

of, a caldera. The regional structural pattern is north-south faulting. Northeast cross faults forming sigmoid loops are very important ore controls.

Massive enargite-pyrite veins are up to 33 ft (10 m) wide. Propylitic, argillic, quartz-sericite, and siliceous alteration are widespread, with precious metal content favoring the highly siliceous areas. Gold is rarely visible as average grain size of the native metal is 5 microns.

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#### Australian Energy Development and Policies for the 80s

Australia has substantial reserves of energy resources and energy-related minerals, and therefore has the potential for major increases in the production of such resources and the processing of minerals for export. Realization of this potential in the 80s will depend largely on the state of world markets.

Australia's resource base and its energy position have been described, and evaluated in the context of the development of Australia's energy resources as a contribution to the national and global transition away from oil. The economic growth that will flow from energy resources development and related activity is noted and possible constraints on development are considered.

The role of the Commonwealth government is addressed, proceeding from the key energy policy goal of ensuring adequate supplies of liquid fuels for Australian industry, especially the transport sector, and private consumers. Specific objectives and achievements in energy conservation, fuel substitution, oil exploration and production, and the development of synthetic fuels are discussed. The preparations made by the Commonwealth and State governments and the private sector to deal with severe disruptions to imported oil supplies are outlined. Energy research and development policies and programs are described briefly.

The Commonwealth government's policies are also examined in the context of setting the scene for resource development in the 80s. The importance of appropriate macro-economic and other supporting policies is emphasized.

Major individual resource projects are described, and Australia's potential contribution to the Pacific region, both in direct energy trade and in technological cooperation, is considered.

It is concluded that Australia has developed a flexible policy framework which will facilitate the development of its natural resources in the 80s.

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#### Impact of Renewables on China's Energy Supplies

The People's Republic of China has abundant conventional as well as renewable energy resources. During the 33 years since liberation, the energy production has increased some 25 times and the country is now self-sufficient for all the 800 million tce (ton coal equivalent) energy demands, including the biomass consumed as fuel in the vast rural region. However, due to the enormous population, the energy consumption per capita is rather low, around some 0.8 tce/capita including the noncommercial energy sources. The PRC is now making great efforts to increase the energy supplies to meet the tremendous energy demands in the course of "Four Modernizations."

The renewables constitute a considerable portion of China's

energy supply. The potential hydraulic resources amount to 680 Gw, of which about 430 Gw is exploitable. Mini-hydro stations constitute the main supply for the electrification in rural regions. Agriculture waste provides about 33% of the rural energy supply, 28% comes from firewood, and 10% from coal from local small mines. Due to the shortage of domestic fuel in some regions, excessive burning of agriculture wastes and deforestation results, threatening the future of agriculture production. Therefore, policies are being adopted to develop biogas as well as other renewables in order to improve the ecological equilibrium in rural regions.

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#### Operating Experience of Johnson & Johnson Solar Industrial Process Steam Facility

(No abstract)

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#### Study of Microearthquake Activity in Four Geothermal Areas of Taiwan

Detailed microearthquake surveys were conducted in four geothermal areas of Taiwan, namely, Tatun volcanic region, Chingshui-Tuchang geothermal area, Lushan hot spring area, and Hungyeh hot spring area, during the past few years. It is found that most of them have microearthquake activity. Based on the microearthquake data, fracture zones permitting deep circulation of water are inferred. Microearthquakes in the Tatun volcanic region are concentrated in a 1.9 mi (3 km) wide and 4.3 mi (7 km) long, northeast-striking elongated zone, where conspicuous geothermal manifestations are present. The focal depths of these events are mostly less than 0.6 mi (1 km). The occurrence of these microearthquakes may be related to the minor normal faults in that region. In the Chingshui-Tuchang geothermal area, microearthquakes are located in a northeast-striking zone, 25 mi (40 km) long and 4.3 mi (7 km) wide. The foci clearly define a northwest-dipping fracture zone with a thickness of about 1.9 mi (3 km). Three composite fault plane solutions are all of the normal fault type. No microearthquake activity was found within a 3 mi (5 km) radial range around the Lushan hot spring area, during a 34-day recording period. A highly active microearthquake zone was found in a region 1.25 mi (2 km) to the west of the Hungyeh hot spring area and the foci define an east dipping fracture zone. However, the causative faults of these events are of the thrust fault type.

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#### Bulgusa Granitic Activity and Metallogeny in South Korea

South Korea can be divided into five northeast-trending geologic provinces: the Precambrian Gyeonggi and Ryeongnam massifs, the Ogcheon fold belt, the Paleozoic Taebaegsan basin, and the Mesozoic Gyeongsang basin. The Gyeongsang basin occupies the southeast quarter of South Korea and contains Lower Cretaceous post-orogenic fluvial and lacustrine deposits overlain by volcanoclastic and volcanic rocks of middle and Late Cretaceous age. Granitic plutons, ranging in age from 107 to 44 m.y., occur mostly in the Gyeongsang basin, but are also exposed to the north in the Ogcheon zone and Taebaegsan basin.

These plutons are known as the Bulgugsa granites, dominantly composed of granodiorite-quartz monzonite-granite and their porphyritic equivalents, in part are believed to be cogenetic with the Gyeongsang volcanics, which ranges in composition from andesite to basalt. Distribution of the granitic plutons in the Geyongsang basin appears to be structurally controlled by north-northeast, west-northwest, and east-northeast trends, on which circular features are sometimes superimposed.

The majority of mineral deposits in South Korea are closely associated with the Late Cretaceous to early Tertiary Bulgugsa granitic activity. Hydrothermal vein, breccia filling, and porphyry types of copper, iron, lead-zinc, gold-silver, tungsten, and molybdenum deposits characterize the mineralization of the noncarbonate, volcano-sedimentary host rocks in the Gyeongsang basin. In the Taebaegsan basin to the north, however, contact metasomatic (skarn) and hydrothermal replacement types of zinc-lead, gold-silver, tungsten-bismuth, and molybdenum deposits, hosted in thick carbonate beds of the Cambro-Ordovician sedimentary sequence, dominate the

country's most productive Taebaegsan mineral belt. The Bulgugsa granites can be correlated with the Chyukoku granites of western Japan in age and accompanying metallogeny.

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Fossil Energy Resources of China

China's sources of energy including fossil energy resources have been inventoried from the standpoint of their geological setting. An order of preference for development has been determined, with coal in first place, followed by water-power and, finally, petroleum. Since resources of coal and waterpower are relatively well known, oil and gas are currently the subjects of research emphasis. The habitat of oil and gas fields and the prospects for locating additional reserves are being related to the tectonic framework of the country.