STATUS OF THE SWISS ENERGY TRANSITION
WHERE ARE WE NOW AND WHAT COMES NEXT?
CONTENTS

1. Guidelines

2. Where are we now?

3. What comes next?
Energy Policy:
Energy transition &
Security of supply

Climate Policy:
Planned
Greenhouse gas
reduction

Energy Strategy 2050:
Guidelines for:
Average per capita energy consumption
Average per capita electricity consumption
Average domestic renewable production
excluding hydropower
Hydropower

CO₂-Act (currently in parliament): Binding reduction target for 2030:
- 50% (compared to 1990)

CO₂-Target 2050 shall be strengthened according Federal Council: Net Zero Emissions
## GUIDELINES ENERGY STRATEGY

<table>
<thead>
<tr>
<th>Area</th>
<th>2020 (short term, EnG)</th>
<th>2035 (medium term, EnG)</th>
<th>2050 (long term according to Energy Act dispatch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per capita energy consumption</td>
<td>minus 16%</td>
<td>minus 43%</td>
<td>minus 54%</td>
</tr>
<tr>
<td></td>
<td><em>(compared to 2000)</em></td>
<td><em>(compared to 2000)</em></td>
<td><em>(compared to 2000)</em></td>
</tr>
<tr>
<td>Per capita electricity consumption</td>
<td>minus 3%</td>
<td>minus 13%</td>
<td>minus 18%</td>
</tr>
<tr>
<td></td>
<td><em>(compared to 2000)</em></td>
<td><em>(compared to 2000)</em></td>
<td><em>(compared to 2000)</em></td>
</tr>
<tr>
<td>Yearly renewable energy production (excl. hydro)</td>
<td>Min. 4400 GWh</td>
<td>Min. 11’400 GWh</td>
<td>Min 24’200 GWh</td>
</tr>
<tr>
<td>Yearly hydro production</td>
<td>(no target)</td>
<td>Min 37’400 GWh</td>
<td>Min 38’600 GWh</td>
</tr>
</tbody>
</table>
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1. Guidelines

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3. What is coming next?
ENERGY ACT
STRATEGIC OBJECTIVES

Measures to increase energy efficiency
- Buildings, Mobility, Industry, Appliances

Measures to increase the use of renewable energy
- Promotion, Improvement of legal framework

Withdrawal from nuclear energy
- No new general licences, step-by-step withdrawal – safety as sole criterion

Ensure access to international energy markets

Advance the conversion and expansion of electrical networks and energy storage

Strengthen energy research, P + D + L program and SwissEnergy

Exercise role model role of the public sector
MONITORING / INDICATORS


Objective: observe progress – create a case for intervening, if necessary

List of indicators (over 40)

- **Consumption**: Energy and electricity power consumption
- **Production**: Electricity production from renewables & hydro
- **Network / Grid development**: Long lead times for grid development, high voltage cables underground (owes to social acceptance)
- **Security of supply**: Diversification of energy supply, dependence on other countries, system adequacy (electricity)
- **Expenditures & Prices**: Economic impact
- **CO$_2$-Emissions**: Reduction of emissions
- **Research & Technology**: Public investment in research and innovation
- **International environment**: Switzerland is at the heart of Europe
ENERGY EFFICIENCY
PER CAPITA FINAL ENERGY CONSUMPTION

Source: SFOE, FSO, FOCA, Prognos/TEP/On behalf of the SFOE

Index: 2000 = 100

2000: 100
2017 (corrected for weather conditions): -16.3% (= 83.7)
2017: -15.7% (= 84.3)
Guideline 2020: -16% (= 84)
Guideline 2035: -43% (= 57)
ENERGY EFFICIENCY
PER CAPITA ELECTRICITY CONSUMPTION

Guideline 2020:
-3% (= 97)

2017 (corrected for weather conditions):
-5.0% (= 95.0)

2017: -4.9% (= 95.1)

Guideline 2035:
-18% (= 82)

Source: SFOE, P50, Prognos/TEP/On behalf of the SFOE

Development of per capita electricity consumption\(^2\) since 2000 (indexed)

\(^2\) Excluding statistical difference and agriculture
ELECTRICITY PRODUCTION
RENEWABLES (EX. HYDRO) - UPDATE

Guideline 2035: 11’400 GWh (+ 465 GWh p.a.)

Annual increases:
2017: 486 GWh
2018: 224 GWh

Short term-Guidelines are realistic and not challenging (+250 GWh p.a).

SCCER-SoE:
• Geothermal is absent
• Possibly 5-30 GWh from Lavey and Haute-Sorne by 2025.
ELECTRICITY PRODUCTION
HYDRO POWER - UPDATE

Guideline 2035:
+ 85 GWh p.a.

Recent SFOE-Report:
• Guidelines 2035 (still) manageable with actual potential
• Potential small hydro & residual water volumes relevant
ADDITIONAL: HEAT SUPPLY
RENEWABLES

No numeric guideline
Annual increases:
2016-2017: 446 GWh
2017-2018: 235 GWh

Swiss Federal Office of Energy is currently working on a “heat and cooling strategy”

SCCER-SoE:
• Shallow geothermal is doing well (80-300 GWh annual weather-adjusted growth)
• (Deep) geothermal will enter the picture – about 300 GWh in project pipeline
GRID DEVELOPMENT

ELECTRICITY NETWORK STRATEGY (IN FORCE 6/2019)

- **Progress of grid extension** (especially grid level 1, «electricity highway»): Simplified phases of decision for network extension

- **Predefined cost overrun factors** for simplified acceptance of **placing cables underground** (*development of grid levels, 3, 5, 7 see back up; currently 86% of the grid is underground*) to **increase social acceptance**
SECURITY OF SUPPLY

DIVERSIFICATION SUPPLY, GROSS IMPORT SHARE, SYSTEM ADEQUACY

- Diversification of Energy Supply
- Petroleum ~ 50%, Electricity ~ 25%, Natural gas 14%
- Changes (compared to 2000): Petroleum (-10%), Gas (+3%), Electricity (+2.5%), Wood & Charcoal (+1.3%), Other Renewables (+2.4%), District heating (+0.8%)

- Import share gross energy consumption: 75.3 percent

- System adequacy (availability of electricity & transportation capacities)
  - ElCom: Security of supply guaranteed for 2025 in probable scenario, even when some stressors are taken into consideration. Situation will become more strained in very extreme (and unlikely) stress scenarios.
  - PLEF: Study of Central-Western-Europe: no serious problems for CH (2023/24).
**CO2-Emissions in TOTAL**: 37 Mio. tonnes (2016) -10% (2000)

**Shares**: 41% Transport excl. air traffic, (-0.7 Mio. tonnes, but +3%), 24% Households, 12% Service Sector
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OVERVIEW OF POLITICAL AFFAIRS

Federal Energy Act (2017)
- Popular vote May 21st 2017

Federal CO₂ Act
- Draft Law to Parliament 2017

Electricity Supply Act
- Consultation 2018/9

Gas Supply Act
- Consultation End of 2019

Water royalties
- Law 2018

Electricity grid strategy (2017)
- Adopted by parliament

Others:
- Electricity agreement with EU

2011-2022
## REVISION OF ELECTRICITY SUPPLY ACT

<table>
<thead>
<tr>
<th>Aims</th>
<th>Measures in the revision</th>
</tr>
</thead>
</table>
| Security of Supply                | Storage Reserve *(for late months in winter)*  
                                   | Default for basic supply *(nudging of households energy-mix)*                          |
| Affordable prices & enhancing efficiency | Market Opening  
                                   | Sunshine Regulation *(transparency instrument, Incentive Regulation)*  
                                   | Regulation of flexibility *(ownership rights, integration into network planning, peak shaving, differentiated contracts, …)*  
                                   | Network tarification *(less energy related tariffs possible, dynamic tariffs)*  
                                   | Measuring *(market opening for industry & large producers)*                           |
| Integration of renewables         | Regulation of flexibility  
                                   | Default for basic supply                                                               |
| Growth of internal production & CO2-reductions | No topic *(several inputs during consultation)*                                        |
**REVISION OF FEDERAL CO₂ ACT**

**Measures transport sector**
- Emission standards cars & light duty vehicles (e.g. 2021-24: 95g/km, 147g, 2025 - 29: following EU regulations)
- Increasing compensation fuel importers (*max* 90%, *min* 15% in CH)

**Measures buildings sector**
- Cantonal measures (“Gebäudeprogramm” financed by CO₂ levy, until 2025)
- Focus building refurbishment: Subsidiary introduction CO2 emission limits buildings (by 2029, based on status 2026/27; until 2050 – 80%)

**Measures industry**
- Emission trading (linking CH-EHS & EU-EHS, higher reduction of emission rights)
- Increase maximal CO₂ levy on fossil fuels (210 CHF)
- Technology fund (financed by CO₂-levy)

*In discussion: airline ticket tax, new climate fund, emission standards heavy trucks, emission offset by electromobility, prolongation tax exemptions renewable fuels,…*
THANK YOU FOR YOUR ATTENTION

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GRID DEVELOPMENT
SWISSGRID (GRID LEVEL 1)

(1) Chamoson-Chippis
(2) Bickigen-Chippis (Gemmi line)
(3) Pradella-La Punt
(4.1.) Chippis-Mörel
(4.2.) Mörel-Ulrichen (Ernen-Ulrichen section)
(4.3.) Chippis-Stalden (Agarn–Stalden section)
(4.4.) Airolo-Lavorgo
(5.1.) Beznaub-Birr
(5.2.) Birr-Niederwil
(5.3.) Niederwil-Obfelden
(5.4.) Obfelden-Mettlen
(6) Bassecourt-Mühleberg
(7) Magadino
(9.1.) Mettlen-Innertkirchen
(9.2.) Innertkirchen-Ulrichen (Grimsel line)
(NdD_1) Le Verney/Rosel-Bätiaz
(NdD_2) Bätiaz-Châtelard
(NdD_3) Châtelard-Nant de Drance
# Overview Grid Projects

<table>
<thead>
<tr>
<th>Grid Project</th>
<th>Description and Main Aims</th>
<th>Current Status</th>
<th>Planned Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamoson-Chippis</td>
<td>New 30 km long 380 kV overhead transmission line between Chamoson and Chippis</td>
<td>Realisation</td>
<td>2021</td>
</tr>
<tr>
<td>Bickigen-Chippis (Gemmi line)</td>
<td>Modernisation of substations at Bickigen and Chippis and of the existing 108 km route by increasing current to 380 kV</td>
<td>PGV SFDE</td>
<td>2021</td>
</tr>
<tr>
<td>Pradaile-La Punt</td>
<td>Increase voltage from 220 to 380 kV on existing 50 km route</td>
<td>Realisation</td>
<td>2021</td>
</tr>
<tr>
<td>Chippis-Leverio</td>
<td>Increase voltage to 380 kV on 144 km Chippis-Moërs-Leverio axis (Chippis-Stadlen remains at 220 kV)</td>
<td>4.1 Construction project</td>
<td>2024</td>
</tr>
<tr>
<td>Bezna-Mettlen</td>
<td>Optimisation of existing route over 40 km by increasing current to 380 kV and upgrading on a stretch of 24 km</td>
<td>5.1 Realisation</td>
<td>2025</td>
</tr>
<tr>
<td>Bassecourt-Mühlberg</td>
<td>Upgrading of the existing line over a length of 45 km by increasing the voltage level to 380 kV because decommissioning Mühlberg nuclear power plant will lead to withdrawal of some feed in at the 220 kV grid level</td>
<td>PGV SFDE</td>
<td>2025</td>
</tr>
<tr>
<td>Magadino</td>
<td>Installation of transformers between the 220 kV and 380 kV grids</td>
<td>Project idea</td>
<td>2024</td>
</tr>
<tr>
<td>Génissiat-Foreta</td>
<td>Upgrading of replacement of cables in the existing 220 kV twin lines over a length of 17 km</td>
<td>In operation</td>
<td>2018 and in operation</td>
</tr>
<tr>
<td>Mettlen-Urichen</td>
<td>Upgrade the existing 220 kV line over 88 km to cope with future increase to 380 kV</td>
<td>Preliminary project</td>
<td>2030</td>
</tr>
<tr>
<td>Anschluss Nant de Brance</td>
<td>Connection of pump storage power plant Nant de Brance to the high tension grid</td>
<td>NDD.1 Realisation</td>
<td>2017-2019</td>
</tr>
</tbody>
</table>

*Overview of grid projects, status and proposed date of operation (as at 17.10.2018)*

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GRID DEVELOPMENT
PLACING CABLES UNDERGROUND (LEVEL 3)

Sources: Elcom

Network Strategy in force since 6/2019
GRID DEVELOPMENT
PLACING CABLES UNDERGROUND (LEVEL 5 & 7)

Inventory of cables in the distribution grid (in km)

Network Strategy in Force since 6/2019

Grid level 7 (including domestic connections)

Grid Level 5
EXPENDITURES & PRICES
FINAL EXPENDITURE FOR ENERGY

Index: 2001 = 100

Source: SFOE, FSO

Million fr.

Final consumer expenditure for energy (in million francs) and significant influencing factors (indexed)
EXPENDITURES & PRICES
ENERGY EXPENDITURES, RETAIL PRICES

Expenditures for Energy

- 26.5 billion CHF (2017); + 0.7 % p.a. (23.8 billion CHF in 2000), GDP-share constant

Prices

- Development of retail prices (electricity, gas, petrol prices, heating oil, diesel)
CO2-EMISSIONS
EMISSIONS FROM ENERGY SOURCES

CO2 emissions from energy sources in total and by sector (in million tonnes CO2 excluding international air traffic)
SECURITY OF SUPPLY
DIVERSIFICATION OF ENERGY SUPPLY

Quote in %

From 2000 to 2016, the graph shows the percentage of energy sources used for various purposes. The sources include Oil-based fuels, Gas, District heating, Oil-based combustibles, Wood and charcoal, Electricity, Other renewables, Industrial waste, and Coal and coke.

Source: SFOE
ENERGY RESEARCH: PUBLIC INVESTMENT IN RESEARCH AND INNOVATION

Source: SFOE

Public expenditure for energy research by field of research (in million francs, actual sum)

Efficient use of energy
Renewables
Nuclear energy
Basic research in the energy economy and transfer

11 Expenditure includes a share in overheads (indirect research costs) of the research institutes.