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Oil and Gas Resource Development Potential, Eastern Valle Vidal Unit
A 20-year Reasonable Foreseeable Development Scenario (RFDS)
Carson National Forest

Executive Summary

The Valle Vidal Unit of the Carson National Forest is located in the Raton Basin, a geologic basin in New Mexico and Colorado that is becoming increasingly important in providing the nation with natural gas. The petroleum industry has expressed an interest in leasing within the eastern part of the Unit, an area of approximately 40,000 acres of the 100,000 total acres. The Reasonable Foreseeable Development Scenario (RFDS) is a planning tool. It provides a reasonable estimate of what oil and gas exploration and development activities might be proposed, should a decision be made to lease the area. Under this scenario, the RFDS projects what activities might be conducted by a mineral lessee under current and reasonably foreseeable regulatory conditions and industry interest. The RFDS is a 20-year forward-looking estimation of oil and gas exploration and development that is exclusive of other concerns that might compete for use of land in a multiple-use scenario. As such, it is information about one resource, with a projection of that resource as developed in a reasonable foreseeable manner. This information forms a “knowledge baseline” for the Carson National Forest to consider in any subsequent analyses to examine leasing or development of the resource. The RFDS can be considered by the Carson National Forest if building alternative scenarios of the potential extent and conditions of oil and gas leasing and operations.

The overall potential for occurrence of oil and gas resources in the eastern Valle Vidal Unit is high. This rank is based on geologic conditions predicted to be present at the site relative to adjacent lands that are being actively and economically developed. The primary play of interest is the widespread, shallow (less than 2000 ft deep) coalbed methane and low permeability sandstone natural gas play associated with the Vermejo and Raton Formations. The entire eastern Valle Vidal Unit is underlain by these formations. The coal beds in these formations are assumed to be minimally thermally mature and capable of being economically developed on 160 acre per well spacing. Certainty in this assumption decreases southward over the eastern Valle Vidal Unit due to lack of direct data in the southern part of the Unit. This assumption could be confirmed by core drilling a minimal number of wells, testing the cored coal beds for production potential. Parts of the area (an estimated 6080 acres) could be excluded from being potential for coalbed methane production due to the presence of fractured igneous dikes that could cause excessive water production in nearby wells. Confirming this hypothesis would require drilling, completing, and testing one or more wells in the affected acreage.

Another high potential occurrence play is the fractured “shale” blanket-type Pierre-Dakota play that also has slight possibility of conventional reservoir traps in the Dakota Sandstone. The fractured shale play currently has a poor economic outlook in the short term and is not being pursued adjacent to the eastern Valle Vidal Unit, but it could become significant in the 20-year life of this scenario. A third play, based on postulated presence and source rock potential of the Pennsylvanian Sandia Formation, is assigned a low potential due to uncertainty and lack of positive indicators such as related oil or gas shows nearby.

The potential for development of oil and gas resources in the eastern Valle Vidal Unit is high. If allowed to lease the eastern Valle Vidal Unit, oil and gas operators will be primarily interested in the immediate economic benefit of developing the shallow coalbed methane resources throughout the Unit. Coalbed methane plays benefit from dewatering coal over a large area and it is probable that operators will require large contiguous blocks of acreage in order to operate most efficiently and economically.

Development would likely proceed from an initial phase of exploratory drilling and gas-in-place evaluation at 5 to10 sites spread across the area to evaluate geologic and economic conditions. A second phase would focus on bringing in the proper infrastructure to produce the area as a whole. This would include a pipeline to deliver gas to market and might include electric power. Right-of-way availability and access to pipeline interconnects is a locally sensitive subject that would require negotiation and pose unknown financial considerations to be borne on the part of lessees; thus, pipeline economics were not considered in the RFDS. It is estimated that at least four deep wells would be required for subsurface disposal of produced water in approved saline aquifers. Under this scenario, a third phase would involve drilling every allowed surface location on 160 acre spacing with vertical wells. A fourth phase might involve drilling problematic locations using deviated (not horizontal) wellbores if economics prove to be sufficient. Deep targets would be tested as a side benefit of drilling water disposal wells and do not require additional locations in this scenario.

Development of the coalbed methane resource is not likely to require reflection seismic data. Evaluation of deeper plays would benefit from such data. Operators in the region have expressed interest in 3-D seismic data with lines/cross-lines spaced closer than ¼ mile. No evidence of existence of 3-D seismic data or current acquisition activity was found in the vicinity. It is proposed that once coalbed methane related lease roads were constructed, seismic operations could take place on the road grid.

Over the 20-year life of the RFDS, it is predicted that between 195 and 254 vertical or slightly deviated wellbores could be drilled on 191 to 250 surface locations (well pads) based on current and foreseeable State of New Mexico-regulated well density of 160 acres per well. Four of those wells would be drilled

as water disposal wells/deep tests and could be placed on an existing location with a shallow coalbed methane well. If increased-density spacing of 80 acres per well were approved by the State of New Mexico during the term of the RFDS, then the predicted number of wellbores could double to 390 to 508. Associated 80-acre spaced well pads would number 382 to 500. At present, there is no justifiable need to increase density to 80 acres per well, but necessary data could become available over time, derived from 160 acre-spaced wells. The coalbed methane reservoir conditions are not conducive to horizontal drilling due to complicating factors including the difficulty of artificially lifting water, thin discontinuous beds within a thick gross interval, shallow depth, and poor economics. Deviated (not horizontal) drilling methods could help to reduce the surface impacts of development by allowing optional nonstandard locations for construction of well pads, such as locating multiple wellheads on a single pad.

The area of disturbance for each coalbed methane well location need not be large because the shallow depth and minimal required equipment allow for small well pads. Typical surface disturbance associated with current producing well pads in the Raton Basin is about 0.5 acres whereas well pads elsewhere in New Mexico are normally about 2 acres in size. Roadways and right-of-ways add an additional acre of disturbance per 160-acre-spaced well pad. Water disposal and compression facilities add an additional 15 acres. It is estimated that full development as a single lease at 160 acres spacing per well will require between 396 and 777 acres of disturbance over the entire unit depending upon well pad area required. This doubles if 80-acre spacing per well development becomes an option. Innovative and environmentally responsible development practices are encouraged by the authors to reduce impacts on alternative land uses while promoting maximum economic benefit. Flexibility in locating wells within 160 acre spacing units will promote more effective reservoir drainage and may potentially mitigate other impacts.

There is no official government township-grid survey in the eastern Valle Vidal Unit. This information is critical for assigning lease ownership and locating wells. It is recommended that a survey be performed on the ground prior to mineral leasing if the lands are to be offered for lease.

List of Abbreviations and Acronyms

AAPG	American Association of Petroleum Geologists
ACCESS	a relational database computer program, product of Microsoft
AIME	American Institute of Mining, Metallurgical and Petroleum Engineers
ARCGIS	a GIS computer program, product of Earth Science Resources Inc.
BBL/bbl	barrels, a volumetric term for water, equals 42 gallons
Bw	barrels of water
mBw	thousand barrels of water
CBM	coalbed methane
CIM	Canadian Institute of Mining, Metallurgical, and Petroleum Engineers
C. P. G.	Certified Petroleum Geologist
DRG	Digital Raster Graphic; a digital image product
EIS	Environmental Impact Statement
EPA	U. S. Environmental Protection Agency
EUR	estimated ultimate recovery
ft	feet, foot
GIS	geographic information system
GOTECH	website by New Mexico Petroleum Recovery Research Center
Gp	gas in place
GRI	Gas Research Institute
ISC	Interstate Stream Commission
km	kilometer (s)
m	meter (s)
NM	New Mexico
NMBGMR	New Mexico Bureau of Geology and Mineral Resources
NMIMT	New Mexico Institute of Mining and Technology
NMOCD	New Mexico Oil Conservation Division
ONGARD	Well database by New Mexico Oil Conservation Division
P. E.	Professional Engineer
RFDS	reasonable foreseeable development scenario
RGIS	New Mexico Resource Geographic Information System.
Ro	vitrinite reflectance; indicator of source rock thermal maturity
scf	standard cubic feet, a volumetric term for natural gas
mscf/mcf	thousand cubic feet, standard volumetric unit for market trading
mmscf	million cubic feet
Bscf/Bcf	billion cubic feet
Tscf/Tcf	trillion cubic feet
S. P. E.	Society of Petroleum Engineers
TDS	total dissolved solids, a water quality measurement
U. S.	United State of America
VPR	Vermejo Park Ranch, lease name applied to development areas
WGR	water to gas ratio; water:gas
Wp	water in place