#### Hyperlink: Developing a hydrogen network in North-West Germany

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## Gasune crossing borders in energy

# hyperlink



#### Gasunie: a connecting factor in the energy value chain

*Providing open access and non-discriminatory infrastructure in The Netherlands and the northern part of Germany* 





#### Our hydrogen program

focuses on four pillars



#### Onshore and Off-shore hydrogen network

both in the Netherlands (HNS) and Germany (Hyperlink)





#### Reuse of pipelines

sustainable and more cost-effective



Challenges in developing a hydrogen network

A key challenge is how to balance the network safely, without causing integrity risk due to hydrogen-enhanced fatigue



#### The hydrogen market needs flexibility

supply and demand profiles don't match





#### The rate of defect growth depends on three factors

to what extend can pressure fluctuations during operation be allowed



**Conference 2023** 

#### This poses a dilemma

facilitating market needs without jeopardizing pipeline integrity





A quantitative method is needed to calculate the maximum amount of linepack to be made available to the market



#### A quantitative model was developed

integrated three step approach

 Dynamic network simulation Calculate pressure profiles from network topology data and dynamic network data using Simone software

2. Data processing algorithms Simplify the pressure profiles using the rainflow-counting algorithm and Miner's rule

3. Defect growth calculation

Translate pipeline characteristics and dynamic network behaviour to expected defect growth



For further details, see:

Wesselink, Krom, Van Agteren (2022), Balancing hydrogen networks safely. A method for calculating line pack potential without causing integrity risk due to hydrogenenhanced fatigue. Proceedings of the ASME 2022 14th International Pipeline Conference, IPC2022-86674

#### Key take aways

 Facilitating the Dutch hydrogen market by providing flexibility is possible <u>while staying</u> within safe margins for defect growth



 The integrated crack growth simulation model will run every year for analysis purposes during operation of Dutch national backbone



Application of the integrated crack growth simulation model to the Hyperlink network is on going. Results
expected later this year.







#### Back up





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### 1. Dynamic network simulation









