[Open]

Challenges in Managing Mercury in Field Development and Production

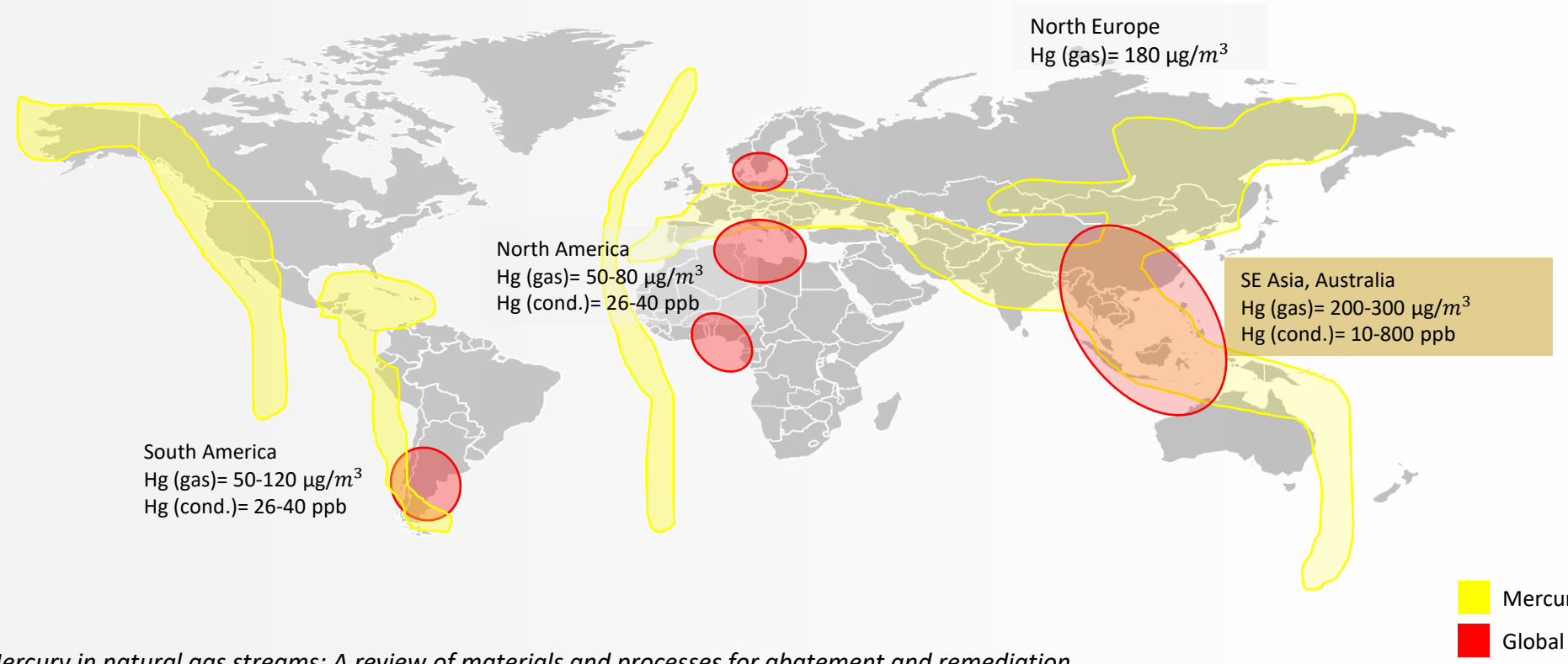
8–9 JULY 2025 | KUALA LUMPUR, MALAYSIA

Innovative Approach for Managing Organic Mercury in Oil and Gas Production

M Rafiq B Hamdan, DFE, PETRONAS
Hamdi Mohamad, UTDI, PETRONAS
Lim Ann Jie, UTDI, PETRONAS
Shannon Soon Pei Fen, DFE, PETRONAS
Nurbalqis M Noh, UTDI, PETRONAS

Background

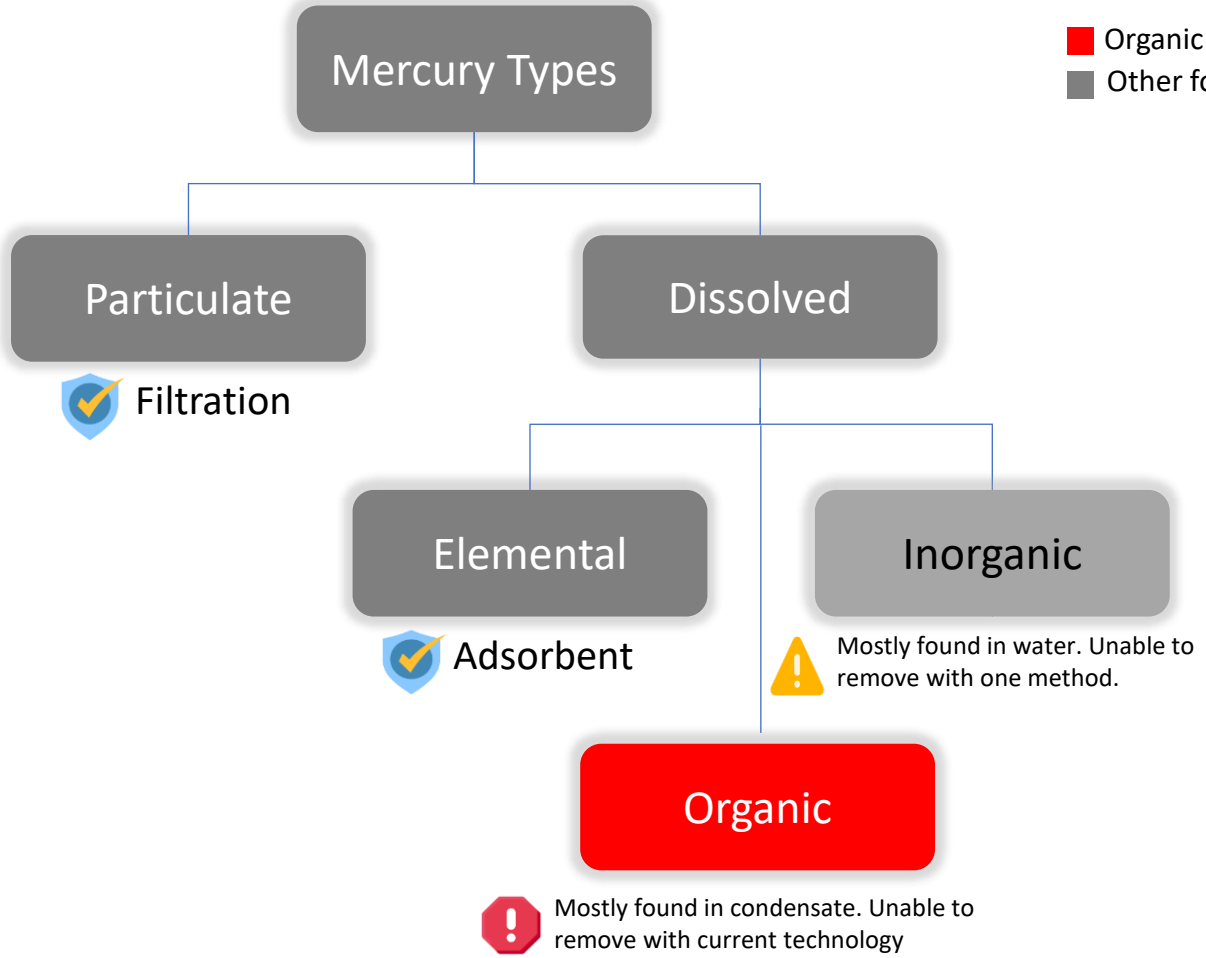
- In Oil and Gas, **Mercury is highly concentrated in SEA.**
- Globally, **not many companies** have conducted in-depth study on mercury, particularly organic mercury, as it has not been a prevalent issue in their area.

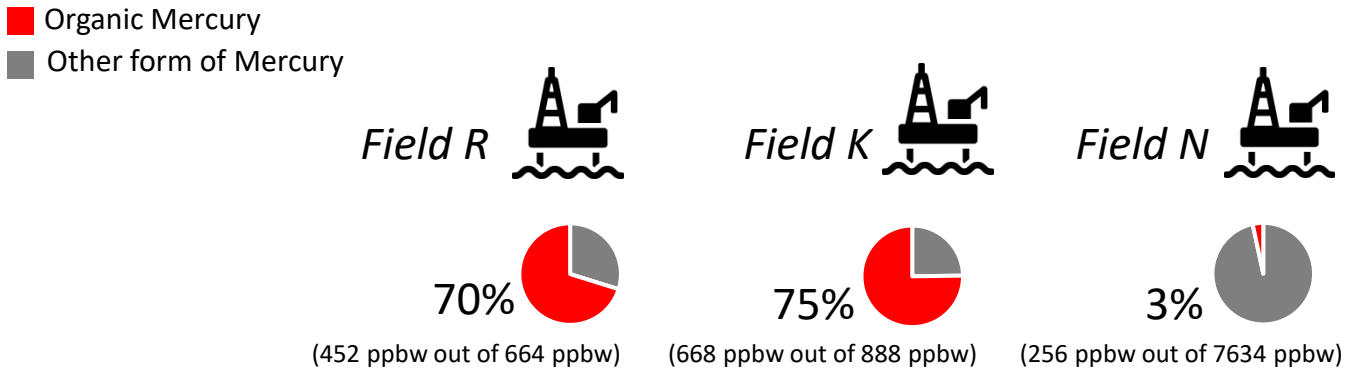


Source: Mercury in natural gas streams: A review of materials and processes for abatement and remediation

[Open]

Organic Mercury in Condensate



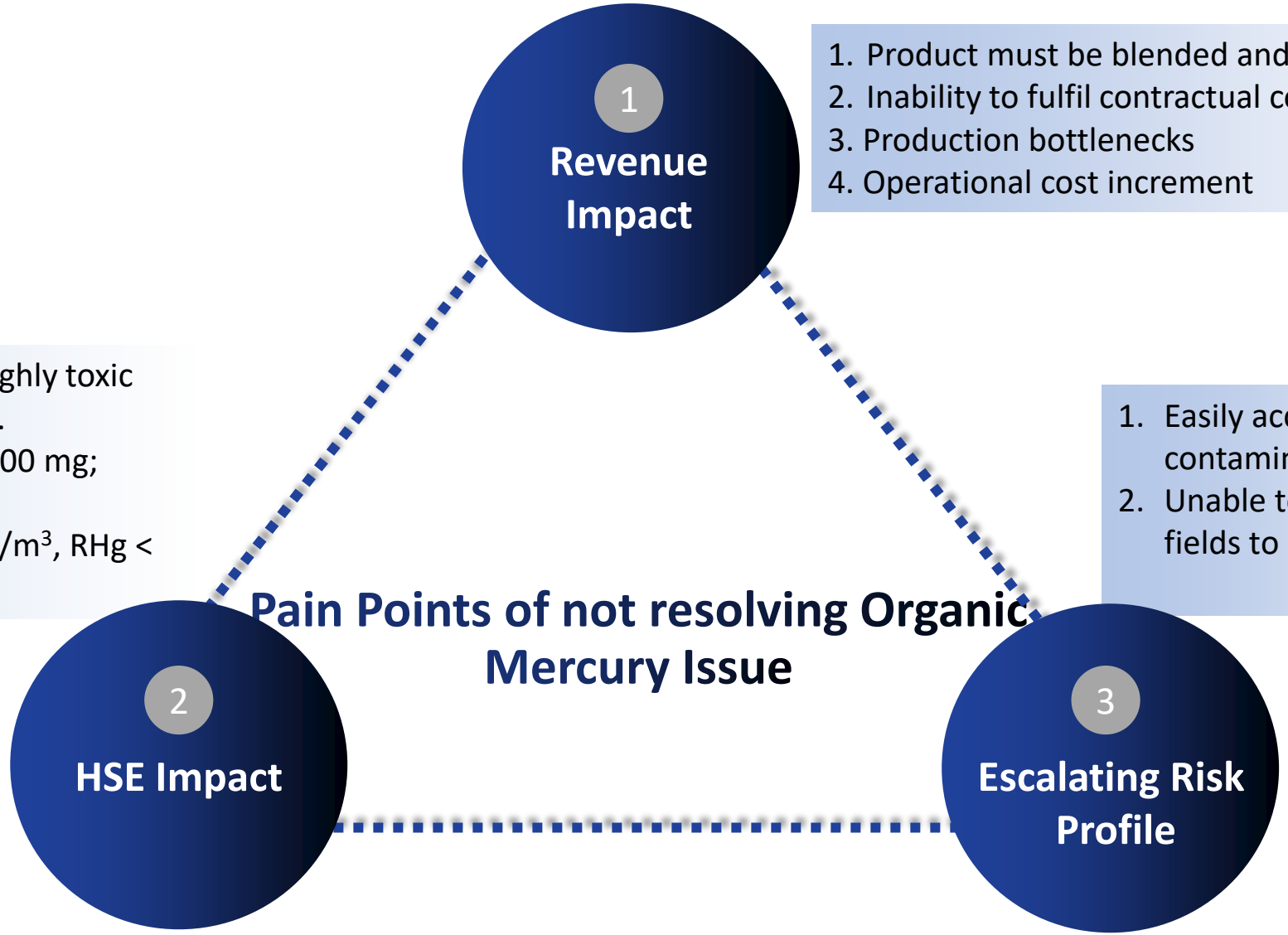


1. Organic Hg levels **exceeding total Hg sales specifications** (100 ppbw) have been identified in condensate over the past years.

2. Despite being found only in condensate, **gas exports are impacted** due to co-production.

[Open]

Problem Statement

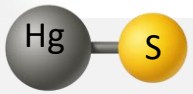


[Open]

Mercury Removal: What is still Missing?

1. Proven treatments

   i. Elemental Hg: Adsorbents
   ii. Particulate Hg: Filtration
   iii. Ionic Hg: Chemical treatment + filtration

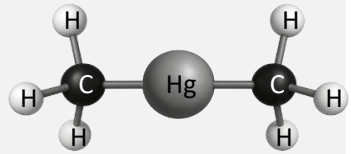


Molecular illustration of Mercury Sulphide


Condensate Mercury Removal System

2. Why it's not working for organic mercury?

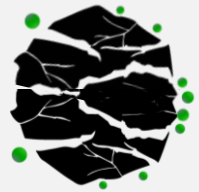
   i. Covalently stabilized
   ii. Interference from other ions
   iii. Tend to bypass sorbent beds due to high solubility in hydrocarbon.



Molecular illustration of organic mercury (Dimethylmercury)

3. Can activated carbon helps?

   i. Physical adsorption: Porous structure
   ii. Chemical interactions: Surface functional groups (oxygen, sulfur)


Activated carbon

How do we validate?

[Open]

Challenges in Validating Organic Mercury Removal Technology

Inconclusive study due to instability and in situ testing constraint.

Speciation **instability** and **interconversion** during sample collection and preservation.

High Hg well reactivation could **threaten production chain** contamination.

Fatal species deters further study.

Inconsistency of organic mercury present from Upstream.

On-site testing is **cost prohibitive** and permits only **limited iterations**.

[Open]

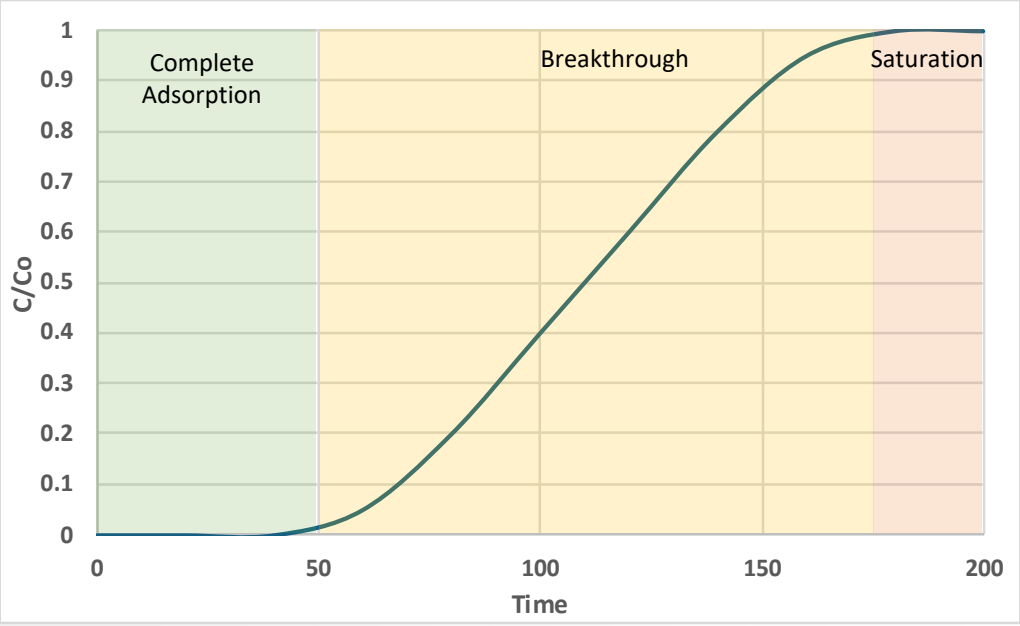
Innovative Approach in Managing Organic Mercury

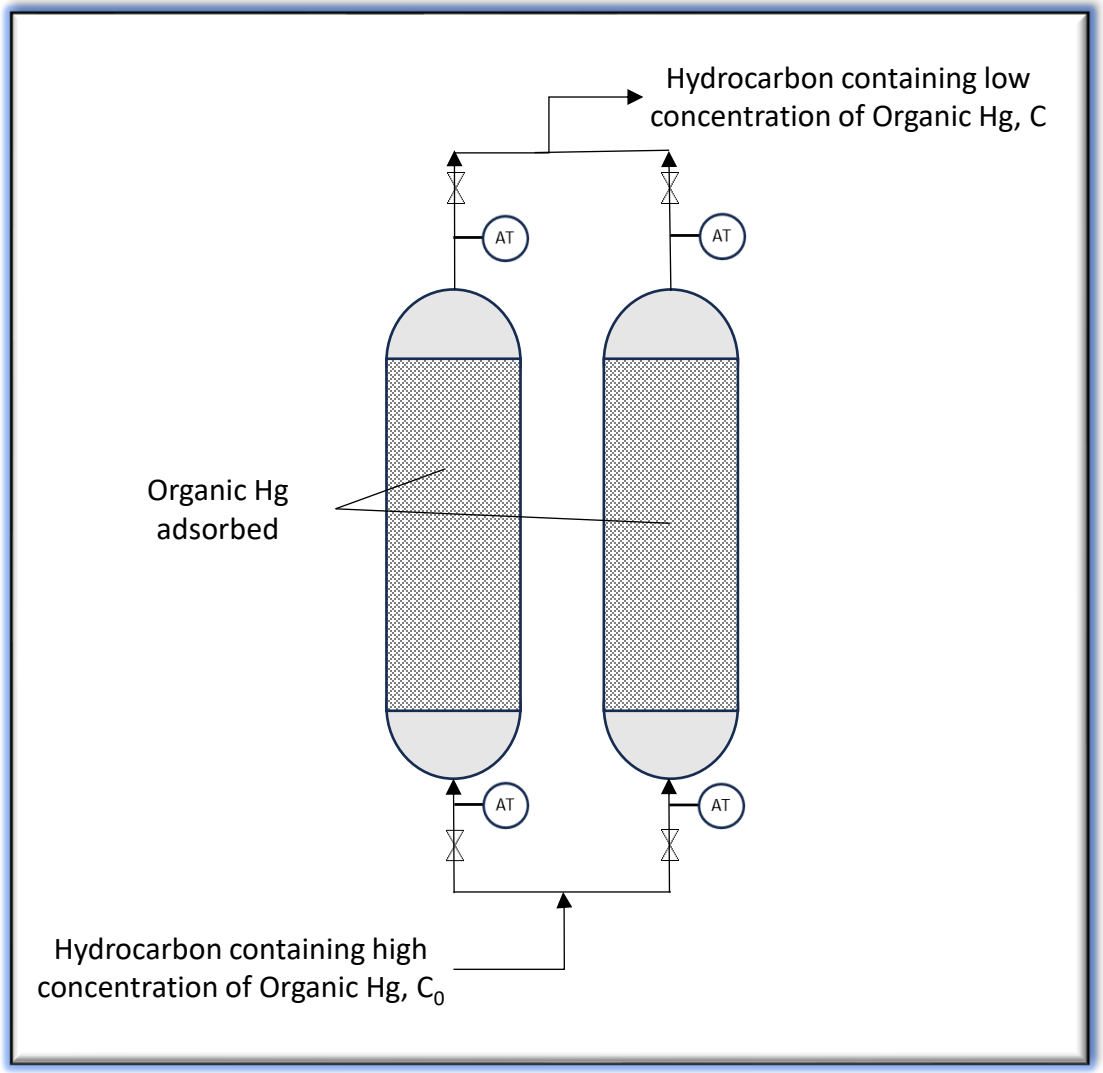
Moving Forward

Stage 1 Problem Validation	Stage 2 Technology Ideation	Stage 3 Feasibility Study	Stage 4 Technology Finalization	Stage 5 Performance Monitoring
1	2  We are here!	3	4	5
Key Activities				
i. Unable to preserve organic mercury sample for lab testing. ii. No proven technology due to no available lab sample. iii. Picture of success: Scalable, feasible and economical technology to treat organic mercury.	i. Identify potential technology currently available in the market/ in-house technology that meet the business requirement. ii. Based on the constraint, customize the lab study strategy to simulate the organic mercury. Allow safe evaluation of adsorbents and effectiveness of mercury removal.	i. Define scope and approach of feasibility study ii. Plan the timeline and duration for qualified vendor to conduct necessary study/ testing iii. Validate technology capability based on the actual business scenario	i. Finalize the technology assessment via concurrence from Technical Authority. ii. Proceed with agile pilot execution.	i. Constant monitoring post execution to measure goals against targets. ii. Conclude the result, refine and optimize accordingly. iii. Scale up to another field post successful deployment.

Way Forward and Recommendation

- To further collaborate with Service Providers and explore **synthetic organic mercury solution and** enable iterative testing in laboratory.
- Test the **efficiency of adsorbents** in removing organic mercury by measuring time taken until breakthrough.





[Open]

THANK YOU