



Bristol Bay – Alaska Peninsula Region Overview of 2004 – 2007 Energy Research

Rocky R. Reifentstahl

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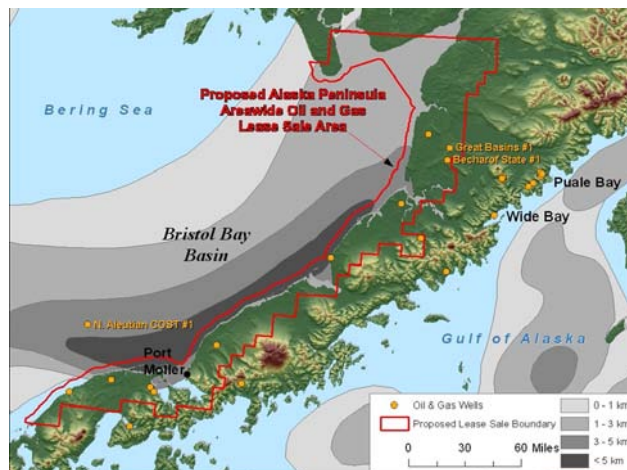
Alaska Division of Oil and Gas, Anchorage, Alaska

Note: AGS meetings will be at the BP Energy Center for 2008-2009.

Please check the website (www.alaskageology.org) and issues of the AGS newsletter for updates.

This newsletter promotes the May luncheon talk of the Alaska Geological Society, to be held Thursday, May 21st, at the BP Energy Center.

State-led field and subsurface investigations into the geology and petroleum systems of the Alaska Peninsula region culminated with the publication of a final report volume in December, 2008. This multi-year project combined stratigraphic, structural/tectonic, geochemical, reservoir quality, and subsurface studies in addition to preliminary geologic mapping in order to characterize key aspects of the Tertiary and Mesozoic successions that control the hydrocarbon potential of this frontier region. The final report is a collection of nine technical papers authored by fourteen contributors, now available for free download from the Alaska Division of Geological & Geophysical Surveys publications web page (<http://www.dggs.dnr.state.ak.us/pubs/pubs?regtype=citation&ID=17921>). This report presents previously unpublished data and interpretations, but does not contain other important findings associated with the project published in earlier reports.



Alaska Geological Society Luncheon

Date & Time: Thursday, May 21st, 11:30 am – 1:00 pm

Program: Bristol Bay – Alaska Peninsula

Speakers: Rocky Reifentstahl, Alaska DGGS
Paul Decker, Alaska DOG

Place: BP Energy Center

Reservations: Please make your reservation before noon Tuesday, May 19th, 2009.

Cost: Seminar only, no meal: Free
Reserve a box lunch: \$13
Nonmember: \$15

Reserve a hot lunch: \$20
Nonmember: \$22

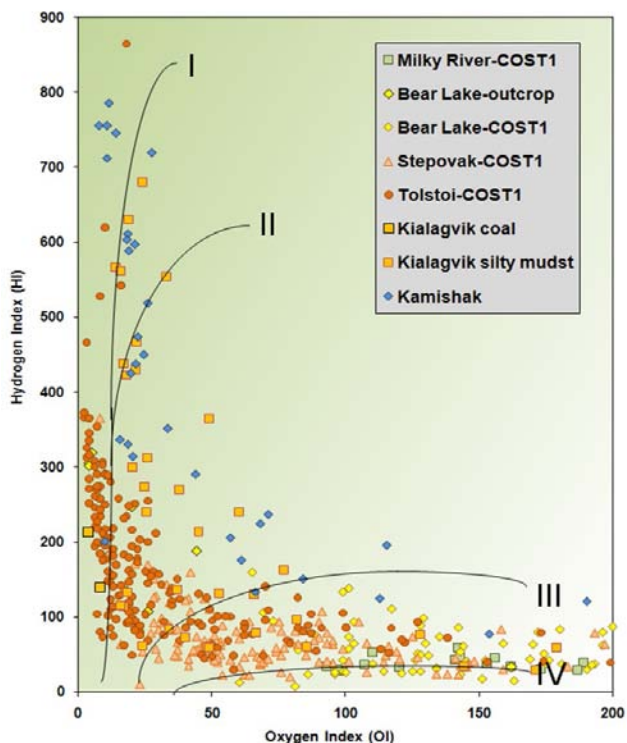
No reservation: add \$5 to the above
(on an “as-available” basis only)

E-mail reservations: vp@alaskageology.org
Or phone (907) 230-1672
(Tom Morahan, AGS VP)

For more information: visit the AGS website:

www.alaskageology.org

Twenty-eight wells have been drilled on the Alaska Peninsula in addition to the North Aleutian Basin COST #1 well drilled offshore in Bristol Bay. Most wells reported at least modest oil and gas shows, but none have produced commercially. New field data identify and characterize various components of the region's potential



petroleum systems. Numerous observations indicate effective source rocks for both oil and gas in the Mesozoic section and mainly for gas in Tertiary units. Thermogenic methane seeps vigorously from Cretaceous outcrops at Port Moller hot springs. Both oil and gas seep from Jurassic formations southwest of Puale Bay (gas is 91% methane, 7% nitrogen, and 2% carbon dioxide). Good to excellent oil- and gas-prone Mesozoic source rocks were profiled in the context of measured sections from exposures at Puale Bay. Micritic limestones of the Triassic Kamishak Formation exhibit up to 5.28% total organic carbon and hydrogen indices as high as 785 mg/g. Shaly siltstones of the Jurassic Kialagvik Formation yield corresponding values reaching 3.51% TOC and 680 mg/g HI. Tertiary and Upper Cretaceous coals and carbonaceous shales are dominantly gas-prone, but some facies of the Tolstoi Formation show local potential to source liquid hydrocarbons. This observation may explain frequent but minor oil shows encountered while drilling in Tertiary formations. Thermal maturity data suggest coaly kerogen in Tertiary units may locally be mature enough for thermogenic generation onshore, where vitrinite reflectance ranges 0.5–0.8% in the Bear Lake Formation. Data from the NAS COST #1 well reveal oil window maturity and projected gas window maturities within the Tolstoi Formation in the deeper parts of

the basin offshore. We present the first published vitrinite reflectance data to corroborate previous pyrolysis-based maturity estimates for the Mesozoic source rocks exposed at Puale Bay. Thermal maturity averages 0.60% R_o in the Kamishak Formation (23 samples) and 0.53% R_o in the Kialagvik Formation (28 samples), both near the onset of hydrocarbon generation. Clearly, these source rocks are mature for oil and gas beneath nearby seeps. Prospective reservoir lithologies have been quantified using about 300 porosity and permeability samples and indicate viable Tertiary reservoirs, particularly in the 743-meter-thick Miocene Bear Lake Formation. Mesozoic sandstones are degraded by zeolite alteration, and are unlikely to form significant conventional reservoirs. Extensive structuring has occurred in multiple phases of subsidence and arc uplift. Both structural and stratigraphic trapping configurations are likely to occur, though traps are difficult to map in much of the onshore area due to extensive surficial cover and scant seismic data. Intra-reservoir seal facies have been identified in fine-grained nonmarine and shallow marine units. Mercury injection capillary pressure studies predict seal capacities capable of sustaining hydrocarbon columns ranging from 250 to 2,500 feet. This is a crucial finding, as it alleviates a previously widespread perception that the lack of blanketing marine shales might condemn the area from a petroleum resource perspective. Further exploration will be required to determine whether these critical geologic components have interacted to form functioning petroleum systems with producible accumulations of either oil or gas. Probabilistic resource assessments were not within the project's scope; the MMS estimated mean technically recoverable resources of the North Aleutian basin beneath the outer continental shelf at 753 million barrels of oil and natural gas liquids and 8.6 trillion cubic feet of gas (Sherwood and others, 2006). This four-year program was funded by the U.S. DOE, AKDGGs, AKDOG, and Bristol Bay Native Corporation.

About the Authors:

Rocky Reifensuhl began his Alaska work in 1977, which included 18 months with Marline Oil Corporation. In 1981 he began working as a field geologist for the Alaska Division of Geological & Geophysical Surveys, and received a B. Sc. in geology (University of Alaska Fairbanks) in 1983. Rocky has published some 80 geologic maps and reports from every region of Alaska

Paul Decker joined the Alaska Division of Oil and Gas in 2004, where he works closely with geologists and geophysicists from both the DOG Resource Evaluation section (Anchorage) and the Division of Geological & Geophysical Surveys (Fairbanks). Current responsibilities include petroleum systems research emphasizing integrated interpretations of subsurface and outcrop data, and serving as liaison to industry and other agencies to promote exploration and facilitate collaborative research. From 1988 through 2004, Paul worked in new ventures exploration and development for ARCO, Phillips, and ConocoPhillips in Anchorage. He holds Ph.D. and M.S. degrees in structural geology from the University of Wisconsin—Madison, and a B.S. degree in geology from Fort Lewis College in Durango, Colorado.