

Alton-Kolob and Johns Valley - Kaiparowits Plateau plays

SUMMARY

ALTON-KOLOB PLAY

The coalbeds of the Dakota Sandstone are best developed in southern Utah in the Alton-Kolob coalfields, and this is the area that has drawn company exploration interest. The 140- to 450-foot-thick Dakota Sandstone in this play contains two subbituminous coal zones, an upper one named Smirl, and a lower one named Bald Knoll. These two, lenticular coal zones can collectively contain up to 18 feet of coal, and they have an average aggregate thickness of about 13 feet. To date, only two gas-content measurements have been reported for shallow coal core samples, and they revealed low gas contents of 0 to 14 cubic feet per ton. This 400,000-acre play could contain nearly 1 Tcf of gas if the average gas content of the deeper coalbeds is only 100 cubic feet per ton. Several companies have leased 84,000 acres or more in the play. Legend Energy of Utah is the most active of these companies, and has staked 23 drill hole locations; drilling began at two locations in November 2002.

JOHNS VALLEY- KAIPAROWITS PLATEAU PLAY

The thick coals of the Straight Cliffs Formation have attracted some company interest in the Johns Valley area and the northern part of the Kaiparowits Plateau coalfield outside the Grand Staircase-Escalante National Monument in Garfield County. The 130,000-acre play contains an average aggregate thickness of 40 feet of coal within the 600- to 1,600-foot-thick John Henry Member of the Straight Cliffs Formation. The 13 gas measurements taken from relatively shallow coal cores were not encouraging, with gas contents of less than 7 cubic feet per ton of coal. A group of investors with a significant fee position in the Johns Valley portion of the play is attempting to put together a drilling program to evaluate the coals and their gas content in this part of the play. They expect that deeper subbituminous coalbeds will be gassier because their gas has not leaked to the surface. This play could contain 0.93 Tcf of gas if the deeper coalbeds contain at least 100 cubic feet of gas per ton of coal.

GAS CONTENT DATA

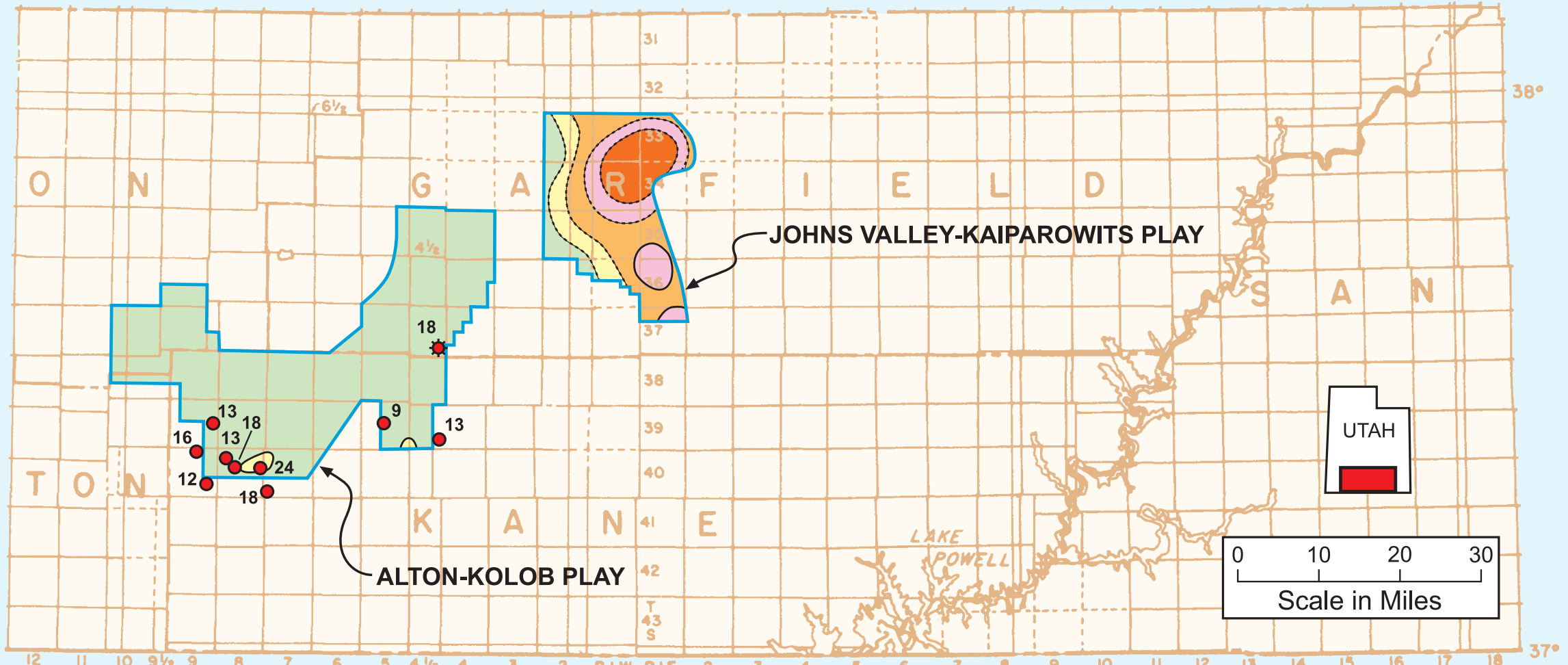
GAS CONTENT DATA FOR THE JOHNS VALLEY COALFIELD								
Company Name	Sample Number	Section Number	Township	Range	Depth (feet)	Coalbed Name	Ash Content (wt. %)	Gas Content (scf/ton)
UGS	35	33	33S	2W	442	unnamed	8.6	3

GAS CONTENT DATA FOR THE KAIPAROWITS PLATEAU COALFIELD								
Company Name	Sample Number	Section Number	Township	Range	Depth (feet)	Coalbed Name	Ash Content (wt. %)	Gas Content (scf/ton)
UGS	116	8	37S	02E	712	Christensen	15.4	7
UGS	117	8	37S	02E	725	Christensen	13.6	6
UGS	107	8	37S	02E	779	Christensen	14.2	0
UGS	105	8	37S	02E	694	Christensen?	14.5	0
UGS	106	8	37S	02E	606	Rees	13.5	0
UGS	59	16	40S	04E	619	Rees	15.0	3
UGS	58	16	40S	04E	491	K2-lower	7.3	1
UGS	60	16	40S	04E	479	K2-upper	7.3	0
UGS	61	16	40S	04E	535	M1	7.3	3
UGS	62	16	40S	04E	574	M2	8.8	2
UGS	63	16	40S	04E	653	N	7.9	5
UGS	63	16	40S	04E	714	P-upper	6.8	7

GAS CONTENT DATA FOR THE ALTON KOALFIELD								
Company Name	Sample Number	Section Number	Township	Range	Depth (feet)	Coalbed Name	Ash Content (wt. %)	Gas Content (scf/ton)
UGS	28	30	37S	03W	273	Bald Knoll	NA	14
UGS	29	34	39S	04.5E	753	Smirl	NA	3

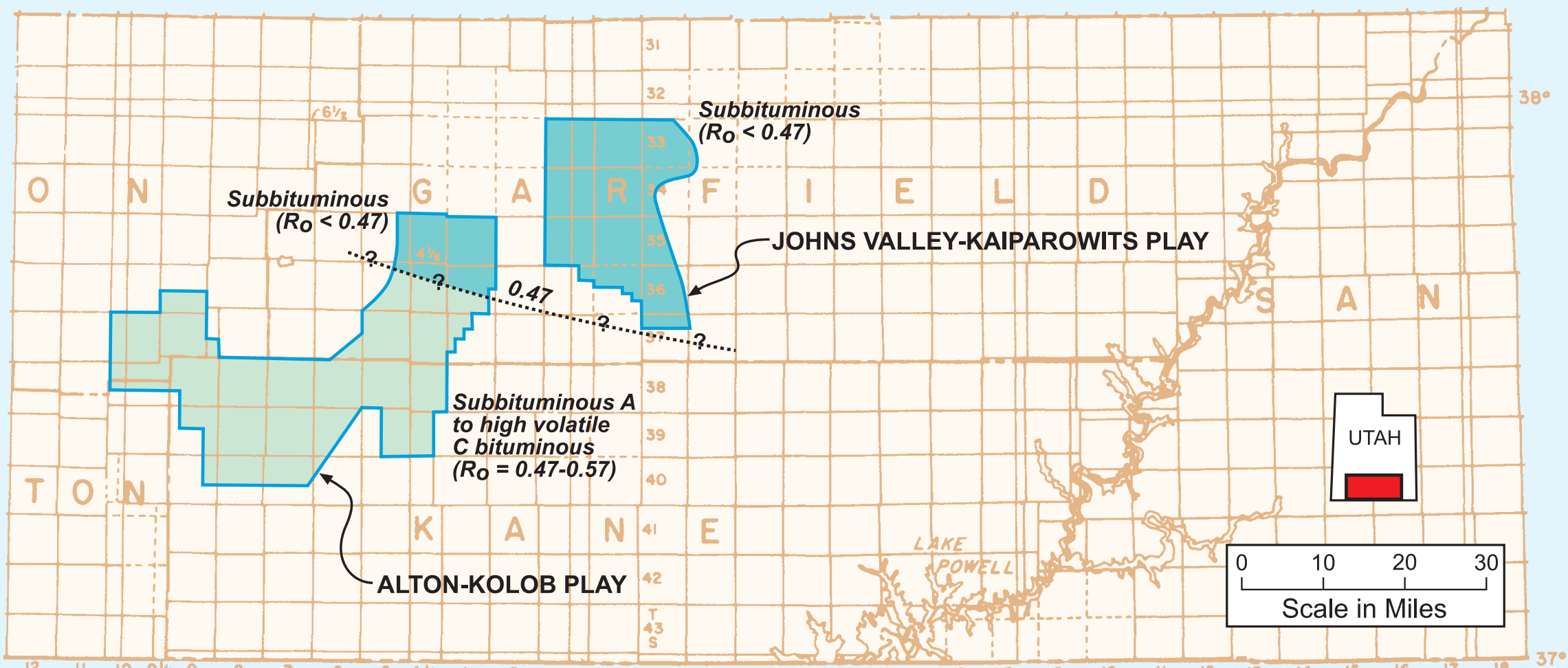
NET COAL THICKNESS OF ALTON-KOLOB AND JOHNS VALLEY-KAIPAROWITS COALBED GAS PLAYS

(Johns Valley- Kaiparowits thickness data modified from Hettinger and others, 1996)



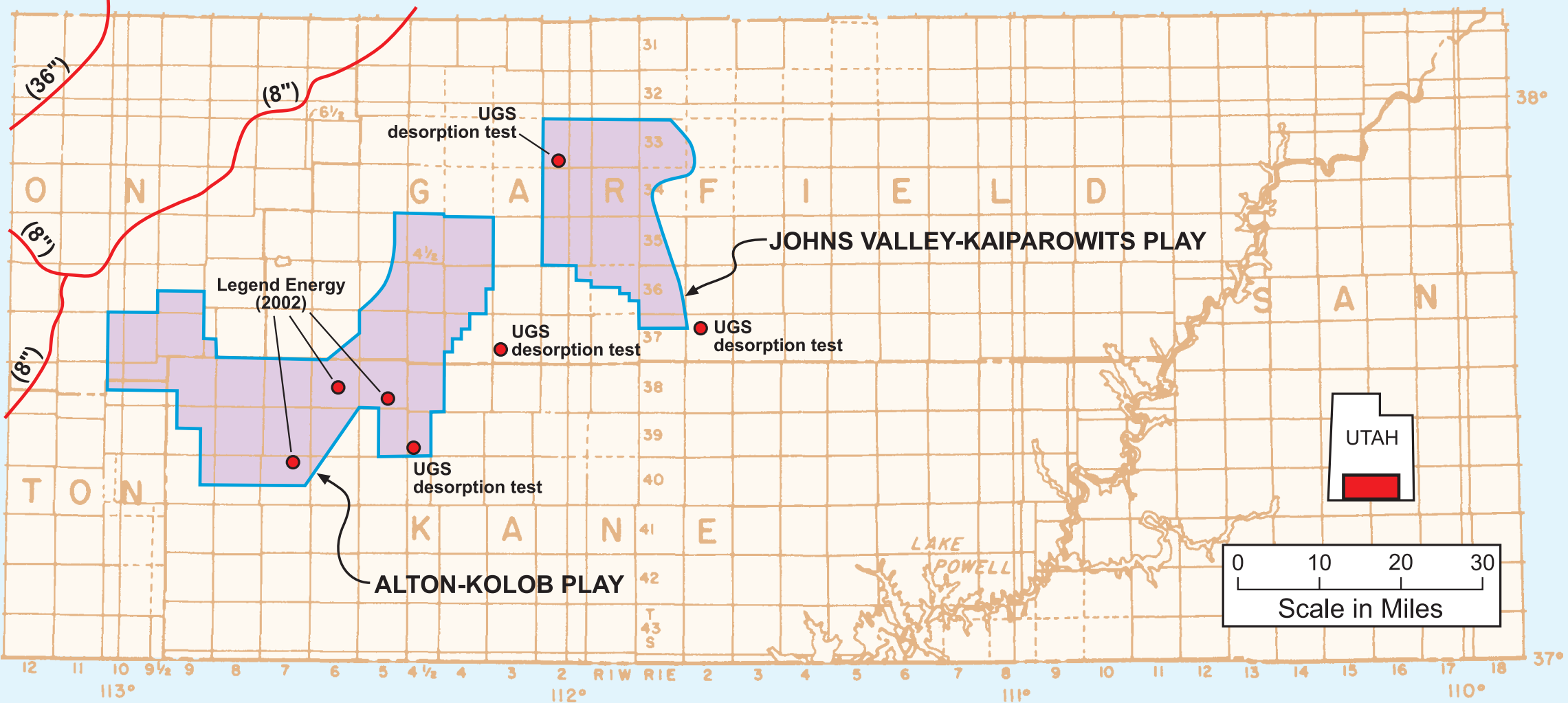
0' - 20' 20' - 40' 40' - 60' 60' - 80' >80' 19 Older oil and gas well with net thickness of coal in feet Coal exploration well with net coal in feet

ESTIMATED MATURITY-RANK OF COALS IN THE ALTON-KOLOB AND JOHNS VALLEY-KAIPAROWITS COALBED GAS PLAYS



Subbituminous - bituminous Subbituminous

LOCATION OF EXPLORATION ACTIVITY IN THE ALTON-KOLOB AND JOHNS VALLEY-KAIPAROWITS COALBED GAS PLAYS



Play area Coalbed gas test well Gas pipeline (diameter in inches)

Utah has six frontier coalbed gas plays that are in various stages of testing or development. All of the plays involve Cretaceous-aged coals in the eastern half of Utah. Prospective coal-bearing formations receiving exploration attention include the Dakota Formation coals in the Alton-Kolob coalfields, the Frontier and Advaville Formations that extend south from Wyoming into Utah's Henrys Fork coalfield, the coals of the Emery Sandstone Member of the Mancos Shale in the Wasatch Plateau coalfield, the Blackhawk Formation coals in the Book Cliffs coalfield, and the Neslen Formation coals in the Segó coalfield. These plays range from one with established production to rank wildcat areas with little known except that coalbeds are present. Gas resources for each play have been estimated based on the average coal thickness, play area acreage, and reasonable assumptions about the coalbed gas content. The undeveloped portions of these six plays are estimated to contain in-place gas resources ranging from 1.96 to 9.78 Tcf. Data on the coal geology, organic maturity, and structure of these various coal-bed gas play areas, as well as the level of company activity, are summarized in the following table.

SUMMARY COMPARISON OF UTAH'S FRONTIER COALBED GAS PLAY ATTRIBUTES

CRITERIA	COALFIELD/PLAY					
	1 Book Cliffs	2 Wasatch Plateau	3 Segó	4 Alton-Kolob	5 Johns Valley/ Kaiparowits	6 Henrys Fork
RESOURCES						
Formation Name	Blackhawk	Mancos/Emery Ss	Neslen	Dakota	Straight Cliffs	Frontier
Fmtn T thickness (ft)	600 to 1,000	1600	400 to 700	140 to 450	600 to 1,600	2,000 to 2,800
Coal Thickness Range (ft)	10 to 70	10 to 120	10 to 30	7 to 25	10 to 80	10 to 230
Coal Thickness Average (ft)	35	40	14	13	40	50
Play Area (acres)	70,000	180,000	240,000	400,000	130,000	15,000
Coal Resource	4.4 billion tons	16.2 billion tons	6.0 billion tons	9.36 billion tons	9.36 billion tons	1.3 billion tons
Coal Rank	hVCb-hvAB	hVCb-hvBb	hVCb-hvBb	subB-subA	subB-subA	hVCb-hvBb
Ash Content (%)	2.7-20.8	NA	2.7-27.9	2.5-32.6	2.9-29.9	2.2-15.3
Vitrinite Reflectance (Ro)	0.42 to 0.84	0.65 to 0.80?	0.58 to 0.76	0.44 to 0.60?	0.44 to 0.60?	0.45 to 0.65?
Gas Content (desorbed)	60-435 cu ft./ton	NA	0-48 cu ft./ton	0-14 cu ft./ton	0-7 cu ft./ton	NA
Samples Desorbed	> 100	0	25-6 wells	2/2 wells	13/3 wells	0
Gas Content (estimated)	180-430 cu ft./ton	10-280 cu ft./ton	50-300 cu ft./ton	0-100 cu ft./ton	0-100 cu ft./ton	50-300 cu ft./ton
Estimated GIP (Tcf)	0.8 to 1.9	0.1 to 3.6	0.3 to 1.8	0 to 0.93	0 to 0.93	0.06 to 0.39
STRUCTURE						
Dip (degrees)	2 to 12 NE	1 to 6 NW	1 to 5 NW	1 to 5 N	1 to 6 NW	30 W
Faulting	E-SE-trending, high-angle, normal flts	N-trending, high-angle, normal flts	E-SE-trending, high-angle, normal flts	N-trending, high-angle, normal flts	E-trending, high-angle, normal flts	N-NE-trending, thrust flts
Folding	minor	a few anticlines	minor	minor	monoclinel folds	moderate
Face Cleat(s)/Joint(s)	N55-65W	N8-35E, N65-85W	N55-65W	N20-45W, N15-30E	N15-30E?	N35-55E, N
Igneous Activity	none	Olig.-Mioc. mafic dikes	none	Quat. Basalt flows	Quat. Basalt flows	none
Depth to coal (ft)	1500 to 6000	1500 to 6000	500 to 5000	500 to 5000	1000 to 6000	1500 to 5000
RESERVOIR PROPERTIES						
Formation Pressure	500 - 2500 psi	NA	220 - 2200 psi	NA	NA	NA
Overpressure	none	none	slight	NA	NA	NA
Fmtn Temperature (est)	110 F	(80 - 110 F)	(80 - 130 F)	(80 - 110 F)	(70 - 100 F)	(90 - 100 F)
TDS of produced water	600-8000	NA	NA	640-2200	NA	NA
Coal Porosity (%)	0.4-13.25	NA	2.99-12.74	NA	NA	NA
Coal Permeability	10 md	NA	NA	NA	NA	NA
INDUSTRY ACTIVITY						
Well Data in Area	~50 O&G wells	< 20 wells	200-250 wells	< 20 wells	< 40 wells	1 well
Gas Shows	Numerous	Mud-log shows	Mud-log shows	Mud-log shows	none reported	gassy mines
CBM Wells	32	A few strat tests	A few strat tests	24 CBM APDs	none	A few WY tests
Companies Active	3	2 to 3	2 to 3	2 to 3	1	0
Gas Production	3.38 Bcf	none	none	none	none	none
Water Production	8.5 million bbls	none	none	none	none	none
Pipelines	1 across area	1 across area	several in area	30 to 60 miles W	60 miles W	1 across area

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