

Cuba's Commitment to Solar Power and Renewable Energy

By Cappy Kidd, the Energy Detective™

I traveled to Cuba with a delegation organized by the Association of Energy Engineers (AEE) in June of 2016. During our eight-day visit to Cuba, we were able to meet with representatives from the Ministry of Science, Technology and the Environment, the Cuban Renewable Energy Research Ctr., Cuba Energía, and Cuba Solar, a nongovernment organization which was founded in 1994 to promote renewable energy. We also had meetings with two professors from the University of Havana—an economist and a senior scholar specializing in international trade and economic development.

Cuba has made a strong commitment to ramping up its use of solar power and renewable energy. They have set a target of meeting 24% of the island's energy needs from renewable sources by 2030.

In our discussions with Cuban energy engineers, we learned that 1,500 small schools and medical clinics located in rural areas that are off the grid have been equipped with rooftop solar photovoltaic panels. These solar panels run the interior lighting and audiovisual instructional equipment that consists of a laptop and a television. At the time of the Cuban revolution in 1959, the population of Cuba was about 80% rural and 20% city dwellers. That ratio has now flipped but there are some remote areas that have not received electrification. The addition of the solar panels has allowed the schools to utilize instructional videos and other Audio Visual instructional tools that are available to the rest of the Cuban educational system. In some cases, satellite dishes have been added to the rooftop arrays. This allows all of the local inhabitants access to regular television broadcasts during times when classes are not in session.

Altogether, the National Rural Electrification Program has installed 10,000 photovoltaic panels to meet the needs of 150 thousand families that the grid does not reach. These families are typically involved in producing important crops and natural resources such as cacao, coffee, forestry, the national Park system and mines.

The AEE delegation was impressed to learn that the Cubans have converted all 59 of their sugar mills from running on petroleum inputs to now running entirely off of biomass. These are very large industrial facilities that process the island's entire sugar crop. Every machine, every conveyor belt and every light in these facilities is run by steam and or electricity produced by burning the biomass in the boilers on site.

The Marabu tree is an invasive nuisance plant that Cubans refer to as 'wicked weed'. The Cubans are making the most of a particular feature of 'wicked weed'. Once it is harvested and dried it becomes a very good feedstock for boilers. The mills also utilize the leftover stalks and

leaves of the sugarcane as fuel once the juice has been extracted. (The renewable energy generated at the sugar mills represents 10% of Cuba's total base energy production.)

In addition to being good fuel for boilers, charcoal made from the Marabu tree is exported. It is prized as a very energy dense heat source. Other substances from the tree have interesting electromechanical properties which are used for battery production.

During the five months of the year that sugarcane is being processed, the sugar mills produce more electricity than they need. The surplus electricity is fed into the electrical grid. Cuban scientists and engineers are now evaluating proposals to operate the sugar mill boilers year-round in order to provide much-needed additional electrical capacity to the national grid. They are also conducting a few bio-gas pilot projects that convert biomass into biogas which is then used for cooking and to power vehicles.

With the reestablishment of diplomatic relations between the United States and Cuba it is expected that there will be a surge of tourism from the United States. It was apparent at the time of the Association of Energy Engineers trip that Cuba is already hosting large numbers of tourists from Canada, Europe, other countries in Latin America and even Japan and China. A major limiting factor to the increase of tourism is the current limitations of the hospitality industry itself. There are far fewer hotel rooms and rental units available than the number of tourists who want to use them.

The Cubans understand that an increase in the number of rental spaces available is contingent on the significant increase in electrical capacity. Rather than trying to dramatically increase the size of their electrical grid which depends on oil fired power plants, the Cubans are looking to smaller distributed generation systems combined with micro grids. This will have the advantage of decentralizing energy production and reducing transmission losses over long distances.

As part of their commitment to increase the capacity of their national electric grid, the Cuban government is underwriting the construction of solar photovoltaic, wind and biomass electric generating stations. The Cuban government has committed \$4.2 billion over the next 15 years for power purchase agreements for electricity generated by alternative sources.

The Cubans are already utilizing solar thermal energy to offset the use of electricity to produce domestic hot-water and process hot water for industry. They have installed 10,500 roof-top solar water heaters and plan to install another 200,000 square meters of rooftop panels for water heating. This trend was apparent at one touristy beach area we visited, with dozens and dozens of small cottages, each with its own rooftop solar powered thermal-siphon water heating unit. The net impact of solar hot-water heating reduces electrical consumption in Cuba by 12%.

While diplomatic relations have been reestablished, the economic embargo imposed by the United States against Cuba 55 years ago is still in effect. Under the current arrangement, there are 12 areas of economic activity where U.S. businesses can function in Cuba by applying for licenses with the US government. Alternative energy and environmental protection is one of those areas. While working under licenses offers a potential temporary solution, the preferred solution would be for the U.S. government to end its economic embargo of Cuba.

In preparing this report, I referenced conversations and correspondence with:

Dr. Manuel Alvarez, the Director General of Cuba Energia

Dr. Luis Berriz, the Director of Cuba Solar

Dr. Carlos Fernandez-Aballi Chief Strategist for the US-based group Cuba Strategies Inc.

Prof. Raul Rodriguez, University of Havana

Dr. Fred Royce, Academic Coordinator, University of Florida-University of Havana Collaborative Exchange at the University of Florida

Dr. Federico Sulroka, recently retired from the Cuban Ministry of Mining and Energy

Dr. Jorge Sanchez, University of Havana

I also referenced the report on the AEE trip prepared by Tim Janos, the Director of Special Projects for the Association of Energy Engineers.

The next report I will be working on will focus on a new technological breakthrough: solar powered air conditioning.

Until then, this is Cappy Kidd, the Energy Detective signing off.

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