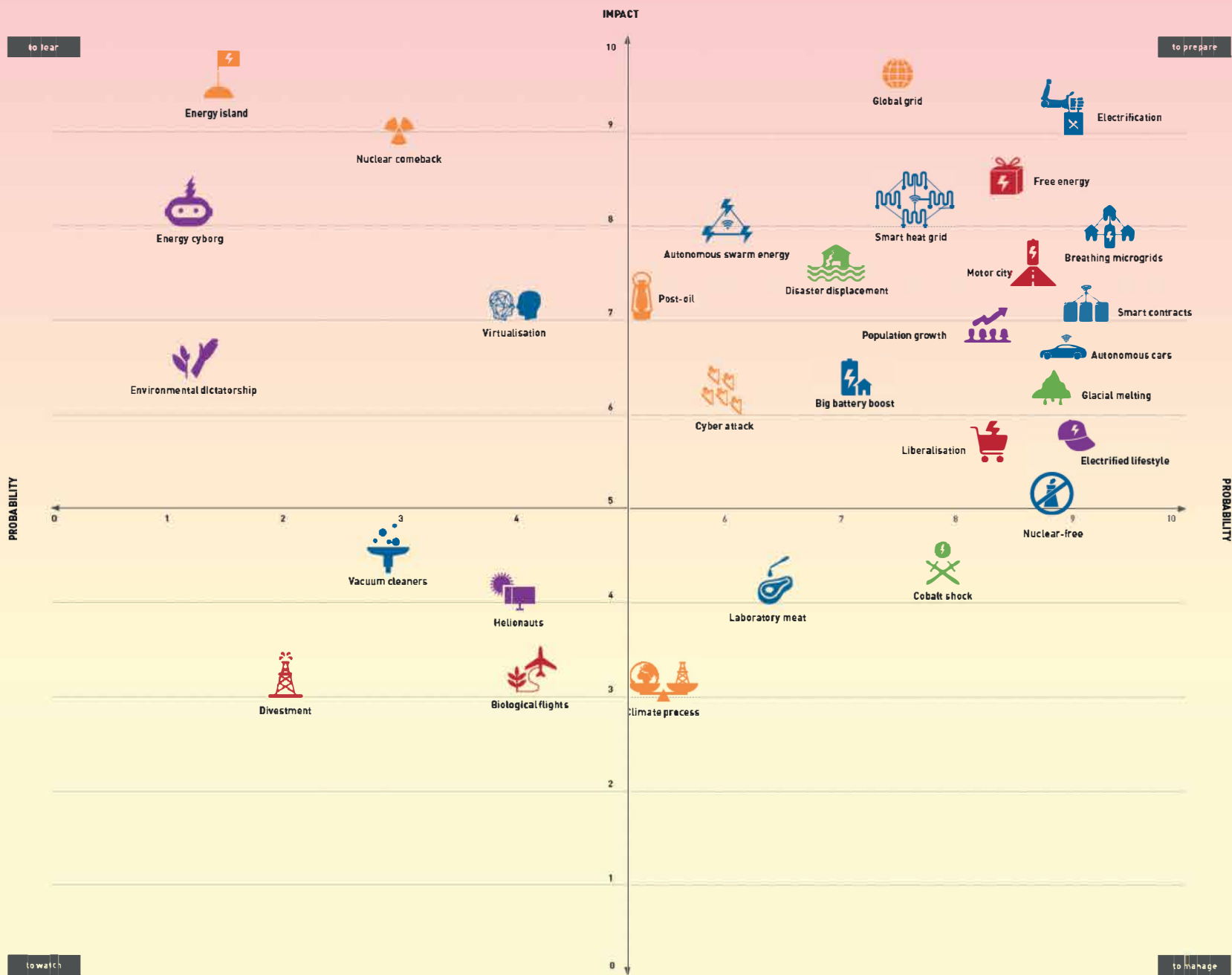


Future shifts in our energy system



● Society ● Technology ● Environment ● Economy ● Geopolitics
 0 = extremely small 10 = very high

Source: GDL 2018

30 Shifts on the way to the energy future

● SOCIETY

- **Electrified lifestyle:** An electrified society craves from one climax to the next, yearning for greater and greater intensity. We are insatiable and want more of everything.
- **Energy cyborg:** Our future energy lifestyle will go beyond sufficiency and voluntary energy thrift. People will become power plants, producing much of their energy requirements in or on their own bodies.
- **Environmental dictatorship:** A radical Green Party comes to power in Germany. It declares a state of emergency and draws all Europe into it. The new government implements personalised CO₂ budgets, temporarily restricting and strictly rationing energy consumption.
- **Helionauts:** Communal energy cooperatives are formed, with their organisational model based on participation and co-determination. Consumers can contribute financially to external, communal solar gardens. In return, they receive credit notes for any surplus energy produced by their share of a solar garden.
- **Population growth:** Over the next decades, the population of Switzerland will steadily increase to more than 10 million people. The country will gradually expand its energy system to handle the increased demand and to guarantee supply.

● TECHNOLOGY

- **Autonomous cars:** Autonomous cars are shared rather than owned and ultimately supplant today's public transport. As a result, considerably fewer cars are on the streets, but they are used more heavily. Mobility remains a status symbol, but the car as a consumer product loses its significance.
- **Autonomous swarm energy:** Digitalised infrastructure leads to a fundamental restructuring of energy companies. Ultimately, it is conceivable that energy companies will no longer require human input. The energy system governs itself through artificial intelligence.
- **Big battery boost:** Large batteries allow energy storage for entire cities to offset fluctuations in energy production. The efficiency of these new storage options strengthens renewable energy sources and pumped-storage power plants will become less relevant.
- **Breathing microgrids:** The electricity providers lose their monopoly. Efficient, local means of energy production and storage enable decentralised power grids. As a result, neighbourhoods and energy cooperatives operate their own networks and become independent. Depending on requirements, they automatically join forces with others or separate. These breathing microgrids shift existing ownership and market structures.
- **Electrification:** The electrification of products and services boosts electricity demand.

- **Laboratory meat:** Petri dishes replace farms: meat is produced artificially, using plant-based ingredients or bovine muscle cells. Less animal feed needs to be grown; land previously used for livestock farming becomes available for other purposes.
- **Nuclear-free:** Switzerland decommissions its nuclear power plants and the proportion of nuclear energy will sink to zero.
- **Smart contracts:** In particular, the energy industry sees blockchain as a new path that could revolutionise the energy system. Smart contracts automate and simplify the purchase and sale for acquisition and feed of energy.
- **Smart heat grid:** Heat can be shared in the same way as electricity. Intelligent, local grids heat residential and commercial areas efficiently.
- **Vacuum cleaners:** Unwelcome CO₂ is extracted from the atmosphere and stored in subterranean geological formations.
- **Virtualisation:** The constant advancement of virtual and augmented-reality technologies shifts more and more activities into the digital sphere. Consumption patterns change and a real physical presence is no longer required for many experiences, such as business meetings.

● ENVIRONMENT

- **Cobalt shock:** A network of new storage options emerges. It gives rise to new material dependencies: raw materials used to produce energy (e.g. mineral oil, gas, coal) become irrelevant in the long term, while those used to produce storage media (e.g. cobalt, lithium) become crucial.
- **Disaster displacement:** Climate change leads to more frequent and severe natural catastrophes and, in turn, more migration. Not only does this increase the population in the regions concerned, but also heightens global awareness of climate change.
- **Glacial melting:** The warming climate destroys (nearly) all glaciers in Switzerland. This results in a loss of Swiss identity, more rock falls and new challenges for the affected regions. The economically prosperous Mittelland is no longer willing to finance the increasingly expensive protection and supply of peripheral regions.

● ECONOMY

- **Biological flights:** The imperative of clean energy will spread to sectors previously untouched by it, such as the air traffic industry. As its share of total emissions continues to increase, kerosene is replaced by other fuels, such as low-emission biofuels, hydrogen and electric drive systems. Airlines voluntarily offer compensation for emissions that cannot be prevented by these measures. What was intended as a communication measure develops into a valid business model.
- **Divestment:** Switzerland recognises that its influence on the world is disproportionately greater than its size and begins to take on greater global responsibility. The government implements measures that reduce both its domestic emissions and its international footprint. As a result, all financial institutions in Switzerland are forced to invest in an environmentally friendly manner. If other countries follow suit, companies will have to become sustainable in order to be able to finance their products.
- **Free energy:** As the marginal cost of renewable energies moves to zero, the same will apply to energy in general. Consumers pay for their energy with user data rather than money.

- **Liberalisation:** Swiss consumers can choose their own electricity provider, which leads to more competition in the national electricity market.
- **Motor city:** China becomes the "Detroit" of electric vehicles. Cars powered by fossil fuels lose their market share and disappear from the streets. This leads to an electrification of road traffic.

● GEOPOLITICS

- **Climate process:** Oil companies continue to contribute to climate change, while others bear the consequences. Coastal cities worldwide receive compensation after suing fossil-fuel companies for current and future climate change costs. The affected companies struggle to remain profitable, and insurance for high-risk business is increasingly hard to obtain.
- **Cyber attack:** An increasingly electrified and digitalised energy infrastructure makes the network susceptible to targeted hacker attacks. Potential consequences range from data theft and power cuts to the destruction of physical property and massive financial losses.
- **Energy island:** In order to avoid dependency on other countries, legislation is passed that obliges Switzerland to provide a largely self-sufficient energy supply.
- **Global grid:** The European electricity grid, which integrates the Swiss system, gradually expands and ultimately merges with other utilities to form a collective global grid. This allows the world's most efficient power plants and transmission technologies to be shared globally.
- **Nuclear comeback:** Forms of energy that were presumed dead may experience a second or third spring. The nuclear industry may also face a renaissance, as it is considered an instrument of power in a central energy supply system.
- **Post-oil:** Oil-fired heating sources are banned from buildings. This leads to a massive reduction of emissions in the building sector. Other systems such as heat pumps and district heating can largely prevent CO₂ and particulate emissions.