

KKE/ESV – Solar and wind energy

Individual work – modeling solar and wind systems

Software used: System Advisor Model (SAM)

Use the screenshot to provide the information you enter when designing the system. The format is specified by the template (Solar Water Heating).

PV Watts (No Financial Model)

Introduction

- Describe the technology. Provide a system diagram. State the theoretical assumptions.

Location and Resource

- Download and use the weather file from the area where you come from. Provide the weather file you are using.
- Provide a graph of total irradiance during the year. What is the value of the average annual total solar irradiation?

System Design

- Choose the power output of the rooftop photovoltaic power plant. How large area is needed?
- Choose a solar module based on a real device. Indicate its effectiveness and provide a link/datasheet.
- Determine the efficiency of the inverter based on the real equipment. Provide a link/datasheet.
- Determine the optimal tilt and orientation (azimuth) with respect to the geographical location of the site (repeated simulation and comparison of results may help).
- Check that the system losses respect the site conditions (dust, snow, etc.). Discuss any changes.

Simulation

- How much electricity does the system produce per year?
- Provide a graph for monthly energy production.
- Provide a graph for power generated throughout the year.
- Discuss options that could mean more energy produced.

Wind (No Financial Model)

Introduction

Describe the technology. Provide a system diagram. State the theoretical assumptions.

Location and Resource

- Determine the wind source information using the Weibull distribution (only one turbine will be used).
- From the previous study (PV Watts) and from the weather file, find out what the average wind speed is. Assume that this value is measured at a height of 2 m above the ground. Recalculate this value to the height at which the turbine rotor (hub) you select will be located.

Wind Turbine

- Choose a turbine with a pitch control system and determine the optimal hub height based on the information from the manufacturer. What is the value of the performance coefficient of the selected turbine? Provide a link/datasheet.

Simulation

- How much electricity does the system produce per year?
- Provide a graph for monthly energy production.
- Discuss options that could mean more energy produced.