

Challenges and opportunities of Shale

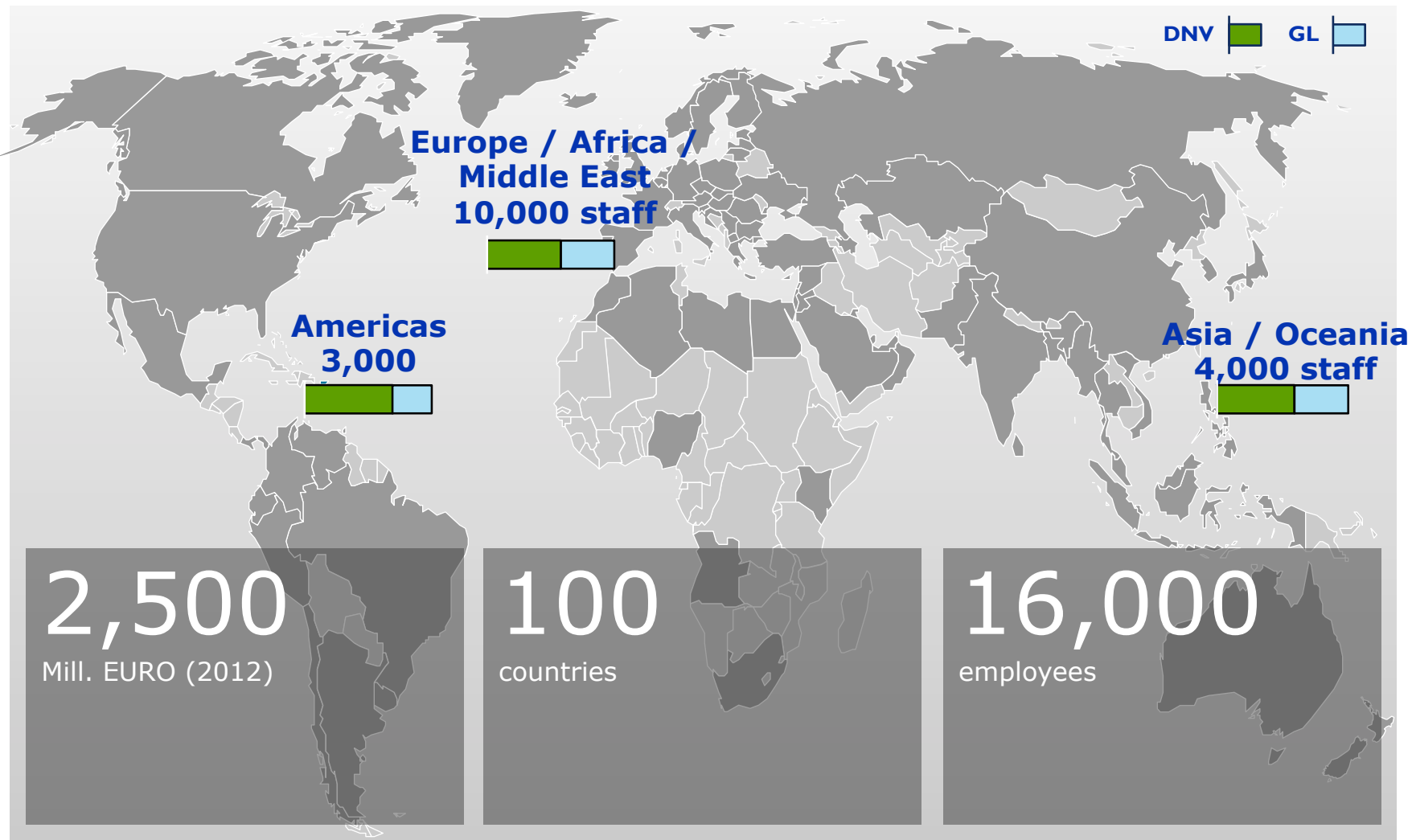
Risk governance for Unconventional Gas and Oil Development

Lars Sørsum, Director, Unconventional Oil & Gas, DNV GL

Talk outline

- Shale risk management and standardisation
- The shale oil and gas global risks and challenges
- A risk management model for operators and regulators
- Our view of the key challenges





Committed to innovation

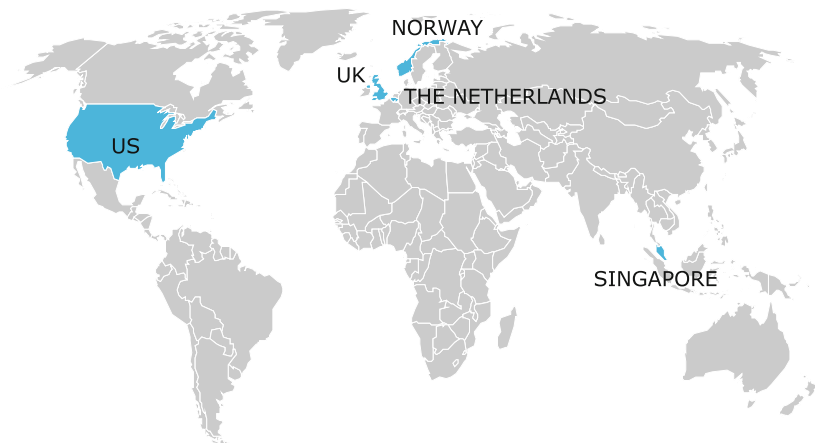
5% of annual revenue reinvested
into research and
development every year

100 joint industry projects
each year

70 internal technology
projects annually

170 industry standards and
recommended practices

+65% of the world's offshore
pipelines are to DNV GL
standards



Dedicated R&D centres in the
Netherlands, Norway, Singapore,
the UK and the US.

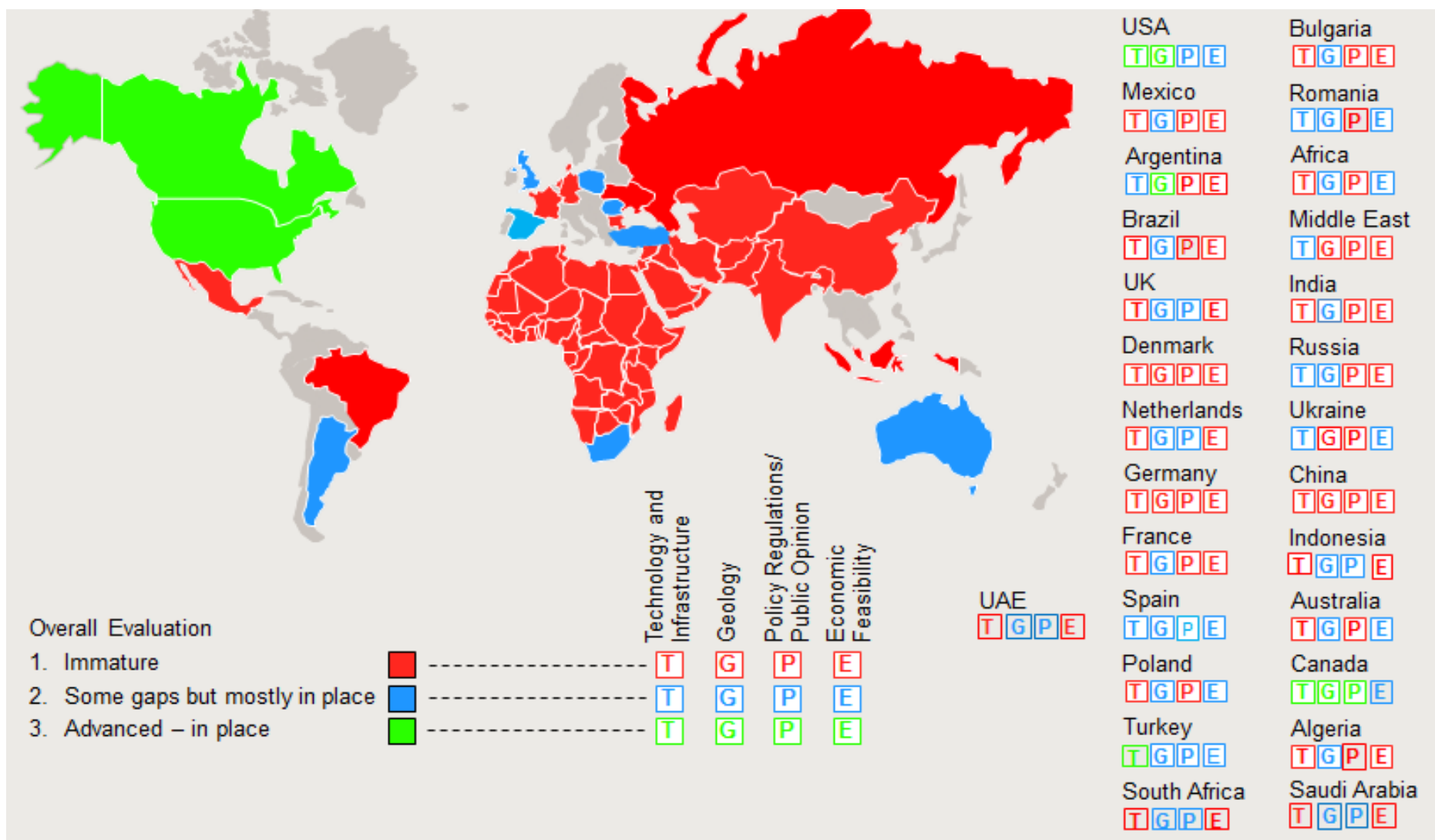
DNV GLs Recommended Practice (RP) focuses on all relevant shale risk aspects in a life cycle perspective

- RP U301 “Risk Management for Shale Operators and Regulators”
 - Management systems
 - Safety, health, and the environment
 - Well integrity
 - Management of waste, resources, water and energy
 - Infrastructure and logistics
 - Public engagement
 - Stakeholder communication
 - Permits
- Our aim is to develop this into an international standard



The shale oil and gas global risks and challenges

Shale gas and oil – DNV GL a global risk assessment



An exponentially growing industry - is the existing governance robust enough to handle it?

- From a few hundred in 2008 to more than of 45000 wells in 2014
- And, with TRR of 830 tcf (18%) and a mean EUR of 1 bcf/well, you need 830.000 wells to extract the resources
- Economies of scale needed on low margins

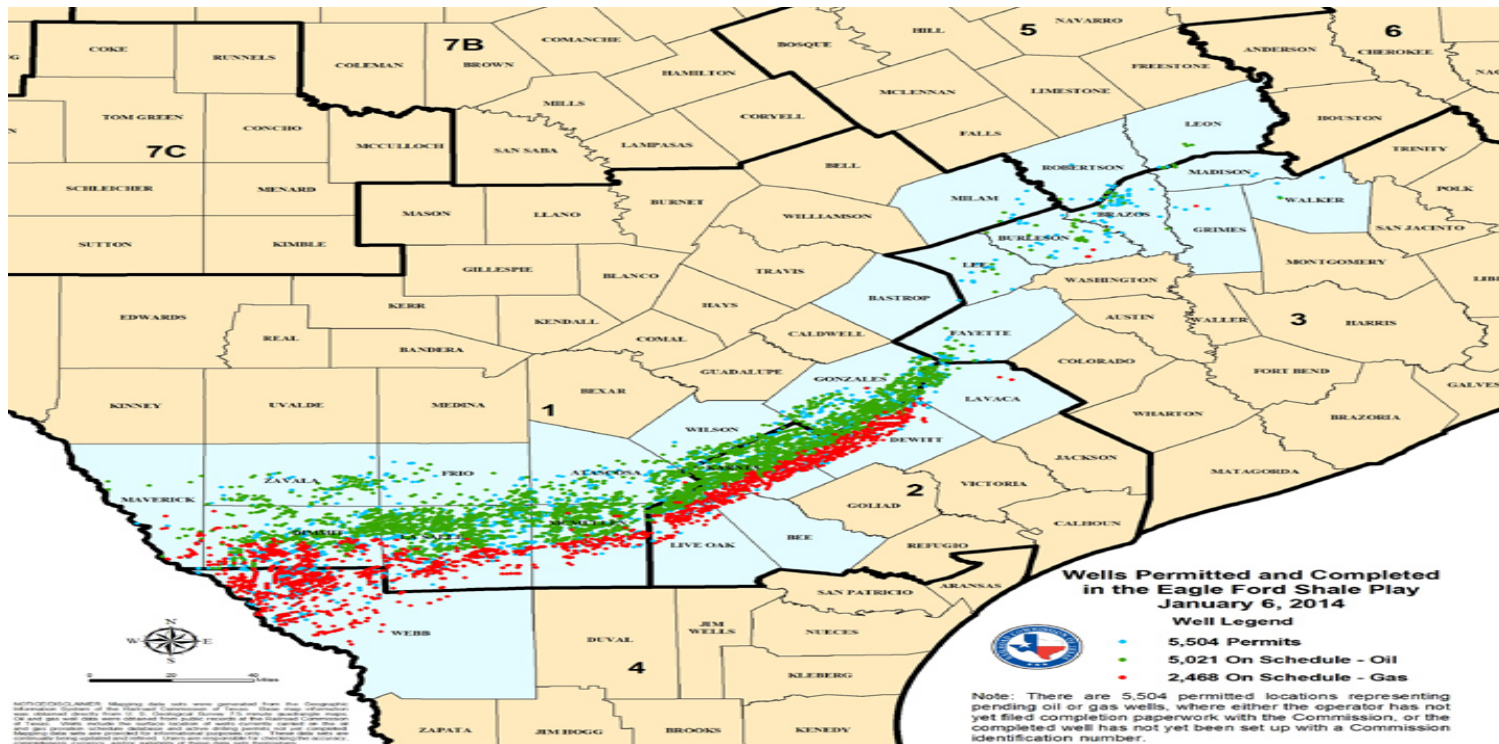
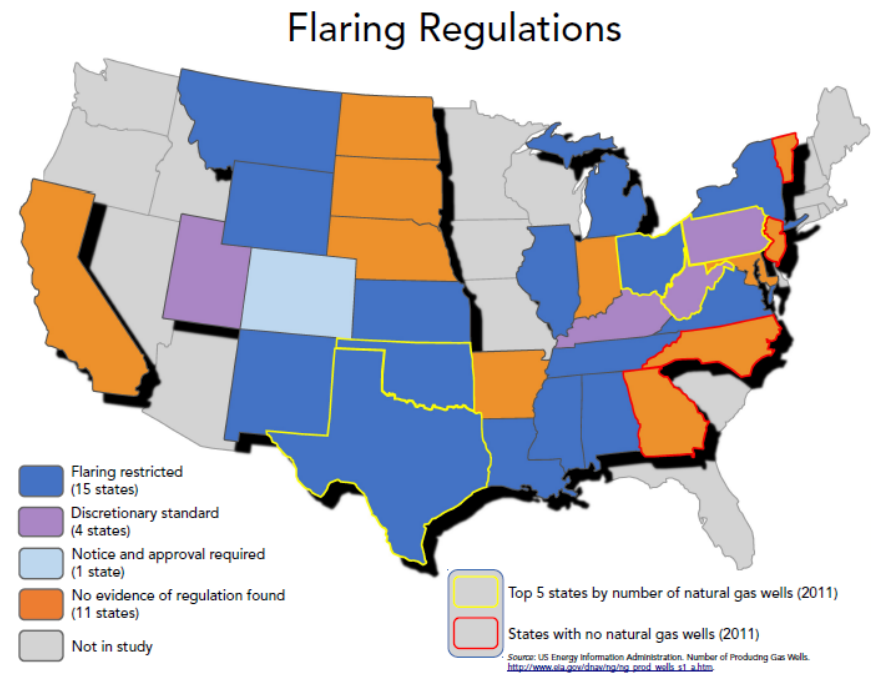


Image Source: Texas Railroad Commission, Woodmack,

Cheap gas has lead to economic boom and prosperity but, be careful what you wish for.....

- Environmental shortcuts to reach the oil
- 40% of the gas (2MTpa) flared in the Bakken field (North Dakota) alone, \$380M/year in revenues up in flames
- Same situation in Eagle Ford (Texas)
- Surreally flaring and emissions are restricted in Texas



The industry has gone from infancy to a substantial industrial operation

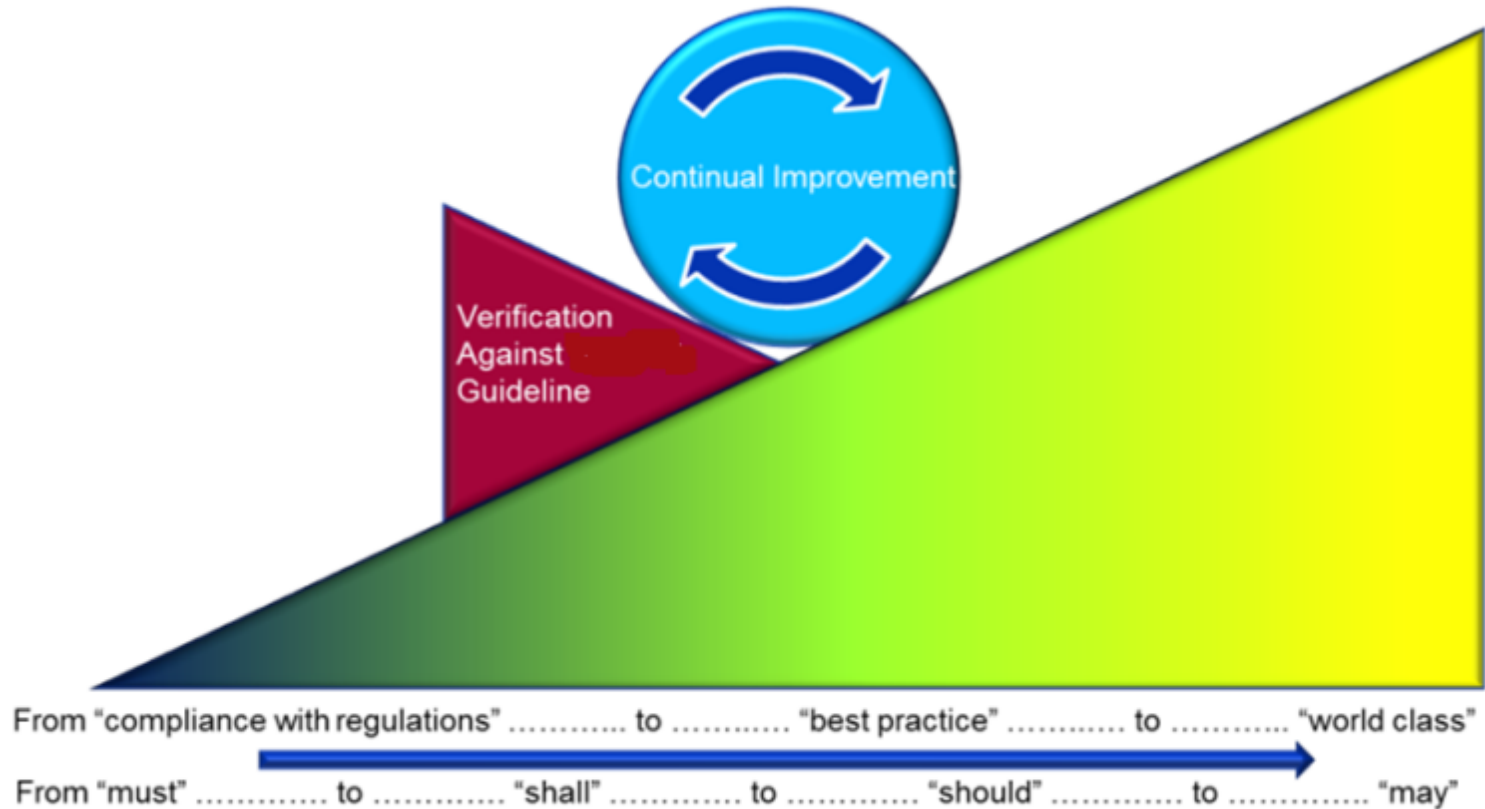
- Without increased governance or oversight
- With an increasing public outcry for governments to impose new regulations
- No effective system for accident data aggregation
- Is disaster looming?



ELIMINATING RISK IS NOT AN OPTION

It's how you manage
your most critical risks that matters

The industry needs to impose on itself a degree of self regulation, demonstrating a safe and sustainable operation



Key challenges for a sustainable and continued development of shale gas going forward

- Political will, courage, foresight and drive
- Economies of scale
- Dealing with less divergence and price volatility
- Dealing with public perception
- Demonstration of safe and sustainable development and production



Thank you for your attention

Lars Sørum

Lars.soerum@dnvgl.com

www.dnvgl.com

SAFER, SMARTER, GREENER