EXERCISES

1. In the lectures, the 2001 data from International Energy Agency was used to quote the world per capita energy usage as 2.2 kW/person. Fay and Golomb\(^1\) quote the worldwide energy consumption in 1997 as 380 Quads and the world population in that year was 5724 million (Energy & Environment, Section 2.2). Convert the Fay & Golomb reference to units of kW/person. \((2.23 \text{ kW})\)

2. In the lecture notes, we arrived at a number of 240 W as the average world electricity consumption per person in 1997. The world per capita energy usage in the same year is estimated in Exercise 1. What is the percentage of the total world energy consumption that is used in electrical power generation in 1997? \((10.7\%)\)

3. Using the electricity cost equation developed in Lecture 1, estimate what the cost of electricity for industrial usage in Turkey would be if nuclear plants were providing all the electricity currently generated by natural gas plants. \((7 \text{ ¢/kWh})\)

4. The 1996 prediction given to the IEA by the Turkish government for the 2005 electricity consumption was 13.71 Mtoe. More recent figures from TEIAS were also presented in Lecture 1, including the actual electricity consumption up to 2005. Was the 1996 prediction correct? If not, what was the percentage error? \((+20\%, \text{ overestimate})\)

5. Using the charts provided in Lecture 1, estimate the ratio of the electricity used by the Turkish electricity consumer to the total installed electrical power generation capacity in Turkey. Discuss the reasons why this number is less than one \((41\%)\).

6. Fit an exponential curve to the annual net electricity consumption chart provided in the lecture notes \((W=Wo e^{kt})\). Using this curve, make a prediction for the national electricity consumption that would need to be satisfied in the year 2016

7. The total installed capacity in the three units of Afsin-Elbistan thermal power plant is 1355MWe. Based on the answers to Exercises 4 and 5, estimate the number of “Afsin-Elbistan equivalents” that will have to be put into operation by 2016.

8. Find the growth of of Turkish net electrical consumption per unit Gross Domestic Product (GDP) over the years 1974 to 2004. Compare this with the USA numbers given by Fay and Golomb on p.19 of Energy and Environment. Can you make any conclusions about the dynamics of Turkish economy by examining your kWh$/\text{GDP}$ curve. \((\text{Note: To do this exercise, you will have to find data on the Turkish GDP growth from 1974 and 2004. The Turkiye Cumhuriyet Merkez Bankasi web site might have this information).}\)

9. Interpolate between 1973 and 2005 to estimate the total usage of coal in Turkey in the year 1995. Compare this against the world total usage of coal in 1995. What percentage of the world coal usage in 1995 was consumed in Turkey? \((0.89\%)\)

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