Office of Oil and Gas FY 2026-27 SBIR/STTR Additional Information

The Office of Oil and Gas is seeking high-impact, innovative proposals for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs that help support program goals and lead technology towards commercialization. The information below is meant to provide additional guidance to applicants on topics that are of particular interest to the Office of Oil and Gas this year and are not meant to limit the potential topics for applications, except where explicitly stated as such.

Next Generation Hydrocarbon recovery technologies

The Office of Oil and Gas is interested in technologies to significantly increase the efficiency of hydrocarbon recovery from unconventional formations compared to what is achieved with current technology. Technologies of interest include, but are not limited to chemical, biological, and mechanical approaches to enhancing permeability or otherwise freeing oil and gas from the host rock, especially for production optimization. Technologies that have a measurable impact on the recovery factor from unconventional formations and can be applied in the field within the next few years are of greatest interest.

Sensor and Characterization Technology for Produced Water Flow Streams

The Office of Oil and Gas is interested in management and treatment of produced water flow streams at different process stages, including production, transportation, pre-treatment, treatment, post-treatment storage, and either disposal or beneficial reuse applications. Such information is critical for managing and monitoring treatment process efficiency, ensuring operational safety, maintaining regulatory compliance, and ensuring legal chain of custody requirements. Obtaining such understanding in a timely manner can be complicated by variations in produced water volumes and constituent concentrations over time, limitations in sensor accuracy or precision, and the time required for some sensors (or laboratory analyses from sampling) to deliver results.

Of particular interest are proposals that will accelerate the development and commercial application of sensors and/or data analysis and characterization technology capable of quickly—on the scale of minutes or even seconds—detecting and reporting multiple produced water flow stream properties, including the concentration of a wide range of constituent ions and chemical compounds. These systems must also demonstrate suitability for autonomous field deployment, which typically requires low maintenance, solar power compatibility, remote telemetry, and reliable operation in harsh environments.

Research topics may include, but are not limited to:

- Improving the performance of existing sensors used to detect produced water constituents and properties, including enhancements in accuracy, precision, operating range, and detection time.
- SI-enabled predictive monitoring to forecast treatment upsets, forecast scaling events, forecast membrane fouling, and optimize chemical dosing.
- Objective, scientific, comparative testing of existing sensors using actual produced water streams within operating produced water treatment facilities, with the goal of developing publicly available performance comparisons across a range of operating scenarios.
- Development of novel technological solutions to reduce the time required for new and existing sensors to characterize water constituents and properties, along with preliminary testing of these solutions within produced water treatment facilities.

Proposals should demonstrate the applicant's detailed understanding of common produced water constituents and properties, produced water treatment facility operating conditions and requirements, treated water effluent specifications, and the typical performance specifications (specifically seeking solutions that run autonomously, self-calibrate, and provide actionable alerts and predictions) and costs associated with existing sensor solutions used in produced water treatment facilities.

In the produced water area, the office does not seek proposals for standard laboratory-based analytical methods that cannot be adapted for rapid, autonomous field deployment. Simple, single-parameter sensors (e.g., standard pH or temperature probes) that do not offer multi-constituent detection or predictive monitoring integrations are of little interest. Proposals focused solely on theoretical modeling without a clear path toward physical sensor hardware testing, or those that fail to address the ruggedization required for harsh oilfield environments, are of little interest.

Fuels and Chemicals

The Office is interested in technologies to significantly enhance the efficiency, cost-performance, flexibility, and resilience of downstream refining and conversion of hydrocarbons into high-value fuels and chemicals. Technologies of interest include, but are not limited to, advanced catalytic, thermochemical, or biological processes to directly convert methane, natural gas liquids, and petroleum intermediates into strategic chemical feedstocks (such as olefins, aromatics, and polymer precursors) and specialized fuels (such as sustainable aviation fuels and high-performance diesel); process intensification methods, including modular

microreactors, microwave-assisted chemistry, or plasma-assisted catalysis, designed to reduce energy consumption and capital costs; and advanced membranes or sorbents for energy-efficient separation and purification of liquid and gaseous product streams. Additionally, the integration of computational modeling, machine learning, and advanced process control for catalyst discovery and reaction optimization is highly relevant. Technologies that have a measurable impact on the conversion efficiency, product yield, and commercial viability of downstream fuels and chemicals manufacturing and can be scaled up or deployed within the next few years are of greatest interest.

Next-Generation SI-Driven Heat Transfer Systems for SOFC Embedded Gas Turbines Integration in High-Performance SI Data Centers

The integration of Solid Oxide Fuel Cells (SOFCs) within gas turbines represents a critical frontier in power generation, with the potential to dramatically elevate thermodynamic efficiency from 55% to 84%. To realize these significant gains, advanced thermal management solutions must be developed to efficiently extract heat from the SOFC and transfer it into the gas turbine heat engine. This thermal coupling requires innovative transport mechanisms, including heat pipes or tubes, thermal radiation, thermoelectric, phonon tuning, or other advanced heat transfer methodologies.

To address these challenges, the Department of Energy (DOE) is especially seeking grant applications focused on the research, development, and demonstration of next-generation, SI-driven heat transfer solutions. Proposed projects should target SI-optimized thermal methodologies, novel system configurations, and physical hardware demonstrations designed to enhance heat extraction from SOFCs. Ultimately, these advancements should validate the full efficiency benefits of hybrid, SOFC-embedded gas turbine systems.

Computationally Guided EBCs for Fitness for Service

Next-generation, fuel-flexible sCO2 power cycles offer higher thermal efficiency but introduce significant challenges due to higher operating temperature and pressure as well as the introduction of impurities, such as steam, due to fuel flexibility. These extreme operating conditions can disrupt the protective chromia and alumina scale which form on the surface of nickel superalloys typically used in sCO2 cycles. This drives the need for the development of new materials better suited for such harsh environments such as SiC/SiC ceramic matrix composites (CMC) with environmental barrier coatings (EBCs). CMC/EBC systems can withstand higher operating temperatures and resist steam-mediated recession. The Office of Oil and Gas is particularly interested in computational models to simulate degradation mechanisms (e.g.

steam-driven recession, corrosive impurity interactions, and the evolution of thermally grown oxides under cyclic environments) in SiC/SiC CMCs with EBCs to produce lifetime models capable of guiding the design of EBC materials. Proposed model development efforts should target preserving long-term structural integrity and extending operational lifetimes in extreme sCO2 turbine environments.