Development and Application of a Workflow Process to Screen Geologic Reservoirs for Site Selection and Drilling

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Abstract

Subsurface geologic characterization is accomplished through historical and modern data collection and is an integral part of identifying surface locations for drilling exploratory wells in underexplored areas. Because of the breadth of data required for comprehensive investigation, this process has proven to be tedious, time-consuming, and labor- and computing-intensive. This paper presents a workflow that is interactive, visual, and accessible by multidisciplinary teams to address the complexity of subsurface geologic characterization, intended to inform decision makers on the multifactor chance of success (COS) for encountering desirable geologic properties for a specified purpose. Work conducted to develop this process targeted bedded salt members in North Dakota for the purpose of hydrocarbon or hydrogen storage in future engineered salt caverns, but the workflow process can be adapted to screen other energy storage opportunities. A 12-million-acre study area in western North Dakota was selected to test the workflow. Data used, primarily log-based, were publicly available and accessed from the North Dakota Industrial Commission (NDIC) to correlate and characterize formations of interest within the Williston Basin. After preliminary regional screening, a focused area of interest (AOI) was selected for detailed characterization. Each interval of interest was evaluated for depth, thickness, surface features, and available operational constraints. The tool was completed using SLB's Petrel "play chance mapping" tool. COS mapping across the focused AOI identified a successful location for placing characterization wells. To coordinate efforts between project stakeholders, an ArcGIS Web map tool was used to visualize results and aid decision making. This process is intended to be iterative and updated as geologic properties are gathered and screened, surface locations are evaluated, and commercial development is considered. The process includes scope definition, data collection, characterization, evaluation, and decision. This workflow allowed for evaluation of COS, criteria leading to decision points, and initial screening to site-specific well location selection. This screening methodology is applicable to multiple geologic investigation scenarios and is quantitative, iterative, quick, and interactive.