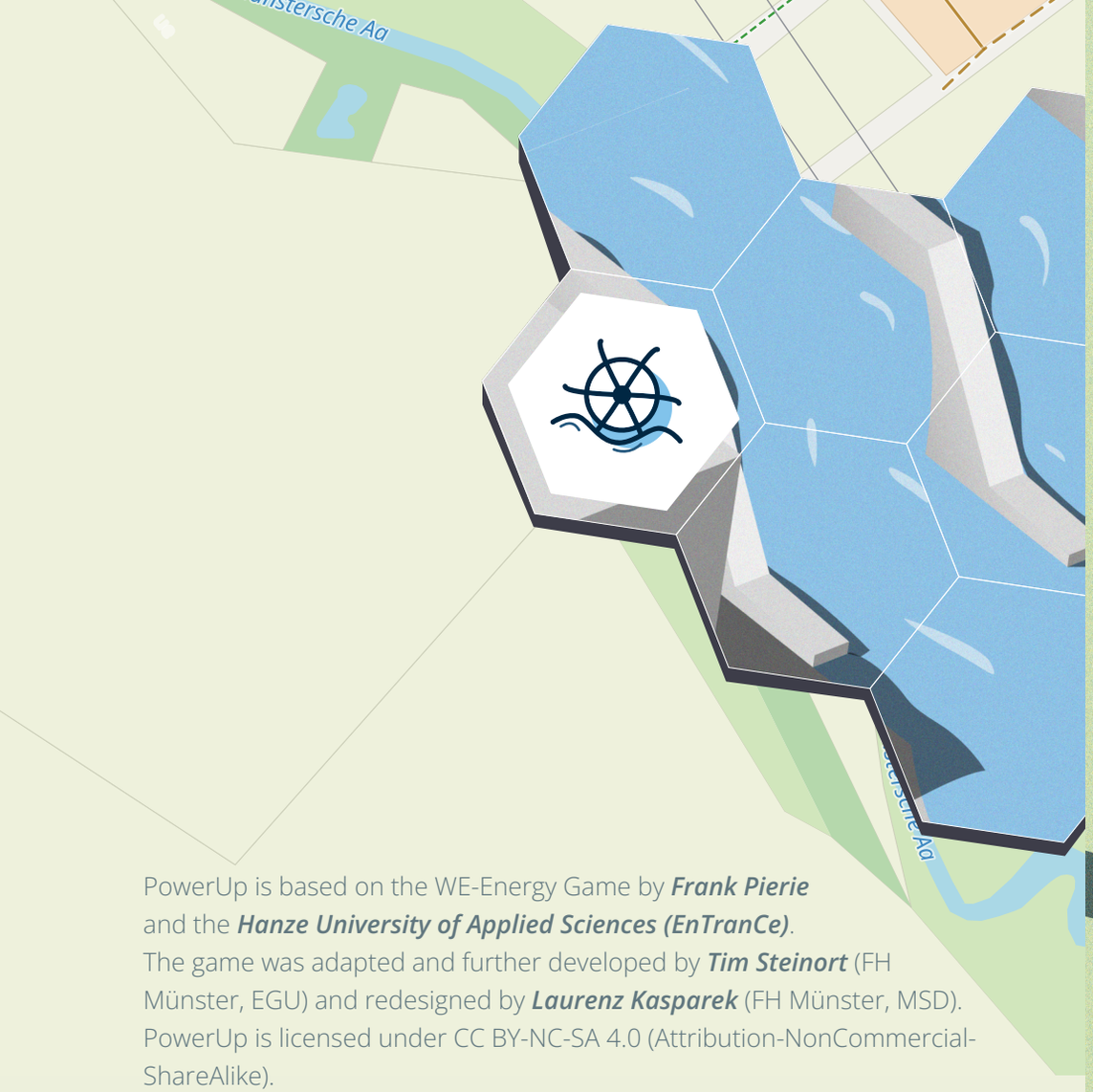

PowerUp is based on the WE-Energy Game by ***Frank Pierie*** and the ***Hanze University of Applied Sciences (EnTranCe)***.
The game was adapted and further developed by ***Tim Steinort*** (FH Münster, EGU) and redesigned by ***Laurenz Kasparek*** (FH Münster, MSD).

FH MÜNSTER

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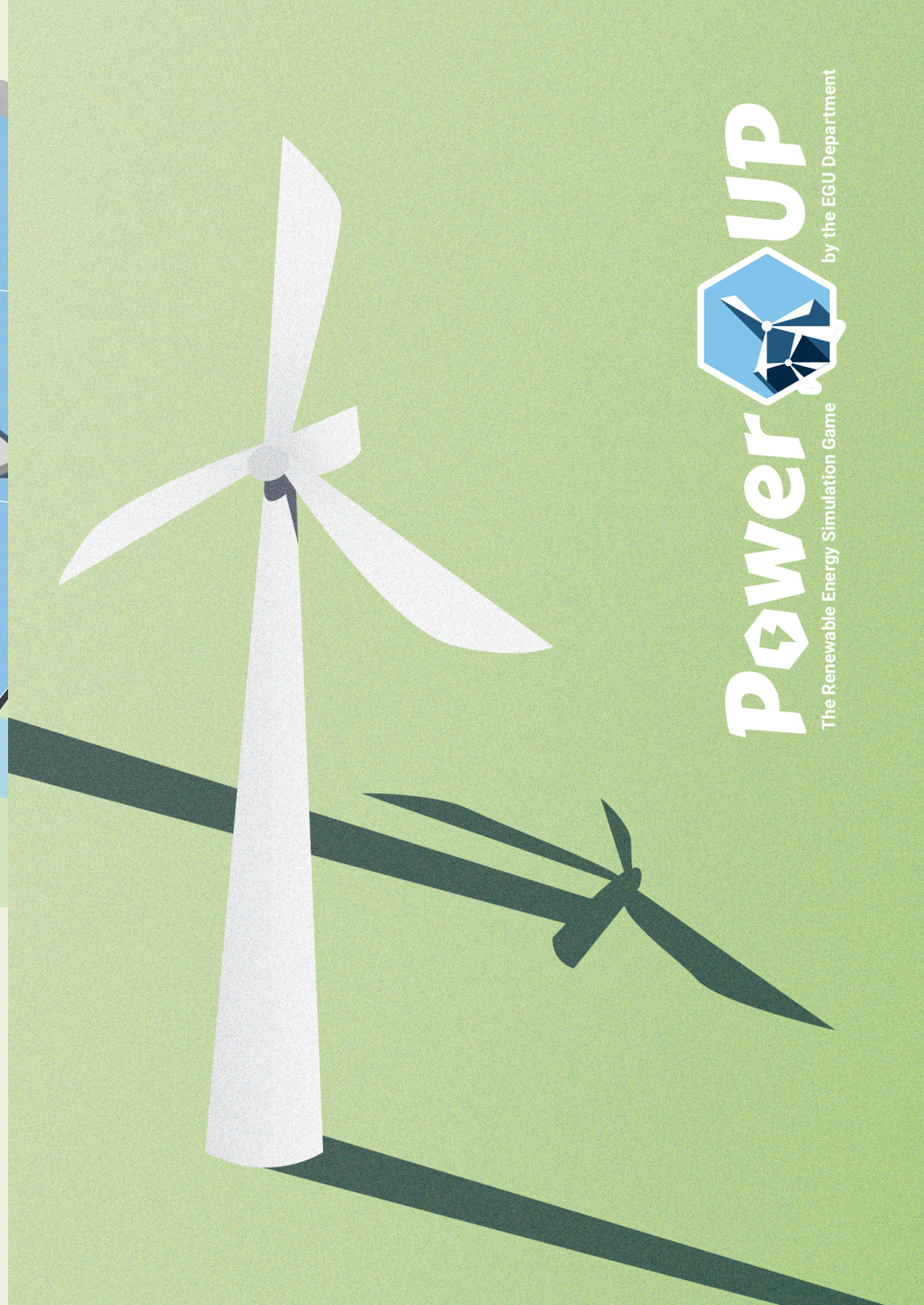


PowerUp

The Renewable Energy Simulation Game by the EGU Department

Game Concept

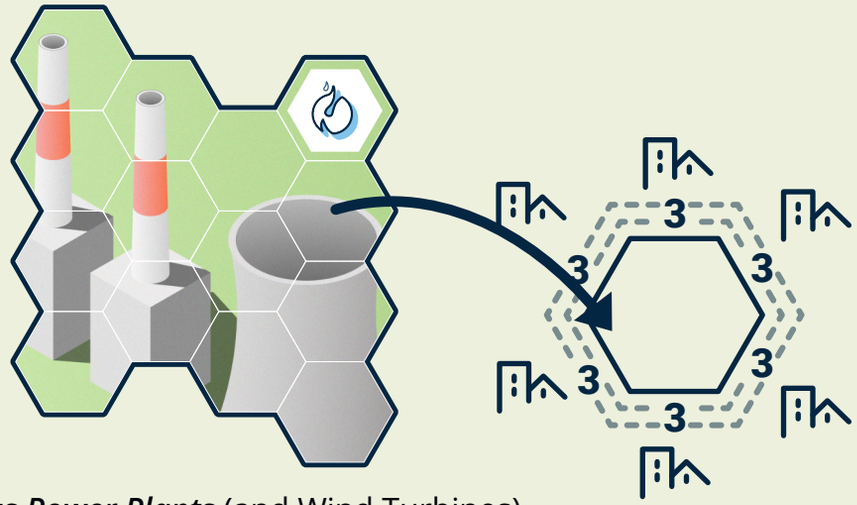
The goal of the game is to ensure a stable energy supply for the city. Each of you takes on the role of an interest group (e.g., environment, economy, local community), each with its own needs and priorities. Your mission is to discuss, negotiate, and find compromises so that every interest group reaches at least 40 points.
Only then do you win together!

Game Setup

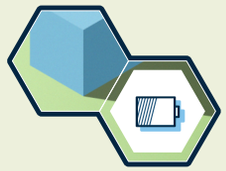
- ***Prepare the game board:*** Place the game board 1 in the center of the table.
- ***Assign roles:*** Each player draws an interest group (player board) 2 face down, starting with the person who lives closest to a wind turbine. Then everyone receives the corresponding marker and game piece 3.
- ***Prepare the technologies:*** Take the technology pieces 4 out of the bag 5 and place them on their designated spots on the board. Then put the bag within easy reach.
- ***Starting position:*** All game pieces begin at 0 on the score track £.
  Place your marker 3 in front of you so everyone can immediately see which interest group you represent.

Player Preparation

Read the description of your interest group and put yourself in their perspective.
You can find more information about their specific needs in the resource section.



Gas Power Plants (and Wind Turbines) must not be placed closer than three spaces to “City Spaces.”



Battery Storage Systems have no special placement rules.

In general, once a technology has been built, it cannot be demolished or moved on the game board. If no other solution is possible, players may agree to swap a technology.

> Gas Power Plant

- ***What is it?*** A gas power plant generates electricity by burning natural gas. It can be ramped up or down quickly to balance fluctuations in the electricity supply.
- ***Advantages:*** Very flexible and can be deployed on short notice.
- ***Challenges:*** Uses fossil fuels, releasing greenhouse gases, and is not sustainable in the long term.

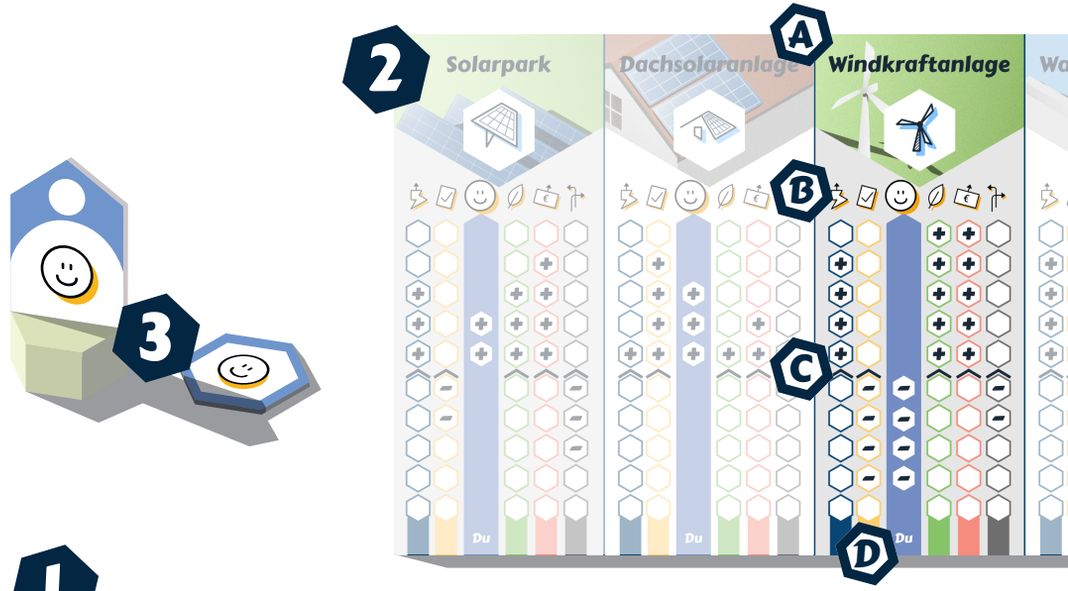
> Battery Storage

- ***What is it?*** Battery storage stores excess energy and releases it when needed to balance fluctuations in the power grid.
- ***Advantages:*** Ensures stability in the electricity grid and enables the use of renewable energy even with variable generation.
- ***Challenges:*** Expensive to produce and dependent on rare raw materials such as lithium.

Rulebook

Game Components

1. Game board (1x)
2. Player boards (6x)
3. Game pieces and markers (6 each)
4. Technology tiles (7 technologies)
5. Technology storage bag (1x)



Each column on the player board (2) is structured as follows:

Each technology (A) has its own column, where the score for the other players is also visible (B).
The score shows, with a + or −, how many spaces the corresponding interest group must move forward or backward on the score track when the technology is built (C).
Your own score is also highlighted (D).

The Game Board Spaces

On the game board (1)(F), there are the following spaces:

City spaces

River spaces

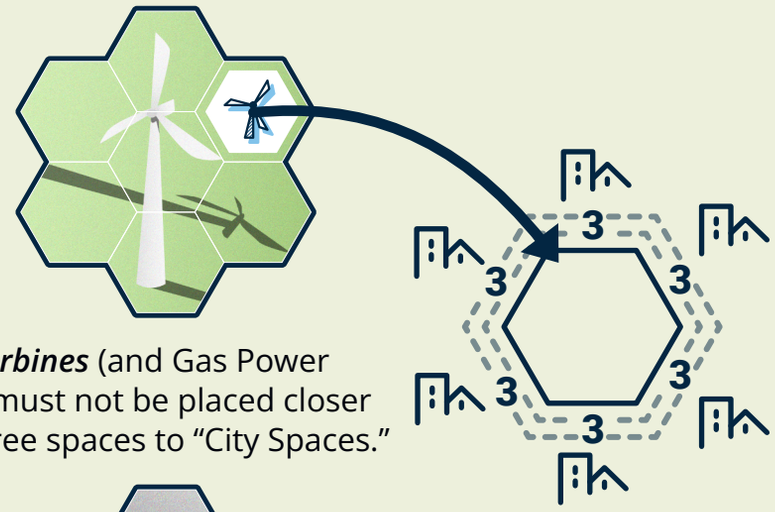
where a flowing body of water is located.

Open spaces

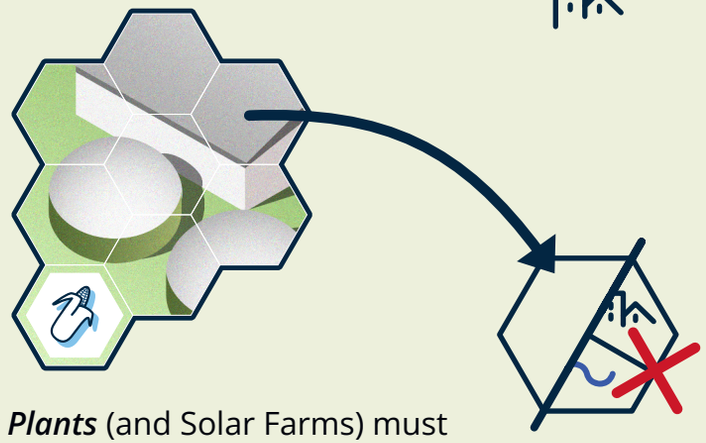
where only fields and meadows are found.

These spaces indicate where a wind turbine or gas power plant can be built.

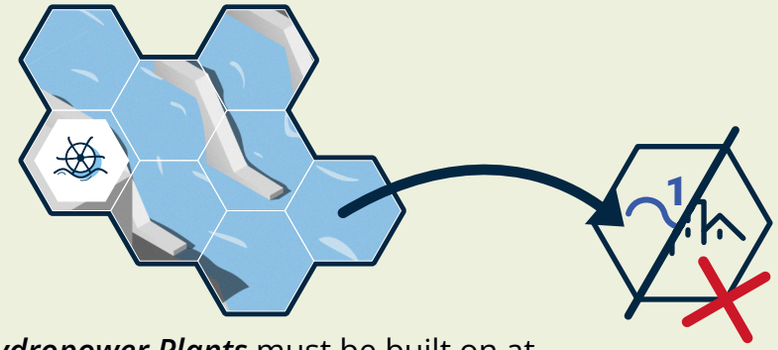
Important: When building technologies, always follow the placement rules in the resource section! (See Technologies | Page 9)



Wind Turbines (and Gas Power Plants) must not be placed closer than three spaces to "City Spaces."



Biomass Plants (and Solar Farms) must be built on "Open Spaces."



Hydropower Plants must be built on at least one "River Space," but never on a "City Space."

> Wind Power Plant

- ***What is it?*** A wind turbine converts the kinetic energy of the wind into electricity. Depending on its location and size, it can generate very different amounts of electricity.
- ***Advantages:*** Produces emission-free electricity in windy areas.
- ***Challenges:*** This highly location-dependent technology can cause acceptance issues among local residents (e.g., noise, impact on the landscape).

> Biomass Plant (Biogas)

- ***What is it?*** Energy is generated by burning biomass (e.g., wood, plant residues, energy crops).
- ***Advantages:*** Uses renewable raw materials.
- ***Challenges:*** Growing biomass requires large areas, which can lead to conflicts with food production.

> Hydropower Plant

- ***What is it?*** These facilities use the energy of flowing water, often from a river's slope, to generate electricity.
- ***Advantages:*** Provides reliable and constant energy, often independent of weather conditions.
- ***Challenges:*** Must protect river wildlife (e.g., fish) and may require interventions in nature.

Game Flow

Introduce your group's needs before the game starts!
The game is played over several rounds, each consisting of three phases:

- ***1 > Discussion:*** Discuss within the group which technology (game piece) 4 you want to build next in the city.
  Each player represents the interests of their own group.

- ***2 > Place technology:*** Decide together on a technology and check if it can be built according to the rules (see resources | Page 9).
  Place the game piece on the game board 1F.

- ***3 > Scoring:*** Each technology affects the points of the interest groups (indicated by "+" or "–" symbols on the player board 2C).
  Move the game pieces accordingly on the score track 1E.

Example:
At the start, all game pieces are at 0 points.
You decide to build a solar farm.
The Energy Producer moves 3 points forward to 3 points, while the Regulatory Officer moves 2 points backward to −2 points. The Resident moves 2 points forward, the Environmental Advocate moves 3 points forward, the Investor moves 4 points forward, and the Grid Operator moves 3 points backward.
For the construction of subsequent technologies, the game pieces are moved forward or backward from their current positions according to the points indicated on the score track.

End of the Game

You win the game when all interest groups have reached at least ***40 points***. This means you have successfully secured the city's energy supply.

Debriefing

As a group, reflect on your game and discuss the following questions:

- Which need was the most difficult to fulfill?
- Which technology was particularly helpful or problematic?
- Is it possible to win with just a single technology? Why or why not?
- What did you learn or notice through playing the game?

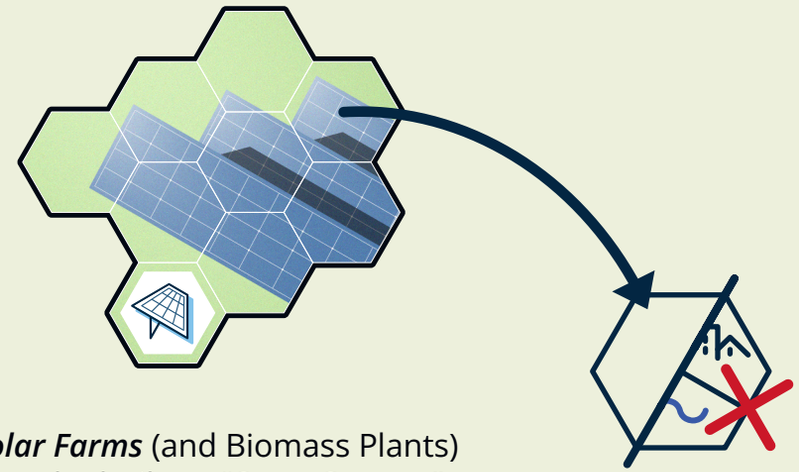
Additional Guidance

To ensure all players have enough opportunity to contribute their ideas, you can introduce a structured discussion from the middle of the game (for example, when a game piece reaches 25 points):

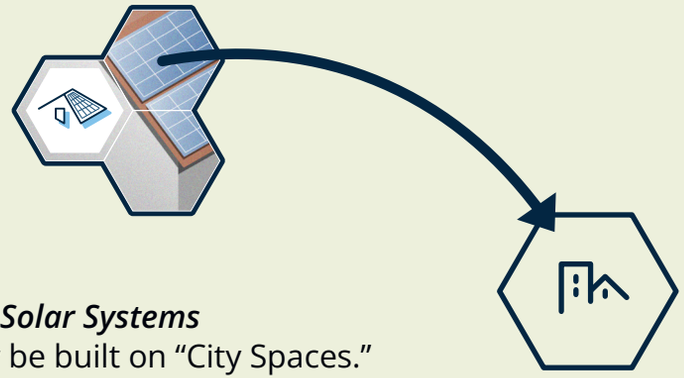
- ***Structured round:*** Going clockwise, starting with the player whose piece has the fewest points, each player briefly presents their preferred energy technology and explains why it should be built.
- ***Other approaches:*** Alternatively, you can try a silent round to liven up the discussion. In this variation, players must reach a joint decision only through gestures and non-verbal communication.

Placement Rules 5

The placement rules reflect the real-world requirements for building and operating energy facilities. In general, all game pieces (technologies) 4 must fit on the grid and cannot overlap. Some technologies also have special construction requirements due to their functionality:



Solar Farms (and Biomass Plants) must be built on "Open Spaces."



Rooftop Solar Systems can only be built on "City Spaces."

> Grid Operator (Flexibility)

This person ensures that the energy supply remains stable, even when consumption or production changes.
Electricity demand and generation are not always equal. Flexible facilities can quickly adjust their output to balance fluctuations.

Technologies (Game Pieces) 4

> Solar Farm

- ***What is it?*** A solar farm is a large-scale facility that converts sunlight into electricity using many photovoltaic modules. The modules are usually installed on open land, mounted on frames, and oriented towards the sun.
- ***Advantages:*** Produces a lot of electricity, especially in sunny weather.
- ***Challenges:*** Requires large areas of land that cannot be used for other purposes (e.g., agriculture).

> Rooftop Solar System

- ***What is it?*** These systems consist of individual photovoltaic modules installed on the roofs of houses, industrial buildings, or other structures.
- ***Advantages:*** Uses already existing surfaces, minimizing disruption to the surroundings.
- ***Challenges:*** Electricity production depends on sunlight and is often limited to self-consumption.

Shorter Game Variant

If you have limited time, you can shorten the game by using a preset starting position.
Place the following technologies 4 directly on the board and move the game pieces 3 to the specified scores 1 F 1 E

4 2 Solar Farms, 3 Rooftop Solar Systems, 2 Wind Power Plants, 1 Gas Power Plant, 1 Biomass Plant and 3 Battery Storage.

3 *Spielfiguren:* = 19 = 11 = 13

= 7 = 11 = 10

This allows you to enter the gameplay more quickly.
Can you still manage to bring all interest groups together?

Before the game begins, it should be clarified that all players are familiar with the technologies and have a basic understanding of how they work. Likewise, the interest groups should be clear to everyone so that a well-informed discussion can take place.

The following section provides additional information on the technologies as well as the needs of the interest groups.

Interest Groups 2 3

Each group represents an essential need for the city's energy supply. The success of the game (and the city!) depends on considering all groups and keeping their needs in balance. Only then can you collaboratively find a sustainable, accepted, and economically viable solution.

> Energy Producer (Production)

This group focuses on how much energy a facility can actually deliver.
The size and the technology used determine the facility's capacity. High production ensures that enough electricity is available for the city.

> Regulatory Officer (Permitting)

This person handles the bureaucratic hurdles for building and operating the facilities.
The effort required for permits depends on the type of technology. Large or environmentally sensitive projects often take more time and resources to approve.

> Resident (Public Acceptance)

This person represents the opinions and needs of the local community.
Support from local residents is crucial for the timely implementation of projects. Facilities that generate noise, take up a lot of space, or significantly alter the landscape are often viewed critically.

> Environmental Advocate (Planet / Climate)

This person works to protect the environment and the climate. It's about the impacts on nature, from CO_2 emissions to ecosystem interventions. Modern technologies increasingly require rare resources, which must be critically considered in extraction and processing. For example, lithium mining for batteries has environmental effects, as does deforestation for the construction of new facilities.

> Investor (Profit)

This person ensures the economic viability of the facilities. Profit depends on the ratio of revenue (e.g., from electricity sales) to costs for construction, operation, and permits.
Economically successful facilities are often easier to implement. A gas power plant can provide short-term profit, while a wind turbine typically pays off only in the long term.