



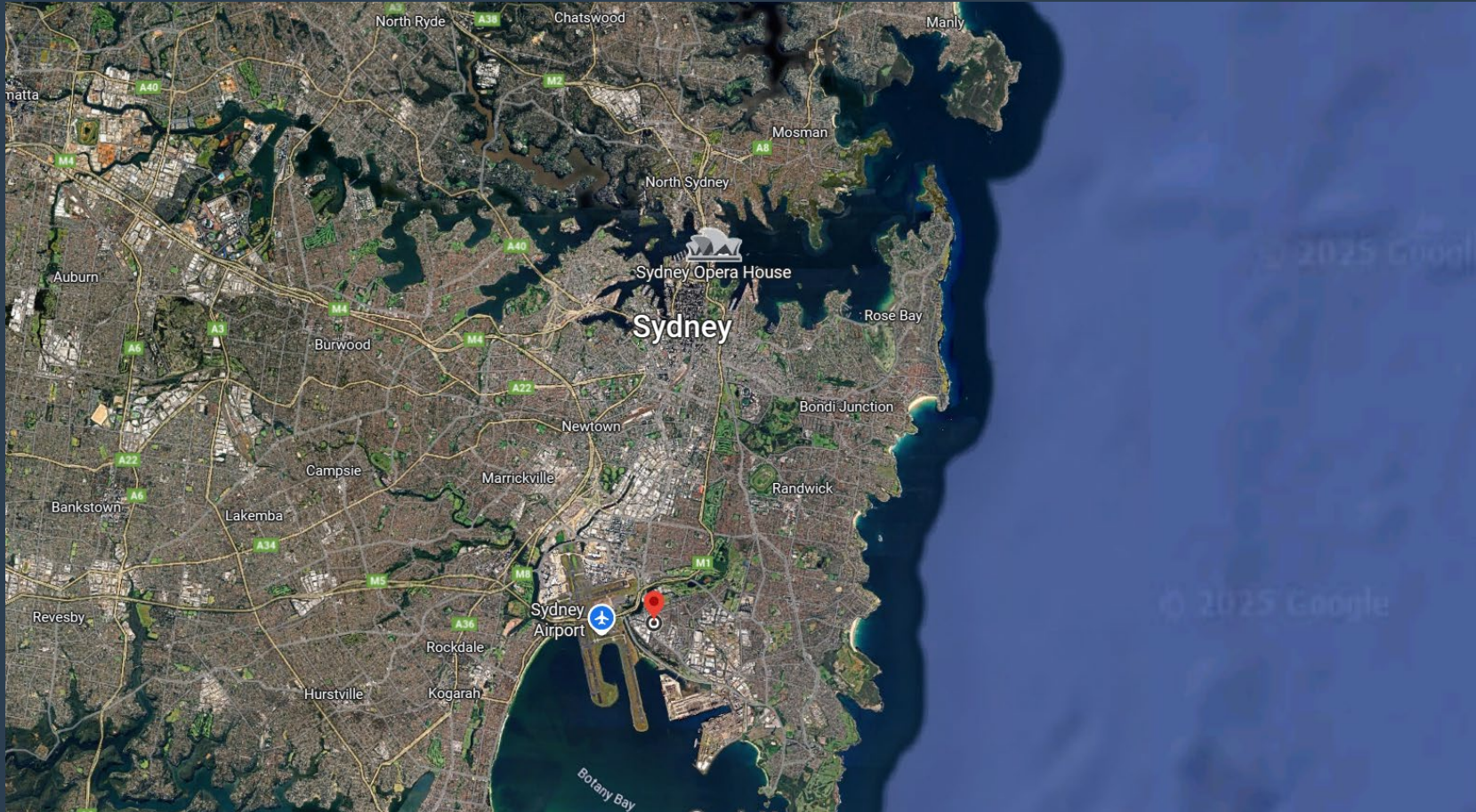
Integration and comparison of three different technologies to
measure vibrations

And more...

Christian Ebel / 21 November 2025

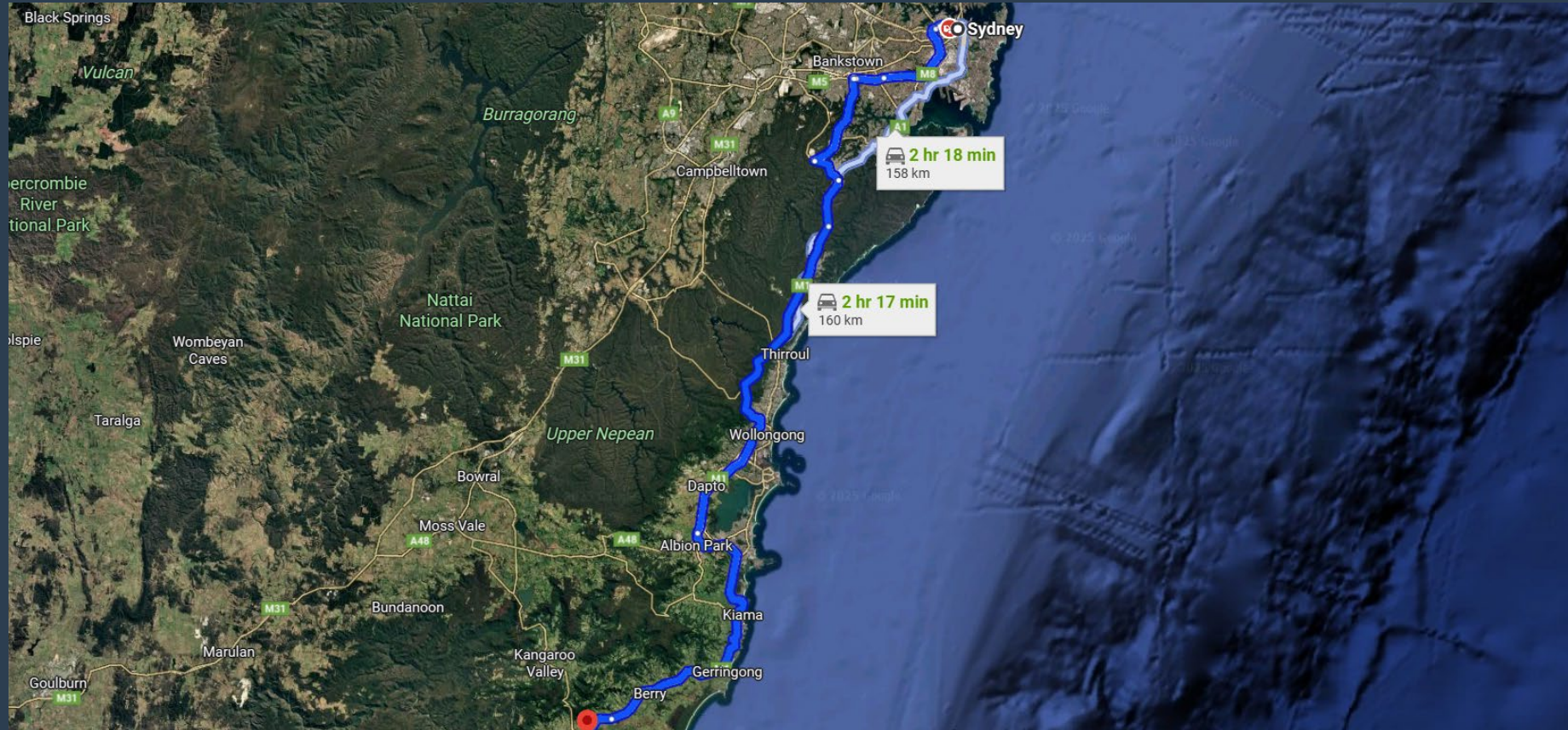


Qenos, Botany, 10 km from Sydney Opera House, February 2023





Manildra, Bomaderry, 160 km from Sydney Opera House, October 2024



Three things in 20 minutes

- A brief introduction
- A not-so-new technology and a paper
- Some thoughts triggered by yesterday's discussions



NVMS

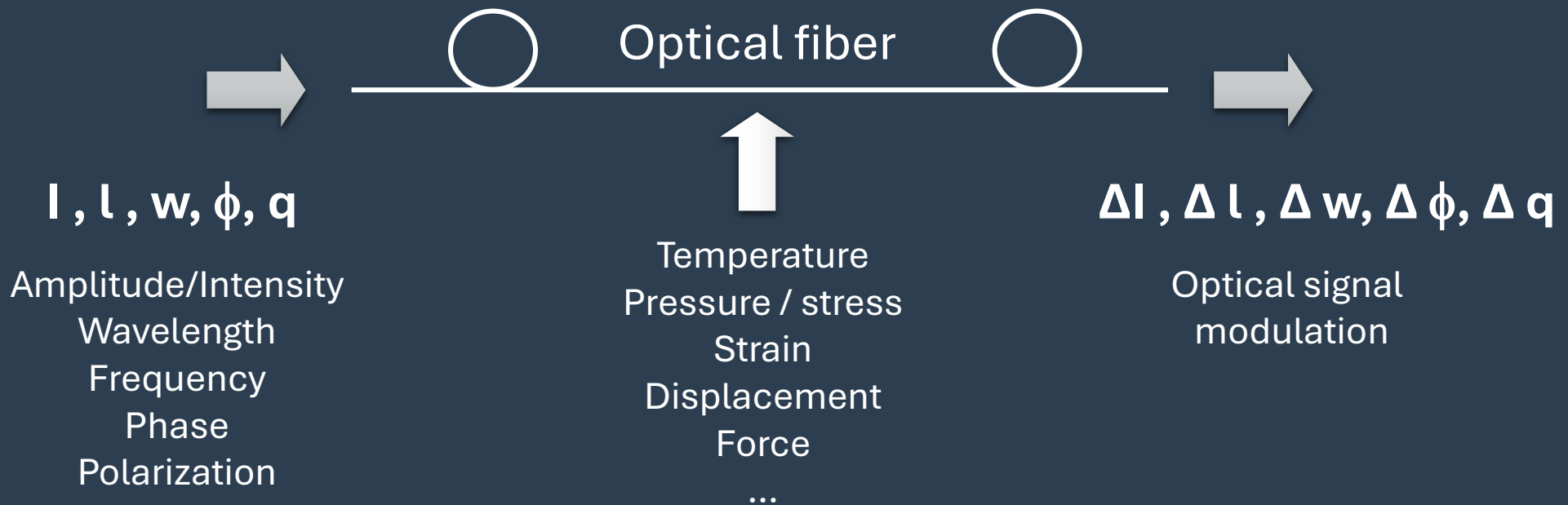
Connecting assets and people to permit optimal decision making

Industries we serve

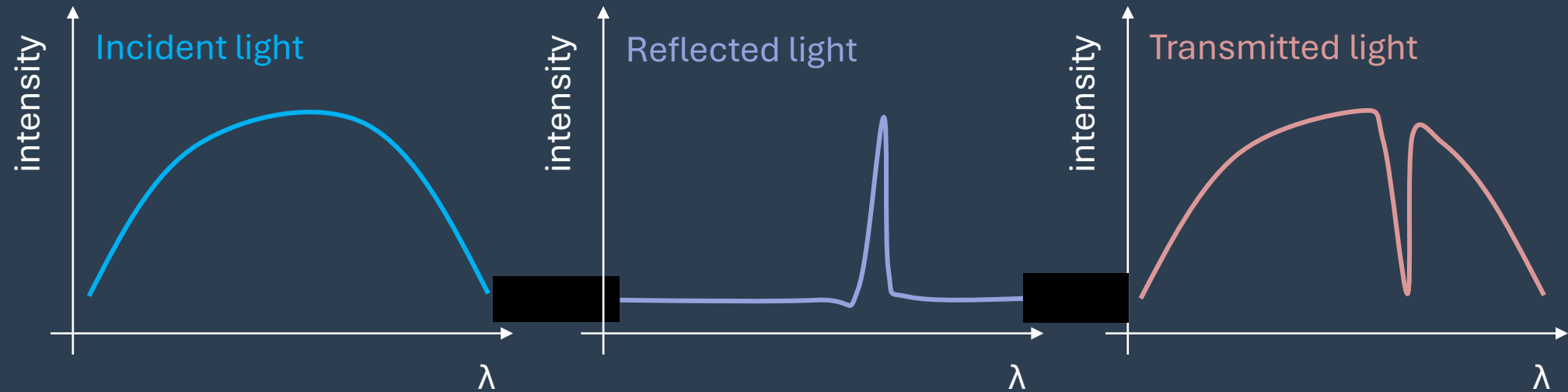
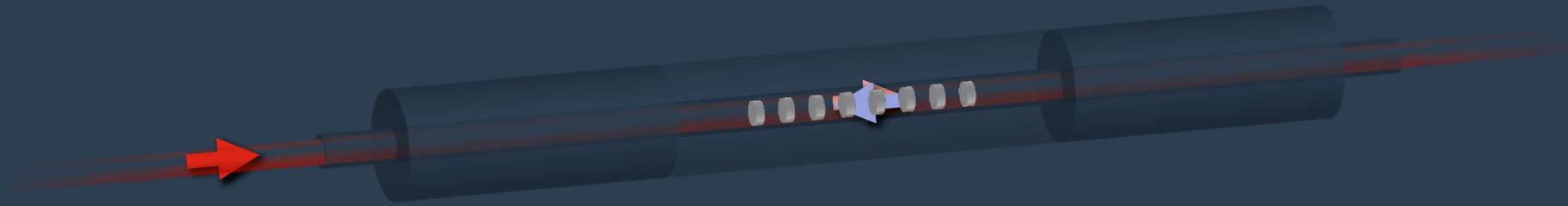


Optical fiber Bragg grating technology

Optical fiber acting as a Sensor



Optical fiber Bragg grating technology



What you can measure with optical FBG technology

Displacement

newLight FS61



Displacement sensors for linear position measurements with incorporated temperature compensation.

Strain

newLight FS62



Strain sensors for linear or three direction rosette strain measurements with many encapsulations and installation methods.

Temperature

newLight FS63



Temperature sensors for accurate temperature measurements or to be used for temperature compensation of different measurements.

Tilt

newLight FS64



Tilt sensors to measure small angle variations towards the vertical with incorporated temperature compensation.

Acceleration

newLight FS65



Accelerometers for vibration measurements under low frequencies.

Where FBG technology can help



Deploy over long or remote structures (Pipelines, bridges, monopiles, power cables)

- Low attenuation on the fiber, wavelength multiplexing and multipurpose transducers on the same optical line



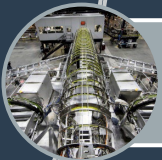
Safely operate on hazardous environments (HV applications, electrical machines, Oil&Gas ...)

- Electrically isolated, EMI/RFI immune & passive sensors and cables



Ensure durability on wet and marine environments (Hydraulic pipelines, ship hull, offshore)

- Good resistance to humidity, salt and high pressure



Install faster, simpler and lighter weight measurement solutions even on large sensor count applications

- In series sensor connection minimizing cabling, weight and sensing network complexity



Meeting new materials performance (Composite materials for aeronautics, space and innovative structures)

- Very high fatigue limits, high strain, CRP/GRP embeddable

Optical FBG Accelerometer



Three types of accelerometers

- Piezo-electric accelerometers
- VC MEMS accelerometers
- Optical FBG accelerometers



QuantumX data acquisition systems

- QuantumX MX1615
- QuantumX MX840B
- QuantumX MXFS optical FBG interrogator



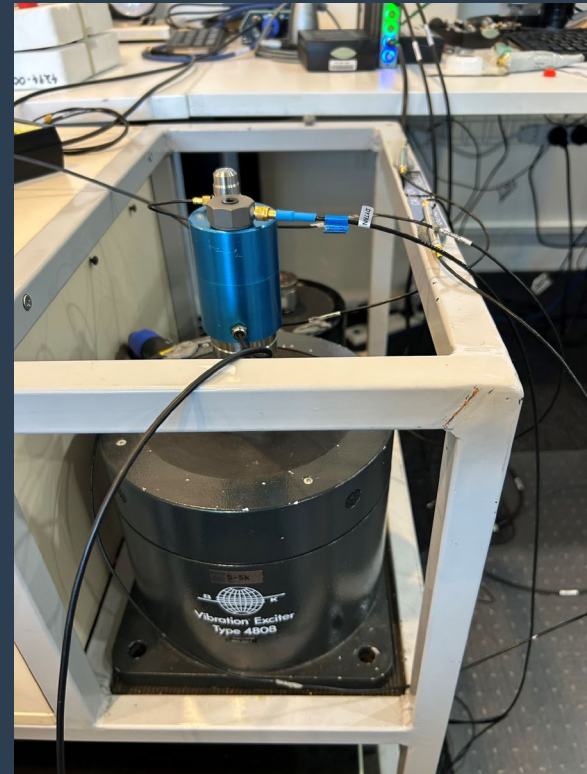
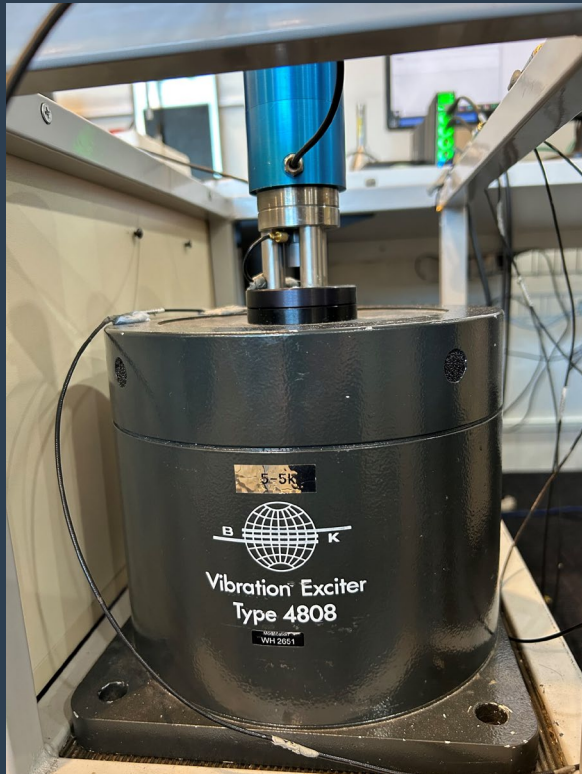
Piezo and VC MEMS

- Exciter HBK 4294-002 at 159.15 Hz

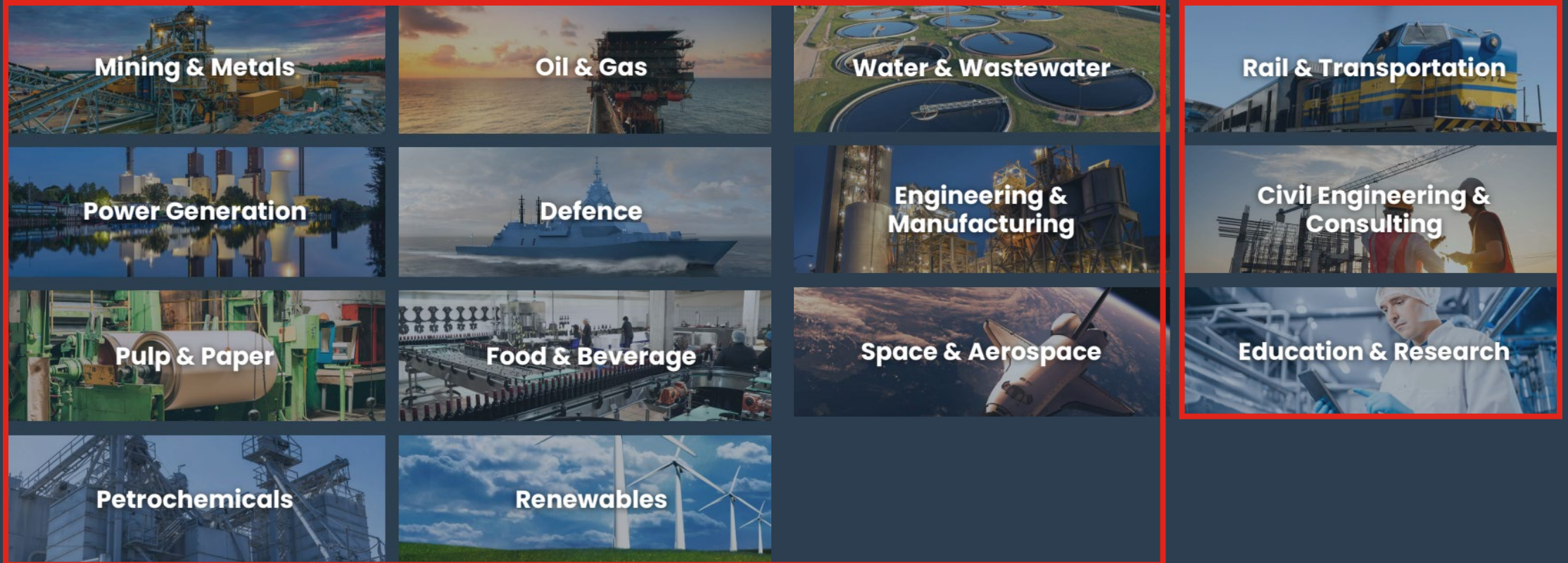


Piezo and optical FBG

HBK Exciter 4808



A few more (provocative) thoughts



Australia is 10 years behind the rest of the world in adopting optical FBG technology



Structural health monitoring is 15-20 years behind the monitoring of rotating equipment

- Size of the ecosystem
- Maturity of the technology
- Structure of the industry
- Role of academia
- Etc.

New bridges and tunnels must be built with built-in sensors

- Just like...
- Cars
- Airplanes
- Rail stock
- Turbines
- And almost everything we buy

Measurement technology is cheap and will get cheaper

- AUD1.2B for blast furnace reline and upgrade
- Circa AUD3m for vibration monitoring, excluding labour
- 0.25% of budget for vibration monitoring hardware

Complexity / Bridges vs. steel plant



Complexity / Railways vs. coal-fired power station





THANK YOU

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