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**Autor:** Ribi, Rolf  
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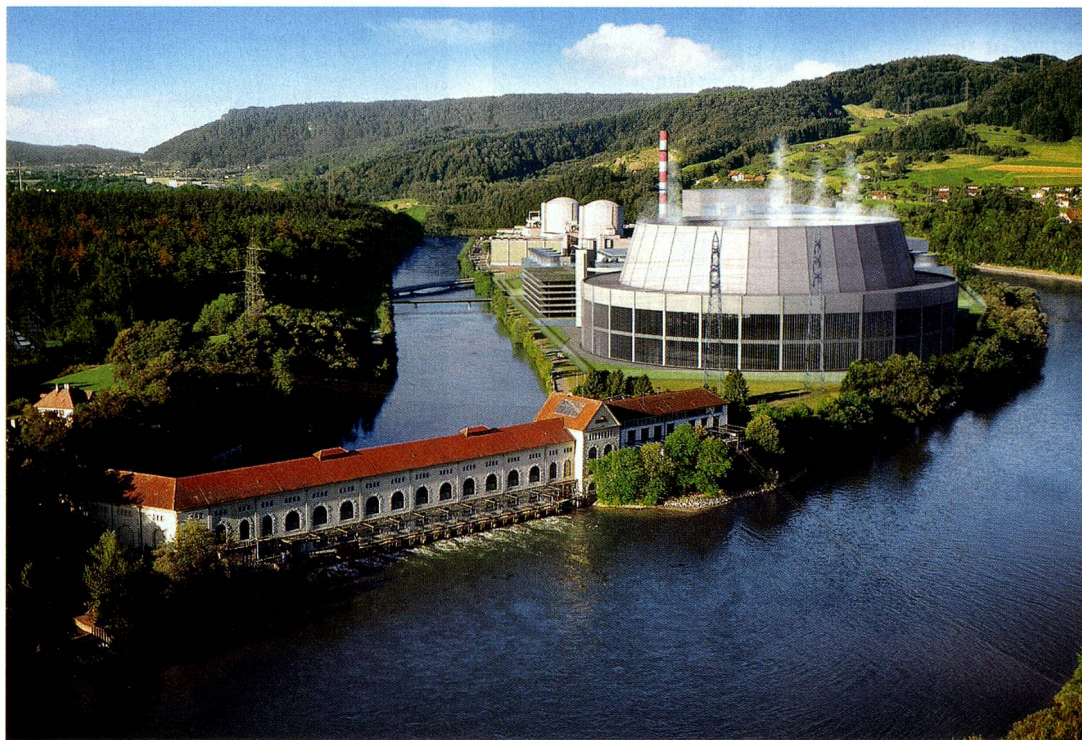
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## Are the lights set to go out in Switzerland?

Words of warning from the electricity industry: the nation's power supply could be in jeopardy without new large-scale power stations. Do we really need new nuclear or gas-fired power plants, or can "green" electricity secure future energy supply? By Rolf Ribi



The Beznau project submitted

"The cheapest and most sustainable energy is energy we don't use", in the words of Federal Councillor Moritz Leuenberger, which have been used hundreds of times in speeches by politicians and managers on the issue of energy. However, this sentiment has had no lasting effect: total energy consumption in Switzerland climbed by 3.5% between 2000 and 2006 (latest figures). The greatest rise was in electricity consumption, which increased by a full 10%. The Swiss have used 1 to 2% more electrical energy each year since 1990. The reasons for this are obvious - more people, greater economic growth and prosperity and silly little things like coffee machines with a keep-warm setting, power-guzzling electric heaters and the stand-by mode of countless electrical products.

Total energy supply in Switzerland in 2006 paints the following picture: four fifths is made up of fossil fuels for heating, industrial process heat and transport, while electricity accounts for one fifth. Around 53%

of domestic electricity is generated by hydraulic power stations and reservoir power plants in the mountains, while 42% comes from the five nuclear power stations (the remainder from recycling, small power stations and renewable sources). At the socket, the reality is quite different: as Switzerland trades in electricity internationally, exports clean hydraulic power and imports unecological nuclear and carbon-generated power, only 34% of hydraulic energy is retained compared to 60% of nuclear and carbon-based power.

### Shortfalls in power supply?

Walter Steinmann, Director of the Swiss Federal Office of Energy, says: "Switzerland's supply of fossil fuels, in other words crude oil and natural gas, is assured until 2020." And the same timeframe applies to the supply of electrical energy. Looking to the future, pro-business circles and the SFOE have identified a shortfall between

domestic production and domestic demand after 2020. There are two key factors at play - the gradual decommissioning of the oldest nuclear power stations from 2020 and the increasing demand for electricity. The expiry of long-term supply contracts with France from 2018 also has to be taken into account. According to the Association of Swiss Electricity Companies (VSE), there

will be a shortfall in electricity of 13 to 22 TWh (1 terawatt hour corresponds to 1 billion kilowatt hours) in 2022 and of 17 to 31 TWh in 2035. The Federal Office of Energy estimates shortfalls of 14 to 17 and 12 to 21 TWh respectively for the same years.

Anxious Swiss citizens are wondering whether the lights in Swiss homes will one day go out. Heinz Karrer, head of the power giant Axpo, anticipates "interruptions to supply in an extreme scenario" and greater dependence on other countries. Giovanni Leonardi, head of Switzerland's largest power company Alpiq, warns that "power cuts in individual regions would be catastrophic for the entire country". Avenir Suisse, a

pro-business institute, forecasts a "greater probability of power cuts if there are also production capacity shortages in neighbouring countries".

### Controversy over power shortages

The "Neue Zürcher Zeitung" comments: "The expression 'electricity shortfall' is inappropriate." It argues that this "mechanistic view" overlooks the fact that a power shortage will lead to higher prices and therefore a reduction in demand. It also says that rising energy prices would have the "welcome side-effect that previously uneconomical sources of energy and technologies would become marketable". The article's author also reminds the reader of the market-economy maxim "scarcity is the mother of invention".

With the impending shortfall in the electricity industry, green critics are taking a hard line. The Swiss Energy Foundation (SES) believes the industry is scaremonger-

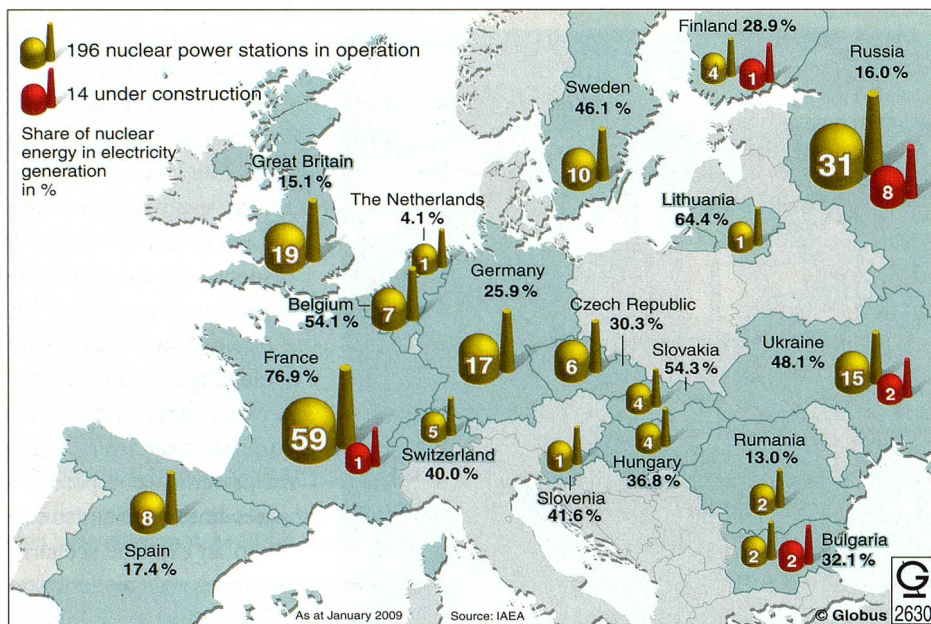


ing to keep the five existing nuclear power stations in operation as long as possible. After all, each extra year in operation beyond the authorised lifespan produces high additional income. WWF Switzerland adds: "The power companies are more concerned about the lucrative peak electricity business with countries abroad than about ensuring power supply for Switzerland."

giant Atel wants to construct Gösigen II, and power companies Axpo and Bernische Kraftwerke have plans for new nuclear reactors in Beznau and Mühleberg. A new nuclear power station with an output of 1600 MW would enable Beznau I, Beznau II and Gösigen to be replaced at the same time.

The three projects share similarities – the European pressurised water reactor

A core meltdown of the reactor with serious consequences for the human population and the environment would be the worst-case scenario in the operation of a nuclear power station. Swiss companies operating this kind of plant have to take out liability insurance with cover up to CHF 1 billion. Federal government acts as an insurer for further damages up to CHF 1 bil-



Electricity from nuclear power in Europe: reality and future

Switzerland is in fact an important hub in the European electricity trade. Axpo Group member, the Elektrizitäts-Gesellschaft Laufenburg (EGL), alone traded a total of 67 billion kWh of power in the 2007 financial year, which is more than Switzerland uses in a year. Water is pumped to reservoirs high in the mountains using cheap energy from nuclear power stations and the peak energy produced is sold at higher prices. According to Heinz Karrer, head of Axpo, "trading in electricity is undoubtedly good business".

### Controversial nuclear energy

Five nuclear power stations are in operation in Switzerland – the smaller stations of Beznau I and Beznau II in the Canton of Aargau, Mühleberg in the Canton of Berne, and two larger stations in Gösigen (970 megawatt output) in the Canton of Solothurn and Leibstadt (1030 MW) in the Canton of Aargau. The legal lifespan of these stations will come to an end between 2020 and 2045. Energy Minister Leuenberger has received no fewer than three applications for new nuclear power stations in the past year. The power

EPR-3, relatively low cooling towers without great clouds of steam, a cost of CHF 6 to 7 billion, suitable locations and acceptance among local residents (except for Mühleberg). But all nuclear projects in Switzerland – nuclear power stations and atomic repositories – are subject to a lengthy legal procedure.

### Safety and liability

There are several issues concerning the planned nuclear power stations, mainly relating to safety and the permanent disposal of radioactive waste.

The opposing sides are very divided on the issue of the safety of nuclear power stations. By law in Switzerland, the risk of damage to the reactor core must not exceed 1 in 100,000 per year of operation. Anton Treier, of the Swiss Federal Nuclear Safety Inspectorate, explains that the new "third-generation" plants – like the ones planned in Switzerland – must even be able to cope with a core meltdown, the most serious potential accident. But he adds: "The release of radioactivity cannot be completely ruled out in the event of a serious accident."



Alternative energy production

lion (an increase to CHF 1.8 billion is planned). Any costs incurred by federal government are ultimately borne by the general public. "Operators are subsidised to give priority to nuclear power over other forms of energy", says nuclear-friendly Avenir Suisse.

### Unresolved disposal issue

The disposal of radioactive material is the main problem with nuclear energy. Since the civil use of nuclear power began, 300,000 tonnes of highly radioactive material have been accumulated worldwide (including 2,000 tonnes of weapons-grade plutonium), to which more than 10,000 tonnes are added each year. There is no system for the disposal of nuclear waste in deep geological strata in operation yet anywhere in the world. Most nuclear waste emits radioactivity in water tanks at temporary sites close to the reactors. The storage of high-level waste from nuclear power stations needs to be based on a time-scale of a million years, and the disposal of low to intermediate-level waste on one of 10,000 years. "Finding a definitive solution for such long periods of time is bordering on science



fiction", suggests Jürg Buri of the Swiss Energy Foundation.

Under Swiss legislation on nuclear power, radioactive waste must be disposed of in Switzerland "in principle". The search for suitable repositories has been going on in Switzerland for 30 years. The National Cooperative for the Disposal of Radioactive Waste (Nagra) believes the construction of a final repository for radioactive waste 600 metres below the ground in Opalinus Clay is feasible. According to the government, this would satisfy the legally required "demonstration of feasibility" for the disposal of spent fuels and high-level waste. The government's aim is to find a final repository for low and intermediate-level waste by 2030 and for high-level waste by 2040.

#### Nagra caught in the crossfire

When Nagra named six possible locations for the disposal of nuclear waste last autumn, there was outrage in all the cantons and regions concerned. There was strong opposition from Zurich's Weinland and Bözberg in Aargau to Südfuss in Jura. There was also a negative reaction in southern Germany and Vorarlberg. The Swiss Parliament would be responsible for granting outline permission for a final nuclear repository. In the event of a referendum, the Swiss people would have the final say, but that is unlikely to happen before 2019.

Even though there is opposition to Nagra's plans, their experts have received some recognition: whenever researchers abroad are looking for permanent repositories for nuclear waste, they visit two Nagra rock caverns in Grimselpass and close to the Jura town of Saint-Ursanne, which dates back to the Middle Ages. Whether granite or clay, Nagra experts believe both rock strata make ideal deep repositories several hundred metres into the mountain: "Geology gives us safety for thousands of years."

Assessing the chances for new nuclear power stations in Switzerland, Energy Minister Moritz Leuenberger says: "New nuclear power stations will only win the support of the people if everything conceivable in relation to energy efficiency and renewable sources has genuinely been done." He adds: "It will be difficult to win a referendum unless the issue of the permanent storage of radioactive waste has been resolved."

#### Are gas-fired power stations the answer?

Could a major gas-fired power station using gas and steam turbines to produce electricity provide an alternative to nuclear power stations? This modern technology offers various benefits – a high level of technical efficiency of around 55%, a plant size of around 400 MW, the production of base load energy around the clock, a short realisation time of just three years and moderate construction costs of around CHF 380 million. However, there are two major disadvantages – fuel costs and environmental pollution.

Fuel costs represent 72% of the production costs, which means high dependency on the price of natural gas. "The greater the instability of gas prices, the greater the instability of electricity prices" (Avenir Suisse). And what about Switzerland's supply of natural gas, which covers 12% of total energy consumption? "Our supply is secure thanks to a geographically broad purchasing base", explains Ruedi Rohrbach, CEO of Swissgas. Three quarters of the natural gas used in Switzerland comes from Western Europe, mainly Norway and the Netherlands. There are no supply contracts with Russian producers but Russian natural gas still makes up 21% of our gas imports.

Gas-fired power stations pollute the environment with the greenhouse gas carbon dioxide. Parliament demands full compensation for these emissions through the purchase of emissions certificates. The revenues from these certificates are used to fund carbon dioxide-reducing technologies in Switzerland and abroad. The costs for the purchase of CO<sub>2</sub> certificates are lower abroad than in Switzerland. The electricity company EOS says the planned gas-fired power station in Chavalon in Valais could be constructed with a foreign share of 50%.

There is also opposition to gas-fired power stations. Left-wing and green parties prioritise renewable sources and will only consider gas-fired stations if nuclear power is abandoned. Conservative parties are mainly opposed to fossil-fuel power stations because they want to promote nuclear power. WWF Switzerland says that gas-fired power stations have "no place in our climate policy".

#### Renewable sources

What contribution is made by renewable sources in Switzerland, such as hydraulic power and the so-called new renewable sources like solar and wind power, geother-

mal heat and biomass? Eco-electricity from all these sources represents 56% of total electricity production, principally thanks to hydraulic power. In terms of electricity consumption, the contribution of the new renewable sources is again very modest at 5.7% – 3.7% from wood and biogas, 0.8% from geothermal heat, just 0.13% from solar power and a mere 0.004% from wind power.

"Green energy" is now set to be promoted in Switzerland too. Swiss energy policy has set a target of 10% of current electricity consumption to be provided by solar (photovoltaic) and wind power, small hydraulic power stations, geothermal heat and biomass by 2030. As in other countries, relatively expensive eco-electricity is subsidised. Ever since the start of the year, all consumers pay 0.45 cents per kilowatt hour into a fund which will reduce the price of green energy fed into the electricity grid for 20 to 25 years. New eco-friendly projects and technologies only have a chance on the market with this state support. However, Parliament with its powerful lobby from the electricity and nuclear power industries has set a low upper limit for this subsidy. The CHF 250 million available has been quickly exhausted by proposed projects. Increasing the levy to 0.6 cents per kilowatt hour is now on the political agenda.

"It will be possible to supply the whole of Switzerland using renewable sources within the next decade", explains SP National Councillor Rudolf Rechsteiner. However, with its current system for promoting these sources, Switzerland risks falling behind. This politician from Basel is calling for the unrestricted feeding of subsidised eco-electricity into the grid, if necessary through a federal popular initiative.

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