



Jonathan Dumon

Project Engineer
GIPSA-lab – CNRS

Domaine Universitaire
11 rue des Mathématiques BP 46
38402 Saint-Martin d'Hères
France

jonathan.dumon@gipsa-lab.fr
www.gipsa-lab.fr



A Study on Wind Power Evolutions

**Abdelhadi Aliouat¹, Ysoline Lopez¹, Estelle Payan¹, Aissa Saidi¹,
Jonathan Dumon², Philippe Menanteau³, Ahmad Hably^{1,2}, Raphaël Genin⁴**

¹ENSE3, Grenoble INP

²CNRS, GIPSA-lab

³Grenoble Applied Economics Lab (GAEL)

⁴ENGIE France Renewable Energy

ENGIE France Renewable Energy (EFRE) develops, builds, finances, and operates ENGIE's renewable electricity generation assets in France, including wind, photovoltaic, marine, and hydropower. ENGIE's renewable electricity generation fleet in France (wind, solar and hydro) now reaches nearly 6,000 MW of installed capacity [1].

Albeit mature, innovation is still important in the wind energy field. New technologies are emerging with short-, medium- and long-term commercialization prospects: new generation wind turbines (NGWTs) with large rotors and airborne wind energy systems (AWESs). In order to better understand future changes in these wind power systems, EFRE has commissioned a study to 4 students of the ENSE3 engineering school at Grenoble (France), under the supervision of researchers from GIPSA-lab and GAEL. The study aims at providing some decision-making elements for EFRE positioning on NGWTs and AWESs in France. In the first place, the study addresses the evolution of wind turbine technology as well as the social, economic and legislative context in France. Different limits and challenges that currently face conventional wind turbines are then analyzed. In the second place, a study on NGWTs and AWESs is conducted. These emerging technologies are compared to conventional wind turbine according to the previously listed challenging aspects and what could be their respective positions in the coming years: complementary or substitution. Special attention is given to several factors such as social acceptance,

cost, environmental impact, regulatory changes, quality of production, and site selection. The study shows that low-wind-speed turbines are the future of onshore production in France, as sites with high-wind-speed are becoming rare. The development of AWESs is more unpredictable as the technology is still under development and facing significant technical challenges. In order to outperform HAWTs in the near future, AWESs need to be developed for niche markets and eventually for low-wind-speed sites.



One of ENGIE's wind farms.

References:

[1] <http://www.engie.com>