Projected increases in drilling and completion costs (JAS) indicate a total cost of $179 billion. *Not included* are lease, geologic and geophysical, development-well, and overhead costs.

A projected increasing role of natural gas and NGL in the total energy mix results from the relatively large proportion of gas, on a Btu equivalent basis, being discovered/foot of new-field wildcat drilled. At present finding rates it is not possible to replace the 7.0×10^9 BOE annual production.

Projected costs are so large that attainment of these limited goals does not seem possible. Total cost of the necessary new-field wildcats ($179 billion), however, is in the same order of magnitude as President Carter's estimated federal income from the "windfall" profits tax for 1980 to 1990. In any case, estimates of available oil and gas resources indicate that it *is* possible to moderate the decline in reserves and production.

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Depositional Environment of Bartlesville Sandstone, Sallyards Field, Greenwood County, Kansas

A facies model of the subsurface Bartlesville Sandstone in Sallyards field, Greenwood County, Kansas, was developed from well-core descriptions, petrographic analysis, electric log examination, and construction of maps and cross sections.

Subsurface mapping indicates that the Bartlesville Sandstone is narrow and elongate in plan view and lenticular in cross section. It displays an asymmetric convex-down base, thickens at the expense of the underlying shales, and is a multistoried sandstone body. Self-potential logs usually show an abrupt basal contact and a blocky or an upright bell-shaped curve. A structure map at the top of the pre-Pennsylvanian surface indicates that deposition of the Bartlesville Sandstone was influenced by underlying structure.

The sandstones are mineralogically and texturally immature with abundant metamorphic rock fragments, micas, clays, angular tourmaline, and feldspar grains. The amounts of clays and micas increase and grain size decreases upward in the sandstone as shown by thin-section measurements. Biogenic material includes abundant wood fragments and organic matter in the conglomerate zones.

Core studies reveal a vertical sequence for the Bartlesville Sandstone consisting of a sharp basal contact, large-scale cross-bedding, massive bedding or conglomerate zones, unidirectional current ripples, and a gradational or sharp upper contact with overlying siltstone. The scale of sedimentary structures decreases upward. The laterally associated facies consist of dark-gray to black shale, greenish-gray shale, ironstone, underclay, coal, and limestone.

Comparison of the described facies model with process-response models of modern depositional environments indicates that the Bartlesville was deposited by a perennial, fine-grained, meandering, alluvial stream following lows on the eroded pre-Pennsylvanian surface. The associated facies were deposited in a delta-plain to shallow-marine environment. Enclosure of the sandstone bodies in oil-rich shale and later structural movement led to favorable conditions for the development of combination structural-stratigraphic traps.

Previous regional work, checked by log correlation across Kansas, suggests that the Bartlesville Sandstone in Sallyards field is laterally equivalent to the surface Bluejacket Sandstone.

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Environments and Diagenesis, Morrow Sandstones, Cimarron County, Oklahoma

Detailed investigations of Morrow Sandstones in Cimarron County, Oklahoma, provide a bird's-eye view of problems encountered during regional exploration, production, and completion practices over a wide area from New Mexico to Kansas. The generally poor lateral and vertical control of sand distribution can be improved through a detailed knowledge of environments of deposition. Frequent formation damage because of poor completion procedures can be largely prevented through an understanding of Morrow sandstone diagenesis.

Morrow sandstones in Cimarron County form two distinct reservoirs. Type 1 reservoirs are thick (10 to 50 ft or 3 to 15 m), porous (20 to 23%), permeable (47 to 236 md), and very coarse grained (0.83 mm). These reservoirs are fan-shaped, being less than 1 mi (1.6 km) wide at the apex (on the northwest) and 4 mi (6.4 km) wide at the southeastern edge. Sand thickness is greatest at the center of the body. These sands were deposited in the estuarine portions of a braided fluvial system.

Type 2 reservoirs are thin (generally less than 20 ft or 6 m), have relatively low porosities (4 to 20%) and permeabilities (3 to 100 md), and are fine grained (0.24 mm). These reservoirs are discontinuous, lenticular, elongate units which trend at approximately right angles (NE-SW) to the Type 1 reservoirs. Maximum width is 1 mi (1.6 km); maximum length is of the order of several miles. These sands were deposited in lower tidal-flat and shallow, offshore-marine environments, as beaches and bars.

Once the reservoir has been discovered, it is vital that completion practices be tailored to the specific rock composition. Failure to do this may result in serious formation damage, and the bypassing of potential production. Problems characteristic of these sands include: (1) a migration of fines, (2) extreme acid sensitivity, and (3) possible water sensitivity. The sand composition may often require a multistage acid job with KCl flushes. Hydrofluoric acid should not be used unless the detailed sand composition has been determined by thin-section analysis.

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Geochemistry of Small Lacustrine Delta, Great Salt Plains, Alfalfa County, Oklahoma

A shallow lacustrine delta is forming at the northern end of the Great Salt Plains reservoir in Alfalfa County, north-central Oklahoma. Although sediment is supplied solely by the river, organic matter may be derived from the land surface (and transported by the river) or de-