**Solar resources:**

Table 1: Solar resources

|  |  |  |
| --- | --- | --- |
| Solar intensity | Insolation |  |
| Solar spectrum | 0.38um-0.78um |  |
| Zenith angle | $$θ\_{z}$$ |  |
| Air mass (A.M) | 1. at atmosphere

1 perpendicular at the earth>1 the path is not perpendicular | $$A.M=\frac{h\_{2}}{h\_{1}}=\frac{1}{\sin(\left(β\right))}$$$$A.M=\frac{h\_{2}}{h\_{1}}=\frac{1}{\cos(\left(θ\_{Z}\right))}$$ |
| Latitude of the site in degrees | L |  |
| Altitude angle ($β\_{N}$) | $β\_{N}$ + θZ = 90°$$β\_{N}=90-L+δ$$ |  |
| Solar Declination angle | δ (± 23.45)March 21st (δ = 0)June 21st (δ = 23.4)September 21st (δ = 0)December 21st (δ = -23.4) | $$δ=23.45sin⁡(\frac{360}{365}(n-81))$$ |
| Tilt angle (zenith angle ($θ\_{z}$)) | $θ\_{z}$ = 90 - $β\_{N}$  | Maximum annual average to be close to the latitude angle.Maximum summer average to be less than the latitude angle.Maximum winter average to be larger than the latitude angle. |
| Azimuth angle of the sun | $$φ\_{S}$$ |  |
| Azimuth angle of the collector | $$φ\_{C}$$ |  |
| Hour Angle (H) | $$H=\left(15°\right)×Hours before solar noon$$ | The angle that the sun make when moving from one meridian to another |
|  |  |  |