

Revision 2012

New Renewable Direction for Japan

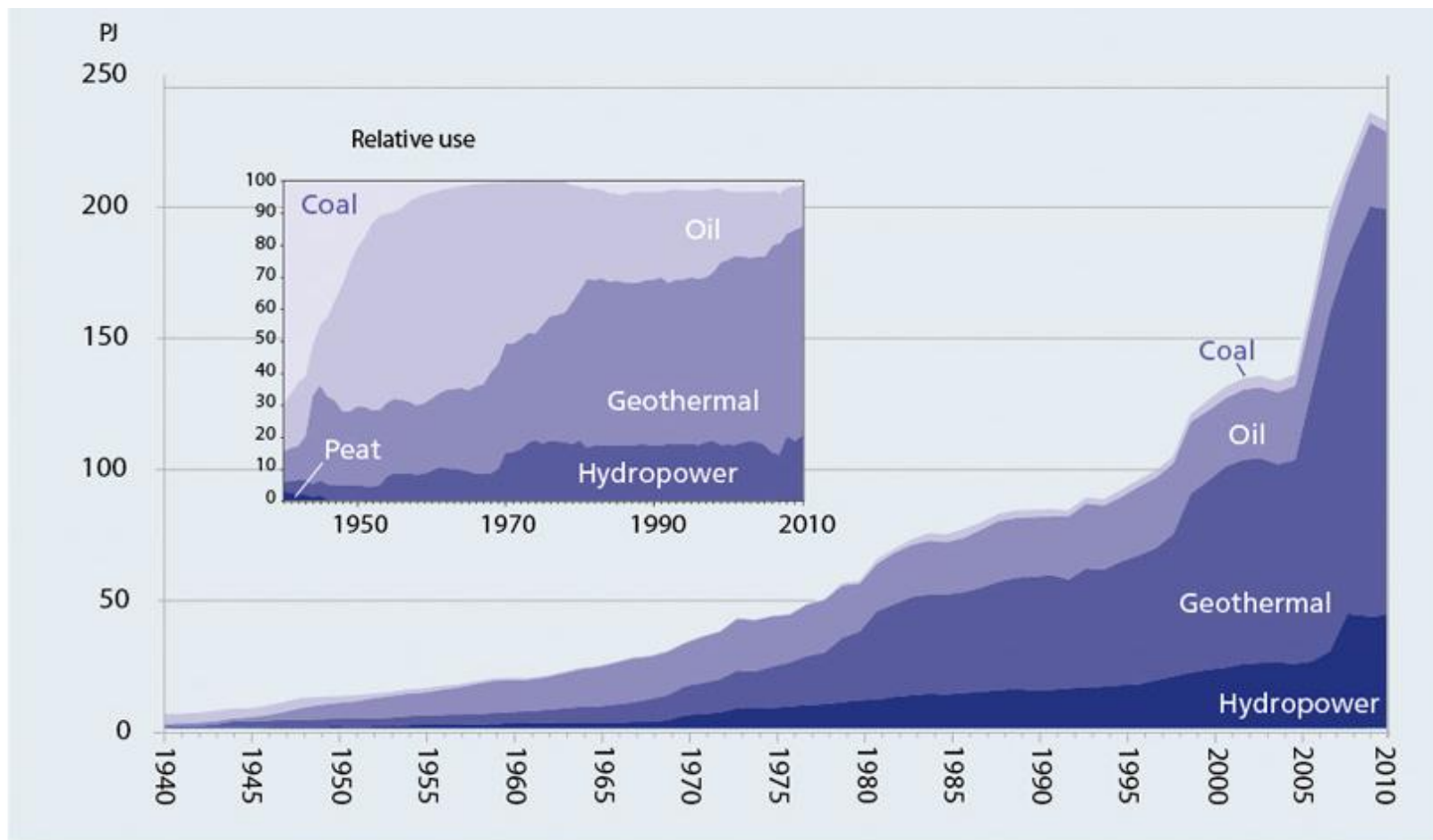
Prof. Dr. Guðni A Jóhannesson
Director General of Orkustofnun
The Icelandic National Energy Authority
ICELAND

- Tokyo International Exchange Center
- 9-10 March 2012

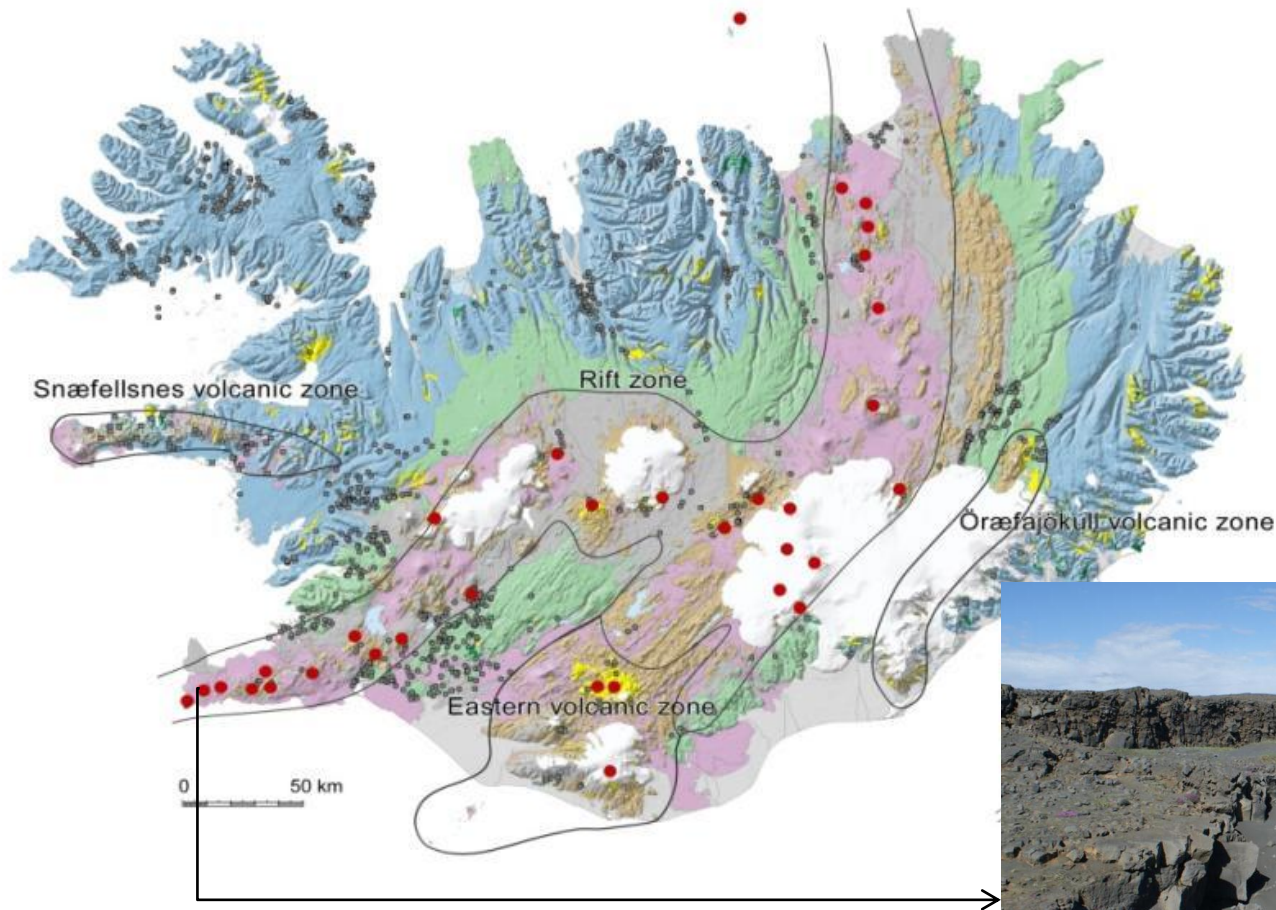
Renewable Energy in Iceland

- All stationary energy is renewable
- 81% of primary energy is from renewables
 - Geothermal contributes 66% of primary energy
 - Highest ratio in OECD - and probably in the world
- Oil still needed for 19% of the primary energy demand
 - About half to operate the fishing fleet
 - The other half mainly for motor vehicles
- 88% of houses heated from geothermal sources

Primary Energy Use in Iceland 1940-2010

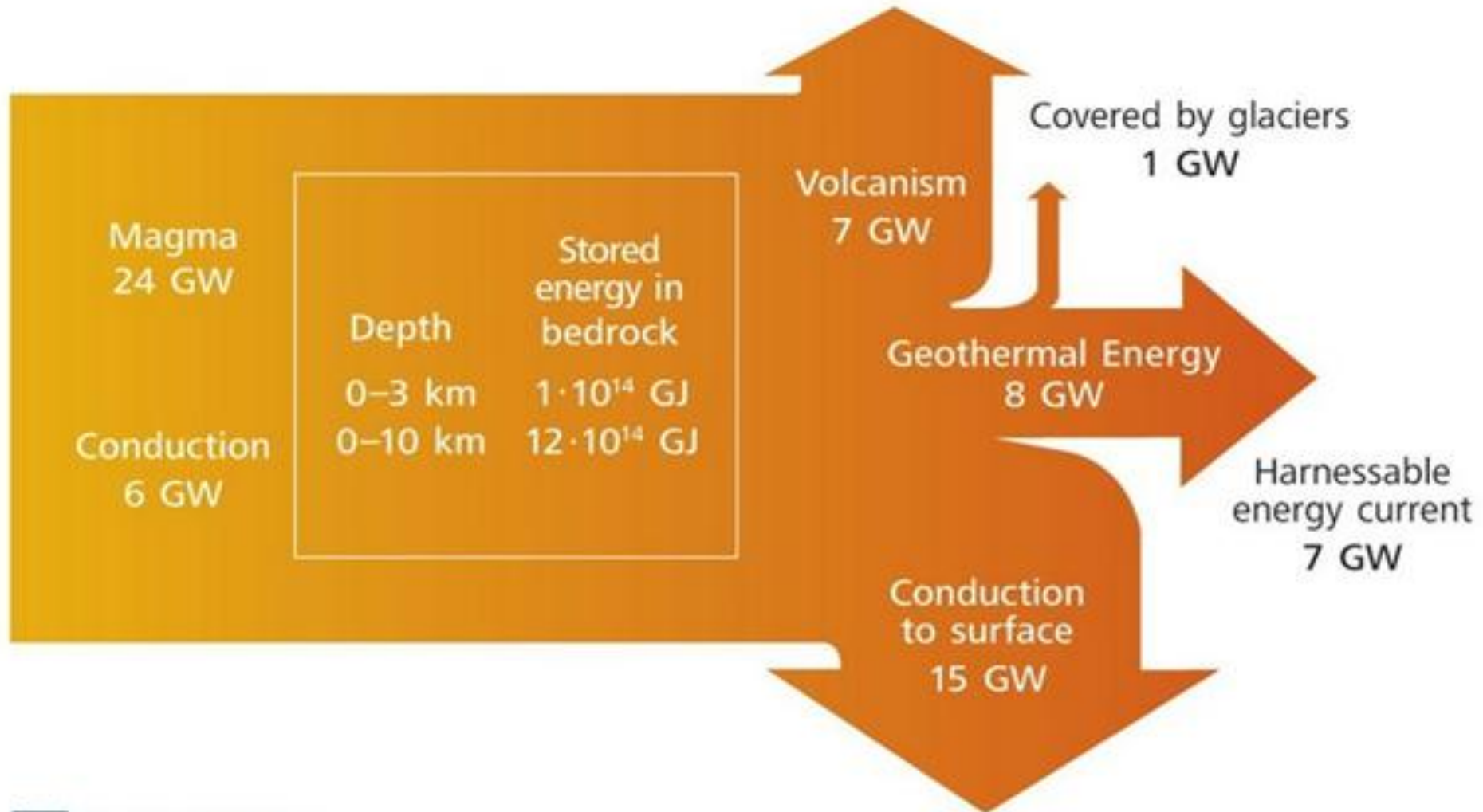


It is all
about
geology



Geothermal map of Iceland. (Basemap: Geological map of Iceland by Haukur Jóhannesson and Kristján Sæmundsson 1999. Iceland. 1:1.000.000. Icelandic Institute of Natural History

Geothermal energy flow



Wells in Reykjavík



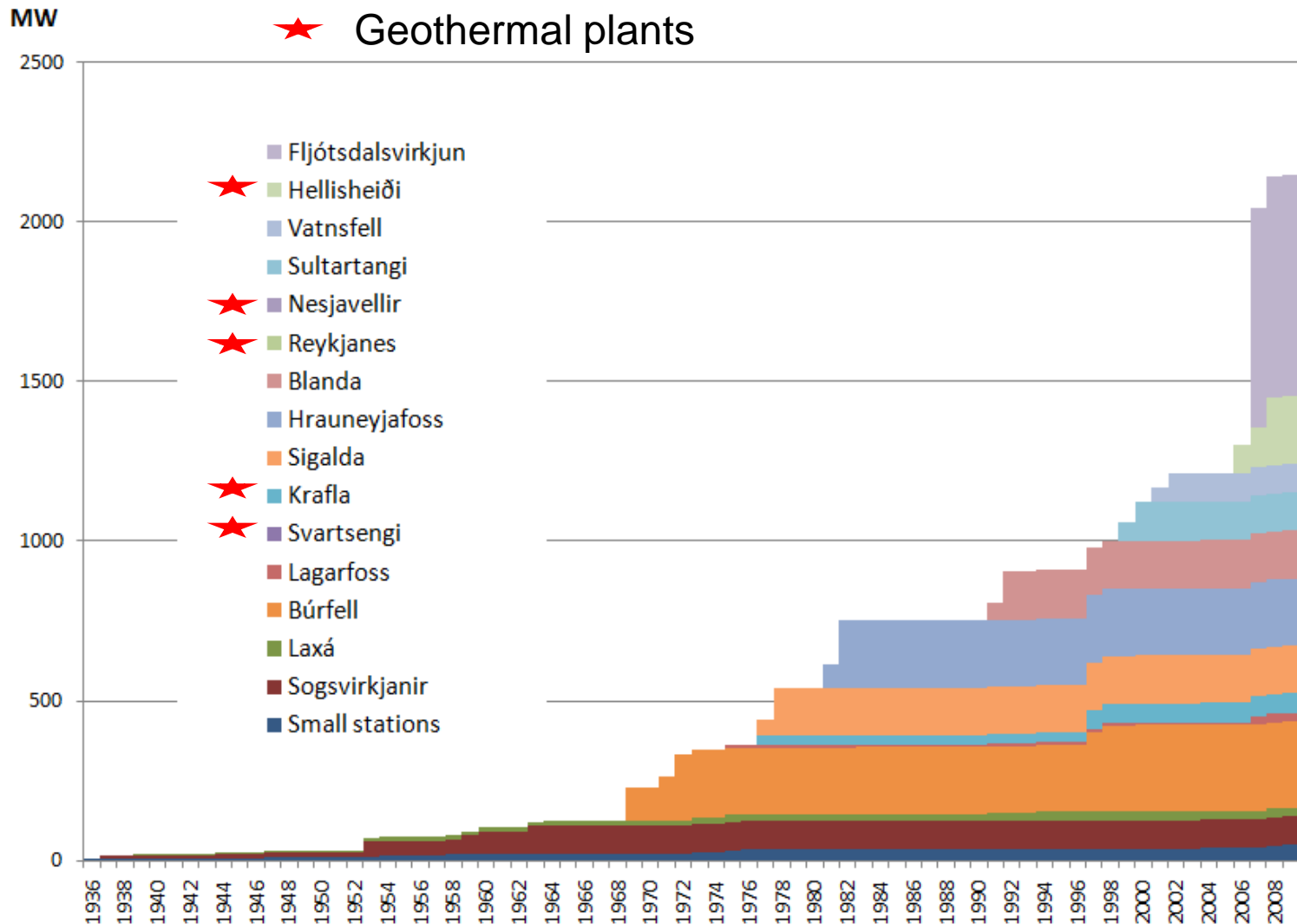
Geothermal District Heating Storage Tanks



Svartsengi Geothermal Plant



Electrical power plant development



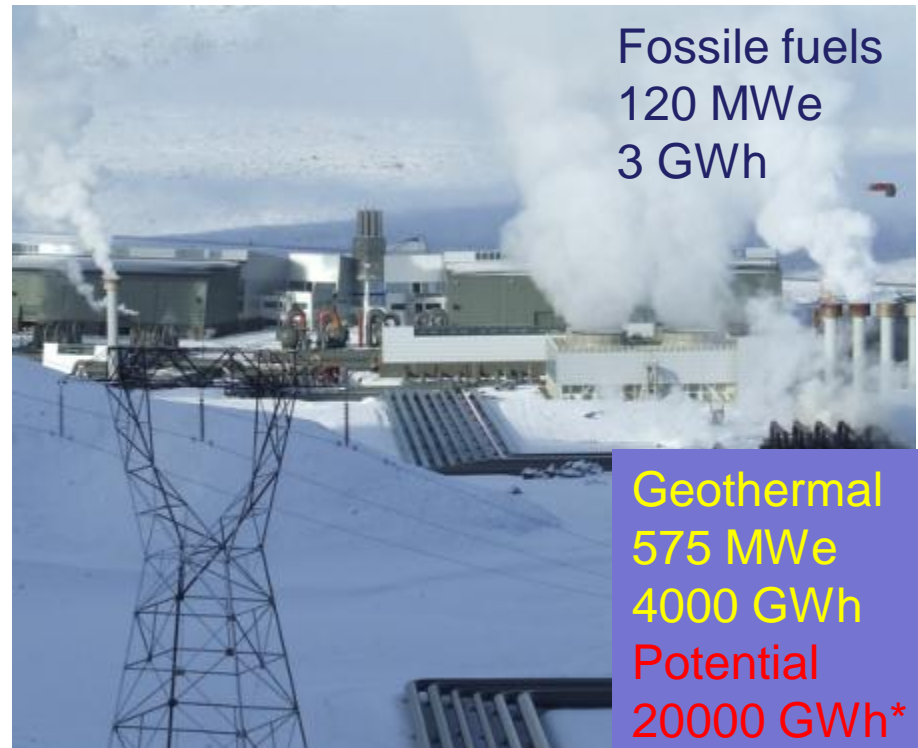
Present Electricity Use

General use	3050 GWh	18.5%
Large industries	12430 GWh	75.5%
System loss	1000 GWh	6.0%



Hydropower
1880 MWe
12400 GWh
**Potential
30000 GWh***

National Energy Authority

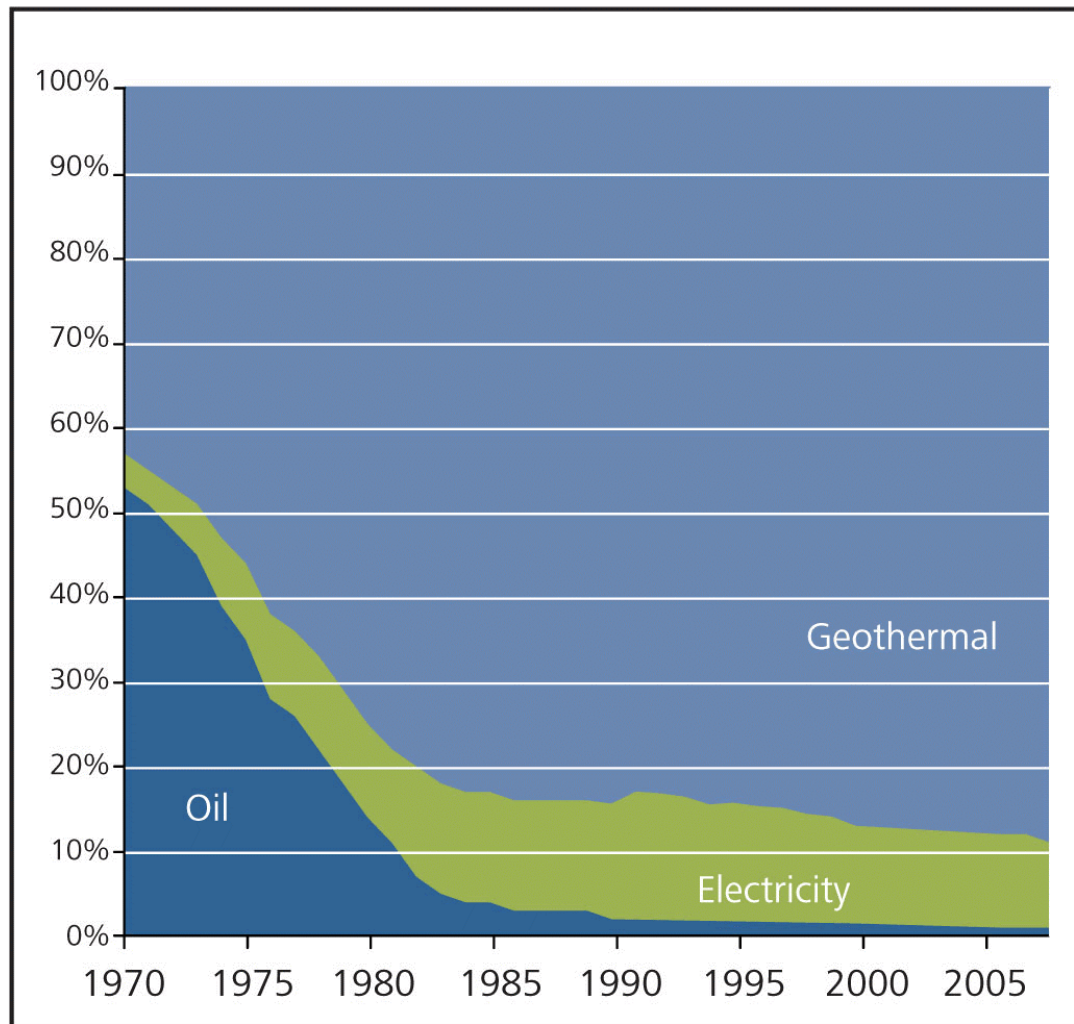


Fossile fuels
120 MWe
3 GWh

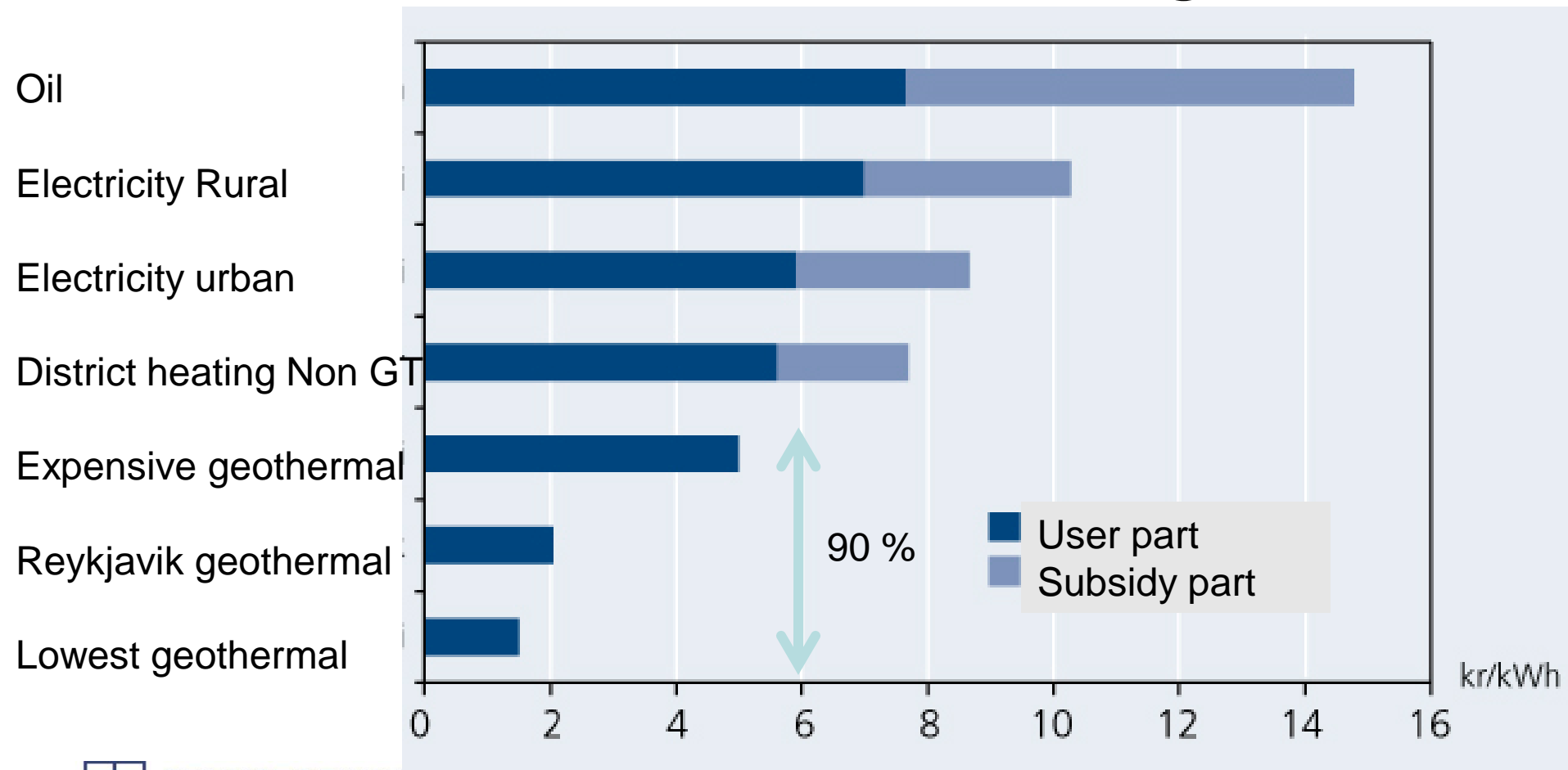
Geothermal
575 MWe
4000 GWh
**Potential
20000 GWh***

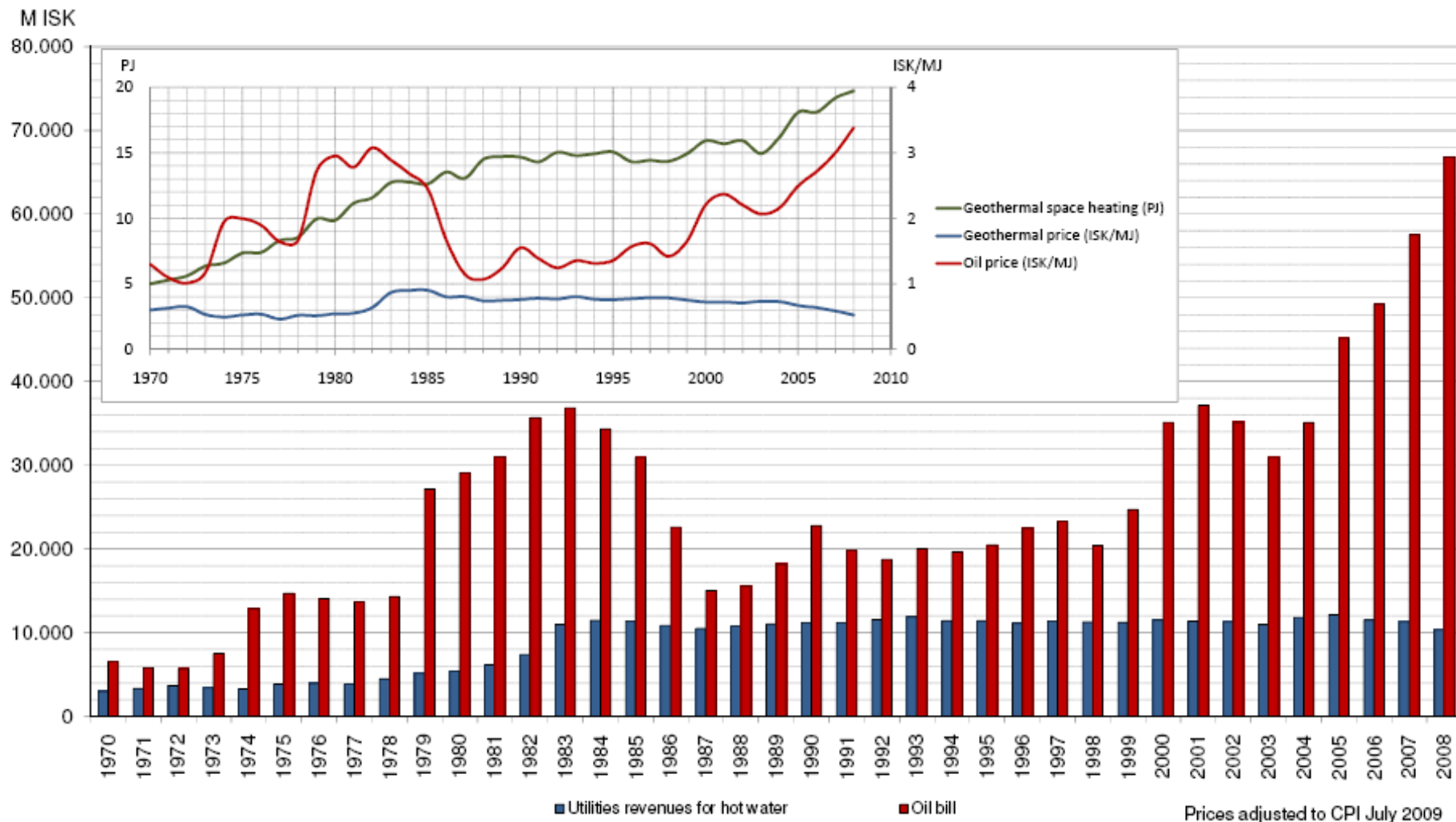
*subject to the result of the Framework program on feasibility and ranking of different power plant options

Space heating by source



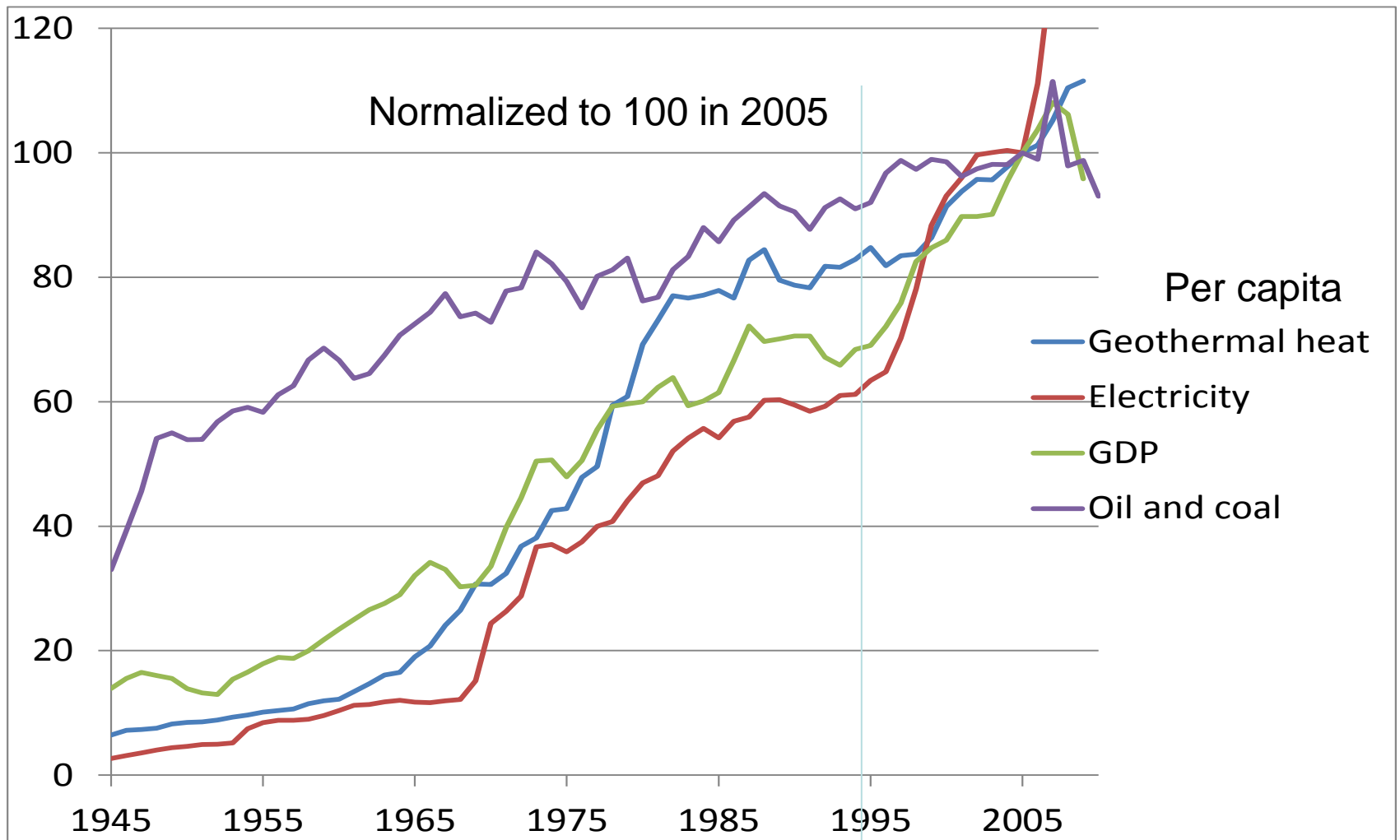
Iceland – Space Heating Cost



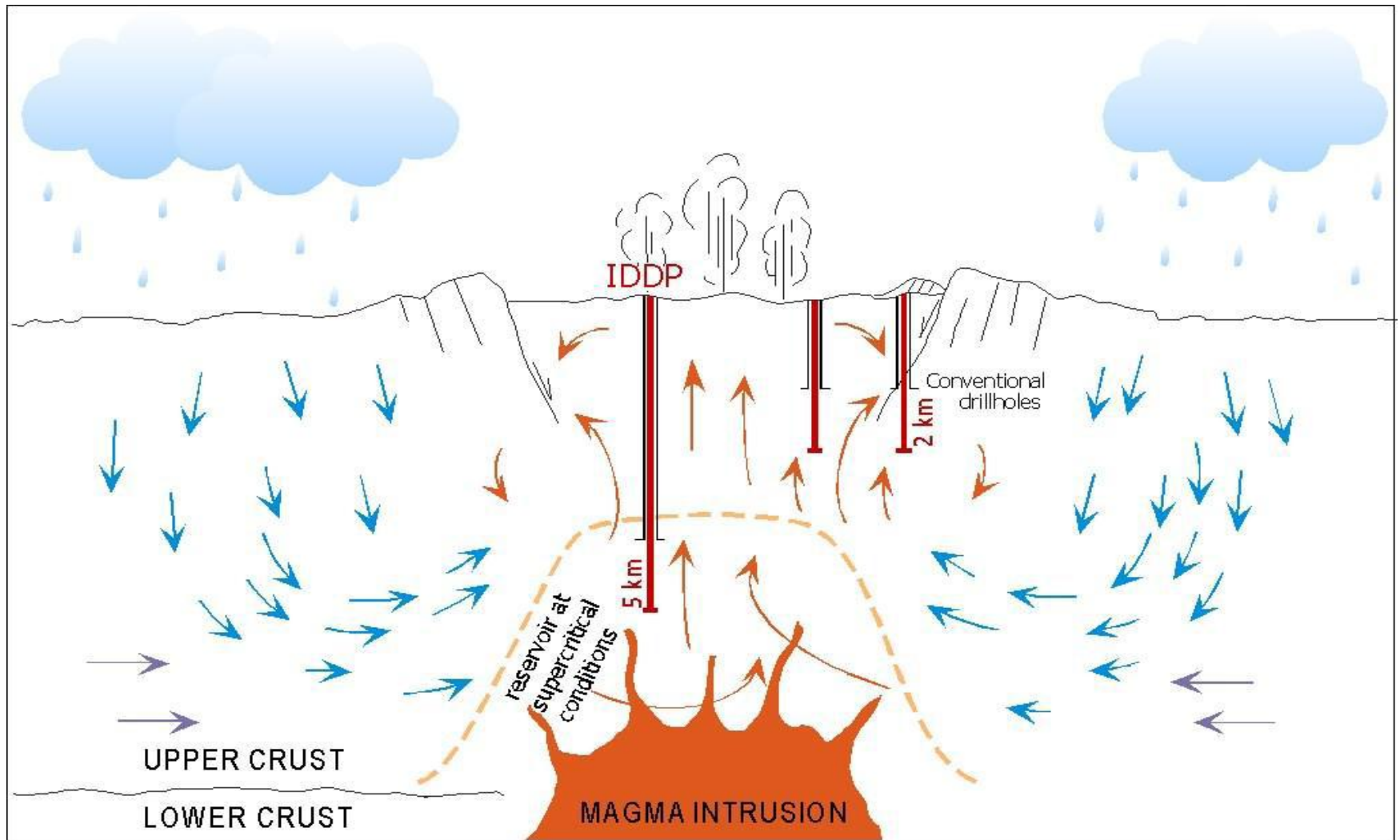


Heating cost of all houses connected at each time to geothermal supply (blue) compared to equivalent oil bill (red).

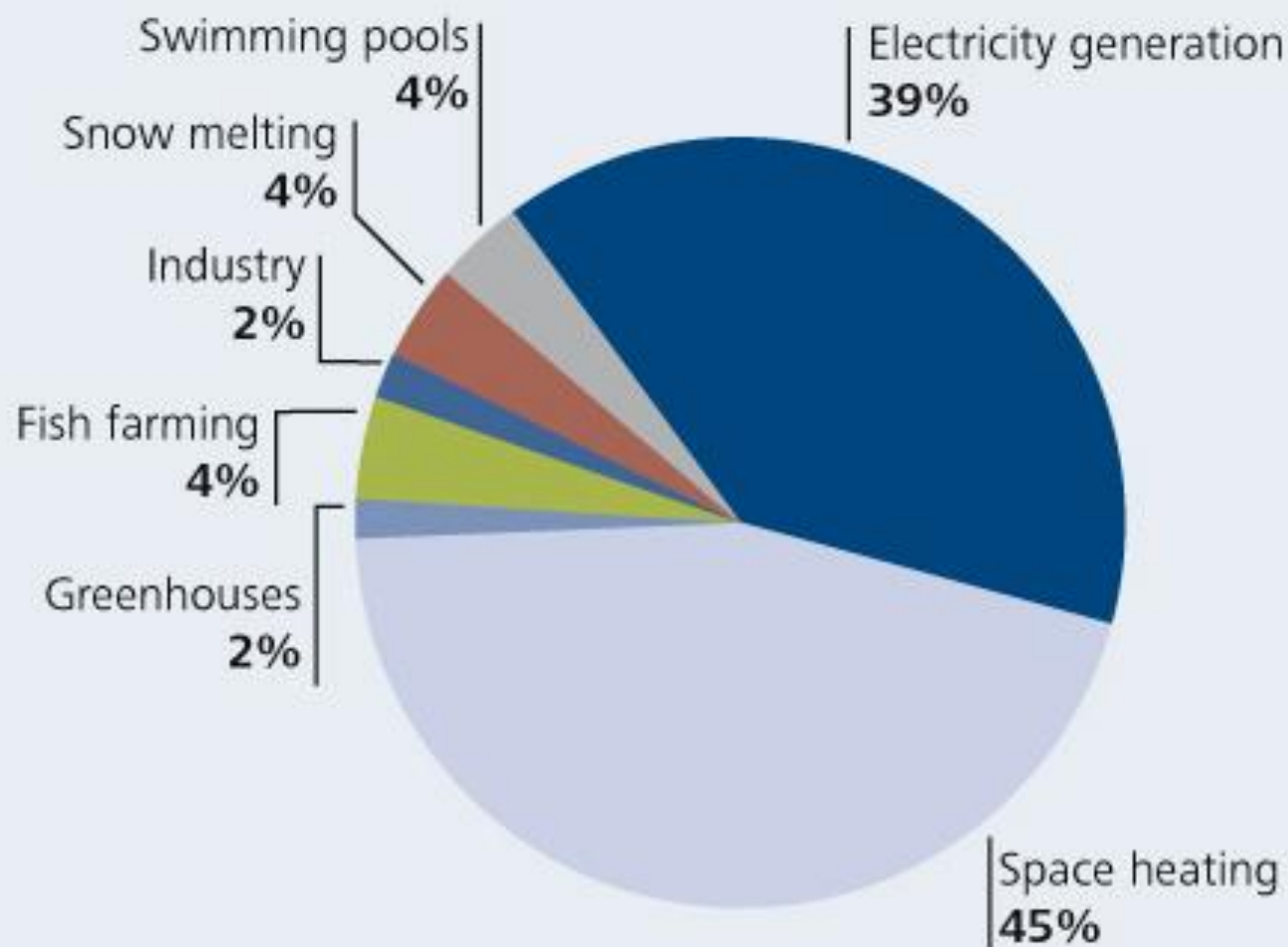
ICELAND 1945 - 2010



The Deep Drilling Project



Utilisation of geothermal energy 2009



Total 41,7 PJ

Examples of Direct Use





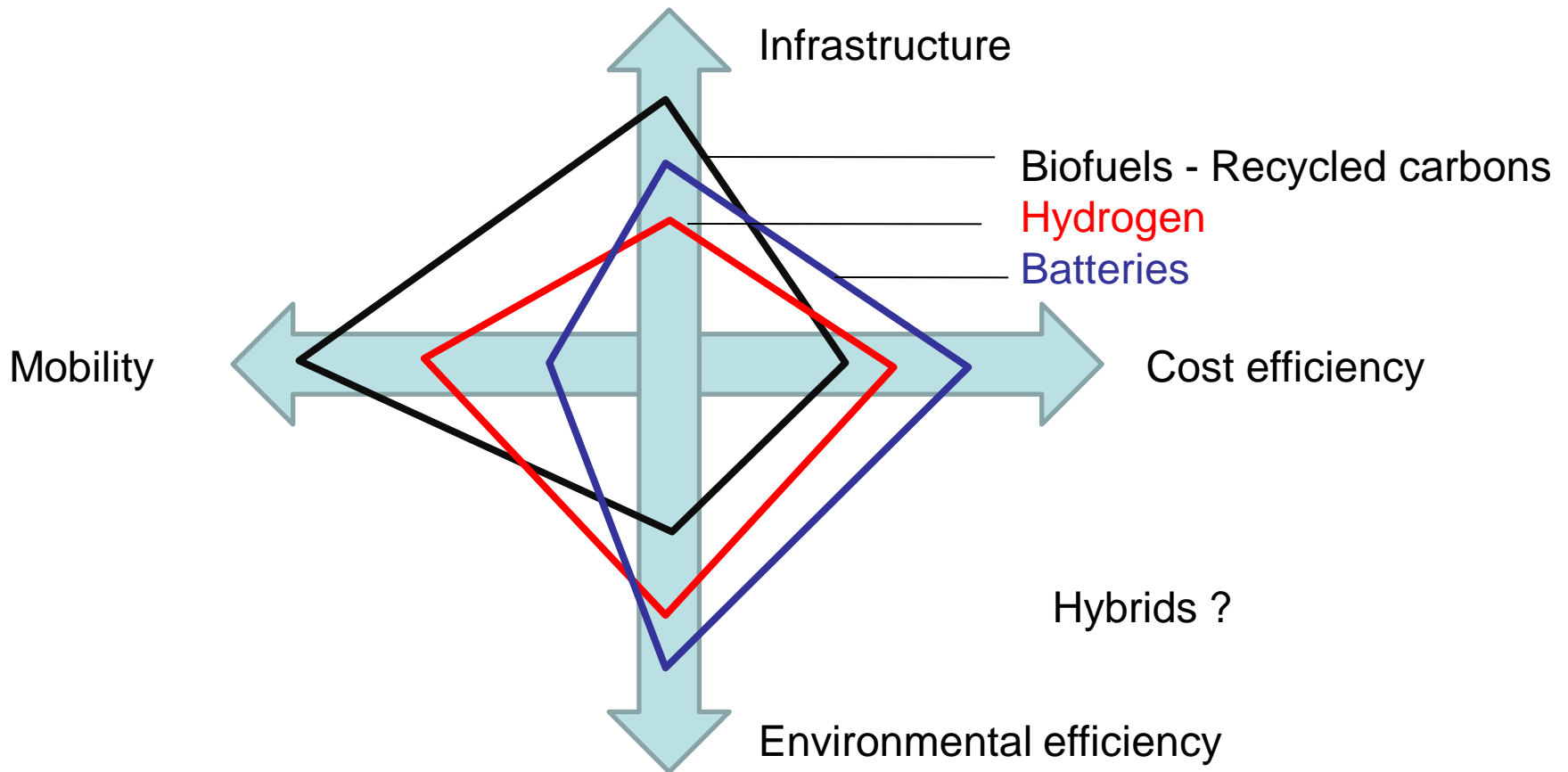
Geothermal Beach



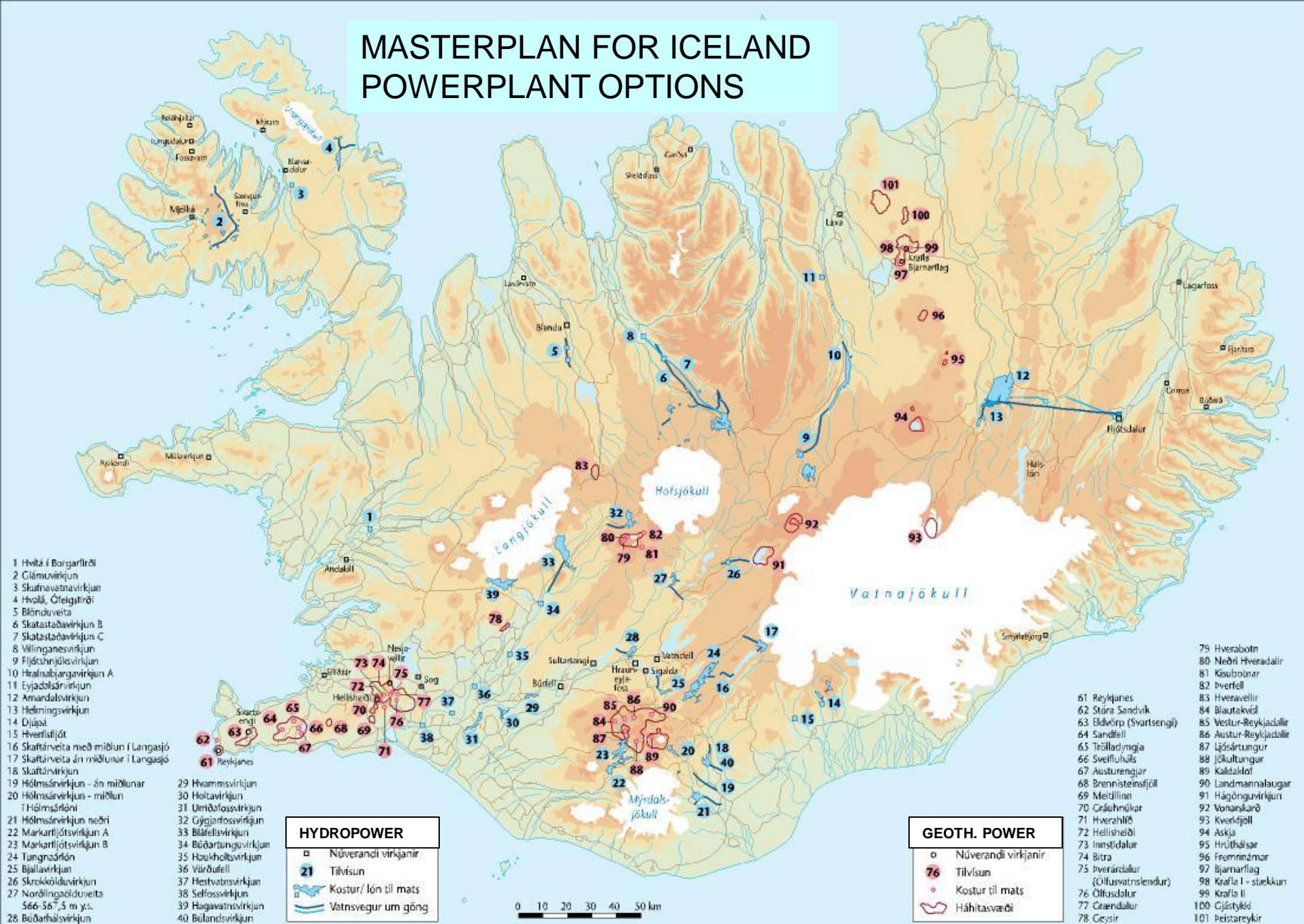




The Alternative Fuel Race



MASTERPLAN FOR ICELAND POWERPLANT OPTIONS



Master Plan (present proposal)

Electric Power Potential	Hydro GWh/a	Geo- thermal GWh/a
Electricity Production (2010)	12,592	4,465
Appropriate for Development	3,326	9,908
Existing & To be developed	15,918	14,373
Appropriate for Protection	7,745	17,765
Awaiting further Consideration	6,008	3,098
Total – Existing & Master Plan	29,671	35,236

International education and capacity building

The UNU Geothermal Training Program has now been run in Iceland for more than 30 years educating and is for now training between 20 and 30 students every year



The Global Potential and Industrial Development

- 160 GW of geothermal power from known sources world wide could generate projects worth more than **600 Bn US dollars**
- Bringing financial capacity, advanced skills and knowhow together can lead to a significant market share in this field
- Future exploration of deeper and warmer sources craves new advances in multiple fields of science and technology.
- The Japanese strong contribution on key technologies and scientific work is of major importance for advancing geothermal energy world wide



Conclusions

- The Icelandic example shows how combination of Icelandic development work and Japanese turbine technology has created highly competitive solutions not only for generation electricity from renewable geothermal sources but also for the general market.
- The environmental concerns have to be taken seriously even for renewable energy use. The Icelandic master plan project gives an example how this can be fulfilled on a national scale.
- International research cooperation aims at new exploration techniques, improved drilling economy, increasing permeability and capacity, reservoir physics and management, deep drilling for high enthalpy fluid, improved reservoir management and induced seismicity.
- The Blue Lagoon in Iceland is an example how high temperature geothermal electricity generation and a successful Onsen activity can coexist in a cascading operation.
- The Japanese strong contribution on key technologies and scientific work is of major importance for advancing geothermal energy world wide

どうもありがとう

