

Analytical Model of Kuwait Power Consumption

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Abstract—In this paper, assessing an analytical model of Kuwait city power consumption is focused. This includes data per person of energy demand, increasing trends over the years to investigate the rapidly increasing power demand due to the growing number of the population in Kuwait and due to modernization of lifestyle. Therefore, this paper focuses on the analytical model for Kuwait city power consumption showing how the peak-hours demand can be complemented by the solar potential from rooftop solar panels. If the solar energy is associated with the highly potential wind power contribution in DG (distributed generation) form, this will help in the existing capacity deficiency at the national grid level be met by an alternative source of energy. The results of this work will help considerably in reducing the investments in the ongoing practice of building new power plants. The renewable energy sources in the form of DG, both renewable and non-renewable, have become an attractive solution for meeting the energy demand in areas having no access to electricity supply from the utility grid.

Keywords—power consumption; renewable energy; non-renewable energy; solar panels

I. INTRODUCTION

Power demand is on the rise due to not only the growing number of the population in Kuwait as well as their lifestyle modernization as well. The electricity demand during peak hours is experiencing heavy surges in power consumption, causing many challenges to utility supply grid. The ministry of electricity and water (MEW) has to meet the growing demand for electricity by constructing new power generating plants at very high investment costs. MEW is vertically integrated and has seven power plants using heavy oil and natural gas. The power sector has been able to suit the highly increased growth in electricity utilization, easily by adding new generation capacity of conventional style. However, there are increased concerns about climate change and energy sustainability, which have been stimulating the demand for alternative energy sources in recent years [1-2]. Alternative energy sources demand increasing research interests because of their various technical, economical and environmental advantages [3-5].

Kuwait has a hot and long summer period of seven months, extending from April to October every year with temperatures soaring some off days as high as over 50°C. Cooling for all type of buildings is, therefore, essential, and as a result, the cooling system of buildings is taking the largest consumption of electricity, accounting for nearly 70% of nation's peak

demand and over 50% of annual energy consumption. Residential buildings make up the major part of utility consumers accounting for 42.3% of total electrical energy consumption as shown in Fig. 1.

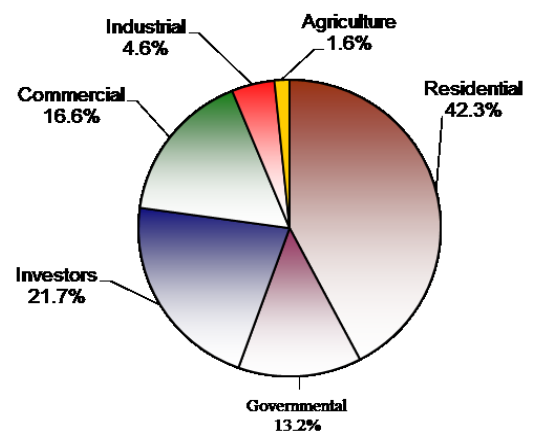


Fig. 1. Distribution of electrical energy consumption by end-use sectors [1].

The shooting-up of peak consumption in residential premises demands for this sector to be supplied for from alternative means pollution-free energy sources proportionately [2], such sources could be oceanic tides, geothermal and solar systems. Further, the research works across the globe are focusing on making these means available with the highest efficient means of conversion ever possible. Kuwait is depending mainly on oil for generating electricity. The need for domestic power demand is growing at the rate of 6% per year, motivating thus genuinely the use of alternative energy sources. Taking into account the environmental impact alongside the high cost of electricity generation, transmission and distribution systems, solar coupled with the wind with improving power quality make the best option [6-7].

Kuwait is known for experiencing very sunny days between June and September every year [8]. Also, Kuwait's wind speed has been noticed to be increasing in recent years showing it to be an equally alternative source of energy. Proper planning and identification of sites for installations of such sources will have a great impact on the overall investment. Therefore, there is a