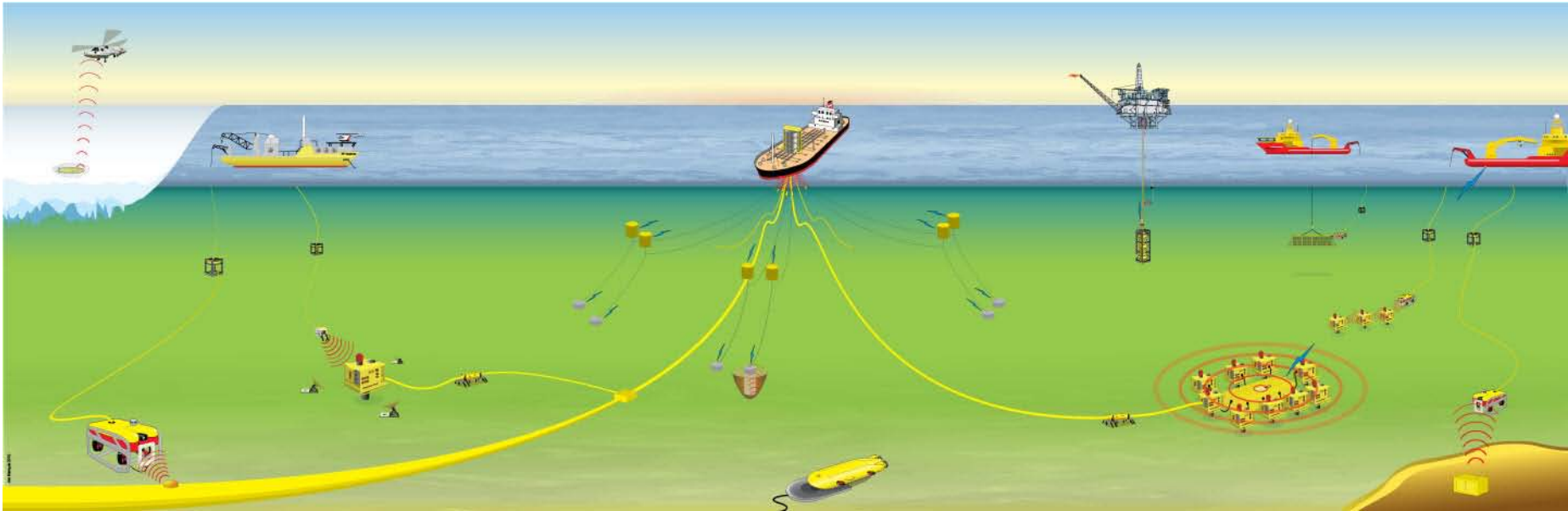


WFS Technologies

Case Study 2: *Underwater Communications*



Mr. Brendan Hyland
Chairman
WFS Technologies

WFS Technologies

- The world's leading developer of through-water and through-ground radio (RF) communications, navigation, location and sensing products



About WFS Technologies

- Company

- Founded 2003
- Technology innovation
 - World leading developer of through-water radio frequency (RF) systems
 - World's first commercial underwater RF modem
 - Over 90 patent applications (UK, US, Rest of World); first 9 granted

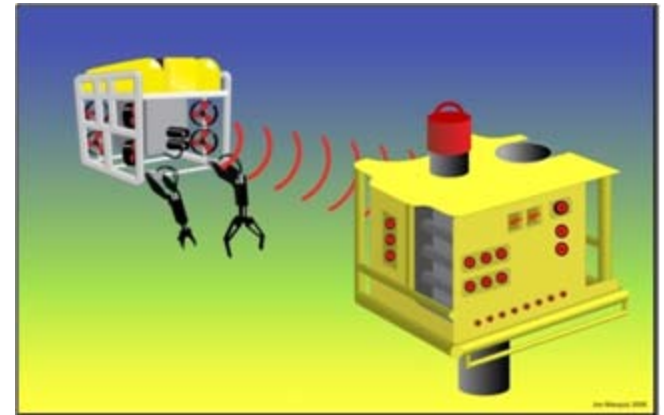


- Markets

- Energy and Environment
- Homeland Security and Defence

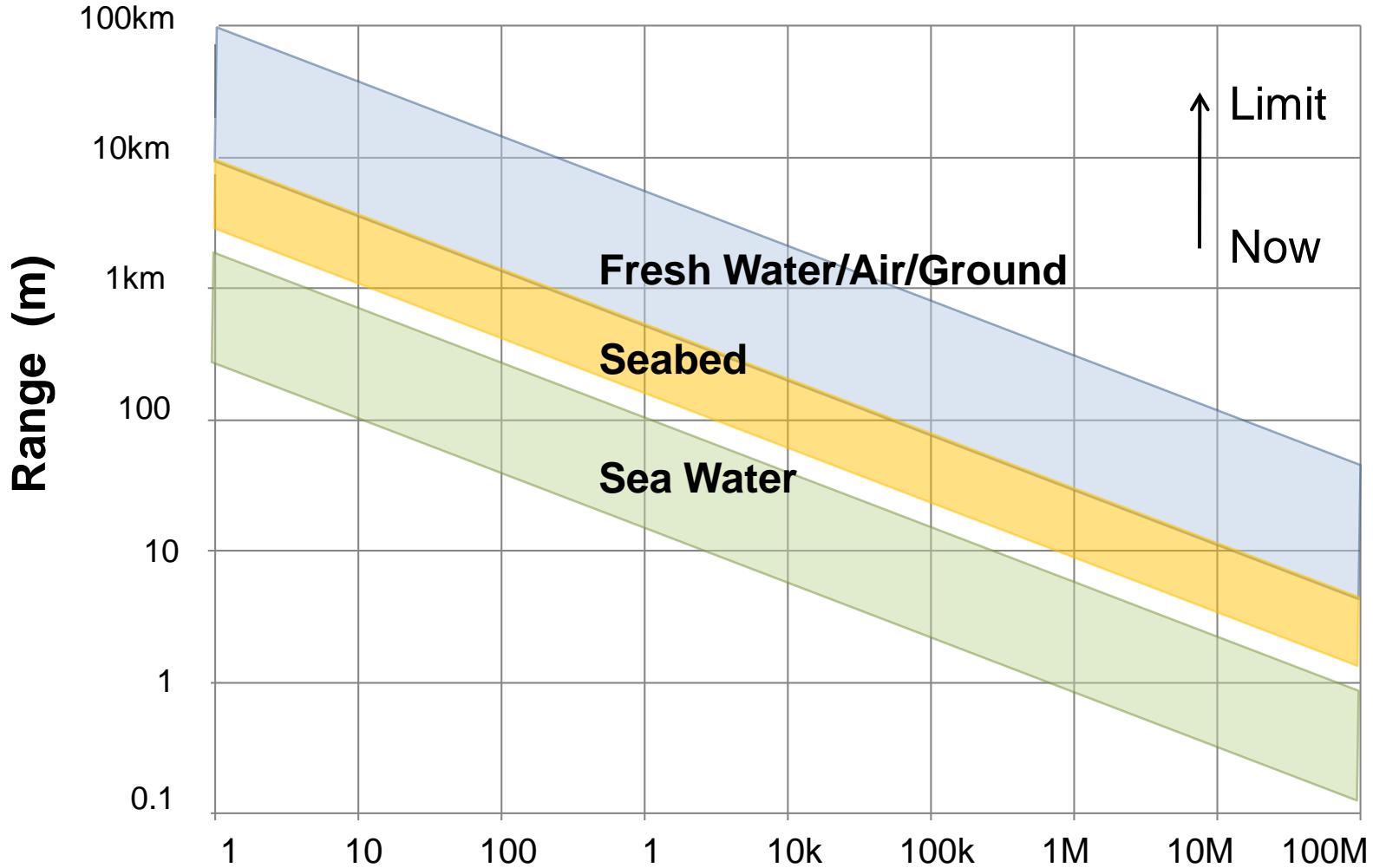
- Locations

- Europe : Edinburgh, Aberdeen, Belfast
- USA : Washington, DC



Technology

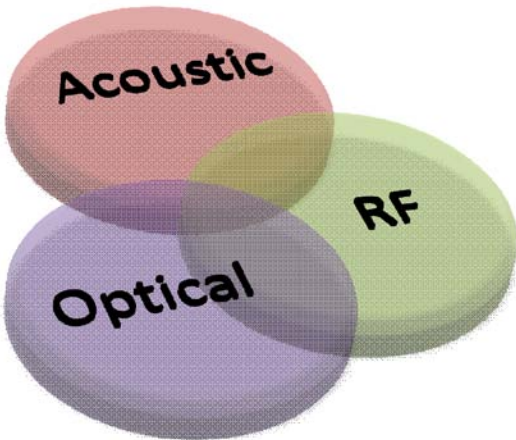
- Low Frequency Radio Propagation Range



Technology

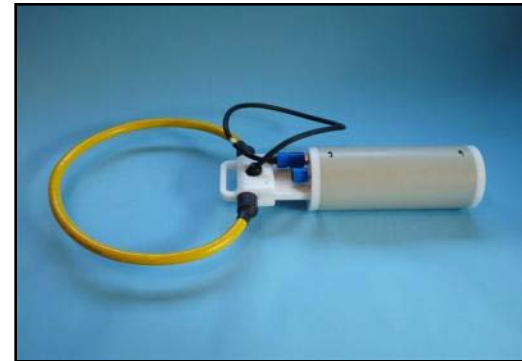
- Complementary underwater wireless technologies

	Pros	Cons
Acoustic	<ul style="list-style-type: none"> • Proven technology • Range: up to 20 km • Energy efficiency • Precision navigation • Low size/cost 	<ul style="list-style-type: none"> • Does not transit water/air • Low data rate in shallow water • Adversely affected by <ul style="list-style-type: none"> - Water aeration - Ambient noise - Unpredictable propagation • Limited bandwidth • Latency • Impact on marine life • Detectable (Military)
Optical	<ul style="list-style-type: none"> • Ultra-high bandwidth: Gbps • Low cost 	<ul style="list-style-type: none"> • Susceptible to turbidity & particles • Marine fouling on lens faces • Needs tight alignment • Very short range • Difficulty transiting water/air
RF	<ul style="list-style-type: none"> • Transits water/air • Transits water/seabed • Unaffected by water depth • Unaffected by turbidity/bubbles • Non-line-of-sight performance • Immune to acoustic noise • Up to 100 Mbps 	<ul style="list-style-type: none"> • Susceptible to EMI • Limited range through water



WFS Products - Through Water

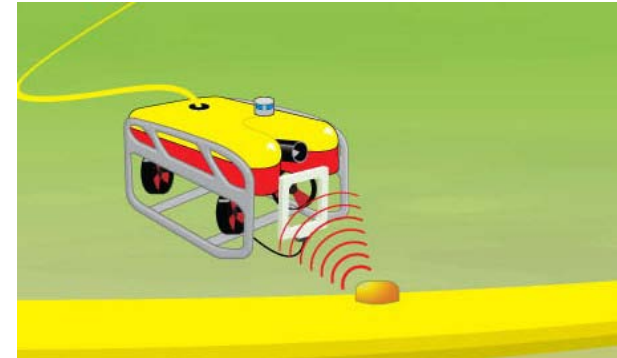
- Seatext[®] : low bandwidth modem
 - 100bps
 - Wireless RS232 bridge
- Seetooth[®] : broadband modem
 - 100kbps
 - Wireless Ethernet
- RAM300 : Hybrid Radio + Acoustic modem
- SeaPar : Wireless Data + Power
 - Radio, Acoustic and Power
 - ‘Sealed-for-life’ subsea sensors
 - Wireless connectors



Future Opportunities for Subsea Wireless Comms

- Energy

- Monitoring/SCADA (ROV & AUV)
 - Integrity management of Pipelines and risers
 - Corrosion, strain, pressure
 - Mooring chain sensors
 - Anchor sensors
- Navigation
 - ROV/AUV precise navigation near assets
 - Docking
- ‘Sealed-for-life’ wireless sensors
 - Wireless data, wireless power
 - Ultra-high reliability
- Docking solutions: AUV, ROV
- Communications
 - Temporary Wireless jumpers & umbilicals
 - Tree and BOP wireless networks
 - Through ice
- Wireless slip rings
- Subsea RFID
- Wireless ROV cameras



Corrosion Sensor Monitoring

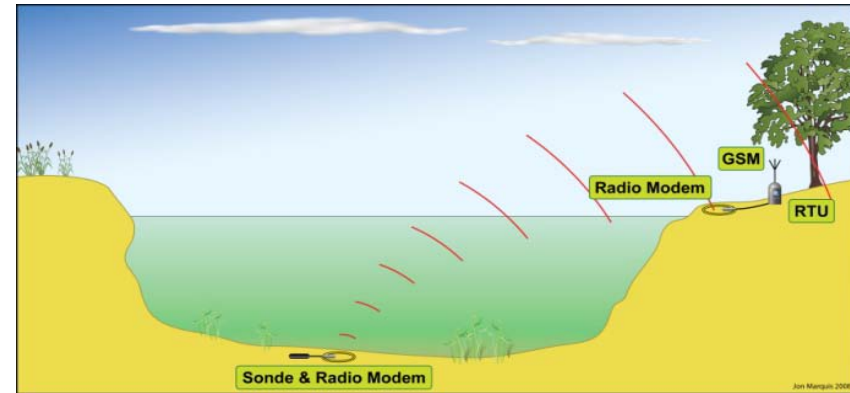


Seabed docking stations

Future Opportunities for Subsea Wireless Comms

- Environment

- Environmental monitoring
 - pH, O₂, salinity, ADCP
- Flood monitoring and hydrometry
 - Water depth, flow rate
- Oceanography and hydrography
- Coastal erosion monitoring
- Deep ocean AUV docking stations
- Marine renewable energy
 - Surveys
 - Maintenance and support
 - Control systems
- Remote sensor networks for Polar research



Environmental Sensor Monitoring



Through-ice Communications

WFS Capabilities

- Summary

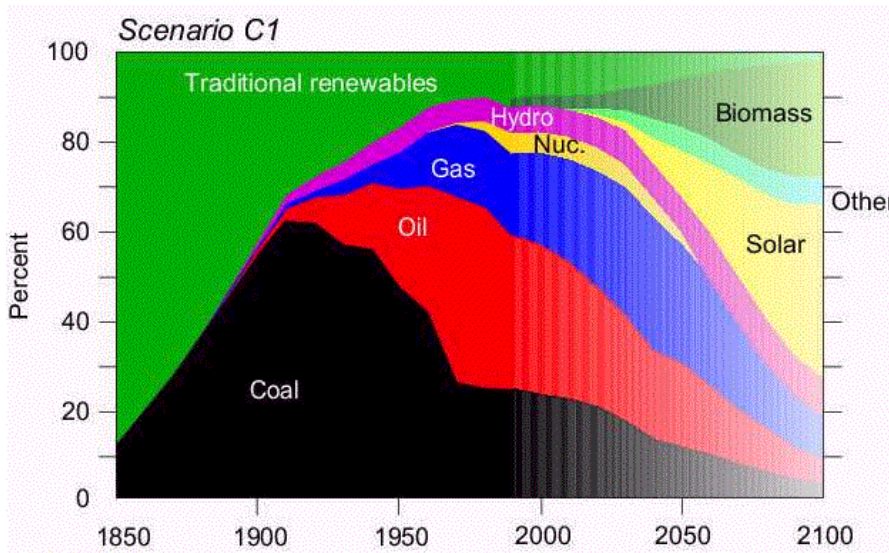
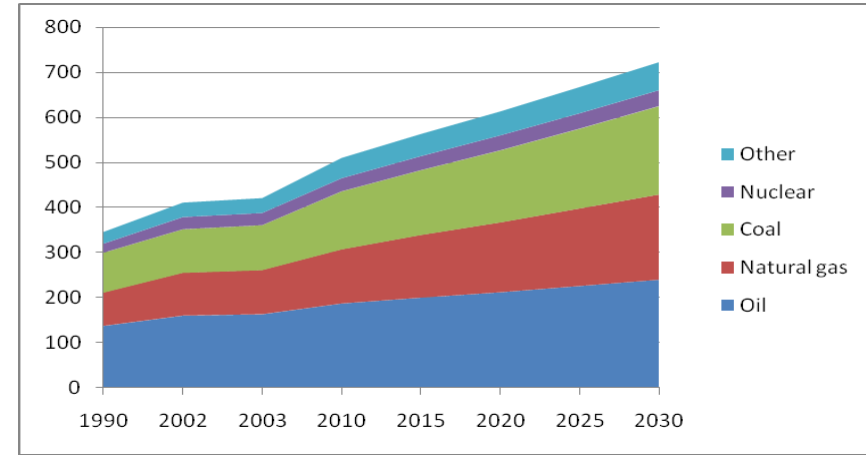
- Subsea wireless communication, sensing and navigation technology & products
- Systems integration
- Research



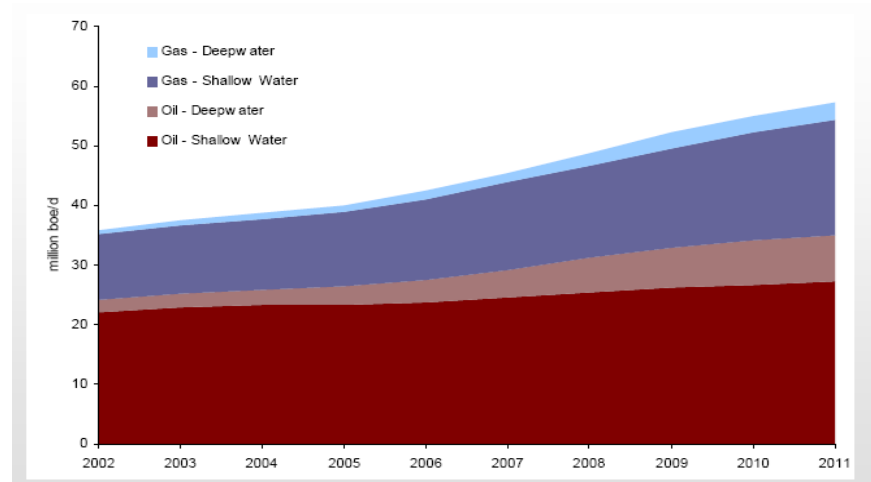
Opportunities for Ireland

- Energy and Minerals

- Global usage to rise >50% by 2030
 - Fossil fuels dominate
 - Easy oils found
 - New frontiers: Gulf of Mexico, W Africa, Arctic
- Technology opportunities
 - deep water exploration & processing
 - Subsea machine-2-machine



Global Energy Consumption Projections Quadrillion Btu
-Source: EIA



Renewables to have marginal impact before 2020?
Source: World Energy Org

Growth in deep water production
-Source: Douglas Westwood

Opportunities for Ireland

- Where to focus limited resources?

- Alternative energy
 - 20 yr + energy subsidy commitment
 - Nuclear/oil base load
 - €100bn investment?
 - ➔ EU play (Ireland too small to lead)
 - ➔ Very high risk for technology companies
- Aqua farming
 - Malthusian economics : oceans increasingly important supply of food
 - Gulf Stream provides favourable conditions
- Coastal erosion
 - Global problem; emerging industry.
 - Systems integration
- Subsea stations
 - Emerging global market
 - No clear leadership in EU
 - Systems integration

WFS Technologies

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