Neutral atoms coupled to highly-excited Rydberg levels are an emerging platform for quantum science, with promising applications in quantum computing, quantum simulation, and quantum sensing. In this presentation, I will highlight some of recent experimental and theoretical work, including work towards demonstrating a Mølmer–Sørensen-like gate between two neutral atoms. I will further discuss our work at LANL towards entangling 10-level nuclear spins, or qudecimals, in 87Sr atoms. Here, full control and entanglement would allow more resources per atom, as well as flexible encoding schemes. This research is supported by the Laboratory Directed Research and Development program of Los Alamos National Laboratory under project numbers 20200015ER, 20210116DR, 20210064DR, and 20240295ER. This research is also supported by the U.S. Department of Energy, Office of Science, National Quantum Information Science Research Centers.