



Well Technologies for Storage of CO₂ or H₂ in Geoformations



CONTEXT

As Shell accelerates its energy-transition activities to become a net-zero-emissions energy business by 2050, it is looking at the underground storage of CO₂ or H₂ as a promising option. Depleted hydrocarbon reservoirs in particular could serve as ideal geologic storage sites for the permanent storage of CO₂— and potentially for the temporary storage of H₂ as well. After all, they successfully held hydrocarbon molecules for millions of years. Additionally, economically viable solutions for the successful storage of CO₂ or H₂ can be engineered on the basis of the substantial body of technical knowledge and vast amounts of geological and petrophysical data that have been accumulated by the oil and gas industry.

WHAT ARE WE LOOKING FOR

Building on Shell's [strong portfolio](#) of carbon capture & sequestration (CCS) projects, we are seeking game-changing technologies related to wells. The technologies of top interest to us include those specifically aimed at substantially improving the design, drilling, completion and operation of wells for injecting either CO₂ or H₂ into subsurface strata. In the case of CO₂, the objective is to keep the gas permanently underground. In the case of H₂, the objective is to keep the gas underground temporarily, so that it can later be brought back up to the surface for use.

The technology that can enable all or part of this must be original and groundbreaking. It must have the potential for yielding significant tangible benefits beyond those of existing technologies. And it must have a broad applicability across the oil and gas industry. The proposed technology must be capable of addressing specific CCS-related well issues and should have a clear business case for implementation. The basic underlying science must be understood, but its hardware or software realization might still need to be proven through modeling or testing in an operational environment.

If your company offers a technology that fits these characteristics, please submit a proposal that includes a clear description of how you would reach a "Proof of Concept" through laboratory tests and field demonstrations. We will evaluate it, help mature it, and where appropriate, may even consider applying it at Shell.

Note: Technologies with a Technology Readiness Level (TRL) of 2-6 (as per API 17N) are typically the best candidates for this Call for Solutions.

IN SCOPE

Specifically, we seek technology-development proposals for the following:

- Broadening of the operating window of wells that enable CO₂ or H₂ storage in depleted reservoirs and geof ormations
- Improvement in well integrity to better withstand changes of pressure and temperature (including significant low temperatures and regular swings of over 100 °C) during and after injection of CO₂ or H₂
- Better materials and connections for well operations, including the handling of “lower quality” CO₂, and the gas-tight containment of H₂
- Novel tools that substantially improve well completion and intervention (preserving formation injectivity while maximizing safety and containing costs) under either CO₂ injection/sequestration conditions or under the more challenging H₂-related operations
- Substantial reduction in ultimate project costs and/or improvement in operational safety
- Control and mitigation in the event of seepage from the geof ormation and cement
- Improvement in the seal integrity of a geof ormation—i.e., its caprock, well cement, capillary threshold pressure or chemical reactivity—making it better suited for CO₂ or H₂ sequestration
- Leak detection along wellbore, for accessible and decommissioned wells, onshore and offshore
- Assessment of legacy wells for CCS and H₂ underground storage
- Plugging of abandoned and orphan wells at CCS sites
- Wellhead modifications
- Prediction of reservoir response to CO₂ or H₂ injection and monitoring of permeation boundary
- Long-term (up to a century) monitoring below and between abandonment plugs, and behind casing, for decommissioned wells
- Optimization of well construction through integrated workflows that make use of data analytics and artificial intelligence

OUT OF SCOPE

- Surface-seepage detection and monitoring
- Tools for geoformation assessment
- Incremental improvements and isolated, one-off solutions
- Repackaging or incrementally improved utilization of existing technologies
- Technologies that are not unique to well operations
- Technologies that may break environmental laws and regulations for underground injection
- Development of best practices and material selection guides

HOW TO SUBMIT YOUR PROPOSAL

- Go to the [online submission form](#) of Shell GameChanger.
- In the “Is this application in response to an ongoing Call for Solutions” field, select “yes” and type “Wells for CO₂ or H₂ storage”.
- Fill in the other fields of the online form. Should your entry exceed the word limit, please add details in your pitch deck.
- Submit your proposal by **April 30, 2021**. *(This deadline is an extension from that of the original Call for Solutions.)*
- Browse around at the [Shell Gamechanger website](#) to learn more about the programme. For specific questions about this “Call for Solutions” contact GameChanger-Solutions@shell.com

WE APPLY THE FOLLOWING CRITERIA IN THE SELECTION PROCESS

- **Novel** – Is the idea fundamentally different and unproven?
- **Valuable** – Could the idea create substantial new value if it works?
- **Doable** – Is there a plan to prove the concept quickly and affordably?
- **Relevant** – Does your solution truly answer this call for solution?

NOTES

- Any information submitted as part of the process must be **NON-CONFIDENTIAL** at this stage.
- The funding opportunity will be around US\$200k (depending on scope) to progress a “proof of concept” in a phased approach over a period of no more than 12 months. Further development may be supported and facilitated by Shell depending on the overall outcome of the initial award.