

The Wind Energy Research Program in Switzerland

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1 Introduction

In February 2007, the Federal Council decided to focus its energy policy on four main areas: energy efficiency, renewable energy, replacement of existing large-scale power plants and construction of new ones, and foreign energy policy. In order to implement this strategy, the Federal Department of the Environment, Transport, Energy and Communications (DETEC) prepared draft action plans for energy efficiency and the use of renewable energy, which were approved by the Federal Council on 20 February 2008. These action plans set out to reduce the consumption of fossil fuels by 20 percent by 2020 in line with the declared climate objectives, to increase the proportion of renewable energy to overall energy consumption by 50 percent, and to limit the increase in electricity consumption to a maximum of 5 percent between 2010 and 2020. From 2020 onwards, the objective is to stabilize electricity consumption.

Although Switzerland has pursued a consistent energy policy since 1990 through the Energy 2000 and SwissEnergy programs (1), it is still a long way from achieving its goal of securing a sustainable energy supply, quoted as a “2000 Watt Society” (2). In view of the diminishing fossil fuel reserves, the challenges associated with climate change, and the high degree of dependence of Switzerland’s energy supply on imports, the focus is increasingly shifting toward renewable forms of energy. For the “SwissEnergy program”, renewable energy is a clear priority. Yet the proportion of wind power to Switzerland’s overall energy consumption is still very modest, however, thanks to technological progress, increasing economic competitiveness in the context with “Cost-covering remuneration for feed-in to the electricity grid (CRF)”, and the positive image of renewable energy, its growth prospects are excellent - both in the near future and over the long term.

Key Statistics 2007: Switzerland

Total installed wind generation	13.8 MW
New wind generation installed	2.3 MW
Total electrical output from wind	.0185 TWh
Wind generation as % of national electric demand	0.03%
Target:	100 GWh/yr in 2010, 600 GWh/yr 2025

2 Development of Wind Energy

2.1 TARGETS

The Swiss wind energy concept (3) identifies the calculated wind energy potential for Switzerland based on the real existing wind conditions on the sites and on the possible number of plants to be installed:

- Time horizon 2010: 100 GWh
- Time horizon 2025: 600 GWh
- Time horizon 2050: 4,000 GWh

In 2008, wind energy in Switzerland produced 18.54 GWh representing 18% of the 2010 objective. By 1 January 2009 there is a “Cost-covering remuneration for feed-in to the electricity grid (CRF)” for renewable energy in Switzerland. This change of politics in promoting wind energy did lead to a boost of new projects.

2.2 MARKET CHARACTERISTICS

The installed capacity of wind energy in Switzerland did increase during 2008 by 2.3 MW. The total capacity of all 38 installed turbines is 13.8 MW, the energy yield in 2008 increased to 18,54 MWh. This brings the average capacity factor up to 16%.

In 2008, 94% of the electricity from wind energy was produced by utility companies. Driven by the new regulation for the remuneration of green electricity, various companies (utility owned and private) are developing activities to get a share of finances at disposition for renewable energies.

2.3 INDUSTRIAL DEVELOPMENT AND OPERATIONAL EXPERIENCE

Swiss industry is active in the following fields of wind energy:

- Development and production of chemical products for rotor blades, like resins, adhesives, etc. (Gurit Heberlein, Huntsman, Clariant)
- Development and production of power electronics like inverters, etc. (Integral Drive Systems AG, Vivatec, VonRoll Isola)
- Services in the field of site assessments and project development (Meteotest, Interwind, NEK, Kohle/Nussbaumer)
- Niche products like ice detectors (Boschung, Markasub AG).

The total turnover in the above mentioned areas is about 200 million €/yr, which represents about 600 employees. The chemical products and power electronics industries account for 95% of this turnover and 85% is covered by the four largest companies. Some companies are mayor players in the world market despite the nearly non-existing home market.

3 R, D&D activities

3.1 NATIONAL R, D&D EFFORTS

The wind energy research program 2008 – 2011 (4) focuses on:

- **Development of innovative turbine components** for specific application in harsh climatic conditions in Switzerland:
 - Reduction of loads with new materials
 - Increase of the energy yield at low wind speeds
 - Employment of Nano-technology against icing and dirtying
- **Increase of availability** and energy yield at extreme sites:
 - Develop planning know how for applications in complex terrain
 - Test and demonstration plants at extreme sits
 - Evaluation of operational experiences, recommendations

- **Increase of the "value" of the wind energy**, optimization of the integration of wind energy into the grid:
 - Fore and Nowcasting of the power production from wind
 - Grid regulation with high amount of wind energy
 - Optimization of the conditions for intermittent production plants in the grid.
- **Increase of the acceptance for wind energy**, integrate social- and environmental authority:
 - Define success factors and strategies
 - Local planning processes, social acceptance
 - Public participation models.

Implementation of pilot- and demonstration projects leads to the stronger market penetration of the wind energy and closes the gap between research activities and application in practice. In 2008, the budget for wind energy related R&D projects was 729'000.- CHF (470,000 €). This is a rise from 2007 by more than 50%! An amount of 677,000 CHF (436,000 €) is spent on promoting activities.

3.2 COLLABORATIVE RESEARCH

Within this framework, the following projects were realized:

- **Development of innovative turbine components**
 - Antifreeze coatings for rotor blades of wind turbines,
- **Increase of availability:**
 - Alpine Test Site GÜtsch, Handbook and seminar within COST 727
 - Measuring and forecasting icing on structures“
 - Development of Wind Turbines for safe Operation in Alpine Environments
- **Increase of the "value" of the wind energy**
 - Fore- und Nowcasting of energy yield from wind turbine in complex terrain
- **Increase of the acceptance for wind energy**
 - Effect of wind power installation in Switzerland
 - IEA Topical Expert Meeting “Social Acceptance.
 - Social Acceptance of Wind Energy in Switzerland – To Invest or Not to Invest
 - „Code of Conduct for the development of wind energy projects in Switzerland
- **Under the title “Pilot- and Demonstration Project”**, the following activities were realized:
 - Support of spatial planning activities for the implementation of wind energy projects.
 - Financial support for site assessment
 - Purchase of a LiDAR, which can be rented out by the Swiss Wind Energy Association

Switzerland participates in the IEA Wind Implementing Agreement Task 11 “Base Technology Information Exchange,” and Task 19“Wind Energy in Cold Climates. Since 2008, the new Task 28 on “Social Acceptance: Winning Hearts and Minds” is managed by Switzerland.

3.3 THE NEXT TERM (5)

Based on operating experience and the possible optimization potential, the emphasis of the research activities should have results on the following key factors:

- Quantifying the production losses and the downtimes due to icing; implementing and evaluation of relevant measures
- Reducing the production cost by increasing the full-load hours and the reliability of turbines in harsh conditions
- Increasing the accuracy of energy yield estimates
- Reducing planning and installation costs by speeding up planning procedures and considering important acceptance issues.

The following research projects are in discussion:

- Product development in the area of antifreeze coatings
- Development of a reliable ice detector
- Provide a freezing up map of Switzerland
- Evaluate the effects of the icing up on the operational behaviour and the energy yield of wind turbine in the Jura mountains.
- Develop a product for "Fore and Nowcasting"
- Further development of a "Code of the of Conduct", accepted procedure in wind energy development in Switzerland
- Project "Before/After" for the determination of the effective effects of the implementation of wind turbines

Thanks to the "Cost-covering remuneration for feed-in to the electricity grid (CRF)" the results in new project development are astonishing. Future research activities have to concentrate on issues which leads to the realization of a substantial amount of these planned projects. The experiences in cold climates will be continuously shared in international seminars and in the project group of the IEA Wind Task 19 "Wind Energy in Cold Climates." Having more experiences in difficult site development and sophisticated planning procedures than in large-scale wind energy development, Switzerland is running a new IEA Wind Task on "Social Acceptance of Wind Energy Projects".

REFERENCES:

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(4) Konzept der Energieforschung des Bundes 2008 – 2011,

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