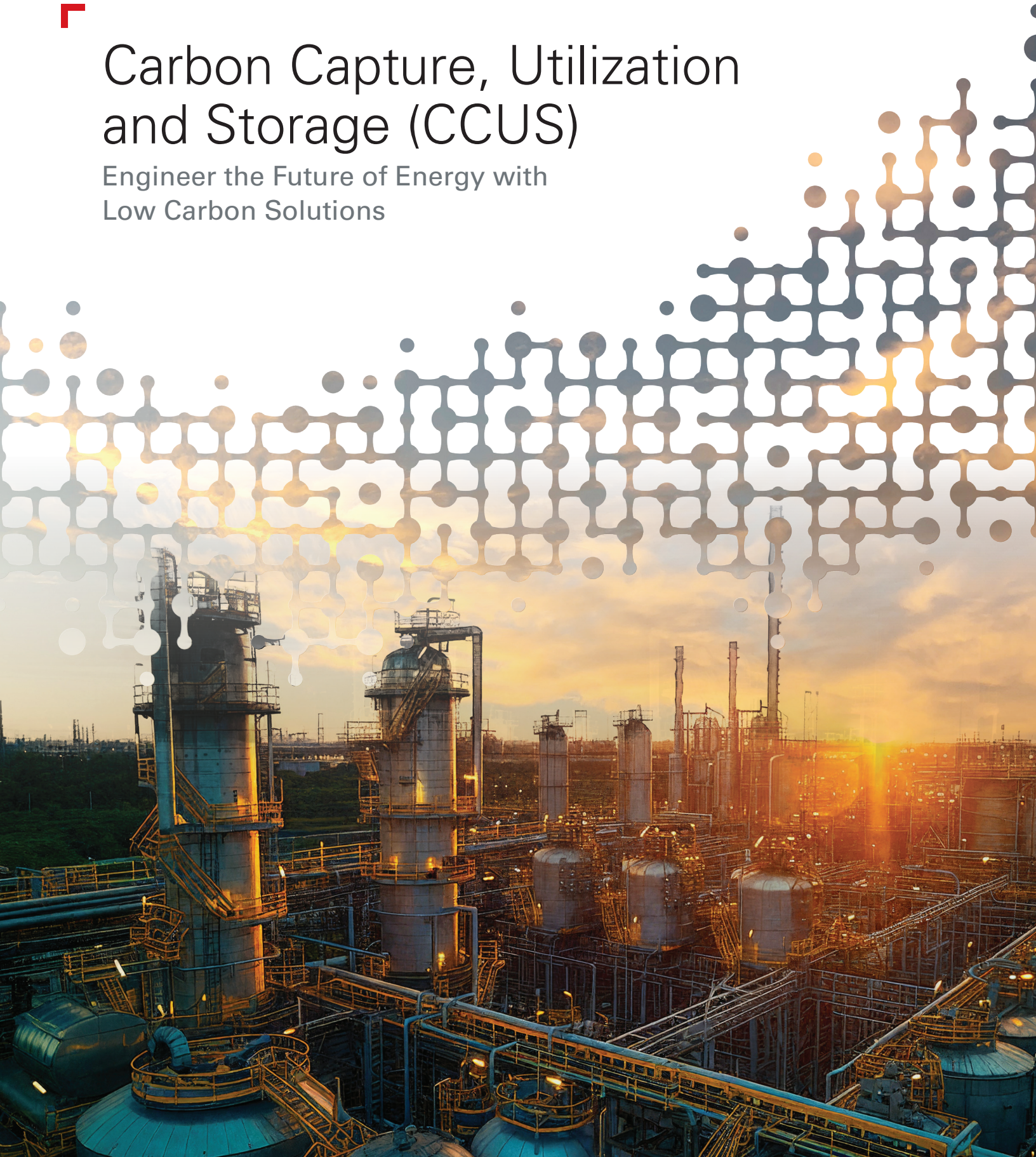




Carbon Capture, Utilization and Storage (CCUS)

Engineer the Future of Energy with
Low Carbon Solutions



Halliburton engineers custom CCUS solutions

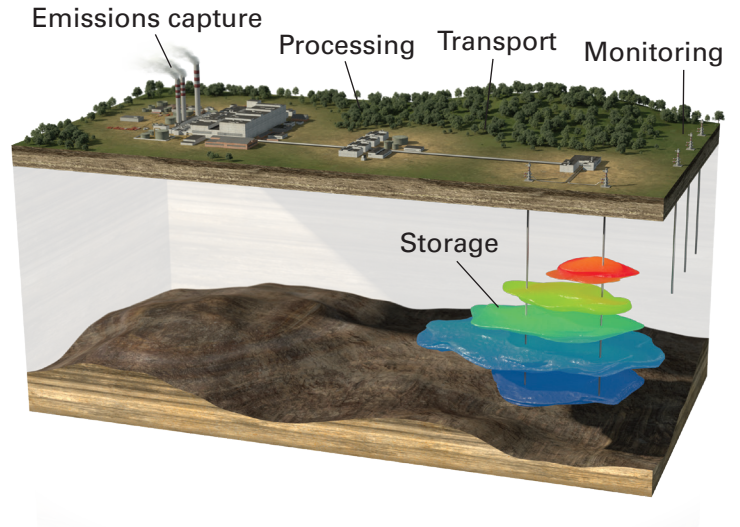
Every CCUS project is unique with its own barriers to success. That’s why you need an execution company with a track record of supporting projects from inception through implementation to help reduce risk and deliver the most commercial viability.

Halliburton’s 100 years of experience in well construction, planning, design, and monitoring, combined with our cutting-edge technology, uniquely positions us to engineer custom CCUS solutions. We actively engage with you to collaborate, design, and deliver a solution that meets your unique CCUS project needs, from consulting on engineering support and permitting requirements to providing full project management from initiation and site assessment through execution.

HOW WE DRIVE VALUE

- Flow assurance. Our CCUS professionals develop custom, commercially viable processes that help ensure controlled flow and compliant movement of your CO₂ across the entirety of your project’s operational lifecycle.
- System integrity. We maximize the uptime and integrity of surface infrastructure and subsurface systems, with dependable barriers and materials designed to withstand dynamic operations, corrosive environments, and leakage risks.
- Containment assurance. We help reduce the likelihood that CO₂ will migrate outside the designated lifecycle pathway or storage site with real-time monitoring and surveillance systems.

CCUS Lifecycle



CCUS SOLUTIONS BY LIFECYCLE STAGE	STORAGE SITE SELECTION	<ul style="list-style-type: none"> ▪ Source assessment ▪ Storage site validation ▪ Formation evaluation ▪ Project viability assessment
	CO₂ PROCESSING & TRANSPORT	<ul style="list-style-type: none"> ▪ Emissions processing ▪ Metering ▪ Pre-commission ▪ Pipeline protection ▪ Pressure boosting ▪ Leak detection
	DESIGNING & CONSTRUCTING CO₂ STORAGE WELLS	<ul style="list-style-type: none"> ▪ Well design ▪ Drilling and well completions ▪ Barrier selection and integrity evaluation ▪ Operations management
	MEASUREMENT, MONITORING & VERIFICATION	<ul style="list-style-type: none"> ▪ Surface infrastructure and well integrity ▪ Safe subsurface operating envelope ▪ Commercial governance

Storage site selection

Selecting the right CO₂ storage site is crucial before beginning a CCUS project. Subsurface unpredictability must be addressed because it poses the highest risk to projects due to geological uncertainty related to capacity, injectivity, and containment. Robust knowledge of the formation and data to develop subsurface models is needed to choose an appropriate site.

Halliburton's informed screening approach leverages data integration and evaluation for rapid storage site screening. Our industry-leading software, used for first-pass screening, models how much CO₂ can be stored, what may happen when it's injected, and the likelihood of CO₂ migrating out of the storage site, allowing for decreased time to evaluate the viability of a site. We employ subsurface modeling to help determine the best placement for injector wells and monitoring systems. This helps to minimize risk and maximize the commercial viability of CCUS projects.

CO₂ processing and transport

During transport, the CO₂ properties can change due to temperature and pressure fluctuations. Water and other substances must be removed to prevent pipeline corrosion before transport. Additionally, pipelines must be evaluated to maximize CO₂ transport and minimize leakage points.

Halliburton offers chemical packages, pipeline monitoring, and booster stations, which can all help meet the requirements to transport CO₂ safely.



Designing and constructing CO₂ storage wells

Due to the nature of CO₂, storage wells must meet higher standards than traditional oil and gas wells. These wells must withstand up to 30 years of harsh injection cycles. Government entities also impose regulations regarding design and construction. Additionally, well design and operations must align to help maximize well integrity, along with reducing the risk of leakage paths from legacy wells and formation damage during injection and storage.

Our team provides guidance to select the appropriate materials for CO₂ storage wells. We offer cementing solutions with enhanced corrosion resistance and have developed completion systems to help ensure wells can withstand CO₂ injection and contain CO₂ for the long term. Together, this reduces possible pathways for CO₂ to escape the storage site and minimizes opportunities for carbonation reactions.



Why Halliburton?

Halliburton advantages

Choosing Halliburton to help engineer your CCUS projects provides many advantages that help ensure safe, compliant CO₂ storage:



More than 40 years of CO₂ project experience



Successful execution of CCUS projects globally



Industry-leading people, products, services, and technology for comprehensive CCUS project planning and execution



Strategic collaboration with leading companies worldwide



Integrated, full-cycle solutions for greater efficiencies and commercial viability of CCUS projects



Global technology centers to develop new and enhance existing CCUS technology and solutions

At Halliburton, we collaborate and engineer solutions to help maximize asset value for our customers. Our products and service solutions are available as integrated offerings or as services, based on customer requirements.



For more information on Halliburton CCUS services, please visit Halliburton.com/CCUS

To learn more about our comprehensive portfolio of Low Carbon Solutions, visit Halliburton.com/LCS

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