NATIONAL ACADEMIES Sciences Engineering Medicine

BESR | BICE

Technologies and Practices for Plugging and Remediating Orphaned and Abandoned Oil and Gas Wells

Meeting #1

THURSDAY, DECEMBER 12, 2024

OPEN SESSION (ALL TIMES IN ET)

LOCATION

Zoom (register here)

Purpose

- Introduce committee members and sponsor
- Sponsor to provide overview presentation
- During a group discussion, come to a common understanding of the report goals and statement of task

10:00–10:05am Session Kickoff

- Study staff to set forward the open session agenda

10:05–10:30 Sponsor Presentation

- Sponsor to overview purpose and goals of the study

10:30–12:00pm Open Discussion

- Committee to ask questions and discuss the study statement of task with the sponsor

STATEMENT OF TASK

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee of experts to provide advice to U.S. Department of the Interior (DOI) Orphaned Wells Program Office (OWPO) on regulatory, technical, scientific, and economic considerations for plugging and remediating orphaned and abandoned oil and gas wells. The committee will:

- Examine current and emerging plugging and abandonment technologies, best practices, equipment, and materials for well characterization, wellbore plugging and barrier placement, wellbore integrity and verification, and durability and lifespan. Information from the National Academies workshop on "Practices and Standards for Plugging Orphaned and Abandoned Hydrocarbon Wells" will be considered in this examination.
- Evaluate unexpected or unique circumstances that necessitate varying criteria and standards, including engineering design, cost, logistics, or technical management.
- Assess available data on potential causes, frequency, consequences, and remediation of plug failures.
- Examine post-plugging monitoring techniques, approaches, and technology that are or will be important for the long-term protection of the environment and public health and safety. Include any identified post-plugging risk management best practices to ensure the long-term protection of groundwater and prevention of methane emissions as well as relevant economic considerations.
- Identify technology, materials, or policies that warrant further research and that may contribute to the success of well-plugging and abandonment efforts carried out by industry, states, tribes, and federal agencies.

The recommendations contained in the report may be used by the Government to assist in developing a technical approach to implement the orphan well clean-up as required in the Bipartisan Infrastructure Law (Public Law 117-58). Recommendations which include the consideration of any emerging materials or technology will also provide details on the current maturity, a realistic timeline on availability of the materials and/or technology, and the overall applicability to the specific topic(s) requested.

The statement of task was revised on 05/01/2024.

COMMITTEE BIOS

Mary (Missy) Feeley, Co-Chair, retired as Chief Geoscientist from ExxonMobil Exploration Company in 2014. Her responsibilities included advising senior ExxonMobil Upstream management on strategic geoscience matters and identifying global geoscience opportunities for ExxonMobil. Her graduate work focused on understanding depositional patterns in upper slope salt basins and the Mississippi Fan using seismic stratigraphy techniques. She also spent many years working on lease sales, prospect maturation, and energy development in the Gulf of Mexico. Feeley received a Ph.D. in oceanography from Texas A&M University. She previously served on the National Academies of Sciences, Engineering, and Medicine's Ocean Studies Board, the Committee on Guidance for NSF on National Ocean Science Research Priorities: Decadal Survey of Ocean Sciences, and the Committee on Offshore Science and Assessment for BOEM.

James (Jim) Slutz, Co-Chair, is the Director of Study Operations for the National Petroleum Council (NPC), an independent federal advisory committee to the United States, reporting to the Secretary of Energy. Prior to NPC, he led a global energy consulting practice with projects in North America, Asia, and Europe. Previously, Slutz served as Acting Assistant Secretary of Fossil Energy at the United States Department of Energy (DOE) and before that as Deputy Assistant Secretary of Oil and Natural Gas. Prior to joining DOE, Slutz served as the Indiana Oil and Gas Director, regulating the state's upstream oil and gas industry and natural gas storage wells. He is a former Vice-Chair of the Interstate Oil and Gas Compact Commission. Slutz serves as an advisor to the National Bureau of Asia Research and is a Board Member of the local chapter of the Society of Petroleum Engineers (SPE). In his capacity with SPE, he serves as the program chair for the annual SPE/American Association of Petroleum Geologists/SEG Washington, DC Technology and Sustainability Symposium. He has published papers in collaboration with the American Enterprise Institute, The East West Center, the U.S. Chamber of Commerce Foundation, and the National Bureau of Asia Research. Slutz received a B.S. from The Ohio State University School of Natural Resources and an MBA degree from The Ohio State University, Fisher College of Business. He previously served as chair of the Committee on Earth Resources and as a member of the Board of Earth Sciences and Resources of the National Academies of Sciences, Engineering, and Medicine.

James (Jim) Bolander is the President of JLB Engineering, LLC, an engineering consulting firm. Bolander has over 40 years of experience in the oil and gas industry, having worked with several companies and state regulators on well integrity issues, natural gas waste, and methane emissions. Prior to forming JLB Engineering LLC, he retired from Southwestern Energy (SWN) as Senior Vice President of Resource Development with expertise in Operations, HS&E, and project management. Prior to SWN, he spent 15 years with Mitchell Energy as an engineer working multiple disciplines (Drilling, Production and Reservoir Engineering) and geographic areas including operations in Texas, Mississippi, Louisiana and New Mexico. He has consulted with the New Mexico Oil Conservation Division in drafting new regulations on natural gas waste, for the Mitchell Foundation's Respect Big Bend Project, Technical Advisor at Independent Energy Standards Corp, and with SWN on special projects such as methane emission mitigation and freshwater neutral. Bolander has most recently consulted with Environmental Defense Fund on wellbore integrity regulatory standards, and plug and abandonment standards from a state and federal perspective. Bolander was previously on the Technical Advisory Board for Project Canary's TrustWell evaluation tool, he is a current member of the Society of Petroleum Engineers, and a registered Professional Engineer in Texas (inactive). He is a co-author of the PNAS publication, "Public data from three US states provide new insights into well integrity," and the technical author of the Model Regulatory Framework which has been used by several states in updating their well integrity and plug and abandonment rules. Bolander received a B.S. in Petroleum Engineering from Louisiana State University.

Walter S. Guidroz is a Research Scientist Emeritus with the U.S. Geological Survey (USGS). Prior to his retirement in 2021, he led the USGS Energy Resources Program by providing strategic direction to energy-related research and assessments that helped underpin U.S. energy policy and ensured U.S. energy security.

He has 43 years' experience in the energy industry, having worked at Amoco, Enron, and BP in multiple geoscience and management roles prior to joining the USGS in 2016. Guidroz has broad experience as a geoscientist not only in the U.S., but also internationally such as in Russia's West Siberian Basin and in offshore Brazil's Campos and Santos Basins. While at the USGS, and in partnership with the U.S. State Department, Guidroz also provided government-to-government advising in Uzbekistan, Greenland, Romania, and Bosnia-Herzegovina. Guidroz presently serves as an Adjunct Associate Professor of Geology and Geological Engineering at the University of Mississippi as well as an Adjunct Professional Lecturer at The George Washington University in Washington, DC. He received a B.S in geology from Nicholls State University, an M.S. in geology from the University of Mississippi, an M.B.A. from the University of Texas at Austin, and a Ph.D. in marine geology from Louisiana State University.

Mary Kang is an Associate Professor in Civil Engineering at McGill University, studying methane emissions from oil and gas systems and subsurface hydrology. Kang made the first direct measurements of methane emissions from abandoned oil and gas wells in the United States, and over the past decade, she has led projects on direct measurements of abandoned/inactive wells in Pennsylvania, West Virginia, Oklahoma, California, British Columbia, Alberta, Saskatchewan, Ontario, and internationally. She conducts data mining, geospatial/statistical analysis, and machine learning to determine the scope of the emissions and develop mitigation solutions. Kang received a B.A.Sc. and M.A.Sc. in civil and environmental engineering at the University of Waterloo, Canada, a Ph.D. in civil and environmental engineering from Princeton University, and was a postdoctoral fellow in Earth system science at Stanford University.

Thomas (Tom) Kropatsch is the State Oil and Gas Supervisor for the Wyoming Oil and Gas Conservation Commission (WOGCC). He previously served as Deputy Supervisor, Natural Resources Program Supervisor and Natural Resources Analyst with the WOGCC and as Project Manager and Project Geologist in earlier work in the environmental consulting industry. He coordinated and managed the WOGCC accelerated orphan well plugging program since 2014 and implemented the agency's environmental/natural resources programs since 2010. He served as a state representative on EPA's National UIC Technical Workgroup from April 2014 until April 2020 and was selected to be a member of several technical workgroups on EPA's hydraulic fracturing studies. Kropatsch is the current Vice-Chair of the Interstate Oil and Gas Compact Commission (IOGCC), is the current co-Chair of the IOGCC Orphan Well Task Force, is a board member of the Ground Water Protection Council and of the Wyoming Energy Authority and is a graduate of Leadership Wyoming. Kropatsch received a B.S. in Geology from Oklahoma State University and is a registered Professional Geologist in Wyoming.

Geoffrey (Geoff) Landry is the Cementing Domain Manager for North America at Schlumberger, where he has worked for the past 16 years in various technical and operational roles. Over the last six years, he has been responsible for engineering cementing solutions, slurry design, and conducting high-level reviews of critical well interventions for North America. Landry leads research and development efforts, holding several patents and pioneering innovations in cementing technology. His expertise lies in the development of advanced materials and additives for primary and remedial cementing, with a focus on durability in extreme well environments. Landry has been instrumental in creating new solutions to enhance wellbore integrity, including alternatives to Portland cement. He has chaired conference workshops, served on the committee for several Society of Petroleum Engineers (SPE) conferences, and published multiple SPE papers and academic journal article. His contributions and passions align with the long-term sustainability goals of the oil and gas industry. Landry earned a degree in chemistry from Louisiana State University.

D. Nathan Meehan is a Professor in the Harold Vance Department of Petroleum Engineering at Texas A&M University, specializes in carbon capture, utilization, and storage, blue hydrogen, emissions reduction in oil and gas operations, and enhanced recovery in unconventional wells using carbon dioxide. He serves as a Senior Technology Advisor for Petro.ai and as a non-executive Director of Ignis H2, a geothermal energy startup. With over 45 years of industry experience, he held leadership roles at CMG Petroleum

Consulting, Gaffney, Cline & Associates, and Baker Hughes. Meehan served as the 2016 President of the Society of Petroleum Engineers (SPE), is a Member of the National Academy of Engineering, and a recipient of SPE's Lester C. Uren Award, the Degolyer Distinguished Service Medal, and the SPE Public Service Award. He received the World Oil Lifetime Achievement Award and Petroleum Economist magazine's Legacy Award. Meehan received a B.Sc. in physics from the Georgia Institute of Technology, an M.Sc. in petroleum engineering from the University of Oklahoma, and a Ph.D. in petroleum engineering from Stanford University.

Adam Peltz is the Director and Senior Attorney of the Energy Program at the Environmental Defense Fund. In his role as a director and senior attorney in EDF's Energy Program, Peltz focuses on oil, gas and carbon capture, utilization and sequestration regulation and policy, and serves as a public advocate on these issues. He is responsible for managing multi-stakeholder efforts concerning oil and gas development and CCUS to improve environmental outcomes through enhanced regulation and improved industry practices, especially concerning secure geological storage of carbon dioxide, and orphaned oil and gas wells. He started as a legal fellow with EDF in 2011, working on natural gas as well as international climate efforts. During law school, he studied international development and climate change law, and interned at the Legal Resources Centre in Ghana, the Overseas Private Investment Corporation in Washington, D.C., and with the Geneva, Switzerland-based carbon credit certifier the Gold Standard. Peltz received a J.D. and an M.A. from Boston University, and an undergraduate degree in political science and international studies from the University of Chicago.

David Perrin is a Well Advisor for Chevron Technical Center. He joined Chevron in 2012 as a Drill Site Manager and has held numerous Wells operations and engineering positions of increasing responsibility in the Gulf of Mexico Business Unit, Environmental Management Company, and Technical Center. His diverse experience includes onshore and offshore drilling, completion, and intervention activities with primary focus on plugging and abandonment. In his current role as a technical subject matter expert, he partners with upstream business units across the enterprise to provide wells engineering support for plugging and abandonment of legacy assets including evaluation for potential carbon capture and storage (CCS) sites. He is well-versed in U.S. Federal and multiple State regulatory requirements for well plugging and abandonment including EPA, BSEE, Louisiana, Texas, and Michigan. Perrin participates in several industry organizations including AADE, IOGP, SPE, and the Plugging & Abandonment Collaborative Environment (PACE) network. He was appointed as Chevron representative and Chair of the IOGP Wells CCS Expert Group and serves on the Board of Directors for the AADE New Orleans Chapter as a Steering Committee member. Perrin received a B.Sc. degree in Petroleum Engineering from the University of Louisiana at Lafayette.

Mileva Radonjic is a Professor & Samson Investment Chair in Petroleum Engineering at the Oklahoma State University, where she established Hydraulic Barrier Materials and Geomimicry Labs, in the School of Chemical Engineering. She spent a year at the Federation of American Scientists in Washington, DC, focusing on building materials for rapid rebuilding post-Katrina in New Orleans, prior to employment with BP America drilling team in Houston. Her primary research interest remains focused on investigating mechanisms of rock/cement-fluid interactions and their impact on engineering performance, in concrete structures, ancient monuments, and wellbores. Radonjic received a Ph.D. from the Interface Analysis Center at the University of Bristol, United Kingdom, followed by a visiting scholarship from Princeton University.

Eilis Rosenbaum is a Research Engineer and Principal Investigator at the Department of Energy (DOE) National Energy Technology Laboratory in the Research and Innovation Center. She leads the DOE Fossil Energy and Carbon Management Environmentally Prudent Stewardship research portfolio as well as several projects under the Environmental Protection Agency Methane Emissions Reduction Program. Her expertise is in applying sound physics-based engineering principles towards solving energy and carbon management-related challenges, with a focus on application of experimental knowledge and

modeling-based approaches to better understand the subsurface and address specific issues to move toward a path to net zero emissions. Her current research is focused on providing science-based solutions to improve plugging oil and gas wells to ensure investments such as the Bipartisan Infrastructure Law and the Inflation Reduction Act are maximized to permanently reduce leaks from wells. She was awarded Gold for the 2024 PGH FEB Excellence in Government Awards for Outstanding Team, Large Team Award and is an invited member of the American Association for the Advancement of Science (AAAS) Center for Scientific Evidence in Public Issues (EPI Center) Orphaned and Abandoned Wells Working Group. She received her Ph.D. from Carnegie Mellon University in Computational Mechanics from the Civil Engineering Department.