

SWISS COMPETENCE CENTER for ENERGY RESEARCH SUPPLY of ELECTRICITY

Swiss Hydro Power Agenda

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In cooperation with the CTI



Energy Swiss Competence Centers for Energy Research

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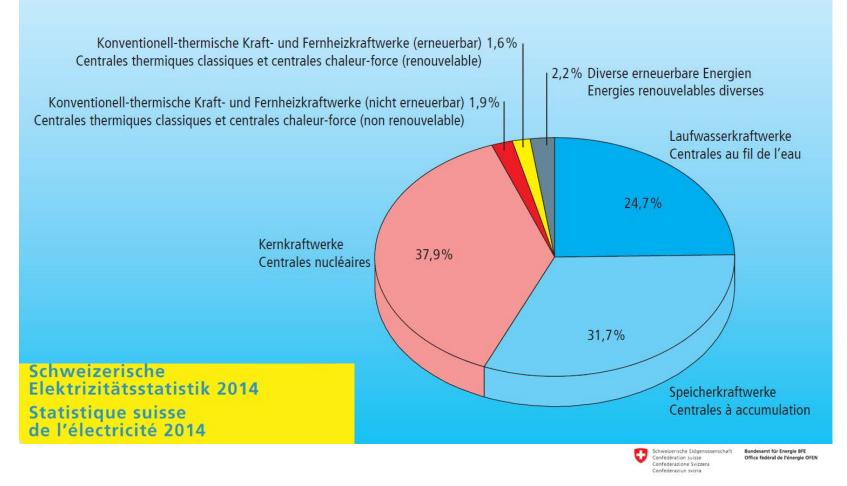
Scope

Energy Strategy 2050
Challenges for Hydropower
Key Research Directions
Roadmap

Kraftwerk Oberaar Kraftwerke Oberhasli AG



Swiss Electricity Supply in 2014 69.6^{*} TWh (68.3^{*)} TWh in 2013).



* Gross generation (Pumped storage excl.)

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Energy Strategy 2050 for Hydropower

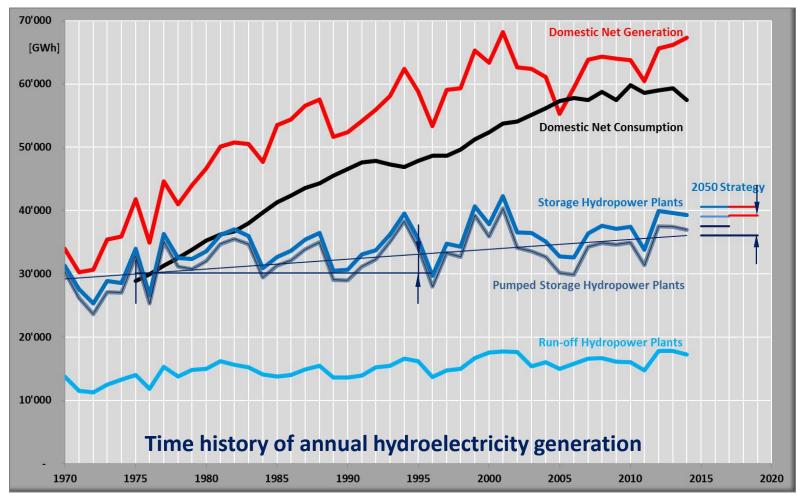
○ Scenario:

- New Large Hydropower Projects
- New Small Hydropower plants
- Modernization and
 Extension of Existing
 Hydropower Plant
- Impact of legal limitations on both minimum environmental flow value and flow change limitation





Energy Strategy 2050 for Hydropower About 20 years of statistical growth

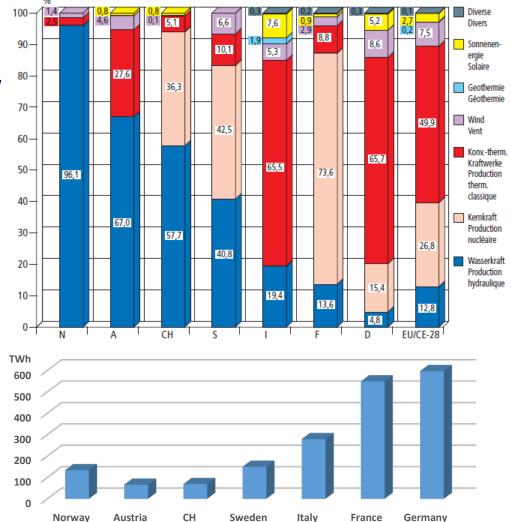


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European Electricity Mix

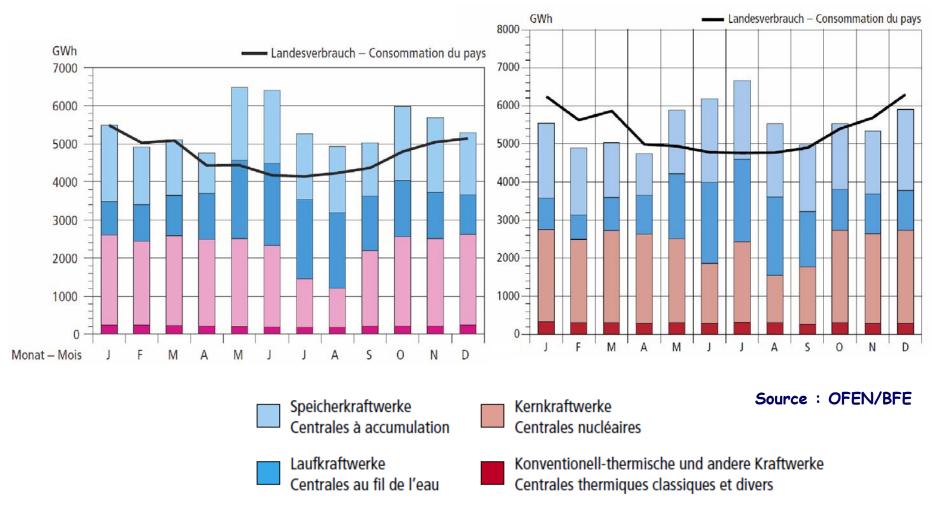
- **O Opportunities**
 - Grid Interconnectivity
 - ✓ Energy Storage
 - Generation Flexibility
- **O** Threats
 - Slow EU activity yielding low demand
 - Low cost of both coal and CO₂
 - Hydraulic fees and NRE subsides





2000: 1 negative month!

2010: 6 negative months!

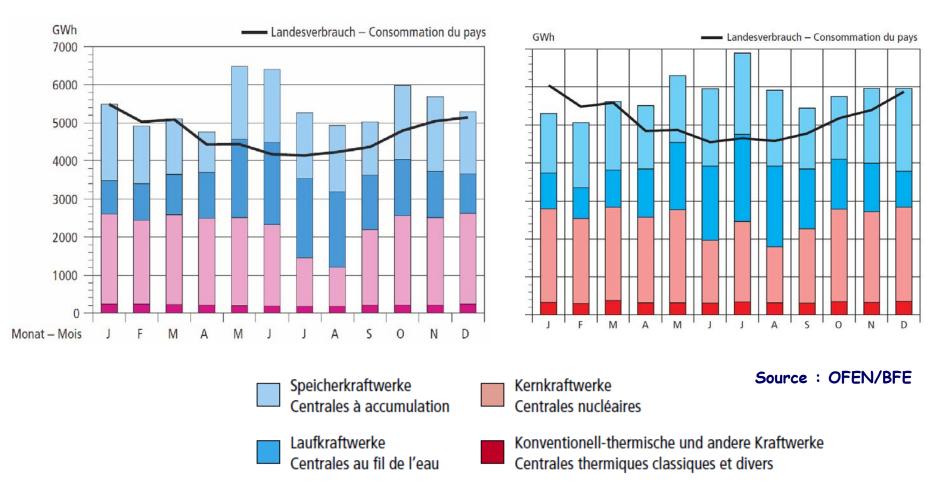


Domestic Supply of Electricity : Monthly Balance



2014: 2 negative months!

2000: 1 negative month!

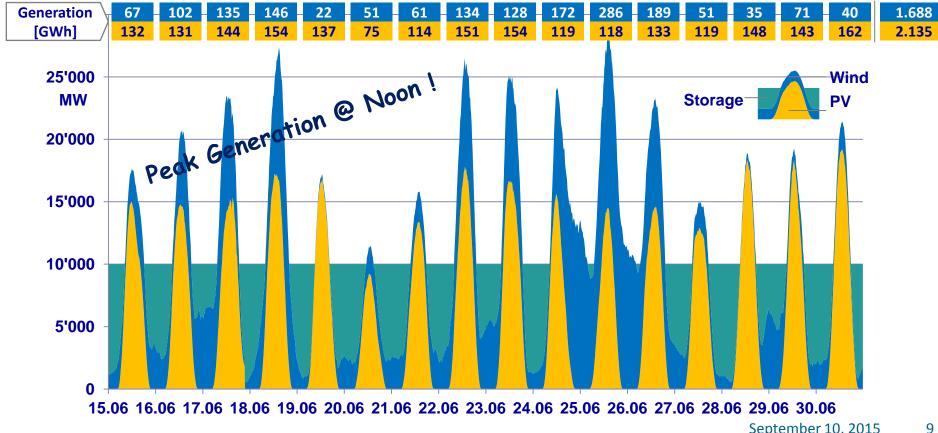


Domestic Supply of Electricity : Monthly Balance



Integration of New Renewable Energy **Sources in Europe**

O Needs of Storage & Grid Primary and Secondary Control ?

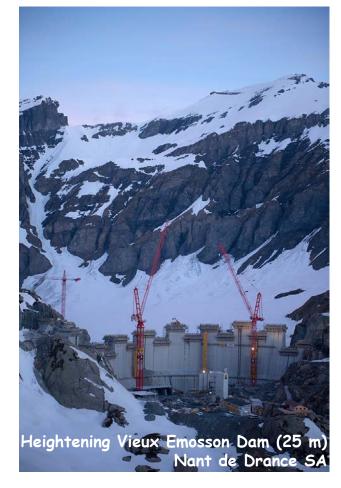


NREs in Germany, Mid of June 2012 : 10 GW Storage Capacity?



Energy Strategy 2050 Challenges for Hydropower in Switzerland: Flexibility

- Environment:
 - Climate change and natural hazards
 - Reservoir sedimentation
- O Economy
 - Electricity demand and energy market
 - Low cost of both coal and CO₂
 - Concession renewal, hydraulic fees
 - ✓ Feed-in tariff
- O Business Model
 - Winter and peak energy production
 - Opportunities of new reservoirs
 - Services to the grid
- O Lex
 - Environmental flow
 - Flow regime alteration
- Technology
 - Severe operation conditions
 - ✓ Safety of hydropower infrastructures

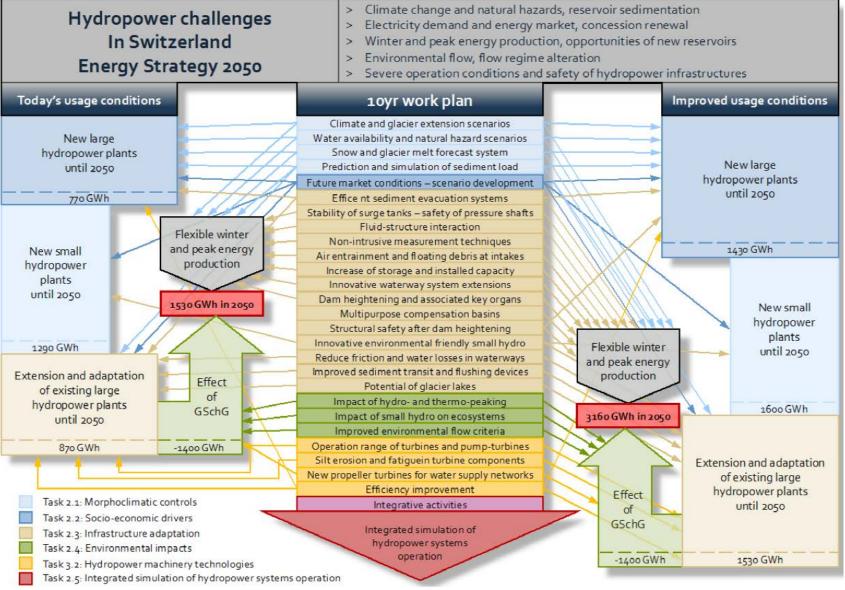




Specific Research Work Packages

Deep Geothermal Energy & CO2 Sequestration	HydroPower: usage & infrastructure	
WP1 Geo-energies T1.1 Resource exploration, assessment and characterization T1.2 Reservoir modeling and validation T1.3 P&D for reservoir creation T1.4 Geo-data infrastructure	WP2 Hydropower T2.1 Morphoclimatic controls of future HP production T2.2 Socio-economic drivers of future HP production T2.3 HP infrastructure adaptation T2.4 Environmental impacts of future HP operating conditions T2.5 Integrated simulation of HP systems operation	
WP3 Innovati T3.1 Geo-energy technologies	ve technologies T3.2 Hydraulic machines	
T4.1 Risk, safety and so T4.2 Global observatory T4.3 SCCER-SoE mode	WP4 Integrative activities T4.1 Risk, safety and societal acceptance T4.2 Global observatory of electricity resources T4.3 SCCER-SoE modeling facility	
Capacity building, Technology Transfer, Outreach		

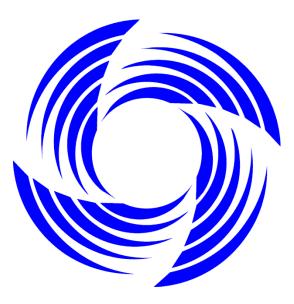






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Thank you for your attention



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