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CLIMATE TRANSFORMED

Repurposing gives oil and gas pipelines the chance to turn green

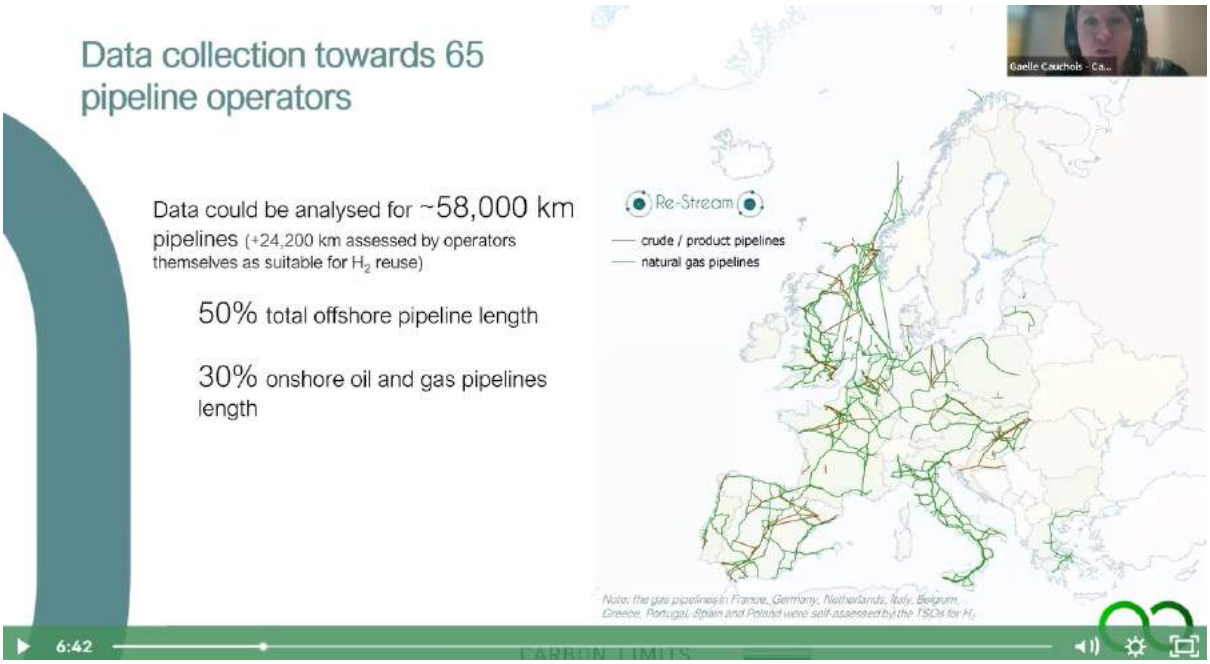
By Dilip Lal

Repurposing gives oil and gas pipelines the chance to turn green

The repurposing of Europe's oil and gas pipelines for the transport of carbon dioxide for carbon capture storage (CCS) and hydrogen to fuel the energy transition, could cut the capital outlay to achieve the European Union's (EU's) ambitious climate change mitigation targets by more than 70 billion euros, a study showed.

Huge investment is needed to develop the infrastructure to cut emissions by 55% by 2030 and reach net zero by 2050. Technologies such as CCS and carbon-free energy carriers based on hydrogen are to play a key role in reaching this target, and a recent study concludes it is both technically feasible and economically beneficial to use oil and gas pipelines, that would otherwise lay idle in the move away from fossil fuels, to transport these materials.

Oslo-based consultancy Carbon Limits partnered with co-located risk management and quality assurance firm DNV to conduct the Re-stream study, commissioned by funding partners including the International Association of Oil and Gas Producers and Gas Infrastructure Europe, on the viability of repurposing. Some 65 pipeline operators participated, covering around 58,000 km of pipelines, representing half of Europe's total offshore pipeline length and approximately 30% of those onshore. Hence, a significant portion of Europe's oil and gas pipeline network from which to draw preliminary conclusions.



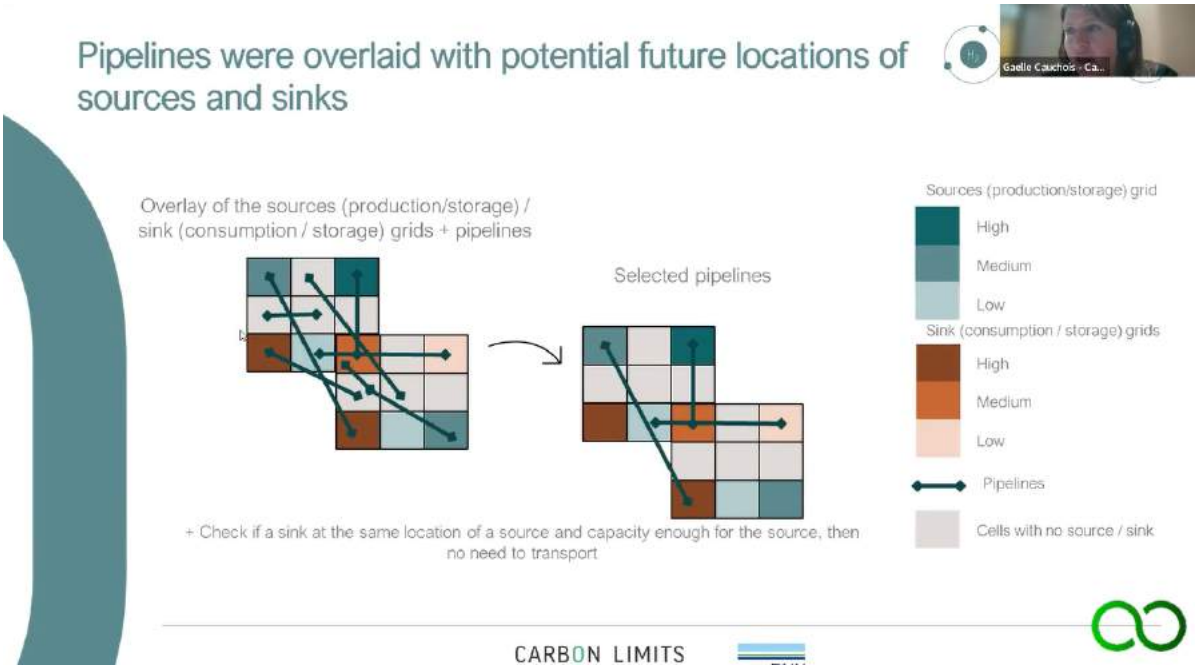
The study determined that carbon dioxide in gaseous phase can be transported in all onshore and offshore pipelines analysed, co-author Gaelle Cauchois, board member at Carbon Limits, told Climate Transformed. Meanwhile carbon dioxide in dense phase can be transported in around 25% of onshore pipelines and in more than half of offshore pipelines analysed. The main limiters are the maximum permitted operating pressure of the fluid they can transport and resistance of the material to running ductile fracture.

Re-stream, published in October 2021, also established that hydrogen can be transported in more than 70% of onshore pipelines and in most of those offshore. More than 24,200 km were assessed by operators themselves as suitable for hydrogen reuse However, potential hydrogen embrittlement was a key limiting factor whereby the pipeline material's ductility and load bearing capability is compromised through absorption of hydrogen atoms or molecules.

Business opportunities

The study estimates pipeline reuse provides strong potential for lower costs compared with new build options, estimated at 53% to 82% for both carbon dioxide and hydrogen, with around a 1 million euros/km reduction for onshore cases and double that for offshore.

After identifying locations of sources, such as carbon dioxide emitters and hydrogen producers and sinks, such as carbon dioxide storage locations and hydrogen storage and consumers, Re-stream concluded there were clear business opportunities. For carbon dioxide, for instance, at least 70% of existing offshore pipeline length was considered suitable for its transport as many of the long pipelines linked harbours to storage locations.



But there are technical challenges, with the main four identified as regulatory, integrity, safety and operability.

"There is still some work to do with regards to standards (to update and make fit for purpose) and before reuse becomes a reality, individual pipelines will have to be fully requalified" Cauchois said.

Despite the hurdles, however, Cauchois believes the reuse of the existing pipeline and storage network represents a strong investment proposition. While this study focuses on Europe, she believes it could be applied elsewhere to accelerate the energy transition globally.