Unit 12 - Week 10 - Primary Energy Analysis, Net Energy Analysis

Course outline

How does an MFTPL online course work?

Assignment 10

Due on 2020-04-08, 20:59 IST.

1. Life cycle costs can be used to evaluate
   a) Environmental externalities
   b) Socio-economic potential
   c) Acceptability of the above
   d) None, the answer is: none
   e) Answered: none

2. Which of the following statements is/are true?
   a) $E_{\text{Prof}}$ of electricity generated from sources other than $E_{\text{Coal}}$ is less than $E_{\text{Coal}}$
   b) $E_{\text{Prof}}$ of diesel, $E_{\text{Prof}}$ of electricity generated from nuclear, and $E_{\text{Prof}}$ of electricity generated from coal are equal.
   c) $E_{\text{Prof}}$ of electricity generated from nuclear is less than $E_{\text{Coal}}$
   d) $E_{\text{Total}}$ of diesel and $E_{\text{Total}}$ of electricity generated from coal is less than $E_{\text{Coal}}$
   e) Answered: a, c

3. A 400 km road with fuel consumption of 2,000 l/yr has an annual average capacity factor of 90%. The road maintenance and transport cost is $5,000 and it is efficient at 80%. The total efficiency of the road is 90%. The generation efficiency is 1%. How much is the primary energy required (in terms of l/yr) to operate the power plant.
   a) 1724 l/yr
   b) 1274 l/yr
   c) 685 l/yr
   d) 1895 l/yr
   e) None, the answer is: 685 l/yr
   f) Answered: c

4. For a DLS, calculate the amount of CO2 emissions generated in million tonnes (MT) per year, if it operates using an indoor coal (industrially available) coal having a calorific value of 28 MJ/kg, which has a carbon content of 60%. (1 tonne = 1000 kg, 1 million = 10^6)
   a) 1.26 MT CO2/year
   b) 5.34 MT CO2/year
   c) 8.01 MT CO2/year
   d) None, the answer is: 5.34 MT CO2/year
   e) Answered: b

5. A gas-based power plant, which uses imported coal gas as the fuel, also has a total nominal power output of 100 MW and an average annual capacity factor of 50%. The efficiency factor of its thermal energy is 80%. From a primary energy point of view, what is the coal-based plant and gas-based plant, which is more favorable?
   a) A coal-based plant and gas-based plant, respectively
   b) A gas-based plant and coal-based plant, respectively
   c) A gas-based plant and coal-based plant, respectively
   d) A coal-based plant and gas-based plant, respectively
   e) None, the answer is: b
   f) Answered: b

6. Which of the following is true?
   a) None of the above
   b) Life cycle analysis can be performed using
   c) Life cycle analysis cannot be performed using
   d) Life cycle analysis may be performed using
   e) Life cycle analysis should be performed using
   f) Answered: d

7. There are two different primary energy source (fuel options), X and Y, for generating electricity, which are to be compared using net energy analysis. The total output energy of fuel option X and Y are 1000 GJ and 900 GJ respectively, whereas the input energy for both the options are 300 GJ. Calculate the net energy yield (%) for both the options. Which option is better for net energy yield (%) for generating electricity in a new large-scale industrial process or a new energy point of view?
   a) 50%, 66.67%
   b) 33.33%, 50%
   c) 33.33%, 66.67%
   d) 66.67%, 50%
   e) Answered: a

8. A coal-based power plant has a life of 50 years. It generates around 4500 MW, of which 35% is fuel cost, and 65% is overall capital and operating cost. The efficiency of the electricity generated from the plant is 30%. How much total input energy does the power plant consume over its life time?
   a) 103630 GJ
   b) 119030 GJ
   c) 121330 GJ
   d) 113730 GJ
   e) Answered: a

9. The total primary energy required for operating a 25 kW wind-turbine PV plant, having a lifetime of 25 years is 20 GJ. If the solar PV plant operates at an average capacity factor of 50% over the 25 years, calculate the net energy yield (%) input energy for the PV system?
   a) 13.11
   b) 14.11
   c) 15.11
   d) 16.11
   e) Answered: a