

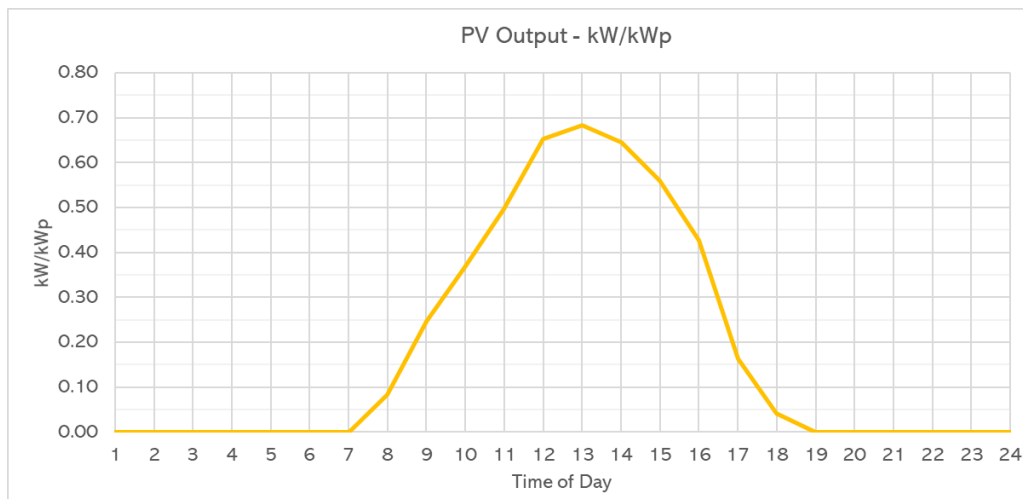
Your Name _____

The Big Quiz

This quiz is split into sections to test your understanding of the various components of the microgrid built at “The Big Thing” as well as basic calculations and system sizing principles with electrolysers and hydrogen.

PV + PV inverter

- 1) We have installed 20 panels with a nominal power of 320 W each. What is the installed peak capacity (in kWp), the estimated average output at 10am (in kW), and the expected average daily production (in kWh) in Thailand?



- 2) How does the SMA solar inverter function in “Island Mode”? An “Island grid” is a microgrid that is not connected to a larger power grid.
- It always outputs the maximum power possible given the PV panels.
 - It regulates the power feeding into the microgrid based on the frequency on the AC line. A lower frequency means that more power is required from the grid.
 - It listens for a signal from the operator or energy management system and provides the required power output accordingly.

Microgrid, Batteries

3) Can Sunny Island function without a grid?

- Yes because Sunny Island can generate itself a grid with the use of a DC source (batteries)
- No the Sunny Island needs a grid in order to function, otherwise it will not be able to have a frequency to attach itself
- Yes because Sunny Island is connected to Sunny Boy, which creates the grid

4) Why are batteries used in a microgrid?

- Batteries are used as a mean to because as they can deliver the needed power instantaneously in DC for the Sunny Island to satisfy the need of the AC loads
- Batteries are used to store the AC current generated by the solar panels
- Batteries are used to just keep the Sunny Island controls on so that in the night it can switch on the fuel cell

5) Can the Sunny Boy solar inverter create its own in a microgrid without a battery inverter?

- No, Sunny Boy needs a grid (with a given Frequency and Voltage) in order to output energy at the frequency and voltage given by the grid generator – in this case the Sunny Island battery inverter
- Yes, Sunny Boy can function and send power to loads without any problem. It can create its own grid. The sunny Island is just there to provide charging of the batteries control of the fuel cell.
- No, it cannot function in a microgrid on its own because it needs batteries to charge, so the solar inverter will not start if it does not sense some batteries on the DC bus.

AC distribution

6) What is the difference between a breaker and a differential breaker?

7) What is the role of rule engine in energy management system?

8) What should be done before starting maintenance of AC distribution box?

Electrolyser

9) What is the hydrogen yield for the AEM electrolyser?

10) What is the lifetime of an Enapter electrolyser?

11) What is the efficiency of the electrolyser?

12) What is the operative power consumption of the EL 2.0?

13) Can an EL Operate without a Dryer?

14) How many EL2.0 can be connected to one Dryer 2.0?

15) a. Assume that you have excess energy of 24 kWh per day. Also, assume that you can use a battery as a short-term buffer, so you are not limited by solar hours, weather, etc. To maximise the H₂ production and minimise capital cost of the electrolyser system, how many electrolysers would you install and what would be the daily production of hydrogen?

b. Now assume that your excess power is evenly distributed over only 5 hours, and you don't have battery capacity to shift this excess power to another time of the day. To maximise the H₂ production, how many electrolysers would you install and what would be the daily production of hydrogen?

H2 Storage Tank

16) What is the storage capacity of a 1,000 liter tank – in kWh - that is being fed with an Enapter electrolyser until it is full?

Fuel Cell

17) Which elements does a fuel cell need to operate? Does it need electricity?

18) Do you think we can use hydrogen at the same pressure as its produced by the electrolyzer (35bar)?

19) Why do you think is not useful to let the Fuel Cell and the electrolyzer work simultaneously?

Energy Management System

20) Which mobile operation systems are supported by Enapter application?

21) Which Enapter device helps to solve Internet connection issues with cloud?

22) Which security protocol used for data encryption for Enapter devices?

Water System

23) What is the water input pressure needed for the electrolyser?

24) What are the water input requirements for the electrolyser?

25) What is the connection type and size of the water inlet?

AEM Chemistry

26) What is the main advantage in the use of water electrolysis for hydrogen production?

- carbon neutrality can be achieved
- a higher efficiency can be achieved
- the costs can be reduced

27) What are the main advantages of AEM systems?

- long lifetime is achieved together with a simple balance of plant
- High hydrogen purity can be achieved with the use of cheap materials
- An industrially available system with high efficiency is possible

28) What is the difference between AEM and PEM half reactions?

- The backbone used for the membrane structure
- The opposite polarity of the applied current
- Different charge carriers are involved