How to correctly assess the value of energy converted from solar and other renewable sources

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QUESTIONS

How can be correctly assesed the future prices of energy generated from renewable sources? and, how to estimate its net present value to allow unbiased comparison with energy generated with other technologies?

THE MODEL

1) According to Wright's law: $P(C) = P_o \left(\frac{C}{C_o}\right)^m$,

where P is the unitary price, C is the accumulated production, m is the slope of the "experience curve", and $P_o = P(C_o)$

2) In an early stage of tech development: $C(t) = C_o (1 + cagr)^{(t-t_o)}$

where $cagr$ is the compound annual growth rate, and $C_o = C(t_o)$

3) Combining these equations:

$$P(t) = P_o (1 + cagr)^{m(t-t_o)}$$

RESULTS

As an example, for the onshore wind technology, from historical data it can be extrapolated for the period 2020-2025:

$cagr = 10.2966\%$ [1]

Learning rate = 32% => $m = \frac{\log(1-0.32)}{\log(2)} \approx -0.556393348524386$ [2]

$P(2020) = 0.039 \left(\frac{2020\ USD}{kWh}\right)$ [2]

So, the forecasted price for the year 2025 would be approximately:

$$P(2025) = 0.039\ (1.102966)^{-0.556393348524386}\ (5)$$
$$= 0.02969 \left(\frac{2020\ USD}{kWh}\right)$$

A price reduction of around 24% in the period 2020 to 2025

REFERENCES

[1] GWEC, (2021). Global Wind Energy Report 2021. March 2021.
[2] IRENA, (2021). Renewable Power Generation Costs in 2020. June 2021.