



Alexandra Katsnelson

2 °C

ENERGY TRANSITION

2 °C is a cooperative game in which you have the common aim of replacing all coal-fired power plants and one nuclear plant with power plants based on renewable energy. Your task is to realise the energy transition and cover the demand for electricity at the same time – not an easy balance to strike. The clock is ticking, as both coal-fired power plant operation and non-compliance with the climate goals accelerate climate change: the global temperature is rising. Get together to prevent it from reaching the 2-degree tipping point!



2-4
Players



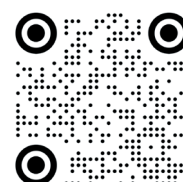
60-120
Minutes



Ages
12+



This game was developed by students in the Industrial Design course at the University of Wuppertal as part of the project “Powers in Play”, which has been funded by the German Federal Foreign Office. The project aims to develop games that turn different aspects of politics into an interactive experience. You will find all the games in the series at www.powers-in-play.com. For more information on the German Federal Foreign Office and its programmes, please visit www.diplo.de/aussenpolitiklive.



Warning: Contains small parts that can be swallowed. Not suitable for children under 3.



CONTENTS

The board consists of 21 fields and can simply be printed out and used or modified according to individual needs. The coin trays used to indicate your energy and profit production are ready to use without cutting out. The remaining components of the game must be cut out and folded or put together in some cases. Print on one side only.

----- Cut

===== Fold

INCLUDED



20 cards



7 playing pieces:
4 roles + 3 markers



1 board with 21 fields



2 coin trays: Energy + Profit



1 thermometer (two-part)



43 power plants, 1 price list,
1 calculation table (2 pages)

REQUIRED



1 pencil



1 pair of scissors

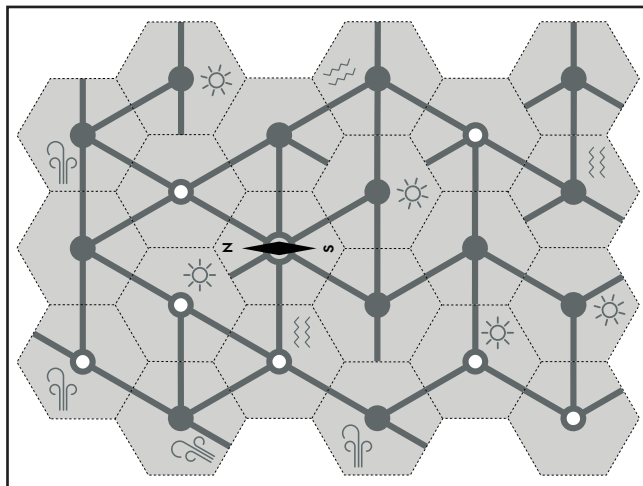


1 coin

COMPONENTS

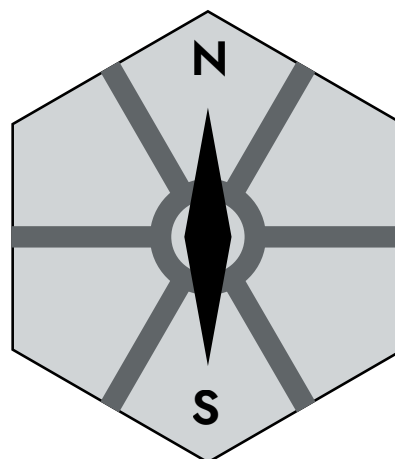
Board



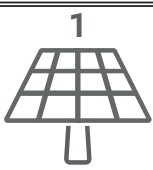
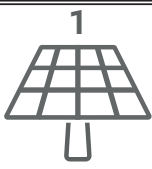
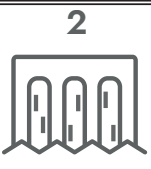

Twenty-one hexagonal fields combine to form your board. You can use the print & play template without cutting anything out or cut out the individual fields and rearrange them each time you play.



Starting field

The field with the compass is your starting field. The compass shows the cardinal points. It is important when you draw a weather action card that sets up the power plants in a specific compass direction.



 5 ⚡ 2000	 8 ⚡ 3000	 3 ⚡ 1000
 3 ⚡ 1000	 5 ⚡ 2000	 7 ⚡ 4000

Power plants

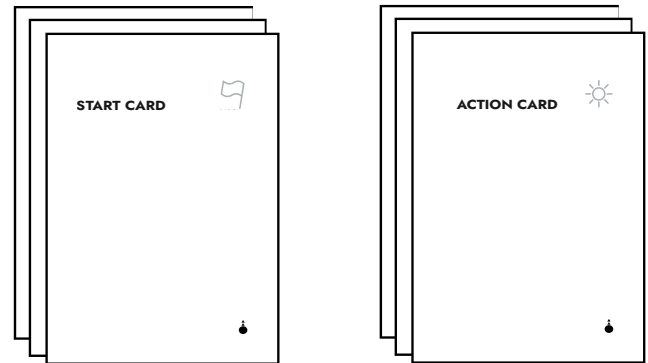
There are six coal-fired, one nuclear, and 36 renewable-energy power plants in three expansion phases. The numbers above the renewable-energy plants indicate their expansion phase. When building, always start with phase 1. You can raise the phase numbers via upgrades. The values below the power plants indicate how much total energy (left) and profit (right) the relevant phase generates.

COMPONENTS

Cards

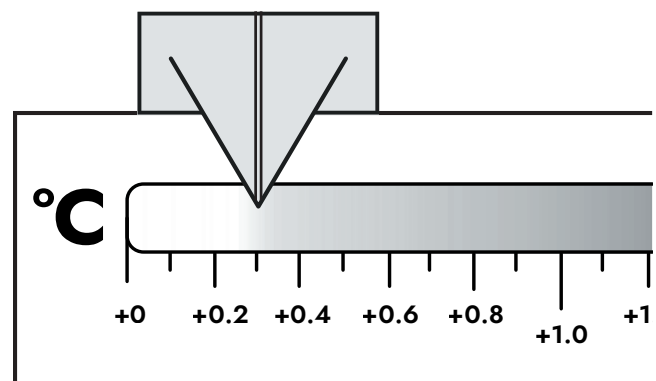
There are two types of cards.

- **Start cards:** You begin the game with one of these.
- **Action cards:** You draw them in the course of the game.



Thermometer

The thermometer comes in two parts: the slide and the temperature indicator. You show the level of the current temperature increase using the thermometer. At the beginning, it is 0 °C and under certain conditions it rises. If it reaches 2 °C, the game is over!



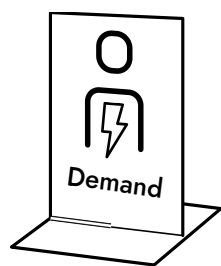
Coin trays: Profit and Energy

With the markers (see next page), you show how much profit and energy your power plants generate each round. Move the marker accordingly as soon as the production values change (e.g., after dismantling, expanding, an upgrade or action).

ENERGY									
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46			
50	51	52	53	54	55	56			
60	61	62	63	64	65	66			
70	71	72	73	74	75	76			
80	81	82	83	84	85	86			

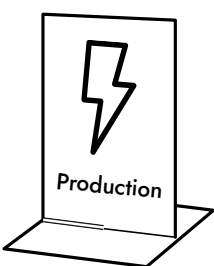
PROFIT									
0	100	200	300	400	500	600	700	800	900
1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900
2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900
3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900
4,000	4,100	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900
5,000	5,100	5,200	5,300	5,400	5,500	5,600	5,700	5,800	5,900

COMPONENTS



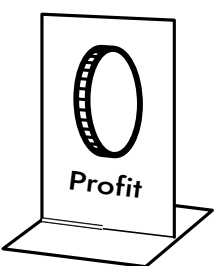
Marker: Demand

Use it to show how high the population's demand for energy is.




Marker: Production

Use it to show how much energy your power plants generate.

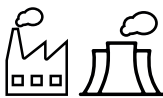


Marker: Profit

Use it to show how much money you earn with your power plants.



RENEWABLE ENERGY SOURCES



COAL AND NUCLEAR POWER

Level 1


Building costs	-1,000	Dismantling costs	-200
Energy / Profit	$3\frac{1}{2} / 100$		

Level 2

Upgrade costs	-1,300		
Energy / Profit	$+2\frac{1}{2} / +100$		

Level 3

Upgrade costs	-1,800		
Energy / Profit	$+2\frac{1}{2} / +200$		



Price list

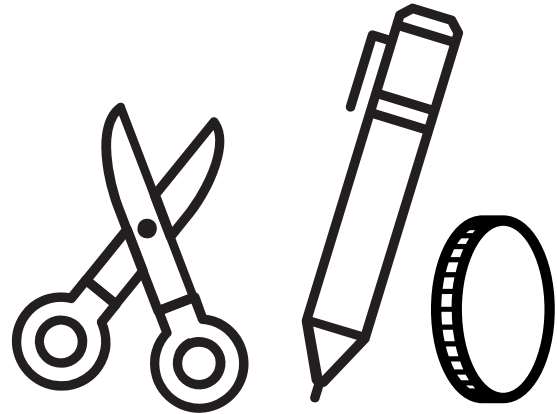
The list contains information on the power plants. For the relevant power plants, it shows the costs of dismantling, building/expanding, and upgrades, and the amount of energy and profit they generate. When a renewable-energy power plant is upgraded to the next phase, consult the list to see the levels of profit and energy production increases.

COMPONENTS

[illegible]

Calculation table

Use the table to write down how much money you currently have.



Additional material: Pencil and coins

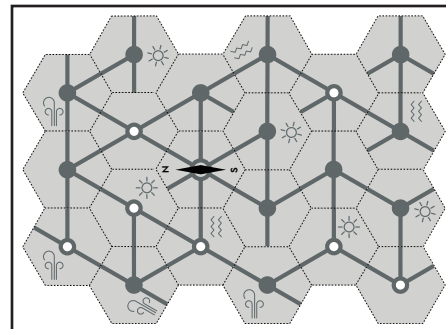
Use the pencil to post amounts in the calculation table. The coin is used if you draw a nuclear power plant card (see p. 10).

GAMEPLAY

PREPARATION

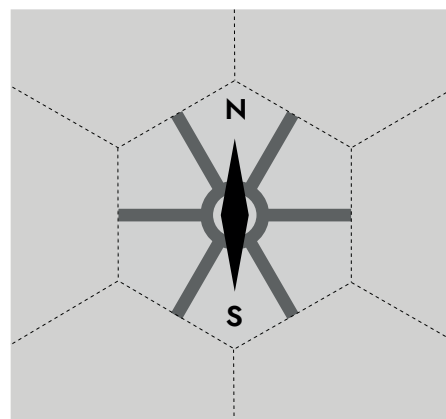
1a) Setting up the board: Easy

Begin to prepare your board. To do so, you can use the print template without cutting out the fields.



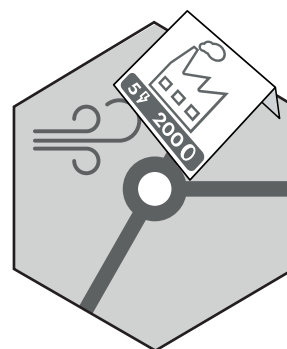
1b) Setting up the board: Custom

Alternatively, you can cut out each field, then design and set up your own board. Make sure that the starting field is located at the centre and each field is connected to at least one neighbouring field via one route.



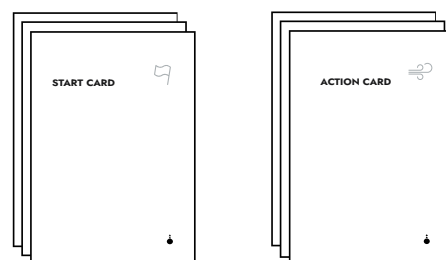
2. Setting up the coal-fired and nuclear power plants

After setting up the board, place the coal-fired power plants and the nuclear power plant randomly on the fields with the white dots, one plant per field.



3. Shuffling the cards

Shuffle the start cards and action cards separately. Place the shuffled cards in two piles, face down.



GAMEPLAY

4. Preparing the coin trays

Put the markers for Demand, Production, and Profit on the matching fields with the box outlined in bold. You start the game with these values.

ENERGY									
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89

PROFIT					
0	100	200	300	400	500
1,000	1,100	1,200	1,300	1,400	1,500
2,000	2,100	2,200	2,300	2,400	2,500
3,000	3,100	3,200	3,300	3,400	3,500
4,000	4,100	4,200	4,300	4,400	4,500
5,000	5,100	5,200	5,300	5,400	5,500

↑
Production

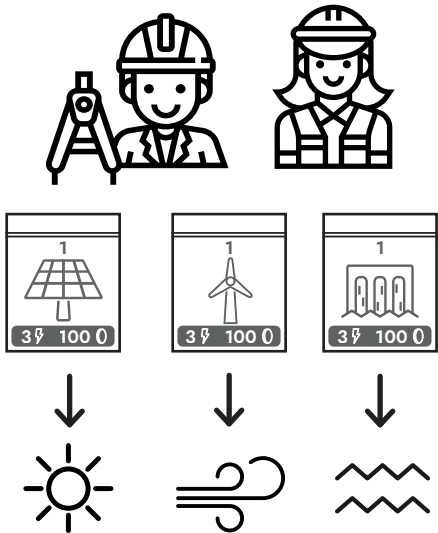
↑
Profit
Demand

SELECT YOUR ROLE

Each of you picks a playing piece (engineer or scientist) and put is on the starting field. **If there are only two players, each player picks two playing pieces.**

Engineer

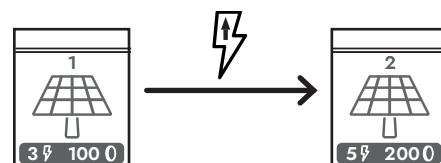
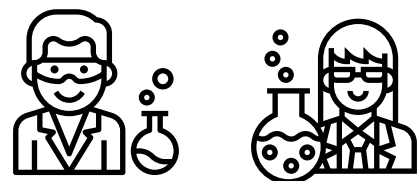
As engineers, you have the ability to develop renewable energy sources. You travel across the board to where you want to build. You can only locate the relevant building on a field with a matching element symbol (sun/wind/water). For example, solar cells can only be built on a field with the sun symbol (see right).



GAMEPLAY

Scientist

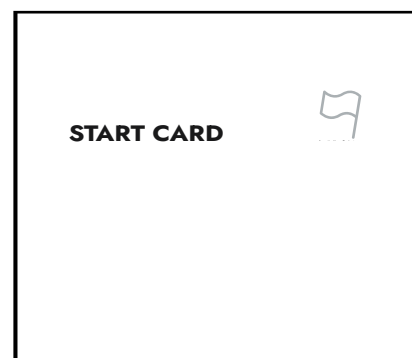
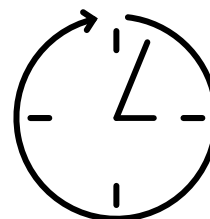
As scientists, you have the ability to upgrade power plants with renewable energy sources. This makes them more efficient and they can generate more energy and profit. To do this, you have to travel across the board to the power plant you want to upgrade.




GAMEPLAY

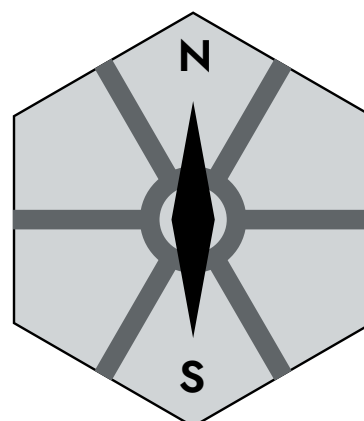
Pick a starting player. You make your move in turn, going clockwise.

Draw a start card to begin. It poses the first challenge that you have to master together. You have three rounds to do so, which is your “action period”. A round is over after each playing piece has made a move. After completing the third round, the action ends and you determine the result. Continue playing until the condition for ending the game is fulfilled (see p. 12).



START!

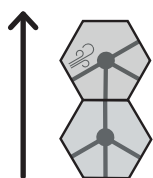
Each of you is paid 1,500  before starting. Now it's time to play!



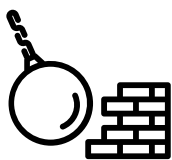
GAMEPLAY



YOUR MOVE



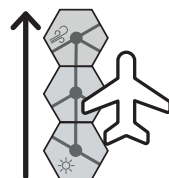
Two steps



Dismantle



Special ability



Quick trip + one action



Lose turn

In his/her move, each player carries out **one** of these five actions:

- Move one playing piece by up to two fields in one direction
- Dismantle a power plant
- Use 1x role ability (engineers build, scientists upgrade)
- Take a quick trip and perform one other action before or after the trip (Caution: Each quick trip means a temperature rise of 0.1 °C!)
- Lose turn

PROFIT									
0	100	200	300	400		600	700	800	900
1,000	1,100	1,200	1,300	1,400	Profit	1,600	1,700	1,800	1,900
2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900

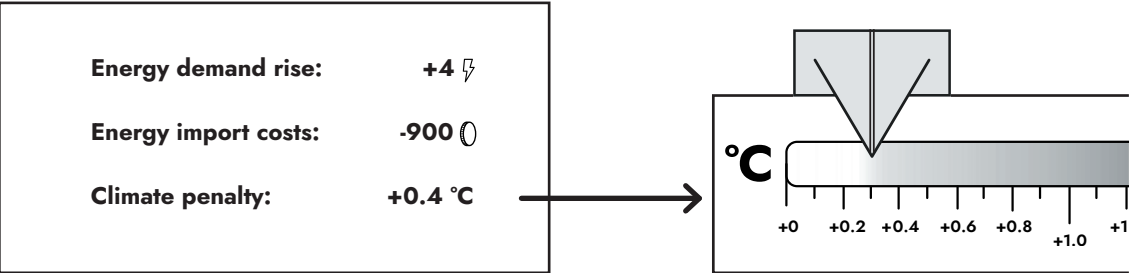
→ +1,500

At the beginning of each round, you are paid your profit according to your power plant's output. Move the profit marker to the relevant field.

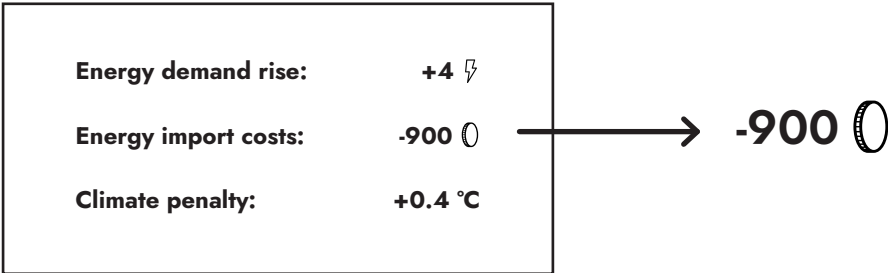
GAMEPLAY



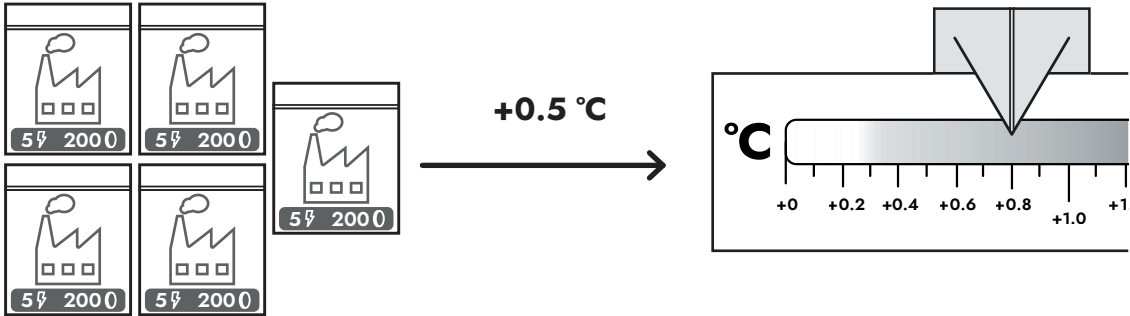
END OF THE ACTION PERIOD



After the third round, check whether you have met the card's requirements. If not, the temperature rises by the value under "Climate penalty". Move the slide on the thermometer accordingly.



If you were unable to cover the population's energy demands, you must offset the difference from your budget as you will have to import power to cover the demand.



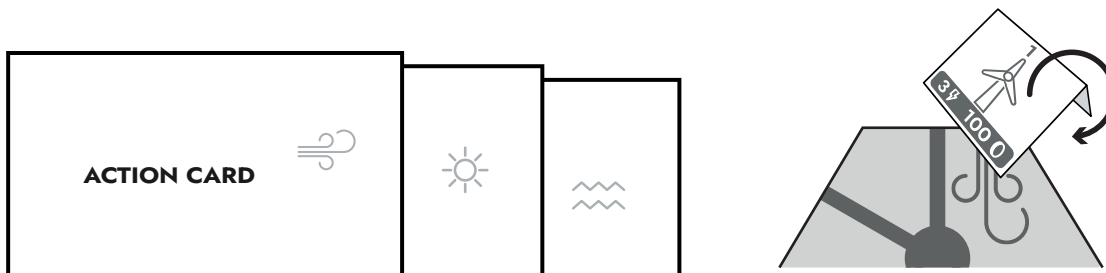
Further, each coal-fired power plant that exists at the end of the action period means a temperature increase of 0.1 °C per power plant.

GAMEPLAY

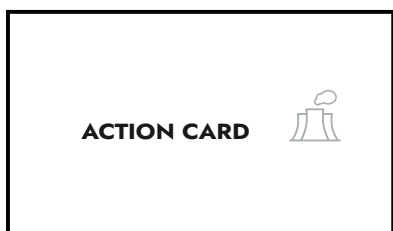
SUBSEQUENT ROUNDS



Continue the game the same way with one difference: you draw an action card at the beginning of the round instead of a start card. Your action period is three rounds again. If you cannot meet the climate target specified (example: You need to dismantle two coal-fired power plants but there are none left in the game), draw a new card and discard the other one.



If you draw a weather event card, turn the affected power plant face down. This shows it has been decommissioned. After the action period ends, turn it face up to recommission it.



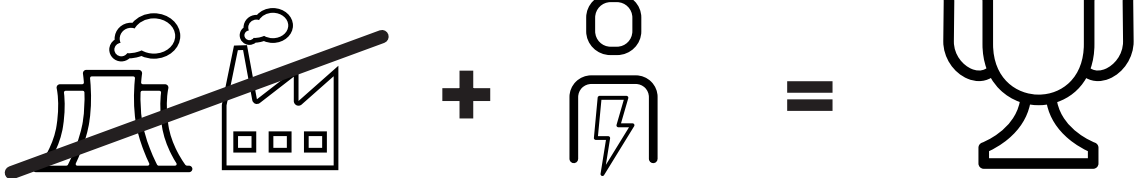
If you draw a nuclear power action card, you either have to dismantle the nuclear power plant during the current action period or leave it alone. If you choose

to leave it, toss a coin twice at the end of the round to determine whether or not the nuclear power plant has a meltdown (heads twice in a row). If meltdown wins, you lose the game immediately.

GAME OVER

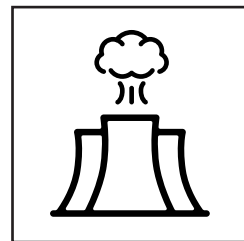
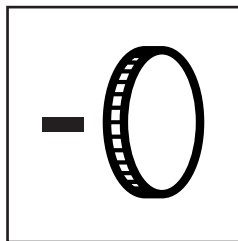
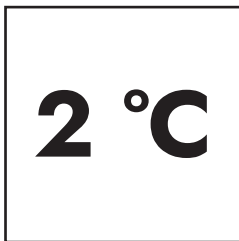


YOU WIN...



If all coal-fired power plants and the nuclear plant have been dismantled and you were able to cover the population's latest demand for energy.

YOU LOSE...



- When the temperature reaches 2 °C or
- You have a negative balance after paying the energy import costs or
- The nuclear power plant has a meltdown.

START CARD



A climate goal was set.
In the action period, **two coal-fired power plants** must be dismantled.

The population's **energy demand** is currently **38**. ⚡

Energy import costs: -800 0

Climate penalty: +0.2 °C



START CARD



A climate goal was set.
In the action period, **two renewable-energy power plants** must be built.

The population's **energy demand** is currently **38**. ⚡

Energy import costs: -600 0

Climate penalty: +0.2 °C



START CARD



A climate goal was set.
In the action period, **two renewable-energy power plants** must be built.

The population's **energy demand** is currently **38**. ⚡

Energy import costs: -800 0

Climate penalty: +0.2 °C



START CARD



A climate goal was set.
In the action period, **one coal-fired power plants** must be dismantled and **one renewable-energy power plant** must be built.

The population's **energy demand** is currently **38**. ⚡

Energy import costs: -700 0

Climate penalty: +0.2 °C



ACTION CARD



The nuclear power plant is old and wearing out. You can either dismantle it in this action period **or** leave things to chance.

For the latter, toss a coin twice. If it comes up heads both times, the power plant has had a meltdown and you've lost the game. Otherwise, nothing happens.

Energy demand rise: +3 ⚡

Energy import costs: -800 0



ACTION CARD



The nuclear power plant is old and wearing out. You can either dismantle it in this action period **or** leave things to chance.

For the latter, toss a coin twice. If it comes up heads both times, the power plant has had a meltdown and you've lost the game. Otherwise, nothing happens.

Energy demand rise: +4 ⚡

Energy import costs: -1,000 0



ACTION CARD



A climate goal was set.
In the action period, **two renewable-energy power plants** must be upgraded.

Energy demand rise: +5 ⚡

Energy import costs: -1,000 0

Climate penalty: +0.4 °C



ACTION CARD



A climate goal was set.
In the action period, **two renewable-energy power plants** must be built **or** upgraded.

Energy demand rise: +4 ⚡

Energy import costs: -900 0

Climate penalty: +0.4 °C



ACTION CARD



A climate goal was set. In the action period, **two renewable-energy power plants** must be built.

Energy demand rise: +3 ⚡

Energy import costs: -800 0

Climate penalty: +0.6 °C



ACTION CARD



A climate goal was set. In the action period, **two coal-fired power plants** must be dismantled.

Energy demand rise: +5 ⚡

Energy import costs: -1,200 0

Climate penalty: +0.4 °C



ACTION CARD



Storm warning!
A hurricane is expected to hit the **north**. Such strong winds can damage wind parks, so they must be shut down preventively.

For this period, the **northernmost wind park** generates neither power nor profit.

Energy demand rise: +3 ⚡

Energy import costs: -900 0



ACTION CARD



Storm warning!
A hurricane is expected to hit the **west**. Such strong winds can damage wind parks, so they must be shut down preventively.

For this period, the **westernmost wind park** generates neither power nor profit.

Energy demand rise: +4 ⚡

Energy import costs: -700 0



ACTION CARD



The weather has changed.
Due to climate change, the **south** is experiencing a drought. The temperature has reached a new high and there's no rain in sight.

For this period, the **southernmost water-powered plant** generates neither power nor profit.

Energy demand rise: +4 ⚡

Energy import costs: -600 0



ACTION CARD



The weather has changed.
Due to climate change, the **east** is experiencing a drought. The temperature has reached a new high and there's no rain in sight.

For this period, the **easternmost water-powered plant** generates neither power nor profit.

Energy demand rise: +3 ⚡

Energy import costs: -800 0



ACTION CARD



The weather has changed.
Thick clouds cover the sky in the **east** for weeks.

For this period, the **easternmost solar system** generates neither power nor profit.

Energy demand rise: +5 ⚡

Energy import costs: -500 0



ACTION CARD



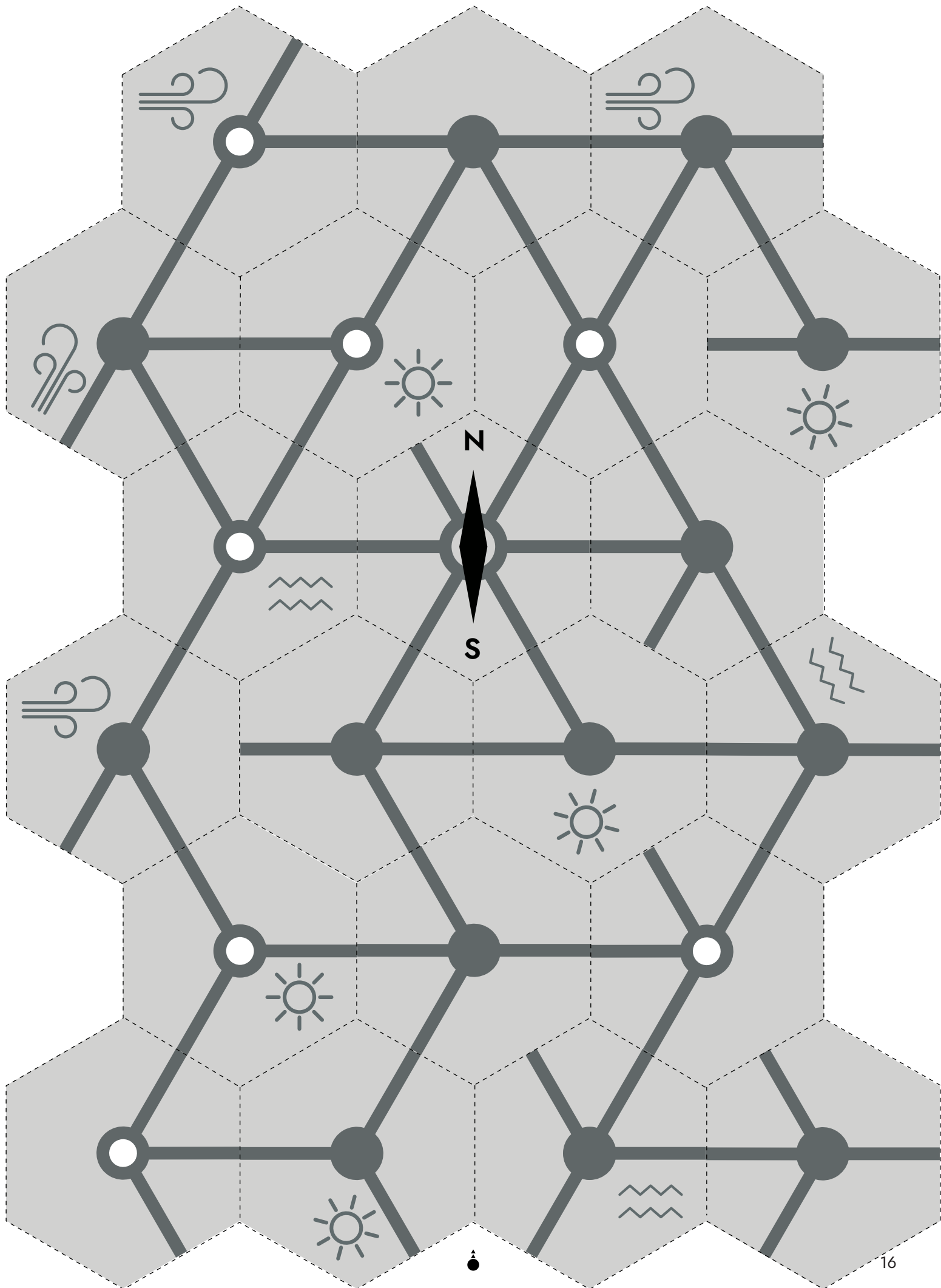
A climate goal was set. In the action period, **one renewable-energy power plant** must be built and **another gets an upgrade**.

Energy demand rise: +0 ⚡

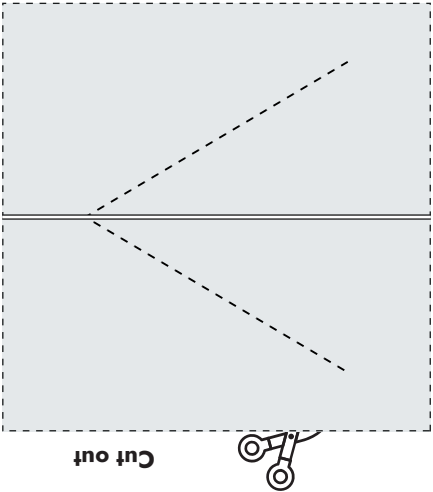
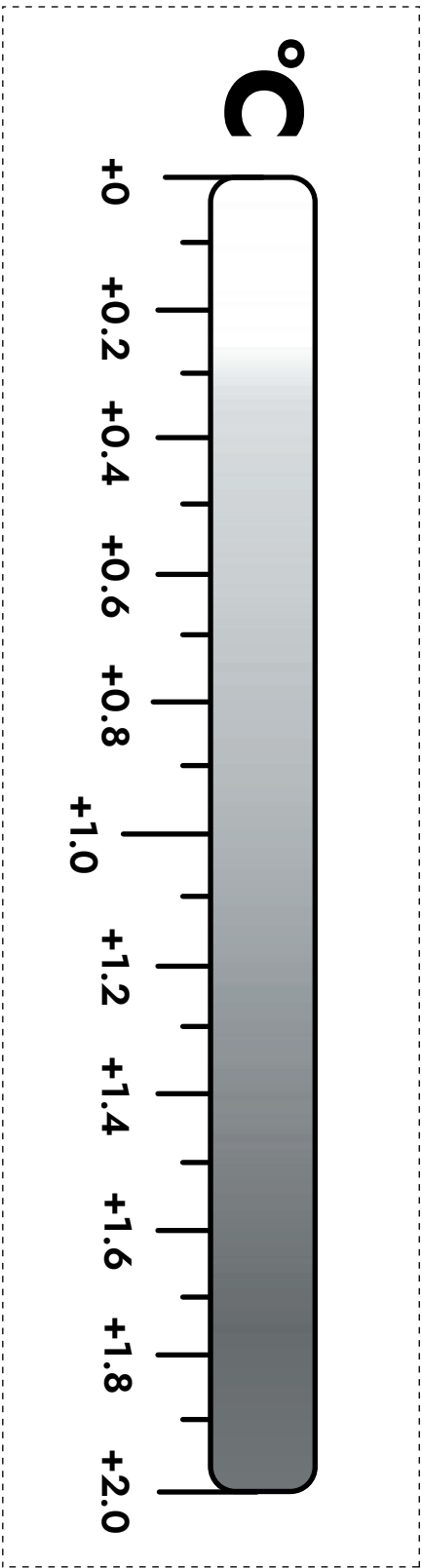
Energy import costs: -1,200 0

Climate penalty: +0.4 °C





THERMOMETER



Cut out

PLAYING PIECES

PRICE LIST



RENEWABLE ENERGY

Level 1

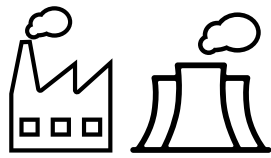
Building costs	-1,000 ⌚
Energy / Profit	3 ⚡/ 100 ⌚

Level 2

Upgrade costs	-1,300 ⌚
Energy / Profit	+2 ⚡/ +100 ⌚

Level 3

Upgrade costs	-1,800 ⌚
Energy / Profit	+2 ⚡/ +200 ⌚











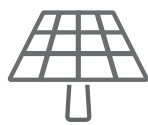













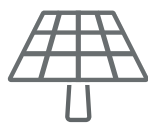











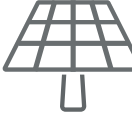







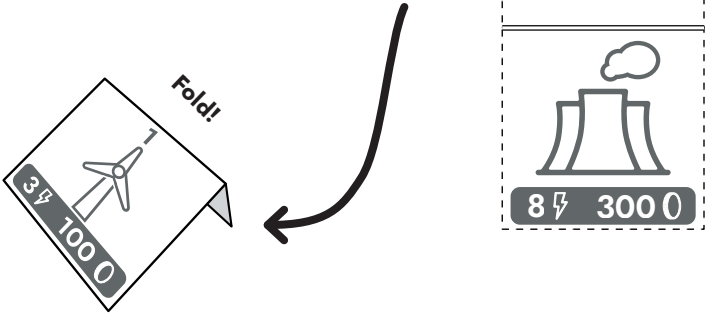
COAL AND NUCLEAR POWER

Dismantling costs	-200 ⌚
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POWER PLANTS

<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div></div> <div>5 ⚡ 200 0</div>
<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div>1</div> <div></div> <div>3 ⚡ 100 0</div>	<div></div> <div>5 ⚡ 200 0</div>
<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div></div> <div>5 ⚡ 200 0</div>
<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div>2</div> <div></div> <div>5 ⚡ 200 0</div>	<div></div> <div>5 ⚡ 200 0</div>
<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div></div> <div>5 ⚡ 200 0</div>
<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div>3</div> <div></div> <div>7 ⚡ 400 0</div>	<div></div> <div>5 ⚡ 200 0</div>



PROFIT

0	100	200	300	400	500	600	700	800	900
1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900
2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900
3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900
4,000	4,100	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900
5,000	5,100	5,200	5,300	5,400	5,500	5,600	5,700	5,800	5,900



Can be cut out as required.

ENERGY

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89



Can be cut out as required.



CALCULATION

[illegible]

CALCULATION

[illegible]