

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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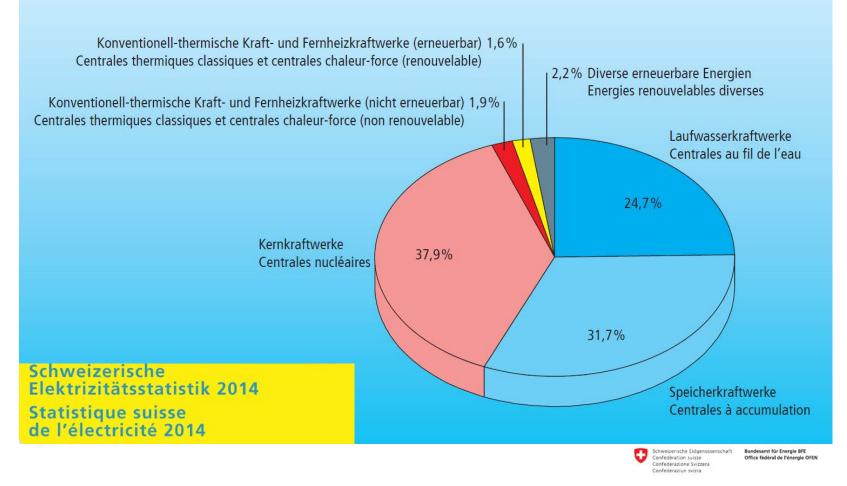
Scope

Energy Strategy 2050
Challenges for Hydropower
Key Research Directions
Roadmap

Kraftwerk Oberaar Kraftwerke Oberhasli AG



## Swiss Electricity Supply in 2014 69.6<sup>\*</sup> TWh (68.3<sup>\*)</sup> TWh in 2013).



#### \* Gross generation (Pumped storage excl.)

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### **Energy Strategy 2050 for Hydropower**

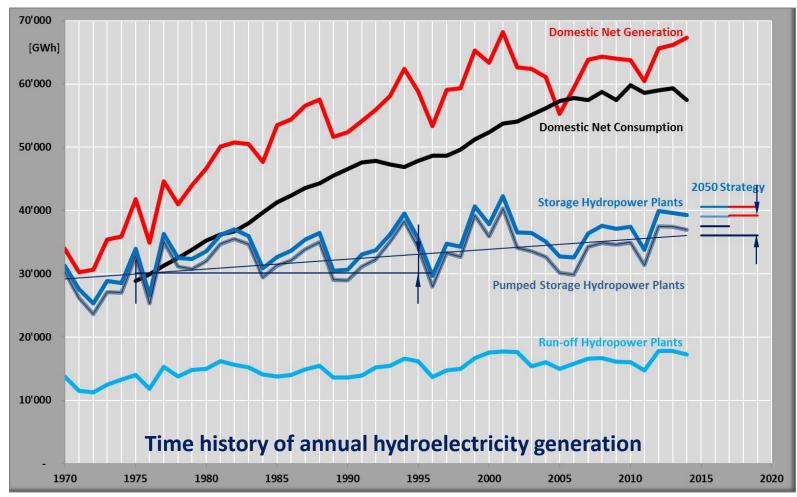
### ○ Scenario:

- 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

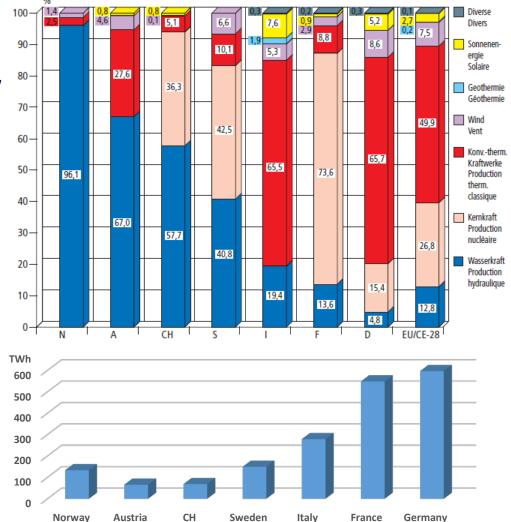


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### **European Electricity Mix**

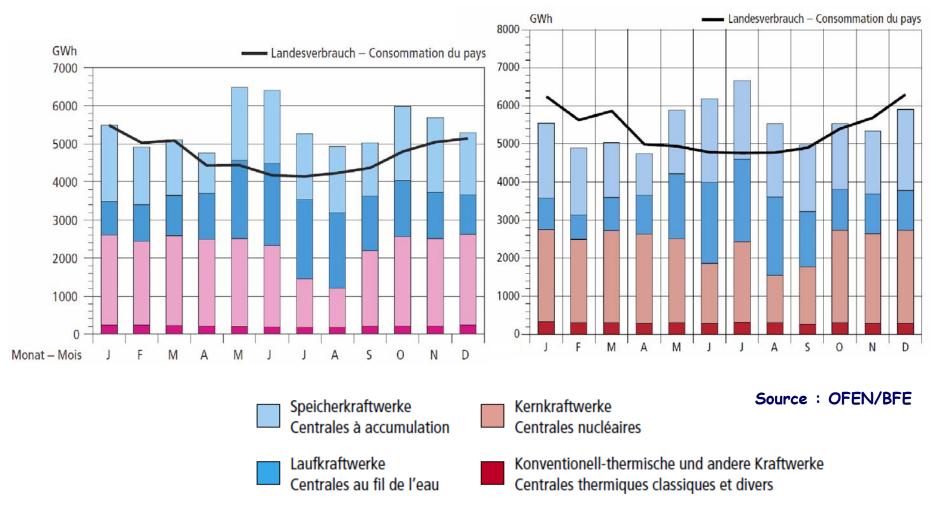
- **O Opportunities** 
  - Grid Interconnectivity
  - ✓ Energy Storage
  - Generation Flexibility
- **O** Threats
  - Slow EU activity yielding low demand
  - Low cost of both coal and CO<sub>2</sub>
  - Hydraulic fees and NRE subsides





### 2000: 1 negative month!

### 2010: 6 negative months!

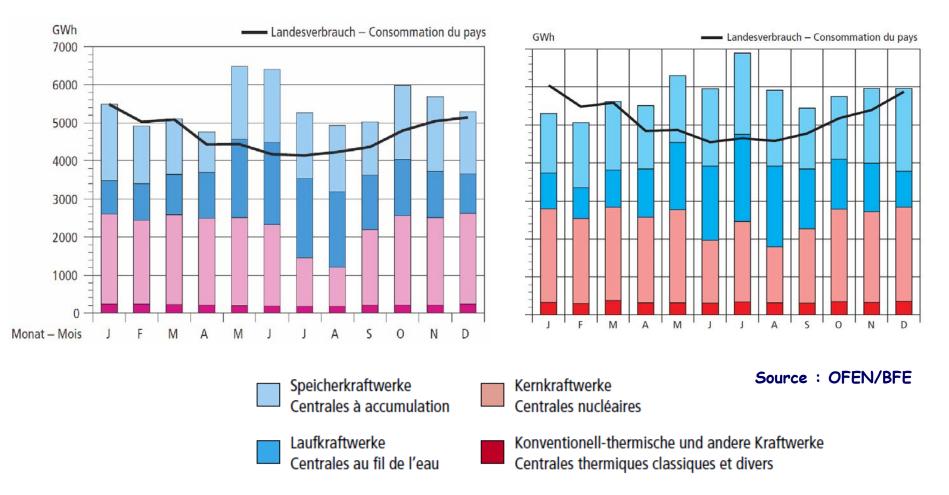


#### Domestic Supply of Electricity : Monthly Balance



2014: 2 negative months!

### 2000: 1 negative month!

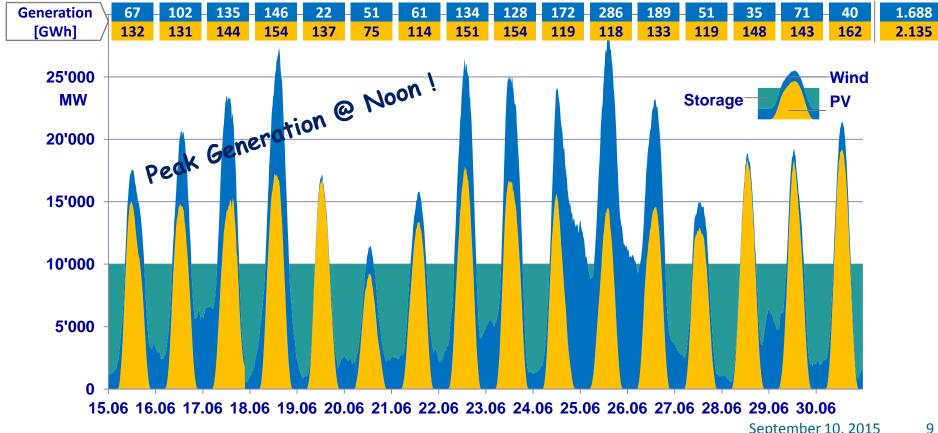


#### Domestic Supply of Electricity : Monthly Balance



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

### O Needs of Storage & Grid Primary and Secondary Control ?

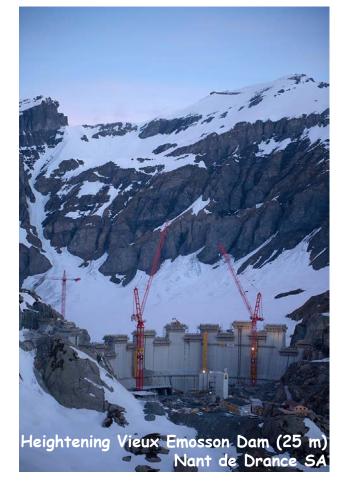


NREs in Germany, Mid of June 2012 : 10 GW Storage Capacity?



# 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 CO<sub>2</sub>
  - 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

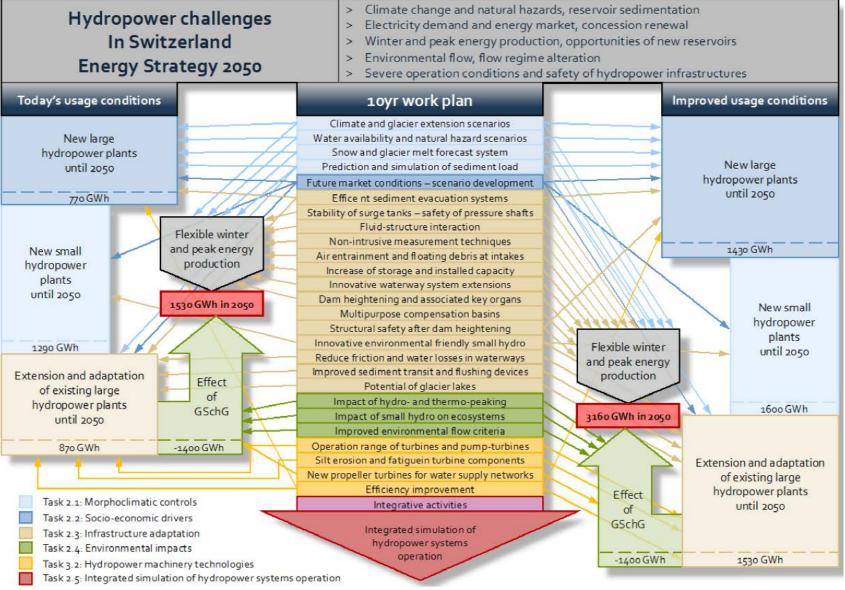




### **Specific Research Work Packages**

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







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### Thank you for your attention



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