

## OVERVIEW OF BULK SOLAR POWER GENERATION IN NORTHERN CYPRUS

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**Abstract-** Energy production, transmission and distribution in north side of the Cyprus Island is under responsibility of TRNC Turkish Electricity Authority (KIB-TEK). Total generation capacity of TRNC (Turkish Republic of Northern Cyprus) with the government and private sector generation is 311.3 MW, and it entirely depended on oil and petroleum products until May 2011. Since then a 1.2 MW Solar generation has been active at Serhatkoy which has been funded by European Union. This is one of the biggest solar generations in the Middle East region. It has been active for two years by now. There have been some problems with the operation but this generation has an importance for the island to gain experience for renewable energy sources as the new legislation about renewable energy in action now.

**Keywords:** Solar Energy, Solar Power Generation.

### I. INTRODUCTION

Solar electricity produced by photovoltaic solar cells is one of the most promising sustainable energy generation for world's future energy requirements. In the past, the technology has been based on the same silicon wafers as used in microelectronics, nowadays a second generation of a potentially much lower-cost thin-film technology is used. Increased demand for manufacturing and improved technology is expected to lower the cell prices over the coming years. The rooftop application of photovoltaics is providing the major application today which causes the market growth. Large centralized solar photovoltaic power stations able to provide low-cost electricity on a large scale would become increasingly attractive approaching 2020 [1].

There is a rising number of renewable energy implementations in various countries of the world. In coming future the growth rates for photovoltaics and solar power generation seems to continue to be high. Researches has shown that photovoltaics will continue to grow at high growth rates in the coming years as shown in the projection in Table 1 [2]. This paper is about the bulk solar electrical power generation in TRNC of station of 1.2 MW that has been operating for the last two years.

Table 1. Evolution of photovoltaics until 2030

Year	Capacity (MWp)		
	2010	2020	2030
Europe	3000	15000	30000
USA	3000	15000	25000
Japan	5000	30000	72000
Worldwide	14000	70000	14000

### II. OVERVIEW OF NORTH CYPRUS POWER SYSTEM

At present, transmission lines in TRNC can be categorized into three voltage level. They are 132 kV and 66 kV. The Distribution System consists of medium voltage lines of 11-22 kV and low voltage lines of 415/240V. At the end of 2008 total length of transmission lines were 554 km. The Total installed capacity started in north of island with 60 MW in March 1995, 120 MW in march 1996 and 327.5 MW in 2008. The power generation of 2008 was 1.22 GWh, at a 15.6% increase of the previous years as shown in Figure 1.

After 2004 construction sector developed much faster. It is estimated that the development of construction sector will keep growing in the next 20 years. By 2020 the total consumption is expected to exceed 1GW [3]. The total electricity generation is given in Table 2. Figure 2 shows the transmission plan of TRNC.

Table 2. The KIB-TEK power per station [3]

Power Stations	Power	Units
Teknecik	2x60 MW Steam Turbine	120 MW
Teknecik	1x20 MW Gas Turbine	20 MW
Teknecik	1x10 MW Gas Turbine	10 MW
Dikmen	1x20 MW Gas Turbine	20 MW
Kalecik	4x17.5 MW Diesel Generator	70 MW
Teknecik	6x17.5 MW Diesel Generator	105 MW
Total Installed Capacity		345 MW
Under Construction		
Serhatkoy	1.2 MWp Photovoltaic Plant	1.3 MW

### III. SOLAR POTENTIAL

Northern Cyprus lies in a sunny area with an average yearly solar intensity estimated to be around 1690 kWh/m<sup>2</sup>. The monthly solar intensity is presented in Figure 3. The flat bed solar collectors are widely used in

the country for the hot water and this helps a lot for the use of energy efficiently and decreases the electrical energy consumption commercially around 5%. The new legislation is put forward by the government to increase the installation of rooftop photovoltaics. Rooftop photovoltaics have been used to some extent up to recent years but due to the lack of legislation the usage was off-grid and this is increasing the initial cost. The new legislation is enabling the on-grid installation without the storage and providing the opportunity to commercially supply energy to the grid when excess energy is generated.

To enable this application electronic meters is necessary and the Electricity Authority is trying to supply these meters to customers. By the end of year 2014 they are planning to replace all analog counters with the electronic counters. This will also enable the authority to collect the data for the system such as the reactive energy and other power quality measures that will enable some statistical analysis to improve the power system quality.

In a typical power system, network losses account for 5 to 10% of the total generation but in the TRNC power system electricity losses are around 20%.

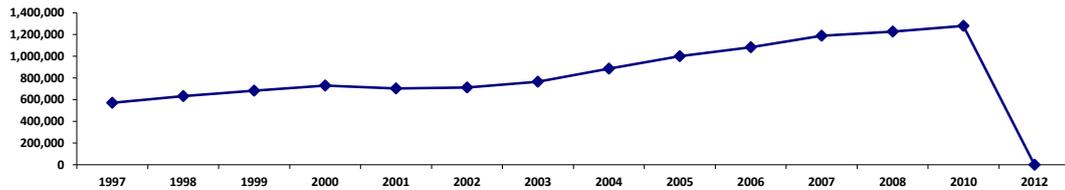


Figure 1. Electricity generation

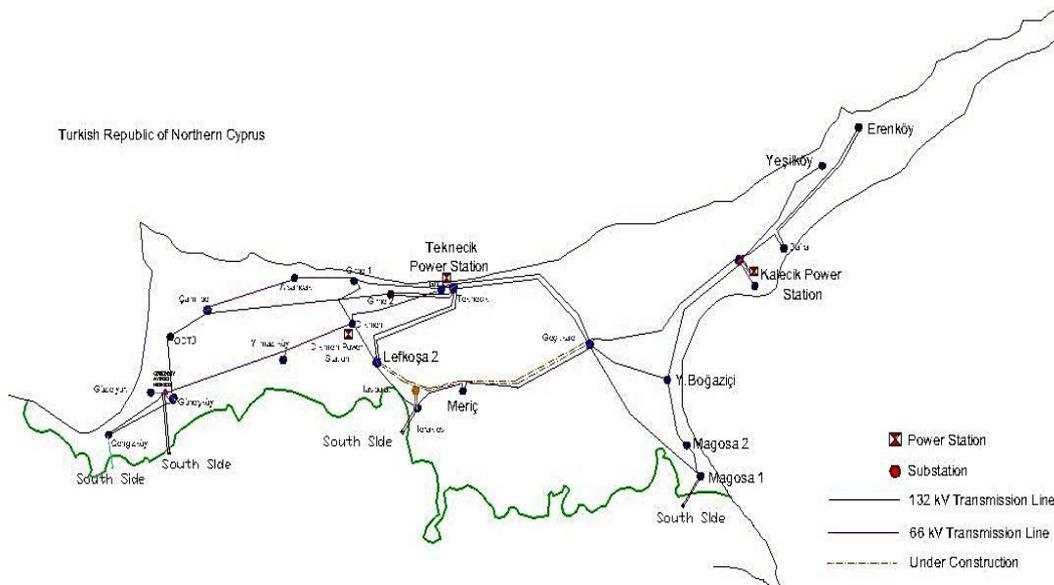


Figure 2. North Cyprus electric network structure with high voltage transmission lines

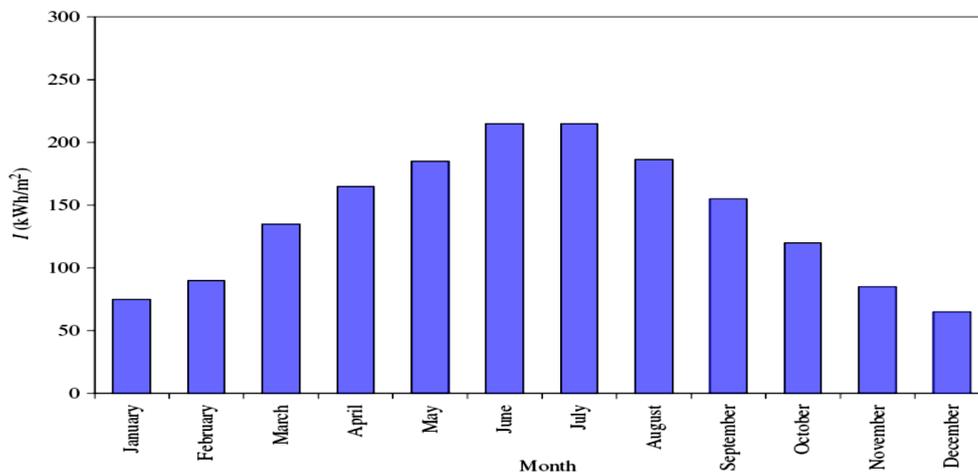


Figure 3. Monthly solar intensity for the Island of Cyprus [4]

**IV. SERHATKOY SOLAR GENERATION PLANT**

Serhatkoy Solar Electrical Energy generation plant has been active for two years. It has been established by EU funds. The technical specifications are given in Table 3. The Plant is shown in Figure 4. The electrical energy generation of the solar plant for 2011 and 2012 are given in Figures 5 and 6, respectively. The total electrical energy generated in 2012 is 2115226,47 kWh.

Table 3. Technical details of solar power station

Total Power	1275.55 kWp
Inverter	86 Group
Group	72 X 206Wp (4 Strings)
String	18 Panels
Group Inverter Power	14.83 kWp
Inverter Type	Power-One PVI-12.5-OUTD/-S



Figure 4. Serhatkoy Solar Power Plant Station

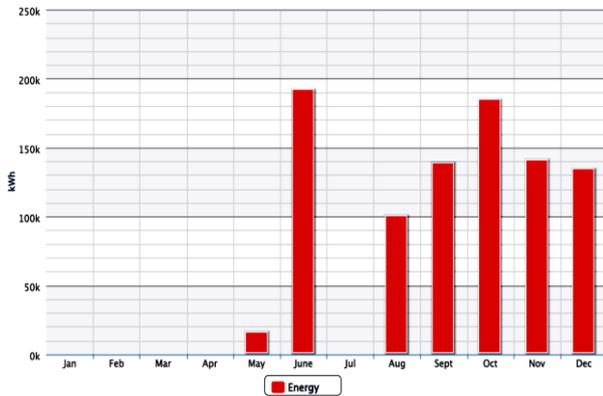


Figure 5. The electrical energy generation of the solar plant for 2011

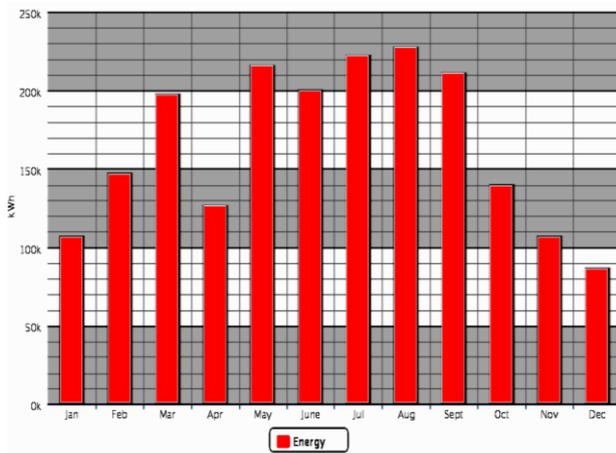


Figure 6. The electrical energy generation of the solar plant for 2012

**V. CONCLUSIONS**

The solar power plant at TRNC which having the capacity of 1.2 MW is the largest in the middle east region has been operating successfully for two years generating a considerable amount of energy and supplying to the grid. The plant has some problems in the summer months facing efficiency problems due to very hot weather.

**ACKNOWLEDGMENT**

The authors gratefully acknowledge to KIB-TEK for providing statistical data.

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**BIOGRAPHIES**



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