6 Energy

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6.1 Sources

With the exception of some small photovoltaic installations and domestic use of firewood, energy on the island is sourced from fossil fuels shipped from Chile [1]. The maritime fuel terminal of Vinapu is equipped with a 500 metre-long 8” submarine pipe for fuel load and download and an anchorage for ships up to 110 m in length and 10 m in draft. The storage is comprised of 6 tanks of 800 m^3 capacity each, currently holding jet kerosene to refuel airplanes arriving in Mataveri airport, 93 NOR gasoline for local transportation and diesel B for electricity generation [2]. After the closing of the state-owned distribution company EMAZA in 2013, private companies continue to supply liquid propane gas (LPG) cylinders for domestic consumption. Common cylinder sizes are 11, 15 and 45 kg. LPG is mostly used for cooking and for domestic hot water production.

In 2014, all fuels totalled 164.2 GWh of energy [1], distributed as follows: 32 GWh (19.5%) from LPG, 10 GWh (6.1%) from firewood, 48 GWh (29.3%) from jet-kerosene, 26 GWh (15.9%) from 93 NOR gasoline and 48 GWh (29.3%) from diesel B. Considering 2014 population, annual per capita energy consumption on the island was 26,700 kWh, already slightly higher than in mainland Chile where annual per capita energy consumption was 23,838 kWh in the same year [3].

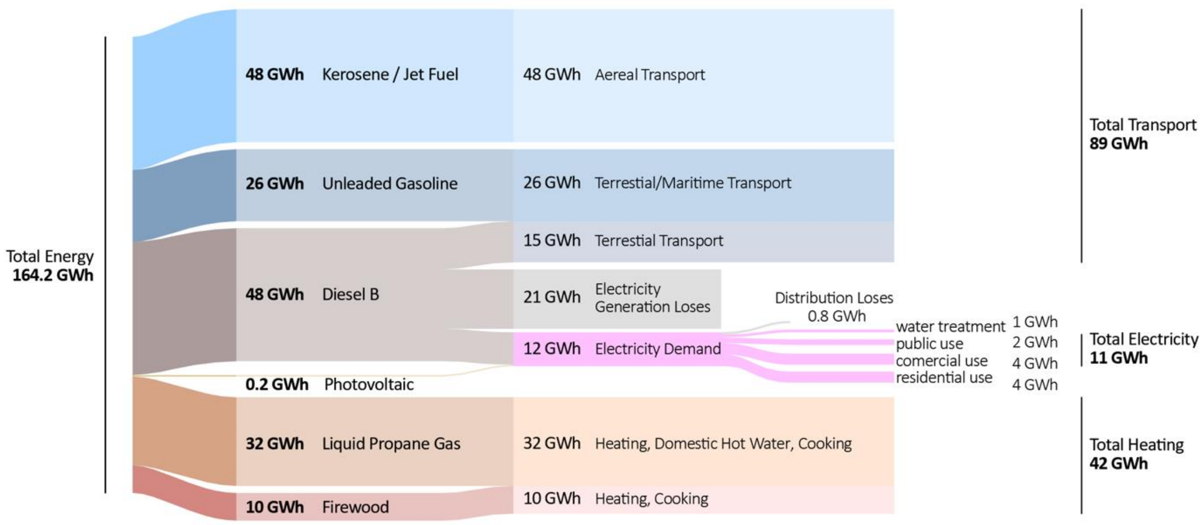

Figure 6.1 Balance of Rapa Nui energy sourcing and consumption (based on FCFM 2015 [1])

6.2 Electricity

Electricity is produced by the state-managed company SASIPA at the Mataveri Central, approximately 2 km west of the Vinapu fuel storage. Installations comprise 6 diesel generators totalling 5,615 kW of power available for continuous operation [4]. In 2014, generation efficiency was around 35% [1]. Data published by the company for the period 2010-2017, shows electricity production has been growing at an approximate annual rate of 5.9%, reaching 13,199 MWh in 2017 [4,5]. Annual consumption in 2017 was 10,038 MWh. The difference between production and consumption is due to internal use for water sanitation (performed by the same company) and to energy losses of 15.8%, which include 8% of technical losses based on the last measurement (performed in 1992).

Consumption increase over time is decoupled from population growth. Per capita electricity consumption has been increasing at an approximate annual rate of 2.3%, reaching 1,470 kWh/year in 2017. This relatively low value compared to per capita consumption in Chile (3,785 kWh/year in 2016 based on sales of 67,785 MWh [6]) implies total electricity consumption can be expected to keep increasing at rates exceeding population growth as individual consumption patterns approach mainland standards. Residential electricity demand on the island increased from 37.6% to 51.1% of total demand in the period 2003 to 2011 [1]. The residential sector thus became the largest electricity consumer, surpassing the commerce sector.

Monophasic electricity tariffs depend on the total monthly consumption of the client [7]. Below 50 kWh/month, the current price of CLP$ 74.6 /kWh (US$ 0.11/kWh) is 30% lower than average price in mainland Chile. Conversely, above 50 kWh/month the current price of CLP$ 165.3/kWh (US$ 0.25/kWh) is 60% higher than average in mainland Chile. The tariffs keep increasing with increasing monthly consumption, making domestic generation an attractive option for larger clients.

Electricity distribution is provided by SASIPA by means of aerial cables supported by wood posts that are shared with private communications providers. The medium voltage electrical network has a total length of around 42 km (Figure 6.2).

Figure 6.2 Medium voltage electricity network coverage (from [8]).

6.3 Renewable Energy

Incident solar radiation is relatively high. At the geographic location of the island, insolation incident on an horizontal surface as measured from space has averaged 5.35 kWh/m^2/day in the last five years [9]. Duration of sunshine averages 7.1 hours/day [10]. At a 15% efficiency, current electricity demand could be supplied with a 6 m^2 per capita photovoltaic installation. Despite this, domestic photovoltaic installations are rare among the general population. Adding to the high initial cost involved, only recently local technical support for deployment and maintenance of photovoltaic installations has become available on the island. Negative outcomes from some iconic projects, such photovoltaic public lightning at Ara Piki soccer field, Hanga Roa Otai playground and Libertad, Riro A Kainga and Toro Tekena squares failing only months after inauguration in 2013, or the dropping of the photovoltaic and solar heating project for the Rapa Nui Hospital in 2010 to cope with unexpected construction costs, have not helped build public trust in alternative energy sources (all this accounted in FCFM 2015 [1]).

Recent initiatives have met higher success. In 2016, an association of 18 local families from the Vai Ki Rea rural area of Rapa Nui was granted subsidy funds by the Ministry of Housing and Urbanism to implement domestic photovoltaic generation. The systems were comprised of 5 roof-mounted photovoltaic panels of 250W each and a multiple battery based storage and control unit (Figure 6.3). The installation was carried out by the local company *Rapa Nui Soluciones Sustentables* (Rapa Nui Sustainable Solutions), at a cost to the Ministry of approximately US$ 10,750 per household [11]. On the other hand, in 2017 SASIPA completed installation of photovoltaic panels totalling 105 kW (1.9% of current capacity) and has communicated intentions to expand solar generation to reach 2.5 MW (44.5% of current capacity) [4].

Figure 6.3 Household photovoltaic installations in Vai Ki Rea (images from Rapa Nui Soluciones Sustentables, @rapanuisolar instagram account)

6.4 Other energy sources

Alternative energy sources have been considered. These include pyro-gasification of municipal wastes, wind power and wave power. Each of these have met specific obstacles and no projects are currently being pursued. A recent study assessing hybrid generation scenarios with a 15 year (2030) horizon showed optimal configurations include a combination of sources, where wind and solar power replace between 46% and 71% of current diesel generation at energy prices below current average [12].

6.5 References

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