET SOLAR MARKET

Most medium consumers meet solar market	*hypothesis*	*solar wtp =*	*6,5 for medium*
Grid better than solar	*conclusion*	*grid wtp >*	*6,5 for medium*
Solar better than traditional	*conclusion*	*by*	*116% for medium*
More for big	*conclusion*	*by minimum*	*116% for big*
	conclusion	*grid wtp >*	*13,0 for big*
Grid better than solar		*by*	*30% for big*
Less for medium	*hypothesis*	*by*	*20% for medium*
		grid wtp =	*7,8 for medium*

3. GRID CONNECTION DISTANCES AND COSTS

Big	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	-1020									
Yearly payment	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48
Willingness to pay	150	150	150	150	150	150	150	150	150	150
Balance	-917	103	103	103	103	103	103	103	103	103
NPV	39,0									
IRR	11%									

Medium	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	-320									
Yearly payment	-36	-36	-36	-36	-36	-36	-36	-36	-36	-36
Willingness to pay	72	72	72	72	72	72	72	72	72	72
Balance	-284	36	36	36	36	36	36	36	36	36
NPV	52,8									
IRR	12%									

Small	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Connection cost	-120									
Yearly payment	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12

Willingness to pay	24	24	24	24	24	24	24	24	24	24
Balance	-108	12	12	12	12	12	12	12	12	12
NPV	-0,0									
IRR	10%									

Acceptable distance beyond admitted within minimum connection one, and acceptable associated investment

	m	US$
Big	900	900
Medium	200	200
Small	0	0

Hypothesis

Subsidized or informal extension cost	*1000*	*US$/km*
LV Cost with poles	*5000*	*US$/km*

4. VILLAGE GRID ELECTRIFICATION (100 HOUSEHOLDS)

4.1. REQUIREMENTS FOR UNIVERSAL ACCESS FINAL LOOP

Clientele mapping		Far	Average	Near	Total
Distance to the final loop	m	200	100	0	
Big households		10%	30%	60%	20
Medium households		10%	50%	40%	50
Small households		20%	50%	30%	30
Total households		13	46	41	100
Investment for grid	US$/con.	200	100	0	

Total grid requirement to connect all (m)		Far	Average	Near	Total
Big	m	400	600	0	1000
Medium	m	1000	2500	0	3500
Small	m	1200	1500	0	2700
Total	m	2600	4600	0	7200

Universal access requirement

Universal loop length	7,2	km
Per household	72	m/household
Universal loop cost	7200	US$

Universal access electrification cost			
Minimum connections	12000	US$	
Connections extra cost	7200	US$	
Total	19200	US$	
Household willingness to pay	Households	US$	US$
Big	20	1020	20400
Medium	50	320	16000
Small	30	120	3600
Total	100	1460	40000

4.2. CONNEXION BY MAIN UTILITY

		Far	Average	Near	Total
People connected					
Big	100%	2	6	12	20
Medium	100%	5	25	20	50
Small	30%	0	0	9	9
Total	79%	7	31	41	79
Total grid length		1400	3100	0	4500
Investment for grid					
Big		400	600	0	1000
Medium		1000	2500	0	3500
Small		0	0	0	0
Total		1400	3100	0	4500

Investment cost	
Near	120
Average	220
Far	320
Energy cost	US$/month
Big	3,0
Medium	2,0
Small	1,0

Total cost

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Big, near	156	36	36	36	36	36	36	36	36	36

NPV	448
Monthly leveled cost	4,0

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Big, average	256	36	36	36	36	36	36	36	36	36

NPV	539
Monthly leveled cost	4,8
Over cost	20%

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Big, far	356	36	36	36	36	36	36	36	36	36
NPV	630									
Monthly leveled cost	5,6									
Over cost	41%									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Medium, near	144	24	24	24	24	24	24	24	24	24
NPV	335									
Monthly leveled cost	3,0									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Medium, average	244	24	24	24	24	24	24	24	24	24
NPV	426									
Monthly leveled cost	3,8									
Over cost	27%									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Medium, far	344	24	24	24	24	24	24	24	24	24
NPV	517									
Monthly leveled cost	4,6									
Over cost	54%									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Small, 0 m	132	12	12	12	12	12	12	12	12	12
NPV	222									
Monthly leveled cost	2,0									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Small, average	232	12	12	12	12	12	12	12	12	12
NPV	313									
Monthly leveled cost	2,8									
Over cost	41%									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Small, far	332	12	12	12	12	12	12	12	12	12

NPV	404									
Monthly leveled cost	3,6									
Over cost	82%									

Cost and WTP	Near	Average	Far	WTP1
Big	4,0	4,8	5,6	12,5
		20%	41%	
Medium	3,0	3,8	4,6	6,0
		27%	54%	
Small	2,0	2,8	3,6	2,0
		41%	82%	

Clientele mapping

	Far	Average	Near	Total
Big	2	6	12	20
Medium	5	25	20	50
Small	0	0	9	9
Total	7	31	41	79

Annual nominal cost

	Far	Average	Near	Total		Average
Big	72,0	216,0	432,0	720,0	16%	36,0
Medium	120,0	600,0	480,0	1200,0	26%	24,0
Small	0,0	0,0	108,0	108,0	2%	12,0
Total	192,0	816,0	1020,0	2028,0	44%	25,7

Annual real cost equivalent

	Far	Average	Near	Total		Average	Real/nominal
Big	95,1	343,3	802,3	1240,8	27%	62,0	172%
Medium	237,9	1430,4	1337,2	3005,4	65%	60,1	250%
Small	0,0	0,0	385,7	385,7	8%	42,9	357%
Total	333,0	1773,7	2525,2	4631,9	100%	58,6	228%

Utility gross income (US$)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Big	720	720	720	720	720	720	720	720	720	720
Medium	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Small	108	108	108	108	108	108	108	108	108	108
Total	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029

NPV	1748
Demand annual growth rate	0%

4.3. INDEPENDENT POWER DISTRIBUTER (IPD)

Clientele mapping

	Far	Average	Near	Total
Big	2	6	12	20
Medium	5	25	20	50
Small	6	15	9	30
Total	13	46	41	100

Conditions		Before	Now	
Minimum connection cost		120	20	US$
Tariff raise	100%			
Energy budgets		3,0	6,0	US$/month
		2,0	4,0	US$/month
		1,0	2,0	US$/month

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Big	92	72	72	72	72	72	72	72	72	72

NPV	697
Monthly leveled cost	6,2
Over cost	55%

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Medium	68	48	48	48	48	48	48	48	48	48

NPV	471
Monthly leveled cost	4,2
Over cost	5%

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Far	44	24	24	24	24	24	24	24	24	24

NPV	244
Monthly leveled cost	2,2

Annual nominal cost

	Far	Average	Near	Total		Average
Big	144	432	864	1440	32%	72,0
Medium	240	1200	960	2400	53%	48,0
Small	144	360	216	720	16%	24,0
Total	528	1992	2040	4560	100%	45,6

Annual real cost equivalent

	Far	Average	Near	Total		Average	Real/nominal
Big	148	444	887	1479	31%	73,9	103%
Medium	250	1248	999	2496	53%	49,9	104%
Small	156	389	233	778	16%	25,9	108%
Total	553	2081	2119	4753	100%	47,5	104%

Real costs	Minimum	Before Maximum	Average	Now	WTP1
Big	4,0	4,8	5,6	10,0	12,5
Medium	3,0	3,8	4,6	6,0	6,0
Small	2,0	*2,8*	*3,6*	2,0	2,0
Change in the total amount really paid by the community		2,6%			

Investment by IPD		
Minimum connection cost balance	10000	US$
Universal access loop	7200	US$
Total	17200	US$

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Utility payment + management	-2280	-2280	-2280	-2280	-2280	-2280	-2280	-2280	-2280	-2280
Investment in grid	-17200									
Income	4560	4560	4560	4560	4560	4560	4560	4560	4560	4560
	-14920	2280	2280	2280	2280	2280	2280	2280	2280	2280
NPV	5857									
IRR	15%									
% of increase of utility remuneration	0%									
Demand growth rate	0%									

Bibliography

Atallah, Paul. 1991. "Of Homes and Machines: TV Technology and Fun in America." *Continuum* 4(2):58–97.

Barnes, Douglas F. 1988. *Electricity Power for Rural Growth.* Boulder, Colo., and London: Westview Press.

Blühm, Andreas, and Louise Limpicott. 2000. *Light!* London: Thames and Hudson.

Bowden, Sue, and Avner Offer. 1994. "Household Appliances and the Use of Time." *Economic History Review* 47:725–48.

Bruno, Michael, Martin Ravallion, and Lyn Squire. 1995. "Equity and Growth in Developing Countries: Old and New Perspectives." Working Papers 1563—Macroeconomics and Growth; Stabilization, Monetary/Fiscal Policy. Washington, D.C.: World Bank.

Cecelski, Elizabeth. 1996. "Decentralized Rural Electrification as a Tool for Development: Some Issues and Questions." Session on Social and Institutional Issues, World Renewable Energy Congress (WREC), June 15–21 Denver, Colorado.

Ceylon Electricity Board, Sri Lanka. 1999. "Rural Electrification Project 4." Asian Development Bank report, Colombo.

Chartier, Anne Marie, and Jean Hébrard. 1989. *Discourses about Reading–1880–1980.* Paris: BPI Centre Georges Pompidou.

Corbin, Alain, and Julia Csergo. 1997. *La fatigue, le repos et la conquête du temps.* Paris: Aubier Montaigne.

Crawford Cousins, Colleen. 1998. *A Question of Power: The Electrification of Rural Households.* Energy and Development, University of Cape Town, South Africa.

Debeir, Jean Claude, Jean Paul Deléage, and Daniel Hemery. 1986. *Les servitudes de la puissance.* Flamarion: Nouvelle Bibliothèque Scientifique.

Duby, Georges, and Michelle Perrot. 1997. *Histoire des femmes en occident; Volume 4, The 19th century.* Paris: Académique Perrin Editions.

Dumontier, Françoise, and Jean Louis Pan Ké Shon. 1999. "In Thirty Years, Less Constrained Time and More Leisure." Conditions de vie et société, INSEE Première no. 675.

Eco, Umberto. 1979. "Can Television Teach?" *Screen Education* 31:15–24.

FACE (Federación Argentina de Cooperativas Eléctricas de Argentina). 2001a. "Energy and poverty in Bolivia."

———. 2001b. www.face.com.ar.

Galbraith, John Kenneth. 1979. *The Nature of Mass Poverty.* Cambridge, Mass.: Harvard University Press.

Godbey, G., and A. Graefe. 1993. "Rapid Growth in Rushing Americans." *American Demographics* (April):27–28.

Hartley, John. 1999. "Uses of Television." New York: Routledge.

INSEE, Timetable survey, 1998–99. http://www.insee.fr/en/home/home_page.asp.

Instituto de Opinión Pública. 1966. Encuesta nacional de radio-televisión, España.

James, B. 1997. "Current-Limited Supplies of Electricity in the Context of South Africa." EDRC, University of Cape Town, South Africa.

Jobart, Ibam. 1839. "Industrie française. Rapport sur l'exposition française de 1839."

Langevin, J. 1913. Novels Review.

Linder, Staffan. 1970. "The Harried Leisure Class." New York: Columbia University Press. Quoted by Geoffrey Godbey.

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

Massé, René. MARGE Sri Lanka report. 2003. Energy, Poverty, and Gender (EnPoGen) study, Asia Alternative Energy Programme (ASTAE). Washington, D.C.: World Bank.

Matly, Michel, and others. 1989. Surveys for the Mali household energy strategy. Washington, D.C.: World Bank.

———. 2001. "L'électrification du monde commence à Labastide-Murat." *La Revue de l'Energie*.

Mukherjee, Nilanja. 1999. "Consultations with the Poor in Indonesia." Washington, D.C.: World Bank.

National Center for Public Opinion Research. 2001. General Social Survey, National Center for Public Opinion Research, University of Chicago.

National Sleep Foundation. 2001. http://www.sleepfoundation.org/.

Newbery, David M. 1995. "Competition and Regulation in the Electricity Industry." Background paper presented at the OECD/World Bank Conference on Competition and Regulation in Network Infrastructure Industries, Budapest, June 28–July 1, 1994. Paris, OECD.

Palacio, Manuel. 2001. *Historia de la televisión en España.* Barcelona: Ed. Gedisa.

Putnam, Robert. 2000. *Bowling Alone: The Collapse and Revival of American Community.* New York: Simon & Schuster.

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*.

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

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

Sri Lanka survey.

Stroumiline, S. G. 1925 and 1961. "Worker's Daily Life in Figures, 1925" and "Problems of Socialism and Communism in USSR, 1961."

Thiesse, Anne-Marie. 1985. "Organization of Workers' Leisure and Robbed Time, 1880–1930."

U.S. Economics and Statistics Administration. 2001. March current population survey, U.S. Economics and Statistics Administration.

Zeldin, Theodore. 1978. *L'histoire des passions françaises 1848-1945.* Retranslation from French version. Paris: Seuil.