

0. INTRODUCTION

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1. STEP 1: PROBLEM IDENTIFICATION & INITIAL DATA COLLECTION

1.1 Case study No 1: Ikaria Island

Regional data

Ikaria Island is located at the North – East of the Aegean Sea (Figure 1.1). It is part of the administrative Region of North Aegean. Geographical and climatic data of the island are presented in Table 1.1



Fig. 1.1. Map of Ikaria island

Table 1.1 Geographical and climatic data of Ikaria¹

Area [km ²]	Coast length [km]	Average wind speed [m/sec]	Precipitation [mm]
255	107	9.31	703.6*

*10 years monthly average (1981-1990)

The permanent population is 4,280 people but in the summer the population rises as high as 30,000 due to tourism. Analytical population and energy data are presented in Tables 1.2 and 1.3.

Table 1.2. Population Data of Ikaria²

Population per Municipality			Total population
Agios Kirikos	Evdilos	Raches	
1,691	1,452	1,137	4,280

Table 1.3. Energy Data of Ikaria*

Diesel installed capacity	RES installed capacity	Max energy production (August)	Min energy production (May)	Annual energy consumption	Anticipated annual increase in consumption
[MW]	[MW]	[MWh]	[MWh]	[MWh]	[%]
6.3 (+3,1 portable unit)	0.985	2,060	1,168	19,650	5

* Local PPC- primary data, 2004

¹ Statistical year book of Greece, 2001

² National statistic accounts, census 2001

Current state

Ikaria, like most islands in the Aegean Sea has an autonomous electricity grid. Due to high load fluctuations, the installed generation engines work with low efficiencies. The result is excessive fuel combustion and due to the relatively high price of oil, a high cost of electricity generation.

The total installed wind capacity in Ikaria is currently 0.985 MW comprising of 2 wind parks (0.6 and 0.385 MW) located 10 Km north-west from the capital town, Ag. Kirikos. Unfortunately, wind energy penetration in autonomous grid system cannot reach a satisfactory level due to:

- technical minimum of conventional units
- stability of the grid
- the stochastic nature of wind

Type of R.E.S: Hybrid (hydro-wind) project

Hybrid power production systems are defined as energy systems that combine different energy sources aiming to increasing the penetration of RES and particularly of wind energy. The finest cooperation of the combined energy sources and the reduction of electricity supply cost per kWh should be pursued, accompanied by improvement of the electrical power quality. Such a system is proposed for the island of Ikaria, as described in the next paragraphs.

In order to cover the excess water demand for irrigation, in 1993 the Ministry of Agriculture has created a dam and an artificial lake with a total capacity 1,000,000 m³. Public Power Corporation (PPC) showed interest for utilizing the overflow amount of water for electricity production. Thus, they proposed a hydro-wind hybrid power generation unit as shown in Figure 1.2. Table 1.4 presents the technical characteristics of the project.

Table 1.4. Technical characteristics of the hybrid (hydro-wind) project in Ikaria

Hybrid hydro-wind project in Ikaria			
Subsystems	New W/Ts	Station A	Station B
Wind Energy	1 st stage: 2.4 MW (4*0.6)		
	2 nd stage: .2.4 MW (4*0.6)		
Hydro energy		Altitude: 555m Volume:80*10 ³ m ³ Turbine: 1.2 MW	Altitude: 65m Volume:80*10 ³ m ³ Turbines:2*1.4MW

Overall the realization of the hybrid power plant is considered by local people and governmental officials as a very attractive project. It is expected that after the construction and operation of the new project the electricity supply cost will decrease from 0.083 Euro/kWh to 0.05 Euro/kWh (Local PPC-primary data, 2004). In addition to its financial benefits, the project is also considered as:

- environmental friendly,
- a means for reducing the dependence on oil imports and
- a touristic attraction pole

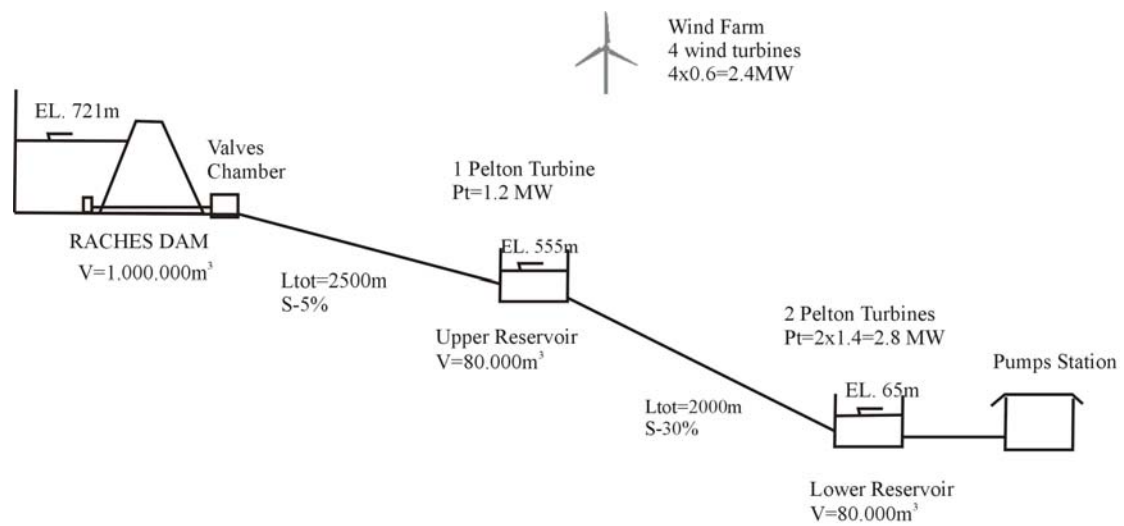


Fig. 1.2. The hybrid (hydro-wind) energy project in Ikaria