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High Temperature Geothermal Well-Logging Techniques in Japan

A high temperature geothermal well-logging system has been developed by Japan Petroleum Exploration Co., under the sponsorship of the Japanese government. The tools developed on this project are: Multi-Spacing Electrical-SP Log (equivalent to Lateral Log); Microspherical-Caliper Log; Side Wall Acoustic-Caliper Log (P-S Wave Sonic Log); Steering Tool (Azimuth, Hole Deviation and Inclination); Optical Borehole TV; Production Logging Tools (Temperature, Pressure, Continuous Flow and Caliper, and Borehole Sampler).

The maximum operating temperature of these tools is 325°C and they can withstand pressures of 500 kg/cm^2, by the use of TFE teflon insulator armored cable. The tools have been subjected to field tests over 50 geothermal wells, since 1978, and all except the Optical Borehole TV were successfully operated where bottom-hole temperatures were as high as 210 to 275°C.

The side wall acoustic tool, which consists of P and S wave transducers, is very useful for the detection of formation fractures in volcanic rocks. The Optical Borehole TV could not be used where temperatures exceeded 150°C, because of heat radiation emitted from the mud and the holewall surrounding the down-hole probe, or when the tool was focused at the surface of the semiconductor imagesensor on the TV and the temperature of the image spot exceeded 120°C, even when placed in a Dewar bottle and heat sink assembly.

Super high temperature (450°C) production logging tools, using mineral insulation cable, are under construction and will be in operation by the end of August 1982. They are: Absolute and 1-meter spacing differential Temperature Survey; Continuous Pressure Measurement; Continuous Flow and Caliper Measurement; High Temperature Microphone and Accelometer, with a wall set mechanism.

The diameter of these tools is 2 inches and their maximum operating time is 30 hours at 450°C. They can withstand pressures of 500 kg/cm^2.

The success of this system is apparent from the summary of field results and the technical report of the super high temperature production logging tools.

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Preliminary Tectono-Stratigraphic Terrane Map of Circum-Pacific Region

The geologic evolution of the proto-Pacific Ocean (Panthalassa) underwent a major change during Middle Triassic time that involved initiation of rifting and dispersal of allochthonous terranes from equatorial paleolatitudes. Fragments of these rifted terranes are now found plastered onto cratonal margins (which locally may contain Paleozoic accreted terranes) in most parts of the Pacific basin. A preliminary map at a scale of 1:20,000,000 has now been completed for most of this margin (exclusive of parts of South America) that shows the location and character of major terranes, as well as position of suture zones and ophiolitic belts.

Combined paleomagnetic, paleobiogeographic, and lithologic data substantiate that some terranes have been displaced thousands of kilometers during the Mesozoic, but adequate data of these kinds are still lacking for many terranes. Such data are required in order to control paleogeographic reconstructions through time, and then to eluciate the tectonic evolution of the entire Pacific basin.

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Mineral Resources and Maps of New Zealand, the New Hebrides, and the Solomons

The following maps covering southwest Pacific island arcs and sedimentary basins are completed: (1) Petroleum Concession Map of New Zealand, 100 × 80 cm; (2) tectonic classification of New Zealand oil—prospective basins (map), 80 × 60 cm; (3) Cretaceous-Cenozoic sedimentary basins of New Zealand (map), 65 × 50 cm; (4) Structural Map of the New Hebrides island arc, 90 × 60 cm; and (5) Structural Map of the Solomon Islands, 90 × 70 cm.

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Southwest Pacific Island Arcs: Sedimentary Basins and Petroleum Prospects in New Hebrides and Solomons

Several thousand meters of Miocene-Pliocene sediments are predominantly fine to coarse-grained volcaniclastics deposited in shelf to deep marine environments, commonly as turbidites; coralgal reef limestones and fore-reef calcarenites formed locally. Original basins in both the Solomons and New Hebrides measured 375 to 435 mi (600 to 700 km) by 62 to 125 mi (100 to 200 km) but parts of their margins are strongly deformed, uplifted, and eroded. Cross-faulting and Holocene volcanism caused segmentation and further reduction of basinal areas. In both island arcs, the sediments are little deformed along a median structural basin which was downfaulted in Pleistocene to Recent time in the Solomons, and from Pliocene onward in the central New Hebrides; no downfaulting occurred in the northern New Hebrides.

Little is known of hydrocarbon source potential and degree of maturation. Back-reef or rapidly buried fore-reef environments may be the principal areas for source rock formation. Reefal limestones are the main potential reservoir rocks; they have, however, lost porosity locally because of recrystallization. Turbidite sandstones may form additional reservoirs, but volcanic derivation keeps permeability generally low. The main structural traps are fault-controlled near basin margins, but limited folding also occurs. The pre-Pliocene unconformity in the northern New Hebrides could generate stratigraphic traps. Water depth in the main prospective areas is several hundred to 5,000 ft (1,500 m) in the Solomons, and up to 10,000 ft (3,000 m) in the New Hebrides. Nearshore and onland prospects are extremely limited in both island arcs.

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Alternative Liquid Fuel Developments in New Zealand

Recent exploration has shown New Zealand to be an energy-rich country, except for liquid fuels. Less than one-third of the hydroelectrical and one-sixth of the geothermal potential are utilized, subbituminous coal reserves will suffice for a century or more, and very large lignite resources have been located.

The major Maui offshore gas-condensate field, found in 1969, required the commitment of large electrical generation load for its initial development. That expected load diminished, however, so that when the government established the Liquid Fuels Trust Board in 1978, to advise it on methods for reducing New Zealand's dependence on imported petroleum, the gas was

the most readily available raw material.

The Board reported on the merits of alternative methods of increasing gas usage, especially as a fuel, to yield additional condensate to the liquid fuels system. After a year's detailed investigation on the merits of available alternative technologies, the Board recommended, and the government approved, a major gas to gasoline via methanol development, using the first commercial plant to use the Mobil process.

The Board subsequently recommended against introducing low-methanol petrol blends (M15), principally because of distributional problems.

New Zealand should be about 50% self-sufficient in liquid fuels by 1986. Currently the Board is investigating the possibilities of either increasing that level or producing liquid fuel in the post-gas era. Several options are being considered—high methol blends, potential ethanol-production from biomass, and options for major liquid fuels production from lignite, or from New Zealand's fast-grown wood.

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A Marine Geologic Map Series of California

A comprehensive geologic map series covering the California continental margin is currently in preparation as a collaborative effort between the State of California Division of Mines and Geology, the State of California Coastal Commission, and the United States Geological Survey. Geologic, geophysical, and seismological data are portrayed at a scale of 1:250,000 on NOS bathymetric base maps for the purpose of defining regional stratigraphy, structural patterns, tectonic history, and historic seismicity. Individual subject data sets are being compiled from existing literature as well as from current research activities. The map series consists of composite overlays depicting surficial and bedrock geology, character and recency of faulting, regional geologic structure, locations of historical earthquakes, well-defined focal mechanisms, gross regional Bouguer gravity, and regional magnetic anomalies.

The geologic information is derived in large part from subbottom seismic reflection profiles and to a lesser degree from core and dredge samples. The explanation of the geologic mapping is accompanied by interpretive line drawings constructed on actual seismic profiles. Each profile illustrates and defines, using symbols standardized for this project, specific geologic features shown on the map.

The purpose of this new marine geologic map series is to acquire and compile in a standard format all available geologic data along the California coastal zone. Although a considerable amount of geologic data exist for the California offshore, heretofore no attempt has been made to compile and present these data at a common scale using a standardized symbology. The compilation phase of this study is scheduled to continue through 1983. Contributions by individuals can be made, with credit assigned, up to mid-1983.

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Resource Driven Economic Potentials of Circum-Pacific Region

(No abstract)

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Methanol and Ethanol from Wood as a Resource

(No abstract)

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Geothermal Energy in United States: Directions and Results, 1976-1982

Development of the giant steam field at The Geysers, California, largely by private industry, has continued steadily, with over 900 Mw of generation online, and nearly 500 Mw additional under construction or design. The area of the field is at least 15 mi^2 (40 km^2); production depth is from 0.8 to about 1.9 mi (1.3 to about 3 km). Immediately adjacent to the east, exploration of hot water resources (to 482°F, 250°C) is underway. In Imperial Valley, California, several small plants (10 to 50 Mw) are either operating or under development. These are located in a sedimentary basin, essentially nonvolcanic, but having an extremely thin crust. Brine salinities remain a major problem.

Geothermal power plants are under construction or design in Utah and Nevada. On Hawaii island, a pilot 3 Mw plant is operational. Total US geothermal generation is now about 1,000 Mw.

Research into power generation from low-temperature fluids (302°F, 150°C) has resulted in construction of a 5 Mw binary-cycle experimental station at Raft River, Idaho, using federal funds. Federal funds also are used in research into energy extraction from hot dry rocks and from high-pressure methane-bearing sands at great depths along the Gulf Coast.

Low-temperature utilization to date has been limited mostly to demonstration projects using public funds in Idaho, South Dakota, Texas, Oregon, etc, heating buildings with waters of 122 to 212°F (50 to 100°C). This segment of the geothermal industry continues to need public support in order to become competitive.

Perhaps the most significant change has been the growth of interest and activity by electric utilities, especially publicly owned utilities in California. Several now are investing in exploration, singly or in joint ventures with traditional exploration companies. Tax-exempt status, lower burrowing costs, and lack of profit demands add to their competitiveness.

Current exploration interest is focused on the volcanic Cascade Range, Imperial Valley, areas in northern Nevada, the Coso Range of California, and the greater Geysers–Clear Lake region.

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Hawaii's Renewable Energy Program

(No abstract)

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Volcanogenic Manganese Deposits in Western Cordillera

Our preliminary investigations suggest that numerous stratiform manganese deposits in the western United States were