An Assessment of Undiscovered Uranium Resources in the Texas Gulf Coast: Part 2—Assessment Approach and Results

Mark J. Mihalasky[1], Brent A. Elliott[2], and Susan M. Hall[3]

[1]Geology, Minerals, Energy, and Geophysics Science Center, U.S. Geological Survey, 904 W. Riverside Ave., Rm. 202, Spokane, Washington 99201

[2]Bureau of Economic Geology, University of Texas at Austin, University Station, Box X, Austin, Texas 78713–8924

[3]Central Energy Resources Science Center, U.S. Geological Survey, Box 25046, Denver Federal Center, Mail Stop 939, Denver, Colorado 80225–0046

GCAGS Explore & Discover Article #00079*
http://www.gcags.org/exploreanddiscover/2016/00079_mihalasky_et_al.pdf
Posted September 13, 2016.

*Article based on an extended abstract published in the *GCAGS Transactions* (see footnote reference below), which is available as part of the entire 2016 *GCAGS Transactions* volume via the GCAGS Bookstore at the Bureau of Economic Geology (www.beg.utexas.edu) or as an individual document via AAPG Datapages, Inc. (www.datapages.com), and delivered as an oral presentation at the 66th Annual GCAGS Convention and 63rd Annual GCSSEPM Meeting in Corpus Christi, Texas, September 18–20, 2016.

EXTENDED ABSTRACT

An assessment of undiscovered uranium resources in the Texas Coastal Plain region (Mihalasky et al., 2015; Elliott et al., 2016, <http://www.gcags.org/exploreanddiscover/2016/00062_elliott_et_al.pdf>) was conducted by combining the U.S. Geological Survey (USGS) Three-Part form of mineral resource assessment (Fig. 1) (Singer and Menzie, 2010) and Weights-of-Evidence mineral potential modeling (Bonham-Carter, 1994). The Three-Part methodology is a quantitative approach that uses descriptive mineral deposit models, frequency distribution curves to model the grade, tonnage, and number of undiscovered deposits, and Monte Carlo Simulation to calculate a probabilistic estimation of resources contained in undiscovered deposits. Weights-of-Evidence is a GIS-based methodology that uses geoscientific datasets to model the geospatial distribution or potential occurrence of undiscovered mineral deposits (Fig. 2).

Using information and data specific to sandstone-hosted uranium roll-front deposits in southern Texas, the assessment involved: (1) compiling a database of all known occurrences (deposits, prospects, showings, and anomalies), (2) developing a descriptive deposit model, (3) delineating geographic regions (tracts) that are permissive for hosting undiscovered deposits (as well as identifying within the permissive tracts areas more favorable and very prospective for hosting undiscovered deposits), (4) building deposit grade and tonnage frequency distribution models, (5) estimating the number of undiscovered deposits within a given permissive tract using expert-derived subjective probabilities, and (6) calculating probabilistic estimates of undiscovered uranium resources for each permissive tract using Monte Carlo Simulation (Root et al., 1991).

Estimates of the number of undiscovered deposits and their potential resources were made separately for each of the six sub-tracts, as a unit inclusive of each tract's respec-

Originally published as: Mihalasky, M. J., B. A. Elliott, and S. M. Hall, 2016, An assessment of undiscovered uranium resources in the Texas Gulf Coast: Part 2—Assessment approach and results: Gulf Coast Association of Geological Societies Transactions, v. 66, p. 837–840.

tive permissive, favorable, prospective areas. Within each sub-tract, undiscovered resources were assessed to a depth of 1500 feet (~450 meters). Although most uranium mining has taken place at depths less than 800 feet (~240 meters), economic deposits have been identified to depths of more than 1200 feet (~365 meters); therefore, 1500 feet (~450 meters) is the practical depth for the purposes of uranium mineral resource assessment in the region at this time.

Uranium deposit grade and tonnage data were reported for individual mining operations, where some ore bodies were exploited by multiple small mining operations and others by single large operations. In order to define a deposit as a consistent geologic entity, individual mines exploiting the same ore body were grouped on the basis of proximity, previous studies that showed a relationship to a single ore body, and expert judgment.

An estimated 111 undiscovered sandstone-hosted uranium roll-front deposits contain a calculated mean total of 220 million pounds of recoverable U_3O_8 encompassing all six permissive sub-tracts in the Texas Coastal Plain (Fig. 3). This represents nearly 1.6 times the amount of uranium that has already been identified and (or) produced from the region. The Rio Grande Embayment sub-tract region has the largest estimated undiscovered resource, with a calculated mean total of 200 million pounds of undiscovered U_3O_8, whereas the Houston Embayment sub-tract region is estimated to host a mean of 20 million pounds of U_3O_8. Among the six sub-tracts, the Catahoula-Oakville sub-tracts (as a whole) have the largest estimated undiscovered resource (calculated mean total of 88 million pounds of U_3O_8), followed by the Goliad sub-tracts (73 million pounds of U_3O_8) and the Claiborne-Jackson sub-tracts (59 million pounds of U_3O_8).

In 2014, U.S. utilities purchased 53 million pounds of U_3O_8 for use in civilian nuclear power reactors (U.S. Department of Energy, 2015). Based on these data, the current identified in-place resource of 140.6 million pounds of U_3O_8 represents about 1 year of U.S. nuclear fuel requirements. If the estimated undiscovered deposits of the Texas Coastal Plain are found, the calculated uranium resources potentially available from them may satisfy roughly another 4 years of domestic requirements.