

15.2 **Addressing opportunities and challenges for energy development in western basins of the U.S. using a hybrid energy systems approach**

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A collaborative team comprising Idaho National Laboratory, Utah State University Energy Dynamics Laboratory and the University of Utah are investigating the application of the hybrid energy system (HES) approach to the Uinta Basin. The HES approach can potentially result in enhanced energy production efficiency at the “basin scale” and is focused primarily on increasing the energy return on investment (EROI) relative to oil shale development, minimizing the environmental footprint and extending the longevity of Basin resources. The HES approach tightly couples regionally available energy sources (e.g., fossil, renewable and nuclear energy) in a synergistic fashion and can be used to optimally produce electricity, liquid transportation fuels and other chemical products. Through a faculty-staff exchange grant, the three institutions have begun to explore HES scenarios that may be applied to oil shale development within the Basin, a process that can be very energy intensive. For example, the HES approach can potentially utilize the “waste heat” from one energy processing plant in the basin as heat input for use in developing oil shale. Another example discussed in the literature is the possibility of combining renewable energy resources in the oil shale development process. This discussion will focus on how the HES approach can address earth science-related concepts and processes that to date have often been overlooked. The energy requirements for subsurface/environmental processes can account for upwards of 30 to 50% of the total energy consumption for some unconventional strategic fossil fuel developments. The integration of engineering and earth sciences under the HES umbrella will enhance the opportunity for creating greater energy efficiencies when pursuing energy development in western basins.