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THEFT OF ELECTRICITY IN THE DOMINICAN REPUBLIC: A CASE STUDY

by

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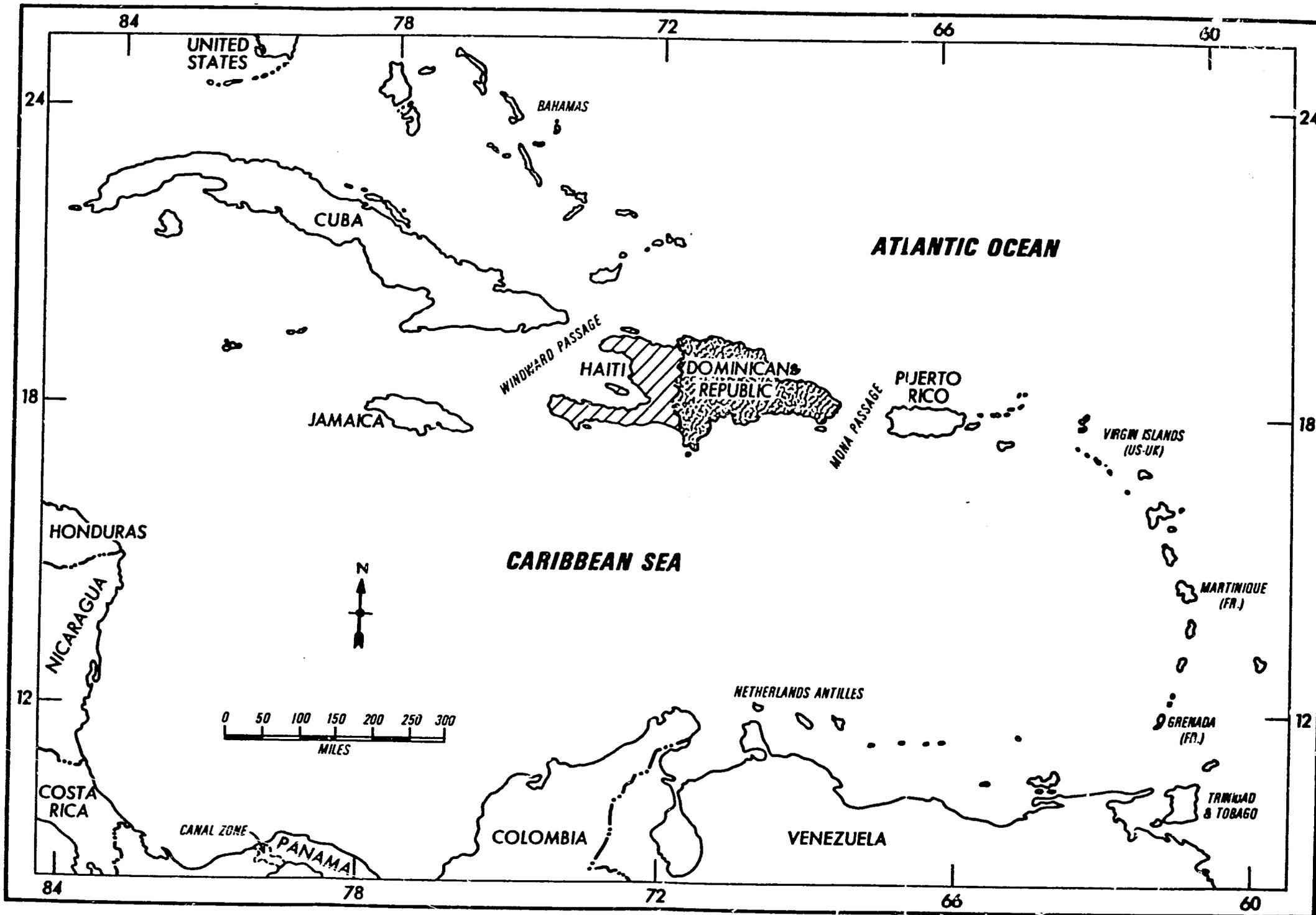


Figure 1. Dominican Republic: Hispaniola and its Position in the Antilles

Source Figure 1: The American University. The Area Handbook
for the Dominican Republic. Washington, D.C.: Government
Printing Office, 1973.

INTRODUCTION

Developing countries are beset by a host of problems which make progress in improvement of conditions extremely difficult. Of all these problems one of the more acute is the lack of reliable energy. This problem is believed to be so critical that experts maintain that there can be no realistic development strategy in such a country without accounting for the factor of energy.¹ The availability of reliable "electrical" energy is the most crucial form of energy as it is essential for commerce and industry and basic services. The losses of electricity after it is put on the lines by the utility, however, contribute directly to the lack of available energy for distribution. The deficit leads to blackouts and brownouts, or to unreliability in service. Theft constitutes one of the losses and in many countries throughout the world is serious. This project, entitled "Theft of Electricity in the Dominican Republic: a Case Study," addresses this particular aspect of the energy problem in a Western developing country

¹Division of Regional Studies, National Center for Analysis of Energy Systems, Brookhaven National Laboratory, Energy Needs, Uses and Resources in Developing Countries (Uptown, NY, Mar 1978), p. 49.

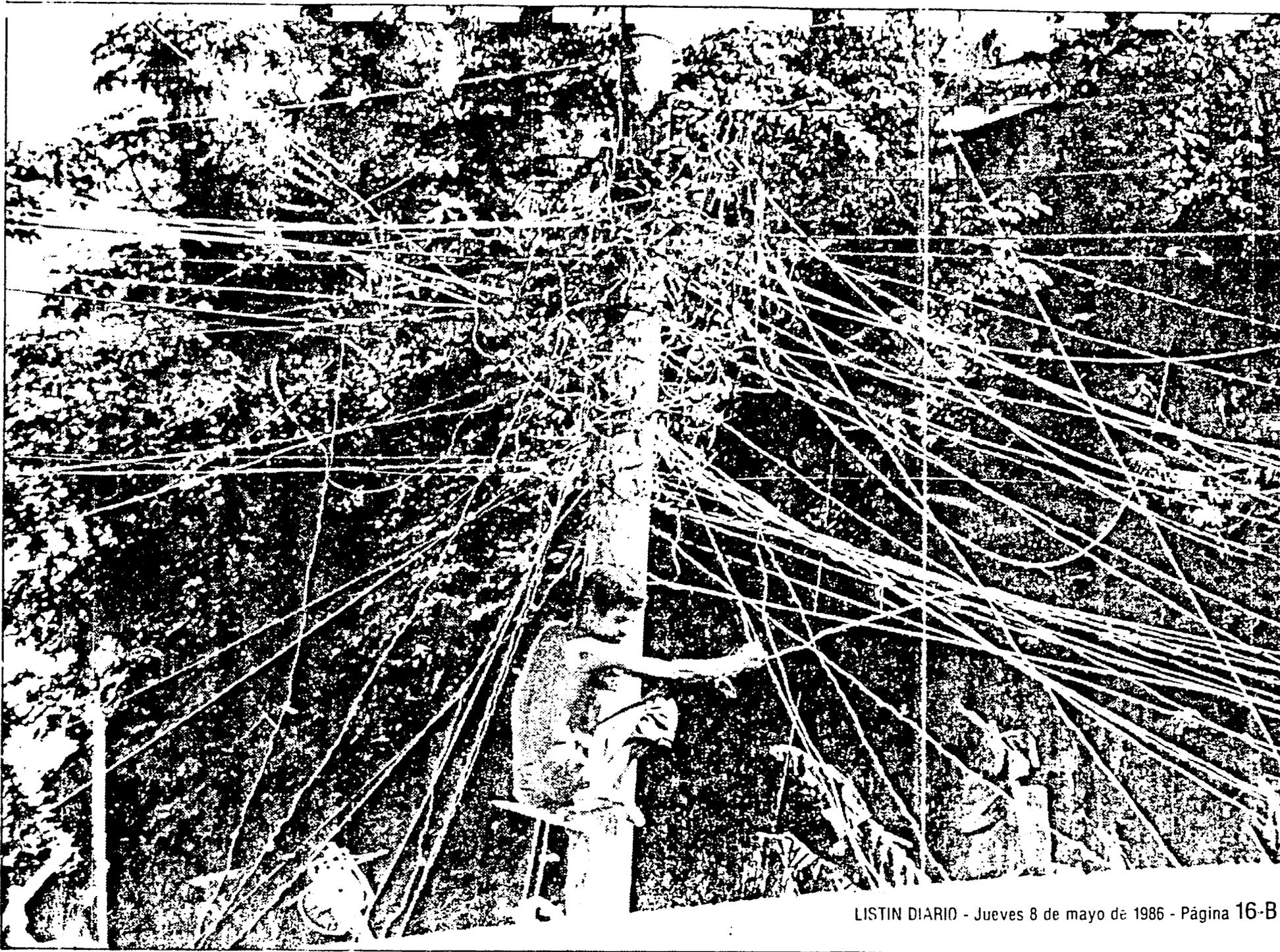
located in the Caribbean.

The situation in the Dominican Republic represents an extreme case of theft of electricity by the general population. See Figure 1. At least 16% of the electrical power generated and distributed to the system is being stolen. The stealing occurs throughout all sectors - residential, commercial and industrial - at all levels of society - rich, poor and middle class - and in all areas - rural as well as urban. The loss accounts for almost one quarter of the utility's subsidy from the central government, contributes to one fifth of the central government's deficit and corresponds to approximately one twentieth of the country's earnings from exports. The magnitude and pervasiveness of the problem, its consequences for a struggling economy, and efforts for its resolution and treatment provide lessons for other developing countries which are experiencing similar losses.

The study that follows analyzes the theft from the national electric utility over recent years, reviews the conditions associated with the loss, its sources and distribution, possible reasons for its occurrence, the impact of this energy loss on the utility and the rest of the economy, the actions being taken to rectify the situation, and, finally, makes observations, draws conclusions and offers recommendations concerning remedial measures.

By first looking at the conditions associated with the theft and then with the utility from which the power is being

stolen, the degree to which this case can be compared to the circumstances of another utility can be evaluated. The analysis of conditions and state of the utility can also provide possible reasons for the theft which must be taken into account when searching for solutions. A description of the loss and an economic analysis show the impact of the theft on the utility and economy. Finally, the actions and remedial measures described provide some solution to the problem and relief from the loss.



LISTIN DIARIO - Jueves 8 de mayo de 1986 - Página 16-B

El ciudadano de la foto podría calificar, obviamente, para trabajar en el intrincado sistema eléctrico del Trashedador. Tal es la destreza que demuestra entresacando polos en esta maraña energizada que la necesidad engendró sobre las redes originales de la

Corporación de Electricidad en este sitio de El Caliche, Cristo Rey. Eso de voltios, amperios y ohmios no se aplica "ni de oído". Y de las sobrecargas, fuegos y "fuá", ¿qué se ocupen los Bomberos y la CDE! (Fot): Nazario García).

Translation Figure 2:

The citizen in the photograph would qualify, obviously, for work on the intricate electrical system of the Space Shuttle. Such skill he demonstrates, interchanging the negative and positive lines within this electrified mess that necessity gave birth to upon the original distribution system of the Electricity Corporation in this place known as "El Caliche, Cristo Rey (Piece of Limestone, Christ is King)." All that about volts, amps and ohms does not apply here, "nor is it even heard of." And as for overloads, fire and blackouts, let the firemen and CDE take care of that!

CHAPTER 1

CONDITIONS ASSOCIATED WITH THE THEFT

The more important conditions associated with the theft are those discussed in this chapter. Directly or indirectly they will be seen to have an impact on the theft.

GEOGRAPHIC SETTING. The Dominican Republic is a nation occupying most of Hispanola, an island which is located within the Greater Antilles on the northern rim of the Caribbean Sea. Hispanola is the second largest island in the Caribbean in size next to Cuba and lies between Cuba and Puerto Rico. See Figure 1. The capital city is Santo Domingo, for many years known as "Trujilloville." The Dominican Republic shares the island with Haiti and claims the eastern two thirds of the land area, or 49,543 square kilometers.

The Dominican Republic boasts both the highest and lowest points in the Caribbean, Duarte Peak, with an elevation of 3,100 meters, and Lake Enriquillo, with an elevation of 40 meters below sea level. Christopher Columbus wrote of the island:

In this land that I have described to you before and we are calling Hispanola, there are high and beautiful mountains, vast plains, wooded groves and fields of great fertility, ideal for raising crops, grazing cattle and habitation by man. The convenience of excellent shelters and the abundance of rivers, so indispensable for man's health, exceed all that imaginable.²

For the most part, the island is warm and humid. The temperatures in Santo Domingo vary between 71°F and 90°F. The humidity in the city is high year around, rarely falling below 65%. Rainfall varies widely throughout the country but in Santo Domingo it averages 61 inches. It is also important to note that the country is endowed with few natural resources technologically available for generation of electrical power. Thus, the country has a high cooling and conditioning load and must import most of its energy.

HISTORICAL. After Columbus discovered the Hispanola on December 5, 1492, he proceeded to circumnavigate the island, sailing around to the east and finally landing at what he named Santo Domingo, on the south coast. In 1509 Christopher Columbus' son, Diego, with his wife, the niece of Ferdinand, King of Spain, became the colony's governor. For more than 60 years the city was the center of Spanish culture and exploration of America. It was the final stopping off place

²Robert D. Crassweller, Trujillo (out of print), p. 23. Letter Christopher Columbus to King Ferdinand and Queen Isabela. Columbus first saw what is now the Dominican Republic on or about January 4, 1493.

for such explorers as Cortes, Ponce de Leon and Balboa. Thereafter, the city declined in importance, was sacked on several occasions and became a port of call for slavers. Such a colorful history is indeed unique but in the short term it does not lead to identification by the population with a national purpose.

SOCIAL SETTING. Initial impressions of the Dominican Republic, especially in the major population centers, can be misleading. While the country is blessed with considerable natural beauty and one can be impressed with the paved streets, apparent availability of services, such as electricity, telephone, water and supermarkets, hardware stores, modern hotels and other colorful attractions, the country in fact has many needs. For example, at least half of the urban populations have incomes below what would be considered the absolute poverty level.^{3,4} Thus, realistic costs for basic utility services, such as that for electricity at US\$0.07 per KW-HR, can be burdensome to the user. Santo Domingo, like many other capital cities throughout the world, suffers from the effects of substantial migration from the countryside. As a result, the city is surrounded by and intruded upon here and

³Banco Central de la Republica Dominicana, Boletin Mensual, Septiembre de 1986, VOL. XL, No. 9 (Santo Domingo, DN, Republica Dominicana, 3 de Diciembre 1986), pp. 180-181.

⁴The American University, Area Handbook for the Dominican Republic (Washington, DC, 1973), p. 29.

there by communities of make-shift housing interconnected by dirt streets. More often than not these communities have grown on the least desirable land as this was all that was available. Such ill planned use of land makes it more difficult for the city to provide and maintain electricity service to its two million inhabitants. This results in increased cost of the services or their being subsidized. Costs that rise too rapidly or are higher than perceived to be justifiable may be used by some of the population as a pretext for theft.

There is another factor deserving of mention. The people of the Dominican Republic were ruled for over thirty years by a dictator who controlled the populace with absolute rule. Under his government the people were victimized in groups and as individuals. At the same time, however, the population was provided those public services as could be made available. Such a paternalistic environment did not encourage initiative on the part of clients nor a responsible attitude towards the government which provided the services. In other words, the government would provide the basic services as available but without any corresponding relationship to the actual costs to generate, provide and maintain the services.

While the economic focus of the country is still the sugar industry and a major element of the society is concerned with the business of making a living off this crop, it is also worthy of note in this context that the farm labor is by and

large not Dominican. The Dominicans themselves no longer assume this role in the sugar economy. Relatively inexpensive labor is readily available from neighboring Haiti. And so, it is primarily the immigrant, or migratory Haitian worker who has taken on this job. The Dominican concerns himself with other work in connection with the harvest or occupies himself in other industries or in the government.

Finally, it would be an omission not to recognize the special relationship that the Dominican Republic still has with the United States. The cultural connection that the Dominican Republic has is with New York City, where the largest Dominican population anywhere outside the Dominican Republic may be found, one million people. The second largest U.S. Consulate in the world is located in Santo Domingo to attend to the great number of daily visa applications. Perhaps some of this interest on the part of Dominicans to emigrate or visit the United States can be explained by the fact that the Dominican Republic missed by one vote of the U.S. Congress in the last century from being declared a U.S. state. The U.S. sent marines twice to the Dominican Republic, once in 1916 and again in 1965.

DEMOGRAPHIC SETTING. The first inhabitants of the island were the indians - Quisqueyas, Tainos and Ciguayos. These were rapidly displaced by the Spanish and then slave populations in the sixteenth century. The total population is over six million with 54% found in urban areas, approximately 33% in

Santo Domingo and another 16% in Santiago, the second largest metropolitan area.⁵ The racial characteristics are generally a mixture of the negro and caucasian peoples of Spanish origin, although most races and many ethnic groups may be found here. The great majority of the population is Spanish speaking. The religion of the country is predominantly Catholic. Of all the demographic features the heavily weighted, urban side population distribution is the most significant for purposes of this study. This is because there is a tendency by rural immigrants to expect that basic services such as electricity will be free in the cities. After all, this is one of the primary reasons the rural populations decided to migrate to the urban areas in the first place. Secondly, there is more anonymity in the cities. Such an atmosphere provides a haven for those committing an anti social act, such as theft.

POLITICAL. The Dominican Republic has had a long struggle to find its identity and independence, as described in the following chronology.

The Spanish were the first to arrive after the indians. They vigorously extracted wealth from the island for about 50 years. Afterward, and for about 200 years, the island was left to competing pirates - the French, British, Spanish and Dutch - of the legendary Spanish Main. In 1795 Spain ceded the prosperous western part of the Island of Hispanola to France.

⁵Ibid, p. 24.

When Haiti won its independence from France in 1804 it promptly invaded the Dominican Republic, holding the country for five years until the Spanish with the help of the British drove the Haitians back to their original borders.

In 1821 the Dominicans declared their independence from Spain and established the Dominican Republic. Almost immediately the Haitians invaded again, this time occupying the country for 22 years.

In 1844 the Dominicans were successful in wresting their country a second time from the Haitians, but by 1861 the country had gone bankrupt and was reincorporated as a Spanish colony. In 1865 the Dominicans won back their independence, forcing the Spanish to depart. For 17 years thereafter, the country was ruled by series of inept leaders, some of which even tried to sell the country to the highest bidder. In one such instance, in 1866, the U.S. Senate came within one vote of annexing the country. Finally, in 1882 the first "progressive" dictator, Ulises Heureaux, came to power and ruled until he was assassinated in 1899.

By 1916 the U.S. had become increasingly concerned with the growing German influence in Haiti under the backdrop of World War I. At the same time, the political situation in the Dominican Republic had deteriorated with the impeachment of a Dominican president. Shortly thereafter, the U.S. landed troops in the Dominican Republic and proclaimed a military rule which lasted for eight years. The U.S. departed in 1924 after

overseeing an election of a Dominican president and the establishment of a national guard.

During the following six years of relative tranquility a one time sugar mill guard, Rafael Leonidas Trujillo, rose rapidly to power. He was elected president in 1930. For the next 31 years Trujillo institutionalized fraud and ruled the country with one of the most ruthless dictatorships in world history. He was finally assassinated in 1961.

With the end of the Trujillo repression, stability was still not to be attained in the Dominican Republic. Initially, there was a vacuum in national leadership throughout all institutions and bureaucracies that resulted in a series of internal struggles. Between 1961 and the present there have been four coups, including an intervention of the U.S. military in 1965 when the politico-military situation deteriorated to the point where American lives were endangered. The Dominican armed forces have had to intervene only once after 1965, however, and since then the country has managed three democratic elections and installed four presidents. In recent times, Dr. Salvadore Jorge Blanco took office on August 15, 1982. On May 16, 1986 a democratic presidential election took place. The new president, Dr. Joaquin Balaquer, is considered a statesman of the highest order and greatly respected by the entire population. Corruption under the previous administration, including within the electrical authority, is being widely discussed in the press but no legal rulings have

occurred.

ECONOMIC BACKGROUND. The economic condition of the Dominican Republic is not good as can be seen from the following indicators. The country owed US\$ 3,719 million on December 31, 1985. During the same year US\$ 531 million were paid to service the country's debt. Such payments amounted to 70% of the country's export earnings. Moreover, the central government deficit to be financed in 1985 was estimated to be approximately one third of that spent on debt service, or RD\$ 500 million.⁶ As continued deficit financing leads to more indebtedness, the government appears to be drawn into a vicious circle.

A major burden on the central government was the estimated deficit of RD\$ 400 million⁷ by the national electricity utility authority, CDE. Resources to cover this deficit had to come from the central government budget and export exchange tax. Subsidy to CDE and debt service constituted 90% of the country's earnings from exports. Also,

⁶Carmen Carvajal, "Almost RD\$ 600 More Than Last Year Were Received by the Central Government," Listin Diario, 3 May 1986, p. 1, Economic Section. In fact the deficit turned out to be less as stated in the article.

⁷Jose Romero, "CDE Warns That the Deficits Will Continue," Listin Diario, 16 Oct 1985, p. 1.

government's entire deficit. Such difficult economic conditions prompted arduous negotiations with the IMF, which, while not leading directly to an agreement per se, did lead to a "stand-by" agreement in late 1984 and early 1985. The important elements of this agreement were to allow the currency to float to its free market value and, not surprisingly, to reduce the central government's subsidy to CDE. The latter entailed a scheduled increase in the CDE tariffs throughout 1985 and market value payment by CDE for its petroleum products used to generate electricity.

How did the central government come to be faced with the large CDE deficit? There are several contributing factors. Of these, the rapid increase in oil prices brought about by the oil cartel, OPEC, was probably the most damaging. Another important factor is that CDE's purchases account for 20% of the country's oil bill. Table 1 illustrates the rapid rise in the country's energy bill.

TABLE 1

VALUE OF IMPORTED PETROLEUM PRODUCTS^{8,9,10}
(US\$ MILLIONS)

YEAR	VALUE	YEAR	VALUE
1967	12	1977	187
1968	12	1978	199
1969	17	1979	306
1970	19	1980	432
1971	25	1981	485
1972	38	1982	454
1973	42	1983	463
1974	153	1984	505
1975	168	1985	410
1976	171	1986	350

Note there was about a four fold increase between 1973 and

⁸Comision Nacional de Politica Energetica, Breve Documento Estadistico del Mercado del Petroleo y Sus Derivados en la Republica Dominicana 1974 -1984, (Santo Domingo, D.N., Sep 1984), pp. 7 & 8.

⁹Franciso J. Castillo, "Un Analisis del Sector Energetico en Republica Dominicana," Estudios Sociales, Abril-Sep 1977, p. 64.

¹⁰Jose Romero, "Record Deficit for Balance of Payments," Listin Diario, 5 Jan 1987, p. 1.

1974, reflecting the effects of the oil cartel's pricing. The drop in 1985 was primarily due to conservation measures while the drop in 1986 was due to fall in oil prices.

For 1985 and 1986, income from exports was US\$ 770 million and 725 million, respectively. As petroleum purchases shown in Table 1 amounted to 53% and 48% for these years, or about half the country's earnings, it is evident, therefore, that the country's energy bill represented a major drain on its income.

Electricity rates charged by the utility remained much the same during the seventies and even into the early eighties. The utility then began running a deficit, which was absorbed by the central government. The GODR constitution sets the value of the Dominican Peso equal to the U.S. Dollar. In 1983, however, the Peso began to lose strength against the Dollar. In the Fall the exchange rate was about 1.5 to 1.0. A "parallel market" was established by the government to legally allow for exchanges in the market place at the rate determined by supply and demand. In 1984 the exchange rate rose to almost 3 to 1, around which it appears to have stabilized. Until agreement by the GODR in early 1985 CDE was still paying for its petroleum at an "imaginary" 1 to 1 while the central government was required to utilize hard currency and exchange the Pesos for Dollars at the Central Bank to buy the Petroleum on the world market. While CDE claimed to have eliminated the subsidy from the central government by the end of 1984, it was

still purchasing the petroleum at the 1 to 1 rate. There were some moderate rate increases in 1984 which enabled CDE to increase revenues and reduce the deficit. It also appears that the initial efforts by CDE which began in late 1983 started to have some impact towards the end of 1984. This also assisted in reducing some of the deficit.

Among other factors contributing to CDE's economic plight were high operating costs due to low efficiencies of the plants when they were operating. The lack of regularly scheduled maintenance programs led to less electricity produced for the same amount of fuel used to fire the boilers. The lack of maintenance also led to more plant breakdowns and shortened the useful life of the plants which then required that the more expensive or less efficient plants be utilized to meet peak demands. As there was no additional capacity, that is, the demand generally required the mobilization of all generation resources, the condition of the plants deteriorated, the number of breakdowns increased, causing power shortages and frequent and extensive blackouts. The utility had by now entered into a vicious circle of events.

Lack of maintenance of the transmission and distribution system led to further inefficiencies. As the theft component of the loss increased, the losses tended to compound: with the slow, illegal extension of the distribution system, transmission at low voltage increased technical, or friction losses, especially in the distribution system. Legal

extensions of the distribution system at low voltages also increased technical losses. Meanwhile, the Dominican congress was slow to approve loans acquired by the utility to finance new generating capacity and transmission systems.

Finally, operating costs of the utility increased through the strength of the union and the number of workers on the active and retirement payrolls. For comparison purposes CDE paid RD\$ 57 million in salaries and only RD\$ 8 million in plant maintenance in 1985.¹¹ This was not a proper balance as the amount spent on maintenance represented less than 1 % of the capital investment for the utility's power plants alone.

Thus, CDE found itself in a very difficult situation: a large operating deficit; reluctance by the central government to continue subsidies because of IMF pressures; a system deteriorated and further deteriorating; and, insufficient generating capacity to meet demand. Raising rates, although a condition imposed by the IMF that would lead to an IMF agreement, would not be politically popular within the inflationary environment that besieged the economy. Accordingly, the utility began to look more carefully at its power losses as one of the few ways left to improve its desperate situation.

¹¹Ramon E. Colombo, "CDE: A Laborer's Paradise," Hoy, 4 Jun 1985, p. 2.

CHAPTER 2

DESCRIPTION OF THE DOMINICAN REPUBLIC ELECTRICITY UTILITY

THE INSTITUTION AND ITS ADMINISTRATION. The Corporacion Dominicana de Electricidad, CDE, is a parastatal, or wholly owned government corporation. The utility is governed by a board of directors, whose chairman as well as other members are appointed by the President of the Republic for an indefinite period of time. Day-to-day operations are managed by a general administrator, who is also appointed by the President. The corporation employs approximately 5400 personnel,¹² the great majority of which are represented by a relatively strong union referred to as SIDRACODE. While the board of directors is active and the general manager is capable, the management level just below the general manager is weak. The technical personnel of the company are rated fairly well.

The utility was formerly owned by an American company, Stone and Webster. In 1955 it became an autonomous public institution by Public Law 4115. The new organization was invested with all legal prerogatives, provided its own capital and charged with the production, transmission, and distribution

¹²Ibid.

of electricity throughout the nation.

GENERATION AND DISTRIBUTION SYSTEM. While the utility's generating system has an installed capacity to generate over a 1000 MW, it is only able to produce approximately half that amount when all systems are operating and no units are off line for emergency repairs. The system does not lack redundancy insofar as the types of generating units. These include thermal generating plants, gas turbines, hydroelectric facilities and some diesel plants. The thermal electric plants include one dual-fired, coal-oil power generating plant.

The approximate percentages of power base are as indicated below in Table 2.

TABLE 2

CDE'S POWER BASE DISTRIBUTION¹³

Oil fired	65%
Coal fired	15%
Gas turbine	5%
Hydroelectric	10%
Diesel	5%

¹³Victor Grimaldi, "Growth in Energy Use Declines," Listin Diario, 28 Aug 1986, p. 1.

The base demand is satisfied by the oil fired plants. While these are more expensive to operate than the hydroelectric, the latter are primarily intended for irrigation and, so, the hydro is only available to meet peak demand. What cannot be met by the oil and coal fired is normally met by the gas turbines, even though their cost of operation is considerably greater than that for the oil fired plants.

The country's intermediate range plans are to move to coal fired plants and try to increase the percentage of hydroelectric base up to, say, 20%, which is considered the potential for the country. Some minable lignite deposits have been located and prefeasibility studies carried out.

The long range plans are to look for technologically available solar power sources.

The transmission and distribution system is entirely interconnected except for a small portion in the isolated and rural Southwest. Most of the country is accessible by an all weather road system. It is primarily because of this factor that CDE has been able to interconnect the system. Naturally, this has been quite beneficial as it has enabled the corporation to redistribute the hydroelectric power and to capitalize on the redundancies of the system when faced with plant breakdowns and peak demand. It also is beneficial in that it reduces transmission losses and maintains the level of voltage that would otherwise be reduced by transmission of the power over the distances required.

Similar to the nation's economic condition, the overall condition of the electrical system is poor. This is due in great part to the lack of maintenance. Failure to carry out preventive maintenance and the required overhauls has resulted in complete breakdowns and even explosions in the generating plants themselves. This has led to expensive rehabilitation and prolonged periods when the plants are out of service. A global accounting of the electrical power that is transmitted to the national net shows that 31% of the power is unaccounted for. A figure of 10% is generally accepted for the legitimate, or technical losses in transmission and distribution for a well maintained system such as one would find in the United States. Given that the CDE system suffers from lack of maintenance it is considered allowable that the technical losses may be as high as 15%.¹⁴

REHABILITATION AND NEW GENERATING CAPACITY. As a result of the series of breakdowns that seriously affected the ability of CDE to meet demand and associated power blackouts during May 1985, CDE embarked on a determined effort to rehabilitate its power plants. The work began in June 1985 and is expected to be finished by 1987. When finally completed, the generating capacity will have increased by approximately 250 MW. As the largest unit is rated at 125 MW, CDE will be able to satisfy

¹⁴Author's conversations with retired electric utility executive vice president, John T. Kimball of Pleasant Hill, CA, on November 27, 1984, Santo Domingo, Dominican Republic.

the demand and, with the new generating capacity, also be able to temporarily remove any unit from the line to perform preventive or emergency maintenance without disruptions or inconvenience to clients. Such an improvement in the reliability of this basic service will do much towards meeting common criticism of the utility and improving its image.

The utility has also began work to raise the voltage of the transmission elements of the transmission-distribution system in the Santo Domingo metropolitan area to 69 KV. As "technical" losses substantially decrease with increase in transmission voltage in accordance with the laws of physics, transmission losses can be expected to decrease with implementation of this project. The work involves not only raising the transmission line voltage, however, but also literally raising these lines to approximately double their present height. Removal of the lines to a level above the tree line, therefore, will also reduce technical losses due to wind damage. Finally, raising the voltage of the lines so that the power is more difficult to tap into by unauthorized persons will reduce the "theft loss" that is more fully described in the succeeding chapter.

CHAPTER 3

DESCRIPTION OF THE THEFT

DEFINITION. The Dominican electricity utility defines "theft" as the following:

All persons that steal electrical current . . . by whatever means, device or mechanism, causing it to pass around the meters or mechanisms used to measure or control it, or by whatever other means intended to defraud the seller, will be punished by prison from six months to two years and a fine of from 100 to 1000 pesos. In cases of recurrence double the penalty imposed under the first infraction will be applied.¹⁵

The foregoing warning notwithstanding, there have been seemingly countless ways that have been used to defraud the utility. These include the following:

1. Tapping into the line See Figure 2. Tapping into the CDE supply line at a point between where the line enters the property, such as a wall or post, and the meter. In such cases not all of the electricity used passes through and is registered on the meter. Tapping into the line by someone

¹⁵Corporacion Dominicana de Electricidad, Leyes, Reglamentos, Resoluciones y Decretos de la Corporacion Dominicana de Electricidad, (Santo Domingo, Republica Dominicana, 1985), p. 130.

passed through the meter, and, usually, before the current passes through the circuit box, would not technically be considered theft from the utility but would be theft from the CDE client.

2. Damaging the meter Physical force to the point where the meter operates improperly so that it no longer correctly reads the amount of electrical current passing through the meter. Extreme cases, but not uncommon, are complete destruction of the meter. One method utilized by a thief to leave the appearance of not having tampered with the meter was to fire a BB gun into the meter from above, causing particles to fall into the delicate metering mechanism and thus impede commensurate readings of the electricity used.

3. Use of magnets Causing the meter to operate improperly by the use of large magnets. The magnets were placed adjacent to the meter during darkness then removed at daybreak. As air conditioning is often on during the evening and sleeping hours and constitutes a substantial load, the consequent theft can be significant.

4. Diverting Simply diverting the electricity around the meter, especially during hours of darkness. This is believed to be more common in commercial operations than in residential areas.

5. Fictitious names Changing the name on the client contract. In Latin American cultures an individual's name may be composed of four or more parts, unlike the first, middle and

last names of the Anglo-Saxon culture. The thief uses this to his advantage, at least temporarily, by refusing to pay his bill then opening another account using different combinations of his name. This would be a case of fraud described in the second part of the definition of theft set forth above.

6. Removing the meter cover Removing the meter cover and tampering with the meter mechanism. A variety of actions have been known to have been taken. These range from such delicate methods as carefully removing teeth from the gear assembly to more forceful methods, such as employing a heavy blunt instrument until the meter operates improperly.

7. Reversing the leads Disconnecting the leads to the meter and reversing them. By reversing the two electrical leads to the meter the counter will run in reverse. In so doing, the meter registers a smaller number than before the leads were tampered with. By reversing the leads for part of the billing period the client is billed for less electricity than he actually used.

Thus, the theft is clearly defined legally and numerous examples have been reported.

While this definition may be adequate legally, one must go another step in order to quantify the theft, or at least be able to arrive at some reasonable estimates. Having done this the significance of the loss can be assessed. Moreover, as soon as the quantity has been isolated a genuine search for those parameters contributing to the theft can be launched. Next a

sensitivity analysis can be performed to determine which causes should be addressed and with what resources. The electricity corporation has maintained records of losses for years. These records show the amount of electrical energy produced and put on the lines from the power plants for the system as a whole and the amount of revenues or energy for which revenues have been collected. The losses then are simply a matter of subtraction, being the difference between these two quantities:

$$L_T = L_t + T$$

Where,

L_T = Total Losses

L_t = Technical Losses

T = Theft Losses

Technical losses are defined as (1) friction losses in the transmission and distribution lines, including transformer losses, (2) connection losses, which may also be considered a form of friction loss, and (3) losses due to meters which do not operate properly because they were damaged prior to installation, or manufactured or calibrated improperly. Line losses can be estimated fairly accurately as these are a function of the voltage, its duration, and the physical properties of the wires. Generally, however, a well maintained system in the United States, for example, could expect such losses not to exceed 9 or 10%. For a system such as that in

the Dominican Republic, where the distribution system is in a poor state of repair, these losses could be as high as 15%. While the wiring itself may not deteriorate, the connections are improperly or poorly made. This increases the friction loss at the junction. Also, illegal drops from high voltage lines, especially those using small diameter wires, which is usually the case in illegal connections in the marginal communities, contribute to increases in the technical losses as well as direct loss due to the theft.

HOW MUCH ARE THE LOSSES DUE TO THEFT? Table 3 shows the losses by CDE over the years of electricity generated and put on the lines.¹⁶

¹⁶Banco Central de la Republica Dominicana, Boletin Mensual, Septiembre de 1986, VOL. XL, No. 9, (Santo Domingo, Republica Dominicana, 3 de diciembre 1986), p. 194.

TABLE 3

ELECTRICITY LOSSES FOR THE CDE SYSTEM (L_T)

Year	L_T	L_t	T	delta T
1967	20.6	12	8.6	
1968	21.3	12	9.3	0.7
1969	21.6	12	9.6	0.3
1970	21.2	12	9.2	-0.4
1971	22.7	12	10.7	1.5
1972	23.1	12	11.1	0.4
1973	22.7	12	10.7	-0.4
1974	24.1	12	12.1	1.4
1975	25.0	12	13.0	0.9
1976	(25.0)	12	13.0	0.0
1977	(25.0)	12	13.0	0.0
1978	(25.0)	12	13.0	0.0
1979	(25.0)	12	13.0	0.0
1980	(25.0)	12	13.0	0.0
1981	25.2	12	13.2	0.2
1982	33.7	15	18.7	5.5
1983	37.5	15	22.5	3.8
1984	31.5	15	16.5	-6.0
1985	28.6	15	13.6	-2.9

The percentage of theft is seen to vary between a low of 8.6% and a high of 22.5%. Available records show 8.6% in 1967 with gradual increases over the years to about 13% theft after the oil crisis at which value it stabilized. Then there is a dramatic increase in 1982! It peaks in 1983 at 22.5%. The utility appears to have gotten the theft under control by 1985, at least lowered the theft to its pre 1982 levels of around 13%.

SOURCE AND DISTRIBUTION.

Who is responsible for the theft? Considering first an economic stratification of the society among the residential clientele, it is patently obvious that the lower classes in the marginal areas of the metropolitan areas are stealing electricity. Illegal drops are readily visible to even the uninformed passerby on the street. The tangle of wiring on many power lines is almost unbelievable. Figure 2 is a photograph of such a case. There are no meters in these areas.

Members of the Dominican middle class have been found to steal too. In lower income apartments, meters have been simply destroyed and the wiring blatantly reconnected around what was once the meter.

Members of the upper classes also steal. They are more discrete, however, and may use euphemisms or make light of the theft to justify their actions.

Thus, while obviously not all members of any one economic class steal electricity and one should keep in mind that this

is about 16 % of the electricity and that if this percentage were divided equally between classes discussed only one out of twenty persons or so, speaking in very general terms and on the average, would be practicing this theft.

Finally, considering categories of customers by type of service, it has already been stated that theft by residential clients and non clients is taking place. Reports of theft by commercial customers is also commonplace. Likewise, theft by larger industrial customers has been reported. Theft by larger industrial users, although not identified, is believed to be less because the installations are more visible to the utility, other plant personnel and the general public.

Where does the theft take place? At this point it is not known which clients are stealing or exactly from what points in the lines the electricity is being stolen. As the preponderance of the country's population and commerce is in the Santo Domingo area, the supposition is that the greatest amount of theft is occurring here. In addition there are suspicions that a very substantial amount of theft may be occurring in the heavy, commercial zones such as that referred to as "The Conde."

When does the theft take place? For those who are illegally connected to the system and who have made relatively permanent connections, the theft is continuous. The demand on the system increases markedly during the hot and more humid months, namely July, August and September. In such cases,

therefore, the theft is greatest during those months. There are those businesses which operate 24 hours and during the nighttime hours make the clandestine connection, while during the daylight are legal clients.

How does the theft occur? In addition to what has been described above, where it is obvious that the owner is responsible, there are reports that those actually making the illegal connection are those who have had experience in electrical work, such as those who have been, or may still be employees of CDE. There are also reports of residential clients attempting to bribe the CDE representatives when they come to assess the load for new construction. Lastly, there are reports of even professional people, such as architect, offering to the owner to design diverted circuits, or other schemes to defraud the utility, into the construction of the building.

In review, the theft has been described from a legal viewpoint, examples of the theft have been given and the total loss from the system quantified. The utility has been unable up to this point, however, to identify geographical locations of the theft or classification of clients that are stealing, let alone client. This is primarily because the billing system of CDE does not yet yield sufficient data. Further discussion of this problem is given in Chapter 6. The following chapter considers possible motives for the theft which can be useful in identifying the sources.

CHAPTER 4

POSSIBLE REASONS FOR THE THEFT

Identification of motives for the theft can be useful in identifying sources. One obvious motive, for example, is economic. However, since those who are able to afford the present electricity rates in this case are also found stealing from the system, there may be other motives as well.

ECONOMIC. There already was an unacceptable level of theft of 8.6% in 1967 and a gradual increase during the ensuing years to about double this amount. Surprisingly, the electricity theft actually decreased when rates went up significantly in 1985! As noted earlier, the effects of the world increase in petroleum prices that shook the world economy in 1973 were not passed on to the clients until 1985. Thus, the increases were sudden and substantial. The data in Table 3, suggests, therefore, that the dominant factor contributing to the theft, T, was neither the amount of the bill nor the rate of increase.

POLITICAL. Referring to the associated political conditions reviewed earlier and to Table 3, it is evident that substantial theft took place regardless of the political party in office during the period of fledgling, democratically elected

governments.¹⁷ At first, the theft gradually increased, seemingly unmindful of the change in governments. However, it is hard to ignore the dramatic increase which coincided exactly with the coming to power of the Revolutionary Democratic Party (PRD) in 1982. Much to its credit, that government was able to reduce the theft to pre 1982 levels before it left office in 1986. The PRD lost the May 16, 1986 elections to the party currently in power, the Christian Social Democratic Party (PRSC) led by Dr. Joaquin Balaguer. It can be concluded from this data, therefore, that politics was indeed a factor contributing to the theft.

SOCIAL. The population on the whole professes to be Catholic. Stealing is against the basic tenents of this religion. These tenents do not provide for exceptions such as poor service by the utility or the fact that everyone else does it or that fluctuations in voltage or outages have caused losses to the client's business and equipment, and by so doing have caused him to become frustrated and desperate. While these distressing events do occur quite often, they would not justify theft by the client. Thus, the moral guidelines of the society would not allow the theft. In addition, once a lawbreaker has been brought before the courts by the police, the courts can be quite strict. Accordingly, the matter

¹⁷There was no theft of electricity by customers under Trujillo's regime, except by Trujillo himself and he owned the utility.

remains a paradox. The mores and laws should act to restrain the theft but seemingly do not.

Morality has been perceived as a national issue since the new government took office. There are signs, for example, that the Dominican Republic may be becoming a transfer point for drug traffic from Colombia. Dominican authorities have detected major quantities of cocaine passing through the Las Americas International Airport near Santo Domingo. Drugs are reportedly available on the streets and for tourists in the resort hotels. Prostitution is tolerated in most places throughout the country. Drivers of motor vehicles have little regard for traffic rules. The police ask for and accept bribes from drivers of motor vehicles for routine traffic violations. City employees who are responsible for collecting garbage threaten to discontinue service if they are not given gifts. Even the congress recently approved the year's budget without a quorum. As a consequence, national leaders at the highest levels have exhorted the general public through the mass media to return to moral principles. Thus, while it is difficult to quantify morality and much less to relate it as a factor influencing the amount of theft of electricity, suffice it to say that there does not appear to be a strong moral environment that would work to restrain a tendency on the part of a client to steal.

Some of the more common motives for the theft have been considered in this chapter. The next chapter analyzes the

theft loss in detail. The analysis further quantifies the loss and provides additional insight into motives.

CHAPTER 5

ECONOMIC ANALYSIS

This chapter considers the costs of the electricity from several viewpoints and the impact of the costs on the client, utility and central government.

COST OF ELECTRICITY. It is especially important in the context of this study to recognize at the outset that there are two costs. The cost of electricity to the utility and the cost to the client, or user. The cost to the user is referred to as a tariff. This is discussed in the succeeding section. The cost of electricity to the utility may be termed the production cost. The latter could be stated in terms of fuel costs only. This definition would be erroneous of course because it is incomplete. It does not represent true costs. Failure to take into all costs in the environment of rising tariffs, or what are perceived to be high tariffs by clients, is an especially serious omission. First of all, it grossly underestimates the real cost to the utility to generate the electricity. Real costs include not only fuel but also operation and maintenance, personnel, cost of money and debt service, the major cost of the generation plants themselves, their insurance and ancillary tools, vehicles and equipment. Note, for example, that in the

case of power generated by a hydroelectric facility, the cost of fuel is negligible, but the cost of the facility over a life cycle is substantial. At the other extreme, the cost of electric power at a diesel plant due to fuel only is quite high, about RD\$ 0.30. As described in Chapter 2, the type of units in the CDE system do include hydroelectric, as well as diesel and fuel oil, thermal, among others. Moreover, the cost of fuel itself has varied markedly within recent years. This has been widely acclaimed. The other costs, while not receiving as much attention in the press, have risen dramatically, particularly the costs of new generating facilities. Be that as it may, CDE did state in 1985 that its average cost of production of a kilowatt-hour of electrical energy was RD\$ 0.17, equivalent to about US\$ 0.06.

The second reason such an omission is serious is that it leads to a severe public relations problem. If the general public is uninformed on the contributing cost factors, the utility will be faced with a general outcry each time there is a fluctuation downward in petroleum prices and there is no corresponding adjustment in their bills. Even in the United States, where the general public is considered informed, utilities have had a difficult time in passing on true costs to users during periods of falling world petroleum prices. Unfortunately, one must conclude from the generally hostile press and private conversation among what are normally expected to be informed persons that CDE has not been very successful in

educating the public on what the true costs actually are.

TARIFFS. What is the cost to the client? As a result of mutual efforts by the Dominican Government and the IMF towards the end of 1984 and early 1985, CDE substantially raised its electricity tariffs for its customers. In the case of residential customers, there were no increases for those utilizing small amounts of energy. These were considered to be the poor. For them the cost of production was not passed on. The utility apparently decided to absorb this differential and hoped to recoup it by penalties against other customers who utilized more than what was judged to be a "reasonable" or "normal" amount of electricity. This amount was determined to be 800 KW-H and for which the rate is only RD\$ 0.17 per KW-H. The penalty is rather severe for those using six times this amount, or 3000 KW-H. At this consumption the rate is RD\$ 0.38.

IMPACT ON THE UTILITY. A public utility can ill afford to have 16% of its services stolen. For example, in the United States a mere 1/2% theft alarmed electricity utilities to the extent that they united to embark upon a significant research and development effort.¹⁸ In the Dominican Republic the situation is critical because of the subsidy, lack of maintenance, need for operational resources, and funds for new generation capacity. Until recently, however, CDE was able to

¹⁸Electric Power Research Institute, Detection of Electric Meter Tampering, (Palo Alto, March 1985).

sustain the financial impact of the loss. This was done in two ways. First, CDE, along with other government agencies, operated for several years with an artificial, monetary exchange rate. A brief description of this is as follows: The Constitution fixed the exchange rate between the RD\$ and the US\$ at 1:1. This arrangement seems to have operated satisfactorily until about 1980 when the world market value of the Dominican currency began to drop against the U.S. currency. In late 1980, for example, the exchange rate was about 1.5:1, in favor of the U.S. currency. There was no impact yet on CDE, however, since CDE was purchasing its petroleum through the Central Bank, still, in effect, getting US\$ for RD\$ at the 1:1 rate. In reality, the central government had begun a subsidy to the utility and, in turn, to the utility's clients. By early 1985, when the value of the Dominican currency had fallen to the extent that the exchange rate was then about 3:1, this artificial exchange rate enjoyed by CDE was becoming a major burden to the central government and had become an issue with the IMF. Even before this point had been reached, however, CDE had begun to incur a deficit and was requiring a subsidy from the central government to operate. The efforts of the CDE management to reduce illegal connections and improve collections started in late 1983 and began to receive some publicity in 1984. By the end of 1984 CDE claimed that it had eliminated the subsidy from the central government, except for the very substantial subsidy being tolerated by the artificial

exchange rate.

Aside from the ability of CDE to artificially "balance its books," the impact on the utility was still significant in terms of as KW-H and revenue lost. For the year ending 1984 a total of 3,202 million KW-H of electrical energy was generated by CDE, or purchased from others who had generated it, and then put on the corporation's lines for transmission and distribution.¹⁹ The 16% loss amounted to 511 million KW-H and represented a monetary value to CDE of RD\$ 103 million. This was approximately 25% of the RD\$ 400 subsidy to CDE by the central government estimated for 1985. Therefore, CDE could have used this lost revenue to reduce the subsidy. Alternatively, it could have used it to purchase a 33 MW power plant for meeting the unsatisfied demand for more power by its clients or to purchase critically needed spare parts for maintenance of its units.

IMPACT ON THE GOODR ECONOMY. While the financial impact of the loss was postponed by the utility until 1985, it could not be avoided by the central government. The subsidy represented 30% of the central government's budget, 60% of total value of exports and 50% of the central government's

¹⁹Banco Central de la Republica Dominicana, Boletin Mensual, Sep 1986, VOL XL, No 9, (Santo Domingo, Republica Dominicana, 3 Sep 1986), p. 194.

income generated from taxes on imports and exports.^{20,21} The subsidy was widely discussed in the press causing considerable embarrassment to the political party in power, especially as national elections were scheduled for April of 1985 with presidential elections a year later.

As can be seen from this economic analysis, the impact on all concerned - the customer, the utility and the central government - has been severe. The following chapter discusses the actions taken or planned to reduce the loss.

²⁰Octavio Mata Vargas, "Petroleum Will Cost the Dominican Republic RD\$ 100 Million Less," Listin Diario, 2 March 1986, p. 12.

²¹"Government Income Rises to RD\$ 750 Million Not Including Effects of Reduced Oil Prices or Export Taxes," Listin Diario, 6 June 1986.

CHAPTER 6

ACTIONS BEING TAKEN TO REDUCE THE THEFT

Both for economic and political reasons CDE can no longer tolerate the high theft loss. Some of the actions to reduce the loss have already begun. Others are still planned.

UNDERWAY. Beginning in late 1983 the utility began taking a number of actions to deal with the theft problem. These could be grouped under the following categories:

Administration

Public relations

Service connections

Distribution system

International donor assistance

Administration. While there has been a law against theft of electricity on the books for some years, there was not any indication until recently that this law would be enforced. In mid 1984 full page newspaper ads appeared in the press.²²

²²CDE, General Administration, "Theft of Electricity Represents Millions of Pesos in Loss for CDE and Its Clients," Listin Diario, 7 July 1984, p. 10-C.

These ads referenced the theft law, penalties when convicted and showed the new standard detail for legal customer hookups. This was the first sign that the utility administration was embarking on actions to solve the problem. Since then, several other administrative actions have been taken by CDE.

First, new clients were asked to provide information during contract interviews which would enable CDE to estimate the electricity that the client might be expected to actually use. Also, a substantial deposit was required.

Information began appearing on the CDE billings advising the client that unless the bill were paid within a certain period there would be a late charge of RD\$ 15.00. If the bill were more than one billing period late, the client was advised on the bill that his service would be disconnected unless the total bill were paid within a certain period, normally 15 days. In many cases CDE carried out the threats. Reconnects constituted quite an inconvenience to the client as often several days would pass before a CDE crew would reconnect the service.

Beginning in 1985 CDE contracted out some of its billing distribution.²³ There was about a month additional delay in receipt of bills by customers.

New meter installations began to be located at the street side property line to facilitate CDE meter reading and keep the

²³CDE, General Administration, "Notice, Bill Collecting Program," Listin Diario 26 Jan 1986, p. 2.

lead-in line to the meter completely visible to the meter reader.²⁴ On occasions there were complaints by clients that the meters were too high and were improperly read by the CDE meter reader. On the other hand, if the meter were too accessible it could be easily vandalized. Vandalism would not be in the interest of the client as CDE began holding the clients responsible for their meters, even if located on the street side property line.

In some cases, such as certain apartment buildings, tenants vandalized the meters to the extent that "metered" connections were not considered practical. Connections thereafter were left unmetered and contracts signed for flat rates. In other instances, such as heavily congested commercial areas, secondary meters were installed to measure electricity use at intermediate points.

In some of the more bizarre instances, where renters began complaining loudly over steeply rising electricity bills, CDE crews also began to perform inspections, sometimes uncovering illegal connections where neighbors had tapped into the line after it had left the meter.

The central government has agreed to payments for electrical power by group of parastatal organizations referred to as CORDE, Corporacion Dominicana de Estatales. These include a cement factory, glass factory, a paper mill and

²⁴"CDE Establishes a New System for Customer Contracts," Hoy, 15 Oct 1985, p. 12.

several others. Such industries obviously use significant amounts of electrical power by the very nature of the processes involved. Moreover, these particular companies have a reputation for being very inefficient. Thus, it was of some relief to CDE when CORDE organizations began making some payments in mid 1985. It is debatable whether or not non payment by such parastatals is "theft."

Finally, in 1985 CDE began a cadaster program.²⁵ This work involved primarily two activities. The first of these was a block-by-block, house-by-house interview of clients. Customers were questioned on the appliances utilized in the household in order to provide data for estimating expected loads along the circuit. The field work is approximately 50% complete in Santo Domingo. Data is being gathered by women social workers.

Public Relations: Because of its poor reputation before the public, the utility has undertaken several actions aimed at improving its image. These have included the following:

1. Rapidly issuing press statements describing the reasons for the power outages.²⁶
2. Announcing ahead of time when outages will occur in

²⁵CDE, General Administration, "Notice, Sector to be Visited," Listin Diario, 3 June 1985.

²⁶CDE Explains the Cause of the Prolonged Blackout," Listin Diario, 30 April 1986, p. 14.

each sector of the city.^{27,28}

3. Promptly advising the public on the actual capacity of the system by power generating unit and the limitations of each type, such as hydroelectric when reservoir levels are low or agricultural needs take priority.²⁹

4. Informing customers on how to correctly read their meters.³⁰

5. Using women soil workers to carry out the block-by-block cadaster in Santo Domingo which involved doorway interviews to determine area loads and potential theft.

6. Announcing improvements in service such as more telephone numbers to receive customer complaints, local commercial offices, service equipment, such as more computer terminals to determine customer status and repair crew vehicles.³¹

7. Sponsoring nation wide essay contests for school³²

²⁷"CDE Will Suspend Electrical Service in Certain Sectors," Listin Diario, 22 March 1985, p. 7.

²⁸"Advice on Service Interruption Over the Weekend," Listin Diario, 22 March 1985, p. 4.

²⁹CDE, "The Electrical Energy Situation," Listin Diario, Notice dtd 8 March 1985.

³⁰CDE, "Check Your Use of Electricity, You Yourself Can Read the Meter," Listin Diario, 10 Sep 1985, p. 5.

³¹"CDE Announces An Information Service for Its Customers," Listin Diario, 21 March 1985.

³²"Prizes Were Awarded for the Children's Painting Contest," Linea Interna, June 1984, p. 2.

children to educate the public about CDE.

8. Publicizing benefits to CDE employees, such as recreational programs.³³

Service Connections. New service connections began to exhibit the designs published by CDE in the press. These designs show the wiring leading directly from the distribution line to the client's meter and the meter located at the property line. While this may not be aesthetically pleasing, it easily allows the meter reader to verify that power is not drawn off the system prior to its passing through the meter and being recorded. The utility announced that integrity of the meter was the responsibility of the client, even though the meter might be on the property line facing the street and subject to vandalism from passerbys. There were vociferous objections in the press to this CDE policy.³⁴

Distribution System. As the system grew during recent years an increasing percentage of the power began to be transmitted through the distribution system, or at lower voltages. In 1986 construction began on a modification to the system to increase the percentage of power transmitted at the higher, 69 KV. This modification to the system will have several beneficial effects. First it will reduce technical

³³CDE, "A Camp of Happiness," Listin Diario, 9 August 1985, p. 2-B.

³⁴Editorial, " El Nacional de Ahora!, 15 August 1985, p. 16.

(resistance), or friction losses, as these are less when the power is transmitted at higher voltages. Secondly, it will reduce theft since it is considerably more dangerous to make illegal connections to high voltage lines. Thirdly, it will eliminate frequent outages caused by damage to lines from tree limbs swaying during storms and thereby increase revenues. The new lines are above the tree line, while the existing low voltage lines are within the trees.

International Donor Assistance. Starting about 1985 CDE began implementing a theft reduction effort with financing by the World Bank. This appears to have been a very limited effort, however, involving small amounts of technical assistance. This assistance did include field inspections of client connections during which illegal connections were identified.

PLANNED. The most important activity planned at this point by CDE to deal directly with the theft problem is a project financed by USAID.³⁵ This project is basically a pilot effort to be focused first on a suspected area where the theft is believed to be greatest. This area will be carefully investigated and then rehabilitated as fraudulent connections are isolated. The rehabilitation is to be carried out area by contiguous area until the greater part of Santo Domingo has been covered. Continued supervision and monitoring will be

³⁵U.S. Agency for International Development, Dominican Rep, Project Agreement, CDE Revenue Collections, 3 March 1986.

directed toward the area after it has been rehabilitated. The stated goal of the project is to reduce the theft loss from an estimated 16% to 10%. This project is expected to last three years. It will be carried out by CDE personnel with technical assistance from the U.S. and funded by the project.

While the lead element of the project consists of small teams which actually identify and make most of the corrections, there are several support elements designed within the project. These are a public relations campaign, a training element and equipment procurement. The public relations campaign is intended to improve CDE's image and blunt resistance that may occur in those areas where high theft is encountered. The campaign will employ radio and television spots, newspaper articles and literature distributions. The campaign will be primarily directed towards the public but some focus will also be given towards CDE employees themselves.

The technical ability of CDE technicians is considered fairly good by various advisors who have visited CDE and provided technical assistance in the past. Thus, most of the training for technicians will be on-the-job training by the technical advisors. As a part of the perceived need to improve CDE's image, however, and to improve chances for successful encounters by rehabilitation teams, team members will be given training in human relations.

The equipment procurements are intended to provide access and mobility to the crews and thus will involve specially

equipped pickups to accommodate four persons and outfitted with radios and appropriate tools and meters. Some metering equipment will be needed. No client meters are provided for, although recently developed, anti-tamper meters will be tried out at selected locations.

If the project is successful it will not only reduce CDE's theft losses but will result in a corresponding increase in revenue that may be used to reduce the subsidy from the central government.

The actions reviewed are those which are a consequence to the particular conditions associated with the theft in the Dominican Republic at this time. There may be other measures, however, that will have to be considered by the utility if these actions do not lead to reductions in the theft or if conditions change.

CHAPTER 7

OTHER POSSIBLE REMEDIAL MEASURES

Obviously, once theft has become as widespread and pervasive as it is believed to be, it is not an easy matter to eliminate it. The actions that the government has undertaken, or is undertaking, may be appropriate considering the circumstances, such the cultural environment, socio-economic and political factors that are part of the problem as well as the solution, or at least must be carefully taken into account when considering solutions.

Still, there may be other remedial measures that might be undertaken. One such measure would be application of the administrative law that calls for fines and or jail sentence for convicted thieves. A few successful, or even unsuccessful applications well publicized, could have a very beneficial impact and give more credibility to the utility. Another measure might be to publically list the names of companies or individuals who have been caught violating the law. Further use could be made of suspension of services. Since the theft is from the government, interagency agreements might be prepared that would lead to temporary suspension of other services, such as telephone or water. The fact that this could

happen would be given wide publicity. The church and social organizations, such as the Rotary Club, could be called upon to influence their constituent members to abide by the law. The public and private schools should not be overlooked as a means to inform and influence those tempted to commit fraud. Finally, the theft of electricity is certainly not confined to the Dominican Republic. It is known, for example, that serious theft problems have occurred in Colombia, Honduras and India. No doubt it occurs elsewhere too. The utility also needs to give more emphasis to these sociological methods. Informational gathering visits could be made to those countries' utilities to gain firsthand and from people of similar cultures and professional backgrounds their experiences and practical solutions.

CONCLUSION

The theft of electricity in the Dominican Republic appears to be a widespread phenomenon that constitutes a substantial loss of revenue to the utility. Loss of revenue can ill be afforded by a power company which owns a deteriorated system, sadly in need of maintenance and new generating capacity to meet a formidable, unsatisfied and growing demand; a system which is desperately in need of funds to attend to such operation, maintenance and investment needs but still retains the legal responsibility as sole producer and vendor of electrical power to the nation.

The purpose of this study was to consider this theft in detail. First, the conditions associated with the theft were reviewed. It was seen that the Dominican Republic is located on an island which receives high amounts of solar energy that results in high humidity that in turn provokes a substantial demand for electrical energy because of air conditioning and refrigeration. A brief history of the Dominican Republic was given. The evolution of the government and social and demographic conditions were described. The Dominican Republic was classified as a developing country. It was pointed out that the economic conditions of the country are not good, that

CDE is directly responsible for part of the economic plight of the government, that the country has no natural resources to produce cheap power but that the sharp rise in petroleum prices was not passed on to the consumer until recently.

Next, the utility itself was looked at. It was found that CDE is incapable of meeting peak demand. While there appears to be sufficient installed capacity, the lack of preventive maintenance and periodic overhauls have left the system in a very poor condition. One of the results is a serious public relations problem for the utility due to outraged customers who have received interrupted service, had electrical and electronic equipment damaged, and incurred production losses associated with commercial activities. Moreover, it is probable that there is a substantial hidden demand as no new capacity has been added in recent years yet industries cannot tolerate blackouts. While it may not be legal to produce their own electricity except for emergencies, many businesses are using these emergency plants for much longer periods than what would normally be considered an emergency. It was seen that CDE is aware of its inability to meet demand and is attempting to rehabilitate important units and is looking wistfully at new generation capacity. Given the economic conditions of CDE and the government, however, this is not easily obtainable.

Losses of electrical power were found to be excessive. Technical losses are believed to be somewhat higher than

normal. Available data indicates that the theft losses, however, are unusually high and estimated to be about 16%. The theft is believed to be widespread.

The main reasons for the theft were found to be economic and political, as increases corresponded to periods during which the economic conditions gradually worsened and when a change occurred in a ruling political party.

It was shown that reduction in theft was one of the few alternatives that CDE has left to improve its position. The significant amount of theft translates into a corresponding amount of revenue that drains the utility's resources and contributes to the embarrassing subsidy the utility must obtain from the central government to operate.

Finally, the utility has undertaken several measures to reduce the theft. These were discussed in detail. It must be pointed out, however, that CDE has not resorted so far to publically castigating thieves, suggesting that the phenomenon is not limited by class boundaries and that CDE still does not have the will or political support to enforce the law against theft that is already on the books. Also, some of the measures still planned by CDE were looked at and other possible measures were suggested.

WHAT ARE THE LESSONS TO BE LEARNED AND APPLICATIONS FOR OTHER DEVELOPING COUNTRIES? Certainly, the Dominican Republic is not unique in being faced with the problem of electricity theft. The amount of loss, however, may be higher than in

other countries and for obvious economic reasons cannot be tolerated for long periods. Nevertheless, other countries with similar conditions might well profit from some of the lessons of the Dominican Republic's experience. Associated with these lessons are corrective actions that can be taken by the utility. These may be classified as "preventive" or "after the fact." In retrospect, preventive measures that might have been taken by the Dominican electricity utility could have included the following:

1. Faithful application of the existing law against electricity theft.
2. Broadening of the penalties to provide more flexibility in applying the law.
3. Strong and unequivocal public denunciations by the utility administrator and other public officials against the theft.
4. Attention to preventive maintenance needs of the utility's power generation and distribution infrastructure in order to provide better service and so eliminate excuses for the theft by irate clients.
5. Prohibition of service connections which enable a thief to wire around the meter.
6. Location of meters where they can be easily read from the street by the meter reader.
7. Installation of circuits throughout an area so as to enable easy input/output comparisons of electricity provided, versus that billed. This capability would in turn enable early detection of fraud and identification of the group of clients within which the theft is occurring.
8. Establishment of decentralized commercial offices headed by responsible directors to develop close, customer service relationships with neighborhood utility clients.
9. Rewards for information provided that leads to

identification of electricity thieves.

10. A more aggressive effort to provide information on how to cut down on use of electrical power, thereby reducing costs to the client and demand on an overtaxed system.

After the fact corrective measures could include most of the preventive measures listed above. Others would include the following:

1. Improvements in the billing system to enable rapid input/output analyses over area wide circuits.
2. Installation of tamper proof meters in suspect and appropriate areas.
3. Use of meters which read electrical consumption, regardless as to whether the leads have been reversed by unauthorized persons.
4. Rehabilitation of areas where theft is suspected, followed by surveillance of the area combined with account reviews.
5. Training of crews in public relations.
6. Exposure of midlevel management personnel to experience of utilities in other countries.

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