Assessment of Solar Energy Investment

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The business case for the **Solar Energy Investment** is that the initial outlay for system costs will be offset by savings of the cost avoidance of paying utility companies at the expected utility rate for Your Consumption.

Net Present Value, or **NPV**, is an estimate of the value of something to me today.

Is it costing me something? Is it making me something?

So, if I invest in Solar Energy, is it costing me something, or making me something?

Before you can answer that question, you need to collect your data.

Significant factors that determine the NPV for Solar Energy.

- Your Consumption in kW hr.
- Your Utility Rate per kW
- System Cost
- Loan Interest Rate
- System Lifespan
- Annual degradation

I found that when considering Solar Energy as an investment, the **Loan Interest rate** was a very significant factor. Possibly the most significant factor. This investment can easily have a positive NPV when the Loan Interest Rate is not a factor.

Attempt to minimize the **System Cost** by installing **Production Capacity** that at least meets the **average monthly Consumption** in kW hr., and then attempt to extend the **Life span** of the service provided by considering installation options. With today's technology the NPV can always be positive. Better engineering today at better costs continues to show improvements in the output and the expected life span of the service.

These offsets are recorded as savings, and this period of the time that it requires the savings to overcome the system cost is the **Payback period**. The event recorded when savings exceeded the system cost is the **Payoff** event.

When the **Payoff** is reached, you have more than if you had not done anything, and you will continue to save more than if you had not done anything.

Your desire for a **Payoff** to occur sooner than later is part of the NPV computation.

For example, some projects will not be funded if they do not have an expected positive Payoff within 2 years.

Most building projects fall in a 10-to-15-year range for expected return.

The solar energy projects appear to fall into a 9-year payoff if you can manage to reduce the dependency on Loan interest.

There can also be other tax incentives which when added to the cost avoidance savings can reduce the time to the Payoff event and further improve the NPV.

This Python script provided an analysis of these variables and produce determination of whether the NPV is positive.

KHM Assessment of Solar Energy Investments

I've created a Python script that calculates the NPV and payback period for a solar energy investment based on your inputs. More complex model can add more features like tax incentives or utility rate escalation.

Calculate the Net Present Value (NPV) of a solar energy investment.

Parameters:

- consumption_kwh_per_year: Annual electricity consumption (kWh).
- utility_rate_per_kwh: Current utility rate ($/kWh).
- system_cost: Total upfront cost of the solar system ($).
- interest_rate: Annual loan interest rate (as a decimal).
- system_lifespan: Expected lifespan of the system (years).
- annual_degradation: Annual efficiency loss of the solar system (as a decimal).

Returns:

- NPV of the solar investment.
- Payback period in years.

In this example case:

1. NPV of Solar Investment: $-75,798.90
2. The investment does not break even within the system's lifespan.

Python Solar NPV Calculator Model function

Example inputs

```
consumption = 12000  # kWh per year
utility_rate = 0.15  # $/kWh
system_cost = 100000  # $100k system cost
interest_rate = 0.05  # 5% interest

npv, payback = calculate_npv(consumption, utility_rate, system_cost, interest_rate)
print(f"NPV of Solar Investment: ${npv:,.2f}")

if payback:
   print(f"Estimated Payback Period: {payback} years")
else:
   print("The investment does not break even within the system's lifespan.")
```

```
def calculate_npv(consumption_kwh_per_year, utility_rate_per_kwh, system_cost,
              interest_rate, system_lifespan=25, annual_degradation=0.005):
```

Model Enhancements:

Incorporating an **expected utility rate increase** will increase the NPV of the investment.

- It is this increase that makes the loan interest rate become less of a factor.

Incorporating **tax incentives** will increase the NPV of the investment.

- These incentives are added to savings stream and also makes the loan interest rate become less of a factor.

Please contact info@khm-llc.com for more information about this model.

Assessment

To be clear, solar energy becomes a particularly good investment when utility rate increases are expected to continue to grow, and you have the capital to invest without incurring loan interest.

If I was in a position to do so, I would consider withdrawing capital to invest in my own solar energy solution to start saving money on my utilities today.

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