

### Vibrations

- Analysis and avoidance of vibration related problems



### Vibration issues at OKG







# Vibration issues at OKG cont.



#### • EDGs vibrations



- The machine 1000 rpm 4th order vibration response
- Resonance observed to be in the range of 68 to 74 Hz in the no-load speed sweep, dropping in frequency to about 67 Hz under high loads
- Stiffening plates, extra mounting feets



### Vibration issues at OKG cont.

### • Cyclic/spiral vibrations





# **General vibration issues in Nuclear**

- Measurements: sensor type, type of equipment, sensor support, location, analysis of results, requirements – what is ok?
- Analyses/calculations good for visualization
- Resonances
- Acoustic and flow phenomena

# Phase 1, 2014-2015

- Focus areas:
  - Computation
  - Requirements/verification
  - Components
- Important projects:
  - Mapping of pipe vibrations
  - Mapping of emergency diesel generator set vibrations
  - Mapping of turbine and generator vibrations
  - Fluid induced vibrations experiment and CFD calculations
- Workshops
  - Internal workshop on diesel vibrations
  - Open workshop on the theoretical background to vibrations within nuclear applications







## Focus areas, phase 2, 2016-2018

- Vibrations in piping, including valves and pipe supports
- Emergency diesel generator (EDG) set vibrations
- Turbine and generator vibrations





# **Benefits and deliverables**

- Higher availability and predictability of the NPP
- Guidelines and recommendations on analysis and avoidance of vibrations in:
  - Pipes
  - Emergency diesel generator sets
  - Turbine/generator

