

The IEA-GIA Geothermal Trend Report

A new survey report about geothermal applications and developments in IEA-GIA member countries

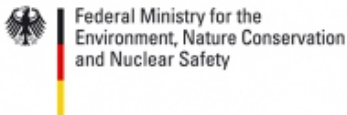
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International Energy Agency – Geothermal Implementing Agreement (IEA-GIA)
Annex X – Data Collection and Information



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IEA-GIA Data Collection Activities

ANNEX X

Request Information →

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Annex X- Data Collection and Information

Operating Agents: Leibniz Institute for Applied Geophysics (LIAG), Germany; and the Federal Office of Energy (BFE), Switzerland

Annex Leader: Britta Ganz, Leibniz Institute for Applied Geophysics (LIAG), Germany

Status: Ongoing

Participants: Mandatory participation of all GIA Country Members

Description

The main objective of Annex X is to collect essential data on geothermal energy uses, trends and developments in GIA Member Countries and to publish these data in an annual reports available as hardcopy and on the GIA website for wide public distribution. This report will provide a brief overview of data trends such as installed capacities and produced electricity and heat, as well as relevant political and economic information. All Country Members are required to participate in this Annex, and all Sponsor members support this effort by providing supplementary material. There are plans to extend the data collection to non-GIA Member Countries, with emphasis on the remaining leading geothermal nations.



- collect data on geothermal energy uses in GIA countries
- publication of annual report (web, hardcopy)
- data trends (power and heat) + relevant political/ economic information

Questionnaire

POWER

HEAT

SAVINGS

Geothermal Power 2011		
>> Total number of geothermal power plants and plants newly installed in 2011 <<		
<i>Table 1</i>		
Total number of geothermal power plants in operation (2011)		18
Newly-installed geothermal power plants in 2011		0
>> Installed capacity in different plant types <<		
<i>Table 2</i>		
Plant type	MWe installed (cumulative) by the end of 2011	Number of units (end of 2011)
Dry Steam	53	1
Flash Steam	507	4
Binary (ORC/ Kalina)	77	9
Other	157	4
Total	794	18
if "other" plant type, which?	3 hybrid binary-flash, 1 combined heat-power	
>> Capacity and Electricity Production << (power plants and combined heat and power plants)		
<i>Table 3</i>		
Capacity and Energy Production	unit	Value
Gross installed capacity by the end of 2011 [MWe]	MWe	794.0
Operating capacity by the end of 2011 [MWe]	MWe	758.0
Newly installed geothermal capacity in 2011 [MWe]	MWe	0.0
Geothermal power produced in 2011 *	GWh/yr	5,770.0
Capacity factor (2011)	-	0.87
Please note that the installed capacity is given in MWe, and the energy produced in GWh/yr.		
* Combined heat and power plants: Please fill in here data for power produced and installed (electric) capacity. Heat production is asked for in a separate sheet.		
Difference between installed and operating capacity is caused by Ohaaki (installed 105 Mwe, but operating capacity as of 2011, 69 MW) Actual output was 340 GWh, ie average capacity factor relative to operating capacity (69 MWe) was 0.56. Average capacity factor for all other plants was 0.9		

Fossil fuel and CO₂ Savings

Automatic Heat calculation by

- installed produced energy heat use
- category and savings
- geot factors (GHP)
- geothermal contribution
- cooling with GHP

stated (+ new) capacity
electricity production

Questionnaire

HIGHLIGHTS & HSE

POLICY

Geothermal Highlights 2011
 Highlights: Please give a brief overview about 2011's geothermal highlights, such as newly installed plants or planned projects, new research activities, or other positive developments in the geothermal energy sector or use expansions.

Energy Market and National Policy - News for 2011

How does geothermal fit into the national energy strategy? Is geothermal part of policy concepts to reduce greenhouse gas emissions? Which national support mechanisms are provided? What is new in 2011?

JOBS & COSTS

Jobs, Costs, Investments 2011

>> Geothermal-related employments in 2011 <<
 Table 11

SAVINGS

CO₂- and Energy Savings for 2011

Tables 8, 9 and 10 are filled in automatically (you can skip this page).
 To provide comparable data of the participating countries, energy and CO₂ savings by geothermal

HEAT

Direct use of Geothermal Heat 2011

POWER

Geothermal Power 2011

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Policy

- role of geothermal in national policy
- investment in geothermal
- planning national policy

Highlights & Challenges

- project news
- research and development
- challenges and development constraints (induced seismicity, technical problems, legal aspects)

Savings factor [toe/GWh]	Fossil fuel savings [toe]
253	1,462,118
127	357,581
	1,819,699

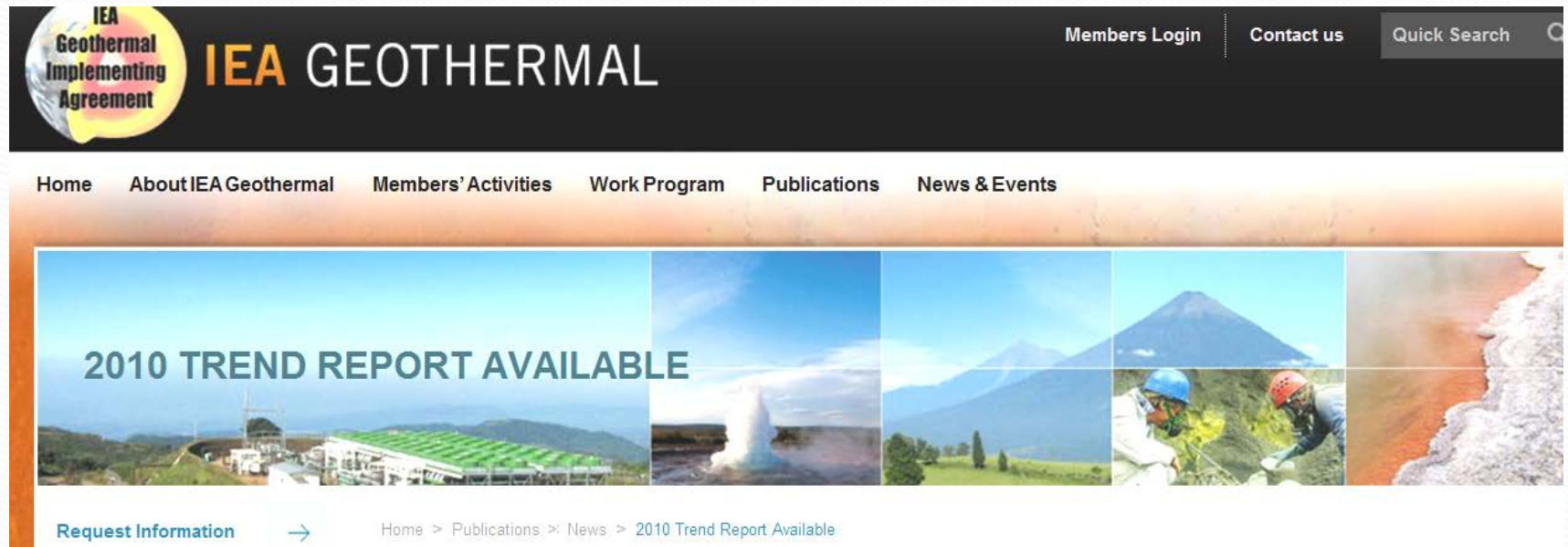
Total CO₂ savings by substitution of gas/ oil/ coal in tonnes [t CO₂]

1,113,610	US\$ 900,000,000
4,714,090	US\$ 900,000,000
5,498,810	

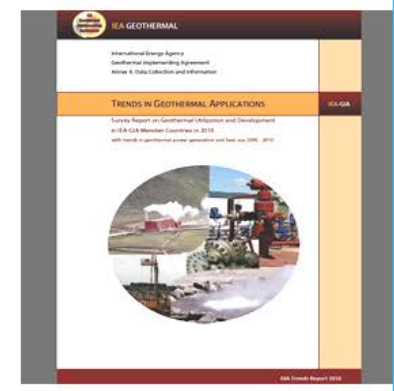
Total CO₂ savings by substitution of gas/ oil/ coal in tonnes [t CO₂]

273,759
1,154,306
1,346,219

First Trend Report



- 2010 Trend Report available since August 2012 on GIA Homepage (<http://iea-gia.org>)
- 250 hard copies



Relevant Links

[2010 Geothermal Trend Report](#)

2011 Trend Report



IEA GEOTHERMAL

International Energy Agency
Geothermal Implementing Agreement
Annex X: Data Collection and Information

TRENDS IN GEOTHERMAL APPLICATIONS

IEA-GIA

Survey Report on Geothermal Utilization and Development
in IEA-GIA Member Countries in 2011
with trends in geothermal power generation and heat use 2000 - 2011



Geothermal Heat and Power 2011: Overview

France

17.7 MWe/ 56.6 GWh/a
1,599 MWt/ 3,594 GWh/a

United Kingdom

298 MWt/ 500 GWh/a

Norway

1,000 MWt/ 3,000 GWh/a

Switzerland

1,239 MWt/ 1,910 GWh/a

Germany

7.3 MWe/ 18.7 GWh/a
2,433 MWt/ 4,600 GWh/a

Spain

75 MWt/ 195 GWh/a

Italy

882.5 MWe/ 5,315 GWh/a
1,000 MWt/ 3,500 GWh/a

Japan

540.1 MWe/ 2,652.2 GWh/a
2,096 MWt/ 7,141 GWh/a

Iceland

664.6 MWe/ 4,701 GWh/a
2,061 MWt/ 7,000 GWh/a

USA

3,111 MWe/ 16,700 GWh/a
9,564 MWt/ 21,144 GWh/a

Republic of Korea

343 MWt/ 622 GWh/a

World

11,250 MWe/ 69,370 GWh/a
54,200 MWt/ 127,500 GWh/a

GIA total

6,975.3 MWe/ 41,738.1 GWh/a
22,289 MWt/ 56,829 GWh/a

Mexico

958 MWe/ 6,524 GWh/a
156 MWt/ 711 GWh/a

Australia

0.1 MWe/ 0.6 GWh
30 MWt/ 90 GWh/a

New Zealand

794 MWe/ 5,770 GWh/a
396 MWt/ 2,822 GWh/a

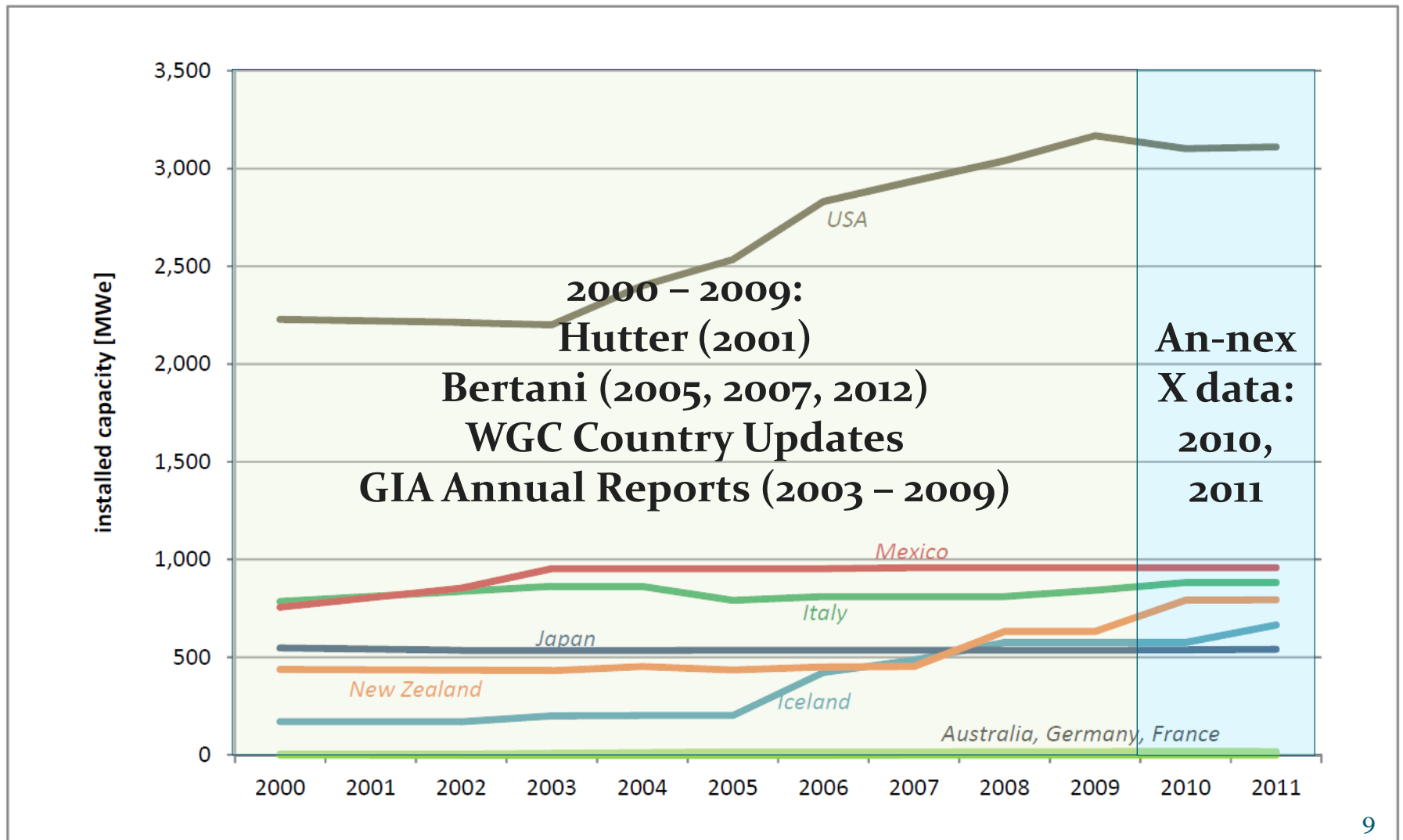
--- electric capacity and power generation
--- heating capacity and heat production

Geothermal Power Generation



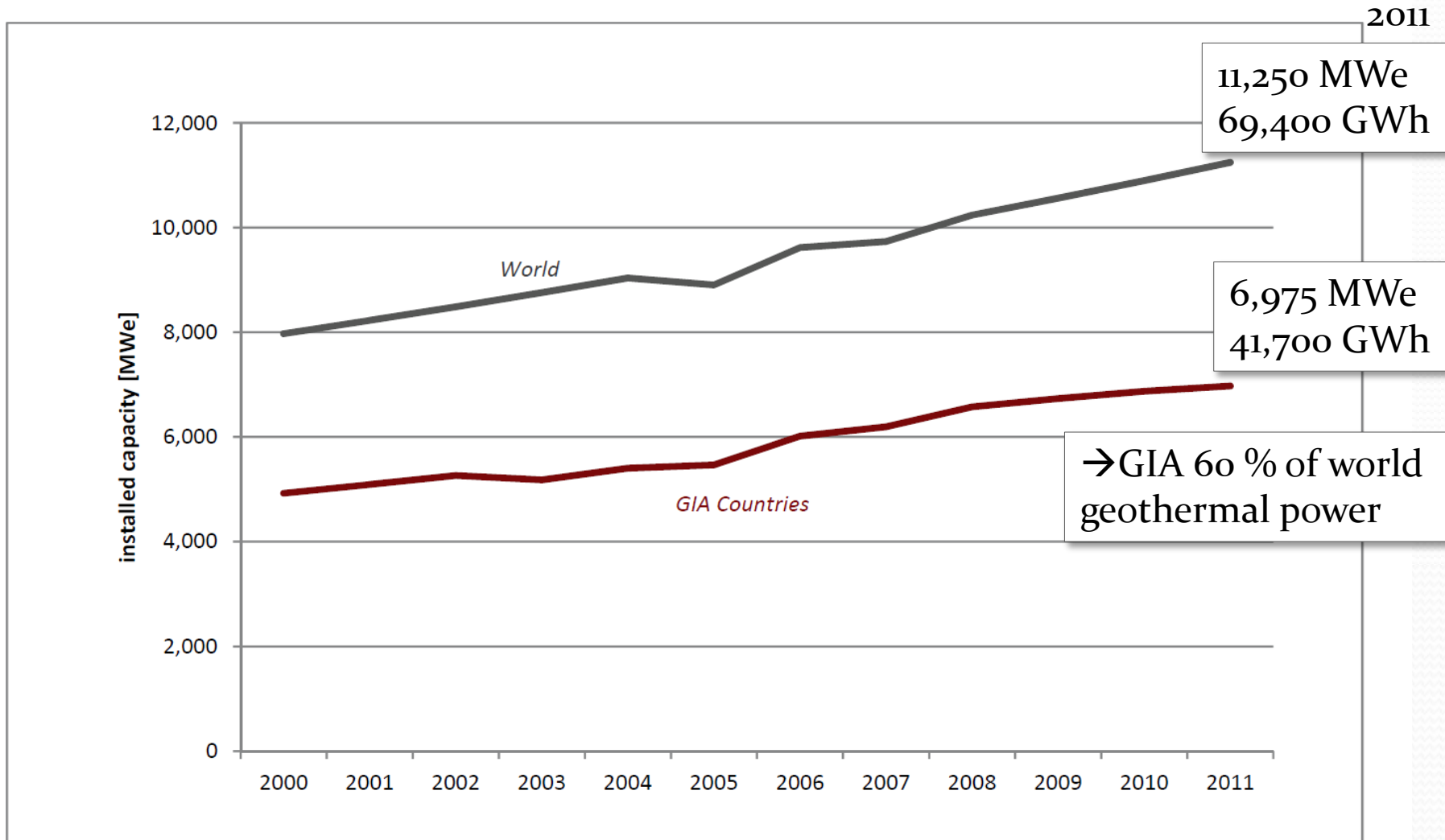
Electricity: Installed Capacity

Trends in geothermal power generation: installed capacity in GIA countries 2000 - 2011

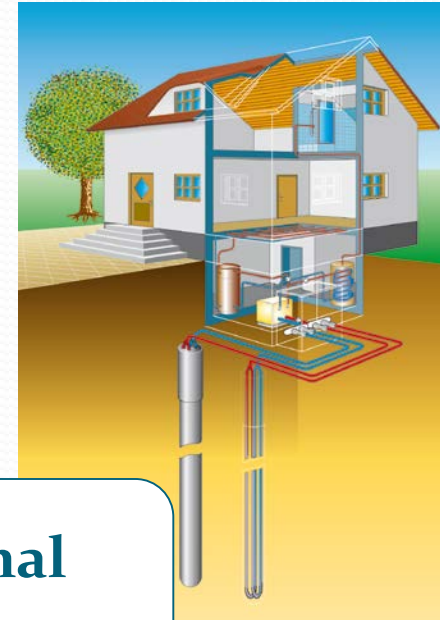


Installed Capacity GIA/ World

Trends in geothermal power generation: installed capacity worldwide and in GIA countries 2000 - 2011



Heat Use



Direct use categories

- District heating
- Space heating
- Greenhouses
- Bathing/ spa
- Agriculture
- Fish farming
- Snow melting
- Other



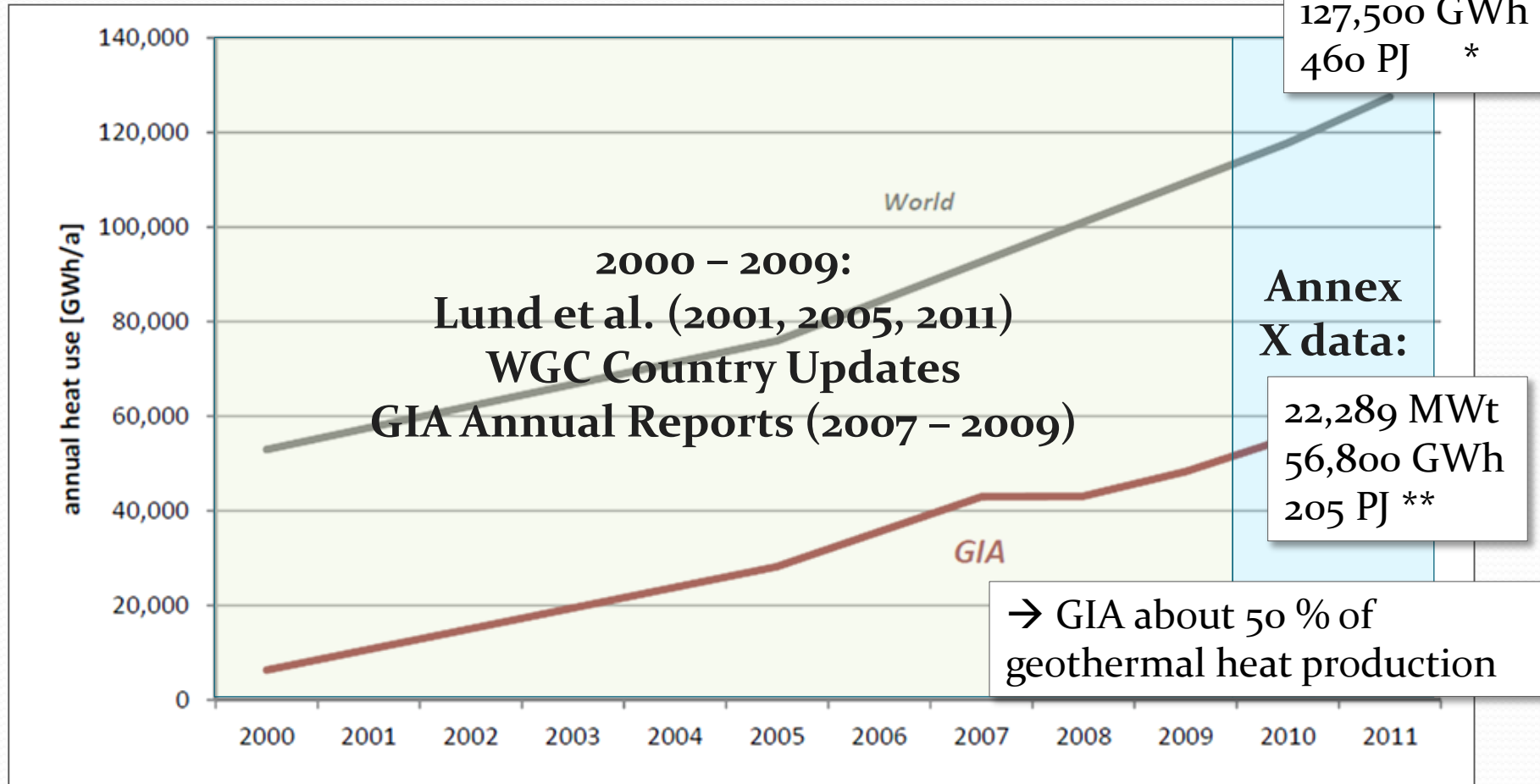
Geothermal heat pumps



Heat Use: Data Quality

- GIA: standardized data from 2010 on, but reliable, up-to-date statistics often not available
- geothermal cooling: almost no official data
- difficult to outline trends for GIA from 2000 on (e.g. reliability and availability of data, total heat/ geothermal contribution)
 - heat use data best possible estimation
 - trend with uncertainties
 - aim to further improve data-base

Trends in Geothermal Heat Use

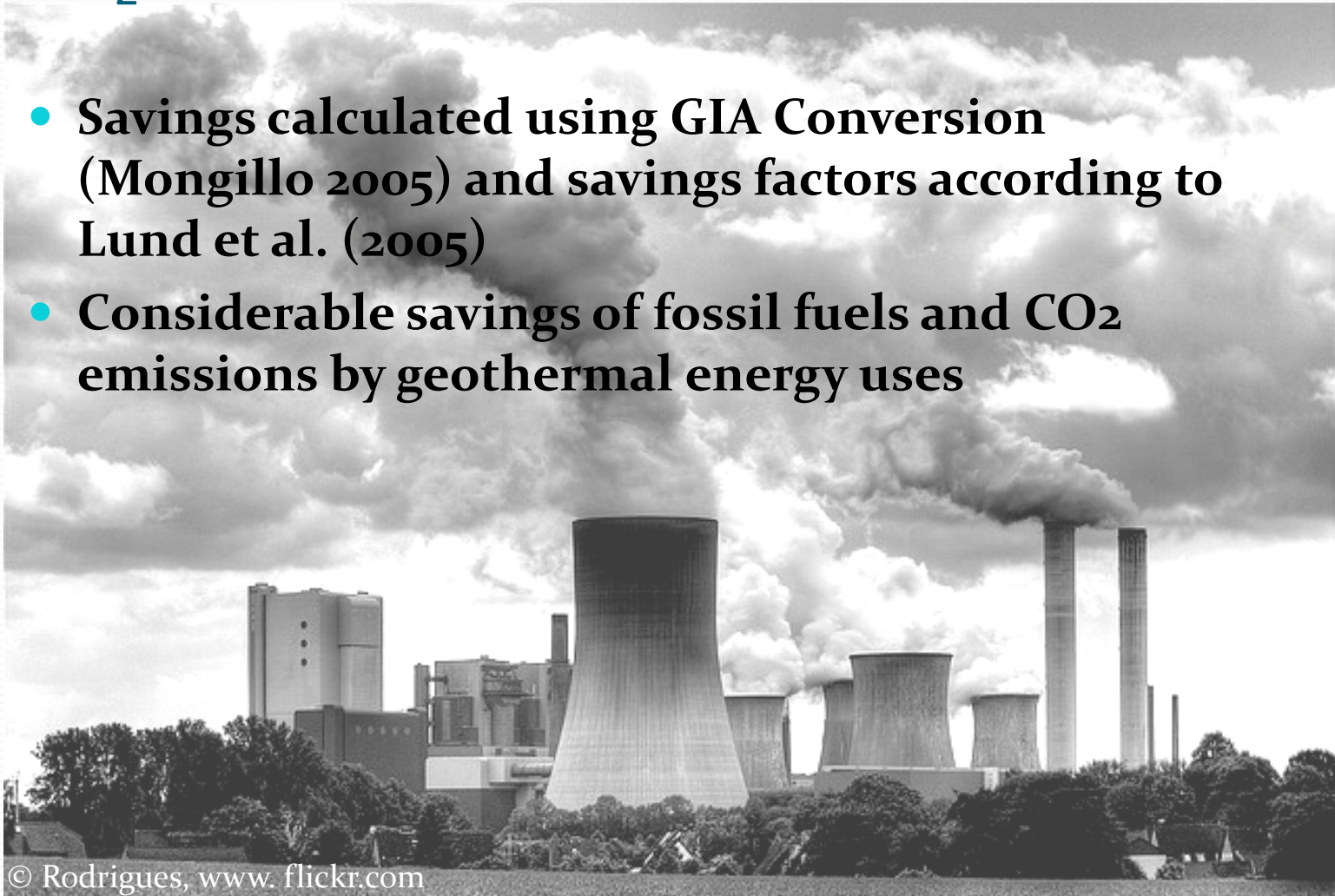


* estimation based on data world 2010 (Lund et al., 2011) using average growth rate

** GIA since 2010: estimated geothermal contribution (EU Directive)

CO₂ and Fossil Fuel Savings

- Savings calculated using GIA Conversion (Mongillo 2005) and savings factors according to Lund et al. (2005)
- Considerable savings of fossil fuels and CO₂ emissions by geothermal energy uses



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Additional Information

Employees, costs, investments

- plant costs in million USD per MW_e
- cost for heat pumps (USD/ kW_t)
- professional personnel in geothermal-related jobs
- capital investments in the geothermal market

Energy market and national policy

- geothermal as part of national energy strategies (energy plans and road maps, special programs, feed-in tariffs, emissions trading)
- share of geothermal in energy mix
- R&D funding
- market incentives, credit offers, other public support

Highlights and HSE Management

- project highlights: new projects, planned projects, R&D news



Los Azufres,
Mexico



Insheim,
Germany



Paralana,
Australia



IDDP,
Iceland

- other positive developments (new programs, positive developments for funding and support)
- Health, Security, (Safety), and Environment (HS(S)E): Challenges and development constraints (induced seismicity, technical problems, legal aspects)

Valuation of the Trend Report

- good data base for geothermal power
- heat use data of less quality, but estimation of heat use in GIA countries possible
- information on ecologic benefits (CO₂ and fuel savings)
- relevant political and economic information
- project highlights and R&D news from various countries
- challenges for geothermal developments

Problems:

- data availability + reliability, national statistics
- deadlines, publication date

→ GIA Trend Report adds substantial information on geothermal energy uses on an international scale and helps to point out trends and developments.

Aims and Outlook

- Efforts for data collection within GIA to be continued
- Further improvement of data base and Trend Report
- Earlier date of publication
- Extend data collection to non GIA countries, with emphasis on the remaining leading nations
- Seek collaboration with other international institutions and organizations



Thank you for your Attention!



Geothermal Museum, Larderello