

SUNMINE LCOE

The Levelized Cost Of Energy (LCOE) is a standard methodology used by utilities, policy-maker, and industry to calculate the cost of electricity produced by a generator over its lifetime. It is the ratio of the initial capital cost plus the present value of all future operational costs (administration, maintenance and fuel) to the present value of all the energy produced during the anticipated lifetime of the project.

In the case of SunMine, the fuel is free (the sun) and costs of the administration provided by Teck and Kimberley are not taken into account.

The LCOE formula is therefore:

$$LCOE = \frac{\text{CapInit} + \sum_1^{lt} PV(Mi)}{\sum_1^{lt} PV(Ei)}$$

where

LCOE is in \$/MWh

*CapInit = Initial Capital Cost = cost per watt * 10⁶*

*Mi = Maintenance cost at year i taking into account inflation (cpi) and calculated at mid-year. $Mi = mY1 * (1+cpi)^{(i-0.5)}$*

mY1= Maintenance costs \$/MW in the first year

cpi = Consumer Price Index

*Ei = Energy produced at year i taking into account annual PV modules derating = $enY1 * (1 - (lid + (dr25 - lid)/lt*(i - 1)))$*

cpw = Cost per Watt

enY1 = Energy produced the first year

lid = PV First Light Induced degradation

dr25= PV total derating after 25 years

lt = project lifetime

*PV = present value : $PV(x) = x * (1+bnkr)^{-(i-0.5)}$ calculated at mid-year*

bnkr = Discount (or sometimes called bank) rate

The LCOE for SunMine is calculated with the parameters in Table 1:

Table 1 : SunMine LCOE Calculation Parameters

Variable	Meaning	Value	Unit	Notes
enY1	Energy produced 1 st year by 1 MWp	1,998	MWh/a	According to DNV study
cpw	Cost per Watt Installed	2	\$/MWp	SunMine Target
mY1	Maintenance costs \$/MW in the first year	20,000	\$/MWp	Typical average costs
cpi	Consumer Price Index	2	%	In BC, average from Stats canada
lid	PV First Light Induced degradation	3	%	Typical for most modules
dr25	PV total derating after 25 years	20	%	Including lid
bnkr	Discount rate	5.5 - 6	%	Rate used by BC Hydro in their own projects
lt	Project lifetime	25	year	PV modules expected lifetime. Infrastructure and BOS may actually last longer

The LCOE formula with the parameters of Table 1 gives

LCOE= 93.30 (\$/MWh) with discount rate = 5.5%

or

LCOE= 96.85 (\$/MWh) with discount rate = 6%

In conclusion, with the solar resource in Kimberley and the above parameters the LCOE of SunMine will be inferior to \$100/MWh

The LCOE will vary linearly with the initial capital cost if the other parameters remain constant. Figure 1 show the relation between LCOE and capital costs. The red dotted line is the LCOE of BC Hydro tariff over the project lifetime.

Figure 1 : LCOE vs Cost/MW

