



What drivers and barriers do we see for technology choices on NCS? - How decision models may over- or underestimate risk

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November 29th 2018 – OG21 Forum 2018

What drivers and barriers do we see for technology choices on NCS?

- How decision models may over- or underestimate risk

Since 1864, DNV GL has been working to manage risk

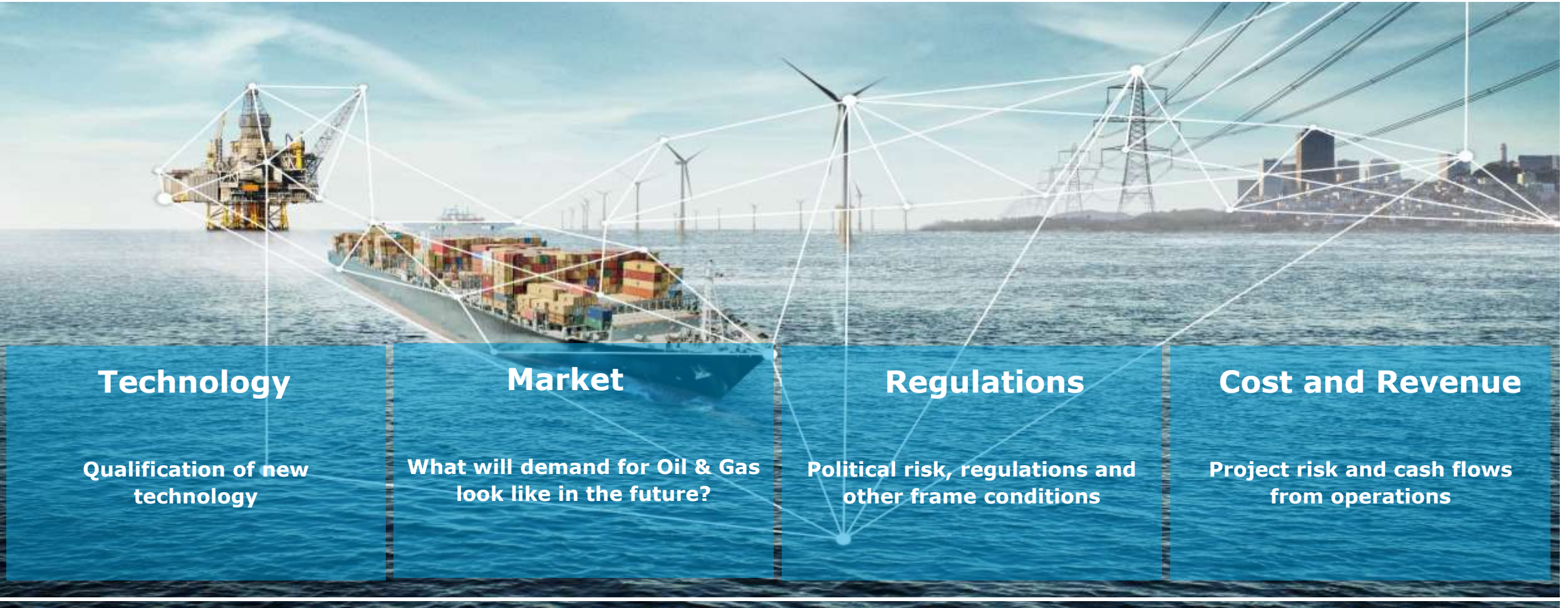
What have we learned?



**Safeguarding life,
property
and the
environment**

Risk and Opportunities are driven by several issues beyond technology

- A broader view on risk is needed to capture everything affecting a decision



Risks we cannot control or quantify often increase perceived risk



Soft vs hard

Non-technical risks are often harder to quantify

Decision making

Ownership and decision level will impact perceived risk

Control

Risks beyond own control will in general be perceived as higher risk

Uncertainty

Uncertainty will in general increase perceived risk

Case 1 – New technology challenging existing regulations

All-electric x-mas trees



Technology

Qualification of new technology

Market

What will demand for Oil & Gas look like in the future?

Regulations

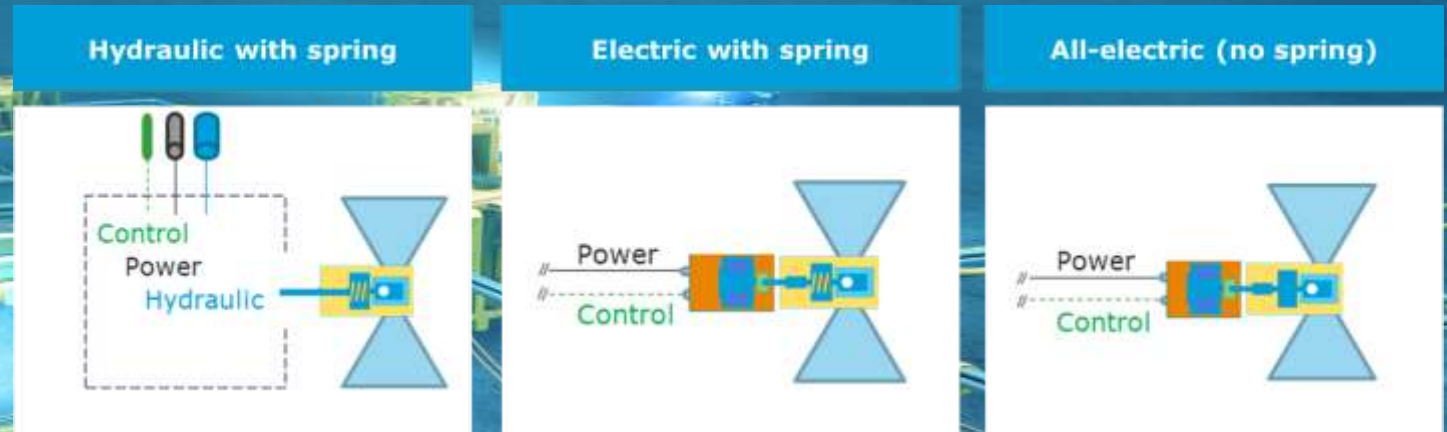
Political risk, regulations and other frame conditions

Cost and Revenue

Project risk and cash flows from operations

The all-electric subsea technologies is not new – but still has not scaled

- *Uncertainty in demonstrating compliance towards regulations and standards*



- While regulations are flexible and functionally based – still a challenge to demonstrate compliance for new technologies
- Regulations require fail-safe solutions and guidelines refer to NORSOK standards that prescribes “*Hydraulic or pneumatic... spring return*”.
- The new solutions offer much better diagnostics and different failure modes –requiring novels way of demonstrating safety

Case 2- Business case and scale of new value chains

Hydrogen value chains



Technology

Qualification of new technology

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Political risk, regulations and other frame conditions

Cost and Revenue

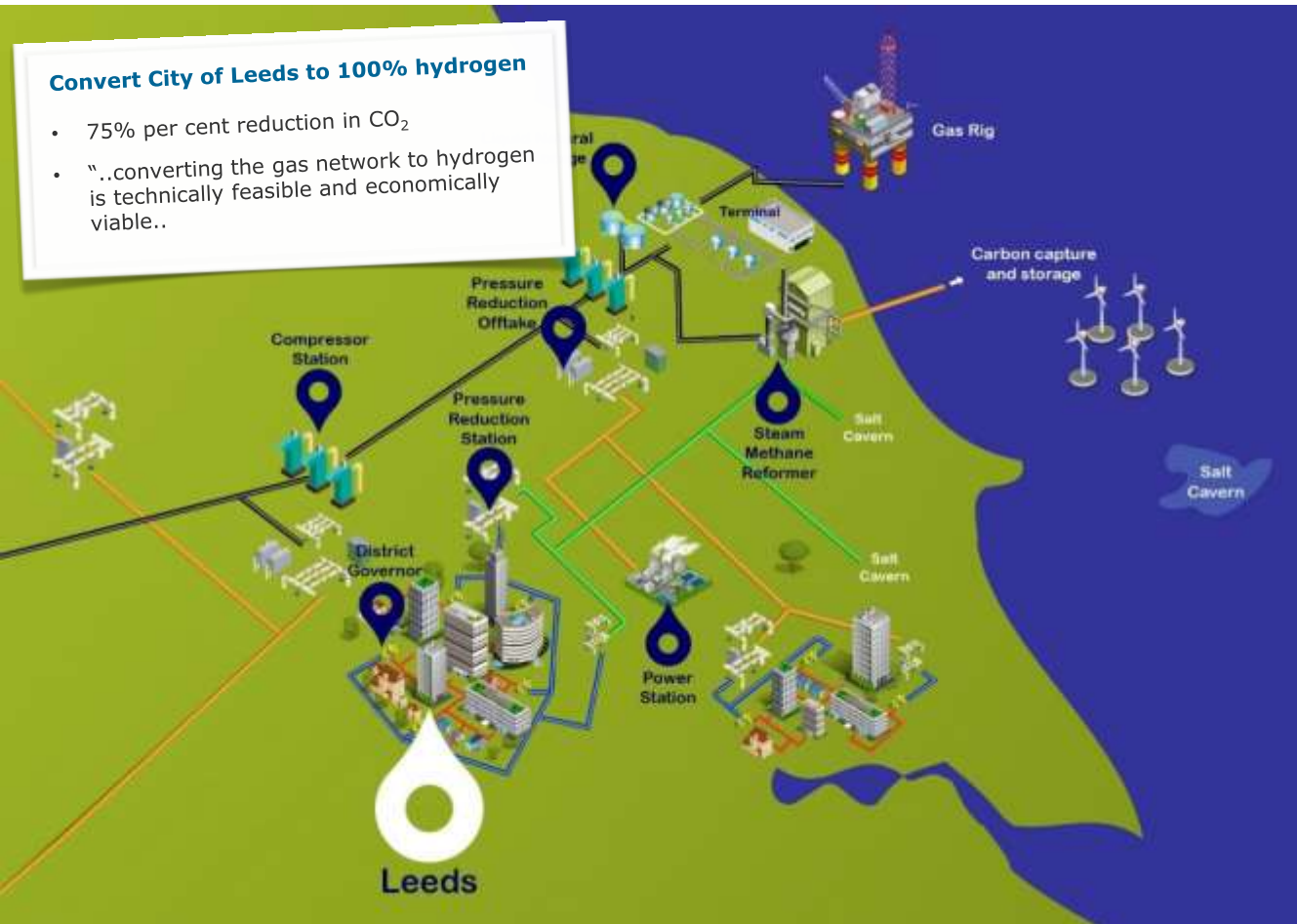
Project risk and cash flows from operations

Governmental initiatives to reduce political and market risks

- The H21 project may transform Leeds into a hydrogen city

Convert City of Leeds to 100% hydrogen

- 75% per cent reduction in CO₂
- "...converting the gas network to hydrogen is technically feasible and economically viable.."



?

It is **currently unclear** if H₂ will become a major zero-carbon energy carrier



Uncertainties include:

- What role will the governments take?
- Will CCS be in place in time?
- What value chain will eventually succeed?
- Will society accept the perceived HSE risk?

Summary – A Broader view on risk is needed to support decision making

“We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten” – Bill Gates

1

Estimate risk explicitly and share it

- Estimate risk
- Share risk
- Project, portfolio and national level

2

Create appropriate frame conditions

- Proper ownership
- Up-to-date regulations
- Global scaling of technology

3

Make the value chains work to create value

- Focus on value chain enablers
- Consider risks along value chain
- Strategic partnerships



Thank you

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