

# Alpine Test Site Guetsch: Meteorological measurements and wind turbine performance analysis

COST 727 Measuring and forecasting atmospheric icing on structures

Météo Suisse, Payerne / *METEOTEST* Bern / <http://www.meteotest.ch/cost727/index.html>

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## Project Summary

There is worldwide an increasing demand for accurate information on icing in cold climate and mountainous regions mainly to fulfill the growing needs of meteorological information for various human activities, such as construction, recreation and utilization of natural resources, in particular of wind energy.

The submitted project "Alpine Test Site Guetsch: Meteorological measurements and wind turbine performance analysis" will expand the knowledge base on atmospheric icing specifically in the alps. It fits into an international comparison network and will allow for comprehensive testing and improvement of monitoring equipment.

The project covers mainly the objectives of Working Group 2 of the COST 727 action. Some topics cover as well issues of Working Groups 1 and 3:

1.

Evaluate ice detecting devices in the real alpine atmospheric conditions by comparison of existing commercial and newly developed ice detectors of various types in the winter periods 2005/6, 2006/7 and 2007/2008.

2.

Monitor the behavior of the wind power generator Enercon E-40 installed at the Gütsch site in icing conditions by EWU (Elektrizitätswerk Ursern). As the EWU plans to expand the power generation and as the site is the highest production and test site for large wind generators in the alps, the objective has a significance for the whole alpine space.

4.

Set up tools and recommendations for estimating icing conditions at standard meteorological stations not equipped with ice detectors.

5.

Set up guidance in meteorological measurements and modelling to fulfil the needs of the industry (traffic, power transmission, wind energy) – especially for alpine sites in Switzerland.

It is foreseen, that there will be actions (COST meeting, workshops on icing, workshops on wind energy in the alpine space) coupled with the presented project and organized in connection with the test site Guetsch (e.g. at Andermatt).

The research plan contains the following elements

Upgrade the existing meteorological station Guetsch as test station for ice detector testing. Guetsch is a synoptic station of MeteoSwiss developed in 2003/2004 in the context of the new meteorological network SwissMetNet. It is already equipped with a large variety of high quality sensors and will allow to monitor precisely the atmospheric conditions. Upgrading the station with (to be developed) devices to measure liquid water content and drop size distribution at least during some phases of the project will give a complete picture of the atmospheric icing conditions.

A large variety of icing sensors to detect periods and amount of ice accretion will be installed and monitored. The sensors work on very different physical principles as weighting of the ice mass, change of reflectivity of the surface on which ice accretion occurs, IR detection of ice films, etc.. The evaluation of the experimental data will give feedbacks on the suitability of the different principles under real conditions and for different applications and purposes.

The combination of a comprehensive meteorological monitoring on the site and the detection of icing will help to establish a better understanding and modelling of the icing processes. This will allow to develop the algorithms to calculate and map the risk of icing in the alpine space.

Comprehensive monitoring of the icing on the highest located large wind turbine will allow to better understand demands for standard ice sensors to be integrated on turbines. Automatic icing sensors, indirect measurements (loss of power production, unbalance of the rotor) and optical control by cameras and image processing will be combined.

The main topic of the research plan is to carry out a comprehensive experimental study under the specific conditions of one of the high mountain areas in the world with most human activities - the Alps.