**Sun properties:**

Table 1: Sun properties

|  |  |  |
| --- | --- | --- |
| Solar irradiance | Power | W/m2 |
| Solar constant at A.M = 0 | Power | 1370 W/m2 |
| Solar irradiance at A.M = 1 | Power | 1000 W/m2 |
| Solar irradiation | Energy | Wh/m2 |
| Extraterrestrial solar radiation |  |  |
| Global Radiation | Direct-beamDiffuse (clouds)Albedo (Ground) |  |
| Air mass (A.M) | 1/cos(ΘZ) |  |
| Zenith angle | ΘZ |  |

**Example 1 (CO2 Emissions):**

How much CO2 is released by burning a kg of Methane (CH4)?

Answer:

Methane is decomposed from 4 Hydrogen atoms and 1 carbon atom. Each Hydrogen atom is 1 atomic weight while each carbon atom weights 12 atomic weight.

$$H\_{1}\rightarrow 1 atomic weight$$

$$C\_{12}\rightarrow 12 atomic weight$$

The total weight per methane molecule is:

$$Total Weight=(12×1)+(1×4)=16$$

The carbon percent weight of the total methane weight is:

$$C\%=\frac{12}{16}=0.75$$

In other words, a kg of methane contains 0.75 kg of carbon.

Applying the combustion reaction for methane gives:

$$CH\_{4}+2O\_{2}\rightarrow CO\_{2}+2H\_{2}O$$

As it shown from the equation the combusted carbon is formed only in the CO2. This means all the carbon weight is forming the CO2. Recall the atomic weight of oxygen is 16.

$$O\_{16}\rightarrow 16 atomic weight$$

Therefore, the carbon in CO2 makes up 27% of its weight by the following calculation:

$$CO\_{2} Total weight=\left(12×1\right)+\left(16×2\right)=44$$

$$C\%=\frac{12}{44}=0.27$$

To put it in another way, for every 1 kg of combusted carbon 3.67 kg of CO2 is released.

Finally, to know how much CO2 is released by burning a kg of Methane; 1 kg of methane contains 0.75 kg of carbon. Multiply this value by the CO2 released from 1 kg gives:

$$0.75×3.67=2.7 kg of CO\_{2}$$