per capita energy consumption and human development is well established, as can be observed in a number of studies [4, 5]. What is not too clear is what form of energy, how much of it and for what applications, is required to break the vicious circle of underdevelopment. However, experience shows that a little electricity properly applied could help resolve many of these ailments of society.

23.1.4 The Centralized Electrical System

Electricity is certainly the most sophisticated and flexible form of energy in use today around the world. But it has some drawbacks: electricity has to be used almost immediately after it is generated, as storing it may be expensive, time-limited and inefficient, and in the current scheme of supply, it has to be transported over long distances from the point of generation to the point of use, which can be inefficient and unreliable, especially when these two points are too far apart from each other in places lacking support infrastructure.

In the early days of the electric power industry, electricity was generated right at the point of use. Around 1880, even street lights in places like Paris and London had their own individual generators [6]. Electricity was also then mostly generated using local and renewable sources of energy. Water wheels originally used in the factories to mechanically power process machinery, were later retrofitted into prime movers to turn electric generators, which in turn began powering electric motors in the late nineteenth century.

As the demand for electricity increased because of industrial and urban growth, and the distance between the point of generation and that of use became increasingly large, electric companies searched for new ways to deliver their services within good profit margins. Engineering research focused on alternatives to increase the power and hence the scale of the generating stations and the carrying capacity of transmission lines. Thus, the concept of economies of scale was introduced in the electric power industry, which for over one hundred years has influenced decision making for new investments in electric systems.

Since the generating units grew in size, electric companies oftentimes found themselves with excess generating capacity at the end of the construction of a new plant. The need to recover their investment in this excess capacity frequently motivated them strongly to look for new customers. Transmission and distribution lines were extended to reach the new customers, so an extensive grid was eventually created. Sometimes when demand was nonexistent, it was artificially created. For such purpose, donation of appliances was, at times, made by the electric company to the customer.

23.1.5 Rural Electrification

At some point in time, agricultural processes were identified as potential applications for electricity and, consequently, the lines began to be extended into the rural areas. Here, the density of potential clients and the intensity of electricity use was not as large as in the cities or the industrial centers; therefore investments in grid extensions became hard to recover, so new institutional and financing mechanisms were developed to support the operation. Official rural electrification programs were introduced in the most advanced nations, an initiative that eventually trickled down to the developing countries.