



Possibility study for decentralized renewable energy approaches for Galápagos/Isabela



OCT 2012

summary

Sustainable Energy Competence (M.Sc)

Stuttgart University of applied science

Georg Göhler Matr.Nr.:650955





Currently on the Galápagos (GPS) Islands nearly all energy is generated by fossil fuels. Diesel or gasoline are shipped by a tanker every two weeks from Guayaquil to the islands. Fossil fuels are also a source of small or big spills, which is always a threat to the marine and coastal ecosystems. Examples for these spills are the massive accidents produced by the tankers Jessica and Taurus in 2001 and 2002. As a result of these threats for the environment of GPS, which are caused by the energy system, the Ecuadorian Government has launched the policy “Cero combustibles fósiles en las Islas Galápagos al 2020”, also known as the ERGAL project, in the year 2007. This policy promotes a radical change in the vision regarding the energy production in the Galapagos Islands. Thereby the energy on the Galápagos Islands is supposed to be produced 100% regeneratively. As the realization of the project is more difficult than thought, it is reasonable to search for alternatives. A possibility would be to examine decentralized generation techniques and to realize them single-mindedly.

First of all, to evaluate the theoretical potential on Isabela Island of decentralized renewable energies, it is important to know how high the requirements for several forms of energies are (the following chart shows the demand for energy on Isabela):

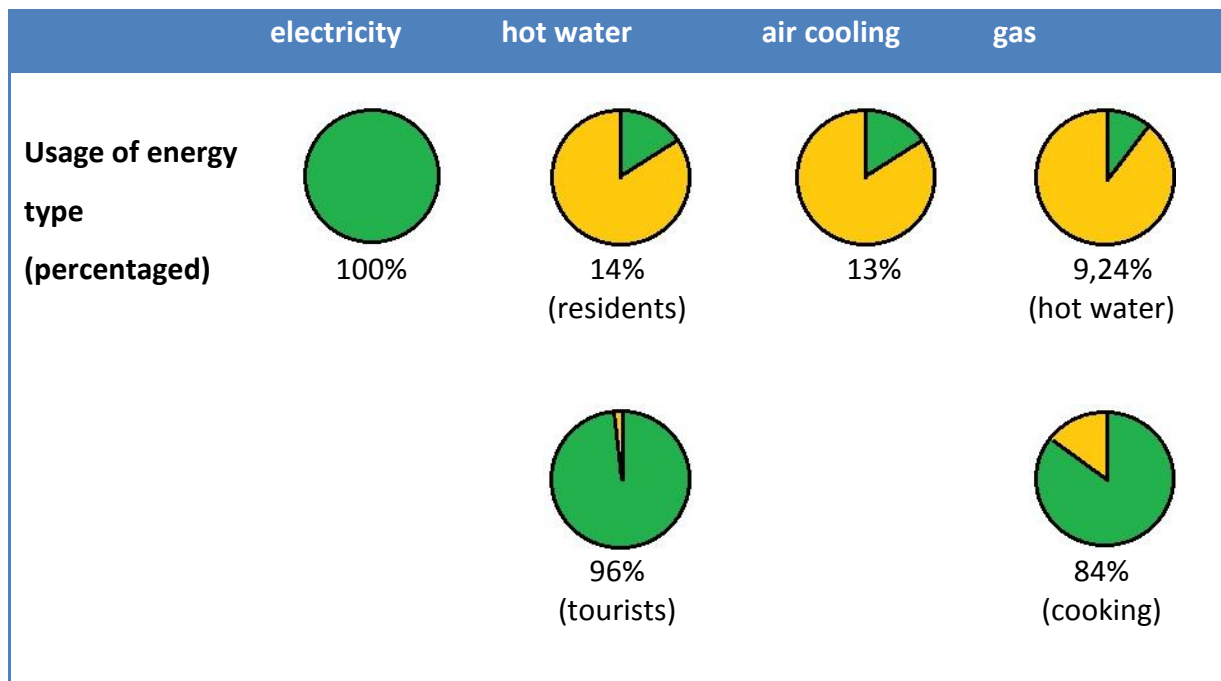


fig. 1: usage of energy (in percent) on Isabela (source: own chart, referred to own questionnaire 2012)



Looking at the table you can see that mainly electricity and the demand for warm water in hotels face high potential for decentralized renewable energies.

If one compares the predominant resources of renewable energies (sun, wind and biomass), which are relevant for decentralized plants, with the demand for energy on Isabela, there is the following result. The **theoretical potential** for decentralized energies on Isabela is 100 %

- the demand for heat could theoretically 100 % be covered by solar thermal energy
- the demand for cooling energy could 100 % be covered by solar cooling
- biogas plants could produce the gas for cooking
- the demand for electricity could be covered by photovoltaic systems and block heat and power plants (operated by biogas, fuel cell, etc.)

But one shouldn't forget that a theoretical potential doesn't take into consideration the technical and economic aspects. Furthermore, the theoretical potential is reduced by locational factors such as load-bearing capacity of roofs, the plan of nature conservation and the missing know-how.

The here calculated **technical potential** of decentralized renewable energies is 768.740 kWh for electricity, 420.112 kWh for heat energy and 500.000 kWh for cooling energy. The electricity demand on Isabela increased to nearly 3.500.000 kWh. This means that ca. 36 percent of the electricity demand could be covered by decentralized renewable energies.

But due to the enormously high subsidies for fossil fuels and thus low energy prices it is almost impossible for renewable energy systems to get economic. Therefore on the GPS there has to be a system of advancement to support decentralized renewable energies, e.g.:

- a. contracting by ELEC subsidized by the Ecuadorian state
- b. compensation for electricity fed into the grid
- c. development funds for certain systems

The following two charts show two proposals for an energy concept for the two populated areas of Isabela, the coastal area and the highland.



4.3.1 Proposal for the coastal area

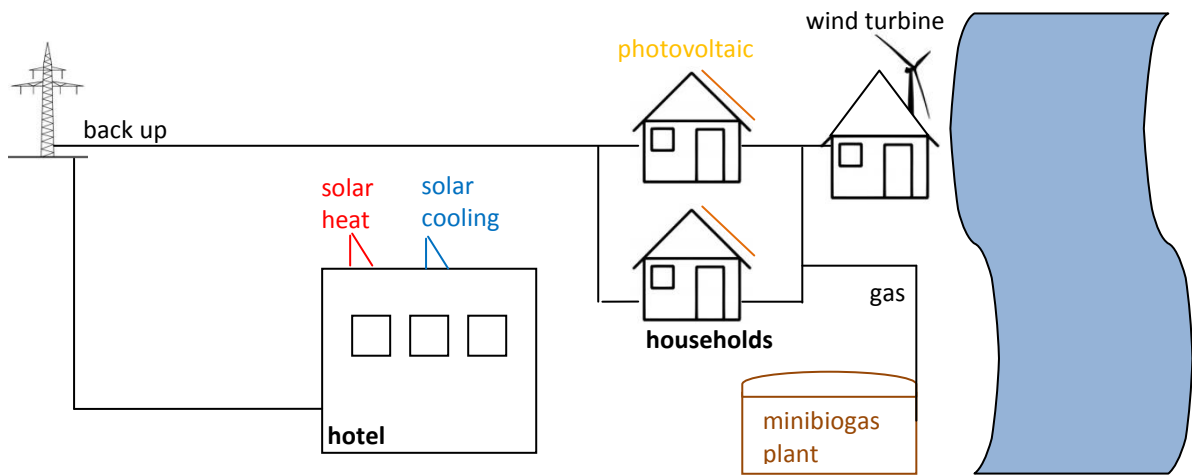


fig. 2: circuit diagram of decentralized energy system for coastal area (source: own chart)

4.3.2 Proposal for the highland

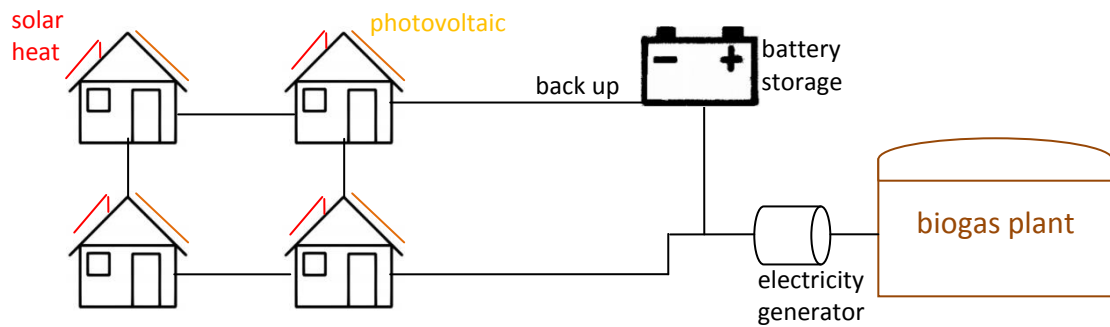


fig. 3: circuit diagram of decentralized energy system for highland (source: own chart)