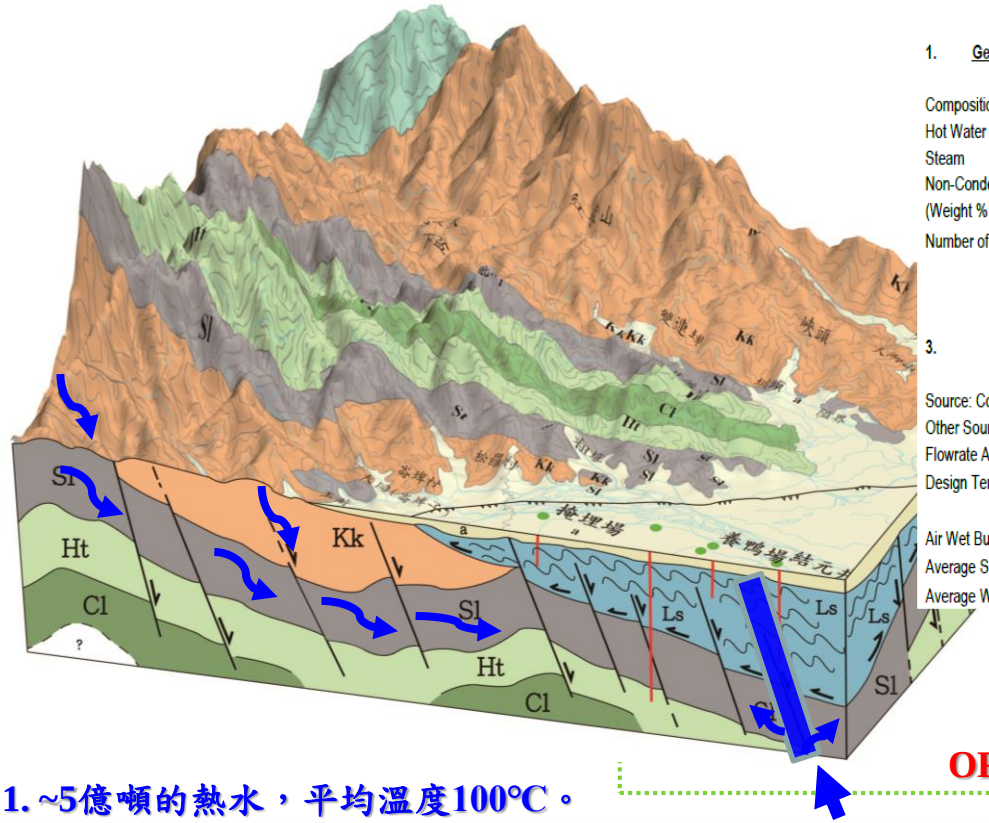
宜蘭平原深層地熱探勘鑽井及地熱系統開發研究-宜蘭平原南部地熱概念模型和精確潛能評估(1/2)

執行單位	台灣大學地質科學系暨研究所	計畫主持人	宋聖榮

- **三星地區地下3D地熱概念模型，提供未來在宜蘭平原地底下深層地熱探勘的基礎和精確地熱潛能的評估**

三星地區地下3D地熱概念模型



Geothermal Site Name: Sanxing Township, Yilan County (Cardinal Tien Junior College of Healthcare and Management)

1. Geothermal Fluid Data

Composition: (*
Hot Water : 100 %
Steam : 0 %
Non-Condensables : _____ %
(Weight % of vapor/volume % of vapor)
Number of wells for one OEC : 1

2. Flow and Output Characteristics

Geothermal Well Identification: 1 wells
Flowrate: 200,000 kg/hr
Type of Well: Yes Artesian? (Y/N)
Temperature (at input to OEC): 100 °C
Minimum Discharge Temperature required: °C **(Recommend by ORMAT)**
Pressure (input to OEC): _____ Bar
Enthalpy: 418.88 kJ/kg
Well Casing Dimensions: _____

3. Cooling system Water / Air

Source: Cooling tower: YES (Y / N)
Other Source: _____
Flowrate Available: ___ m³/hr
Design Temperature: Winter 20.5 °C
Summer 32 °C
Air Wet Bulb Temperature: 22.71 °C (AVG. TEMP.)
Average Summer Air Temperature: 28.4 °C (°F)
Average Winter Air Temperature: 16.9 °C (°F)

4. Electrical Power Data

Price of Electricity ($/kWh): _____ Peak
0.154375 Average
Voltage Required: 4160 V (3 ph)
Frequency : 60 Hz
Kind of generator required: synchronous

ORMAT估計紅柴林二號井的產能約為 400 kWe.

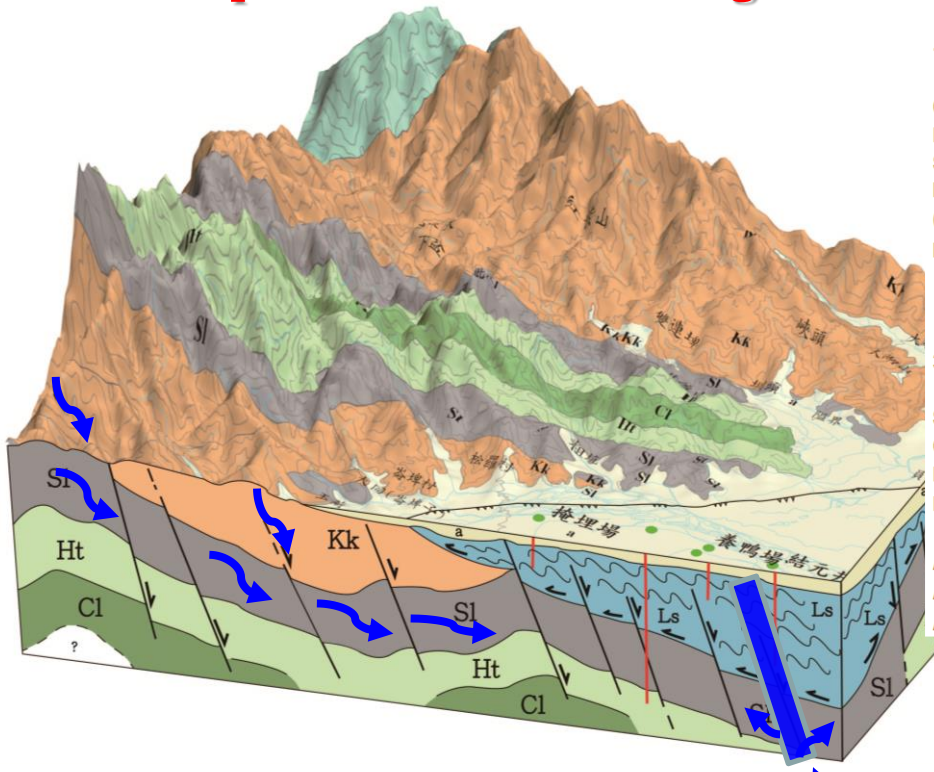
1. ~5億噸的熱水，平均溫度100℃。
2. 來自地下深部熱水平均溫度240℃ (220~260℃)。

- 承續能源國家型科技計畫中地熱主軸內容，在宜蘭地區獲得的成果，並結合國內外的專家學者，進行宜蘭地區從地表地質、地體構造、現地應力量測和溫度隨深度變化、裂隙分布、水文地質等到地質、地球化學、鑽井探勘等方法，再結合地球物理地探勘，建立深層地熱能源探勘和開發加強型地熱系統(EGS)的技術。
- 引進國外相關技術等，進行宜蘭蘭陽溪以南地區深層地熱概念模型和潛能評估、以及加強型地熱系統的場址選擇和統合研究，建立台灣自有地熱區地質探勘、鑽探、地熱儲集層模式和發電等整套地熱能源的探勘和開發技術。
- 第一年工作重點在蘭陽溪以南、羅東溪以東地區包含利澤—龍德地區；第二年在蘭陽溪以南、羅東溪以西地區包含三星紅柴林地區。未來進一步推廣應用於台灣其他地熱區的探勘與開發，期能達成國家能源規劃的目標。
- 已建立地下3D地熱概念模型，提供深層地熱能源探勘的技術。
- 受邀至IEA-Geothermal & IGA 所舉辦的研討會介紹台灣地熱。

Conceptual Model and Resource Evaluation of Geothermal Energy in the Southern Ilan Plain, Taiwan (1/2)

Execution Unit	Department of Geosciences National Taiwan University
Project Director	Sheng-Rong Song

3D conceptual model of Sanxing Area.



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Kind of generator required: synchronous

1. **~500 millions tons hot waters with average temperature around 100 ℃ in shallow reservoir.**
2. **Hot waters with average temperature around 240℃ from deep reservoir.**

The ORMAT estimates that the Well No.2 of Hungtsailin can produce about 400 kWe.

- Follow the purpose of MOST's master project of National Energy Program II on geothermal energy, the results collected from Ilan Plain, and recruiting domestic and international experts to develop the exploring and exploiting deep geothermal power potentials and evaluating the sites for enhanced geothermal system (EGS) in the Ilan area.
- The works include on the survey of surface geology, determining the stress of current state from focal mechanism regionally, and borehole- and core-based methods locally and of paleo-states from fault-slip data of outcrop and core, temperature variations with depth (geothermal gradient), distributions of fracture pattern, hydraulic fracturing test, the fluids of hydrology and geochemistry, geophysical investigations and drilling, etc. The aims are to explore the deep geothermal reserves preciously, to build up conceptual model and to evaluate the feasibility, build the techniques and choose the best sites for enhanced geothermal system.
- The exploring sites focus on the southern Lanyan River with the east and west of Luodong River covering the Liche-Longte and Sansing areas at the first and second years, respectively.
- We have constructed the 3D geothermal conceptual model in Sanxing area, that provides techniques for deep geothermal exploitation in Taiwan.
- I was invited to present geothermal energy in the IEA-Geothermal & IGA workshops.