



POLICY BRIEF

(Marietta Sander, Executive Director of the International Geothermal Association)
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Geothermal in International Energy Strategy Papers

In early summer 2011 three energy strategies were launched by leading international energy organisations. In the following I would like to inform you about their main contents and implications for the geothermal sector:

1. Technology Roadmap - Geothermal Heat and Power, International Energy Agency (IEA)
2. Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN), Intergovernmental Panel on Climate Change (IPCC)
3. Renewables 2011 Global Status Report, REN21

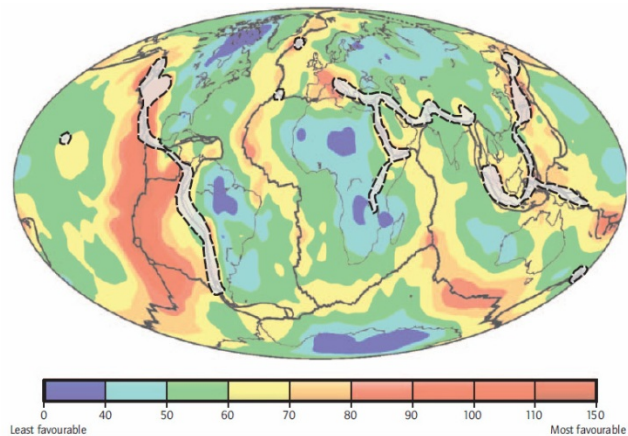


Fig. 1: Convective hydrothermal resources (IEA Technology Roadmap Geothermal 2011)

Ad 1) Technology Roadmap – Geothermal Heat and Power, International Energy Agency (IEA)

The "*Technology Roadmap - Geothermal Heat and Power*" was recently launched by the IEA at the occasion of the EURELECTRIC annual conference in June 2011 in Stockholm. The IEA was founded in 1974 as autonomous organisation, in order to safeguard energy security in its 24 member states and additional countries. The IEA aims at promoting sustainable energy strategies, transparency and international cooperation in order to identify solutions for global energy challenges.

With the series *Technology Roadmaps* the IEA formulated a targeted guideline for governments, industry and research institutes in order to propose specific measures and milestones which are necessary to increase the use of renewable energies (RE). A clear target for geothermal energy



use globally is to increase the percentage of geothermal in the global power generation from currently 0.3% to 3.5% by 2050. Accordingly, the use of geothermal heat shall be increased from the current level of 0.3% to 3.9% by 2050. Geothermal heat pumps are exempted from the study.

The study emphasises the necessary measures to bring geothermal a step ahead:

1. Further development of geothermal sites of high enthalpy reservoirs (see figure 1) with increasing subsequent use of geothermal heat through binary power plants (ORC, Kalina).
2. Increasing efforts in Research and Development (R&D) and demonstration projects of submarine resources, supercritical resources, mine waters, drilling technology and Enhanced Geothermal Systems (EGS). An increase of the EGS projects from the current 20 (also in planning stage) to 50 by 2050 is necessary. Herewith, EGS systems shall be deployed sustainably, widely and in an economically cost-efficient manner by 2030.
3. Establishing clear geothermal and investor-friendly framework conditions (concessions, feed-in-tariffs, Power Purchase Agreements, tax holidays, national energy masterplans).

According to the study necessary prerequisites for the above proposed action items are financial incentives like risk mitigations funds or insurances, strategic advisory to decision-makers, databases and technical guidelines.

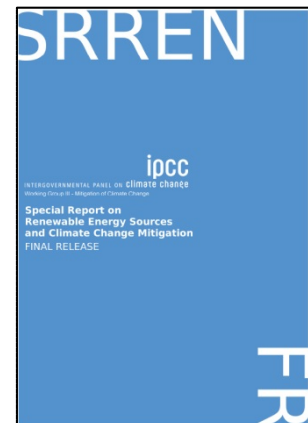
The Technology Roadmap provides clear, but rather general advice for the measures to be taken. It becomes clear that significant R&D funds are available in industrialised countries. Hopefully, this will lead to a closer cooperation of industrialised countries with developing countries. The Technology Roadmap also incorporates information on the different geothermal resources, technologies, power plant technology, economics and case studies from Indonesia. In addition, country-specific risk mitigation schemes are presented and advice given to the involved stakeholders. Hints to how to attain the necessary financial resources for developments are not yet included in the roadmap.

Document download at: http://www.iea.org/papers/2011/Geothermal_Roadmap.pdf

Ad 2) Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN), Intergovernmental Panel on Climate Change (IPCC)

The *Intergovernmental Panel on Climate Change* (IPCC) was established by the *United Nations Environment Programme* (UNEP) and the *World Meteorological Organisation* (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.

Since April 2008 a group of 120 leading experts compiled the SRREN with the aim of presenting the role of renewable energies for climate change mitigation. The report provides clear guidelines how 80% of energy supply could be provided through RE resources by 2050. Besides a summary for policymakers and chapters with integrated topics the six RE technologies bioenergy, geothermal, solar energy, ocean energy, hydropower and wind energy are presented in detail.



The SRREN shows that investor-friendly political and legal framework conditions like national energy strategies and clear license procedures play a vital role to achieve the 80% RE target by 2050. It is inspiring to see that 50% of the global RE resources are deployed in developing countries. Similar to the IEA Roadmap the target group of the SRREN are decision-makers in governments, industry, financial sector and academia.

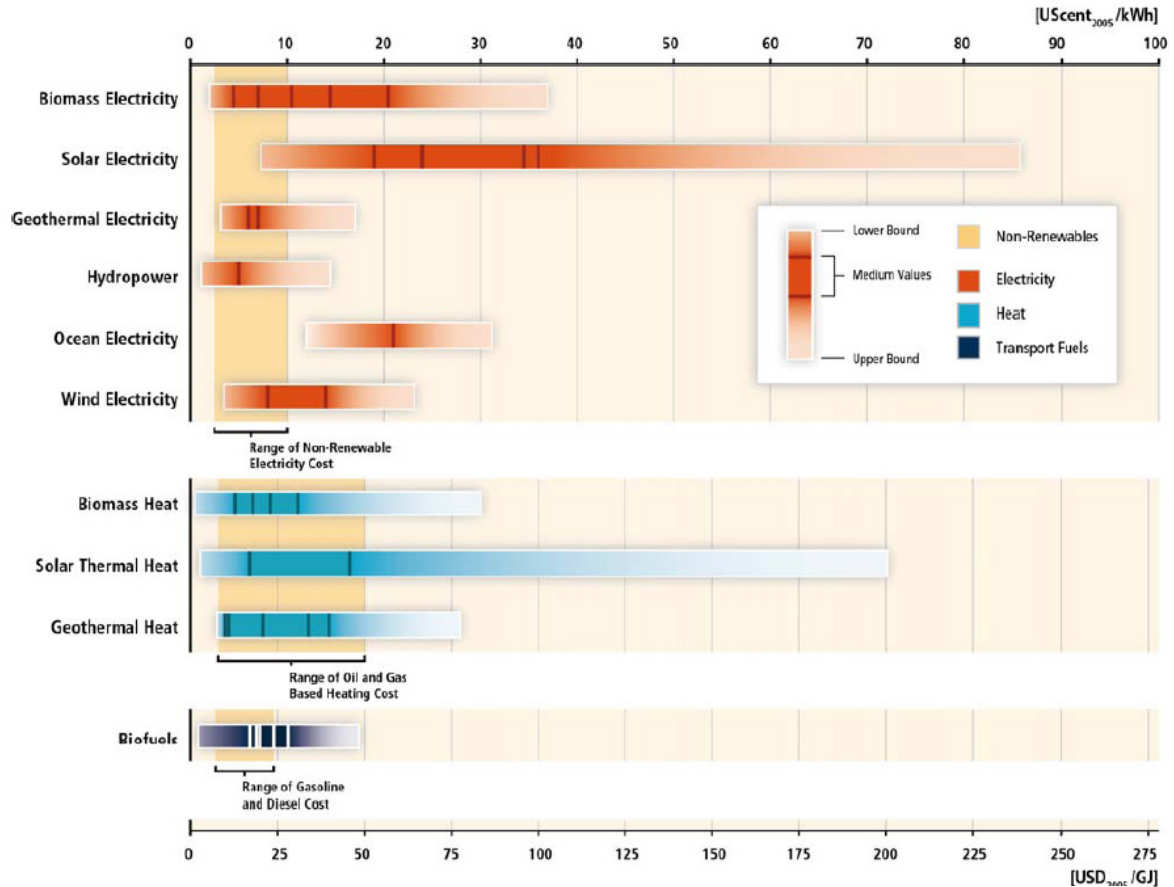


Fig. 2: Range in levelised cost of energy (IPCC SRREN 2011)

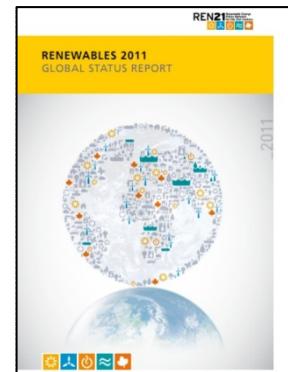
For geothermal the authors estimate an increase to 140-160 GW_{el} by 2050 from the current level of 11 MW_{el}. The installed direct use capacity is estimated to reach 800 GW_{th}. The geothermal chapter provides a good overview of the global and regional resource potential, GHG emissions in the whole project cycle (Life Cycle Analysis), emission during operation, economics (see figure 2) and required research and optimisation approaches.

Document download at: <http://srren.ipcc-wg3.de/report>

Ad 3) Renewables 2011 Global Status Report, REN21

The REN21 was founded subsequent to the *International Conference for Renewable Energies – Renewables 2004* which took place in Bonn, Germany. REN21 promotes RE to meet the needs of both industrialised and developing countries that are driven by climate change, energy security, development and poverty alleviation. Herein three action areas are promoted: Policy, Advocacy, and Exchange.

The *Global Status Report 2011* focuses on regulatory and investor-friendly framework conditions and provides information on market trends and investment developments. Until now RE enabling policies have already been established in 119 countries.



Regarding geothermal the latest data on global applications are provided, the largest equipment suppliers mentioned and the *Renewable Heat Incentive* of Great Britain is presented. This incentive provides subsidies to house owners for the installation of heating and cooling systems in buildings.

Document download at:

<http://www.ren21.net/REN21Activities/Publications/GlobalStatusReport/GSR2011/tabid/56142/Default.aspx>

Conclusion:

All three recently published strategy documents reflect that groundbreaking steps are necessary in order to increase the use of geothermal resources. Significant tasks are required in the following fields:

1. Creation of RE-friendly regulatory legal and institutional framework conditions (policy) and investor-friendly incentive schemes.
2. R&D and technology optimization for EGS, drilling projects, exploratory methods, supercritical and submarine reservoirs, binary power plant technology.
3. Advocacy and policy dialogue on geothermal.

The proposed action items of the examined energy strategies correspond with the insight I gained while working on an international technical assistance project in countries adjacent to the East African Rift System over the past 3 years.

During the last geothermal workshop in East Africa in December 2010 (see Figure 3) the following action items were identified: (1) Financing; (2) Optimisation of national regulatory framework conditions; (3) Advisory to policy makers; and (4) Capacity building.

The German government supports the geothermal sector in East Africa through the *Geothermal Facility for Eastern Africa* which was developed by the KfW (German Development Bank).



Fig. 3: Participants of the *Geothermal Policy Workshop*, Rwanda, Dec. 2010