1. EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

EXECUTIVE SUMMARY

Switzerland has taken major decisions not to replace existing nuclear reactors and to reduce by a fifth its greenhouse gas (GHG) emissions by 2020 using only domestic measures. These are challenging objectives, and the country now needs to identify the most viable ways to meet them at least cost and at minimum risk to its energy security.

NUCLEAR PHASE-OUT

The accident at the Fukushima Daiichi nuclear power plant in March 2011 had a far-reaching impact on energy policy in Switzerland: in May 2011, the government (Federal Council), followed by the parliament in September, decided not to allow replacement of existing nuclear reactors and therefore to gradually phase out nuclear power at the end of the current plants' lifetime, while redefining the country's energy policy.

Since nuclear energy provides 40% of Switzerland's electricity generation, the decision to phase it out is very significant. The decision to do so gradually, as the plants reach the end of their operating life, is a cautious one. Although the notion of "operational lifetime" of nuclear power plants (NPPs) does not exist in Switzerland, the actual end of operation could occur in the period from 2019 to 2034, with the largest plants retiring towards the end of this period. It may take even longer, as according to the Swiss law, NPPs may operate as long as they meet the safety criteria.

Phasing out nuclear power gradually gives more than two decades to implement the major change, necessary for planning the appropriate policies and measures and for attracting investments. It is also important to acknowledge that the phase-out decision was guided by the highly probable rejection of new nuclear plants in foreseeable referendums; in a country of strong direct democracy, the possibility of a further referendum on nuclear energy cannot be ruled out.

ENERGY STRATEGY 2050

Following the phase-out decision, the government adopted an energy strategy for 2050, which aims at substantially reducing final energy and stabilising electricity use. Reaching these strategic goals will likely require great effort, especially as Switzerland's population and economy are expected to continue to grow. Electricity demand, in particular, is generally closely linked to economic growth, and electricity demand may actually increase in several sectors in the coming decades, for example because of potential widespread penetration of electricity-using innovations, such as heat pumps and electric vehicles.

The government is now preparing legislative proposals in line with the strategy, to be submitted for wide public consultation later in 2012 and to parliament in mid-2013. The new legislation is scheduled to enter into force at the beginning of 2015. The medium-

term policies and measures would primarily focus on improving energy efficiency and increasing electricity generation from hydropower, but also from other renewable sources and, as a last resort, from natural gas.

Over the longer term (after 2020), a gradual overhaul of energy and CO_2 taxation is mooted. The current promotion of renewable energy and buildings refurbishment through a grid levy and partial CO_2 tax revenue earmarking would be gradually substituted by an overall energy tax, which would have a "steering" effect on energy demand.

Implementing these plans will require a range of new incentives, including financial and institutional ones. An increase in the CO_2 tax and the feed-in tariffs is foreseen and the eligibility of individual technologies for remuneration will be increased. The government is currently working on combining long-term policy goals with programmes and policy milestones that keep pace with each NPP shut-down.

In the absence of nuclear power, maintaining sufficient electricity capacity will require strong policies to promote energy efficiency and renewable energy. Such measures have already been outlined, but they will likely not be enough. New baseload capacity and imports are options on the supply side. For baseload generation, gas-fired power plants would be the simplest option. Treating their CO_2 emissions the same way as in the neighbouring countries, *i.e.* as part of an emissions trading scheme, would give a strong positive incentive for investors.

Changing the energy system in the decades to come will also require efforts in energy technology research, development and demonstration. The government should maintain plans to double public funding for these activities, with an emphasis on development and demonstration, for example systems management and efficiency of electricity networks.

ELECTRICITY MARKET REFORM

Since the last IEA in-depth energy policy review in 2007, Switzerland has made clear progress in electricity market reform. The Electricity Supply Law, in force since 2008, initiated the first stage of electricity market liberalisation. End-users with an annual consumption of more than 100 megawatt-hours (MWh) are free to choose their supplier. Subject to a possible referendum, market opening would be extended to all customers by 2015. This would be a positive step.

Commendably, Switzerland has also created an independent regulator (ElCom), with sufficient authority and resources. Non-discriminatory access to the grid is now ensured, and grid tariffs are fixed by the regulator. The ownership of transmission grid assets will be transferred to Swissgrid, the transmission system operator, by the end of 2012 which will create highest independency of the transmission network. Moreover, market transparency regarding final prices has been improved since ElCom publishes very detailed price information by canton and municipality.

Whatever the choice for replacing nuclear power, large investments in generating capacity will be needed. Major investments will also be needed in transmission (including cross-border) and distribution grids, even without the nuclear phase-out, because of ageing infrastructures, increasing cross-border flows and load from new hydro facilities. The procedures for permitting new generating capacity, including storage, and for new power lines, should be simplified and shortened. As the electricity industry is capital-intensive, investors need clarity over the long term. This implies a need for stable political decisions and legislation.

CO_2 emissions from gas-fired power should be treated as much as possible as in the neighbouring countries where the power sector is within the EU Emissions Trading Scheme, ensuring no overall increase in European CO_2 emissions. The current domestic compensation obligation deters investments and therefore reduces the options for replacing nuclear power in a timely manner, which in turn potentially weakens security of electricity supply over time.

To encourage more investments in generating capacity, the regulatory framework of the retail and wholesale markets should be reconsidered. As end-user prices are regulated close to generating cost and below spot market prices, consumption is subsidised and incentives for investing in generating capacity are reduced. It is no wonder that very few customers have switched from regulated tariffs to market contracts.

Furthermore, the wholesale market price should be able to drive investment decisions. To play this role, the wholesale market must be sufficiently transparent and liquid. Further cross-border integration, based on efficient cross-border capacity management and market coupling with implicit auctions of cross-border capacity, should be continued and accelerated. Generation transparency should be improved, with the publication of comprehensive data related to capacity availability and utilisation.

As a result of Switzerland's geographical location in Europe, the country has significant cross-border electricity flows and its reservoir and pump-storage hydropower plants could represent a battery for the wider region. The country should continue to pursue more effective regional integration to developing its electricity infrastructure, to its own benefit and to that of its neighbours. The efforts to join the Central-West Europe market coupling are very welcome, as that would allow for the optimisation of the allocation process for cross-border capacity and closer market integration in Europe.

The combination of regulated low end-user prices and integrating regional electricity markets could pose a potential concern for Switzerland's security of electricity supply, but it could also be turned into an opportunity for the country. As the domestic retail electricity prices are distorted, as in many countries, power exports may be preferred at the expense of serving domestic consumers. With increasing cross-border market integration, this may over time lead to domestic supply shortages and other reliability issues. If domestic end-user prices better reflected regional wholesale prices, such concerns would be reduced. On average, electricity would cost more for end-users, but in order to increase the acceptability of higher prices, particularly for energy-intensive, trade-exposed enterprises, Switzerland could introduce measures to buffer their impact.

Switzerland could thus benefit more from its hydropower capacity for exports and at the same time encourage efficiency improvements in both electricity generation and use. Cost-reflective pricing would also enable to create clear incentives for efficient, timely and innovative investment, as well as operational and end-use responses. Moving to such a system could be gradual, starting with the eligible customers.

ENERGY RELATIONS WITH THE EUROPEAN UNION

Switzerland has been negotiating an agreement on electricity with the European Union in order to ensure full compatibility between Swiss and EU market rules. This makes sense, given Switzerland's strong integration in the European electricity market. The IEA welcomes efforts to bring these negotiations to a successful close.

The Energy Strategy 2050 implies an even closer integration with the European Union, as cross-border electricity flows will increase and heavier reliance on gas imports is likely. Ambitious efficiency policies are more effective, if closely aligned with those of the European Union. In this context, it makes sense for Switzerland to envisage future negotiations on other energy issues, such as natural gas, energy infrastructures and efficiency.

DECARBONISING HEATING AND TRANSPORT

Switzerland has set a national target to reduce GHG emissions by 20% from 1990 to 2020. Because the country's energy-related CO_2 emissions come mostly from oil use in transport and space heating, action is most needed in these areas. Commendably, the country is making polluters pay by using a CO_2 tax for financing decarbonisation efforts in space heating and process heat. Stronger efforts will be needed to reduce emissions from road transport, however.

Now that the 2020 target has been set, the government needs to introduce new and/or strengthened policies and measures without delay. It should also thoroughly examine the implications of a strictly domestic 20% reduction target and ensure more even marginal abatement costs across sectors.

Turning to end-use sectors, road transport is the largest CO_2 emitter in the country and has the most potential for further cost-effective emissions reductions. The fleet-wide CO_2 limits for new passenger cars will take full effect in 2015 which is an important initiative. As an incentive measure, the government should also consider raising transport fuel taxes, possibly in a revenue-neutral manner.

The government has for years worked on improving the public transport system, already of a very high standard. Efforts to shift freight traffic from road to rail have also been successful, but potential for further improvements still remains. Switzerland's distance-related heavy vehicle fee has been copied in several other countries.

Emissions in the buildings sector are also high, owing to a large share (more than 50%) of oil in heating. Replacing oil heating by heat pumps or renewable energy sources, for example, makes sense for both CO_2 reduction purposes and as a means to shielding heating costs from changes in international oil price developments. Here, the building refurbishment programme is a very useful tool. The IEA welcomes the plans to accelerate the programme and increase its budget. Incentives for energy-saving renovations in rented dwellings have been improved and could be raised further, a crucial matter in a country with a high share of tenants.

Since the 2007 in-depth review, the cantons have adopted more stringent and harmonised standards for energy efficiency in new buildings, reaching the levels of the voluntary Minergie labelling system. This work to gradually increase stringency deserves credit and should continue.

The government should allocate sectoral emissions reduction targets evenly to limit differences in abatement costs across sectors. The CO_2 Law's main instrument is the CO_2 tax. It is a rational approach and the tax has already helped reduce oil use for space heating and in industry processes.

Switzerland has a tradition of light-handed regulation and gives priority to "effective and voluntary" private-sector measures. "Effective and voluntary" measures are those like

the CO_2 tax scheme, where market players are exempted from the tax if "voluntarily" fulfilling pre-agreed targets. Many past purely voluntary schemes, *e.g.* car fleet efficiency or appliances, have proved ineffective and have been replaced by minimum efficiency performance standards. As the need to reduce CO_2 emissions is becoming more urgent, price-based instruments may have to be more extensively used. A broader use and higher rates of CO_2 taxes would encourage investments in new technologies and innovation.

PUBLIC AWARENESS

Several aspects of Switzerland's energy policy suggest a likelihood of higher energy prices: CO_2 emission reductions, nuclear phase-out, even if a gradual one, investments in electricity grids and capacity and convergence with price levels in surrounding countries. Higher prices have often also proved to be a useful instrument for meeting energy and climate policy goals. On the other hand, electricity market opening and energy efficiency measures may help reduce this pressure on prices. The IEA encourages the government to continue informing the general public on energy policy issues to increase understanding of the reasons for possible price rises, particularly important in a country with a strong direct democracy.

OIL AND GAS SECURITY

Oil and gas supply continues to be secure. Oil supply is well diversified, both by country of origin and import route. Natural gas is also supplied by several countries through various routes. As a landlocked country with no domestic production of fossil fuels, Switzerland consistently holds emergency stocks much in excess of those required by the IEA. Oil stocks are also part of gas security. As Switzerland does not possess large-scale gas storage, dual-fired users are obliged to hold large stocks of fuel oil. Switzerland's oil and gas security policy is fundamentally sound.

KEY RECOMMENDATIONS

The government of Switzerland should:

- ☐ *Develop the legal and regulatory framework regarding the Energy Strategy 2050 to provide stable long-term conditions for energy market participants.*
- ☐ *Adopt a detailed strategy for reducing domestic CO_2 emissions in a cost-effective way.*
- ☐ *Work to improve incentives for investment in electricity grids and generating capacity, including by deregulating end-user prices, shortening and simplifying licensing procedures, and encouraging closer cross-border market integration.*
- ☐ *Pursue closer integration with European energy markets and closest possible alignment of its energy policies with those of the European Union.*