PRECISIONIMPULSE

Seismic 2020
14 September 2020

MONITORING EARTH'S CARBON IMBALANCE

MER – CO2 Storage – CO2EOR

William Davie
Managing Director,
Precision Impulse

www.precisionimpulse.com

Good afternoon and thanks to the organisers of Seismic 2020 to present at this excellent event.
Today I will be presenting a key piece of technology to acquire data with which geophysicists can improve the image of the subsurface and reassure people that the answer to reducing atmospheric CO2 concentrations is to store CO2 safely and permanently underground. It can also be used to maximise the economic recovery of hydrocarbons, especially through CO2EOR.
In 5 minutes I will present a low environmental impact seismic source that can be placed on the seabed, or underground below the weathered zone on land, to acquire very high quality 4D seismic data with low cost. The next slide shows the source in operation in Oman last year.

The source was set up to acquire data into a 25 x 10 km spread in a BGP crew for comparison with an Inova AHV IV 80,000 lb vibroseeis unit.
A test was also made into a permanent monitoring well in the mature Yibal field but unfortunately we were not allowed to take pictures of this.

BUT DOES IT WORK?

At a fraction of the Renegade's size and weight, the PI seismic source is more powerful and more reliable.

ONSITE TEST FOR PDO IN OMAN

Inova AHV-IV Renegade vibroseis vs. Precision Impulse into 25 x 10 km spread

✓ **Excellent results presented at SEG workshop in November 2019 leading to second R&D funding contract**

SEG SOCIETY OF EXPLORATION GEOPHYSICISTS

Petroleum Development Oman

TOTAL'S METIS PROJECT

3 R&D funding contracts awarded to develop highly portable land source

✓ **Result: 3 successful demonstrations against vibroseis (penetration & endurance)**

PDO was pleased with the comparison with vibroseis and we could see events down to 3 seconds and out to 3km. The results were presented at an SEG workshop in Oman in November last year and I would be delighted to share the released data. The source has also been demonstrated 3 times to Total as part of the Metis project and evaluated for penetration, endurance - 43,000 shots and in comparison to vibroseis.

CO2 Storage Monitoring
A Critical Component in Clean Energy Systems

Seismic 2020

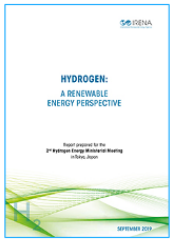
WHY MONITOR?

- **Prove to Society we are doing what they want**
- **Build trust and confidence between governments/public and oil and gas**
- **Provide data required by regulatory and reporting agencies**
- **Ensure maximisation of capture and storage rates**
- **Guarantee that remaining emissions are accounted for correctly**
- **Account for storage efficiency in geological formations—currently the only viable option for storing CO2**
- **Promote circular economy — monitoring hydrocarbons out / CO2 in**

*Experts state that Monitoring, Reporting and Verification (MRV) is key to storage integrity.**

The talent pool required includes geophysicists and geologists as well as specialists in big tech data, AI and HPC. Upgrade our image!

* IRENA, OECD, IEA, etc.

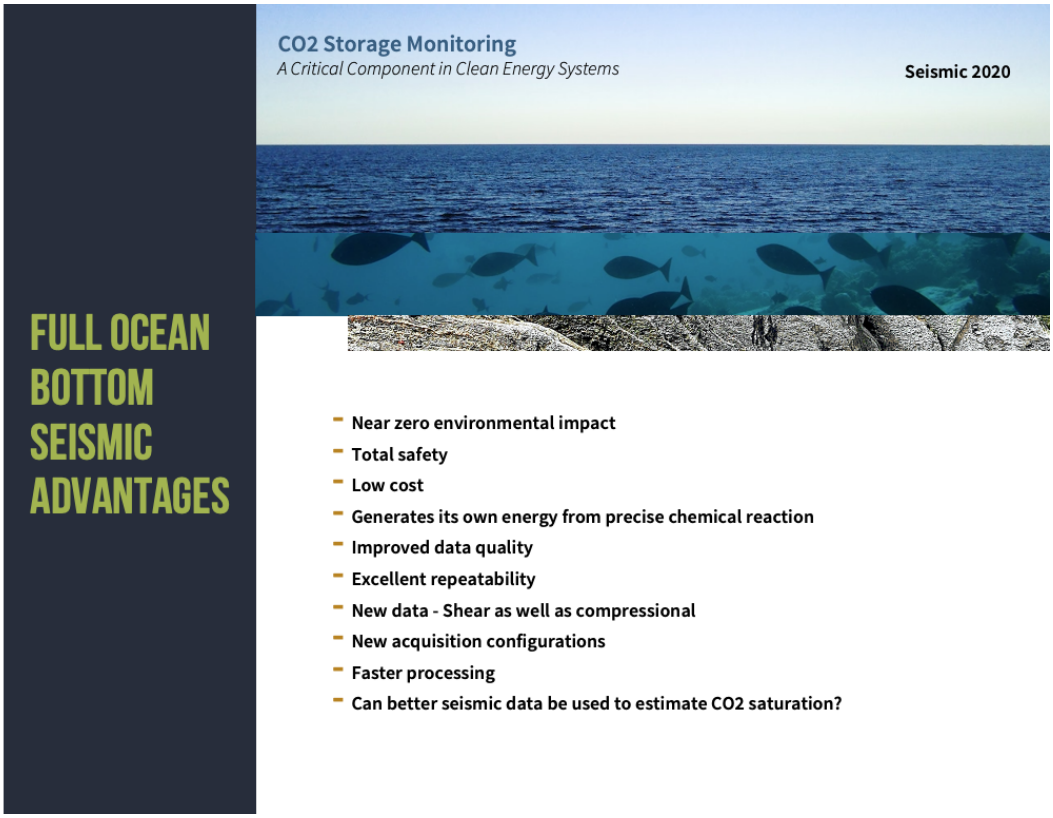


So why is monitoring important. I believe the ability of geophysicists to see what is happening far below the surface is amazing and think the general public would too if they were offered images or a seismic movie. Perhaps the key to convincing the public that the solution to providing reliable, affordable and clean energy is CO2 storage. Maybe the answer to supplying a new hydrogen economy is blue hydrogen from natural gas but with solar power at 1.35 cents per kWh in Abu Dhabi and 1.32 cents in Portugal the competition and collaboration with green hydrogen is clearly intense.

Monitoring the carbon imbalance is clearly a term associated with achieving a circular carbon cycle as part of a circular economy.

Regulators will need to be assured that CO2 is being safely and permanently stored before paying out credits as is the case in US 45Q where operators get $35 per tonne for CO2 used in CO2EOR and $50 per tonne for CO2 storage.

All experts agree that Monitoring Reporting and Verification are key to CO2 storage.



As shown on this slide, we believe that our simple source, deployed on the seabed will address many of the current issues associated with sources for illuminating permanent arrays of sensors.

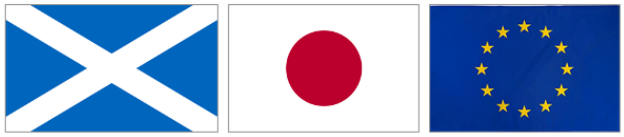
We believe seismic sources on the seabed will provide more and better quality measurements with which to understand dynamic changes as CO2 is injected into the subsurface, especially with regard to CO2EOR. It may even be possible to determine CO2 saturation from high quality seismic in combination with other data?

The same permanent array of sensors and sources can be used to supply seismic data for MER, CO2 storage and CO2EOR.

In 2001 I worked on the IEA World Energy Outlook for global energy supply and wrote about the incredibly results from 4D seismic. 19 years later perhaps it is possible that advances in geophysics coupled with big tech data management and analytics skills and high performance computing can use 4D seismic data to provide incredible visualisation of the subsurface. Studies of the surface area required for improving standards of living suggest that we will need to use the subsurface. To do that we must show the public what is happening underground. Perception can be far more damaging than reality.

We have been fortunate to secure a grant from Scottish Enterprise, Japan and the EU to develop the technology and are now actively seeking partners to realise our vision to monitor the carbon imbalance and provide opportunities to demonstrate. Together we hope to improve the image of the subsurface and the new CO2 storage industry.

GOVERNMENT SUPPORT



MARCH 2020

Awarded Scotland/Japan/EU major grant to develop seabed seismic source for monitoring CO2 storage

Contact: will.davie@precisionimpulse.com

THANK YOU