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Nuclear Energy in Switzerland

Brussels Nuclear Law Association

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21. May 2025

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A. Switzerland's Energy Landscape

1. Main developments & key milestones

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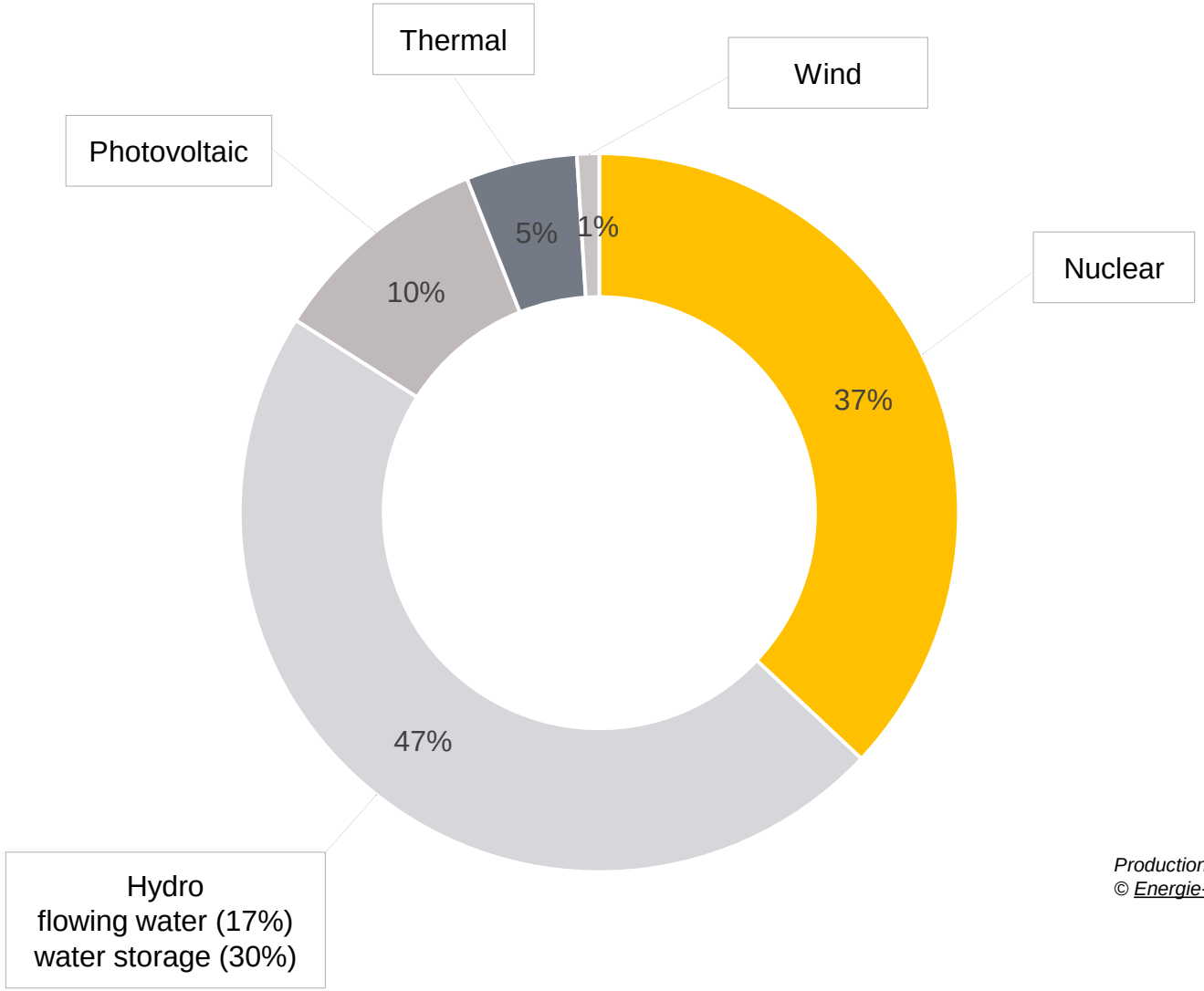
1999	• Federal Energy Act
2007	• Energy Strategy with four pillars: (1) Energy Efficiency, (2) Renewable Energy, (3) Replacement of production plants (including nuclear plants), (4) Foreign energy policy
2011	• Fukushima incident leads to commencement of nulear energy phase out, full revision of the Federal Energy Act and development of Energy Strategy 2050
2017	• Switzerland ratifies Paris Agreement
2018	• Entry into force of fully revised Federal Energy Act (confirmed with in the referendum vote 2017 [58.2%])
2025	• Federal Act on a Secure Electricity Supply from Renewable Energy Sources (in stages)

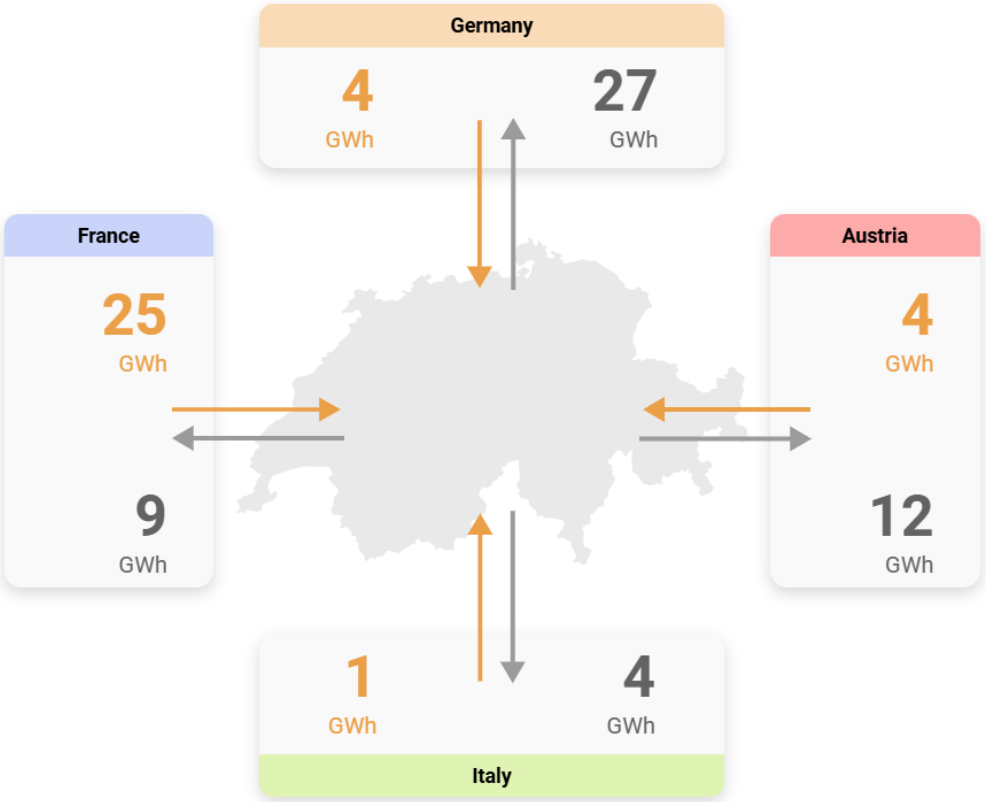
2. Switzerland's Energy Mix



Production by energy type per year, Jan – May 2025
© Energie-Dashboard Bundesamt für Energie

3. Electricity Import and Export

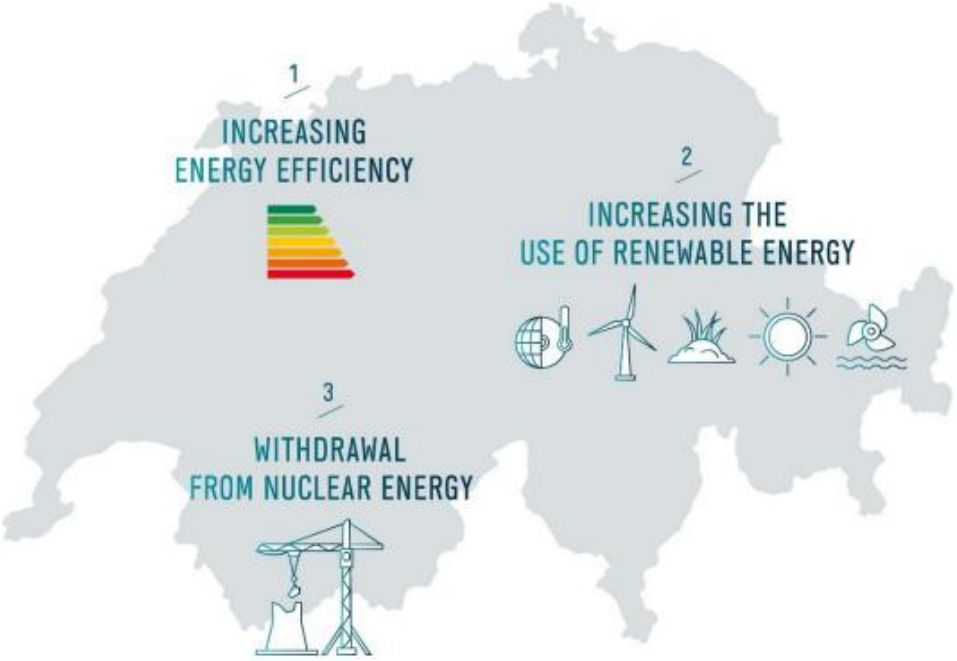
- Imports and exports largely balanced:
  - Imports mainly from France, Austria and Germany;
  - Exports mostly to Italy and Germany.
- Consumption stable at 55–60 TWh (last 10 years):
  - The Swiss Federal Office of Energy (SFOE) provides daily updates.
- Switzerland has a "winter gap" due to limited winter electricity generation and excess summer capacity:
  - Water reservoirs produce 30-50% of Switzerland's winter electricity.
  - The rest is currently being supplied by nuclear energy and imports.
  - ElCom: "*Electricity reserves still needed in Switzerland in midterm*".



Daily update of electricity import/export, May 11, 2025
© Energie-Dashboard Bundesamt für Energie

4. Energy Strategy 2050

- Goal is to achieve climate neutrality:
  - Measures: (1) increase energy efficiency (buildings, mobility, industry, appliances), and (2) increase the use of renewable energy (promotion and improvement of legal framework).
- Withdrawal from nuclear energy:
  - No new general licences;
  - Step-by-step withdrawal – safety as sole criterion;
  - Gradual approach intended to provide sufficient time to restructure Switzerland’s energy supply.
- Reduce Switzerland's dependance on other countries.
- The share of renewable energy in total energy consumption is over 25% (2024).
- Elevated Alpine areas are considered particularly effective for energy production.



Three strategic objectives
© BFE, Energy Strategy 2050 once the new energy act is in force.pdf

B. Nuclear Energy in particular

1. Legal basis of Switzerland's use of Nuclear Energy

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732.1

English is not an official language of the Swiss Confederation. This translation is provided for information purposes only and has no legal force.

Nuclear Energy Act

(NEA)

of 21 March 2003 (Status as of 1 April 2025)

The Federal Assembly of the Swiss Confederation

on the basis of Article 90 of the Federal Constitution[1],
and having considered the Federal Council dispatch of 28 February 2001[2],

decrees:

[1] SR **101**

[2] BBI **2001** 2665

Chapter 1 General Provisions

Art. 1 Subject matter and purpose

This Act regulates the peaceful use of nuclear energy. Its main purpose is to protect humans and the environment against the risks of nuclear energy.

2. Federal popular initiative "*For a Planned Phase-Out of Nuclear Energy*" (1/2)

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Samstag, 29. Oktober 2016 — Abstimmung 3

«Versorgungssicherheit wäre gefährdet»

Atomausstieg Nur weil sie alt sind, seien die Schweizer AKW nicht unsicher, sagt Doris Leuthard. Einen vorzeitigen Ausstieg aus der Atomenergie findet sie überstürzt. Weder das Stromnetz noch die saubere Alternativenergien seien bereit.

Corriere del Ticino MERCOLEDÌ 16 NOVEMBRE 2016 — CONFEDERAZIONE 9

L'INTERVISTA DORIS LEUTHARD

«Uscire adesso dall'atomo è prematuro»

Secondo la consigliera federale la via più sicura è l'abbandono graduale del nucleare

Aargauer Zeitung

ENERGIESTRATEGIE

Bundesrätin Leuthard: «Das ist kein Etikettenschwindel – der Atomausstieg ist beschlossen»

LE TEMPS

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ACCUEIL › SUISSE

Doris Leuthard milite contre l'initiative «Sortir du nucléaire»

NZZ

Leuthard warnt vor hohen Kosten und Stromausfällen

«Initiative schafft grosse Probleme»

© Leuthard warnt vor hohen Kosten und Stromausfällen | NZZ
© Energiestrategie - Bundesrätin Leuthard: «Das ist kein Etikettenschwindel – der Atomausstieg ist beschlossen»
© Doris Leuthard milite contre l'initiative «Sortir du nucléaire» - Le Temps
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2. Federal popular initiative "*For a Planned Phase-Out of Nuclear Energy*" (2/2)

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- On 27 November 2016, the Swiss voters rejected the nuclear phase-out initiative, with 54.2% voting "No".
- Aim was to:
  - Ban the construction of new nuclear power plants in Switzerland;
  - Limit the operating lifespans of the five existing nuclear plants (the last one would have been shut down in 2029).
- The Federal Council and Parliament recommended rejecting the initiative as it would have led to a premature shutdown of existing plants.
- Instead, under the Energy Strategy 2050, the government plans a gradual phase-out of nuclear energy.

3. Nuclear Power Plants in operation in Switzerland

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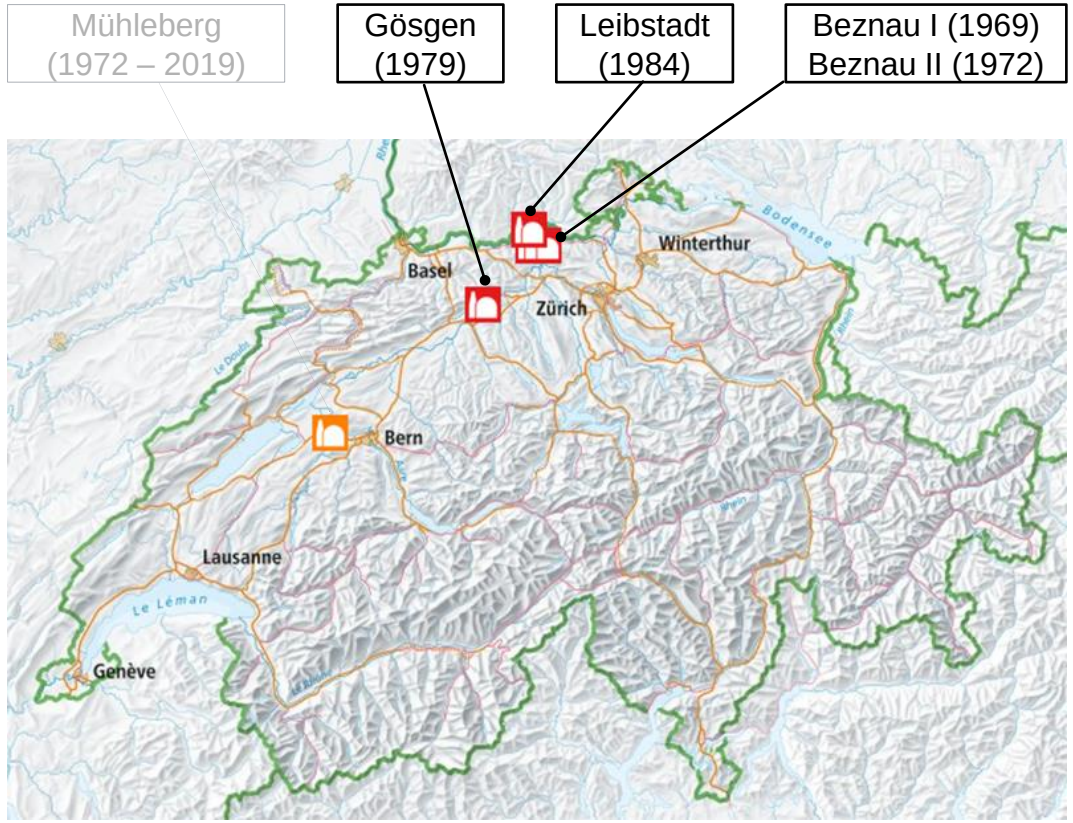
- 5 Nuclear Power Plants began operation in Switzerland between 1969 and 1984, spread across four sites.
- Permanent shutdown of Mühleberg in 2019, 4 plants at 3 sites remain in operation.
- 3 of these Plants have been running for over 40 years, and the newest has crossed the 40-year mark in 2024.
- The "*Nationale Genossenschaft für die Lagerung radioaktiver Abfälle*" ("Nagra") handles all matters related to nuclear waste.
  - Following long-term evalulation, Nagra has proposed the region "*Nördlich Lägern*" (cantons of Zurich and Aargau, close to German border) as the final site for underground disposal of nuclear waste.
  - Construction of the deep underground disposal site currently expected to commence in 2045.



Switzerland's 5 Nuclear Energy Plants
© *Maps of Switzerland - Swiss* Confederation - map.geo.admin.ch

4. Ownership structures of the Nuclear Power Plants

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- Ownership structures vary significantly.
- They are to 82% publicly owned.
- The newer plants operate as “partner plants,” highlighting deep interconnections within the Swiss electricity industry.
- Partner plant shareholders assume total energy production and cover annual costs according to their shareholdings.

Beznau I & II	100% owned by Axpo Power AG (fully held by Axpo Holding AG)
Gösgen	• Alpiq AG (40%) • Axpo Power AG (25%) • Centralschweizerische Kraftwerke AG (12.5%) • the City of Zurich (15%) • Energie Wasser Bern (7.5%)
Leibstadt	• Axpo Power AG (22.8%) • Axpo Solutions AG (16.3%) • Centralschweizerische Kraftwerke AG (13.6%) • Alpiq AG (27.4%) • BKW Energie AG (14.5%) • AEW Energie AG (5.4%)
Mühleberg	100% owned by BKW Energie AG (fully held by BKW AG)

5. Memorandum on the long-term operation of Nuclear Power Plants

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- On 9 July 2024 the Swiss Federal Office for Energy ("SFOE") published a memorandum on the long-term operation of nuclear power plants:
  - All currently operating plants have open-ended licenses, allowing operation as long as they remain safe.
  - The SFOE asked Axpo and Alpiq to comment on the long-term operation of the existing Nuclear Power Plants.
  - Primary objective: understand the operators' planning assumptions regarding the remaining operational lifespan of their facilities.
  - Investments are continuously necessary and must be profitable, otherwise they cannot be economically justified.
  - The planned operating time depends particularly on economic considerations.
  - SFOE concludes that both operators have demonstrated robust planning and measures for 60 year long term operation of the nuclear power plants, further supportive measures of the Swiss Confederation are not needed.
  - Both operators are preparing for operating the nuclear power plants beyond 60 years. The SFOE voices understanding for the operator's petition that the regulatory environment needs to be stable. The SFOE believes that it would be premature to take legislative measures with respect to enabling long-term operation beyond 60 years, given that operators will first want to analyze costs.

a. Current Status of operating Nuclear Power Plants

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- Periodic Safety Reviews (PSR), Art. 34 Nuclear Energy Ordinance (NEO)

Art. 34[a-c] Comprehensive safety reviews for nuclear power plants

[1] The holder of an operating licence for a nuclear power plant must carry out a comprehensive safety review every 10 years (Periodic Safety Review, PSR).

- Required retrofitting (Art. 22 (2) (g) NEO)

g. backfit the installation to the necessary extent that it is in keeping with operational experience and the current state of backfitting technology, and beyond insofar as further upgrading is appropriate and results in a further reduction of risk to humans and the environment;

- Monitoring of ageing (Art. 35 NEO)

Art. 35 Ageing management

[1] With the aid of a programme for managing ageing, the licence holder must systematically monitor the ageing of all systems, structures and components, the functions and integrity of which are of importance with regard to safety and security.

b. Long-term operation of (over) 60 years

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- Axpo and Alpiq are planning for about 60 years of operation but are also examining longer operating scenarios.
- Operators deem operation beyond 60 years technically possible but face uncertain political acceptance:
  - Existing construction and prior upgrades are assumed to be amortized after 60 years, with minimal additional costs expected for waste disposal;
  - Significant investments for extended operation, including continued staffing and expertise, could nonetheless be required;
  - Operators will likely only choose such a long-term operation if higher market prices can justify these extra costs.
- Regulatory shifts or stricter rules may increase nuclear power expenses, though stable frameworks for decommissioning and waste funds could enhance predictability.
- SFOE considers reviewing existing regulations, evaluating measures to maintain competency, and keeping open communication with operators as primary steps.

c. Challenges regarding the long-term operation

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- No fundamental issues expected to prevent operation beyond 60 years
- However:
  - Unforeseen internal events could cause long shutdowns, making continued operation uneconomical;
  - Stricter regulations and global nuclear incidents may require costly upgrades or early closure;
  - Swiss rules limit flexibility for new solutions and technologies, restricting cost and safety optimization;
  - The nuclear supply chain has been shrinking, with some suppliers leaving the market due to high compliance demands, complicating the sourcing of critical parts and services.

6. Evolving Swiss Perspectives on Nuclear Energy

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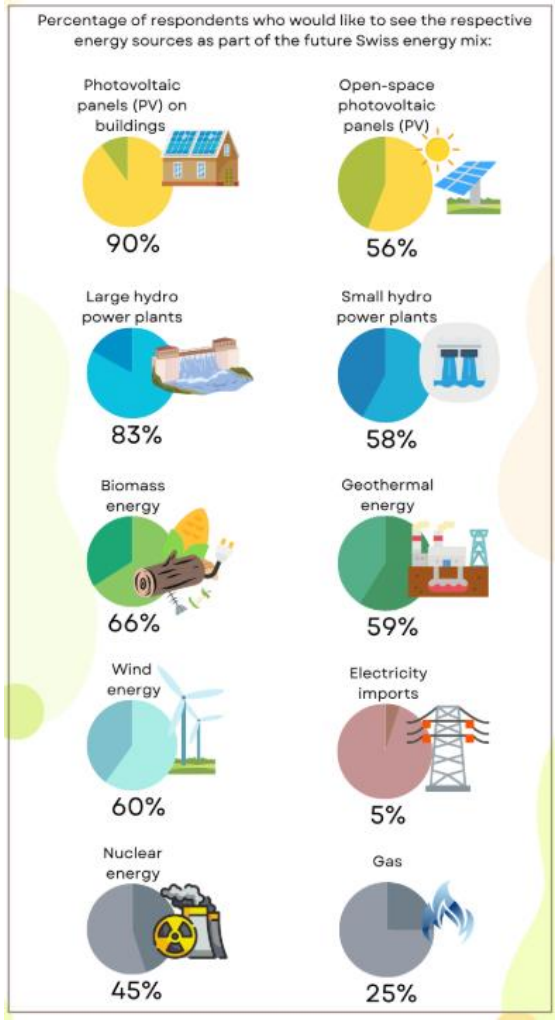
- **2022** Results from the EDGE population survey (based on 4948 Swiss respondents)
  - Most would like to see more renewable energy, mostly photovoltaic panels on buildings;
  - Electricity imports are very unpopular, so is gas;
  - Population is split regarding nucelar energy.
- **2023** Poll whether Switzerland should use nuclear energy alongside renewables to produce electricity:
  - Yes (54%) / No (38%) / I don't know (8%);
  - 68% agree with the statement that existing nuclear power plants are essential to guarantee Switzerland's electricity supply.
- **2024** Memorandum on the Long-Term Operation of Nuclear Power Plants
  - Nuclear plant operators seek clearer political support to ensure long-term operation and attract skilled workers.
  - SFOE highlights the importance of public perception but has limited influence and no mandate to promote nuclear energy.
- **2025/05/19** Federal Council Rösti stated that the prohibition to build new nuclear power plants should be reconsidered.



SWEET EDGE national population survey 2022
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Thank you for your attention.

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