

Re-regulation of geothermal energy development in Japan

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Geothermal resource areas based on hot spring distribution

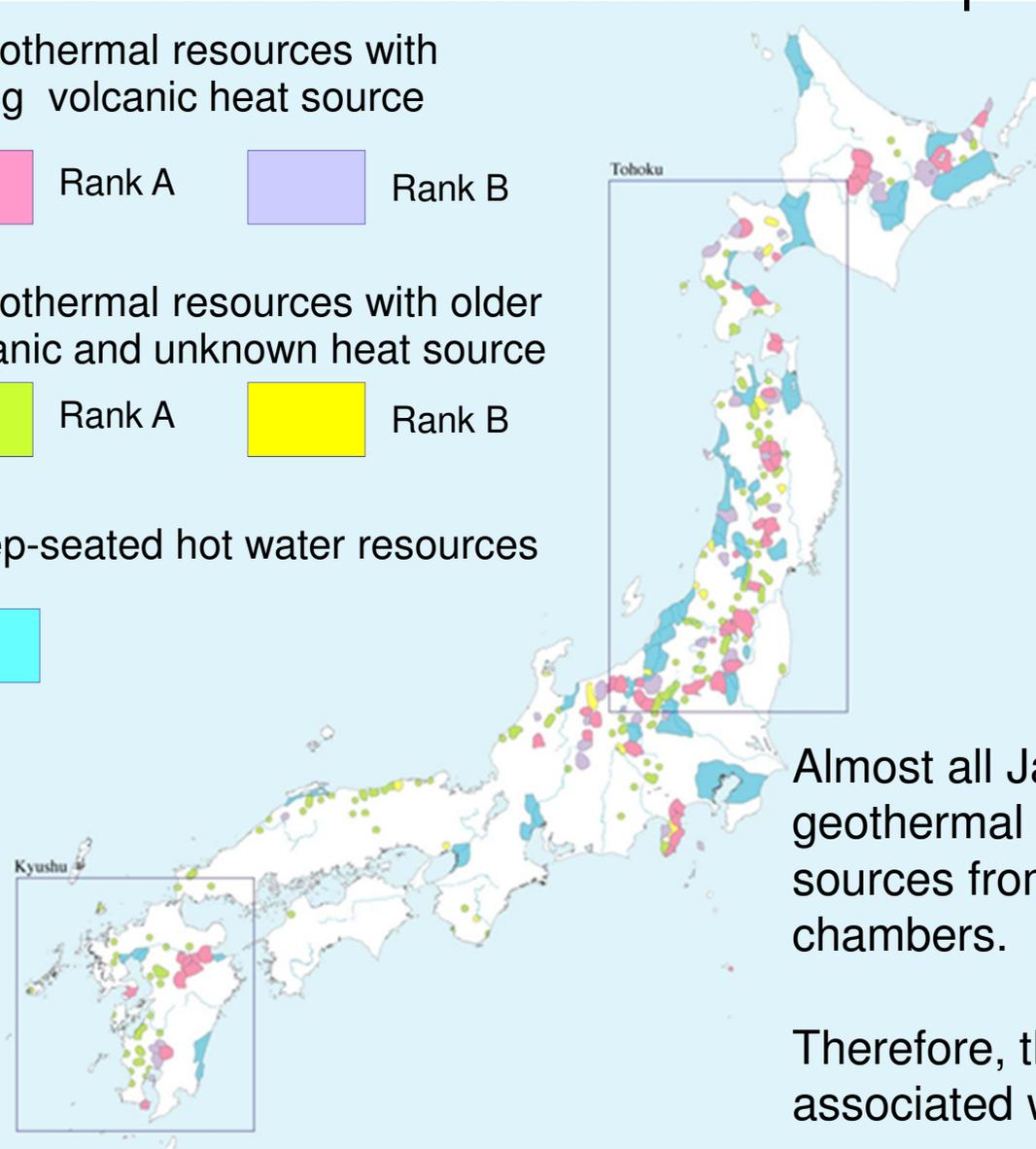
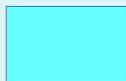
Hydrothermal resources with young volcanic heat source

Rank A
 Rank B

Hydrothermal resources with older volcanic and unknown heat source

Rank A
 Rank B

Deep-seated hot water resources



Almost all Japanese high-temperature geothermal systems have their heat sources from late Quaternary magma chambers.

Therefore, the systems are intimately associated with national parks.

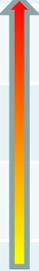
Natural Park Categories (Natural Parks Law)

Natural Parks	Administrative management
1. National Parks	Ministry of Environment
2. Quasi-National Park	Prefectural government
3. Prefectural Natural Parks	Prefectural government

Category based on degree of importance

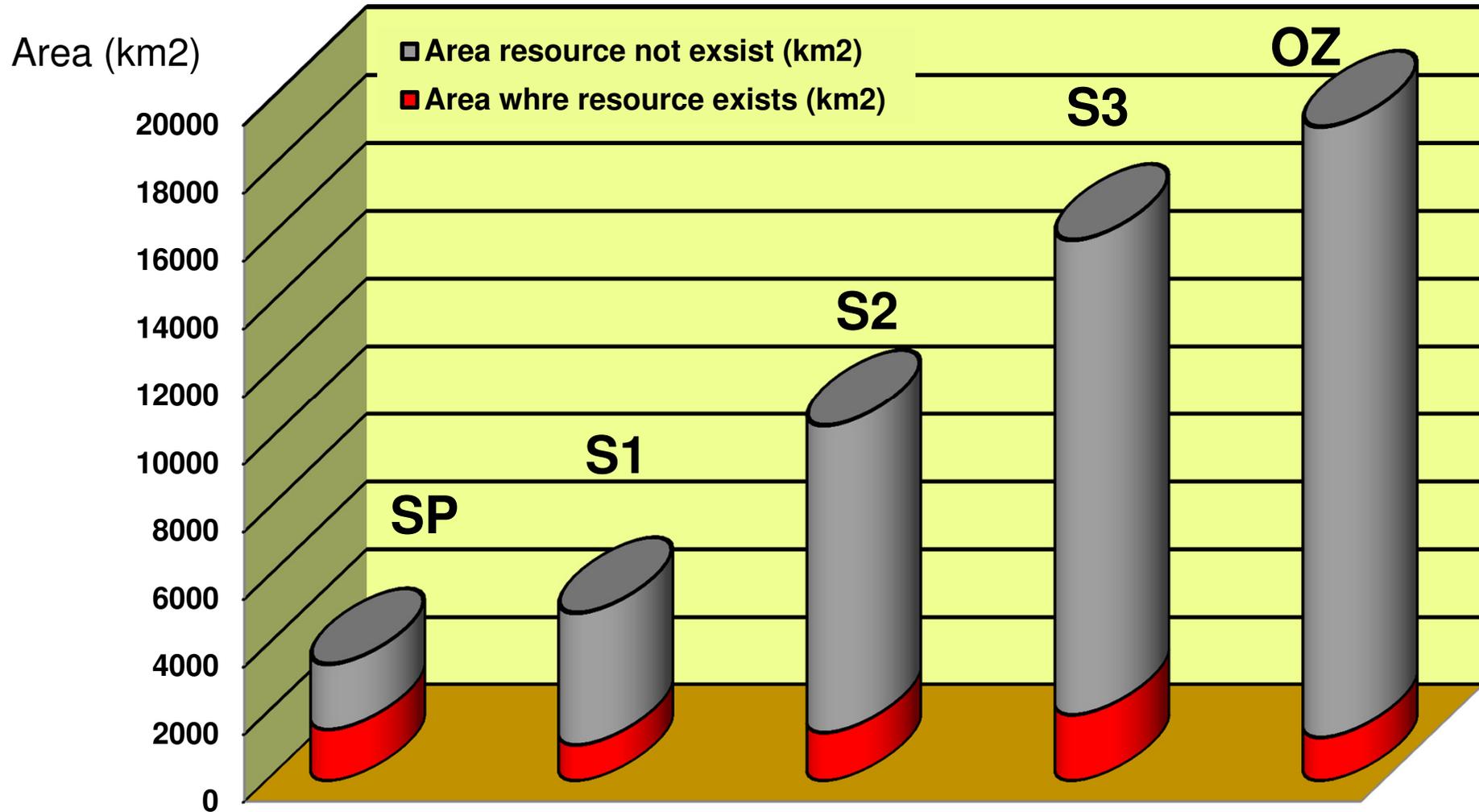
Natural Park Plans (5 terrestrial zones)

Division	Sub division	Abbreviation in following figures
Special zones Strict regulation	Special protection zones	SP
	Class 1 special zones	S1
	Class 2 special zones	S2
	Class 3 special zones	S3
Ordinary zones Soft regulation	Ordinary	OZ



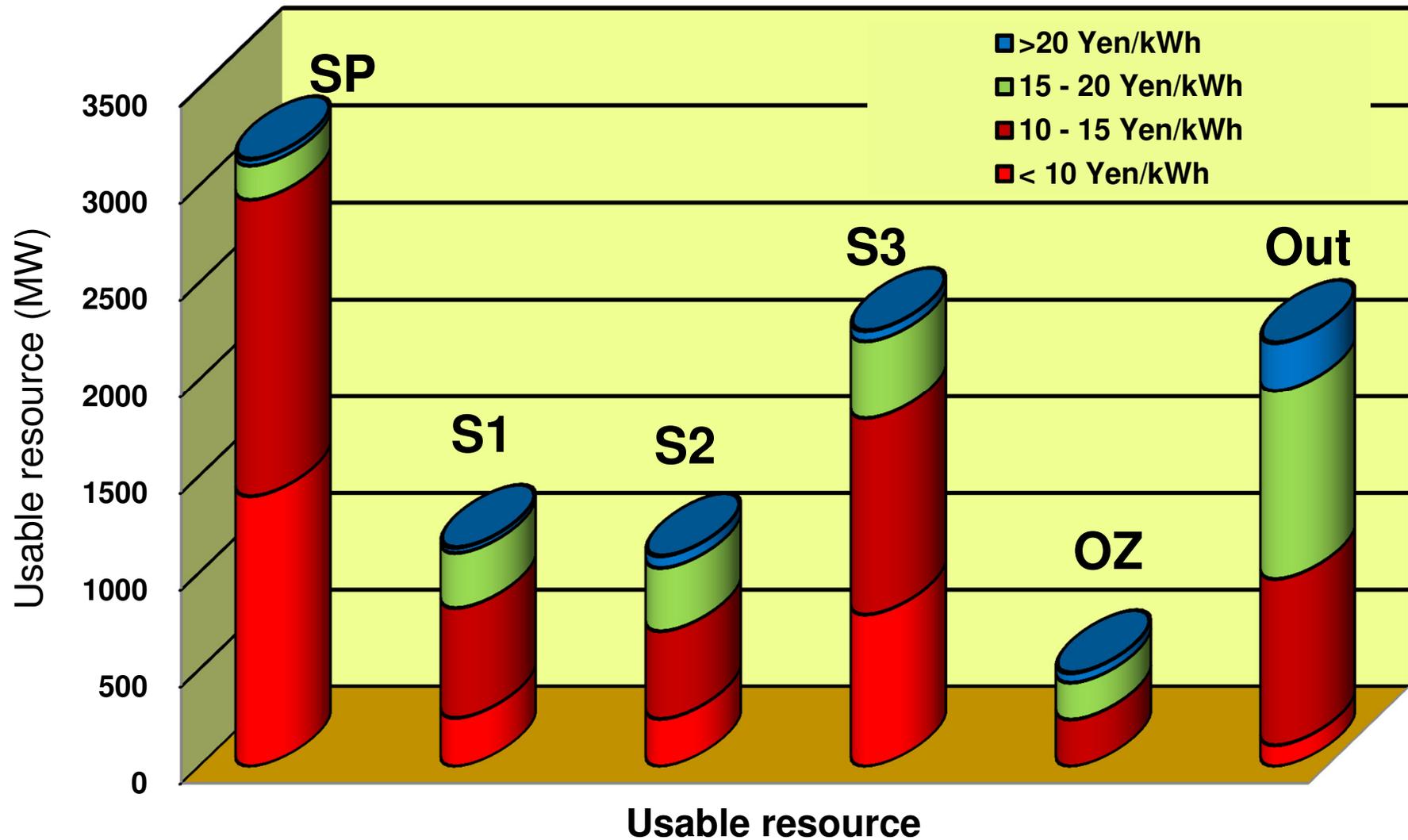
Geothermal resources in natural parks

- 81.9 % of high-temperature geothermal resources are distributed in the special protection zones and special zones of Natural Parks (Muraoka et al., 2008).
- Re-regulation is needed to carry out the geothermal developments in these zones



Comparison of area wherre resource exists and not exist

Ratios of areas containing high-temperature resources for each Natural Park category. High-T resources are relatively more common in highly ranked zones (SP)



Cost of Power Generation for each category: SP zones contain large resources (3000 MW) of relatively high-quality (low cost).

Development and exploration surveys in the Natural Parks

- Special Protection Zones and Class1 Special Zones often cover the central part (crater area) of volcanoes. Therefore, there might be some difficulty in developing geothermal energy in these areas.
- Exploration surveys of the wider area are necessary to understand underground resources. Surveys throughout the park areas are desired to clarify the situation regarding geothermal resources in the area. (Distribution of geothermal resources is not ruled by surface park plans.)

The Japanese Cabinet directed the Ministry of the Environment to re-examine the regulations regarding exploration and development in National Parks in order to promote geothermal development.

The Ministry of the Environment undertook a one-year study of the regulations in National Parks, and has made a new notice regarding geothermal development within National and Quasi-National Parks in March 2012 (see following slide).

Geothermal development, especially large scale development, in class 2 and 3 special zones is 'not impossible' according to the new ordinance, but is still very difficult.

Ordinance of the Ministry of the Environment

(27 March 2012)

1) Special Protection Zone and Class 1 special zone (SP and S1)

Development is not admitted, but gravity or MT survey will be admitted. This covers a wide area.

Deviated well drilling is not admitted.

2) Class 2 and Class 3 special zones (SP2 and SP3)

The development is not admitted unless of a small scale*.

Use of the existing hot spring water will be admitted.

Deviated well drilling will be admitted if there is no effect on the surface.

* Comment: Small scale development is expected to mean with a generator size of less than 3 MW.

Summary

- Among the Natural Park zones, special protection zones, which are the highest ranked protected zones in Japanese National Parks, have the best geothermal resource potential in quality and quantity.
- Investigations in Natural Parks, including special zones, were strongly desired to better understand the condition of prosperous geothermal resources.
- By the ordinance of the Ministry of the Environment on 27 March 2012, development at a small scale (<3 MW) is admitted.