Overview:
Types of underwater noise mitigation measures implemented
Mandatory Noise Limits for OWP

Offshore Windparks & Converter stations

- Dual noise limit criteria: 160 dB re 1µPa (SEL05) and 190 dB (Lpeak) in 750 m distance from pile
- Installation time limit: 180 min per monopile/jacket installation
- 30 minutes deterrence - effective until 750m radius

Noise mitigation concept (Federal Ministry for the Environment, 2013)

- A noise value of 140 dB (radius 8 km from pile) may occur
  - Simultaneously on max 10% of the area of the German EEZ
  - Simultaneously on max 10% of the area of a Natura2000-area
  - Simultaneously on max 1% of the area of the main concentration area of the harbour porpoise (Sylt Outer Reef) during May – August
  - Simultaneously on max 1% of the area of the Natura2000-areas Sylt Outer Reef and Doggerbank during May – August
Noise Abatement during OWP constructions

**FAR FROM MONOPILE**

Double Big Bubble Curtain (reduces high frequencies)

**CLOSE TO MONOPILE**

HSD-Net (Hydro Sound Damper) (reduces low frequencies)

NMS (Noise Mitigation Screen) (reduces high and partially low frequencies)
Efficiency control and monitoring

- **Noise Monitoring before, during and after construction activities**

  - **Before:** underwater noise & porpoise presence in vicinity of construction site
  
  - **During:** underwater noise/porpoise presence at 750m and 1500m, immediate surroundings, nearest Natura2000 area → if noise limits are exceeded, additional measures apply
  
  - **After:** noise monitoring/porpoise presence in OWP for several years
Guidelines for unexploded ordnances

- Mitigation measures are considered for each planned detonation including:
  - separation of the fuse box from the main charge in certain types of air mines
  - translocation of UXO and detonation in shallow waters or on a sandbank (in air)
  - use of pingers/seal scarers, use of bubble curtains.

- **Lower Saxony (incl. Wadden Sea):**
  - binding guideline for the handling of Unexploded Ordnance (UXO),
    - if possible, UXOs are defused.
  - If not possible: UXOs are towed to tidal areas, where ignition above water level is possible during low tide,
  - If removal is not possible, ignition is carried out on site using double bubble curtain and seal scarer.

- **In process:**
  - **Guidelines** for the legal and technical nature conservation requirements for the clearance of explosive ordnance in the German North Sea and Baltic Sea.