CUBA’S INFRASTRUCTURE: PRESENT AND FUTURE

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INTRODUCTION

The prevailing view of Cuba’s economy, even before the break-up of the Soviet Union, was that it was sickly and distorted. In the intervening 30 years Cuba received large subsidies from the former Soviet Union via its sugar-for-oil agreements, and other monetary assistance, which kept things going but did little to develop the infrastructure, industry, and, therefore, the economy.

The government spent disproportionately large sums of money to establish its influence in many Third World countries through both military and foreign aid expenditures. Also, large sums were spent in the creation of a large and highly qualified intelligence and repressive military domestic force.

Large sums were also directed to activities, such as the development of biotechnology and bioscience centers, not appropriate in magnitude and expenses for a small nation. In fact, this sector, in spite of the fact that it has state-of-the-art facilities, has continued to receive investment despite cutbacks in every other sector of the economy. Therefore, the government was unable to create a modern industrial infrastructure.

Much of the industrial plant and equipment, as well as the basic infrastructure, such as electrical energy, telecommunications, transportation, water and sewer facilities, housing, etc., obtained or assisted in the construction and/or maintenance by the Soviet Union or East European countries, was greatly inferior to what was available in the Western markets, and in particular was highly inefficient and highly wasteful of fuel.

The level of the future investment-on a post Castro, democratic nation- needed in industry and infrastructure in general, will depend on factors such as age and
appropriateness of the installed technology and the degree to which the installations have
deteriorated as a result of recent neglect.

However, basic, tangible infrastructure, which will be the topic of this paper, will need to
be overhauled at all levels.

**ELECTRIC ENERGY**

All the electric energy generation, transmission and distribution in Cuba is controlled by
the government, under the “Empresa Electrica Cubana”, which is part of the Ministry of
Basic Industries”. Presently, the system has an installed generating capacity of 3,500
Mwatts. However, due to several factors that will be explained later in this section, the
real generating capacity is only 1,200 Mwatts.

Approximately 95% of these plants use oil as fuel. The industry employs 29,000 persons,
of which, 1,100 are engineers, and 4,000 are technicians. In 1989, a year much used as
reference for many industrial and economic comparisons, the electrical energy demand in
Cuba was 2,500 Mwatts, distributed as follows: 60% for the industrial sector; 8% for the
commercial sector; 4% for the agricultural sector; and 25% for domestic usage. The rest
is miscellaneous. The demand, in 2000, is down to 950 Mwatts, mainly due to the almost
standstill of the industrial sector, as well as a low in the agricultural and domestic usage.
There are 46 units in operation, located in 20 different sites. Only 30% of the units are
classified as of high efficiency. According to the type of fuel used, 94% use fuel #6, and
5% use fuel #2. The equipment comes from the United States, Russia, Eslovaquia,
Germany, France, Japan, and Italy. Transmission voltage is 110Kv and 220Kv. The
country is interconnected by a 220Kv network.

The transmission cables are ACSR 150mm. The transmission structures are of concrete,
for the 110Kv lines, and metal for the 220Kv. Distribution lines are 4.16Kv, and 13.8Kv,
60Hz. Wires for distribution are of 150mms, 70mms, and 35 mms, ACSR. Almost all
distribution is overhead, except some pre 1959 underground in La Habana.

The average service time of the operating units is 25 years. Some of the units have over
50 years in service. The newest units were installed in Matanzas, Cienfuegos, and Felton.
The former with Japanese and French technology, and the latter from the Eslovaquian
Republic.

Cuba consumed 13 million tons of oil in 1989, of which, 40 million barrels, some 7
million tons, were for the generation of electricity. In 1999, Cuba consumed, for all
needs, not only to generate electricity, 6.3 million tons. Of these, 1.2 million are domestic
oil, not suitable to be used in the generation of electricity because of its high content of
sulphur, approximately 9%.

The system has deteriorated tremendously, due to several factors: lack of proper
maintenance; use of inappropriate fuel; aging; unsuitable spare parts; lack of system
equilibrium; effect of the blackouts. In order for a nation to have an adequate economic development, it must have enough capacity of generating electric energy. In a post Castro, democratic Cuba, this figure can be estimated at 3,900 Mwatts for the first 3 years. This capacity must double in 10 years. In fact, in 5 years of the reconstruction period, the objective must be to have 350 watts per person.

The present average cost of construction or reconstruction of power plants is $900 per kwatt. The estimate is then an investment of $1,500 millions in the first five years in plants. To this figure, we must add an additional investment of $650 millions in five years for the construction and reconstruction of all transmission and distribution systems. During the first year, emergency units must be installed through the country, since the industrial and construction activities will need immediate energy supply. It is very difficult to assign a dollar amount to the total investment of these units, since they will vary from small to large units, using oil, propane and diesel fuel. The typical average cost for portable units is from $250/Kwatt to $950/Kw.

**TELECOMMUNICATIONS**

Telecommunications is not only one of the most important areas of infrastructure for the future of Cuba, but one where investment and development will be most needed. In the last 30 years we have seen a real revolution in the world in telecommunications technology, and one where Cuba has not been part of. Microwaves, fiber optics, satellites, wireless phones, digital switching, computer networking, internet, electronic mail, faxes, interactive TV, just to name a few, are some of the most recent technological breakthroughs.

In 1959 Cuba had 15 telephone lines per 100 inhabitants. Presently, in 1999, there are many countries in the world with less than 15 lines per 100 inhabitants. In 1999, Cuba has 3.5 lines per 100 persons. However, is not only a drastic reduction in quantity, but the existing lines and systems are not suitable for the speed, bandwidth, and applications of modern telecommunications. There are approximately 1,500 engineers working in the telecommunications industry in Cuba.

Of the 500,000 telephone lines existing in Cuba, approximately 200,000 are in La Habana. The telephone switching equipment is a combination of crossbar, step-by-step, and a small digital switch, some 1,200 lines serving certain areas of La Habana. Local networks consist of copper and lead feeder and distribution cables whose average age is approximately 30 years. Except in certain areas of La Habana, cables are pole mounted. These cables require, but do not receive, high maintenance, due to age and exposure to elements.

Long distance service is provided by a combination of crossbar switching systems and cord boards. Direct distance dial within the island is made possible by the crossbar toll tandem network. Interoffice facilities in the local networks are served by copper based digital carrier system, of Japanese and German technology conforming to CCITT.
standards. The toll network is served by a combination of a microwave backbone and a coaxial carrier system. Assignment and maintenance practices are similar to the techniques employed in the United States in the early 70’s, which require at least 4 times the labor force as current methods.

The microwave network has a capacity of 960 channels, and it links La Habana with the old province capitals. The coaxial cable system has a capacity of 1920 channels, a mixture of Soviet and German technology. The cable runs by the “new” 8 vias Autopista, all the way to Cabaiguán, and then follows the old Carretera Central to Santiago. There are two satellite systems in service: the IntelSat, an automatic Japanese system with 24 channels, and the Intel-Sputnik, a Russian manual system with 60 channels. There is also, since the 90’s, a small cellular service system, for tourists and businessmen. The system is a mixed venture of the Cuban government with a Mexican firm.

The current value of the equipment in Cuba is calculated at $230 millions. The estimated capital requirements for implementation of a telecommunications system in a post Castro Cuba is $2.9 billion in five years. The analysis assumes the achievement of 15 lines per 100 persons at the end of five years. The typical breakdown of costs are: Central Office Equipment, 30%; Outside Plant Feeder, 30%; Outside Plant Distribution, 10%; Central Office facilities, 15%; Toll Network, 15%. Or, approximately $1,700 millions in Central Offices, and $1,200 millions in Outside Plant. At the same time, and during the transition period, a cellular telephone system must be established to provide instant domestic and international communications. The initial investment for such a system is estimated at $450 millions.

TRANSPORTATION

The transportation infrastructure in Cuba is practically non-existent. The two primary objectives in this area should be: to provide a national transportation network of highways/railroads; to provide an effective and balanced roadway/transit system in all major urban areas. For the first five years, in a post- Castro Cuba, the following conclusions apply:

1. No identifiable major deficiency is apparent in the interregional highways network. Concentrated effort should be on the completion of the “8 vias” Autopista from Ciego de Avila to the east of the island, at an estimated cost of $900 millions. An aggressive maintenance program of the network at an estimated cost of $125 millions/year, while fostering the establishment of an interregional transit system.

2. The infrastructure necessary to provide an adequate urban mobility has been stagnant for the last 25 years. Concentrated effort should be on providing an adequate mass transit system at a total estimated capital cost of $400 millions and an estimated operational cost of $300 millions/year. While providing as many traffic operational improvements as soon as possible, to handle the expected increase of vehicles in the urban areas.

3. Railroad network is in a very poor operational state, both bulk cargo and passenger service. Concentration should be on fast-tracking an upgrade of the railroad network, at a total estimated capital cost of $1,650 millions, and an annual operating cost
of $170 millions/year. 4. Upgrade feeder highways to the major economic centers of the island, at a cost estimated at $1,300 millions.

The urban transit system is very important to facilitate mobility in the major cities. Approximately 5,400 buses, 45 passengers, should be acquired and be in operation within the first five years. Of these, 3,000 will be serving La Habana. Adequate urban, intercities, and railroad transportation is essential to achieve an stable and sustained economic development.

WATER AND SANITATION

Two important services in a post-Castro Cuba will be water and sanitation industries. The water and sewer services infrastructure should be dealt with the objectives of addressing the initial short-term emergency relief program of basic assistance during the initial transition government, and the long-term relief program needed to initiate Cuba’s economic revival.

Very little has been done concerning water and sewer systems since 1959, taking into consideration that the population has doubled since then. No maintenance has been given to plants, distribution, collection and transmission systems, and patch-up work is done when absolutely necessary.

United States manufactured treatment plants have been repaired using parts from the former Eastern Block, making these maintenances a headache. A “zone” distribution system is now in effect since no continuous overall supply can be given. Zones get service at different times as a result of the system deterioration. Since all components are so updated and in disrepair, short range considerations are very difficult.

The bulk of the water and sewer facilities in the urban areas of Cuba have an average life of 70 years. The useful life of water distribution and sewer lines is universally accepted at 50 years, and only when reliable maintenance has been provided. The country, due to the mixing of drinking water and waste from sewer lines, which is flowing along the gutters of the streets.

As a summary we have:

1. The aqueducts built or fully repaired after 1959: 15%
2. Others which only give a few hours of water per day: 65%
3. Aqueducts that just carry the water to collection tanks: 20%

The recommendations to improve this infrastructure can be divided into two parts: water distribution systems; sewage treatment and disposal. Water distribution represents an emergency and should be planned and handled in two stages. One, the emergency task. The other, permanent facilities. The emergency task shall be considered as the level of work to provide the minimum essential volume of water consumption and still maintain a degree of health protection. Water treatment is essential, and permanent facilities should be initiated from the beginning.
This is an infrastructure, which is very difficult to have an accurate estimate of the capital needed to rebuild the entire system. However, it can be estimated, as an approximation, to be $1,900 millions in the first five years, including aqueducts, transmission and distribution systems, water treatment plants, sewer lines.

OTHER AREAS

There are other important tangible areas of infrastructure, which the time frame to present this paper does not permit to be included in this analysis. Among them: public education; housing; airports; ports.