Gentle Driving of Piles

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Date: 12-06-2019

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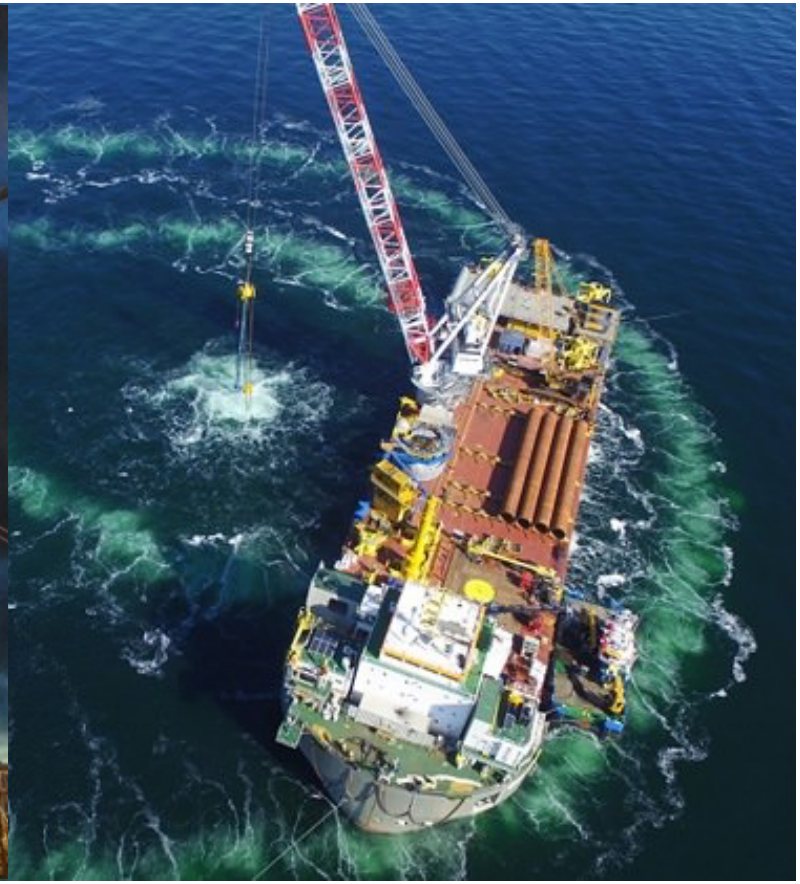
Introduction- XXL monopiles are reality!

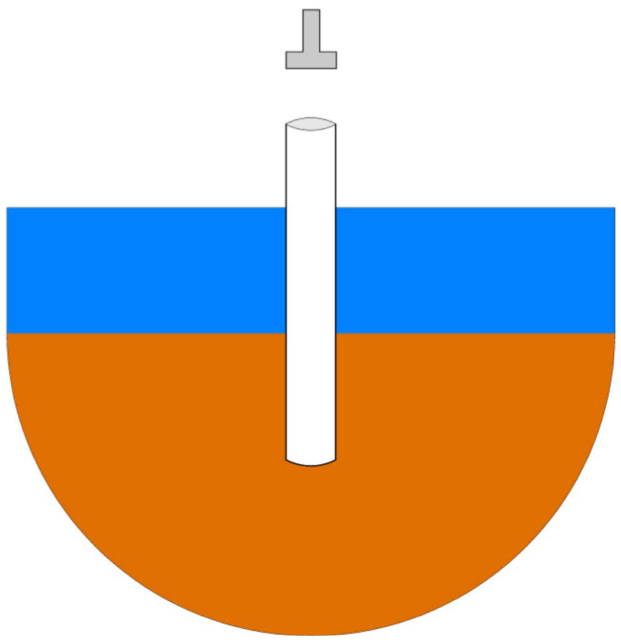
Source: offshorewindindustry.com

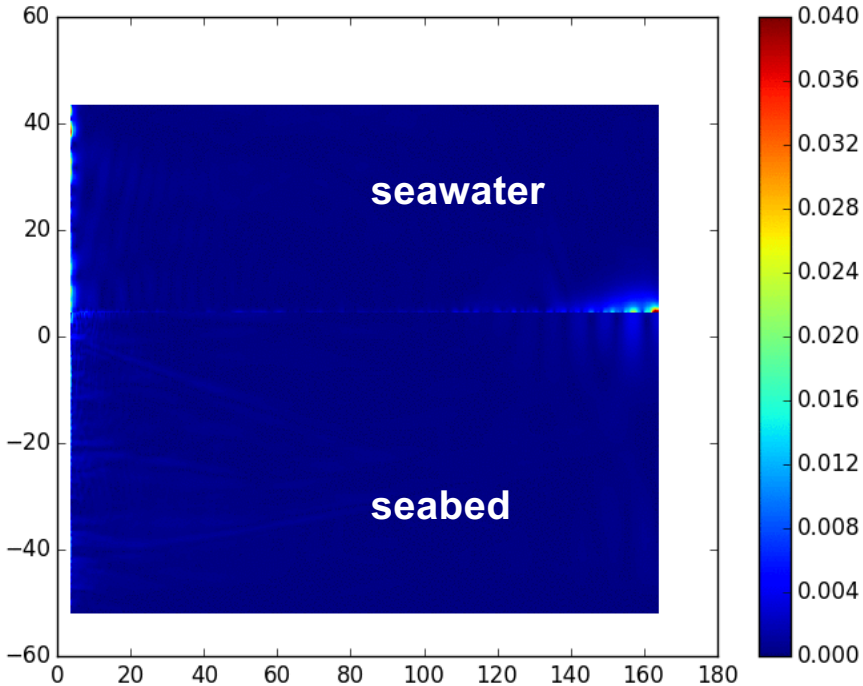
Current installation method

- Mainly Impact Piling
- Restrictions on noise
- This results in
  - Increased costs
    - Noise Mitigation Systems
    - Additional offshore operations
  - Risks
    - Predictability of sound
    - NMS
    - Forced stop



Sound predictions tools





The animation shows velocity field generated in the seawater and seabed due to a single blow of a hydraulic hammer. The video has been composed by using results of the SILENCE software package.

Alternatives

- Eccentric shakers
- Blue Piling

Challenges

- Bearing capacity
- Predictability
- Scalability

Innovation is required

- How to install XXL monopiles?
- How to reduce impact on environment?
- How to ensure bearing capacity?

- The GDP project was born!

Gentle Driving of Piles (GDP)

grow

Boskalis

Deltares

DOT

ECN

TNO innovation for life

Eneco

IHC

innogy

seaway 7

CAPE HOLLAND

TU Delft

Sif

Van Oord Marine ingenuity

Netherlands Enterprise Agency

TKI WIND OP ZEE Topsector Energie

The GDP project goal

The main objective of this project is the development of a novel technique for Gentle Pile Driving that simultaneously improves drivability, reduces noise emission, and ensures that the soil bearing capacity stays uncompromised.

Unconventional approach

- First step: Experimental proof of the concept
  - Reason: When successful, a follow-up full scale project is aimed at which then is led by industry partners
- Second step: Validation of the newly developed prediction models
  - Drivability
  - Sound
  - Bearing capacity

TU Delft project team

Professor Andrei Metrikine

Scientific supervision

TUD project coordinator
Maxim Segeren

Experimental Work (WPs 1&2)

Project Manager
Ahmed Elkadi

Post-doc.
Faraz S. Tehrani

Post-doc.
Sergio Sánchez Gómez

PhDs research (WPs 3&4)

Ass. Professor
Apostolos Tsouvalas

Ass. Professor
Federico Pisanò

PhDs
Thanasis Tsetas

Timo Molenkamp

PhD
Vagelis Kementzetzidis

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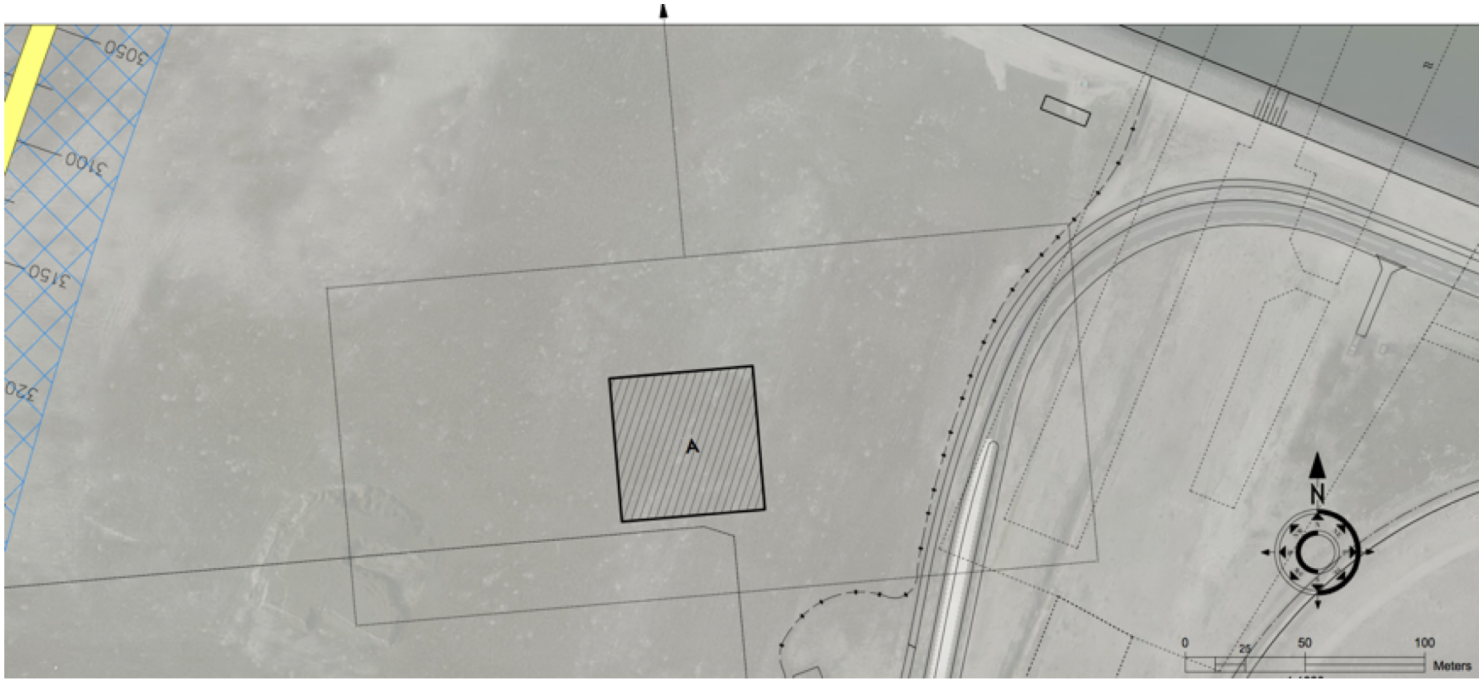
Lab test results

- Lab Test performed at the Stevinlab, TU Delft
- Very promising results
- Ongoing test now with processed soil

Field test

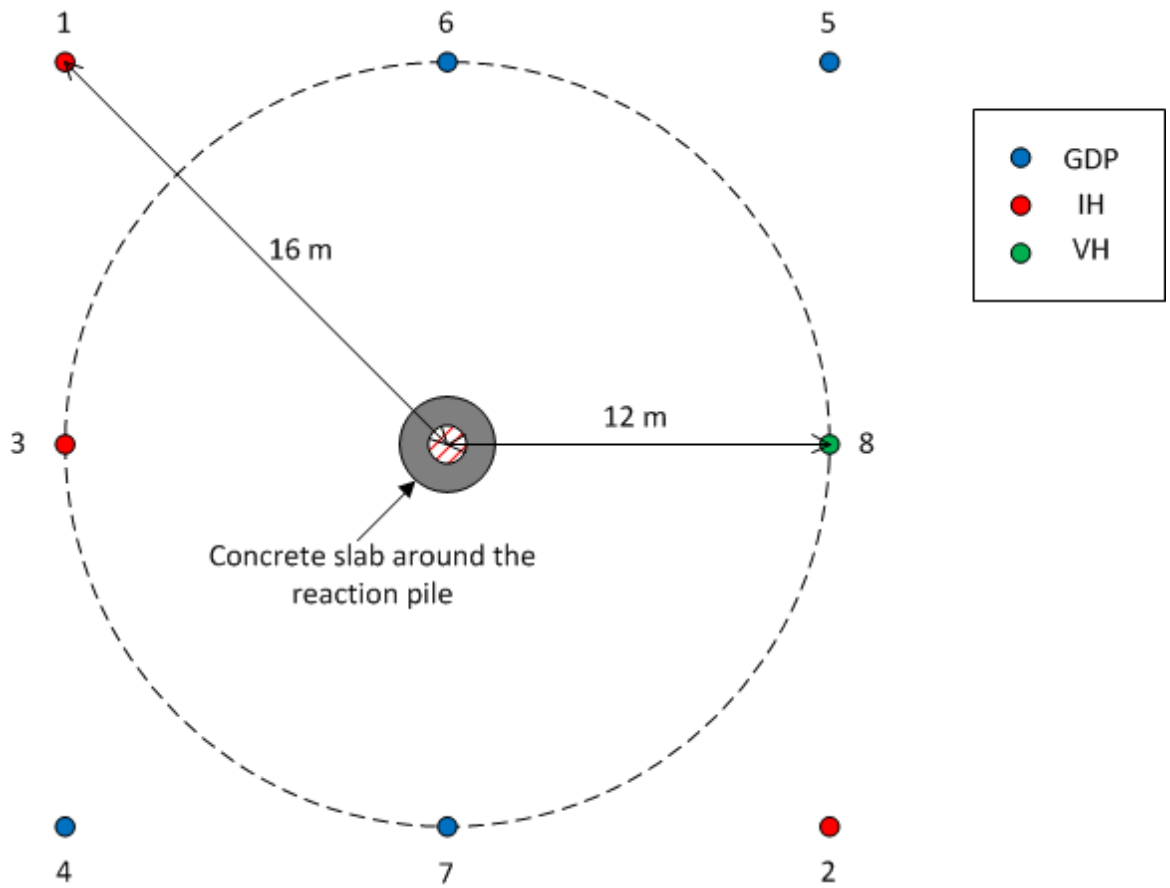
- At Maasvlakte II



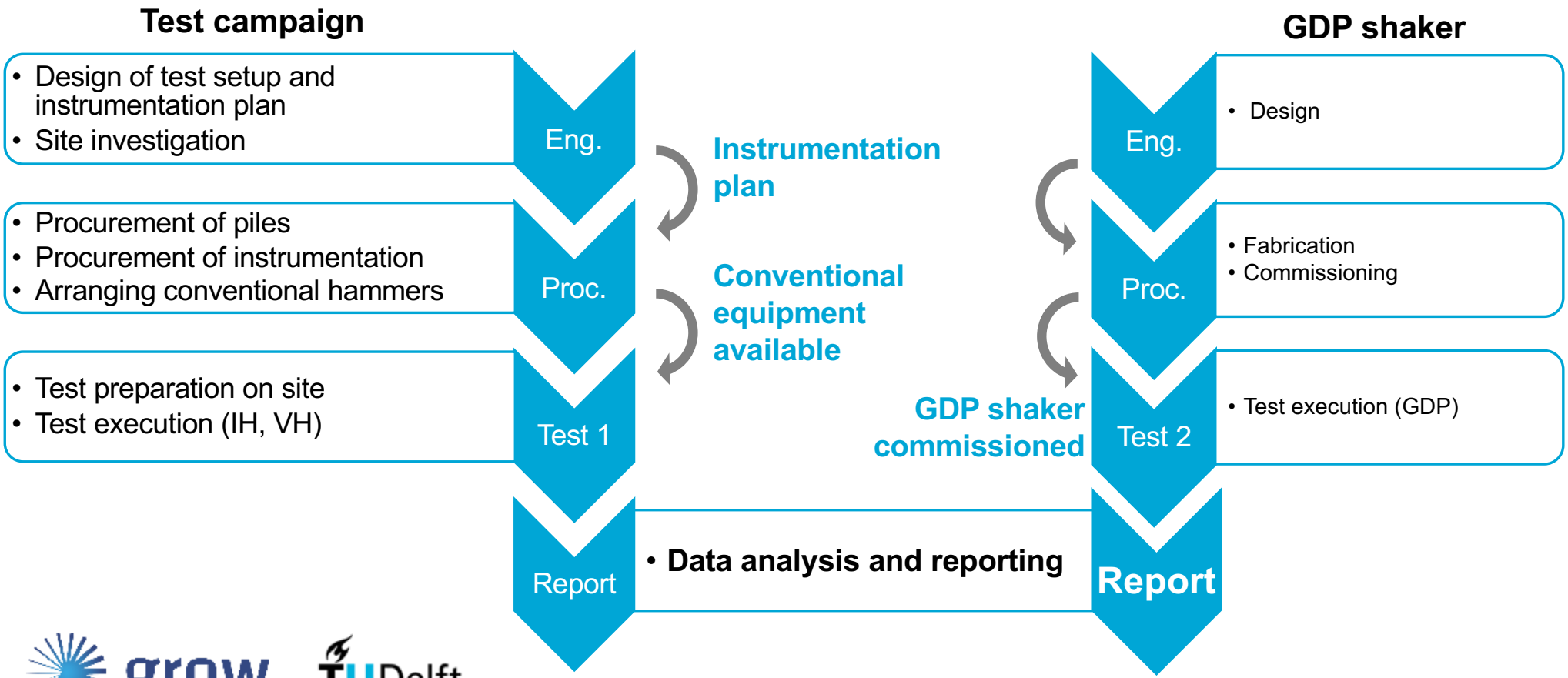
Field test - activities

- Basic site investigations
- Advanced site investigation
- Ground monitoring
- Soil mechanic laboratory tests
- Installation of 8 test piles and 1 Reaction pile
- Loading of piles
- Investigation of soil-pile interaction through ground monitoring and instrumented piles

Field test - Layout of the piles



Status: Field test campaign



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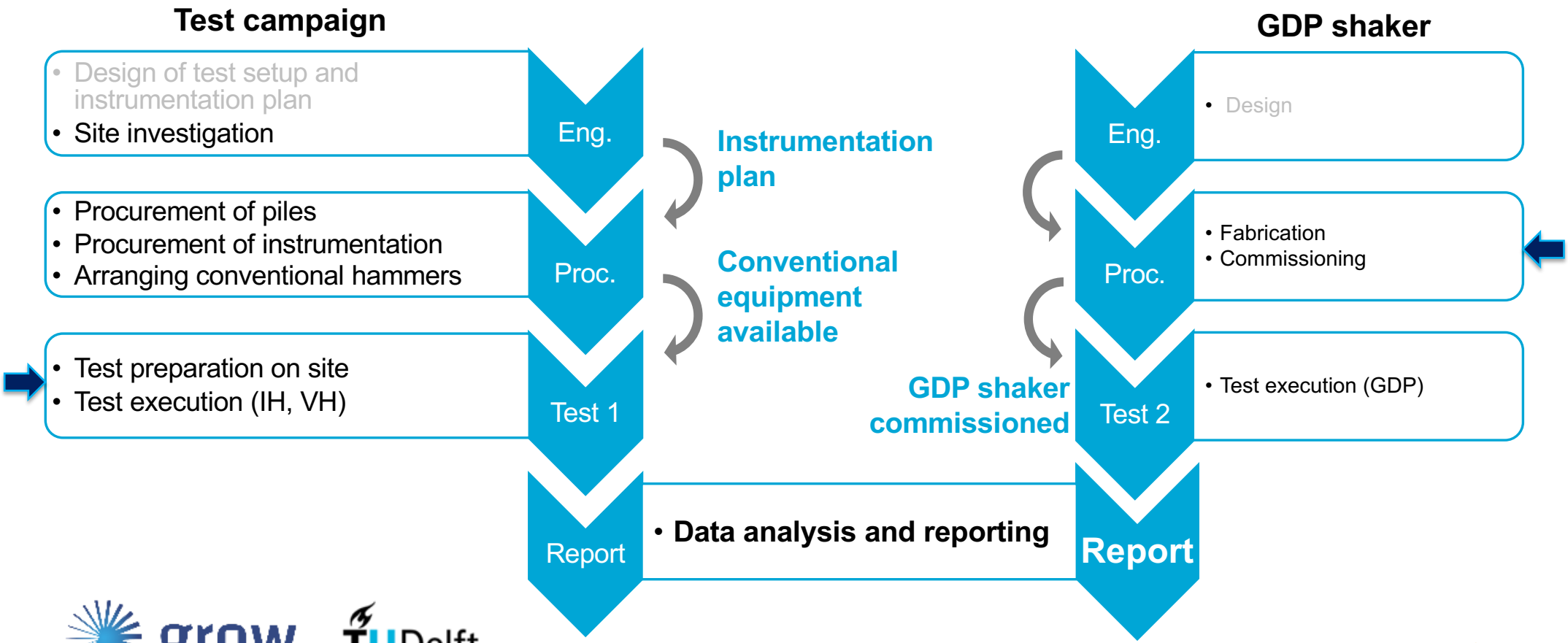

After experiments

- Expect results
  - To proof GDP concept
  - Reduce uncertainty in bearing capacity of vibro-driven piles.
  - Motivation to further develop the GDP method and upscale it
- Still to do
  - The hard work☺
    - Models of drivability, bearing capacity and noise production
    - To validate, predict and to be applied for larger diameter piles and different soil conditions

Thank you

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www.grow-offshorewind.nl