

Applied Energy Mapping at the Ohio Geological Survey

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The Ohio Geological Survey is currently engaged in a number of projects to appraise Ohio's geologic resources as they apply to developing shale oil and gas, storing CO₂, and geothermal potential. This research is being conducted with funding, in part, provided to address specific project objectives for the Ohio Coal Development Office (OCDO), the Midwest Regional Carbon Sequestration Partnership (MRCSP) funded by the U.S. Department of Energy, and the National Geothermal Data System (NGDS), a project funded by the U.S. Department of Energy.

New regional and state-wide isopach maps were developed for the Middle Devonian Marcellus Shale for use in assessing Ohio's shale gas potential. Existing stratigraphic analyses of the Devonian shale in Ohio were used as the starting dataset. The dataset was expanded with additional geophysical logs that span the Marcellus Shale in each county and township, where available. This allowed for an even distribution of control points. The Hamilton Group, Marcellus Shale, and Onondaga Limestone tops were picked using USGS cross sections for reference. With this new information and observing the Marcellus Shale's upper and lower units, net organic thickness was calculated and contoured. Data was also collected from the State Geological Surveys of New York, Pennsylvania, and West Virginia to create a new regional Marcellus organic thickness map.

The initial goal for the OCDO project is to evaluate geologic conditions favorable for CO₂ storage in eastern Ohio. This includes detailed mapping of potential CO₂ sinks by creating a robust well dataset for analysis. Middle Devonian through Middle Silurian drillers' elevations are quickly assessed by comparing them to existing formation tops interpreted by staff geologists for previous mapping projects. The drillers' picks are co-kriged with existing formation tops to create new maps with much denser well control. These new state-wide maps are then merged with existing MRCSP data to update the regional level maps. New structure contour maps have been generated for top of: Onondaga Limestone, Oriskany Sandstone, Bass Islands Dolomite, and Keefer Sandstone. As part of the continual refinement of MRCSP maps, the Precambrian surface map was also updated using more detailed contours provided by Kentucky and Ohio.

CO₂ storage potential is temperature dependent and, globally, geothermal resources are being developed with the aid of new technologies that produce electricity and space heat from relatively lower-temperature (≈ 100 °C) rocks, such as those penetrated by some deep Appalachian Basin oil and gas wells. Electricity production has been possible in conjunction with producing oil and gas wells and from coproduction associated with secondary and enhanced oil-

and-gas recovery. New techniques allow for space heating and electrical coproduction using injection fluids, such as brine or CO₂, that are usually considered waste products in the energy production cycle. The Ohio Geological Survey began research into the state's geothermal resources in July 2010—as part of a 47-state coalition to develop a new NGDS—and is evaluating its very large dataset of bottom-hole temperatures (BHT) and the AAPG corrected BHT dataset. Specifically, selected bottom-hole temperature data was corrected and used with the AAPG dataset to construct BHT and gradient 3-D plots and maps in order to help evaluate the regional, subsurface geothermal environment.