**INTELLIGENT POWER SOURCE SELECTOR**

1. **Cost of Wind Power Generation**
   1. Cost of wind turbine
   2. Installation costs: Includes labour, transportation, and setup required for the wind turbine installation.
   3. Maintenance costs: This accounts for the regular upkeep of the wind turbine, which can include repairs, inspections and system upgrades.
   4. Price of wind vane: The cost of the wind vane, which helps measure the wind direction, contributing to turbine performance optimization.

Formula:

Total Cost of wind power = (Price of Wind turbine + Installation Costs + Price of wind vane) + (Maintenance costs x Lifetime of turbine)

Example:

* Price of wind turbine: 500,000
* Installation costs: 50,000
* Price of wind vane: 2000
* Maintenance cost: 10,000/year
* Lifetime of turbine: 20 years

Total Cost of Wind Power = (500,000 + 50,000 + 2000) + (10,000 x 20) = 762,000

**Levelized Cost of Energy (LCOE)**

The LCOE is a measure of the average cost of generating energy over the lifetime of the power plant, taking into account the initial capital, maintenance, and operation costs. This allows comparison between different sources by normalizing costs per unit of energy (per kwh).

LCOE = Total Lifetime Costs / Total Lifetime Energy production

Where:

* Total Lifetime Costs include capital, installation, operation, and maintenance costs.
* Total Lifetime Energy Production is the expected energy generated over the plant’s lifetime.

LCOEwind = 762000 / Lifetime Energy Production (kWh)

Lifetime energy produced = Power rating x capacity x Operational hours per year x Lifetime

1. Cost of Solar Power Generation
   1. Cost of solar panels
   2. Installation costs
   3. Maintenance costs

Formula:

Total cost of solar power = (Price of solar panels + Installation costs) + (Maintenance costs x Lifetime of panels)

Example:

* Price of solar panels: 200,000
* Installation costs: 30,000
* Maintenance costs: 1000/year
* Lifetime of panels: 20 years

Total cost of Solar Power = (200,000 + 30,000) + (1000 x 20) = 250,000

LCOEsolar = 250,000 / Lifetime Energy production(kWh)

Lifetime Energy production = Power Rating x Solar Panel Efficiency x Avg. Sunlight hours per day x Days per year x Lifetime

**Proposed Load Profile Sizing**

I’m proposing using the department building as a case study. The load in the department includes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Load** | **Rating(W)** | **Number** | **Total** |
| Light bulbs | 50 | 20 | 1000 |
| Fans | 60 | 10 | 600 |
| Sockets | 200 | 5 | 1000 |
|  |  |  |  |
|  |  | **Total** | ~3000W |

Equipments needed:

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Rating(W)** | **Number** |
| Solar panels | 300 | 10 |
| Wind turbine | 1000 | 3 |
|  |  |  |

**LCOE of some sources**

1. Geothermal - $39.61
2. Wind onshore - $37.80
3. Solar, standalone - $36.09
4. Solar, hybrid - $58.62
5. Combined cycle - $37.85

**COE in some countires**

1. France - $0.288/KWh
2. Netherlands - $0.322/KWh
3. Germany - $0.409/KWh
4. UK - $0.417/KWh
5. US - $0.184/KWh

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