Geology of the Luzon Central Cordillera and implications for geothermal exploration

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The Kalinga (a.k.a. Batong Buhay) Geothermal Prospect is found on the eastern flank of the Luzon Central Cordillera, which is a N-S trending mountain range traversing the western part of Northern Luzon. The local geology of the prospect fits with that of the Luzon Central Cordillera region. Basement rocks of Eocene to Oligocene age (~55.8 to 23 Ma) are composed of gently folded metamorphosed basalts, andesites and sedimentary deposits. Unconformably overlying the basement rocks are Oligocene to Miocene sediments of interbedded sandstones, conglomerates and limestones. All these are intruded by the Early to Late Miocene Agno batholith ranging in composition from gabbroic to granodioritic to tonalitic. Further intrusion of smaller quartz diorite porphyry and dacite dikes and stocks near the edges of the batholith occurred in the Late Miocene to Pleistocene (~11.6 to 0.01 Ma). The youngest deposits are composed of dacitic flows and pyroclastics which are of Pleistocene to Recent age.

There are five geothermal prospects in Luzon Central Cordillera with current DOE service contracts: Batong Buhay (Kalinga), Mainit-Sadanga (Mountain Province), Buguias-Tinoc (Benguet and Ifugao), Daklan (Benguet) and Acupan-Itogon (Benguet). Most of these prospects were explored in the 80’s, but deep exploration wells were drilled only at Daklan and Acupan. To date, none of these prospects have been developed for commercial production.

A trend analysis exercise, adopted from oil and gas exploration, was conducted to assess and improve the chances of finding a commercial geothermal resource in Kalinga. Simply put, a trend analysis consists of identifying the geologic trend in which the prospect of interest is located, studying every previously drilled well in the trend, and attempting to understand how those results might apply to the subject prospect - i.e. evaluating similarities or differences in particular geologic units, structures, permeability controls and the like, in order to explain possible reasons for the success or failure of the drilling program. In the case of Kalinga, the trend of interest is the Luzon Central Cordillera region. The data for the other prospects was provided by DOE, and the regional geology was based on published studies.

The trend analysis indicates that high temperatures and possibly an exploitable reservoir may be expected in the lower portion of and underneath shallow-seated basement complex
in Kalinga. This most likely setting would be within the basement complex near the contact between the basement and the large regional batholith, and where the basement and batholith are intruded by the younger quartz diorite porphyry and dacite dikes and stocks.