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Denk-Schrift Energie

Energie effizient nutzen und wandeln
Beitrag zur nachhaltigen Entwicklung in der Schweiz




Summary

Currently, carbon-based fuels account for more than 80% of energy supplies in Europe and worldwide. Due to the burning of these fossil fuels, concentrations of the greenhouse gas CO_2 have risen by 20% over the past 50 years. The anthropogenic increase in greenhouse gases leads to global warming. In the last 50 years only, the mean global surface temperature has risen by 0.6 °C. The warm climate observed over this period is unusual, at least compared with the previous 1300 years. For the next 100 years, climate models predict a substantial further *rise in global temperatures*. If the world continues to rely primarily on fossil energy sources, the temperature will rise by 3.4 ºC (best estimate) by 2100, and rapidly thereafter. If fossil energy sources are largely abandoned, two hypothetical climate scenarios – based on different phase-out times – suggest stabilization at +1.5 ºC (EU target) by the end of the century or an increase of 1.8 ºC with further warming occurring in the next century respectively. In continental inland regions the temperature increase is considerably higher. Because CO_2 is a very persistent greenhouse gas, the climate change that has already arisen cannot be reversed for several generations. However, in the course of this century the expected future warming can be mitigated or stopped by emission reductions.

The damage costs associated with climate change and costs of adaptation measures have only recently been estimated. As climate change intensifies, these costs could increase to 5–20% of global GDP and thus be many times higher than the costs of avoiding greenhouse gas emissions (approx. 1% of GDP). For this reason, greenhouse gas emissions need to be reduced globally by about 70% below current levels by the end of this century. This target is only achievable if industrialized countries cut their emissions dramatically and very rapidly. Furthermore, emerging economies need to limit the increase in emissions and then also start to reduce their emissions within the next two decades. Expecting a global population of 9–10 billion, per capita emissions would need to decrease to around 1 tonne of CO_2 per year. For comparison, India and China currently emit 1.2 and 3.1 tonnes of CO_2 per person per year respectively.

Switzerland's emissions currently account for 1.5 per mille of the global total amount. If "embedded" emissions are also included, i.e. CO_2 emissions abroad associated with the production of goods intended for consumption in Switzerland, the Swiss portion is 70% higher. Considering the ethically relevant measure of per capita emissions, Switzerland's current output of 6 tonnes per person per year (10.7 tonnes including imports) is clearly above the long-term target of around 1 tonne of CO_2. To achieve a reduction to the sixth part of today's CO_2 emissions by 2100, in Switzerland an annual reduction by at least 2% would be required. For a region or country like Switzerland, these reduction efforts not only provide global benefits but also offer direct secondary benefits.

Apart from the challenges posed by climate change, risks related to energy supply arise from the unequal regional distribution of fossil fuel resources, which currently account for 80% of primary energy. The geopolitical supply risk is particularly distinct in the case of oil and gas, which continue to dominate global energy markets, with a 55% share of the primary fuel market. The dependency of major

economies on a small number of mostly politically unstable regions involves a substantial risk of violent conflicts.

An additional *supply-side challenge* will arise from a decline in global oil and gas production. Experts expect global production of conventional oil to peak between 2015 and 2035, and gas production to peak in the second half of this century. Thereafter, available supplies of conventional oil and gas will decrease. If global demand for oil is still rising at that point, then oil and gas prices will increase sharply, as alternative options remain limited in the short to medium term. Switchovers to non-conventional oil (tar sands and oil shale) and particularly coal, which already occur, give rise to substantial additional CO_2 emissions and other environmental impacts.

To successfully meet these challenges will require radical *innovations* and new corporate solutions in the following areas: improving the efficiency of energy conversion; reducing energy demand through improved and alternative processes; increasing recycling and improving efficiency in the use of energy-intensive materials; replacing materials and substances with less energy-intensive alternatives.

The challenge that society needs to face in the decades ahead is to reduce the *consumption of fossil energy* to the sixth part by 2100 while maintaining services at a comparable level. Today, this vision is thwarted not so much by a lack of technical possibilities as by society's ideals and habits, and a lack of political incentives. The construction sector should aim at adopting specific energy standards (e.g. passive house, "Minergie-P") for new buildings and renovations. In the transport sector, public and private modes need to be optimally combined, and traffic growth should be controlled by appropriate spatial planning. CO_2 emissions from private vehicles should firstly be reduced to less than 120 g/km in line with EU targets and later to much lower values. At gas- and coal-fired power plants, it would be essential to capture and sequester CO_2 emissions. To replace aging nuclear power plants by gas-fired power plants of the latest standard would increase CO_2-emissions by 18%. An abandonment of nuclear power plants will complicate climate policy additionally. However, nuclear energy does not find approval by part of the population due to the problems involved (nuclear proliferation, disposal, maximum hazardous incident). The goal of reducing CO_2 emissions to 1 tonne per person per year by the end of the century appears to be attainable if the use of fossil fuels is restricted to the most important applications where substitution is most difficult, e.g. aviation or the production of certain plastics or crude steel.

In addition to the further development of existing forms of energy and to the efficient use of energy and goods in general, *renewable energy resources* are one of the key answers to the challenges of securing future energy supplies. The technical potential of renewable energy resources is sufficient to meet global primary energy demands. At present, the economically practicable potential remains much lower. Although the use of renewables under current market and pricing conditions is in some cases already economically viable, from a business perspective the costs may still be up to ten times higher than with the use of conventional fuels. This difference could be reduced, for example, by giving due consideration to the external costs associated with consumption. However, the costs of the new technologies will also fall as the learning curve and economies of scale take hold. Even so, the extent to which energy demand, especially in the transport sector, can be met by domestic renewables will be limited in the coming decades, and Switzerland will consequently continue to be reliant on imports of fossil energy.

Energy efficiency and renewable sources of energy ought to become more attractive economically. Therefore, energy prices should reflect external costs comprehensively. External costs of energy use do not only include the costs of damage caused by classical air pollutants, the risk-related and legacy costs of nuclear power, and the external costs of renewables, but also the costs of damage and adaptation associated with climate change and the costs of securing access to energy resources. The costs of adapting to climate change have been little studied

to date. For Switzerland, they will be considerable in the mountainous cantons and in the tourism and energy sectors.

External costs can be taken into account in various ways, e.g. by differential taxation or the establishment of emission trading systems. The inclusion of external costs in energy pricing needs to be accompanied by more stringent technical standards, especially in the construction sector and for mass products, and also by obligations and incentives for property owners to reinvest. Investments in energy efficiency, material-use efficiency and in renewable energy resources are also economically attractive as they stimulate domestic value creation and employment and reduce geopolitical risks for Switzerland.

Because of its expertise, high-tech products, innovativeness and outstanding training facilities, *Swiss industry* exerts a considerable influence on future decision-makers in industrialized and emerging nations. A prerequisite for the maintenance of Switzerland's innovativeness is an *outstanding education sector.* The globally recognized status of Swiss research needs to be preserved and enhanced. In the long term, this favourable environment should be reinforced by a progressive energy and climate policy in Switzerland and turned to economic advantage.

Many conceivable technical and corporate solutions – and political measures designed to promote them – raise questions of *acceptability to society.* Although recently the awareness of the need for an effective energy and climate policy framework to avoid anticipated damage has risen, increased education and communication efforts are required on the part of the state, the private sector and civil society in order to translate this consciousness into permanent changes in individual behaviour and the *political framework*.

The energy and climate issue will demonstrate to what extent a social system based on free-market economics is capable of correcting self-induced aberrations in resource use by changing the background conditions. Given the global nature of the problem, there is a need for an effective political framework stimulating immediate action at all levels – municipal, cantonal, federal and international.

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