

A white Pepper robot is shown from the chest up, holding a tablet. The robot has large, expressive blue eyes and a small black dot on its forehead. The word "Exam" is written in a black, sans-serif font across the center of its face. The background is a blurred indoor setting with wooden paneling and a brick wall.

Exam

A white Pepper robot is shown from the chest up, holding a tablet. The robot has large, expressive blue eyes and a small black dot for a nose. The text "Use Case" is overlaid in the center of the image. The background is a blurred indoor setting with a brick wall on the left and a wooden wall on the right.

Use Case

# Working environment

You and your team are working as Data Science Consultant in the Company Smart Energy LLC.

The current demand for renewable energy is increasing rapidly. This is partly due to the growing attention being paid to the issue of green, sustainable energy, but also because of the very sharp rise in electricity prices for fossil fuels.

In order to further develop the company Smart Energy LLC in a future-proof manner, new solar farms are to be built, which should ensure that the demand for electricity at Smart Energy LLC increases and that more profit can be generated in the long term.

The management of the Smart Energy LLC, needs your help by finding a solution for his current problem.

# Problem description

Before the company can create new solar farms to maximize its profits, the question naturally arises:

**Where should we place how many m<sup>2</sup> of solar farms to maximize our profit and at the same time meet our increasing customer demand for electricity?**

**Scenario 1:** New demand for electricity: 2 million kWh/a.

**Scenario 2:** New demand for electricity: 3 million kWh/a.

# Limitations and Information

Unfortunately, Smart Energy LLC cannot provide unlimited financial resources, and there are restrictions on geographic location and construction.

Management imposed limitations and information:

- We divide our country into 4 regions (North-West, North-East, South-West and South-East) for simplicity.
- In order that all people in our country have short distances in the power supply, at least 100m<sup>2</sup> of solar farm must be built in each region.
- Unfortunately, the building space in the regions is limited so may be built in the regions max following area:
  - North-West: 3,000m<sup>2</sup>
  - North-East: 3,000m<sup>2</sup>
  - South-West: 2,000 m<sup>2</sup>
  - South-East: 2,000m<sup>2</sup>
- For one square meter of solar plant Smart Energy LLC has to pay 100€ for the material plus the cost of the land.
- Currently Smart Energy LLC can invest only 2 million €.
- In order to fulfill scenario 2, a budget of 3 million € can be invested.
- In order to perform the analysis, 2 data sets are available:
  - Sunshine hours and land prices by geographic location.
  - Database of already installed solar farms