Japan's RE status - Before and after FIT: The case of geothermal power generation

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Before FIT

Japan was known to have a geothermal potential in excess of 20GW, but no more than 540MW, or at most 2% of this potential, has been developed. The government did put effort into geothermal development as an alternative energy following the oil shock of the 1970s, but from about 1990, it promoted nuclear power generation instead as a measure to tackle global warming. The government became passive toward geothermal development (geothermal was removed from the list of new energy resources; only binary cycle power generation was included in RPS, etc.), and in 2010, the budget for geothermal development decreased to several hundred million yen, and the further budget screening process put the brakes on geothermal development in Japan. Amid such a situation, there was no new construction of geothermal power plants from 2000, and some companies pulled out of the geothermal business. In the context of the government's passive policy, geothermal development in Japan had been stagnant since 2000, unable to overcome three specific barriers: the problem of power generation costs, the problem of national parks, and the problem of hot springs.

After FIT

Following the introduction of the FIT system, since July 2012, the tariffs for geothermal power generation have been set at ¥27.3/kWh (for 15 years) for plants producing 15MW or more, and ¥42.0/kWh (for 15 years) for anything less than 15MW. These tariffs are considered sufficient to realize commercialization at sites with favorable conditions. However, six months on from the enforcement of FITs, at present (January 1, 2013), no plants have commenced generating geothermal power (Approved by November 2012, one small-scale generator will commence generating power in January 2013). This is because of the essential difference between geothermal and solar power generation. With solar, a power generation system can be installed immediately anywhere there is land. Geothermal power generation, however, even on a small scale, requires a certain amount of time for resource assessment and so on (in the case of small-scale binary systems, there are some situations where verification testing of the power generation system has not been completed). Thus, although there have been very few geothermal power plants so far established based on the FIT system, even at this time, it would seem important to examine the effects of the FITs. In doing so, it is reasonable to separate the examination according to the scale of power generation (three tiers: large-scale, medium-scale and small-scale). Large-scale assumes a system generating in the order of 10MW (at least 7.5MW), medium-scale in the order of 1MW (between 300kW and 7,499kW), and small-scale in the order of 100kW (less than 300kW).

1) Systems in the order of 10MW (at least 7.5MW)

At present, it would appear that surveys are being conducted with an aim of constructing power plants of this size in no fewer than ten sites in Japan. It can be said that the tariffs under the FIT system are having a favorable influence on business development at each of the sites where development of this class is assumed. However, more than the problem of costs, those sites are being hindered by the problems of national parks and hot springs.

2) Systems in the order of 1MW (between 300kW and 7,499kW)

This class of geothermal power generation is probably the one that receives the most benefit under the current FIT system. Environmental impact assessments are compulsory for large-scale power generation, and it is estimated that this takes about four years (consideration is currently underway for halving this). However, such a requirement does not apply in the case of systems generating less than 7.5MW (5MW in the case of some prefectural ordinances). Therefore, development of this class is effective, and it would appear that it also has a relative advantage in terms of cost. At present, there are several sites where this class of power plant is envisaged. With these sites, as long as resource assessment can be determined, there is a strong chance of the construction of power plants. In a few years' time, there might be some cases where plant construction has commenced.

3) Systems in the order of 100kW (less than 300kW)

These systems correspond to cases of so-called "hot spring power generation." It is said that there are plans for several sites across Japan, but currently, even the front-runner projects have only conducted verification testing. However, at sites where there are already unused hot spring waters and where resource reserves have been determined, there is the potential to begin operations immediately. According to media reports, a 60kW-class system has started generating power using the hot springs in Beppu, making it seemingly the first system to apply FITs for geothermal power generation. It is possible that this scale of hot-spring binary cycle power generation could be introduced to a number of places within a few years. One technical problem relating to hot-spring binary cycle power generation is the scaling. This problem will have to be resolved in order to maintain stable power generation. One solution could be to first transfer the heat from the hot spring water to fresh spring water and use this to generate power, but then there is the problem of thermal energy loss. An opportune possibility in this case could be to regulate the heat exchange so that the temperature of the hot spring water is just right for bathing. In any case, the conditions for this class of power generation vary from site to site, and so it is likely that progress will be made while accumulating the various experiences gained after the installation of each system. I reckon that, as we go through this learning phase, installation of systems will proceed at many other sites. As more and more people involved in hot springs increase their understanding of power generation based on these experiences, it is hoped that this will lead to understanding of geothermal power generation on a larger scale.

Summary

While it appears that the positive effects of the FIT system are sufficiently large for geothermal power generation, the installation of power generation facilities in a short time is difficult on account of the characteristics of the power generation systems. As such, it will take some time (at least several years) for those effects to materialize. As a consequence, when it comes to the adoption of renewable energy in Japan, for the meanwhile, our hopes will have to be pinned on solar and wind power generation. But, looking to 2020 and beyond, coupled with solutions for the problems of national parks and hot springs, geothermal power generation should also be able to begin making a genuine contribution.