OLIVER WYMAN

Keeping the lights on sustainably

How countries can reconcile the competing objectives of energy security

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Introduction

Energy security is a global concern, driven in the main by fundamental developments in demand and supply. Challenges to it at the national level have arguably never been as various as they are now. In the past eighteen months the topic has hit the headlines on a regular basis. Oil and gas prices have shown extreme volatility as a result of production constraints and financial speculation, while geopolitical tensions have led to the nationalization of energy sources and the temporary closure of gas pipelines. Regulatory bodies have increased openness in the supply market and demanded the unbundling of infrastructure ownership. Mergers and acquisitions have taken place among leading industry players, resulting in an increase in cross-border ownership. The climate agenda has more firmly embedded itself in energy sector policymaking.

Faced with growing energy demand, commitments to reduce carbon emissions and deteriorating infrastructure policymakers and industry players are struggling to assess the many options open to them for future investment. The decision-making process is fraught with difficulty. The scale of investment is high, lead times and life cycles are long, and the technological choices require significant trade-offs. Supply creation needs to be matched with demand management. While it is critical to achieve an outcome that is good for the consumer, the supplier and the environment alike, reaching a consensus between competing stakeholder viewpoints is problematic. As a result, in many countries decisions are piecemeal and delayed, and lack the coherence, vision and follow-through that give confidence to all parties.

Oliver Wyman explores the dynamics of energy security governance with a view to helping countries make better decisions in a more timely fashion and with greater stakeholder support. Our approach uses a deep understanding of stakeholder perspectives, an assessment of the key risk drivers of future scenarios, and an examination of the major trade-offs in order to propose recommendations for both governance improvements and policy direction. For the purpose of this study, more than 30 experts were interviewed from academia, politics, industry and non-profit organizations as well as several workshops were held. The entire fact finding was supported by the development of a detailed quantitative energy security model to understand the different trade-offs.

Part 1 of this paper describes our approach and sets out the generally applicable conclusions obtained from our pilot study on Switzerland. Part 2 presents some of the detailed findings of the Switzerland study and suggests a roadmap through which the main actions should be taken forward. Subsequent phases of this project will test the approach on other countries to examine whether the general conclusions hold true elsewhere.

A new approach to energy security

Assessing future supply and demand

Countries across the globe need policies and strategies that take a broad-ranging view of the energy system and its future dynamics. This means considering three key issues. Countries should first focus on the productivity improvements that can be achieved through energy efficiency and energy substitution. They should then anticipate changes in demand that may arise from gradual macro-economic trends or disruptive technological innovations. Finally they should then work towards a supply mix that best suits their particular circumstances.

At the outset some basic questions need to be asked, such as:

- What role does energy security play in supporting national economic strategies?
- How dependent are we on primary energy imports?
- What are the key drivers for future energy demand?
- What do anticipated levels of energy consumption imply about the need for future energy production capacities and infrastructure?
- What levers can be used to best match supply with demand and meet other national expectations?

To begin answering those questions it is helpful to consider energy security as having four objectives:

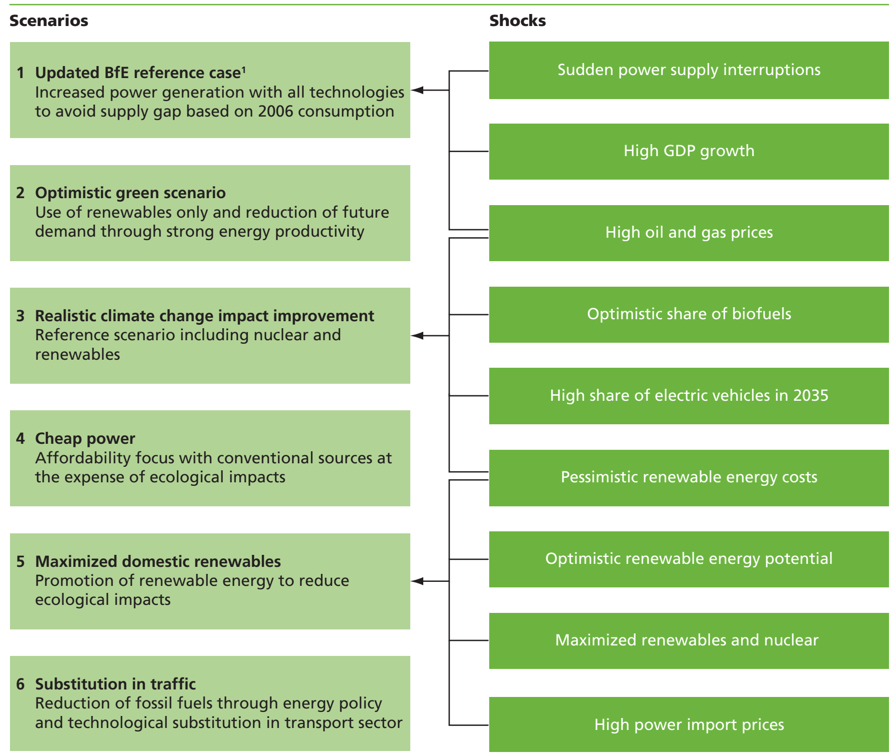
- **Autonomy**: Energy supply that is within the control of a country and is not vulnerable to disruption by external agents
- **Reliability**: Energy supply and distribution that is safe and secure in both the short and the long term and meets demand without interruption
- **Affordability**: Energy prices that are commensurate with the buying power of domestic and business consumers
- **Sustainability**: Energy generation and usage that is sufficient to support a high quality of life and does not damage the environment to an unacceptable degree

The contradictory interests of those objectives indicate the risk trade-offs that need to be resolved within energy security decision-making. Conflicts that are a priority for analysis include the tensions between climate change mitigation and nuclear risks, and between ecological damage and energy shortage.

The impact of these clashes can be modelled within a quantitative supply and demand model that simulates "Volume@Risk", "Cost@Risk" and "Emissions@Risk" (i.e. the bottom-line impacts relating to supply adequacy, productivity and environmental impact), taking into account supply and demand uncertainties. Demand-side uncertainties include GDP and population growth, earth temperature increases and energy efficiency achievements. Supply-side uncertainties include fossil fuel and CO2 allowance price risks, resource supply risks, changing power generation capacities and potential commissioning delays.

The long-term viability of alternative choices are explored through testing the risk-adjusted simulation results in three ways. The first angle supposes different scenarios, based on dominant stakeholder preferences relating to supply and demand. These are based on policy options such as the maximization of renewables, an avoidance of nuclear, and the minimisation of demand (see Exhibit 1). The second angle introduces individual shocks to the planning forecasts. These are largely exogenous variables such as extreme oil and gas prices, emergency plant shutdowns, import cut-offs, and disruptive changes in the market (e.g. a rapid growth in the market for plug-in electric vehicles). Their relevance for some scenarios is greater than it is for others. The third angle looks at optimizing each energy security objective in turn. It considers the demand and supply requirements for this and the associated impacts on the other objectives.

Exhibit 1: Modelled scenarios and shocks in the Switzerland study



1 Bundesamt für Energie (Swiss Federal Office of Energy)

Comparing the results of each risk-adjusted scenario in terms of supply adequacy, productivity and environmental impact enables an articulation the depth of the fault-lines between, say, sustainability and autonomy or between reliability and affordability. By identifying not only the requirements for each strategic choice but also the benefits and risks associated with them, the key alignments and trade-offs within energy policy decision-making can be better understood and communicated.

Factors to influence policy

While countries will inevitably have different policy priorities dependent on their circumstances, the study to date indicates that a number of hypotheses should be borne in mind during decision-making. These relate to:

- The growth of energy consumption and the potential for increasing productivity
- The continued availability of non-renewable energy resources
- The feasibility of the different technological options
- The need for investments into energy infrastructure

Energy consumption and productivity

Energy productivity can be improved through energy efficiency measures and the substitution of fossil fuels by other sources of energy. The potential savings will vary significantly between emerging and industrialized countries. However, given the low price sensitivity within the entire energy system, the achievement of significant improvements is reliant on strong taxation measures, regulatory standards and investment incentives.

In order to achieve a more sustainable regime of long-term resource consumption in the light of regional climate change goals, the substitution of fossil fuels with other sources of energy is critical. In many cases, however, this shift will lead to an absolute increase in power demand, compounding the effects of macroeconomic and social drivers and an increase in global temperatures.

Resource availability

The natural depletion of fossil fuels in the context of a growing global demand for energy will lead to rising energy costs and an associated increase in power market prices. Growing competition for fossil resources will result in higher risk exposures and volatilities regarding the reliability of fossil fuel supply over both the short and the long term. For many countries fossil fuels will thus present both a volume and a price risk. In order to reduce their dependence on imports, countries should look to shrink their fossil fuel consumption substantially. Uranium deposits, however, are broadly spread across the globe, often in countries that are politically stable.

Technological options

In many instances energy generated from national renewable sources will be unable to satisfy future power demand by itself. Due to the current higher cost of renewable power generation compared with conventional thermal technologies, investment incentives remain critical to their take-up, although their unprivileged viability will increase as a result of rising fuel prices and more costly policies to mitigate the effects of climate change.

Fossil fuel technologies (Combined Cycle Gas Turbines [CCGT], coal, gas-fired Combined Heat and Power [CHP]) in combination with the large-scale application of Carbon Capture and Storage (CCS) technology could represent an interesting alternative in the quest to optimize energy security, particularly for power generation in countries with strong fossil fuel deposits. These technologies, however, become a less attractive option over the long term given the expected rise in oil and gas prices, the cost of CO2 allowances and uncertainties regarding the market introduction, volume and cost levels of CCS technology.

The viability of the nuclear option is dependent on a country's technological development, international concerns around nuclear proliferation, the availability of solutions for the safe disposal of radioactive waste and broad societal acceptance. Even though surging raw material prices have substantially increased investment costs for nuclear power plants since 2005, this is still perceived to be an attractive and relatively easy to calculate investment technology.

The degree to which bioenergy (biofuels) can be exploited in a sustainable way over a longer period of time depends on ensuring the change in land use is acceptable in terms of its impacts on a country's food supply and its natural ecosystem (deforestation, water use, biodiversity, etc.).

Thus a renewable energy portfolio combined with a centralised conventional power plant technology will often best meet the four energy security objectives. Such a solution might not only be optimal in terms of its environmental impact, it might also help countries avoid power supply shortages and reduce the risks to price and reliability that would come from any increased dependency on power imports.

Energy infrastructure

In order to meet future demand substantial investments into energy transit (e.g. Liquid Natural Gas terminals, oil and gas pipelines) projects will be required in most regions in order to maintain and/or improve supply reliability. Power grid extension projects to accommodate the output of distributed generation assets (e.g. wind turbines, solar panels) will have the added benefit of increasing the levels of autonomy for national energy security.

Moreover, the increasing uptake of plug-in electric vehicles in the transportation sector over the next 30 years will require high levels of investment to develop a dense power distribution network that will expand and partially substitute the current diesel/gasoline downstream distribution system.

Strengthening decision-making

A roadmap for the future should contain detailed commitments that give comfort to technology developers, energy companies and financial institutions that need to make both near and long-term investment decisions. Ensuring the successful construction and delivery of the roadmap requires an appropriate governance structure and effective stakeholder engagement.

Stakeholder engagement and analysis, achievable through a structured interview process, is crucial for understanding the dynamics of the system and for improving risk governance deficits. Energy security stakeholders can be broadly divided into five categories, although it is important to recognize the different objectives of the individual groups and players within them (see Exhibit 2).

Exhibit 2: Energy system stakeholders

Category	Group	Governance role
Suppliers	▪ Energy companies and utilities, resource countries, transit countries	▪ Policy implementation and system operation
Users	▪ Domestic consumers, service business consumers, industry	▪ Policy preference and endorsement
Enablers	▪ National governments, (inter)national regulatory bodies, financial institutions, solutions providers	▪ Policy direction, guidelines and boundary conditions; opportunity capture
Experts	▪ University research departments, private sector firms	▪ Solutions development
Commentators	▪ Political parties, non-governmental organizations, media research bodies	▪ Policy analysis and endorsement

Governance deficits leading to sub-optimal decision-making and implementation problems arise for a number of reasons. These might be:

- Political – due to entrenched, opposed viewpoints and lobbying by those with vested interests. This might impact on the timeliness and quality of strategic decision-making
- Attitudinal – due to an inherent reluctance to seek the buy-in of critical stakeholders. Failures here might result in low levels of social acceptance and solutions that do not address the investment concerns of large energy consumers
- Leadership-based – due to the inability of key individuals or bodies to make timely decisions that cohere across different policy areas. This might lead to clashes between a country's energy, business and environment goals
- Informational – due to a lack of sufficient robust data to underpin decisions. This might be particularly visible in the area of emerging power generation technologies and their associated risks
- Procedural – due to contradictions, bottlenecks or gaps in the processes designed to green-light new policies or their implementation. For example, energy security decisions might fall foul of planning guidelines
- Structural – due to regulatory weakness and inadequate incentives to support policy implementation. At the macro-level this might result in insufficient levels of investment or a weak alignment with international carbon pricing. At a micro-level it might present itself as, for example, an impasse between building owners and tenants regarding the installation of energy efficiency measures

To move towards a more robust approach to energy security policymaking government bodies and other energy system players should ask themselves the following questions:

1. Does our energy policy fully dovetail with our climate policy in terms of its goals and measures?
2. Are our regulatory and investment incentives strong enough to drive the development of optimal supply solutions, grid infrastructure renewal, energy efficiency measures adoption and new technology development?
3. Is there a need to streamline national regulations, harmonize international laws and strengthen bilateral trading agreements?
4. Does our engagement with the different stakeholder groups enable us to deploy their different strengths to turn the optimal energy solutions into reality?

The approach in action: Switzerland

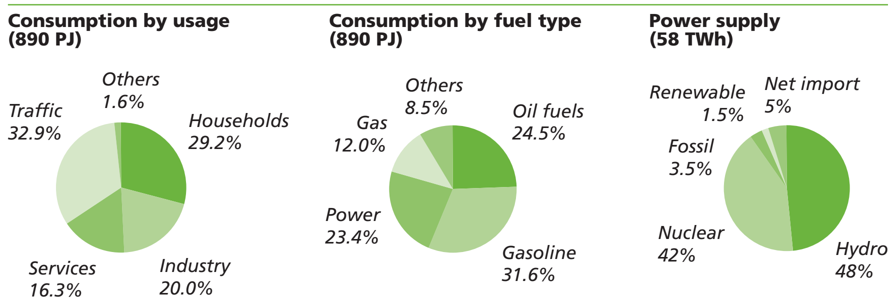
Part 2 sets out the high-level findings of a study of Switzerland's energy security circumstances and governance capability, indicating long-term solutions. The analysis took place between July and November 2008.

Current supply and demand

According to data provided by the Bundesamt für Energie (BfE), total energy consumption in Switzerland has risen five and a half times since 1950 to nearly 900 PJ in 2006. This represents an annual growth rate of 3.1%. The statistics for power show a slightly higher annual growth rate (3.6%) over the same period and a nearly sevenfold increase in overall usage.

Currently households, the business sector and traffic each account for approximately a third of total consumption (see Exhibit 3). In terms of fuel type, gasoline accounts for just under a third of usage, while oil fuels and gas between them account for a little over a third, and power nearly a quarter.

Exhibit 3: Switzerland energy consumption and power supply (2006)



Source: BfE – Swiss Energy Statistics 2006

The almost non-existence of oil and gas resources within Switzerland and the requirement for net power imports means the country is dependent on external sources for approximately 70% of its energy, a cause for concern regarding the future autonomy, reliability and affordability of its energy supply. Current power import contracts will most likely fail to meet demand within the next ten to fifteen years.

Switzerland thus faces a number of energy security challenges in terms of addressing the supply gap and meeting international climate change obligations:

- It has no national deposits of fossil fuel resources on which it can draw
- Public acceptance for increasing the percentage of nuclear power is currently mixed

- The potential of large-scale hydroelectric power is fully utilized
- For geographic reasons the potential for wind power and biofuel production is low
- Infrastructure for using energy from non-hydro renewable sources (e.g. photovoltaic, geothermic, solarthermic) is at an early stage of development

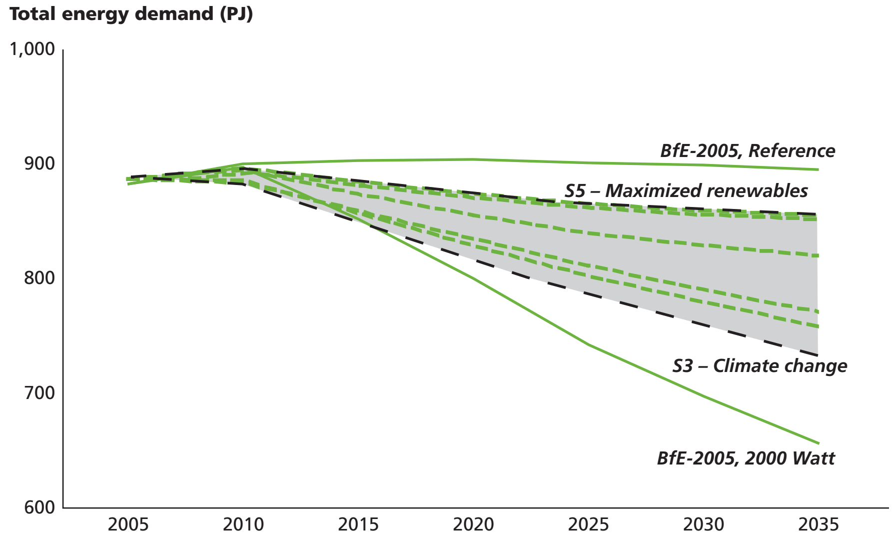
Hypotheses for addressing national constraints

Analysis of the simulations reveal that the sharpest fault-lines are between the sustainability objective of energy security and each of the others. The critical, unresolved question for Switzerland, therefore, is how it can shape its future energy policy to meet the anticipated supply gap in the light of strengthening obligations to mitigate climate change.

Results from the supply and demand model simulations suggest five key hypotheses that should inform policymaking in Switzerland, taking into account national constraints. The first two of these relate to the potential for energy productivity improvements.

1. **Improving energy productivity through increased energy efficiency and demand reduction will significantly benefit sustainability and autonomy.**
   Simulations show that overall energy consumption can be reduced by approximately 10% between 2005 and 2035 (see Scenario 3 in Exhibit 4), even taking into account an annual GDP growth of 0.5-1.4%. The move from fossil fuels to more efficient energy sources can account for up to 50% of overall energy demand reduction, while simultaneously making a major contribution to the reduction of CO2 and particulate matter emissions. Requirements from policy to achieve these benefits include incentives, taxes, regulatory standards and changes in tenancy law.

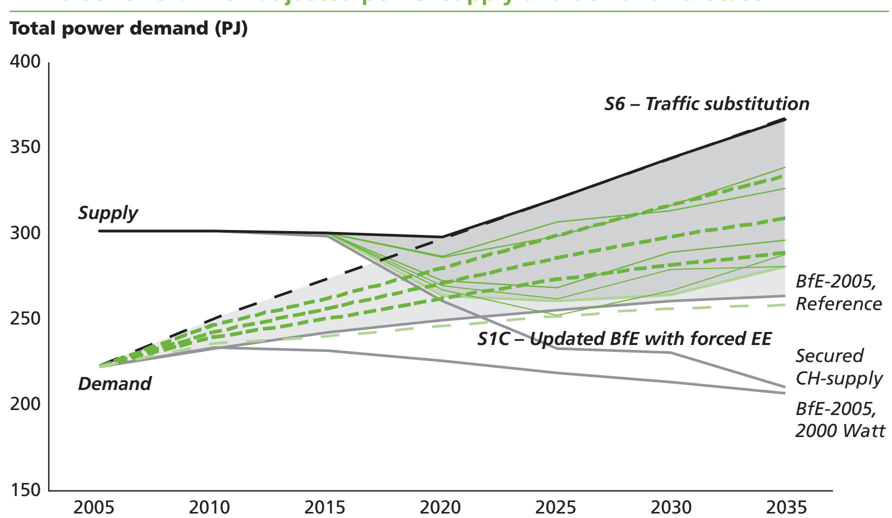
Exhibit 4: Overall risk-adjusted energy demand



Note: Scenarios (e.g. S5) refer to scenarios listed in Exhibit 1

2. **A substantial increase in power generation will be required in order to achieve overall improvements in energy productivity.**
   Energy substitution measures will lead to an absolute increase in power demand. This is due to macroeconomic and social drivers such as the increased heating requirements per capita of a larger number of smaller households. As an example Scenario 3, which employs a combination of nuclear and renewable technologies, shows that even though total energy demand decreases by 17% between 2005 and 2035 power demand rises by 34% over the same period. Scenario 6 in Exhibit 5, which assumes a concerted move towards trains, electric vehicles and biofuels, shows an even more dramatic rise. As a result, it is important to introduce energy efficiency measures to limit the increase in absolute power usage and thus reduce overall future net energy consumption.

Exhibit 5: Overall risk-adjusted power supply and demand forecast

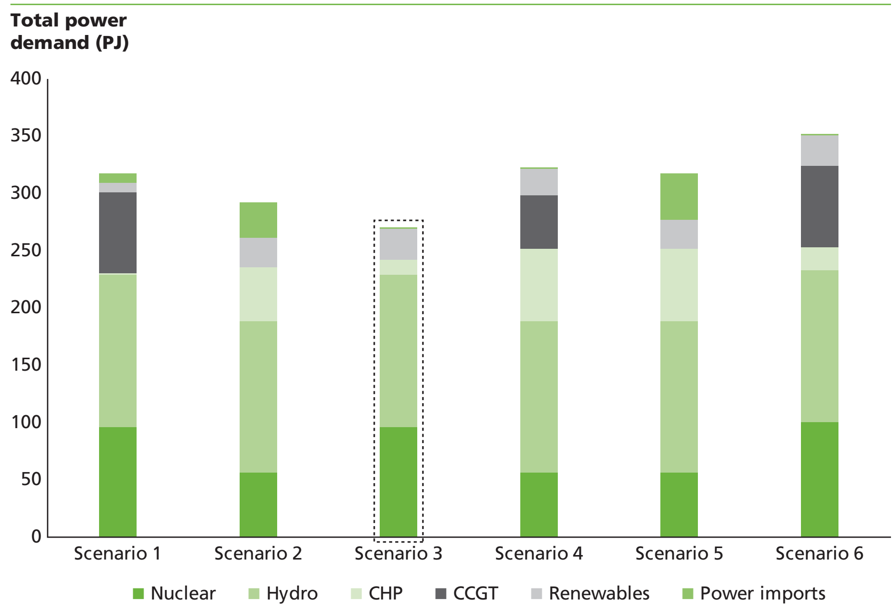


Note: Scenarios (e.g. S6) refer to scenarios listed in Exhibit 1

In the short term demand can be satisfied by existing capacity within the power grid. In the longer term, however, considerable investments are likely to be required to expand either the Swiss grid or the level of imports in order to guarantee reliability. The three final hypotheses therefore relate to the different options for filling the supply gap in the light of expectations concerning demand growth and enhanced productivity.

3. **Energy from renewable sources will be able to meet only a small proportion of future power demand.**
   Even in the scenario that assumes low power consumption and low costs for technology development and power generation (Scenario 3 in Exhibit 6), energy from renewable sources (excluding hydro) will at best meet only 10% of total power demand in 2035. Output of this order will only be achieved through significant and sustained incentives over the next decade in order to ensure the existence of a national renewable portfolio by 2020. It is thus clear that the avoidance of investment in new centralised power generation facilities (i.e. CCGT or nuclear) will lead to power supply gaps and thus a dependence on foreign imports.

Exhibit 6: Potential power demand and supply mix in 2035

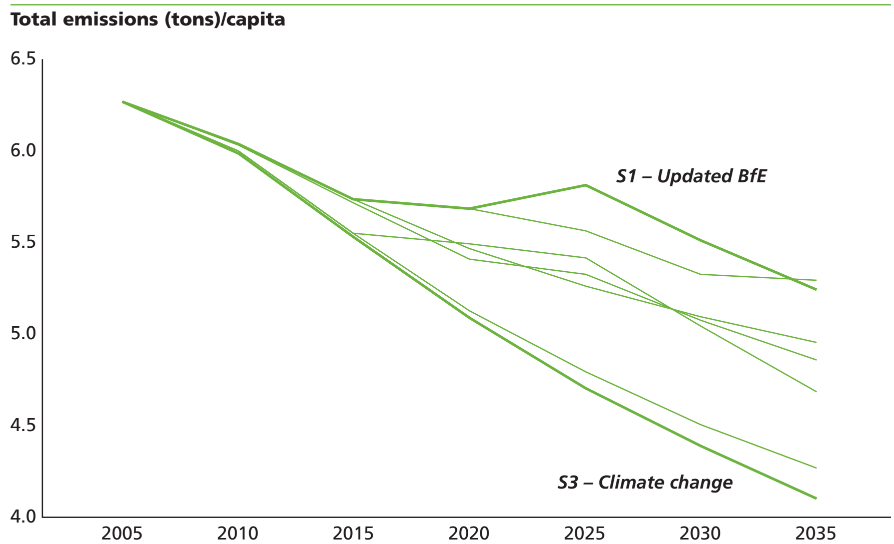


Note: Scenarios (e.g. S3) refer to scenarios listed in Exhibit 1

4. **Competition for global fossil fuel resources will present a significant and increasing price risk.**
   The dependence of the energy system on global market prices will make a CCGT and/or power import strategy a costly option to fill the supply gap, particularly over the long term. However, the risk of short-term economic disruption due to political, market or climatic problems is reduced by the ability of strategic reserves to stand in for supply failures.

5. **The combination of a renewable energy portfolio and nuclear power plants could lead to an optimized solution along all four energy security objectives.**
   Given concerns about fossil fuel prices, emissions reduction, renewable energy capacities and productivity improvements, an additional domestic power generation technology will be required in order to avoid a power supply shortage from domestic sources that will occur between 2017 and 2022 (according to the different scenarios). Assuming that reducing CO2 emissions remains a policy priority, the further inclusion of nuclear in the supply mix is the best solution (see Scenario 3 in Exhibit 7). Not only does it have a lower reliability risk profile than CCGT, but nuclear energy is expected to provide the most cost-effective base load in the future. However, whatever the decisions, a common portfolio strategy setting out the timings of infrastructure development must be agreed in the near future in order to ensure sufficient grid capacity and alignment with neighbouring countries over the long term.

Exhibit 7: Emissions per capita from supply options



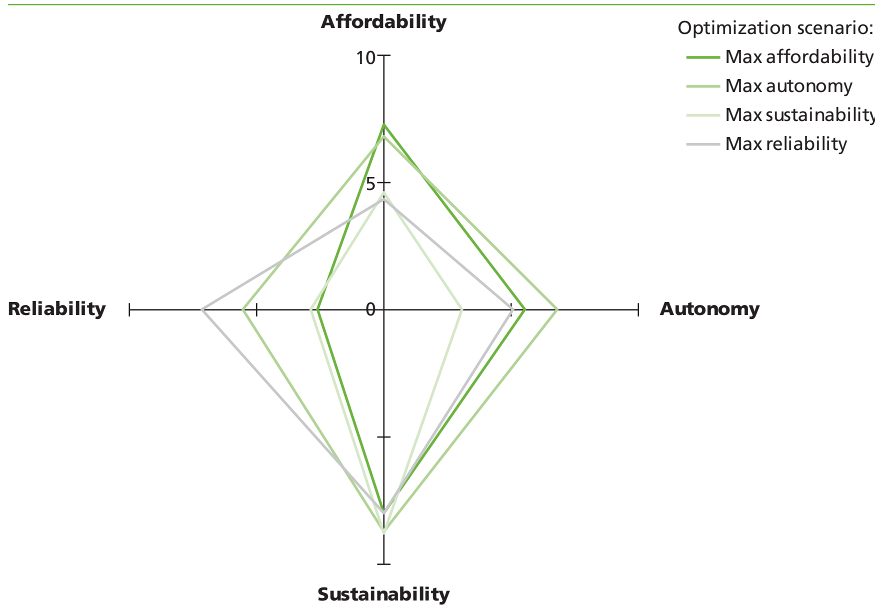
Note: Scenarios (e.g. S6) refer to scenarios listed in Exhibit 1

Optimizing the energy security objectives

Although reliability achieved the highest score for energy security in our dialogue with Swiss stakeholders and energy experts, optimizing sustainability should be the foremost priority in order to achieve the goals of a sustainable national energy and climate policy. The substitution of fossil fuels by other energy sources leads to a win-win situation along all four axes of energy security. This will enable the simultaneous optimization of reliability (carbon supply risks), sustainability (CO2 and particulate matter emissions) and long-term affordability (fossil fuel prices). Autonomy will be optimized by the resulting increased share of domestic energy generation.

While major steps can be taken to enhance sustainability, reliability, autonomy and affordability can only be influenced only within certain limits owing to Switzerland's high level of dependency on fossil fuel from abroad for heating and transportation, and interconnections with the EU power grid (see Exhibit 8).

Exhibit 8: Results of energy security optimization along the four objectives



Thus, assuming an increase in overall energy productivity and the desire for a higher percentage of domestic energy production, the careful development of a renewable energy portfolio alongside nuclear power plants can combine improved affordability with higher levels of sustainability and autonomy. A balance then needs to be struck with reliability, for maintaining reliability by providing extra capacity in the power system results in higher costs and lower affordability. This also implies a closer coordination on oil & gas upstream sourcing, power generation as well as transmission and grid stability with immediate neighboring countries, i.e. the European Union.

Improving governance

Stakeholder interviews and workshops revealed that effective decision-making in Switzerland is currently impeded by the absence of a strong vision and a long-term strategy. Key concerns are the obstacles presented by unsuitable laws, unclear long-term investment conditions and missing social acceptance.

At the macro-level national policy regulations do not align well with overarching EU objectives and international carbon pricing. Nor do they feed through into the cantons in a coordinated manner. This impacts negatively on the assessment of applications for power plant expansion and other infrastructure development.

Incentives to improve energy productivity in energy-intensive assets are commonly regarded as inadequate. Similarly, incentives for real estate developers to build more sustainably are limited, and mechanisms for resolving conflicts between building owners and tenants regarding up-front investments and lifecycle costs are weak.

The timeliness and quality of decision-making are undermined by the failure of opposing political parties to reach a consensus on the way forward and make forward-thinking decisions on new infrastructure. This is due partly to high levels of lobbying and partly to low levels of understanding of the energy system among key stakeholders. Consequently, despite the above average purchasing power and strength of the Swiss economy, excessive weight in position-taking is given to short-term affordability at the expense of long-term sustainability. With respect to the energy companies and the TSO, the conflict between short-term profit maximisation and the fulfilment of long-term national needs must be resolved.

Towards a solution

The challenges facing Switzerland's future energy policy require a comprehensive array of technological standards, fiscal incentives, taxation measures and other boundary conditions in order to achieve an optimal solution. These need to be investigated as early as possible.

The way forward should be underpinned by three principles that emerged from our analysis and from the workshop discussions with Swiss energy system stakeholders:

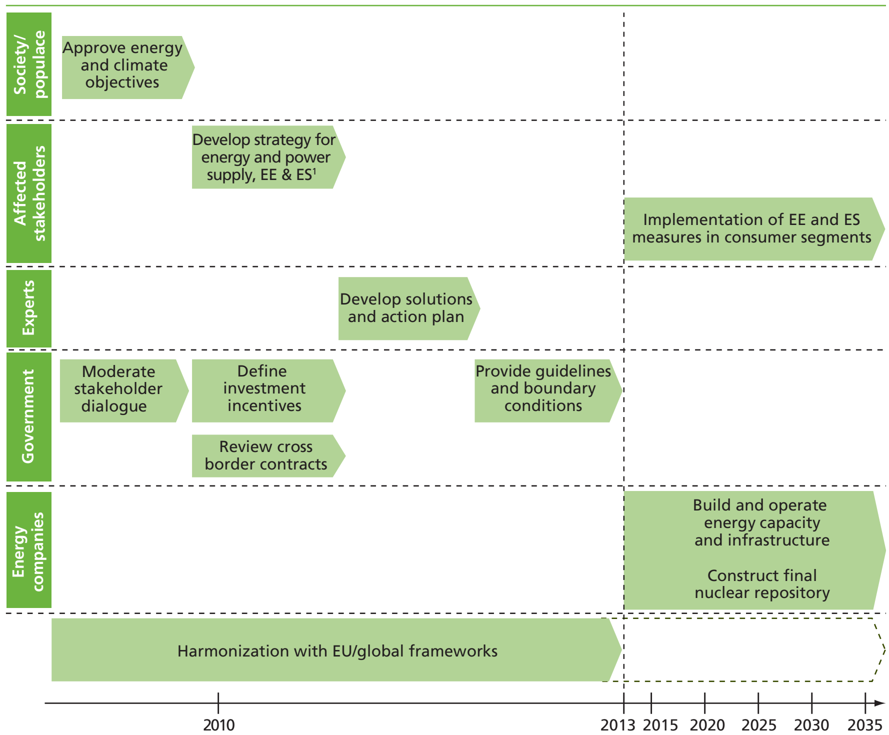
- **Avoid major mistakes.** The magnitude and reach of the required decisions mean that they need to be based on the best available evidence, widely discussed by the stakeholders, and supported by a thorough analysis of potential knock-on impacts. Most importantly, policymakers should not allow narrow objectives to dictate the agenda, but should aim to develop solutions that produce results that are sustainable over the long term. This includes raising understanding about the consumption of grey energy (energy used in the manufacture of goods and transporting them to market)
- **Cultivate the consumer as well as the producer**. Energy efficiency should be achieved not simply through laws and regulations but also through education initiatives and clear price signals that will encourage behavioral change by household, business and industrial consumers alike

- **Exercise leadership with clean technology**. The speed at which new technologies can be developed and rolled out will be key to the optionality and success of energy security measures. Switzerland could position itself at the forefront not just of technology development but also deployment

Chief responsibility for driving the agenda lies with the Swiss Federal Council, which should show greater leadership and build a consensus among the key stakeholders regarding the ambitions of future energy and climate policy, and the measures that will underpin it. In the first instance this requires generating an informed debate across society around the objectives and choices available. Only once this has taken place and a policy framework set can mandates be given to affected parties to design strategies that will achieve the desired goals.

A roadmap for Switzerland's future energy security thus moves from societal debate to infrastructure development (see Exhibit 9) and behavioral change, with high-level actions identified for key stakeholders within the energy system. The appendix contains more detailed recommendations for the participation of different stakeholders in the development and implementation of a future strategy.

Exhibit 9: Roadmap to enhanced energy security in Switzerland



1 EE = energy efficiency, ES = energy substitution

Conclusion

Over the next few decades it is likely that energy security will become an even more critical issue than it is today. As a result many countries need to take decisive action now in order to prevent a crisis in the future. Setting energy security priorities in the light of changing economic, political and environmental circumstances is undoubtedly a tough challenge. Nonetheless, the underlying issues can be approached in a fairly straight-forward manner regardless of the differing circumstances faced by countries.

Our exploration of the issue suggests that in order to develop strong policies and robust implementation it is critical to consider the future match between supply and demand from multiple perspectives. First, employing an analytical framework based on the four objectives of energy security (autonomy, reliability, autonomy, sustainability) is helpful in clarifying the implications of the policy and technological options available. These options include the scope for energy productivity improvements as well as the requirement for new supply-side infrastructure. Second, focusing on stakeholder perspectives is valuable in terms of understanding the current drivers of the key players, the governance deficits that may inhibit effective policymaking, and the potential for deploying different types of expertise towards a common goal.

For many countries, Switzerland included, the successful achievement of energy security is dependent on a clear, evidence-based vision for the future that understands the consequences of the different choices and is underpinned by efficient and transparent governance structure. Only against this backdrop can the key players within the energy system develop and invest in solutions with confidence.

Appendix: Detailed recommendations from the Switzerland study

Exhibit 10: Recommendations for Swiss energy system stakeholders

Stage	Stakeholder	Recommendations
Strategy development	Federal Council	■ Develop overarching Swiss energy and climate policy and establish effective framework to promote investment into energy efficiency and energy substitution
	Utilities	■ Review renewable energies strategy and forward integration opportunities ■ Develop production strategy and secure long-term contracts for public transport providers
	TSO/Swissgrid	■ Build independent decision-making power ■ Promote establishment of EU-harmonized guidelines regarding cross-border power transit regimes
	Oil and gas firms	■ Diversify sourcing countries, means and routes of transportation for fossil fuel supply ■ Develop biofuel strategy and promote domestic production and distribution ■ Develop infrastructure for electric vehicles with partners to obtain first-mover advantage
	Industry	■ Develop energy strategy at the firm level specifying short and long-term actions ■ Review investment into energy productivity measures to maximise future cost savings ■ Evaluate options to build own renewable energy capacities to increase autonomy and reduce long-term energy costs
Solutions development	Industry/academia	■ Technological concepts for domestic energy production, required infrastructure investments and import strategies, including final nuclear waste depository plans ■ Build joint ventures for specific research and development programs to accelerate time to market for renewable technologies and other technological solutions
	Government/NGOs	■ Support fact-based education and awareness-building regarding feasible solutions for curbing climate change in a national and international context
Implementation	Federal Council and regulators	■ Review national security policy regarding long-term energy supply ■ Reach agreement with the EU regarding cross-border electricity transits and trading ■ Implement a process periodically to adjust renewables feed-in tariffs and eligibility levels ■ Align requirements and authorisation processes for energy projects between cantonal land-use planning and the regulation department ■ Harmonize national climate change laws/regulations and requirements for Swiss renewable energy certificate with EU/global regulations ■ Develop incentive system for the financial support of energy productivity investments
	Utilities/industry	■ Develop and promote processes and technologies for energy substitution jointly with partners
	Domestic/business consumers	■ Implement energy efficiency and energy substitution measures as early as possible

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