

Greeting

In 2012, the national supporting system for the geothermal power generation was reformed and feed-in tariff for the renewable energy came into effect. Also deregulation for geothermal development in natural parks where the majority of geothermal power generation promising areas exist was realized with almost same timing. As a result desirable surroundings for the geothermal power generation are being prepared.

Meanwhile, concern about the environmental impact caused by geothermal power generation activity is being expressed by the local people concerned. Mitigation of the impact on the environment and co-existence of hot spring business and geothermal power generation industry are the important issues that the geothermal power generation business world has to tackle with all their strength.

Therefore, the new organization, Japan Geothermal Association (JGA), has been established by broadly calling for the participation of the geothermal related companies with the aim of solving the various issues related to geothermal development and of the healthy development of the geothermal power generation.

JGA represents geothermal development industry both in name and reality as a powerful and fresh association and will fulfil all the duties of the association.

Established Dec.4,2012

Chairman K.Ariki (Mitsubishi Materials Corporation)

- Main Activities**
- To conduct studies and surveys related to geothermal power generation
 - To suggest geothermal policies to the Government
 - To exchange information about geothermal power generation
 - To promote public acceptance for geothermal power generation

Regular Members as of Oct.1,2021 (79 Members)

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| <ul style="list-style-type: none"> •AKEMA BORING Co.,LTD. •Baseload Power Japan K.K. •Civil Engineering & Eco-Technology Consultants Co.,Ltd. •DAIICHI JITSUGYO CO.,LTD. •FIRST BROTHERS Co.,Ltd. •Geothermal Engineering Co.,Ltd. •INPEX CORPORATION •Japan Metals & Chemicals Co.,Ltd. •JFE Engineering Corporation •JGI,Inc. •JX Nippon Exploration and Development Co.,Ltd. •KINDEN CORPORATION •Machiokoshi Energy Co.,Ltd. •Mitsubishi Materials Corporation •MITSUI & CO.,LTD. •Mizuho Bank,Ltd. •Nittetsu Mining Co.,Ltd. •Obayashi Corporation •ORIX Corporation •RENOVA,Inc. •SHIMIZU CORPORATION •Sumiko Resources Exploration & Development Co.,Ltd. •Sumitomo Mitsui Construction Co.,Ltd. •TAKENAKA CORPORATION •The Kansai Electric Power Company Incorporated •Toshiba Energy Systems & Solutions Corporation •West Japan Engineering Consultants, Inc. | <ul style="list-style-type: none"> •Asunaro Aoki Construction Co.,Ltd. •Cenergy Co. •Cosmo Energy Exploration & Production Co.,Ltd. •Electric Power Development Co.,Ltd.(J-POWER) •FUJI ELECTRIC CO.,LTD. •Geophysical Surveying Co.,Ltd.(GSC) •INPEX DRILLING Co.,Ltd. •Japan Oil Engineering Co.,Ltd •JFE Steel Corporation •J-POWER Hytec Co.,Ltd. •Kawasaki Heavy Industries,Ltd. •KYOKUTO VALVE MFG. CO.,LTD. •Marubeni-Itochu Techno Steel Inc. •Mitsubishi Materials Techno Corporation •Mitsui Fudosan Co.,Ltd. •Mori Hamada & Matsumoto •Nittetsu Mining Consultants Co.,Ltd. •OKUAIZU GEOTHERMAL CO.,LTD. •OSAKA GAS CO.,LTD •Schlumberger Limited. •Shizen Energy Inc. •SUMITOMO CORPORATION •Sumitomo Mitsui Finance and Leasing Co.,Ltd. •TELNITE CO.,LTD. •TIX-TSK Corporation •TOSHIN KOGYO Co.,Ltd. | <ul style="list-style-type: none"> •Baker Hughes •Chubu Electric Power Co.,Inc. •COSMOS SHOJI CO.,LTD. •ENEOS Corporation •Geothermal Energy Research & Development Co.,Ltd. •Idemitsu Kosan Co.,Ltd. •ITOCHU Plantech Inc. •Japan Petroleum Exploration Co.,Ltd.(JAPEX) •JGC Corporation •JX Nippon Mining & Metals •K & O Energy Group Inc. •KYUSHU ELECTRIC POWER CO.,INC. •MITSUBISHI GAS CHEMICAL COMPANY,INC. •Mitsubishi Power,Ltd. •Mitsui Oil Exploration Co.,Ltd. •NIPPON STEEL ENGINEERING CO.,LTD. •NKKTUBES •OKUMURA CORPORATION •OYO Corporation •SB Energy Corp. •SK ENGINEERING CO.,LTD. •Sumitomo Forestry Co.,Ltd. •Taisei Corporation •TEPCO LAND MANAGEMENT CORPORATION •Tohoku Sustainable & Renewable Energy Co.Inc. •WELMA Co.,Ltd. |
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Special Members (10 Members)

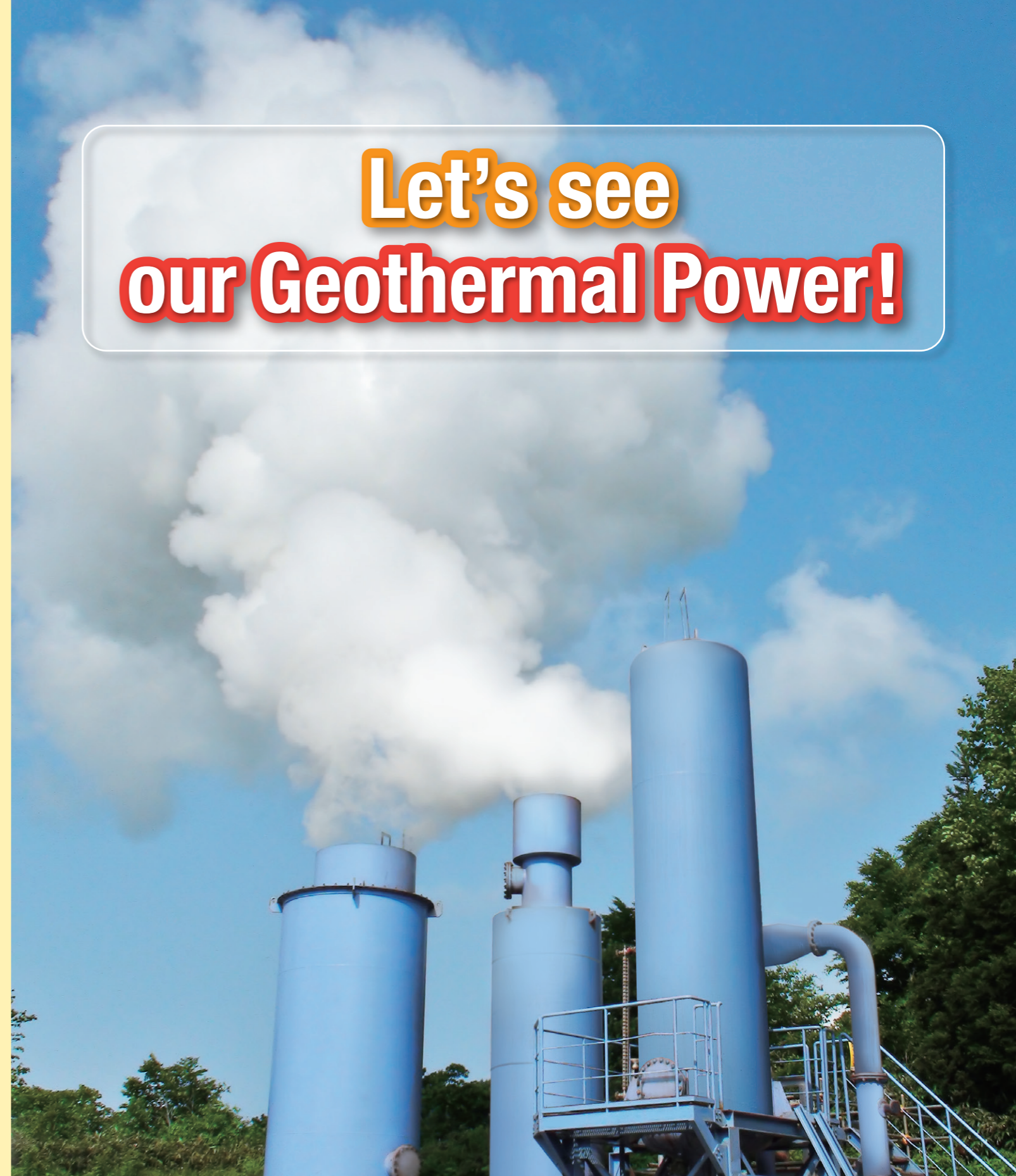
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| <ul style="list-style-type: none"> •Central Research Institute of Electric Power Industry •Institute for Geothermal Information •Japan International Cooperation Agency (JICA) •Kitakyushu International Techno-cooperative Association (KITA) •New Energy Foundation (NEF) | <ul style="list-style-type: none"> •Engineering Advancement Association of Japan (ENAA) •Institute for Sustainable Energy Policies (ISEP) •Japan Mining Industry Association •New Energy and Industrial Technology Development Organization (NEDO) •Thermal and Nuclear Power Engineering Society |
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Let's see
 our Geothermal Power!



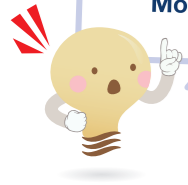
Geothermal Power Plants in Japan

The total installed capacity of geothermal power plants in Japan as of 2020 is 540,000 kW, which is the 10th in the world.

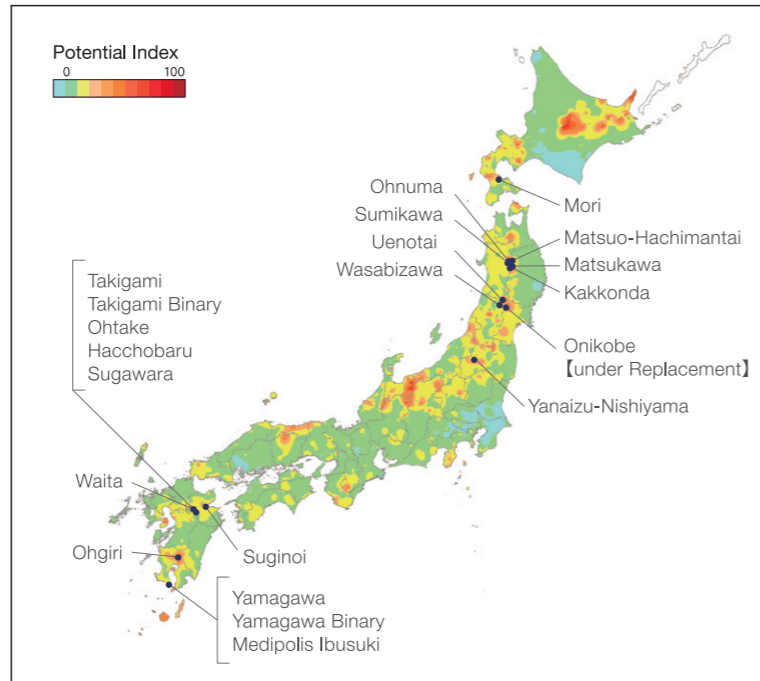
So many geothermal plants in Japan!



However, they account for only 2.3% of the geothermal resources in Japan! Most of our resources has been undeveloped yet!



Locations of geothermal power plants in Japan on the Geothermal Resources Potential Map (Muraoka et al., 2007)



Plant Name(Location)	kW	Type	Since	FIT
Mori (Hokkaido)	25,000	DF	1982.11.26	
Matsukawa (Iwate)	23,500	DS	1966.10.08	
Matsuo-Hachimantai(Iwate)	7,499	SF	2019.01.29	FIT
Kakkonda (Iwate)	(No.1) 50,000	SF	1978.05.26	
	(No.2) 30,000	SF	1996.03.01	
Onikobe (Miyagi) [under Replacement]	[15,000]			
Ohnuma (Akita)	9,500	SF	1974.06.17	
Sumikawa (Akita)	50,000	SF	1995.03.02	
Uenotai (Akita)	28,800	SF	1994.03.04	
Wasabizawa(Akita)	46,199	DF	2019.05.20	FIT
Yanaizu-Nishiyama (Fukushima)	30,000	SF	1995.05.25	
Waita (Kumamoto)	1,995	SF	2015.06.16	FIT
Suginoi (Oita)	1,900	SF	2006.04.01	
Takigami (Oita)	27,500	SF	1996.11.01	
Takigami Binary(Oita)	4,330	B	2017.03.01	FIT
Ohtake (Oita)	14,500	DF	2020.10.05	
Hacchobaru (Oita)	(No.1) 55,000	DF	1977.06.24	
	(No.2) 55,000	DF	1990.06.22	
	2,000	B	2006.04.01	
Sugawara (Oita)	4,400	B	2015.06.29	FIT
Ohgiri (Kagoshima)	25,800	SF	1996.03.01	
Yamagawa (Kagoshima)	30,000	SF	1995.03.01	
Yamagawa Binary(Kagoshima)	4,550	B	2018.02.23	FIT
Medipolis Ibusuki (Kagoshima)	1,410	B	2015.02.18	FIT

[Generaiton type] DS: Dry steam, SF: Single flash, DF: Double flash, B: Binary
 [FIT] Feed-in Tariff is applied
 Revised of / Thermal and Nuclear Power Engineering Society of Japan(2019)

Geothermal Development

In Japan on the graph, geothermal development in terms of installed capacity has not expanded since 1996. There are three main reasons why geothermal power plant installed base has not been growing.

Reason 1. Cost

Geothermal power generation has not received investment by private companies for several reasons; 1. Long cycle times of research and design to deployment, 2. Risk of development of unproven underground resources, 3. High investment cost of initial research, and 4. Unstable and low price of electricity pricing as well as the price of steam.

Feed in Tariff (FIT) began in 2012; it fixed the price of electricity when selling and helped establish stable investment conditions to enable projects. In addition, the subsidy for initial research and financial support for exploration and development have created favorable economic conditions for growth.

Reason 2. National Park

It is well known that geothermal resources are abundant in Japan, but about 80% of the resources exist in National Parks; thereby limiting geothermal development in National Parks since 1974.

An update to policy in 2012 ushered in an era of geothermal development allowed in class 2 and 3 special zone especially when the environment is not impacted or local stakeholders agree to allow development. Moreover, the height restriction on architecture under 13m have been eased and directional drilling from outside of the zone to inside of class 1 special zone is approved.

Reason 3. Hot springs

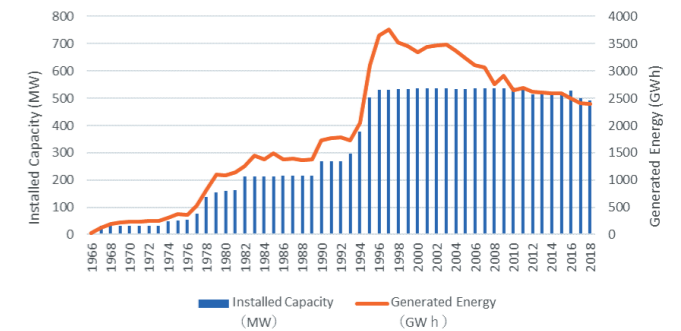
Hot springs are popular not only for Japanese people but also for foreign tourists in Japan. Hot springs can be found all around Japan, and there are quite a few volcanic hot springs which are located near geothermal development sights.

Some of hot springs owners have been reluctant to accept geothermal power plants for fear of adverse effects to their businesses.

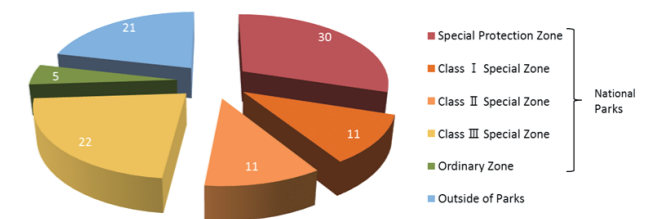
Contrary to the fears, there are 12 large-scale (over 10MW) geothermal power plants, and the oldest one has been running for over 50 years, and they have not had adverse effects on hot springs resort operators. To mitigate the risk, care must be taken to measure and monitor the well for performance so to prevent negative impact to hot springs stakeholders. Many positive secondary impacts can come from developing heat source from geothermal development such as supplying heat to greenhouses.

We have taken steps to work with local communities to educate them about the positive impacts, the commitment we have to them, and our deep respects for the continued operations of the hot springs.

Geothermal Power Generation in Japan



Geothermal Resource Reserves (%)



Geothermal Technology in Japan

Japan is at the forefront leading high level geothermal research and development as well in the deployment of technology. Japanese manufacturers have led the drive to develop technology of the core components of geothermal power plants and continue to lead the world. Most notably, turbines supplied by Japanese manufacturers account for over 60% of world share of geothermal power plants.

World Share of Geothermal Turbines (%)

