

Carbon Capture and Storage an OEM's Perspective

Carbon Capture & Storage Global Legal Symposium

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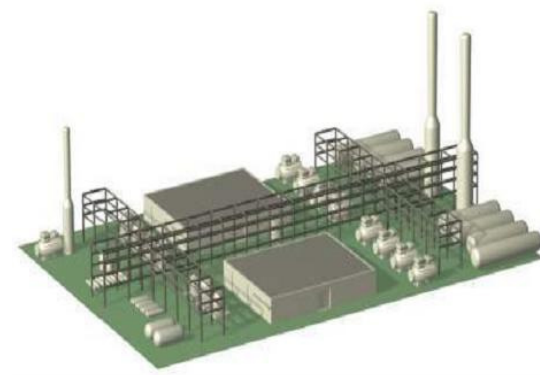
GE IGCC w/ Carbon Capture Product

630MW Standard Plant



In construction in Indiana

Carbon Island™





- Commercially offered
- Proven technology
- Greenfield or retrofit
- 585 MW output¹
- 33% HHV Eff²
- Carbon capture options
 - NGSC_{eq} (1,110lb/MWh)
 - NGCC_{eq} (780lb/MWh)

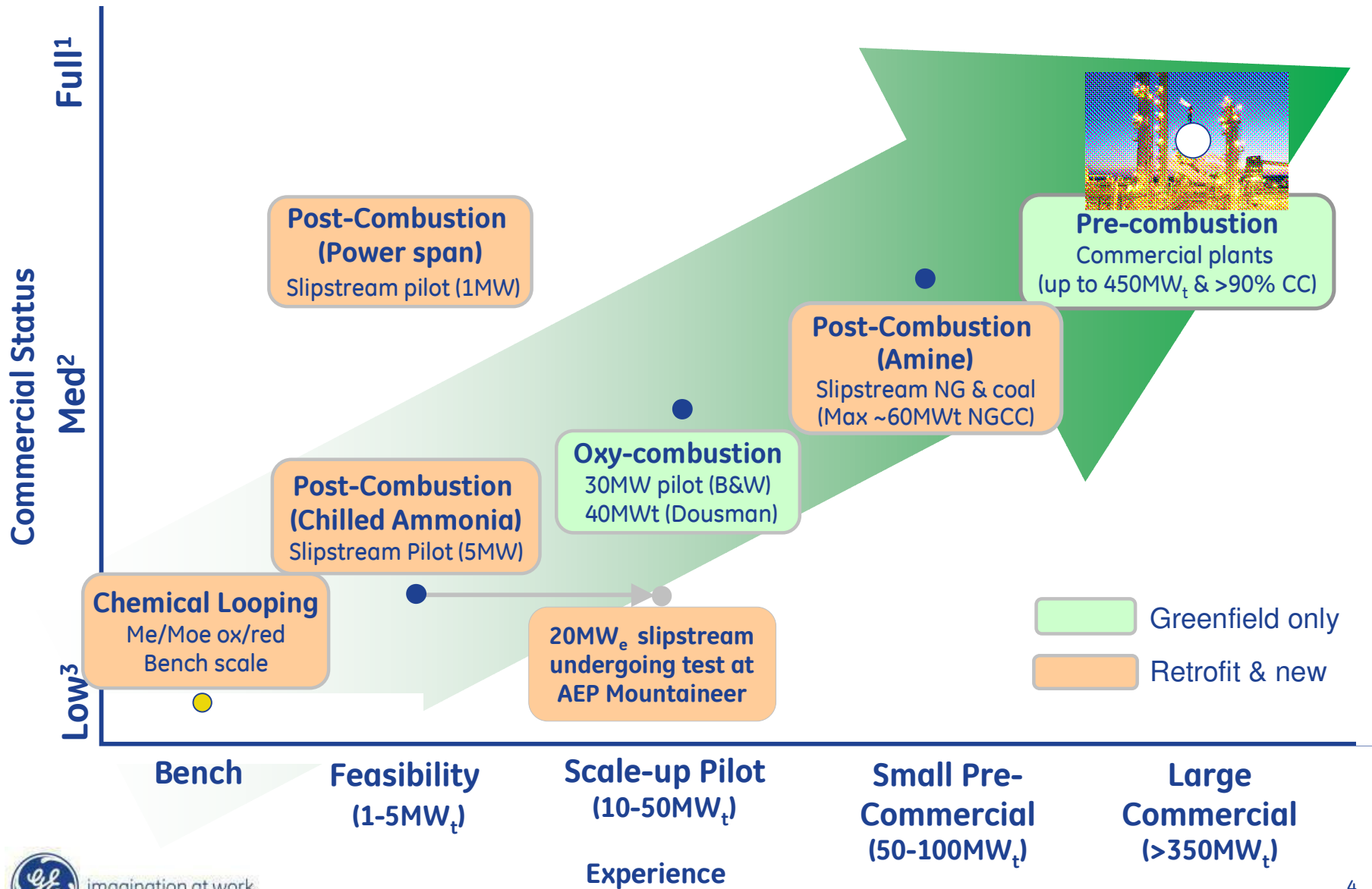
¹ From 630MW base

² From 38.5% base

Reality: Big challenges to CCS

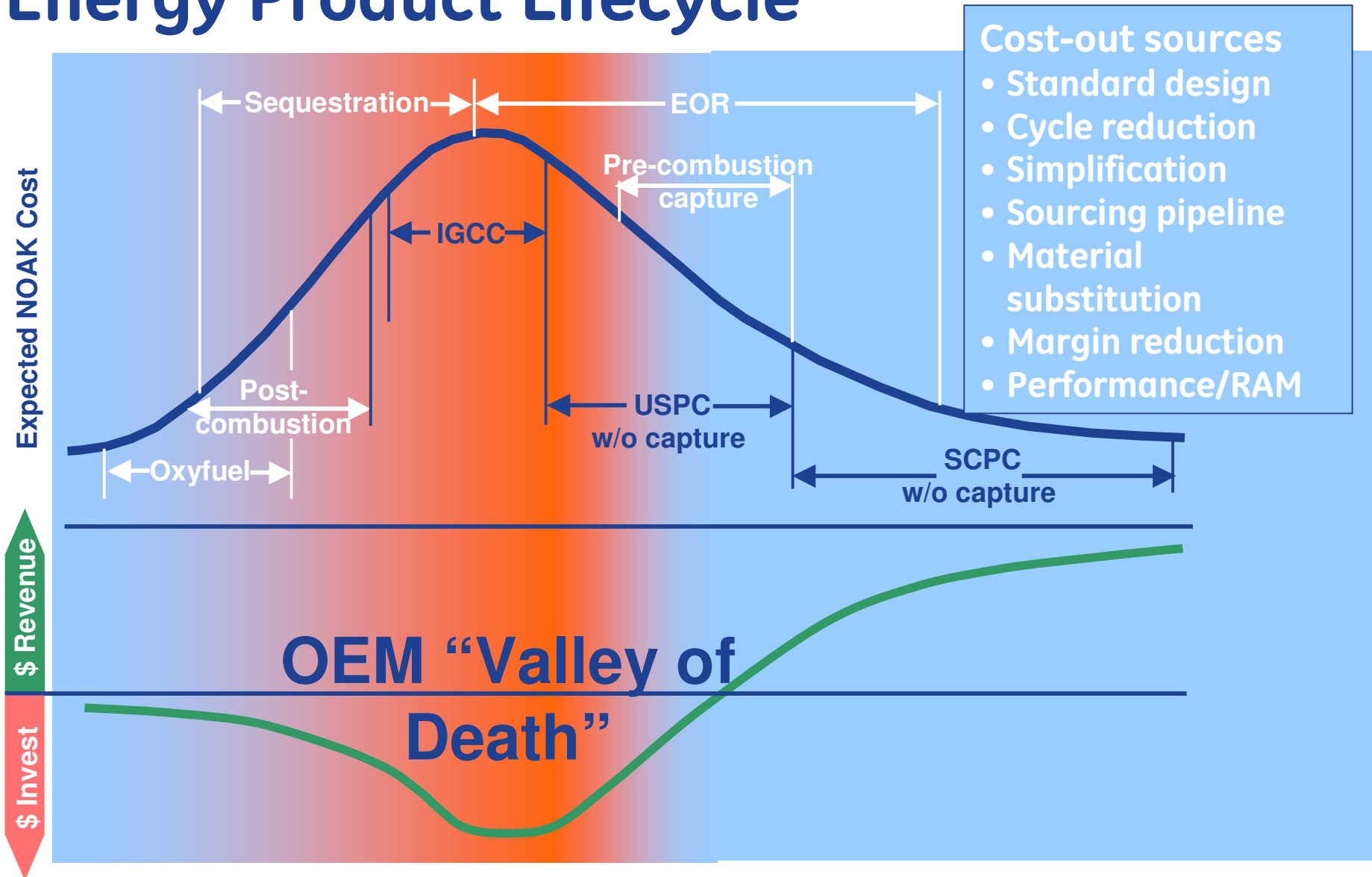
Issue	Challenge
 <p>Changing the Face of Coal</p>	<p>The lack of a consensus coal roadmap Commitment to achieve the change No policy or regulatory certainty that establishes a value for CO₂ and CCS</p>
 <p>Legal Risk</p>	<p>Tort, pore ownership and long-term liability (e.g. RCRA/CERCLA/NRD) for CO₂ will prevent utilities from transporting or storing CO₂</p>
 <p>Technology</p>	<p><u>Existing plants</u>: development and demonstration of retrofit technologies <u>New plants</u>: Commercial deployment of proven capture technology and its integration with storage</p>
 <p>Public Acceptance</p>	<p>NUMBY -- Public resistance to CCS projects in their communities.</p>
 <p>Finance</p>	<p>Government funding inadequate to prove that CCS is commercially viable and poses acceptable risks PUC mandate for lowest cost CO₂ transport infrastructure</p>

Capture Technology Maturity



¹Commercially offered... guaranteed cost & performance
²Requires shared risk & cost for scale-up to pre-or-full commercial
³Technical feasibility only... unknown cost, performance & integration barriers

Energy Product Lifecycle



Integrating capture and sequestration

GE Energy

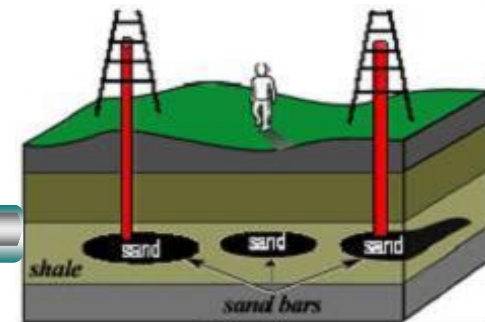


Pipeline Developer

Interface Definition



Schlumberger Carbon Services



Cost Efficiencies

- CO₂ quality
- Preservation of injectivity & capacity
- Regulatory
- Materials, components & features

Operability & Reliability

- Integrated, consistent mission profiles
- Design for planned & unplanned outages
- Response to upsets
- Safety

Project Execution

- Coordinated schedules for plant and storage facility
- Permitting
- Commissioning of plant & sequestration facility

New Technology Investing

Who bears the risk associated with deploying new technologies?

Equity investors

- Is there a wrap being provided? How strong?
 - Capital cost
 - Schedule and completion
 - Performance and availability
 - Operating costs
- High rate of return needed to cover remaining risks

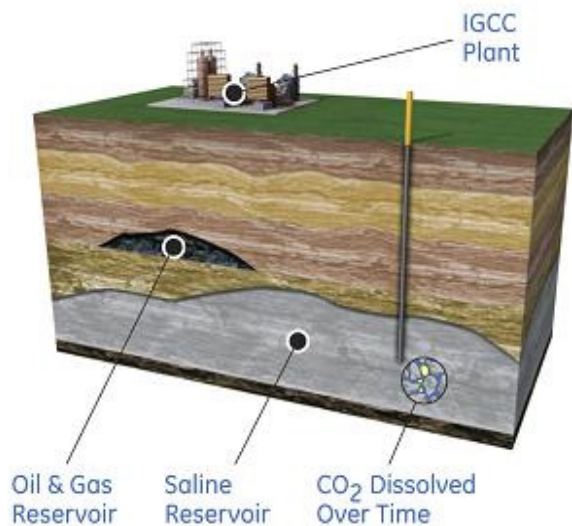
Debt providers

- Want to bear minimal increased risk
- Higher risk = higher spreads required, *if debt is available at all*

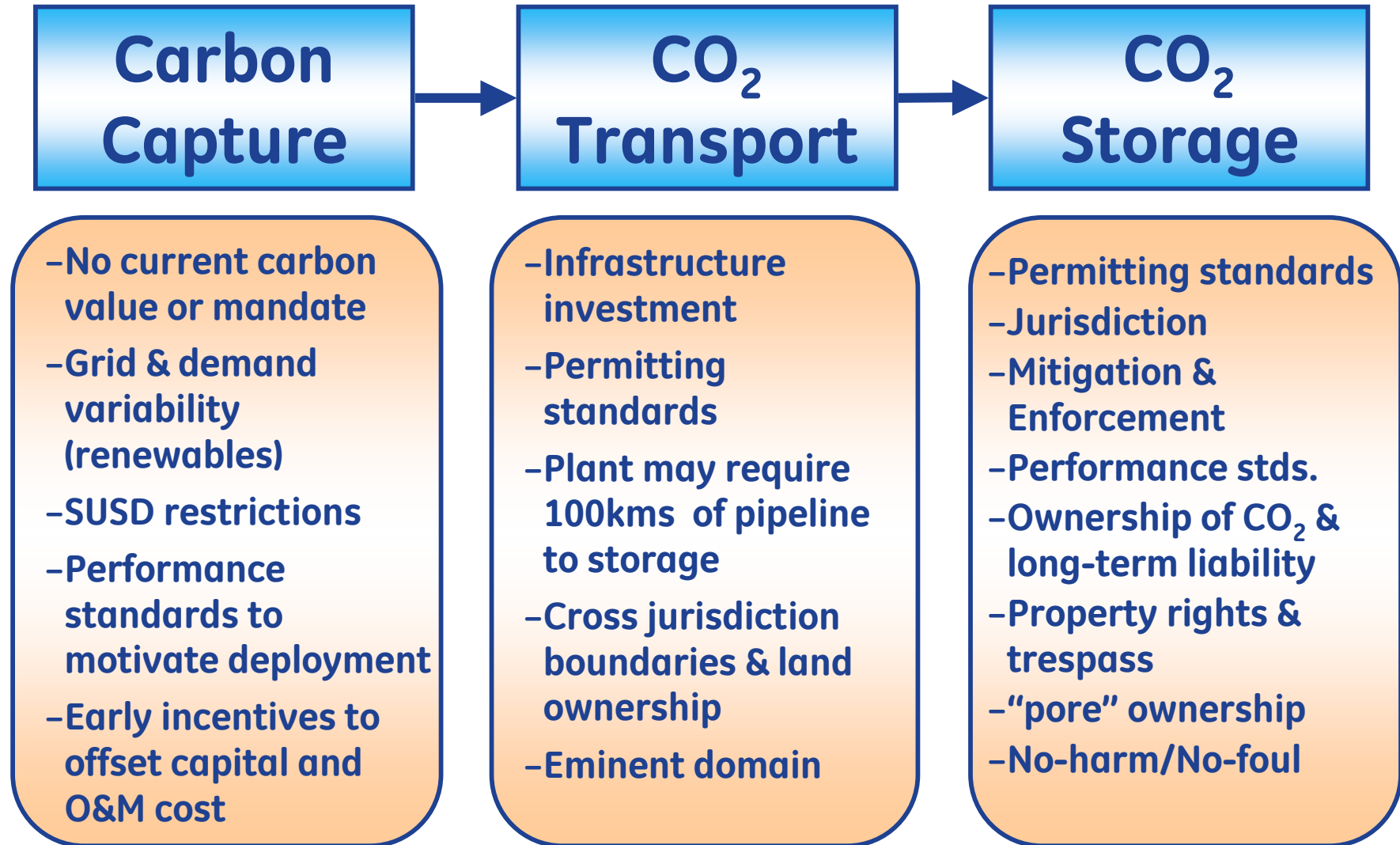


Deployment of CCS Unlikely Until...

- CO₂ emission rules are established
- CCS is demonstrated in several projects with
 - >1 million tonnes of CO₂ per year
 - In multiple geologies
 - Fully integrated power and CCS
- There is public acceptance of CO₂ sequestration in multiple geologies and countries
- The issue of long-term liability for stored CO₂ is resolved
- A stable price (and trajectory) is established for CO₂ emissions



The CCS Train – Gaps



What is the future for CCS?

The industry has...

Proven technology

Potential **projects**

What is needed to move CCS forward...

Government **incentives & indemnities**

Commercial scale projects to drive the experience curve to the next level and **justify investment** in technology improvement by industry

We need to show the world the **solutions** to energy security, GHG.

Carbon Capture and Storage an OEM's Perspective

Q&A

