

# IPLOCA Novel Construction

Adapting the Pipeline Industry to deliver a Net Zero Energy System

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# Agenda

- **Safety Moment**
- **The unstoppable energy transition**
- **What role will pipelines play in the energy transition?**
  - **Blending hydrogen into gas pipelines**
  - **How Hydrogen Pipelines differ from gas pipelines**
  - **How carbon dioxide pipelines differ from gas pipelines**
  - **New water pipelines**
- **What can companies do to thrive in the energy transition?**

# Disclaimer

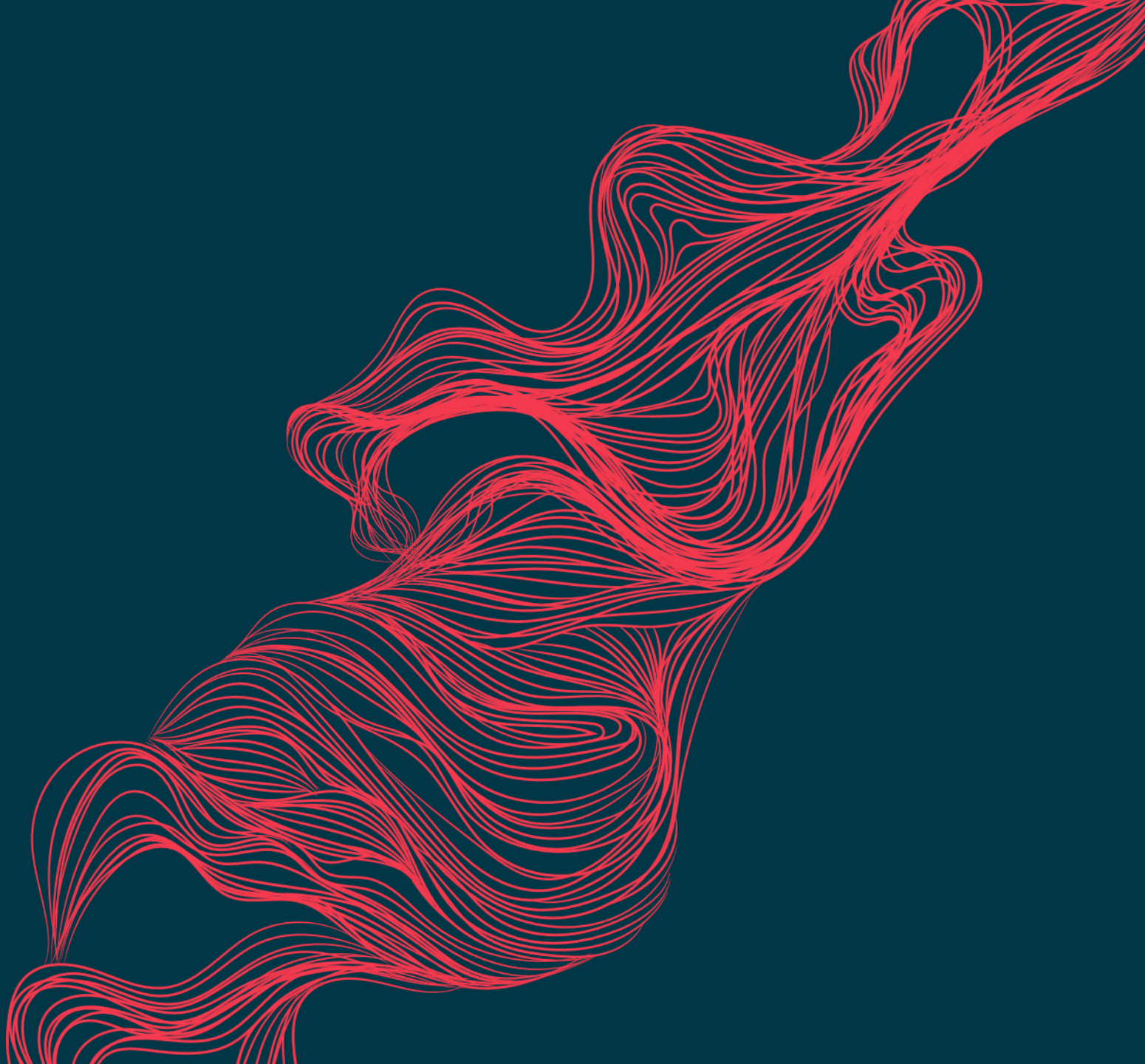
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# Safety Moment

## Denbury Gulf Coast Pipelines, LLC.

### Delta-Delhi Pipeline Rupture Incident

#### February 22, 2020

#### SUMMARY

24-inch pipeline rupture, releasing carbon dioxide that vaporized at atmospheric pressure

SCADA systems detected the drop in pipeline pressure

Operators closed 3 block valves to isolate

County OEM received calls within 8 minutes regarding a foul smell and a possible seizure

200 people were evacuated, and 45 sought medical attention (none required inpatient hospitalization)

The failure location was on a steep embankment adjacent to a highway that experienced land subsidence

An estimated 31,405 barrels of CO<sub>2</sub> were released

#### INSIGHTS & LEARNING

- PHMSA Investigation: The land subsidence caused axial strain on the pipeline, which led to a full circumferential girth weld failure
- First responders first expected a chlorine leak from a nearby water well and ordered closure of the adjacent highway.
- CO<sub>2</sub> is heavier than air and can cause asphyxiation.

#### REFERENCES



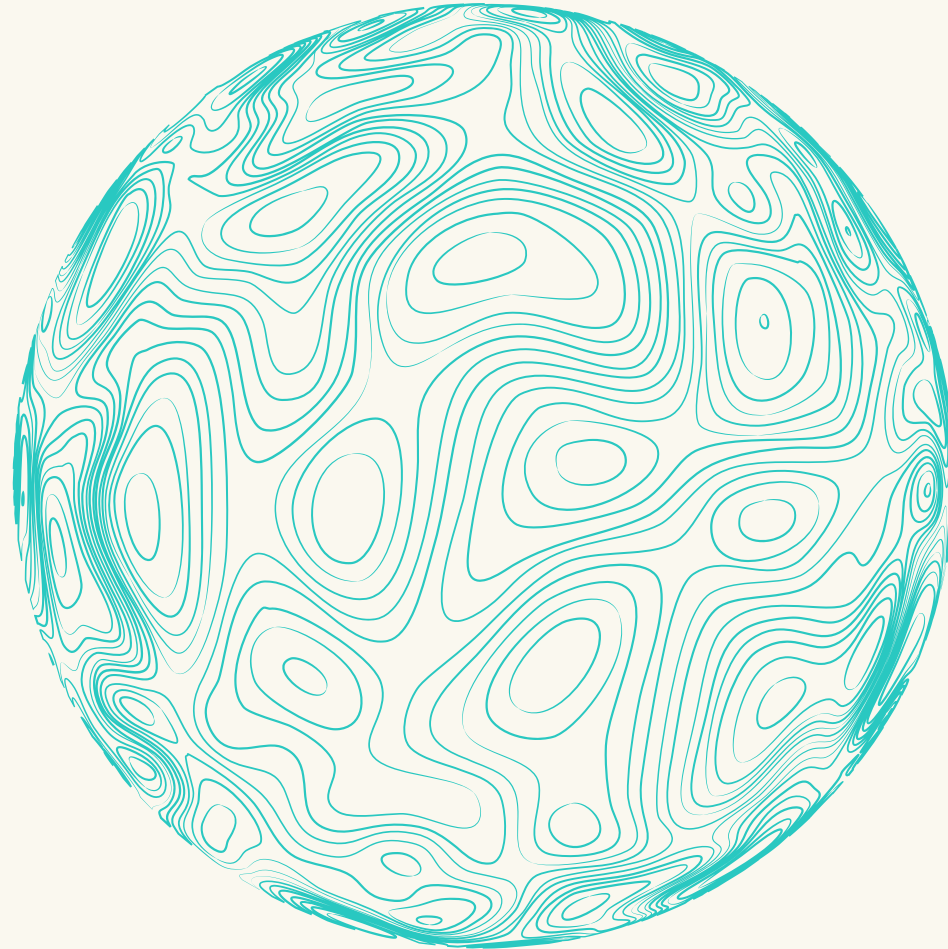
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4202017NOPV\_PCO PCP\_0526022\_(20-176125) - Denbury Pipeline.pdf



# The unstoppable energy transition






Our energy world in 2030, will be very different from what it is today.

**Dr. Fatih Birol**

Executive Director  
International Energy Agency



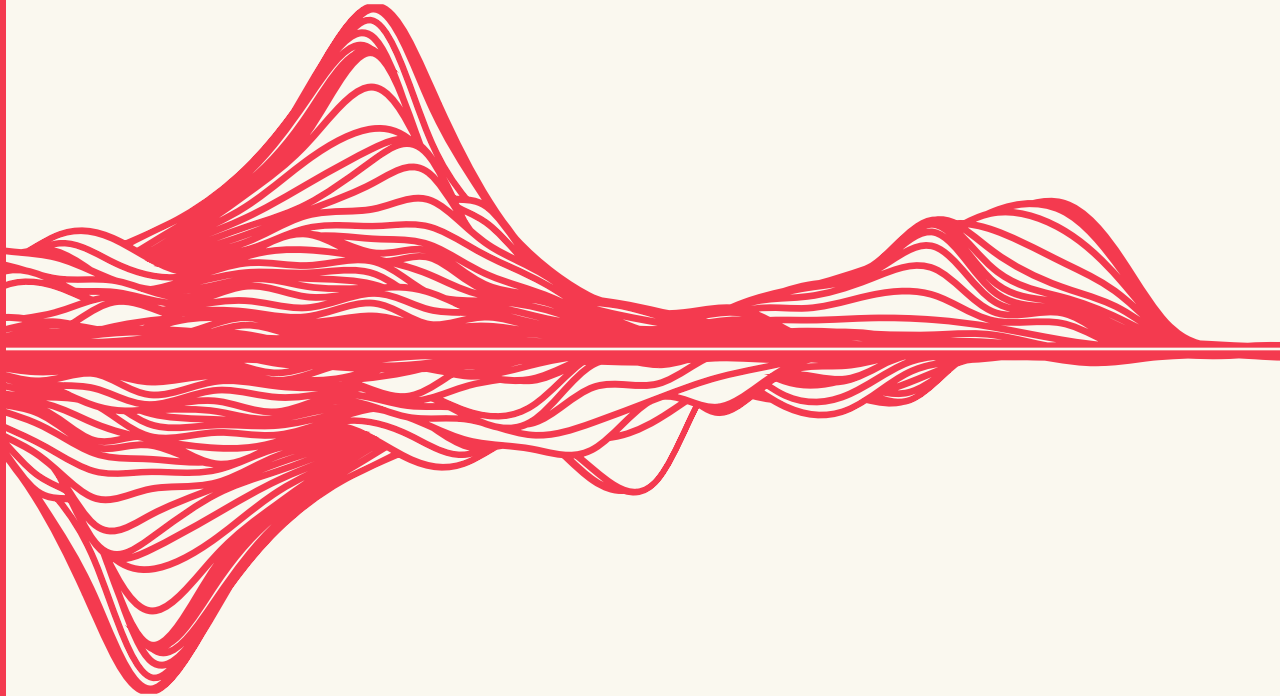


- Gas and oil use remains close to peak levels for the next two decades
- Gas is the 2<sup>nd</sup> largest contributor to global energy supply between now and 2050
- Reaching net zero will be virtually impossible without CCUS.

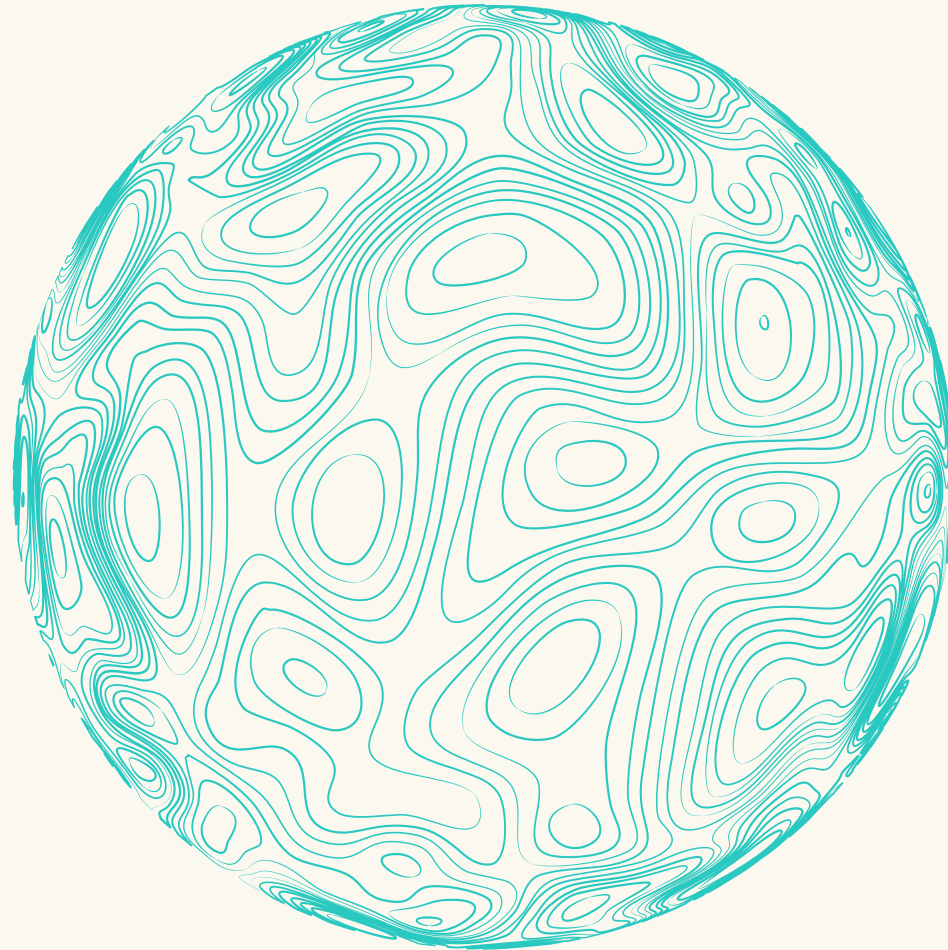


**Dr. Fatih Birol**

Executive Director  
International Energy  
Agency



**What role will  
pipelines play in the  
energy transition?**





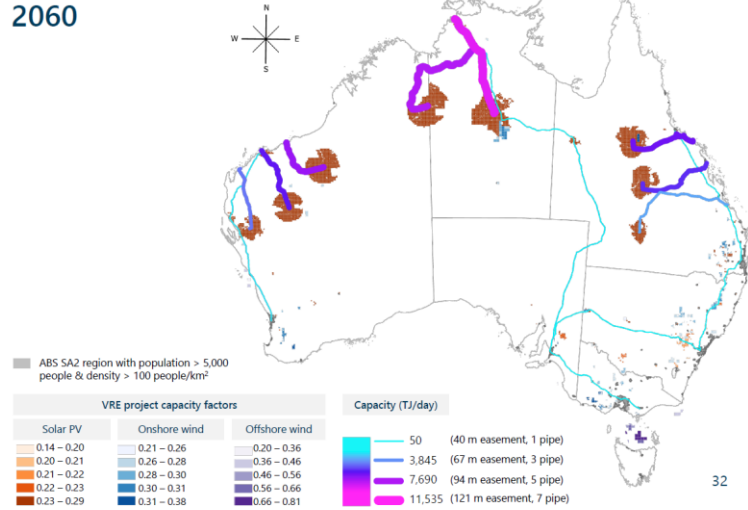
## Energy transition pipelines – Market potential

- H<sub>2</sub> and CO<sub>2</sub> pipelines made up just 4% of global investment in pipelines in 2023
- Investment in H<sub>2</sub> and CO<sub>2</sub> pipelines is set to more than triple by 2030 to \$13B per year (Rystad)
- The European Hydrogen Backbone predicts investment of €80 to €143 billion by 2040
- ~300 onshore CO<sub>2</sub> pipelines are predicted to be operational by 2030 (~half in the North America)
- Currently over 8,000 km of CO<sub>2</sub> pipelines are operating in the US

# Net Zero Australia Study

## 14,839 km of H<sub>2</sub> Pipelines

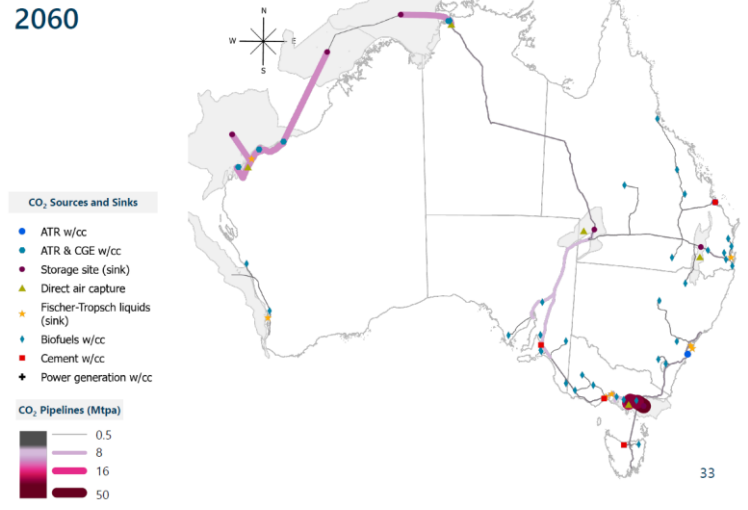
2060



32

## 20,404 km of CO<sub>2</sub> Pipelines

2060



33

## 8,000+ km of Water Pipelines

2060



34

# Net Zero America Study

Net-Zero America carbon dioxide spur pipelines



Net-Zero America carbon dioxide trunk pipelines



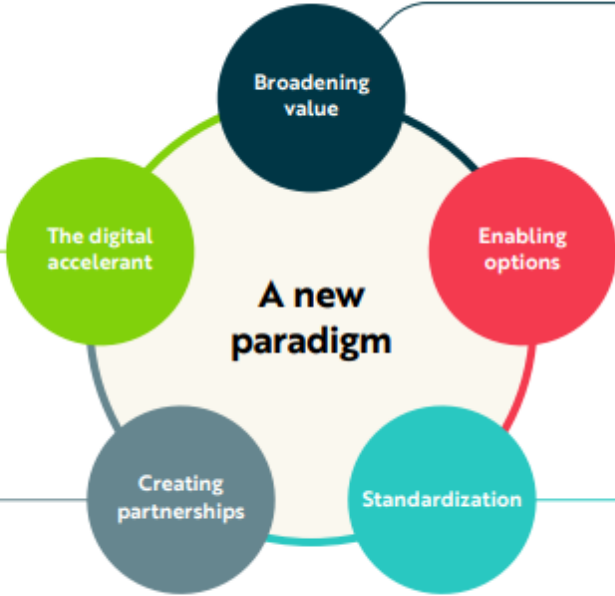
# From Ambition to Reality

## 5 shifts • 15 indicators By 2030 • For 2050

Digital platforms create the trust to move forward



Governments set the objectives and partnerships form



Shift from 'economic' to 'social-economic-environmental'



Address uncertainty through development of all technologies

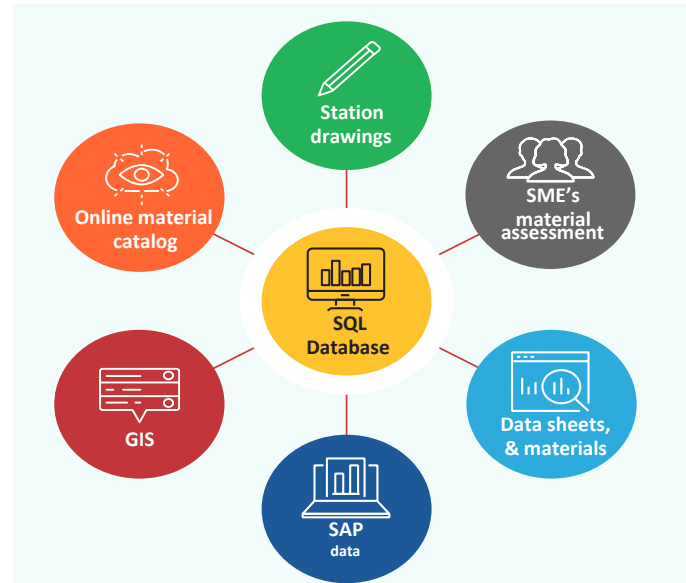


Replicate designs and build in parallel



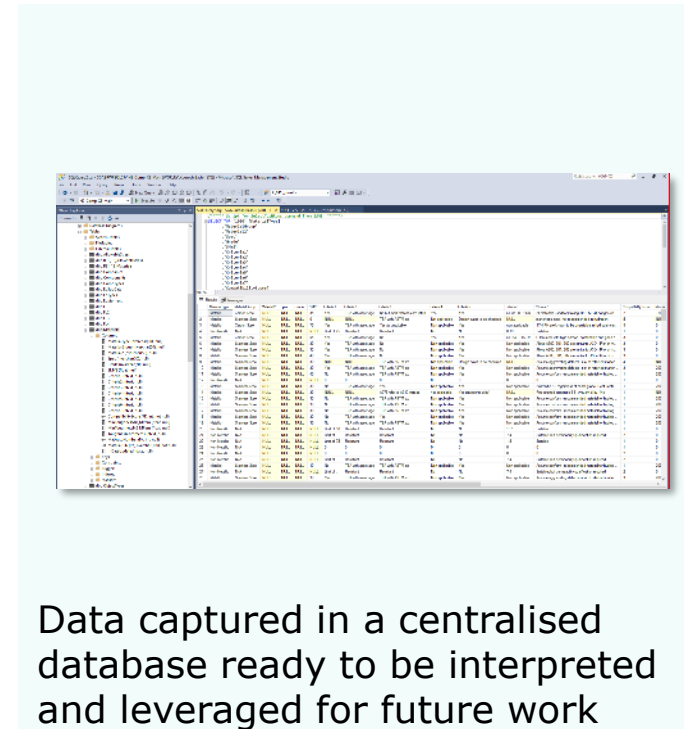
# A digital tool with supporting dashboards that serve as the foundation of a successful blending implementation program

Clear multicriteria logic



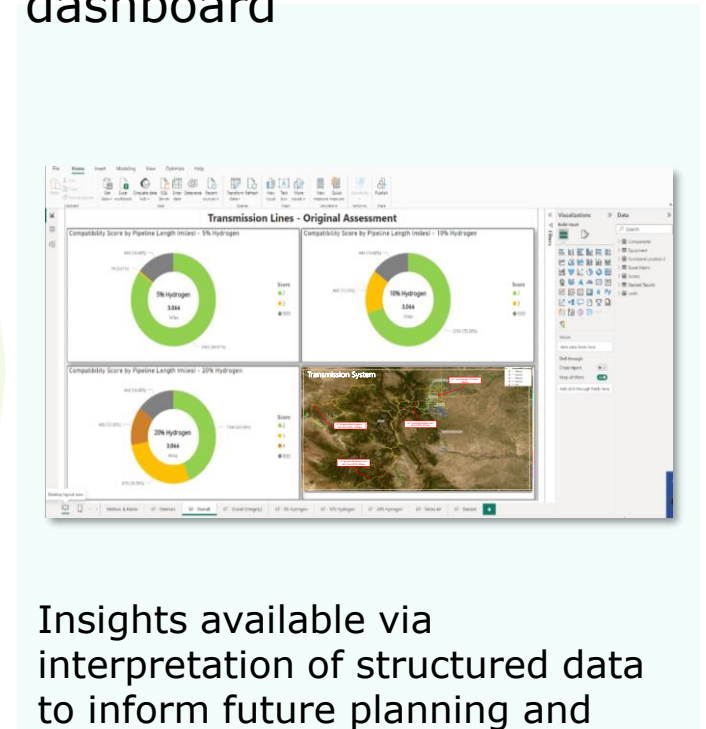
A multicriteria assessment utilising a broad data sources across your system combined with our H<sub>2</sub> knowledge

A centralised database



Data captured in a centralised database ready to be interpreted and leveraged for future work

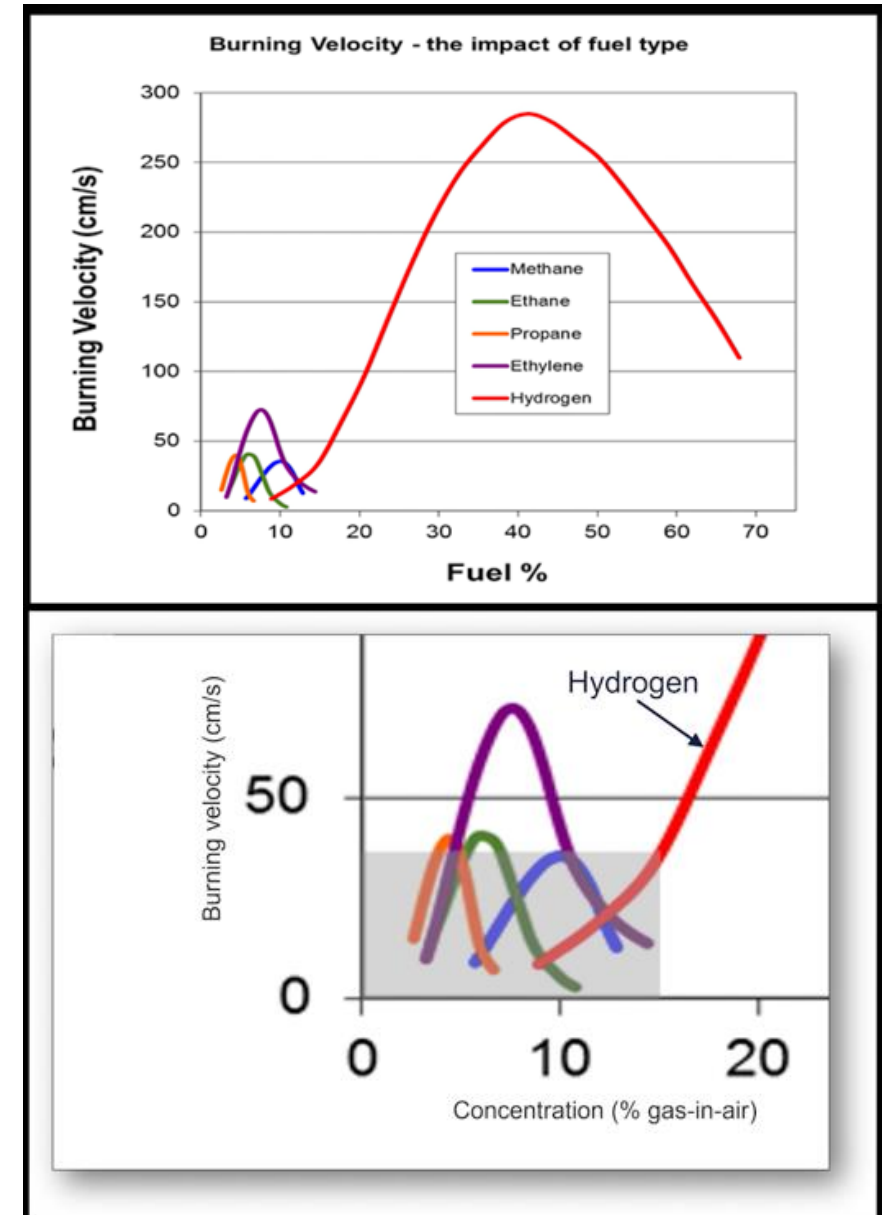
Live and interactive dashboard



Insights available via interpretation of structured data to inform future planning and transformation activities

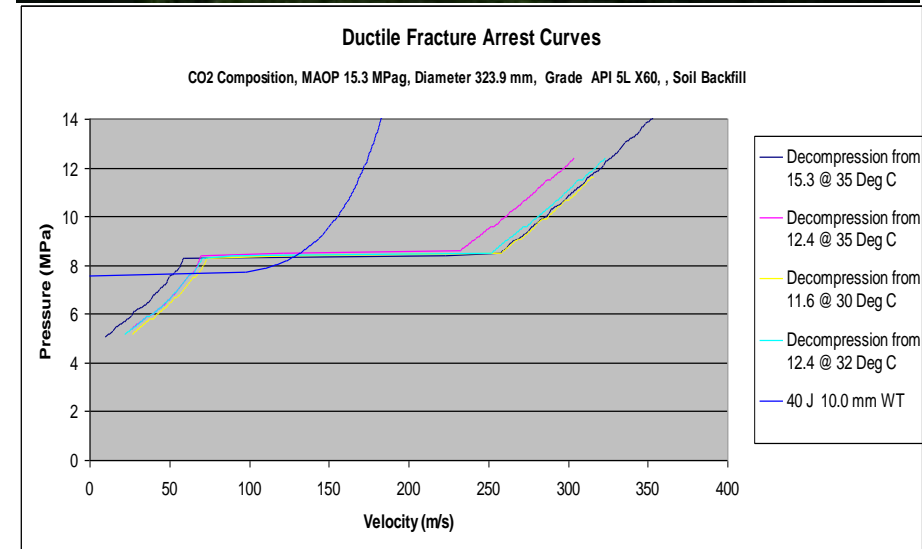
# How Hydrogen Pipelines differ from gas pipelines

- H<sub>2</sub> flammability impacts safety design
- Selection of steel and welding to avoid H<sub>2</sub> embrittlement
- Design for fatigue loading
- H<sub>2</sub> compressors and drivers
- Valve seal compatibility
- Repurposing existing pipelines



# How CO<sub>2</sub> Pipelines differ from gas pipelines

- Safety: CO<sub>2</sub> is non-flammable but can cause asphyxiation and is toxic
- Pressure / Flow Regime
- Fracture Control
- Corrosion
- Valve seals suitable for CO<sub>2</sub>
- Repurposing existing pipelines
- Potential for AI to reduce cost & schedule



Graphs courtesy of DNV

# Water Pipelines

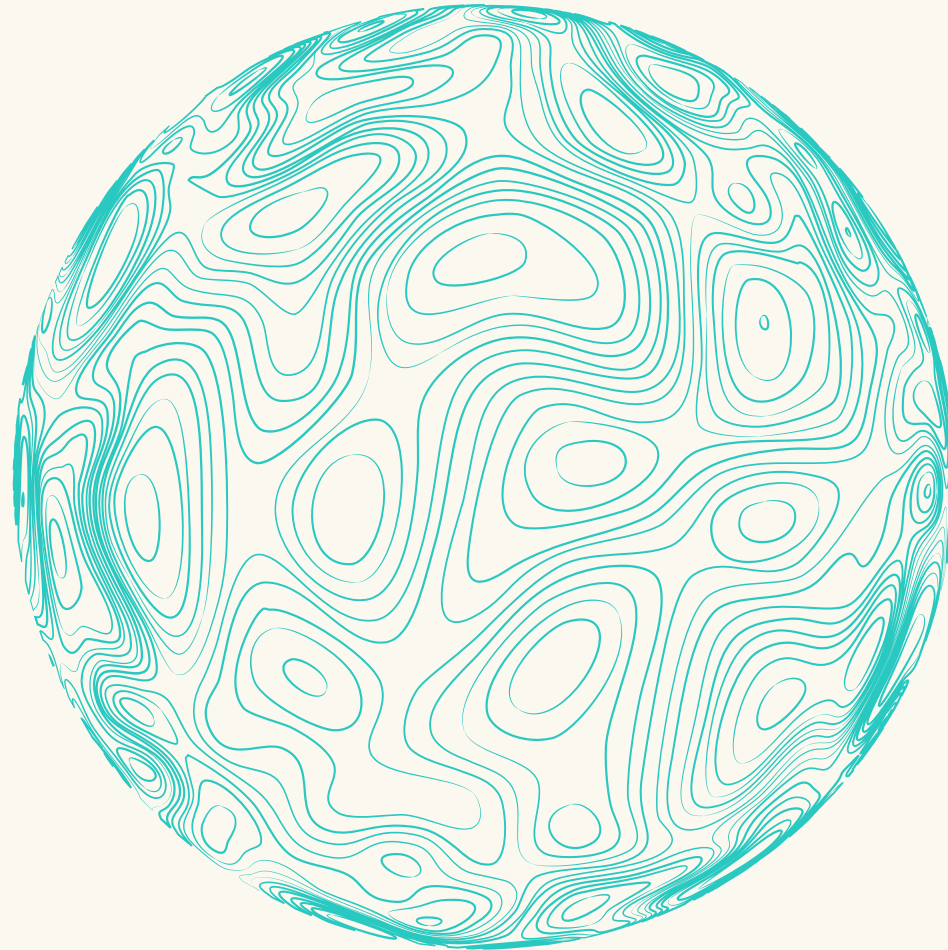
High strength steel welded pipelines with epoxy lining can be significantly lower cost than mild steel cement lined with bell and spigot joints due to

- Lower cost materials,
- Less anchor blocks,
- Lower cost logistics,
- Lower cost pumping
- Increased flow





**What can  
companies do to  
thrive in the  
energy  
transition?**



# ESG is fundamental to be successful

We're driven by a common **purpose**

Delivering a more sustainable world

Our **ambition** translates our purpose into what we do operationally  
Our five-year ambition is that we'll be recognized globally as a leader in sustainability solutions



OUR PEOPLE



OUR PLANET



OUR PORTFOLIO

Our **strategy** to achieve our ambition will be driven via three focus areas

Accelerating sustainability-focused growth in emerging areas

Evolving our core business as we support our customers with the energy transition

Strengthening our value creation through knowledge, technology & digital enablement

Our **values** and **behaviors** underpin who we are and everything we do



LIFE



RISE TO THE CHALLENGE



STRONGER TOGETHER



UNLOCK BRILLIANCE



# Q & A



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