Summary: Business models and local benefits[1]

WP 6: Leader Energieinstitut der Wirtschaft: Summary

Business models for investments in energy saving projects[2]

Policy makers and other market actors have to understand renewable energy projects in general and to value possible technical and nontechnical risks of such projects. High-risk projects and low ranked borrowers will always have problems to finance projects under regular bank conditions. But if the project is technically feasible and the borrower has credit and securities, the right business model can help to stimulate the deployment of renewable energy technologies and energy efficiency measures. Some possible business models for financing the solar cooling and hot water system at IPK hospital are listed below.

1. **Business models based on Energy Contracting models integrating Energy Service Companies (ESCO model)**
   - Energy Supply Contracting (ESC)
   - Energy Performance Contracting (EPC)
   - Integrated Energy Contracting (IEC)

The fundamental concept of the ESCO business model is that the client (IPK hospital) does not have to come up with any upfront capital investment and is only responsible for repaying the investment made or arranged by the ESCO. The ESCO develops and implements (and operates) the energy saving project. The ESCO provides or arranges financing for the upfront investments for the client. The repayment of the investment is coming from (guaranteed) saved energy costs.

Under an **Energy Supply Contracting** (ESC) model, the Energy Service Company (ESCO) **supplies energy**, such as electricity, heat, or steam under a long-term contract to a building owner or building user. An ESC does not have to be combined with energy saving measures, the ESCO has only a contract to operate an existing energy supply system.
Under an **Energy Performance Contracting** (EPC) the ESCO has to **deliver energy savings compared to historical consumption or a predefined baseline** under a long-term contract to the client.

The EPC can be focused on a refurbishment of an existing energy supply unit or energy distribution

[1] **This document was prepared as part of the project Cuba Solar. Cuba Solar was Co-financed by Österreichische Forschungsförderungsgesellschaft (FFG) in the framework of the "Beyond Europe" programme**.

[2] Partly inputs from "Business models for renewable energy in the built environment" http://iea-retd.org/wp-content/uploads/2012/04/RE-BIZZ-final-report.pdf

systems, etc. We differentiate between “shared saving contracts” and “guaranteed saving contracts”.

The **Integrated Energy Contracting** (IEC) is a **combination of ESC and EPC**, the ESCO is responsible for investment in energy saving measures and is operating the energy supply system.

2. Business models based on new revenue models

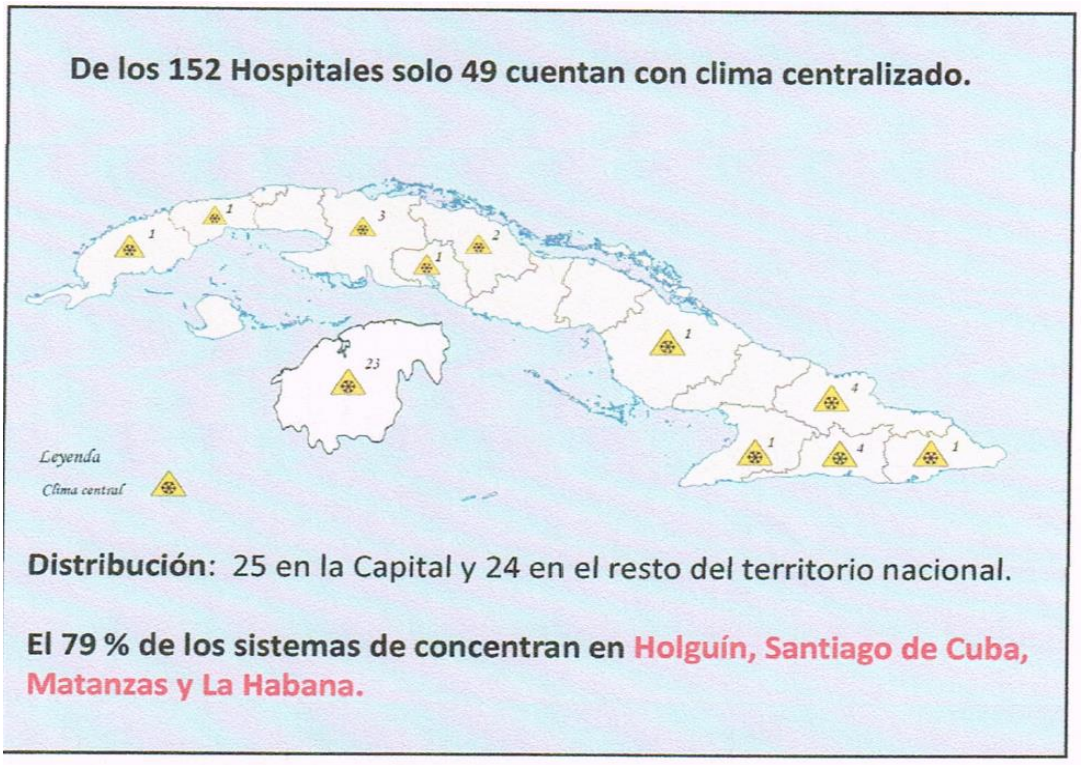
- Developing projects with certified credits

Typical revenues for a renewable energy project like the IPK solar cooling and hot water system could be **Certified Emission Reductions (CERs) through reduction of CO_2-Emissions.** These CERs can be sold to international companies or institutions.

Business models for the solar cooling and hot water system at IPK hospital

Situation of the public health sector

The IPK hospital belongs to the Ministry of Public Health and all investments have to be budgeted in this ministry. At the moment, the air conditioning system of about 150 hospitals in Cuba should be modernized.[3] The total invest will be about 87 mio USD foreign equipment and about 91 mio CUP local contribution. The Cuban government is looking for international financing to start implementation.



Source: Information from RC. Modernizacion de los sistemas de clima en hospitales cubanos [2]

[3] Information from RC. Modernizacion de los sistemas de clima en hospitales cubanos

Investments in energy saving in the public health sector in Cuba will not create direct revenues. The investment produces savings in energy consumption and energy costs for the IPK hospital and reduces Cubans energy imports over the lifetime of the investment.

For implementing the solar cooling and hot water project in the IPK hospital (and other hospitals) three business models for financing are possible:

1. Based on a request of the Cuban Ministry of Health, supported by the Cuban Ministry of Foreign Trade and Foreign Investment (MINSEX) the Cuban government can decide that this project is of strategic importance for Cuba and the Cuban government is asking international donors for a soft loan financing. **Cuba is the borrower and has to pay back the soft loan.**
2. A **foreign investor** or an Energy Service Company is offering financing for the project based on an "energy saving contract" with the IPK hospital or the Cuban Ministry of Health. Based on a request of the Cuban Ministry of Health, supported by the Cuban Ministry of Foreign Trade and Foreign Investment (MINSEX) the Cuban government can decide that this project is of strategic importance for Cuba and the Cuban government can decide that the project can be realised with the foreign partner and that the **"energy saving contract"** can be signed.
3. It is a combination of Point 1. and 2.: The **foreign investor** or an Energy Service Company signs a "guarantee saving contract" with the IPK hospital or the Cuban Ministry of Health and guarantees reduced energy costs generated by the project. The Cuban government is asking international donors for a soft loan financing**. Cuba is the borrower** and can pay back the soft loan based on the saved energy costs. If the saved costs are below the calculated savings, the foreign investor has to pay the difference based on the **"guarantee saving contract".**

To generate additional revenues out of the solar cooling and hot water project in the IPK hospital in any of these models it is possible to create and sell **Certified Emission Reductions**.

Foreign investment in Cuba based on Law No. 118

In 2014, the National People's Power Assembly of the Republic of Cuba passed **Foreign Investment Law No. 118**, updating previous rules established under the "Foreign Investment Act" (Law No. 77) passed in 1995. The primary goal of the law was to "establish the legal framework for foreign investments" in order to gain access to "external financing, technologies and new markets," (National People's Power Assembly, 2014).

The law allows for foreign investors to invest via 100% foreign-owned companies, joint ventures between a foreign company and a Cuban investor, and "economic association agreements" that bring together multiple foreign and domestic investors to complete a single project without merging into a single legal company.

The law includes the state's guarantees for the investors, ensuring their benefits and protecting against expropriation.

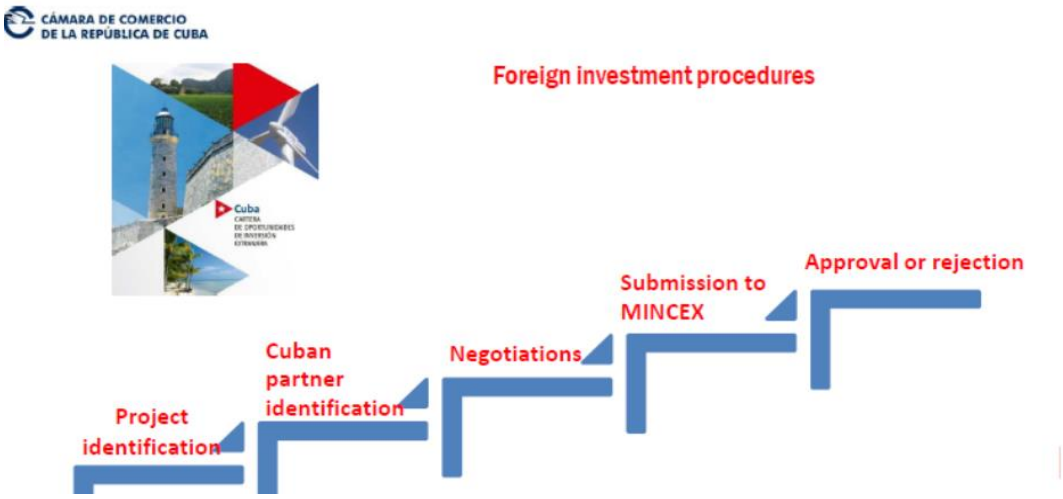
Tax incentives include no taxes paid on dividends, a graduated income tax structure (no income tax paid in the first eight years of operation, 15% income tax after eight years), sales tax incentives (no sales tax paid in year one, followed by 50% of the sales tax rate going forward), and no labour taxes. Additionally, customs duties are waived for the import of most equipment and machinery. Preferential

treatment is also given in purchase agreements with domestic companies to encourage local contracts.

Procedurally, Law No. 118 outlines the steps required for companies to gain investment approval. The Ministry of Foreign Trade and Foreign Investment (MINSEX) reviews and approves all project proposals.

Foreign investment procedure for <u>commercial</u> projects

Cuba is offering investment possibilities to foreign investors. The investment procedure starts identifying the right project and with the identification of a Cuban Partner (mostly state owned companies). The project has to be documented in detail. The project has to be submitted to the MINCEX which decide whether the project is relevant to reach Cuba`s development goal or not. Based on criteria like this, the foreign investor and the Cuban partner will get the decision for the project (Approval or Rejection) from the MINCEX.



Source: MINSEX

Foreign investment procedure for <u>cooperation</u> projects

Cooperation investment projects are different from economic investment projects. **Cooperation project are projects including subsidies from other countries or international donor organisations**. **Cuba is supporting cooperation projects, free local labour is Cuba`s project contribution**. Cooperation projects are dealing with new, innovative solutions and/or are research and development oriented.

Possible ESCO business model for the solar cooling and hot water project

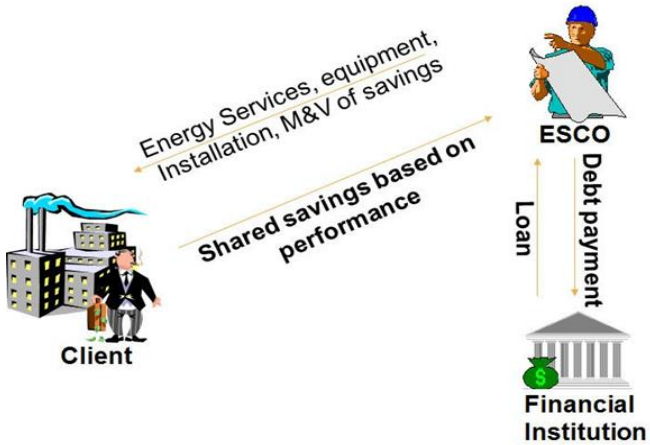
The preparatory phase of the solar cooling and hot water project in the IPK hospital was supported by the Austrian Research-Technology-Innovation-Program "Beyond Europe". The "Beyond Europe" programme supports Austrian companies, research and university institutes and other organisations in creating and extending collaborations. Because of the Austrian subsidies **during the preparatory phase, the project was defined as an Austrian-Cuban cooperation project.**

Because the solar cooling and hot water project in the IPK hospital would be the first project of this kind in Cuba all Cuban discussion partner from relevant institutions and ministries tell us, that the installation of the **solar cooling and hot water project in the IPK hospital will be a pilot project and will be defined as cooperation project**. That means for all further considerations that international subsidies are necessary and Cuban labour costs are free.

For the project team it was important that the utilization of this solar technology is not only based on subsidies and other local benefits. Therefore the business model used for the project financing is oriented on a commercially and financially sustainable structure.

Shared Saving Contract with an Energy Service Company

In a shared-savings EPC, the **ESCO finances the total upfront capital cost** of the project and is totally responsible for repaying the lender. The IPK hospital or the Ministry of Public Health (as client) pays the ESCO a percentage (or it can be a fixed amount) of its achieved savings from the project, large enough for the ESCO to repay the project investment and any other associated costs to its lenders (International Financing Institutions, Development Banks, ..). **IPK hospital or the Ministry of Public Health has no direct contractual obligation to repay the lender**, only the ESCO has this obligation. The achieved savings will be documented under a monitoring and verification (M&V) protocol.



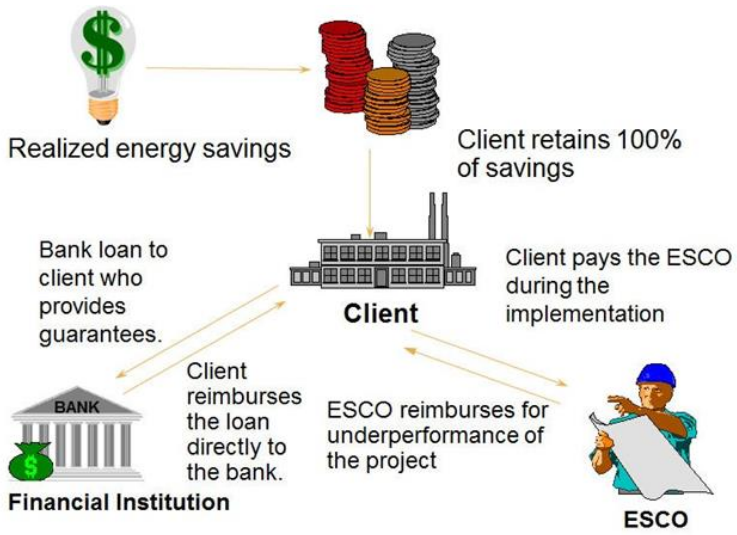
Concept of the guaranteed saving business model[4]

Guaranteed Saving Contract with an Energy Service Company

In a guaranteed savings EPC, the **IPK hospital or the Ministry of Public Health (as client) essentially applies for a loan**, finances the project and has the contractual obligation to pay back the loan.

[4] IFC energy service company market analysis

The ESCO has no direct contractual obligation to the lender. The ESCO guarantees the savings performance and the saved energy costs to the IPK hospital or the Ministry of Public Health (as client) which are used for the repayments to the lender.



Concept of the guaranteed saving business model[5]

The ESCO can be an international company or a joint venture between the foreign company and a relevant Cuban State owned company with experience in the energy and cooling sector.

The Cuban Ministry of Public Health and MINSEX will have to decide which kind of business model will be the best for realizing necessary investments for improving the existing air conditioning and hot water production systems in the most important hospitals. Taking into account the large number of hospitals which need such investments the cooperation with a foreign Energy Service Company should be discussed. Nevertheless for each international investor or ESCO it will be important how the energy costs and therefore the cost saving will be defined. In the special case of the solar cooling and hot water production system as an alternative to conventional electric driven chiller cooling systems and hot water production systems both solutions have to be compared to find the economic most feasible and sustainable investment solution.

Based on the technical and financial data of SOLID, a Net Present Value calculation and a comparison of the solar cooling and hot water solution for the IPK hospital with conventional electricity driven chiller for cooling and an oil boiler for hot water production and a comparison of CO_2-reductions have been carried out.

[5] IFC energy service company market analysis

Local benefits

The Solar Cooling and Hot Water Project at the IPK hospital will create following local benefits:

- Sustainable reduction of use of fossil fuel and mainly fossil fuel based electricity
- Sustainable reduction of air pollution at the IPK hospital
- Workers, technicians and researchers gain experience during the installation, test and acceptance measurement phase
- Gain operation and maintenance experience with an innovative renewable energy and energy saving project for the workers and technicians responsible at the IPK hospital
- Research and monitoring of operation performance by technicians and researchers using the monitoring and evaluation possibilities
- New fields of cooperation between Austrian and Cuban companies (cooperation agreement between SOLID and IRC was signed during the project period)
- New fields of cooperation between Austria and Cuba in R&D (contacts with TECNOSIME, Universities and CUBASOLAR have been established during the project period)

Environmental impact: reduction of CO_2-Emission

The electricity used in the IPK hospital is delivered by the national electricity grid and is mainly produced based **on crude oil fired steam power plants**.
The hot water in the IPK hospital is produced by oil boilers **fired with medium quality oil.**

Emission factors

For the estimation of the emissions of the existing electricity and hot water production the following emission data are used:

Electric grid: **817 g CO_2/kWhel**[6]

9.7 g SO_2/kWhel[7] (5% grid losses included by EIW)

Heat production: 0.27 kg CO_2/kWh emission during fuel combustion (medium heavy heating oil)

Estimated 60% boiler efficiency

Emission factor 0.27 kg/kWh/0.6 = 0.54 kg CO_2/kWhth

0.54 kg CO2/kWh x 11 kWh/liter = **5.94 kg CO_2/liter**

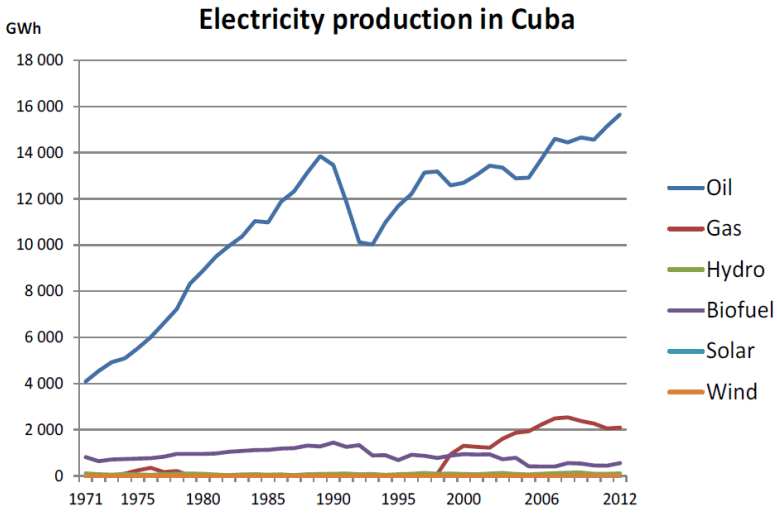
SO2 Emission: **3 g SO2/liter**

Emissions of Nitrogen and dust were not taken into account.

[6] UNEP DTU: Analyses of emission factors for the electricity sector in Caribbean countries. 2015
[7] Berg. Beck: Study on oil fired electricity production in Cuba. 2013
https://www.diva-portal.org/smash/get/diva2:631139/FULLTEXT01.pdf

Reduction of emission by reduced electricity and oil consumption

Implementing the solar cooling and hot water system at the IPK hospital world reduce the consumption of electricity for cooling and heating oil for hot water production.



Source: Mira Käkönen. et al.: ENERGY REVOLUTION IN CUBA: PIONEERING FOR THE FUTURE?[8]

For the Solar Cooling and Hot Water Project at the IPK hospital two scenarios have been carried out:

Scenario 1: cooling load 1,750 kW and 400 RT
4,968 m^2 solar collector
Scenario 2: cooling load 400 kW and 115 RT
2,211 m^2 solar collector

Reduction solar cooling and hot water system Scenario 1

Electricity: Reduction of 1,280.000 kWh electricity from the grid per year
Reduction of 817 kg CO_2/MWhel x 1,200 MWhel/year = 900,000 t CO_2/year or
18 mio t CO_2 reduction in 20 years
Reduction of 9.7 kg SO_2/MWhel x 1 200 MWhel/year = 12.5 t CO_2/year or
250 t SO_2 reduction in 20 years
Oil : Reduction of 75,000 oil per year
Reduction of 75,000 liter x 5.94 kg CO_2/liter = 446 t CO2/year or
820,000 t CO_2 in 20 years

[8] Source: Mira Käkönen. et al.: ENERGY REVOLUTION IN CUBA: PIONEERING FOR THE FUTURE?
https://www.utu.fi/fi/yksikot/ffrc/julkaisut/e-tutu/documents/ebook_4-2014.pdf

Reduction of 3 g SO_2/liter x 75,000 liter = 225 kg SO_2/year or

4,500 kg SO_2 reduction in 20 years

Reduction solar cooling and hot water system Scenario 2

Electricity: Reduction of 54,000 kWh electricity from the grid per year

Reduction of 817 kg CO_2/MWhel x 544 MWhel/year = 445,000 t CO_2/year or

8.9 mio t CO_2 reduction in 20 years

Reduction of 9.7 kg SO_2/MWhel x 544 MWhel/year = 5.3 t CO_2/year or

1,000 kg SO_2 reduction in 20 years

Oil : Reduction of 75 000 oil per year

Reduction of 75,000 liter x 5.94 kg CO_2/liter = 446 t CO_2/year or

820,000 t CO_2 in 20 years

Reduction of 3 g SO_2/liter x 75,000 liter = 225 kg SO_2/year or

4,500 kg SO_2 reduction in 20 years

CDM projects in Cuba

UNFFC focal point: Cuban Ministry of Science. Technology and Environment

Currently for 15 CDM projects with the status PIN/PDD are listed in Cuba.[9] Two projects have been registered. The most of the other projects have the National appropriation for the PIN (project identification note).

With a yearly CO_2 reduction of 445,000 t CO_2 or 900,000 t CO_2 the solar cooling and hot water system would be the largest CO_2-reduction project.

[9] UNEP Riso Center http://cuba.acp-cd4cdm.org/proyectos-mdl-en-cuba/parque-eólico-gibara-2-(pinpdd).aspx