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## Evaluating the Loading and Structural Response of an Offshore Platform Using Integrated Large and Small Scale Testing Combined With Diffraction and Finite Element Analysis and Offshore Measurements

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### Abstract

After discussing the specific roles of model tests, simulations and offshore (full scale) measurements for the evaluation of offshore structures in general, the paper applies this integrated methodology to the investigation of the loading and structural response of the South Arne platform with the aim of extending the platform's capabilities. The South Arne platform deck is supported by a combination of a large volume concrete Gravity Based Structure (GBS) and a slender steel lattice structure. This resulted in a unique project, including the novel combination of small scale tests of the complete structure (GBS and lattice tower) with large scale component testing of parts of the lattice tower to limit and quantify scale effects on these slender members. The paper discusses the different phases (and scales) of model testing and also highlights the related Finite Element (FE) and diffraction calculations and offshore (full scale) measurements.

### INTRODUCTION

In the process of evaluating an offshore structure during its design or while in operation, model tests, simulations and offshore (full scale) measurements all clearly complement one another (Figure 1). All three have their specific roles, strengths and limitations [1] which are summarised below.

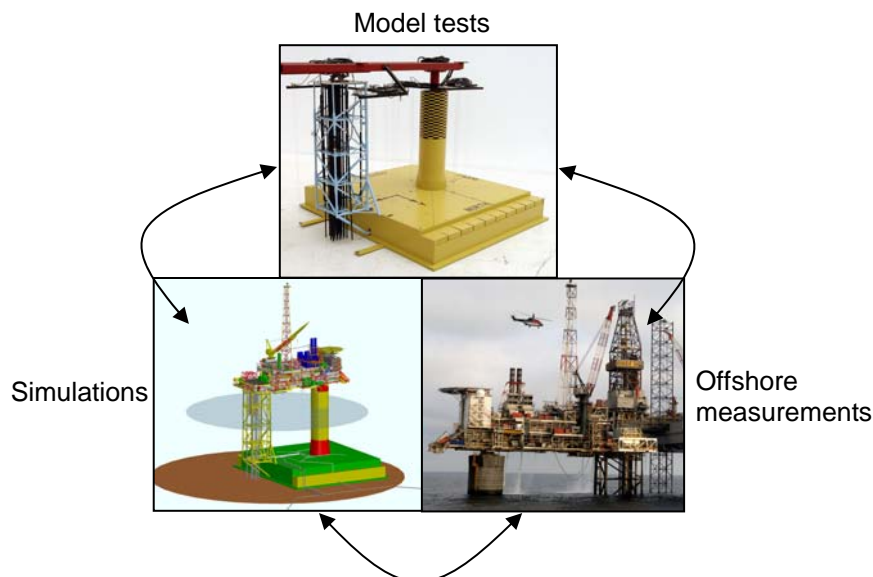


Figure 1 Combined model tests, simulations and offshore measurements to evaluate the South Arne Platform