

Current Geothermal Development Projects in Taiwan

*Shou-Cheng Wang¹, Chung-Cheng Chang² and Chao-Shing Lee³

^{1,3} National Taiwan Ocean University, Institute of Applied Geosciences, Taiwan

² National Taiwan Ocean University, Department of Electrical Engineering, Taiwan

e-mail: singerpronku@gmail.com

ABSTRACT

Taiwan has several high potential areas, the National Energy Program-II (NEP-II) has reassessed about 160 GWe geothermal energy potential in Taiwan, about 30% of that in US. With the new renewable energy targets of Taiwan's new government, the geothermal energy wish to reach 600 MWe by 2025, this market is estimated to be about 6 billion US\$. For green energy choices, conventional geothermal system (CGS) has become the most friendly base-loaded power as for ecosystem impacts and human health impacts, and also demonstrates as distributed generation resource which display a critical alternative for upcoming "Energy Transition" in Taiwan.

A geothermal promotion team in National Taiwan Ocean University (NTOU) has worked together with several local industrial and consultant companies and associations for gathering as Geothermal Developers' Council (GDC) in compliance with international practice for mitigating geothermal development risks. Currently, there are six geothermal plant projects supported by our promotion team, one of the projects is in NTOU campus, the other one is the first passed environment impact assessment (EIA) case.

There are two new exploration technologies improved from magnetotelluric (MT) method have been tested in active fault zone with high geothermal gradient. Comparing to seismic profile, the fracture zone in base rock is easier identified by new technology. However, more cases need to be verified and analyzed.

Bridging the gaps of geothermal technology, legal framework, and social communication are critical for geothermal development in Taiwan, and they are highly relied on the global cooperation among the industry, academia and government.

Keywords: NEP-II, Energy Transition, conventional geothermal system, magnetotelluric technologies

1. NEW GOAL OF NEW GOVERNMENT

The nuclear-free homeland is the vision shared by the public under the "Basic Environment Act". In the meantime, Taiwan's power supply system is independent and over 98% of energy supply relies on imports. According to the "Renewable Energy Development Act", the target of renewable energy installation shall increase up to 6,500~10,000 MW for 20 years. To correspond with the upcoming goals for greenhouse gas (GHG) reduction, energy diversification, and renewable energy expansion, the renewable energy installation target is revised to reach 9,952 MWe by 2025, and 12,502 MWe by 2030. In other words, more aggressive targets are set for developing renewable energy in Taiwan. For geothermal power, the first 0.2 Mwe pilot plant which is executed by ITRI (Industrial Technology Research Institute) is located in Chinshui geothermal area in Dec. 2016. The target has delayed for four years, however new government provide more aggressive goal to reach 600 MWe by 2025, that is three times more and 5 years

shorter than the origin target (Wang et al., 2016). We recommend the international market update report (Anthony Rocco, 2016) should change announced developing capacity of Taiwan to 600 MWe.

2. GEOTHERMAL PROJECTS UPDATE

Our geothermal promotion team funded by NEP-II has worked together with several industrial and consultant companies and associations in recent three years. The organization is similar to development strategy in Japan (Amy Prebble, 2012). With stronger social consensus to green energy, there are ten geothermal projects in Taiwan now, two projects are in initial stage for exploration drilling conducted by MOST (Ministry of Science and Technology) and MOEA (Ministry of Economic Affairs), two pilot projects are in construction stage conducted by ITRI, six projects are boosted up by the promotion team, including the first EIA passed geothermal project in Letzer industrial zone. However, we recommend the international market update report (Anthony Rocco, 2016) should change number of announced projects of Taiwan to 2, based on the Chinshui BOT&ROT geothermal project and the 101 MWe Letzer geothermal project. (Fig. 1)

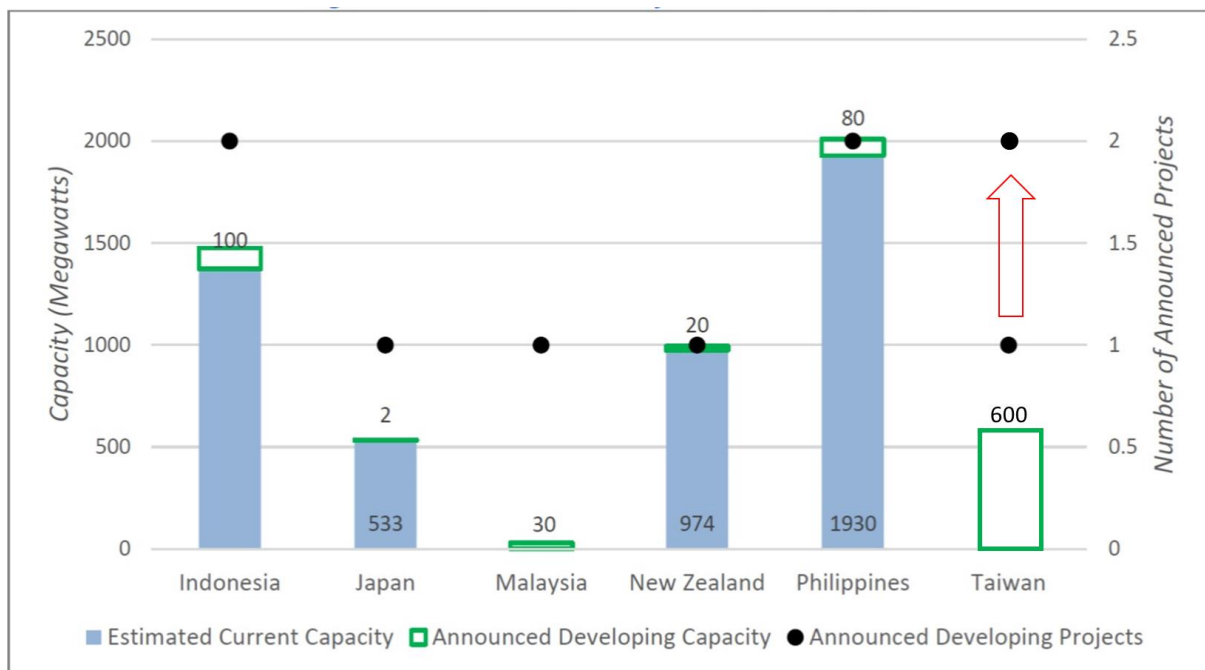


Fig. 1 Asia South-East Pacific Geothermal Power Capacity, the data of Taiwan is corrected.

3. EXPLORATION TECHNOLOGY

We have used the Multi-channel Telemetry Method (MTM) of stratum resistivity and the MT array technology for geophysical exploration in South-Eastern Yiland plain, where the high potential geothermal area have proved by geochemical data and geothermal gradient survey (Wang & Lee, 2015). MTM appears to be a better result for the fault-zone structures as comparing with the conventional seismic profiling as Fig.2. For the next stage, we will compare MT array 3D inversion result to MTM profile.

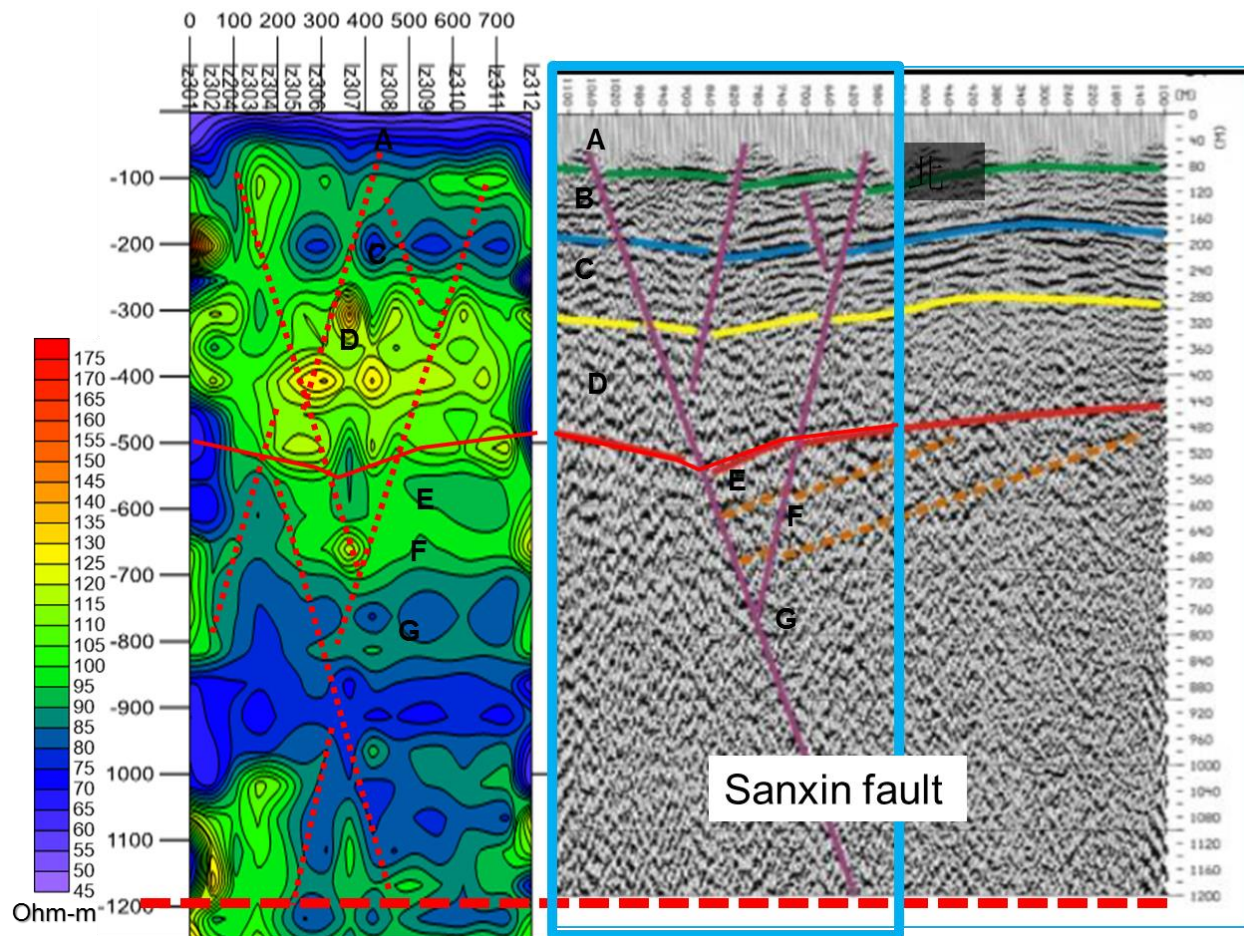


Fig 3. MTM(left) profile compares to seismic(right) profile, which is right through Sanxin fault.

4. CONCLUSIONS

- Conventional geothermal system is a critical green energy choice for “Energy Transition” and “nuclear-free homeland” in Taiwan. Global cooperation is the critical way to bridging the gaps of geothermal technology, legal framework, and social communication.
- There are six small geothermal plant projects are supported by NTOU team. One announced BOT & ROT geothermal project in Chinshui and one EIA-passed geothermal project in Letzer industrial zone. We suggest GEA international market update report should correct the data of Taiwan.
- The structure of fracture zone can be identified easily by MTM technology. We will compare the profile to different geophysical method.

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