**University of Illinois Energy Farm**

**Drilling Prospectus for Deep Geothermal Experiment**

W. John Nelson

December 19, 2017

 Developing a drilling prospectus for a deep test (St. Peter and possibly Mt. Simon) at the Energy Farm is hampered by a lack of nearby reliable well control. Fortunately, the Paleozoic succession in Champaign County is largely “layer cake” and structure in the area appears to be nearly “flat”, allowing long-distance projections to be made with a fair degree of confidence.

 In 2016 the ISGS drilled a shallow, continuously cored test hole at the Energy Farm. This hole penetrated 189 feet of Quaternary glacial sediments and 104 feet of Pennsylvanian bedrock to a total depth of 293 feet. Several Pennsylvanian marker units can be identified with virtual certainty, including the Herrin Coal, which lies at a depth of 208 to 215 feet. The Herrin Coal was encountered in two other shallow ISGS test holes drilled 1.1 and 2.7 miles northwest of the Energy Farm.

 The nearest hole having a good record of deeper bedrock is Peoples Gas #1 Burwash in Sec. 1, T18N, R8E, about 2 miles southwest of the Energy Farm. The electric log and sample study indicate the Herrin Coal at a depth of 250 feet, nearly the same as at the Energy Farm. The Burwash test reached total depth of 820 feet in the upper part of the Silurian Racine Dolomite.

 The nearest Ordovician test is Myers #1 Silver, drilled in 1935 about 3½ miles southeast of Energy Farm in Sec. 11, T18N, R9E. A sample study by H.X. Bay and L.E. Workman of the ISGS is the only record. The Silver hole bottomed in the Kimmswick Limestone (Galena Dolomite or “Trenton” equivalent) at 1725 feet. The Herrin Coal is eroded at the bedrock surface, but is projected to lie at about 150 feet, 100 feet higher than at the Energy Farm.

 Farther afield, the Champaign-Urbana Natural Gas, Coal, and Coal Oil test hole was drilled in 1892 to a depth of 1838 feet. Location is in the city of Champaign (Sec. 12, T19N, R8E), about 4½ miles northwest of Energy Farm. The only record is a driller’s log, which indicates the hole probably reached the Kimmswick Limestone. The nearest hole that reached the St. Peter Sandstone is Barber & Seiver No. 1 Lindsay, which was drilled 10 miles northwest of Energy Farm. The Lindsey hole has an electric log and a fairly detailed sample study made by a team of ISGS geologists. The Lindsey hole drilled only about 10 feet into the St. Peter before terminating at 2054 feet.

 Nine miles east of the Energy Farm is the Gary Horsley #1 Rudisill test (Sec. 2, T18N, R10E), which drilled about 100 feet into the Kimmswick Limestone before terminating at a depth of 1585 feet. A drilling-time log and cursory sample log made by the company are the only records.

 For the nearest Mt. Simon test we turn to the Panhandle Eastern Pipeline #1-28 Hausman test in Sec. 28, T17N, R8E. This hole was drilled near the northern end of the Tuscola Anticline and 12 miles south-southwest of Energy Farm. Electric and sonic logs were run and a core of the Mt. Simon is archived at the ISGS Samples Library. Many additional Mt. Simon tests are on record farther south along the anticline in southern Champaign and northern Douglas Counties.

 The nearest Mt. Simon test holes in the Manlove (Mahomet) gas storage field lie about 16 miles northwest of Energy Farm.

 Taking data from the above test holes together, the following table of anticipated depths, thicknesses, and rock types for the Energy Farm is presented. All thicknesses and “tops” are in feet. “Top” depths are mostly based on average thicknesses of units. Uncertainty of depths and thicknesses increases with depth, but as drilling progresses, depth to the next formation can be estimated more accurately with reference to units already penetrated.

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit** | **Thickness** | **Top** | **Rock Types** |
| Quaternary | 190 | 0 | Silt, clay, sand, diamicton (till); sand and gravel water bearing |
| Pennsylvanian | 150-200 | 190 | Shale, siltstone, sandstone, coal beds |
| Mississippian | 120-240 | 365 | Largely siltstone; Chouteau Limestone at base |
| New Albany | 70-90 | 530-580 | Dark colored, hard shale |
| Grand Tower (Devonian) | 70-90 | 610-660 | Limestone, commonly sandstone at base |
| Silurian | 620-680 | 690-750 | Vuggy dolomite, lower part limestone; shows of oil likely |
| Maquoketa (Ordovician) | 200 | 1370 | Shale; limestone in middle |
| Kimmswick | 140 | 1570 | Limestone |
| Decorah and Platteville | 300 | 1710 | Limestone, thin shale layers |
| Joachim | 70 | 2010 | Dolomite and sandstone, shale layers |
| St. Peter | 200-250 | 2080 | Pure quartz sandstone, water bearing |
| Knox Group | 1300 | 2300 | Dominantly dolomite, partly sandy and cherty |
| Ironton | 150 | 3600 | Pure quartz sandstone, water bearing |
| Eau Claire | 450 | 3750 | Shale, sandstone, and limestone; shale increasing downward |
| Mt. Simon | 2500+ | 4200 | Sandstone, commonly coarse grained; water bearing |