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TITLE: Produced water volumes and management practices in the United States.

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ABSTRACT:

Produced water volume generation and management in the United States are not well characterized at a national level. The U.S. Department of Energy (DOE) asked Argonne National Laboratory to compile data on produced water associated with oil and gas production to better understand the production volumes and management of this water. The purpose of this report is to improve understanding of produced water by providing detailed information on the volume of produced water generated in the United States and the ways in which produced water is disposed or reused. As the demand for fresh water resources increases, with no concomitant increase in surface or ground water supplies, alternate water sources, like produced water, may play an important role. Produced water is water from underground formations that is brought to the surface during oil or gas production. Because the water has been in contact with hydrocarbon-bearing formations, it contains some of the chemical characteristics of the formations and the hydrocarbons. It may include water from the reservoir, water previously injected into the formation, and any chemicals added during the production processes. The physical and chemical properties of produced water vary considerably depending on the geographic location of the field, the geologic formation, and the type of hydrocarbon product being produced. Produced water properties and volume also vary throughout the lifetime of a reservoir. Produced water is the largest volume by-product or waste stream associated with oil and gas exploration and production. Previous national produced water volume estimates are in the range of 15 to 20 billion barrels (bbl; 1 bbl = 42 U.S. gallons) generated each year in the United States (API 1988, 2000; Veil et al. 2004). However, the details on generation and management of produced water are not well understood on a national scale. Argonne National Laboratory developed detailed national-level information on the volume of produced water generated in the United States and the manner in which produced water is managed. This report presents an overview of produced water, summarizes the study, and presents results from the study at both the national level and the state level. Chapter 2 presents background information on produced water, describing its chemical and physical characteristics, where it is produced, and the potential impacts of produced water to the environment and to oil and gas operations. A review of relevant literature is also included. Chapter 3 describes the methods used to collect information, including outreach efforts to state oil and gas agencies and related federal programs. Because of the inconsistency in the level of detail provided by various state agencies, the approaches and assumptions used to extrapolate data values are also discussed. In Chapter 4, the data are presented, and national trends and observations are discussed. Chapter 5 presents detailed results for each state, while Chapter 6 presents results from federal sources for oil and gas production (i.e., offshore, onshore, and tribal lands). Chapter 7 summarizes the study and presents conclusions.

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