

# Geothermal shows potential

**M**ORE THAN 500 MW of geothermal power capacity (newly installed) was realised in 2013, a 42.3% increase over 2012. This translated to an overall global capacity of approximately 12 GW of geothermal power by the end of 2013.

Unlike solar or wind, the concentration of geothermal energy seems relegated to a few select areas. New Zealand, Turkey, the United States, Kenya, Mexico, the Philippines, Germany, Australia and Italy added the bulk of the new geothermal capacity in 2013. In fact, around 75% of the global geothermal capacity was installed in five of those countries [63]–[68]. Following is a breakdown:

**Africa.** Kenya represents around 220 MW and Ethiopia generated 7 MW of energy from geothermal resources, particularly those sources in the East African Rift Valley. Kenya added 36 MW and 16 MW of capacity at the Olkaria III complex in 2013 and early 2014, respectively. Additionally, Uganda, Ruanda and Tanzania have plans to increase or install new capacities in geothermal power plants.

**Asia.** This continent represents the biggest potential of geothermal reserves. Considerable geothermal reservoirs are already partly developed in the Philippines (1,900 MW) and in Indonesia (1,300 MW). By contrast

Japan (540 MW), China (Tibet, 24 MW) and Thailand (0.3 MW) have a significant lower installed geothermal capacity. In Asia, roughly 60 projects are currently under development and approximately 860 MW newly installed electrical capacity are under construction (e. g. the Lumat Balai complexes in South Sumatra).

**Europe.** Geothermal electricity generation is dominated by Italy and Iceland. By the end of 2013 there were approximately 880 MW and 600 MW installed in these countries, respectively. Meanwhile, Turkey and Russia (Kamtschatka) have an installed capacity of 150 and 82 MW. In Germany (32 MW), Portugal (23 MW), France (17 MW) and Austria (1.4 MW) only a relatively small capacity in geothermal power plants exists. In 2013 Europe added around 140 MW in 8 power plants to this power plant stock (e. g. Kirchstockach, Dürrenhaar and Sauerlach (Germany, totaling 15 MW), Kizildere II (Turkey, 80 MW). More than 120 projects across 13 countries are

currently under development.

**North America and Central America.** The US represents the biggest player in geothermal electricity generation with 3.6 GW. In 2013 the US added around 90 MW of geothermal capacity to the existing geothermal power generation system. The most noteworthy installations were the Enel Green Power binary power plant in Fort Cove (Utah, 25 MW) and the Don A. Campbell binary power plant (Nevada, 16 MW).

In Mexico, geothermal installed capacity increased by 1,000 MW. In El Salvador (205 MW) and Costa Rica (170 MW) geothermal energy contributes up to 26% and 13% of the national electricity demand, respectively. Geothermal energy is also being developed in Nicaragua (87 MW) and in Guatemala (49 MW).

**South America.** This region is home to excellent geothermal reservoirs, but they remain largely untapped due to high investment costs for exploration and drilling and the lack of necessary infrastructure.

**Oceania.** In New Zealand geothermal energy contributes up to 11% to cover the national electricity demand in 2013 (850 MW). In 2013 the country added around 240 MW of geothermal capacity. The Ngatamariki power plant (82 MW) was commissioned in 2013; Papua New Guinea has an installed geothermal capacity of 61 MW. In Australia geothermal energy plays only a minor part (0.12 MW).

## References

1. BNEF: Global Trends in Clean Energy Investments, 15.01.2014.
2. Hydropower World Atlas, 2013.
3. International Water Power and Dam Construction, 2013.
4. 2013 IHA Report.
5. Wikipedia
6. 2013 IHA Report.
7. Hydropower World Atlas, 2013.
8. Wikipedia
9. Hydropower World Atlas, 2013.
10. Pumped Storage Development Council.

Region	Cumulated installed capacity 2013		Installed capacity 2013		Estimated electricity generation 2013	
	[GW]		[MW]		[TWh/y]	
North American	5.1		100.0		28.8	
South American	0.0		0.0		0.0	
Europe	1.9		140.0		11.5	
Asia	3.8		0.0		26.5	
Oceania	1.0		240.0		4.7	
Africa	0.2		52.0		1.5	
<b>World Total</b>	<b>12.0</b>		<b>532.0</b>		<b>73</b>	
Largest national market	USA	3.6	New Zealand	240	USA	19.0

Table 9. Summary of global geothermal power market in 2013 [63]– [69].

11. [www.nordex-online.com](http://www.nordex-online.com)
12. [www.genewscenter.com](http://www.genewscenter.com)
13. [www.triglobalenergy.com/newsblog](http://www.triglobalenergy.com/newsblog)
14. [www.africareview.com](http://www.africareview.com)
15. [http://vestas.com/en/investor/announcements#!140401\\_ca\\_uk\\_17](http://vestas.com/en/investor/announcements#!140401_ca_uk_17)
16. [www.sunwindenergy.com](http://www.sunwindenergy.com)
17. [www.nawindpower.com](http://www.nawindpower.com)
18. [www.londonarray.com/2013/07/05/prime-minister-david-cameron-inaugurates-worlds-largest-offshore-wind-farm](http://www.londonarray.com/2013/07/05/prime-minister-david-cameron-inaugurates-worlds-largest-offshore-wind-farm)
19. [www.stromtarife.de](http://www.stromtarife.de)
20. EPIA Global Market Outlook for Photovoltaics 2014-2018 - Medium Res.
21. U.S solar Market insight-Q1 2014.
22. IEA PVPS Annual Report 2013.
23. [www.germanenergyblog.de](http://www.germanenergyblog.de)
24. Il Sole 24 ore <http://www.ilsole24ore.com/art/notizie/2013-06-06/fotovoltaico-stop-conto-energia-174258.shtml?uuid=AbSRim2H>. Federico Rendina, 06 June 2013.
25. PV-Tech [http://www.pvtech.org/news/french\\_energy\\_regulatory\\_commission\\_to\\_announce\\_new\\_tariff\\_rates\\_for\\_q1\\_of](http://www.pvtech.org/news/french_energy_regulatory_commission_to_announce_new_tariff_rates_for_q1_of). Lucy Woods, 03/02/2014.
26. [www.gov.uk https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/the-renewables-obligation-ro](https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/the-renewables-obligation-ro)
27. PV Magazine [http://www.pv-magazine.com/news/details/beitrag/greece-announces-drastic-fits-cuts\\_100011277/#axzz35HfeHM29](http://www.pv-magazine.com/news/details/beitrag/greece-announces-drastic-fits-cuts_100011277/#axzz35HfeHM29), Ilias Tsagas, 13 May 2013.
28. Greentechsolar <http://www.greentechmedia.com/articles/read/how-romania-became-a-1-giga-watt-market>. Scott Moskowitz and Adam James, 24 March 2014.
29. Trefis <http://www.trefis.com/stock/tsl/articles/235585/the-state-of-the-chinese-solar-market/2014-04-29>, April 2014.
30. PV Magazine.
31. IEA <http://www.iea.org/policiesandmeasures/pams/japan>.
32. IA. U.S. Solar Market Insight report Q1 2014.
33. [www.energy.gov.to http://www.energy.gov.to/index.php/term/172-implementation-of-uae-grant-funded-500-kw-solar-station-vava-u-to-commence-early-2013](http://www.energy.gov.to/index.php/term/172-implementation-of-uae-grant-funded-500-kw-solar-station-vava-u-to-commence-early-2013)
34. <http://www.pvresources.com/pvpowerplants/top50.aspx>
35. PV Tech [http://www.pvtech.org/news/german\\_pv\\_jobs\\_fell\\_by\\_almost\\_50\\_in\\_2013\\_more\\_losses\\_expected](http://www.pvtech.org/news/german_pv_jobs_fell_by_almost_50_in_2013_more_losses_expected) Andy Colthorpe
36. PV Tech [http://www.pv-tech.org/guest\\_blog/top\\_10\\_pv\\_module\\_suppliers\\_in\\_2013](http://www.pv-tech.org/guest_blog/top_10_pv_module_suppliers_in_2013) Ray Lian
37. PV Tech [http://www.pv-tech.org/news/ihs\\_predicts\\_cp\\_v\\_market\\_set\\_for\\_explosive\\_growth](http://www.pv-tech.org/news/ihs_predicts_cp_v_market_set_for_explosive_growth) Lucy Woods, 11 December, 2013.
38. PV Magazine <http://www.pv-magazine.com/investors/module-price-index/#axzz35SU0aiSB>.
39. 2013 PV Inverter Supplier Rankings: Asian Suppliers Tighten Grip as European Leadership Weakens <https://technology.ihs.com/496723/2013-pv-inverter-supplier-rankings-asian-suppliers-tighten-grip-as-european-leadership-weakens>.
40. NREL <http://www.nrel.gov/csp>.
41. CSP Today Global Tracker <http://social.csptoday.com/projects>
42. Stromgestehungskosten Erneuerbare Energien, Studie, November 2013. Fraunhofer ISE.
43. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century): Renewables 2014- Global Status Report, Paris, 2014.
44. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century): Renewables 2014- Global Status Report, Paris, 2014.
45. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century): Renewables 2014- Global Status Report, Paris, 2014.
46. EurObserv'ER: Solid Biomass Barometer, December 2013.
47. EurObserv'ER: Renewable Municipal Waste Barometer, 2013.
48. EurObserv'ER: Biogas Barometer, December 2013.
49. International Energy Agency (IEA): IEA Energy Technology Essentials - Biomass for Power Generation and CHP, Jan. 2007.
50. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century): Renewables 2014-Global Status Report, Paris, 2014.
51. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century)
52. EurObserv'ER: Solid Biomass Barometer, December 2013.
53. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century)
54. EurObserv'ER: Solid Biomass Barometer, December 2013.
55. EurObserv'ER: Renewable Municipal Waste Barometer, 2013.
56. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century): Renewables 2014 - Global Status Report, Paris, 2014.
57. EurObserv'ER: Biogas Barometer, December 2013.
58. REN21 (Renewable Energy Policy Network for the 21<sup>st</sup> Century- Global Status Report)
59. EurObserv'ER: Solid Biomass Barometer, December 2013.
60. EurObserv'ER: Renewable Municipal Waste Barometer, 2013.
61. EurObserv'ER: Biogas Barometer, December 2013.
62. International Energy Agency (IEA): IEA Energy Technology Essentials - Biomass for Power Generation and CHP, Jan. 2007.
63. Janczik, S.; Kaltschmitt, M.: Nutzung der Tiefen Geothermie in Deutschland und Weltweit- Statusreport 2014; Erdöl, Erdgas, Kohle 130 (2014), 7/8, S. 280 - 285.
64. Proceedings in World Geothermal Congress 2010, Bali, Indonesia, 25-29 April 2010.
65. EurObserv'ER: The State of Renewable Energies in Europe 2009 Edition. [www.eurobserv-er.org/downloads.asp](http://www.eurobserv-er.org/downloads.asp) (Zugriff: 06.03.2010).
66. REN 21, Steering Committee: Renewables 2013 - Global Status.
67. Geothermal Energy Association: Annual U.S and Global Geothermal Power Production Report, April 2014.
68. Rybach, L.: Global Geothermal Energy - Status and Challenges, 7th International Geothermal Conference, Freiburg 2011.
69. Bloche, K.; Witt, J.; Kaltschmitt, M.; Janczik, S.: Erneuerbare Energien. Stand 2012 weltweit BWK 65 (2013) Nr. 6, S. 6 - 17.
70. BNEF: Global Trends in Clean Energy Investments, 15.01.2014..
71. EIA, U.S. Energy Information Administration: International Energy Statistics, Data Set as of July 2014.