



Courtesy Mario Alberto Antasía Avila

Viva La Revolución Energética

In two short years, energy-smart Cuba has bolted past every country on the planet.

Laurie Guevara-Stone

WHAT NATION is the most sustainable in the world? If you guessed Sweden, Denmark or maybe Norway, you would be wrong. Instead, the World Wildlife Fund (WWF) has declared Cuba to be the only country on the planet that is approaching sustainable development. Key to this designation is the island's *Revolución Energética*, an energy conservation effort launched only two years ago.

The WWF's *Living Planet Report 2006* assesses sustainable development using the United Nations Development Programme's (UNDP) Human Development Index (HDI) and the ecological footprint. The index is calculated using life expectancy, literacy and education, and per capita GDP. The UNDP considers an HDI value of more than 0.8 to be high human development. According to the ecological footprint, a measure of human demand on the biosphere, 1.8 global hectares per person or less denotes sustainability. The only country in the world that meets both of the above criteria is Cuba.

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Just a few years ago, Cuba’s energy situation was bleak. This communist nation of 11 million people had 11 large, inefficient thermoelectric plants that functioned less than half of the time. There were frequent blackouts and high transmission line losses. Adding to the crisis, most Cubans had inefficient appliances, 75 per cent of the population cooked with kerosene and residential electrical rates did not encourage conservation.

In 2004, back-to-back hurricanes slammed into Cuba, leaving a million people without electricity for 10 days. In the face of an antiquated system, violent storms, peak oil and climate change, Cubans realized that they had to make energy a priority. Thus, in 2006, they embarked on their *Revolución Energética*.

Today, two years later, the country consumes 34 per cent less kerosene, 37 per cent less LPG (liquefied petroleum gas) and 80 per cent less gasoline. Cuba’s per capita energy consumption is one-eighth of that in the US, while Cubans’ access to health services, education levels and life expectancy rival those of their North American neighbours (see table 1).

Prior to the 1959 Cuban revolution, about half of the country had electricity.

By 1989, this number had risen to 95 per cent. After 1991, however, food, gas and oil all became scarce as a result of the collapse of the Soviet Union and the US economic blockade. This time came to be known as the “Special Period” because Cubans had to learn how to produce more of their food, medicines and energy locally and sustainably.

Thus, in the mid-1990s, Cuba embarked on a drive to save energy and use more renewables. All rural schools, health clinics and social centres not previously connected to the grid were supplied with solar energy, making lights, computers and educational television programs accessible to all students. This program garnered Cuba the Global 500 award from the United Nations in 2001.

However, despite 10 years of revolutionary effort, Cuba still had a crisis on its hands. So in 2006, it took some drastic steps. Cuba’s energy revolution has five main aspects: energy efficiency and conservation, increasing the availability and reliability of the national grid, incorporating more renewable energy technologies into its energy portfolio, increasing the exploration and production of local oil and gas, and international co-operation.

In an address to the Cuban electrical utility in 2006, then-president Fidel Castro said, “We are not waiting for fuel to fall from the sky, because we have discovered, fortunately, something much more important: energy conservation, which is like finding a great oil deposit.” To decrease energy demand, Cuba began changing over to more efficient appliances. In two years, residents have replaced almost two million refrigerators, over one million fans, 182,000 air conditioners and 260,000 water pumps. Compact fluorescent light bulbs were handed out for free and within six months, over nine million – or almost 100 per cent – of the island’s incandescent bulbs had been replaced. At the same time, Cubans were discouraged from cooking with kerosene. Families have consequently purchased almost 3.5 million rice cookers and over three million pressure cookers.

To encourage conservation, Cuba introduced a new residential electrical tariff. People consuming less than 100 kWh per month pay 0.09 pesos per kWh (a fraction of a cent). For every increase of 50 kWh per month the rate rises steeply. Consumers using over 300 kWh per month pay 1.30 pesos per kWh.

Cuba’s national energy program

Table 1 Cuba Challenges the World

	Cuba	US	Mexico	Canada	Germany	Spain	Denmark
Human Development Index (2005)	0.838	0.951	0.829	0.961	0.935	0.949	0.949
Ecological Footprint (ha per capita in 2000)	1.53	9.57	2.59	8.56	4.26	4.90	5.32
Life Expectancy	77.7	77.9	75.6	80.3	79.1	80.5	77.9
Literacy Rate	99.8	99	91.6	99	99	99	99
Infant Mortality Rate (per 1000 live births)	6	6	22	5	4	4	4
% Infants with low birth weight	5	8	8	6	7	6	5
% Children enrolled in primary school	97	92	98	99	96	99	95
Public expenditure on education (% of GDP)	9.8	5.9	5.4	5.2	4.6	4.3	8.5
Electricity consumption per capita (kWh)	1380	14,240	2130	18,408	7442	6412	6967
CO ₂ emissions per capita	2.3	20.6	4.2	20.0	9.8	7.6	9.8
GDP per capita	\$6900	\$48,200	\$12,400	\$38,400	\$33,900	\$31,260	\$39,100

Data from the *United Nations Human Development Index Report 2007/2008* and *Footprint of Nations 2004 Update*.



Courtesy: Mario Alberto Arrastia Avila

implemented in 1997, teaches Cubans about energy-saving measures and renewable energy. "If we begin to insist on [energy efficiency] at the preschool age, we are creating a conduct for life," explains Teresa Palenzuela, a specialist with Cuba's energy-saving program.

The program has held energy festivals for the past three years, educating thousands about efficiency and conservation. The festivals target students, who express energy conservation through songs, poetry and theatre. In each Cuban school, the children with the best energy efficiency projects go on to the festival at the municipal level. The best of them then move on to a provincial event and from there to the national stage. The public lines up for blocks to attend the national festival. "These contests are important to the entire country; they motivate children, students and the general population to save energy in all their actions," says 15-year-old Liliana Rodríguez Peña.

The media does its bit to help disseminate information about energy. Dozens of billboards that promote

conservation are scattered across the country, a weekly television show is dedicated to energy issues, and articles espousing renewable energy, efficiency and conservation appear regularly in newspapers. In 2007 alone, there were over 8000 articles and TV spots dedicated to energy efficiency.

Nonetheless, in 2005, blackouts were still common as a result of an old and inefficient electrical grid. Thus began the move to decentralized energy, which involves generating electricity in smaller substations.

In 2006, Cuba installed more than 1800 diesel and fuel-oil micro-electrical plants, which now produce over 3000 MW of power in 110 municipalities. This switch virtually eliminated the blackouts. In 2004 and 2005, there were over 400 days of blackouts greater than 100 MW that lasted at least an hour. In 2006, there were three and in 2007 there were none at all.

Cuba also embarked on an impressive plan to fix its old electrical transmission network. It upgraded over 120,000 electrical posts, installed almost 3000

kilometres of cable and half a million electrical meters. As a result, the nation reduced the amount of oil needed to produce a kWh of electricity by three per cent, from 280 grams in 2005 to 271 grams in 2007. It is estimated that over the same period, Cuba saved almost 872,000 tonnes of oil through its energy-saving measures.

Cuba's move towards incorporating more renewables into its energy mix is also impressive. One hundred wind-measuring stations and two new wind farms bring the island's total wind energy installation to 7.23 MW. The Cubans are also developing the country's first grid-tied 100 kW solar electric plant.

"We need a global energy revolution," says Mario Alberto Arrastia Avila, an energy expert with Cubaenergia, an energy information centre. "But in order for this to happen we also need a revolution in consciousness. Cuba has undertaken its own path towards a new energy paradigm, applying concepts like distributed generation, efficiency, education, energy solidarity and the gradual solarization of the country." ☞

Social Workers Power the Revolution

TO CARRY OUT its ambitious energy conservation plan, Cuba relied on its small army of *trabajadores sociales* or social workers. Cuba's social workers are made up of youth who have the task of bringing social justice to the island in many different spheres, including labour, education, culture, sports and the environment.

As well as assisting people with disabilities, the elderly and those convicted of crimes, the social workers help carry out the Energy Revolution. Since 2006, 13,000 social workers have visited homes, businesses and factories around the island, replacing light bulbs, teaching people how to use their new electric cooking appliances and spreading information on saving energy. The social workers also teamed up with the Ministry of Agriculture to save energy during the sugar cane harvest and for the national bus system. Former president Fidel Castro, who founded the program, refers to the social workers as "Doctors of the Soul."

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What makes Cuba the most sustainable country in the world? For more, look to Cubaenergia, the Center for Energy Information and Development in Cuba, www.cubaenergia.cu; Cubasolar, www.cubasolar.cu; and Global Exchange www.globalexchange.org.

To take a renewable energy tour of Cuba in March 2009, contact laurie@solarenergy.org.