

# FEASIBILITY STUDY FOR CO<sub>2</sub> H<sub>2</sub>S MANAGEMENT PROJECT CASE STUDY

PETRONAS - Sarawak Cluster  
Offshore Sarawak, Malaysia

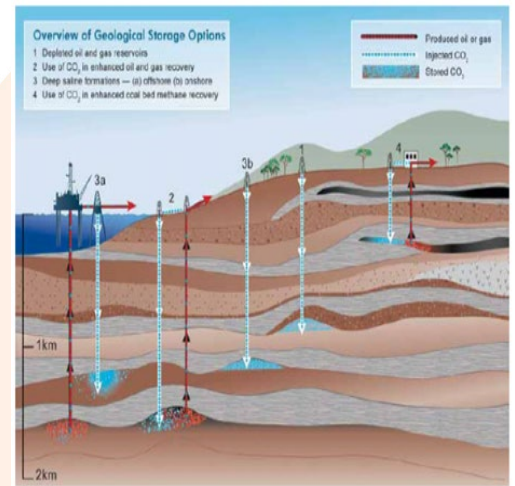
## AWT DISCIPLINES

- Geology
- Geophysics
- Reservoir Engineering
- Drilling Engineering

## AWT WORKSCOPE

The contaminants sequestration feasibility study consists of:

- All related requirements, methods, technologies, reference and philosophies for sequestration at depleted fields.
- The study also was to include the metallurgy for injection wells and associated processing / transportation system for the sequestration.
- Proven technical capability and technology on Monitoring, Mitigation and Verification
- Provide techno-economic viable concept for contaminants sequestration.



## PROJECT BACKGROUND

In July 2015, Malaysia Petroleum Management (MPM) and PETRONAS CARIGALI SDN BHD (PCSB) requested a Sequestration Feasibility Study to be undertaken on the fields within the Sarawak Cluster. AWT was sub-contracted by Ranhill Worley Parsons SDN BHD to undertake the work in particular the management option of potential storage sites within the Sarawak water for the reject gas including the injection and disposal technology.

**Location:**  
Offshore Sarawak Fields, Malaysia

**Study Phase I:**  
Global Literature Review

**Study Phase II:**  
Feasibility / Screening and Risk Assessment of the Reject Gas Storage Site (RGSS)



The following deliverables were supplied:

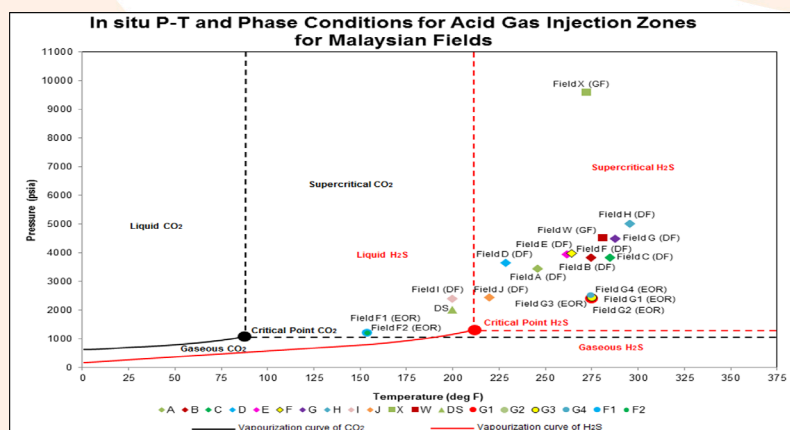
Sequestration feasibility report including techno-economic viable concept

- Sequestration material selection report
- Long term Monitoring, Mitigation and Verification (MMV) methods and philosophy report and references

## THE SERVICES - PHASE I

To assist in the framing study requirements, AWT provided background and context of global H<sub>2</sub>S and CO<sub>2</sub> projects with a context where possible placed on applicability and possible transferability to PETRONAS fields. The background review addressed:

- Lessons learnt from earlier work, inclusive of why CCS projects fail to reach FID (i.e. failure to identify/quality an acceptable H<sub>2</sub>S and CO<sub>2</sub> storage site, lack of a supporting policy, lack of public acceptance, economic viability, etc.),
- Success vs failure criteria,
- In projects with successful H<sub>2</sub>S and CO<sub>2</sub> management, what options have been applied and what does success look like, and
- Identify potential issues considered in analogue projects.



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## CASE STUDY

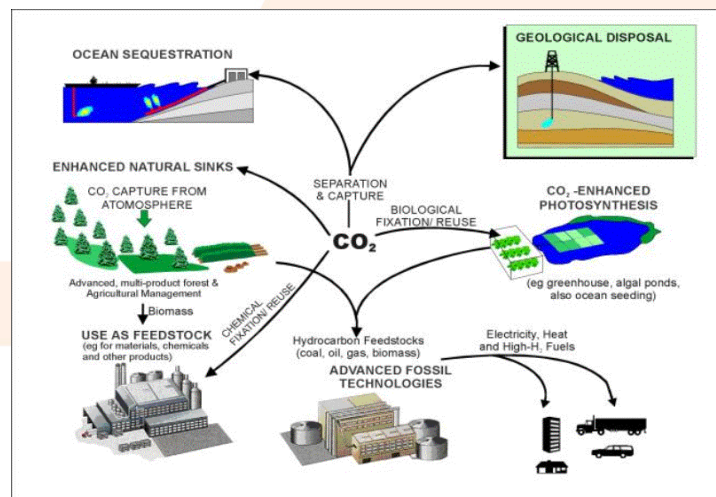
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### THE SERVICES - PHASE II

A risk-based approach was the most prudent for reject gas sequestration as attention is directed towards potential adverse events specific to that site. Adopting a risk-based approach to site selection provides more flexibility in the project design. To adequately screen potential storage sites as supplied by PETRONAS, AWT developed a Chance of Reject Gas Storage Site Success, which details the chance of probability that the lead or prospects (Storage Site) will be suitable and effective Reject Gas Storage Site (RGSS).



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The screening process was iterative and instructed by data availability. Desk top reviews, such as AWT have undertaken in this study, will only ever be guides as to storage potential and they will not necessarily contain the essential elements to comprehensively understand the geological storage potential of a site, either because the data set is inadequate or biased in the way it was collected (for petroleum) or where it was collected. While site security is of paramount concern the RGSS Ranking emphasis is on:

- Location, political/regulatory status – eliminate projects in sensitive, 'no-go' areas,
- Cost, as this will immediately eliminate some projects,
- Site security, and finally
- Capacity.

### AWT VALUE ADDED

Based on the study and collaboration with the PETRONAS subsurface team, AWT developed a number of recommendations for future work and review:

- Seal integrity (Leak off testing and capillary pressure)
- Well Integrity Study
- Injection modelling based on Dynamic and Static model
- Regulatory Framework (study the road rules)
- Dry Structure specific: Dry hole analysis (charge or seal problem)
- MMV: determine what type of measurement systems can and cannot be used and the cost
- Understanding water solubility and chemical reactions within the reservoir
- Facilities will have major influence on commercial viability of the project sites, in-depth economic modelling needed
- Understanding Geological model (Petrology, Permeability etc.)
- Recommendations for detailed study (Static and Dynamic model)
- Provision of Indicative Project Development plan