
Lloyd's Register Singapore Group Technology Centre
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Singapore GTC Objectives
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Managing Director
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Challenges for the Next Generation in Oil and Gas Business
• In an energy hungry world, to
• Exploit resources in increasingly harsh environments, and
• Confront the age of global warming, while facing a
• Demographic cliff
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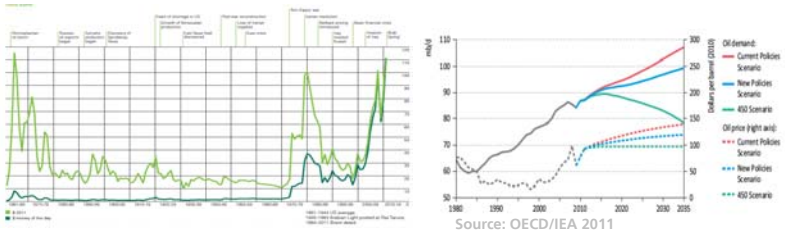
An energy hungry world

- Oil reserves are limited
- Cycles around growing price trend
- Contraction in energy prices devastating to investments and employment in sector, but implies innovation in
  - Efficiency at energy supply
- Energy price bubbles lead to overheating and drives innovation in
  - Efficiency at energy use
  - Diversification of energy mix
  - Pragmatism, e.g., acceptability of nuclear power



Source: OECD/IEA 2011

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Exploit resources in harsh environments

- Lack of experience from harsh environments may imply excessive CAPEX due to,
  - Long project development phase
  - Conservative safety factors
  - Delays to resolve technical issues
- High CAPEX reduces the field of play
  - Fewer and bigger operators
  - Institutionalised employers
  - Less entrepreneurial innovation
- Project viability becomes very dependent on energy prices, implying larger excursions from mean. However,
  - Life extension projects become viable
  - Interest in stretching technology and innovation increases

Courtesy: SEIC

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Events that have Changed the Energy Industry

Alexander L. Kielland flotel, North Sea 1980

capsize, 123 deaths

Chernobyl, Ukraine 1986

•explosion, 4000 deaths, 7.3 million people affected in the aftermath

Piper Alpha North Sea 1988

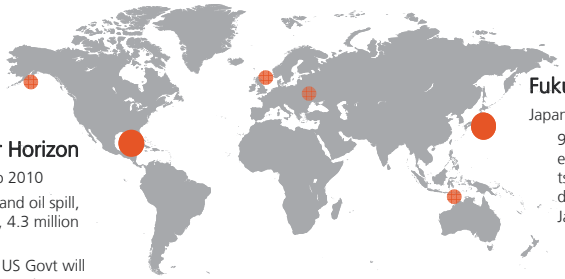
•explosion, 167 deaths

Exxon Valdez Alaska 1989

•grounding and oil spill, estimated around 400,000 bbls

Montara Timor Sea 2009

•oil leak, estimated around 150,000 bbls



Deepwater Horizon

Gulf of Mexico 2010

- explosion and oil spill, 13 deaths, 4.3 million bbls
- Jan 2013: US Govt will seek penalties $21bn +

Fukushima

Japan 2011

9.0 magnitude earthquake and 14 metre tsunami 160,000 people displaced and parts of Japan left unliveable

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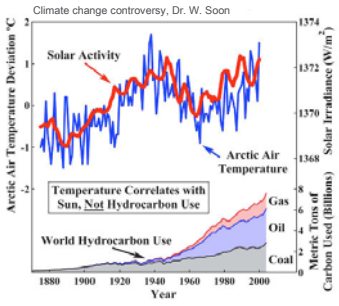
Confront the age of global warming

- Public opinion demands action, whether emissions from human activity influence global warming or not
- Effect similar to energy price bubble:
  - Efficiency at energy use
  - Diversification of energy (renewable) mix
  - Pragmatism, e.g., acceptability of nuclear power



Macondo/Deepwater Horizon well head

- In any case, the perception about environmental impact of industry is negative

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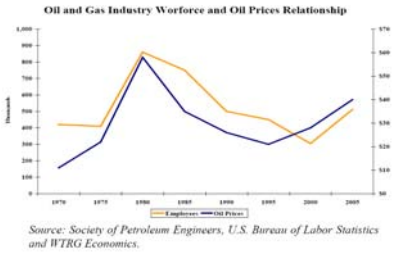
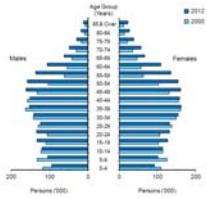
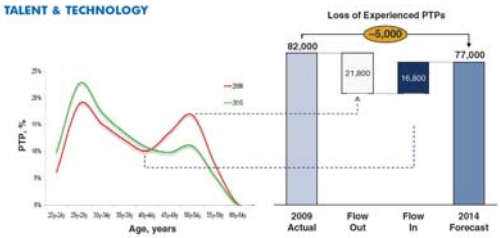
Demographic cliff



Source: Society of Petroleum Engineers, U.S. Bureau of Labor Statistics and WTRG Economics.

- 1,1 million jobs were lost in the sector from 1981 to 2005
- The average age of the Oil & Gas E&P workforce is 50 years, higher than any other industry
- In addition, as stated previously, the demands for the work force increase
  - Difficult (hostile) working environment
  - Increased technical complexity of assets
  - Negative public perception of the industry
  - Affluent youth tends to shy away from engineering
- The industry therefore faces significant challenges in
  - Retention and knowledge management
  - Recruitment
  - Training
  - Staff mobility
  - Salary cost
  - Delays





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Group Technology Centre
(£20m over 5 years)

- Ensure technology readiness
- Theme-based R&D
- Integration of knowledge and skills from acquisitions
- Leverage Singapore technology/ skills base
- Reaffirm position as thought leader
- Training

- Subsea
- Drilling & Well Control
- Asset Performance Management
- Risk
- Deepwater/FOI
- Renewables
- Enabling/Emerging Technology

NUS National University of Singapore

NANYANG TECHNOLOGICAL UNIVERSITY

A*STAR SINGAPORE

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What the Singapore GTC will do

- Research portfolio to improve business sustainability through cycles in energy prices:
  - Efficiency at energy supply
  - Efficiency at energy use
  - Diversification of energy mix
  - Enable life extension projects
  - Less labour intensive solutions
- Focus on harsh environment issues:
  - Trim safety factors to reduce CAPEX
  - Technology qualification to minimize project delays
  - Enable market entry of smaller innovative businesses
- Mechanisms to improve organisational integrity and staff competency
- Management systems to verify / improve HSE performance

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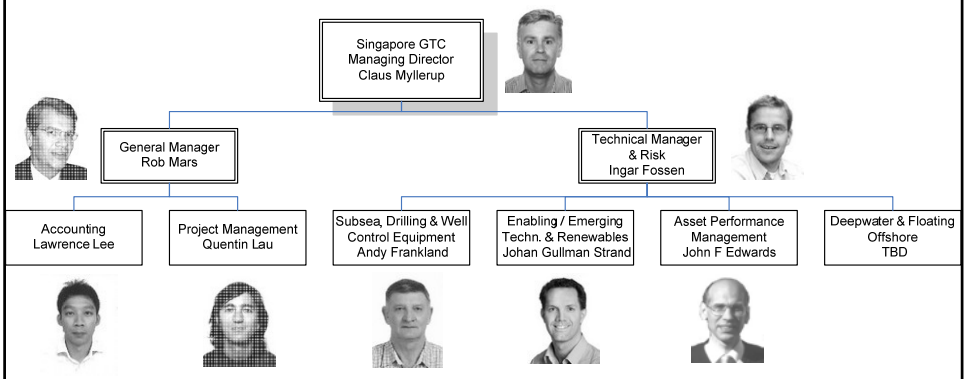
Singapore GTC Management



Our Success Criteria

- The solutions we develop in collaboration with partners and clients improve their performance and reputation
- The Singapore GTC contributes to developing the next generation of technical leaders for the energy business by giving them
  - Versatile skills to face cycles in energy job market
  - Humility towards the technical challenges the industry faces
  - A strong industry network through joint industry projects
  - Pride in providing the world with solutions to its energy needs

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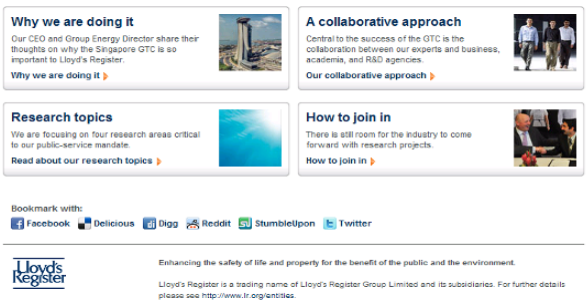
Thank you for your attention

- Interested in making a difference for the industry as well as for Singapore together with us?
- Visit www.lr.org/SingaporeGTC



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