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Standard Guide for Data Management and Reporting Associated with Oil and Gas Development Involving Hydraulic Fracturing[1]

This standard is issued under the fixed designation D8053; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide presents a series of options regarding data collection, data management, and information delivery and reporting associated with oil and gas development involving hydraulic fracturing. Options presented for data management and reporting are intended to improve the transparent information exchange between three primary stakeholder groups: operators, regulators, and the public. Improved information exchange is expected to enhance public understanding of oil and gas development.

1.2 Suggestions contained in this guide may not be applicable in all circumstances. This guide is not intended to represent or replace the standard of care by which the adequacy of a given professional service should be judged, nor should this guide be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means that the document has been approved through the ASTM process.

1.3 *Units*—The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

2.2 *API Standards:*[3]

API RP100-2 Environmental Aspects Associated with Exploration and Production Operations Including Hydraulic Fracturing

API RP100-3 Community Engagement Guidelines

2.3 *ASQ Standards:*[4]

ASQ/ANSI E4:2014 Quality Management Systems for Environmental Information and Technology Programs

2.4 *ISO Standards:*[5]

ISO 14001 Environmental Management Systems

3. Terminology

3.1 *Definitions*—For definitions of terms used in this guide, refer to Terminology D653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *flowback, v*—the act of recovering produced fluids from the formation after hydraulic fracturing operations. (API)

3.2.2 *hydraulic fracturing fluid, n*—a fluid blend that can include a base fluid, proppant, and other additives, that is expressly designed to hydraulically induce fractures in the target formation. (API)

3.3 *Acronyms:*

3.3.1 *API*—American Petroleum Institute

3.3.2 *ANSI*—American National Standards Institute

3.3.3 *ASQ*—American Society for Quality

3.3.4 *ISO*—International Organization for Standardization

3.3.5 *IT*—Information technology

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.26 on Hydraulic Fracturing.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, http://www.api.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.3.6 *QA*—Quality assurance

3.3.7 *QAPP*—Quality assurance project plan

3.3.8 *QC*—Quality control

3.3.9 *USEPA*—United States Environmental Protection Agency

4. Summary of Guide

4.1 The goal of this consensus standard is to foster a greater degree of transparency regarding oil and gas development through improved information delivery to the public. This guide examines the regulatory frameworks of data flow, reporting and information delivery, and offers suggestions for improving the communication throughout oil and gas development operations. The benefits of collaborative stakeholder relationships and better-defined roles and responsibilities regarding data capture, collection, and storage are suggested to enhance interagency and industry coordination resulting in improved information delivery to the public.

4.2 The guide's primary objective is to promote the efficacy of providing stakeholders easy access to comprehensive high-quality information on oil and gas development operations, allowing for better decision making during each phase relevant to their particular areas of interest, in as efficient and cost-effective manner as practicable. A challenge for regulators is the presentation of important technical data in layman's terms so the public understands potential ramifications of certain values. Finally, the collection of insufficient data may result in a failure to identify and, thereby, prevent damage or harm to the environment, natural resources, and public health.

4.3 The target audiences for the data management and reporting options discussed in this guide are operator and regulator stakeholders. The target beneficiaries of these practices are public stakeholders. Public stakeholders increasingly request easier and more frequent access to information to understand: (1) the regulatory and operational activities associated with oil and gas development operations in their communities and (2) environmental aspects of these operations and safeguards to their health, safety and welfare. The following paragraphs provide a summary of stakeholder considerations and goals.

4.3.1 Regulators (especially state technology offices, budget offices, and agencies regulating oil and gas development operations) should collaboratively determine what data are reported to agencies from operators and establish data protocols for those transmissions (data formats, volumes, acceptable variations, and reporting frequencies). This collaboration should specifically include policy on how operators, agencies, and third parties will manage and secure data in the future.

4.3.2 Federal, state, and local rules, policies, and regulations should determine: (1) how data collection may be standardized for better data integration; (2) what required data are collected; (3) how the data are defined, collected, processed, quality assured, and stored; and (4) when data will be submitted and made readily available.

4.3.3 Operators and agencies should strive to use national, international, industry and technology best practices for data collection, data security, data management, and submissions.

4.3.4 Stakeholders should strive to improve transparency and communication through publicly accessible (internet) reporting, transitioning to an automated self-service model, and significantly expanded mobile applications.

4.3.5 Stakeholders should benefit by improved timeliness of oil and gas development operations information reported to the public including frequency of data collection and updates.

4.3.6 Regulators, operators, and other non-governmental organizations should improve interagency and industry coordination through cross-jurisdictional collaboration among federal, state and local agencies involved in oil and gas development regulation and leverage resources for more effective data management, information delivery and reporting to the public.

4.4 Stakeholders should benefit by improved public understanding of the oil and gas development activity.

5. Significance and Use

5.1 *Limitations of Guide*—This guide is for use by stakeholders involved with collecting, managing, reporting, and delivering data during oil and gas development operations using hydraulic fracturing. Some data collected for operational and business concerns regarding hydraulic fracturing is classified as proprietary and can be classified as such by individual operators based on state regulatory conditions. Accordingly, this guide will not address the collection, management, and reporting of proprietary operator data other than to note that significant benefits may be achieved by narrowing the classification of proprietary data, and standardizing the definition of "proprietary data" between regulators. Regulators' interests in data vary widely based upon a specific agency's charter, statutory/legislative mandates, legacy requirements, and considerations relating to operator compliance. Depending upon jurisdictional boundaries, multiple regulatory agencies generally have statutory responsibilities regarding oil and gas development operations. These agencies properly determine what information will be collected based on agency specific responsibilities. Accordingly, this guide will not address the selection of data elements to be collected by regulatory agencies other than to note that significant efficiencies may be achieved by using integrated or common, interagency, data management processes, protocols, systems, and best practices and by reviewing data collection activities against those of sister agencies to minimize gaps and overlaps.

5.2 Oil and gas development operations include the entire well life cycle, as shown in Fig. 1.

5.3 This guide distinguishes the term hydraulic fracturing from oil and gas development operations. Many consider the terms interchangeable. The industry typically refers to hydraulic fracturing as the explicit act of pressurizing a well in a shale formation to fracture that formation and release oil and gas. However, the public commonly views hydraulic fracturing as the life cycle of activities used to extract oil and gas from shale formations, which include the process of hydraulic fracturing those formations. Hydraulic fracturing is a specific method for stimulating horizontal, vertical, or slanted oil and gas wells that

FIG. 1 Phases of Oil and Gas Development Operations Well Life Cycle

typically only lasts a few days, whereas oil and gas development operations could continue for decades and may include multiple hydraulic fracturing events.

5.4 *Implementation of Guide*—This guide does not prescribe policy actions, but provides technical suggestions data producers and managers should consider when developing or enhancing data management and reporting mechanisms to satisfy the needs of end users and the public. Stakeholders may implement suggestions presented in this guide as a means of aligning data objectives and supporting improved data analysis and processes. Data management and reporting processes should be periodically evaluated and improvements made to address ongoing stakeholder requirements and needs.

5.5 Data reported to the public should be relevant, timely, accessible, accurate, and verifiable. Unfortunately, in some instances, relevant data are not being collected, received, or stored by the regulatory agencies in a form that allows effective and timely access by the public.

5.6 *Anticipated Benefits Expected from the Use of This Guide*—Increase public information access by providing stakeholders a self-service area or portal to view accurate and consolidated information regarding oil and gas development operations;

5.6.1 More certain and consistent IT planning and decision making for local, state, and federal agencies and other stakeholders;

5.6.2 Publicly accessible, queryable, spatially distributed databases through an interface supplied by each respective agency;

5.6.3 Improved database accuracy, completeness, and QA verifications are in place for publicly accessible data;

5.6.4 Direct and immediate access to designated health-related data for environmental emergency responses and remediation during oil and gas development including construction, maintenance, decommissioning and monitoring data;

5.6.5 Improved environmental and operational data management by regulators through collaborative inter and intra-state data sharing, reducing duplication of efforts through cross-jurisdictional data protocols, exchanges, integrations, and interoperability among stakeholders;

5.6.6 Comprehensive data reporting, and information delivery regarding new, existing, or refractured oil and gas wells for community awareness of potential areas of concern regarding public health safety and welfare;

5.6.7 Direct and timely access to easily queryable data and reporting for state, regional, and national analyses of potential environmental impacts from oil and gas development.

5.6.8 Data sets linked to related research and development studies conducted by other stakeholders (for example, other agencies, related departments, research and academic sources, and industry sources).

6. Data

6.1 *Overview*—The primary objective of this guide is to promote the efficacy of providing stakeholders easy access to comprehensive and useful information on oil and gas development, relevant to their particular area(s) of interest, in as efficient and cost-effective manner as practicable. Carefully