




## / GC RIEBER SHIPPING IN BRIEF

BUSINESS AREAS	ACTIVITIES / ASSETS	CATEGORY	STAKE	
OFFSHORE SUBSEA	<b>SUBSEA VESSELS</b> / Owns and operates three vessels within offshore subsea support / Three newbuildings contracted with delivery 2009/2010	CORE	100% 51%	
	<b>SUBSEA SUPPORT</b> TECHNOCEAN INCLUDING SUBSIDIARY SCAN MUDRING / ROV/ROD operations / Trenching operations / Underwater inspection / Movement of soil at seabed	VALUE CHAIN	(58%)	
	<b>GEOTECHNICAL SERVICES</b> BLUESTONE OFFSHORE / Deepwater geotechnical analysis (core drilling)	VALUE CHAIN	(40%)	
ICE / RESEARCH	<b>ICE / RESEARCH</b> / Owns and operates two vessels within ice/research. Oil support – Sakhalin; Research – Antarctica. / Two crew boats to be operated in the Sakhalin II field from June 2009	CORE	(50-100%)	
MARINE SEISMIC	<b>PERMANENT MONITORING &amp; TOWED SEISMIC</b> OCTIO / Owns and operates one seismic vessel; Towed seismic / Permanent reservoir monitoring	VALUE CHAIN	(60%)	
	<b>SEISMIC VESSELS</b> / Owns and operates one 3D seismic vessel	CORE	(100%)	
	<b>PROJECT MANAGEMENT &amp; BUILDING SUPERVISION</b> / Operates 10 seismic vessels owned by Fugro, PGS and CGGVeritas / Project mgnt. & building superv. for 4 seismic newbuilds for PGS	CORE	(100%)	

## / BERGEN – AN INNOVATIVE CENTER OF EXCELLENCE FOR APPLICATION OF SEISMIC METHODS

Bergen, 20 August 2009



## / OCTIO – UNIQUE SEISMIC METHODOLOGY APPLICATION IN ICE

### Geo Explorer hit first ice



### DNV-1A1 Ice-Class 2D Seismic Vessel



- "Geo Explorer" currently in North-East Greenland, where the vessel will be used for acquisition of approximately 6,500 Km of 2D seismic multi-client data
- Upgraded in March and July 2009 for operation in ice including new ION Steerable Digistreamer and purpose built Streamer and Source handling

## / INTRODUCTION







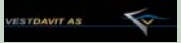

- Bergen's long tradition within shipping has produced a platform for expansion into related new market segments, such as marine seismic, offshore support and subsea
- Over the years a number of world class companies within these market segments has been established out of Bergen, based on the heritage from the shipping industry
- In this presentation we will take a closer look at the marine seismic industry in Bergen and explain how Bergen has become a frontrunner within application of seismic methods

/ INCUBATION AND SPIN-OFFS THROUGH THE MARITIME CLUSTER IN BERGEN

- The Maritime Forum in Bergen
  - works **based on an expressed strategy**
  - has an ambition of being **visible**
  - represents a **complete maritime cluster** – a significant advantage
  - represents companies which are highly **international**
  - focus on **competence**
  - uses the **scientific/research institutions** in Bergen actively
  - has access to **experience**
  - represents an old, but nevertheless **modern industry**
  - develops **new or related industries** with basis in maritime activity – e.g. offshore fixed and floating wind turbines

More about Maritime Forum in Bergen: [www.maritimt-forum.no](http://www.maritimt-forum.no)

/ SPIN-OFFS FROM THE MARITIME INDUSTRY IN BERGEN

<p><b>Marine Seismic</b></p>  <p>+ Wavefield InSeis + Bergen Oilfield Services</p>	<p><b>Shipbuilding</b></p> 	<p><b>Crane Manufacturers</b></p> 
<p><b>Offshore SubSea</b></p>  <p>+ DOF Subsea</p>	 <p>SHIPPING COMPANIES</p>	<p><b>Engine manufacturer</b></p>
<p><b>Logistic support</b></p>		<p><b>Lifeboat davits</b></p> 
<p><b>Insurance</b></p>	<p><b>Universities/Education</b></p> 	<p><b>Finance</b></p>

The Maritime Forum counts 110 members – all from all parts of the maritime cluster

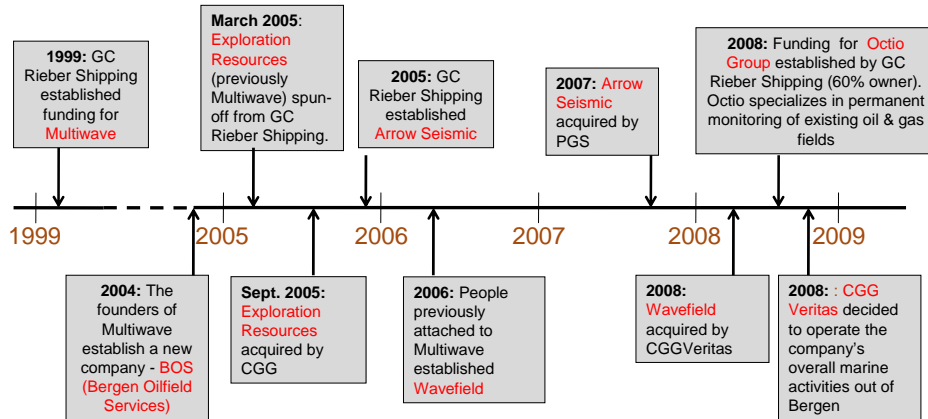
## Marine Seismic



## / HISTORY OF MARINE SEISMIC IN BERGEN

- Bergen's history within marine seismic descends from Nansen, Bjerknes, Sverdrup, Mohn and others within Earth Science
- The Department of Earth Science at University of Bergen (UiB) has produced several of our leading geophysicists, such as Anders Farestveit (honorary doctor at UiB)
- The conditions for building a powerful marine seismic cluster in Bergen were available:
  - Shipping companies - GC Rieber Shipping, Ellen Forland and others have been active within marine seismic since the late 1960s
  - Streamer production through Western Geco's Fjord Instruments north of Bergen
  - Seismic vessel construction through Bergen Group's yards
  - Extensive local competence on seismic data acquisition

## / MARINE SEISMIC IN BERGEN IN THE LAST DECADE



- Interpretation and processing of seismic data and Electromagnetic (EM) data are important fields for the future, where Bergen have the competence to play an important role

## / SEISMIC COMPETENCE ORGANISATIONS IN BERGEN



A unique cluster of companies and organisations with competence through the seismic value chain

## / MARINE SEISMIC – LONG TERM MARKET TRENDS

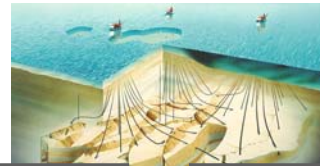
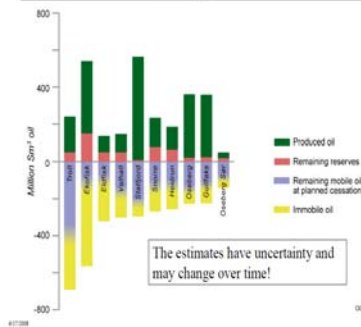
- Exploration - Towed seismic
  - The development of new technology (such as 4D) with more accurate recording of new and existing resources is expected to be an important underlying market driver
  - New capacity demanding technologies a driver for high and low capacity vessels
- Exploration - Electromagnetic investigations
  - Use of EM is growing, but not fast enough for EM companies
- Production - Permanent monitoring of oil & gas fields
  - Oil companies' focus on a more optimal use of exploration and extraction budgets
  - Increasing interest in expanding production of existing fields
  - Triggers use of permanent monitoring (4C/4D)
  - Technology development within data processing is however required

## / WHY 4D ?

- 4D seismic involves comparing the results of 3D seismic surveys repeated at considered time intervals (e.g. before a field starts producing versus various production stages)
- 4D increases the accuracy of the information
- 4D also allows for understanding the dynamic properties of an oil or gas field

## / WHY PERMANENT 4D ?

NPDs estimate for mobile and immobile oil in the 10 largest fields

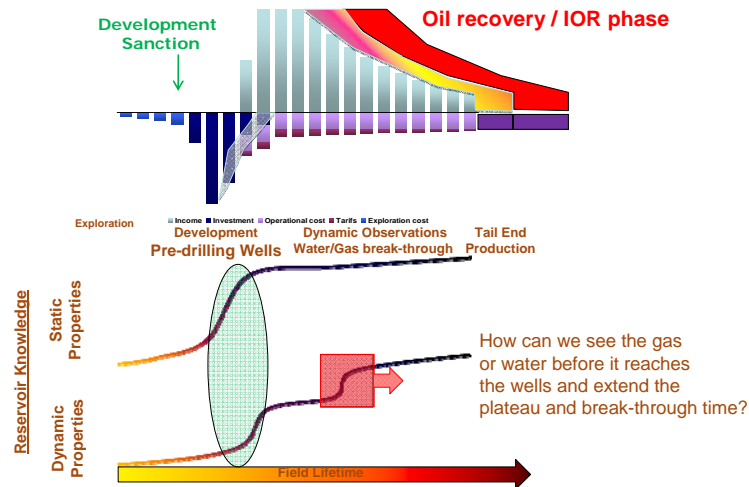


Bringing Oil to the Wells

Bringing Wells to the Oil

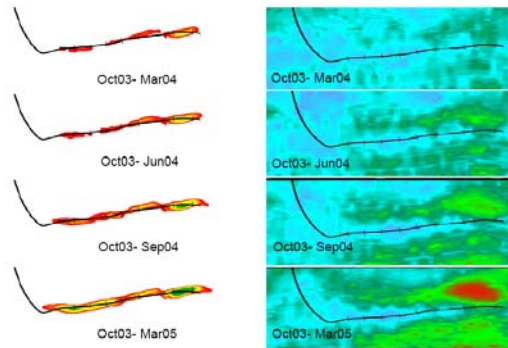
- Injection of water, gas, chemicals
- Intelligent wells
- Subsea / downhole separation and injection
- **But do we understand the local flooding pattern and dynamics??**
- 4D Seismic for identification of by-passed field segments
- Better placed and cost efficient wells
- 5% additional reserves for StatoilHydro

## / CATCHING THE DYNAMICS OF THE OIL FIELD RESERVOIR



/ THE VALUE OF INCREASING RESERVOIR UTILISATION

- BP estimates that Valhall permanent monitoring system will provide 60 million barrels in added production worth \$4.2 billion, having invested approximately \$50-60 million

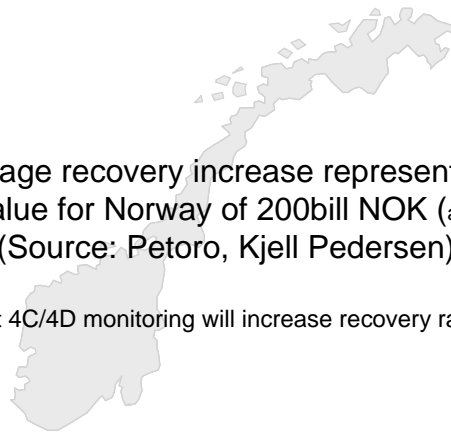


- 4D Depletion effects
- Impact of individual perforations

/ 4D PERMANENT MONITORING – POTENTIAL ON THE NCS

1% average recovery increase represents a total added value for Norway of 200bill NOK (at \$50/barrel)  
 (Source: Petoro, Kjell Pedersen)

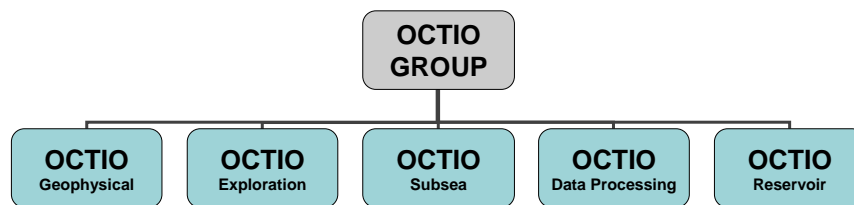
Permanent 4C/4D monitoring will increase recovery rate by 1-5%





/ OCTIO – USING 4D TO BRING RESOURCES TO RESERVES

**OCTIO GROUP**  
is an Integrated Service Supplier  
with sole focus on  
Enhanced Oil Recovery (EOR)



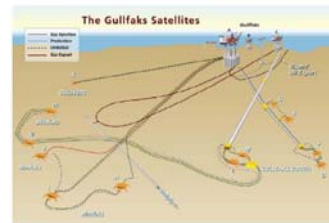
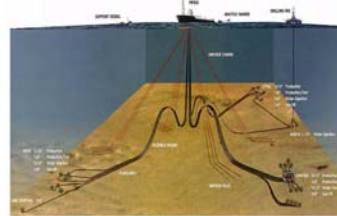
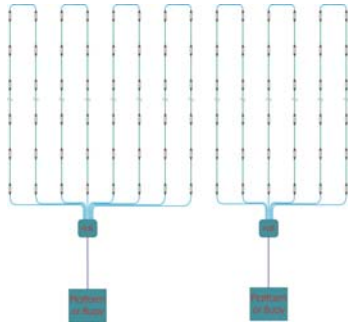
/ CRITICAL FACTORS FOR RESERVOIR MONITORING

The following four focus areas are critical for success within Reservoir Monitoring, and Octio has addressed them throughout the whole process of modeling, designing, testing and qualification of our REservoir Monitoring (REM) system:

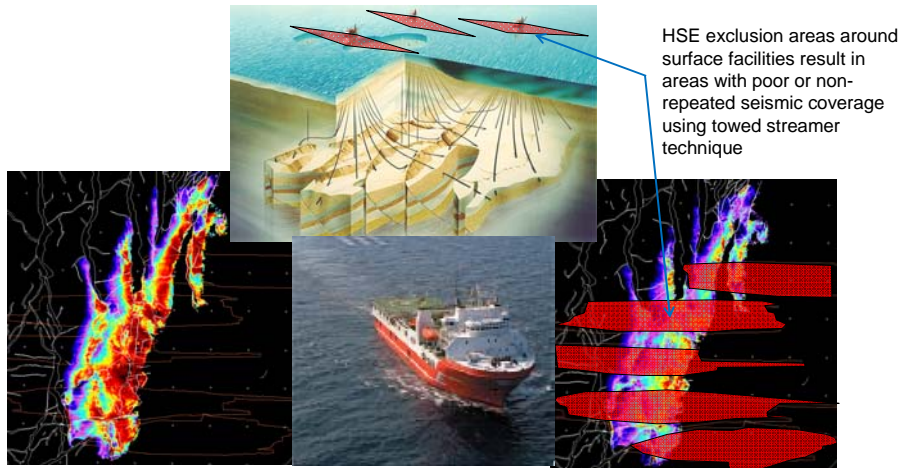
- Technology:** REM is the world's most advanced acquisition system using state of the art MEMS sensor technology
- Reliability:** REM is designed for **25 years** lifetime
- Multi functionality:** REM has an open architecture for integration of future expansions like EM, micro-gravity etc.
- System Installation:** To deploy REM we have designed innovative solutions for fast and safe deployment and trenching

## / PERMANENT MONITORING - THE OCTIO APPROACH

- Exclusivity on proven sensor technology
- Adopt to subsea obstruction
- Exchangeable subsets



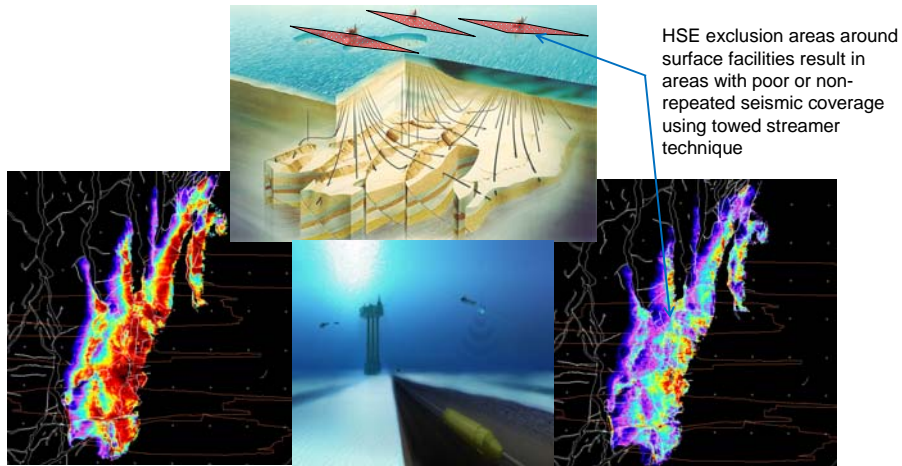
## / PERMANENT SYSTEMS – ELIMINATE NON-COVERAGE ZONES



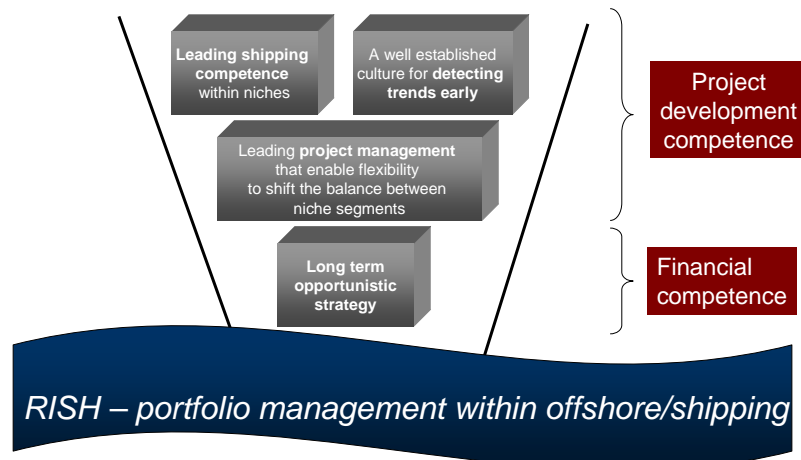
The diagram illustrates the use of a towed streamer for seismic monitoring. It shows a ship towing a streamer, which is connected to multiple sensors. The diagram also includes seismic data visualizations, showing a 3D cutaway of the streamer and sensors, and a 2D seismic data visualization with red and yellow highlights. A blue arrow points from the text to the 3D cutaway.

HSE exclusion areas around surface facilities result in areas with poor or non-repeated seismic coverage using towed streamer technique

## / PERMANENT SYSTEMS – ELIMINATE NON-COVERAGE ZONES



## / GC RIEBER SHIPPING - INCUBATOR MANAGEMENT



## / CORE INVESTMENTS & VALUE CHAIN INVESTMENTS



## / GC RIEBER SHIPPING – SEISMIC SUCCESS STORIES

- 2005; Spin-off of Exploration Resources (EXRE)**
  - Market cap of approx. NOKm 700 on first day of listing
  - Acquired by CGG for approx. NOKm 2100 6 months later

  
 Return of 200% in 6 months

- 2007; Listing of Arrow Seismic on Oslo Axess**
  - Listed in the OTC market February 2006; Market cap. NOKm 666
  - Listed on Oslo Axess May 2007; Market cap. NOKm 1260 (prior to IPO)
  - GC Rieber sold 42.5% share November 2007 - implied market cap on Arrow of NOKm 2256

  
 Return of 170 % in 20 months

*We create values and take necessary steps to visualize them.*