16 Standard Procedures for the Determination and Assessment of Noise Impact on Sea Life by Offshore Wind Farms

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16.1 Introduction

Offshore wind energy is a new technology created by the merging of classical wind energy technology and classical offshore technology. Wind speeds are considerably higher over the sea as compared to onshore sites, but also the cost per installed kW will increase when moving offshore. The rapid development of wind energy use in Germany is accompanied by an increase of the installed power per wind turbine. In the German areas of the North and Baltic Seas, several large offshore wind farms are planned; each with several hundreds turbines of up to 5 MW each.

The Institute for Structural Analysis (ISD) of the University of Hannover, the German Wind Energy Institute (DEWI) in Wilhelmshaven, and the Institute for Technical and Applied Physics (itap) in Oldenburg are partners in a project on: “Standard Procedures for the Determination and Assessment of Noise Impact on Sea Life by Offshore Wind Farms” which is funded by the German Federal Ministry for Environment (BMU).

The aim of this project (CRI, DEWI, itap 2004) is to study the generation, radiation and attenuation of underwater noise, to develop forecasting hydro sound models of offshore wind converters and future noise reduction methods during pile driving, to determine the impact area of offshore wind farms, to allow the formulation of recommendations for acoustic emission thresholds for offshore wind farms in cooperation with biologists, and to develop standard procedures for the determination and assessment of noise emissions.

The operation and in particular the construction of offshore wind converters induce considerable underwater noise emissions. It is assumed that small whales and seals can be affected by noises from machines and vessels, piling and installation of the wind turbines. Piling, in particular using hydraulic hammers creates high frequency noise with considerable sound power levels. Currently, only little knowledge about the effects of different noises to marine life is available. With a view to determining the effects on
the marine flora and fauna and structural design aspects, the research platform FINO 1 (Fig. 1) was erected in the North Sea.

Measurements of the underwater noise during construction of offshore research platforms and numerical investigations are used to develop future forecasting hydro sound models of offshore wind converters.

![Research Platform FINO 1](image)

**Fig. 1. Research Platform FINO 1**

### 16.2 Physical-technical Principles

There are differences between the treatment of air borne noise and hydro noise. Basic acoustical parameters such as sound pressure, sound velocity, near range, far range, sound pressure levels and mean levels are introduced in the research project with the special focus on underwater noise.