Iceland Liechtenstein Norway grants

Norway grants

Geothermal District Heating and Good Practices in Iceland

Baldur Pétursson

Manager International projects and PR

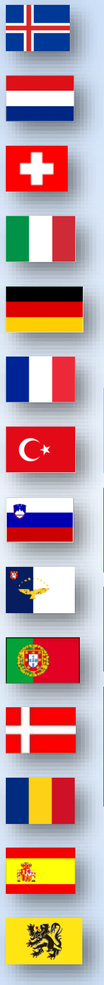
National Energy Authority

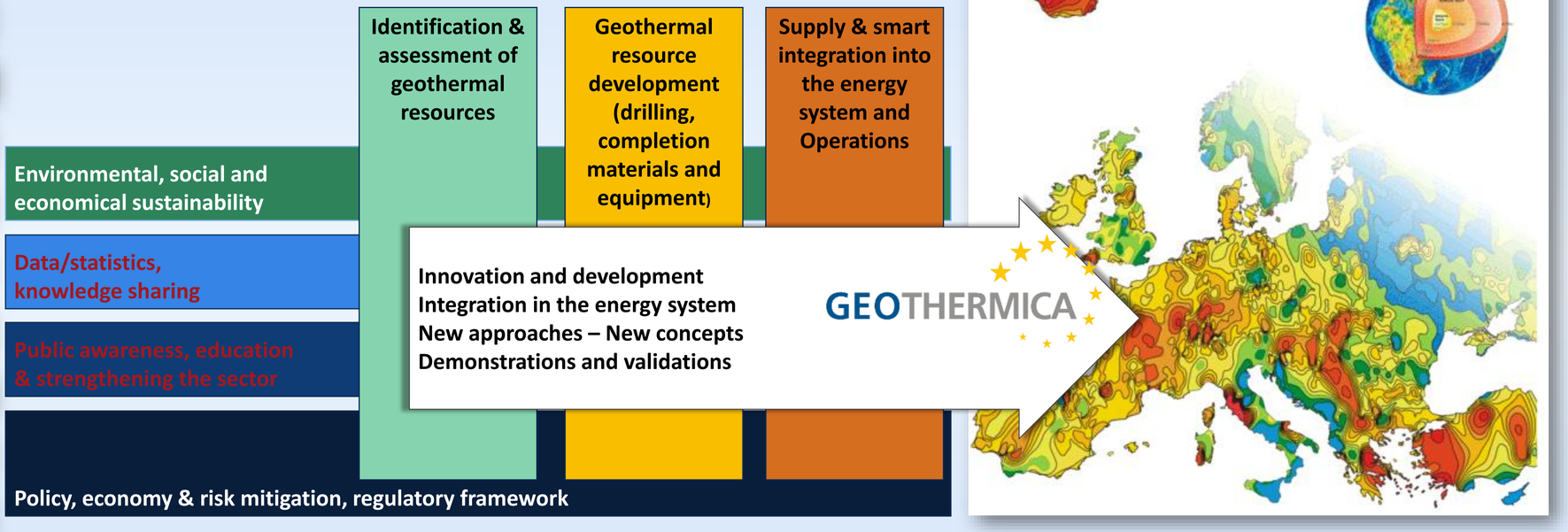
02.02.2021

Role and tasks of Orkustofnun

1. Energy Policy Recommendation
2. Licensing resources
3. Monitoring resources
4. National Regulatory Authority
5. United Nations University (UNU-GTP)
6. International cooperation, EEA Grants, WEC, IGA, IEA, etc.
7. Energy Fund
8. The Energy Agency, (Orkusetur Akureyri)
9. Initiatives for geothermal exploration
10. Dissemination of information
11. Data, energy efficiency, research

The follow up
GEOTHERMICA – ERA NET Cofund





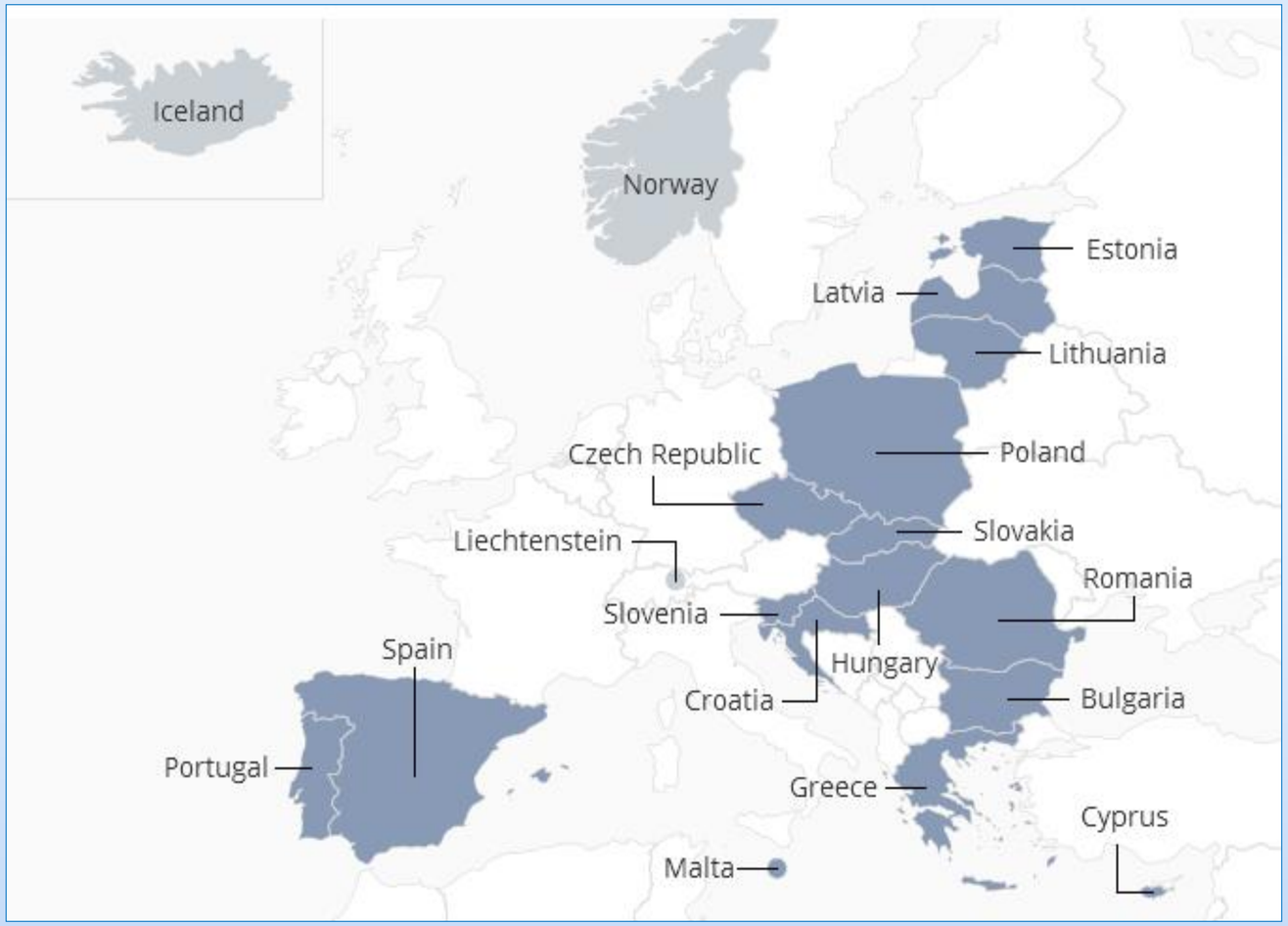
National commitment
~24M€

EC “top up”
~8M€

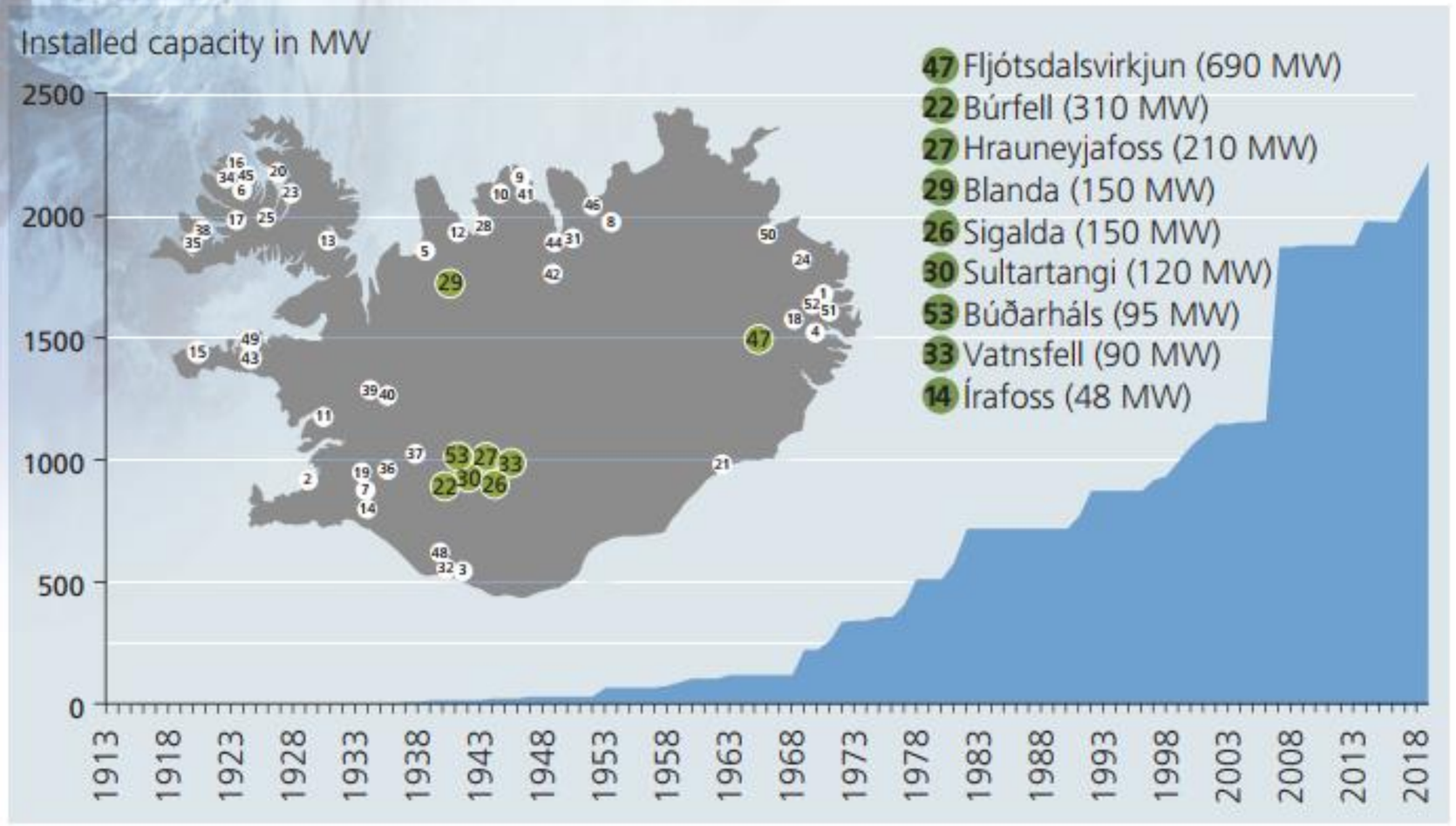
Estimated industry commitment
~30M€

International Cooperation – EEA Grants

Orkustofnun is Donor Program Partner (DPP) for Renewables in some Countries, Poland, Romania and Bulgaria 2014-2021



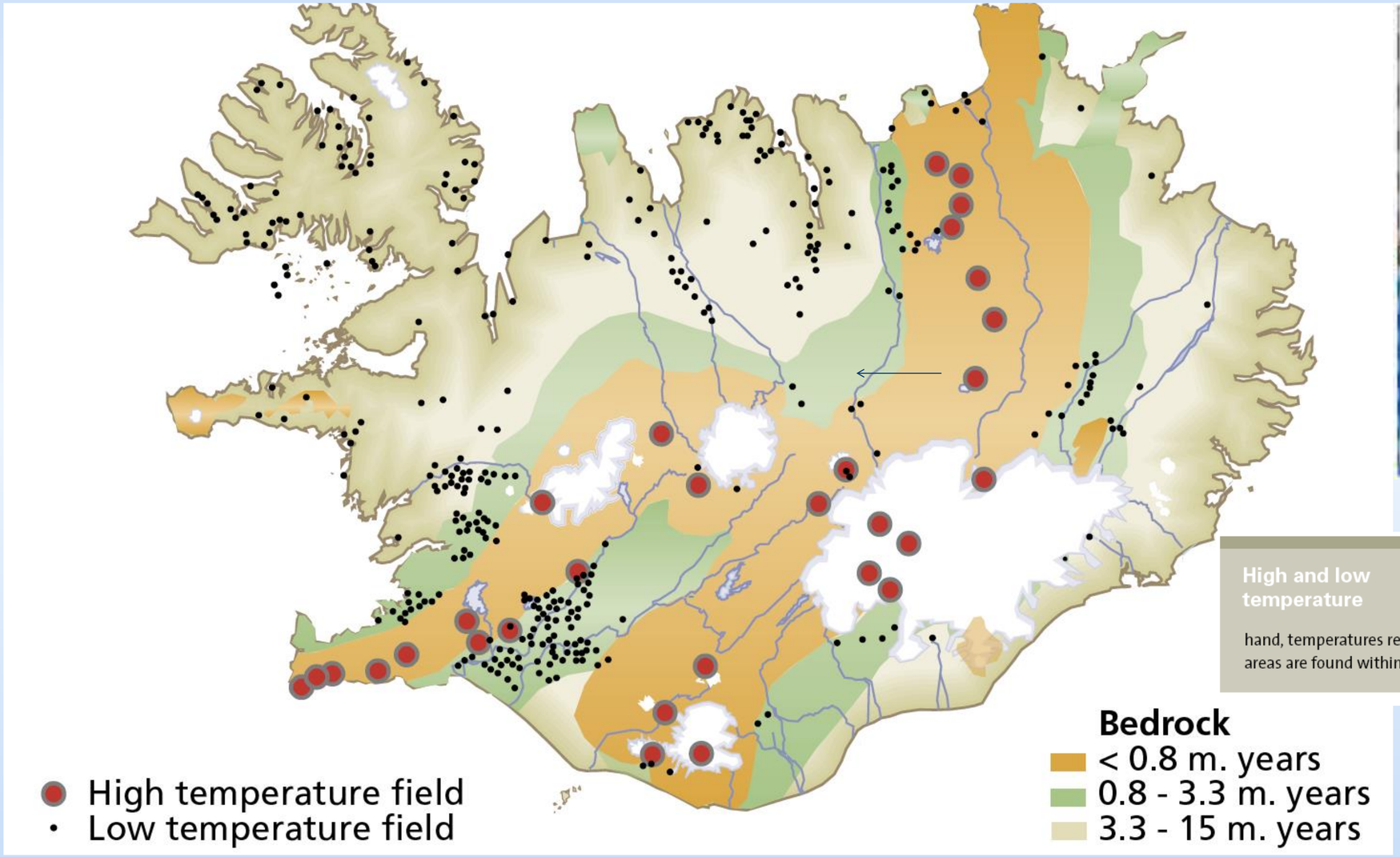
Installed capacity in hydro power plants 1913-2019

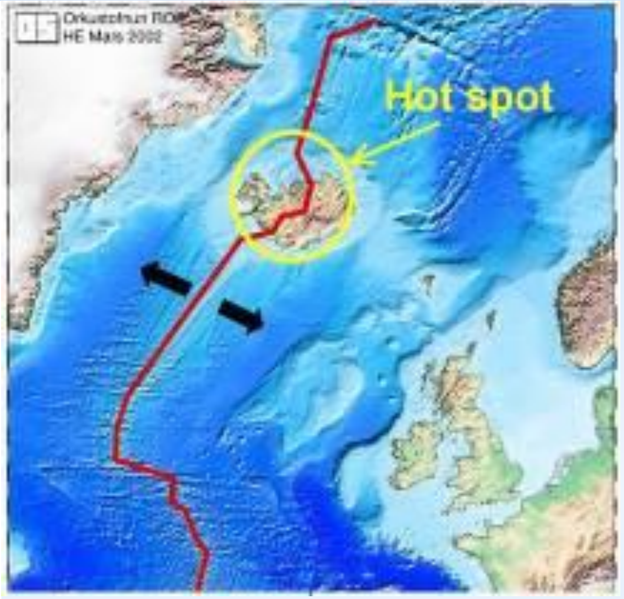


The numbered dots in the picture show the main hydro power plants in Iceland.
The largest are specified (green dots).

Source: Orkustofnun

Geothermal Fields in Iceland



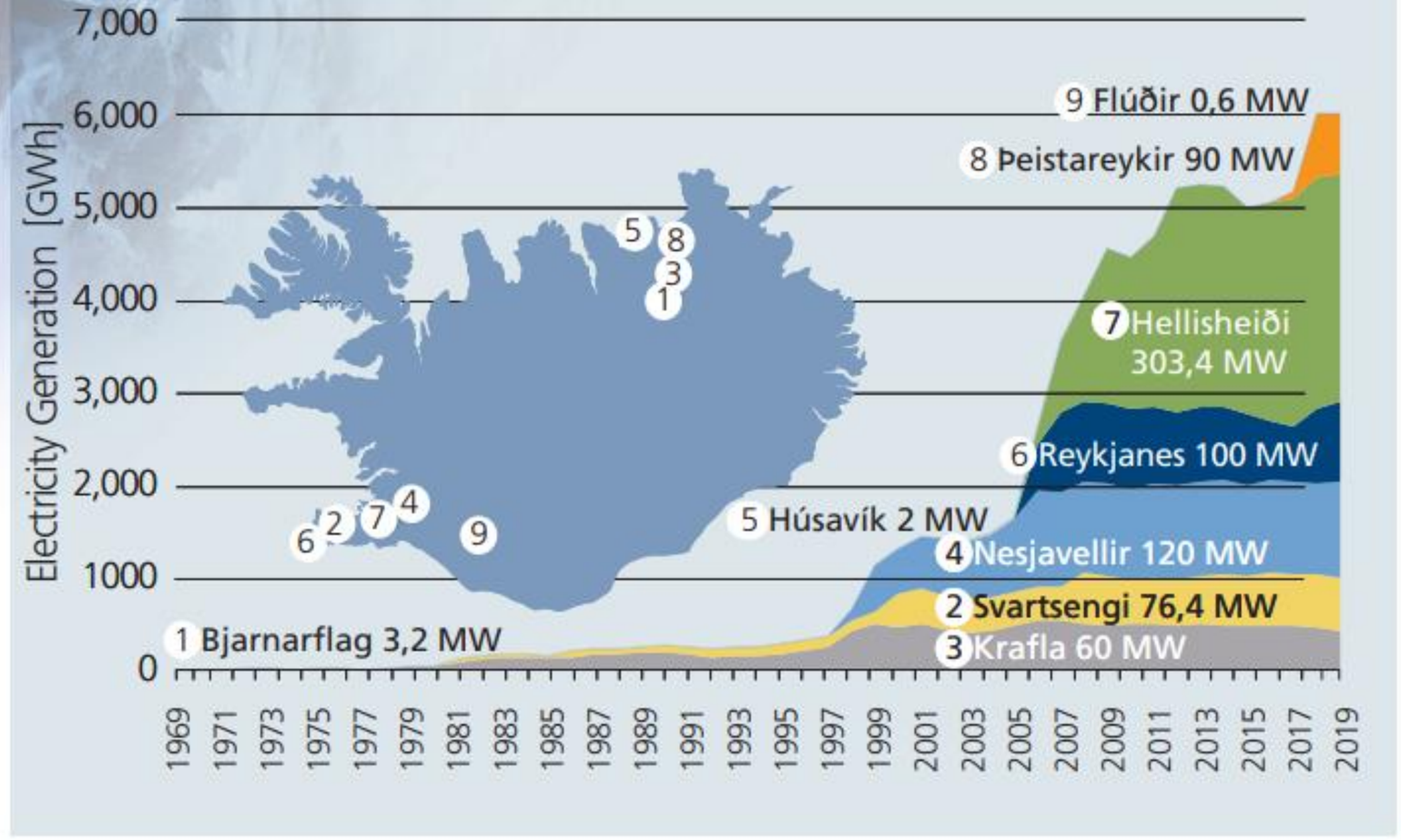


High and low temperature

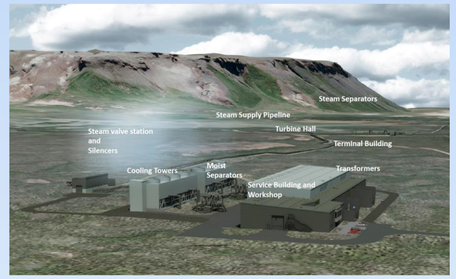
In low temperature geothermal systems, temperatures in the uppermost 1,000 m may reach up to 150°C. In the high temperature fields, on the other hand, temperatures reach over 200°C at 1,000 m depth. High temperature geothermal areas are found within the active volcanic zone of Iceland.

T_{avg} = 0°C (january) to 10°C (july) in Reykjavík

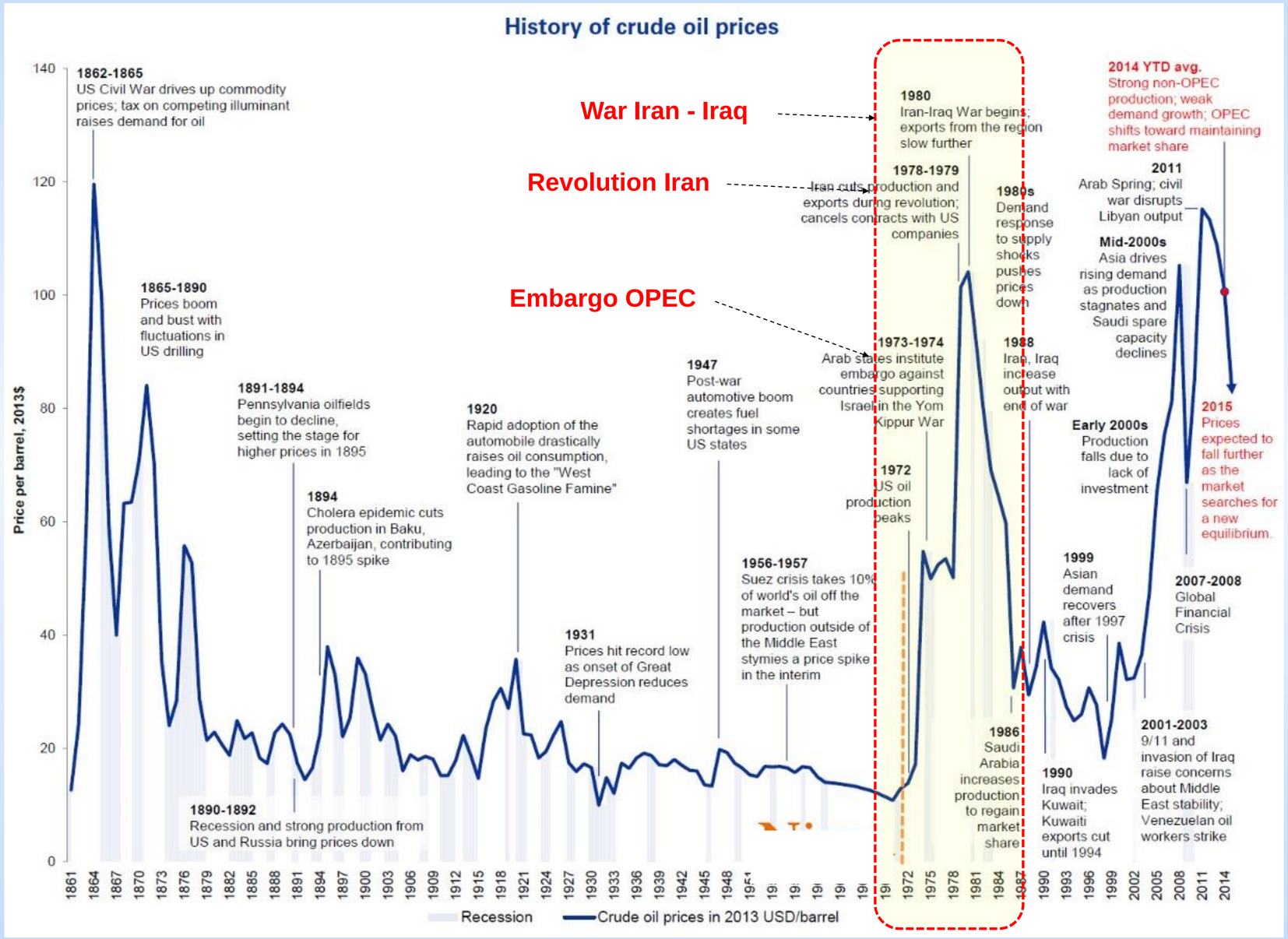
Electricity generation of geothermal power plants 1969-2019



Orkustofnun Data Repository: OS-2020-T006-01



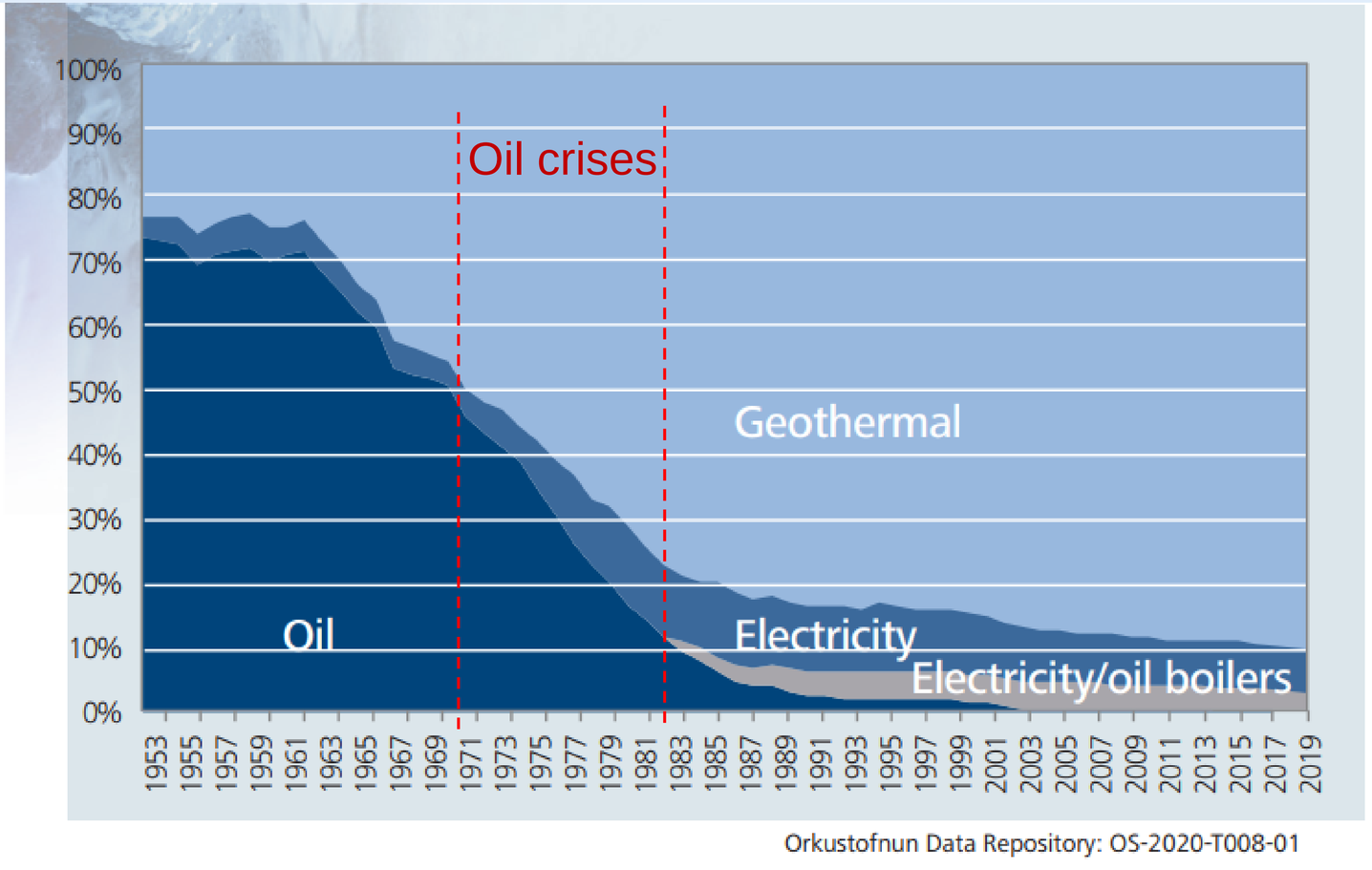
The Oil Crises 1970 -1980



Expansion of GeoDH

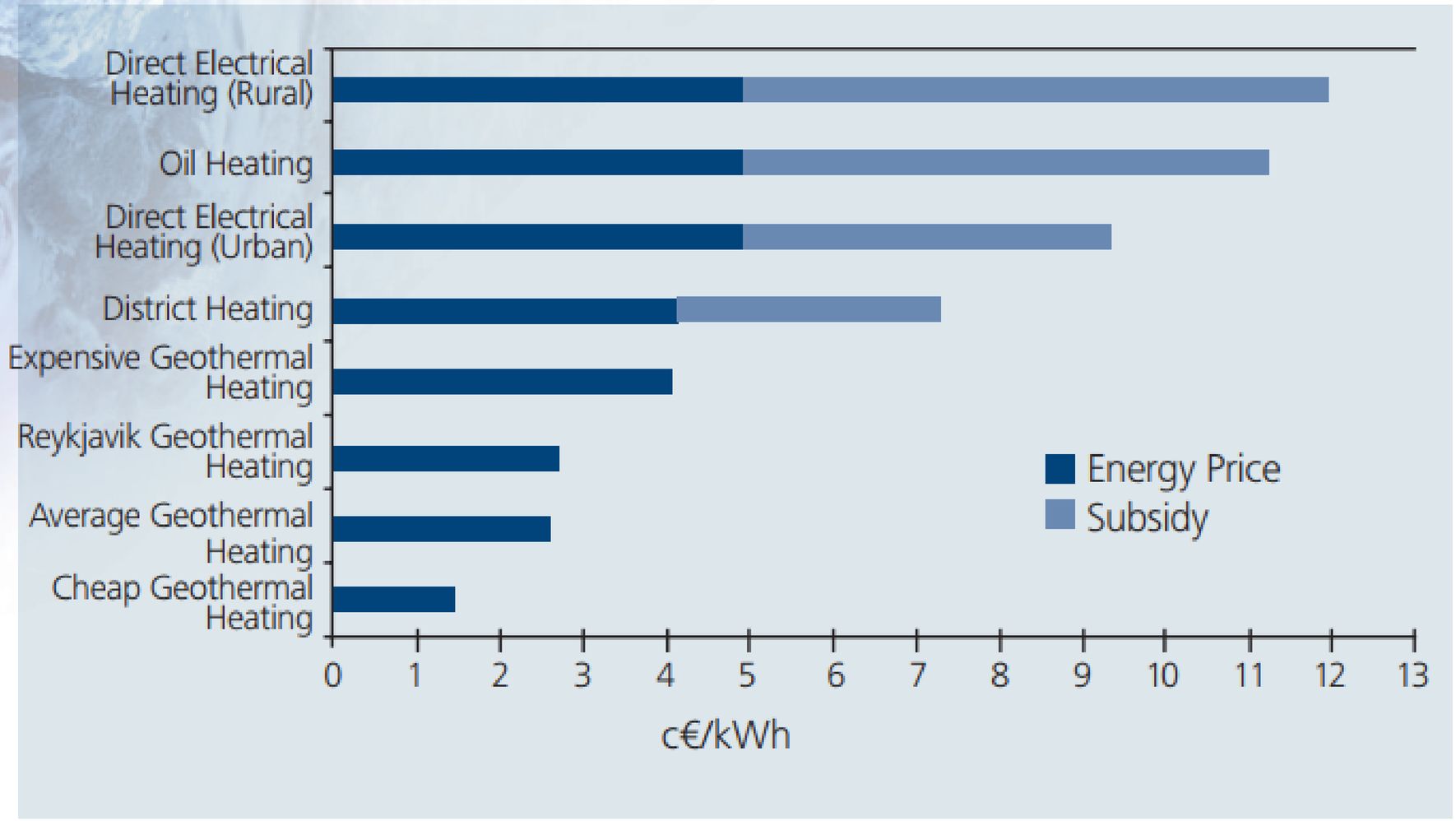
Space Heating by Source 1953–2019

- Biggest steps in GeoDH were taken during the oil & war crises 1970 – 1982
- External conditions – raised the need of evaluation and GeoDH Planning
- Policy goals to increase geothermal – both national and within main cities
- It took only **12** years to increase GeoDH from 5**0% to 80%** of total space heating
- **It took only 12 years to decrease oil for heating from 50% to 10% in 12 years**



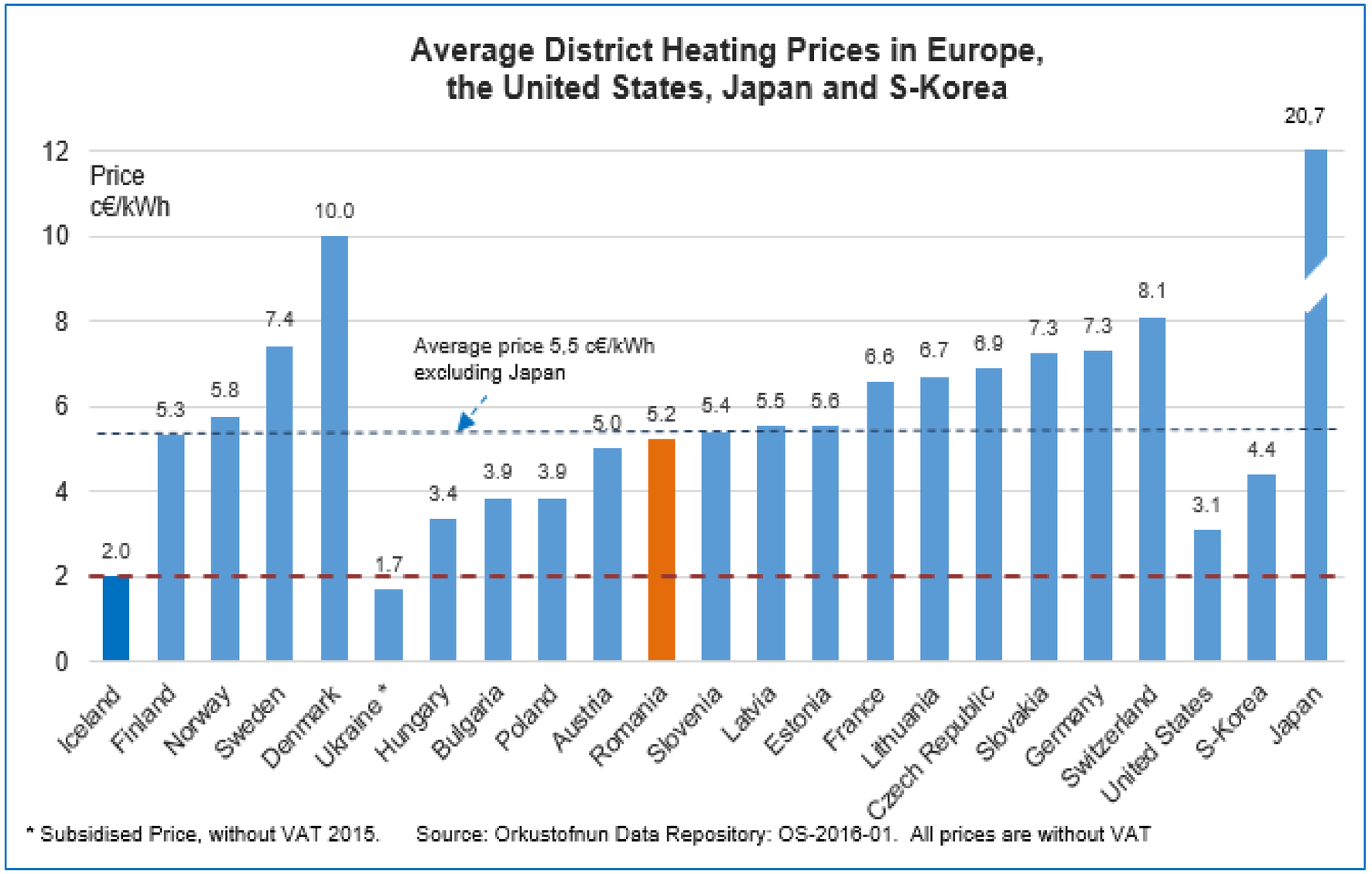
Orkustofnun Data Repository: OS-2020-T008-01

Energy price for space heating in September 2019

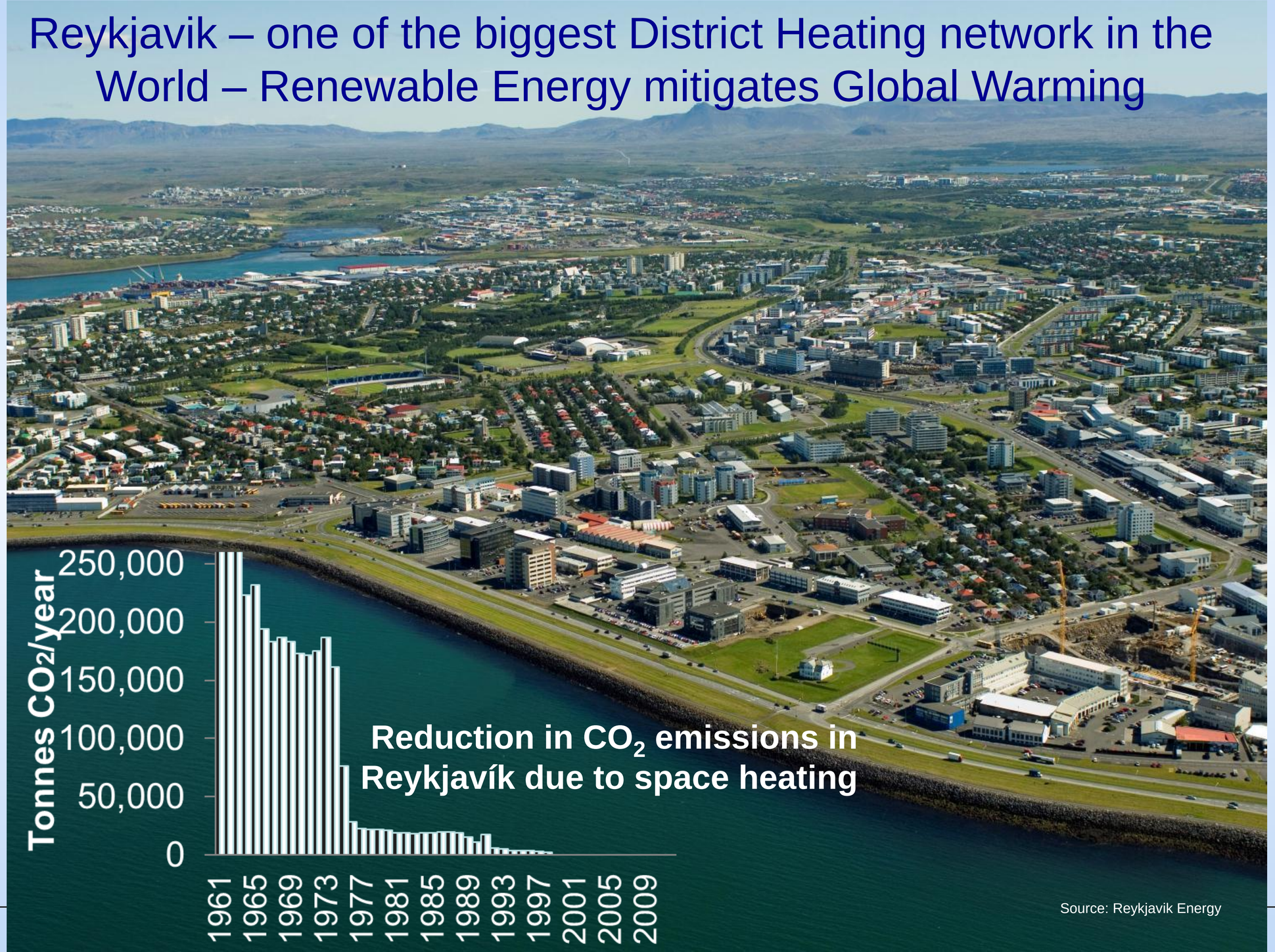


Orkustofnun Data Repository: OS-2020-T005-01

District Heating Prices in Europe in 2015



Reykjavik – one of the biggest District Heating network in the World – Renewable Energy mitigates Global Warming



Source: Reykjavik Energy

Environmental Benefits of Geothermal Utilisation

Reykjavík 1933

Reykjavík today

Source: Reykjavik Energy

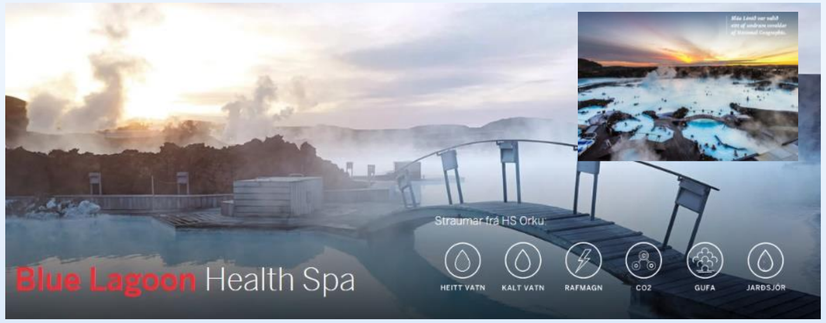
Utilisation of Geothermal Energy

Companies within the Resources Park at Reykjanes

Geothermal Power and Heat Generation

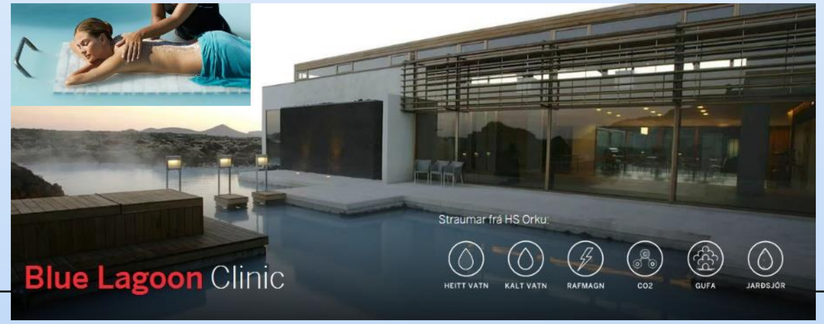
Geothermal Power and Heat Distribution

Blue Lagoon Health Spa

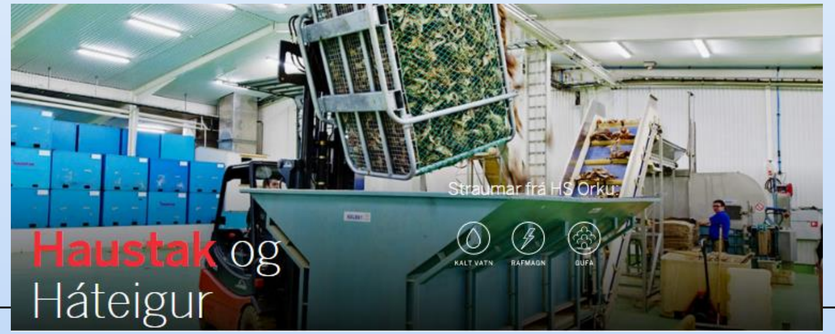


Blue Lagoon R&D Centre

Blue Lagoon Clinic



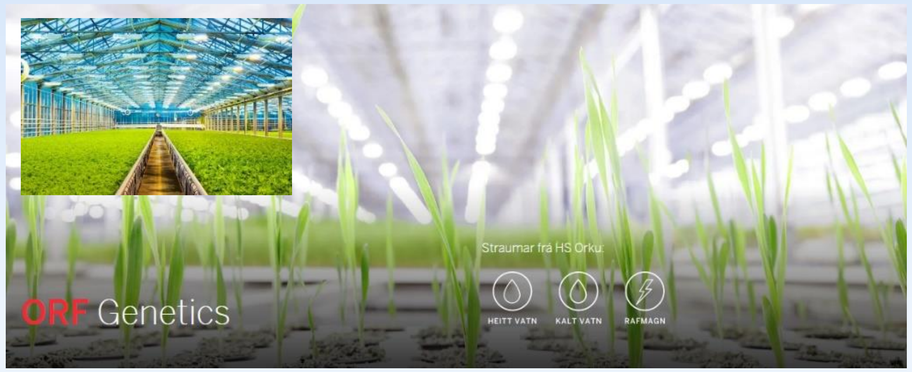
Fish Drying



Utilisation of Geothermal Energy

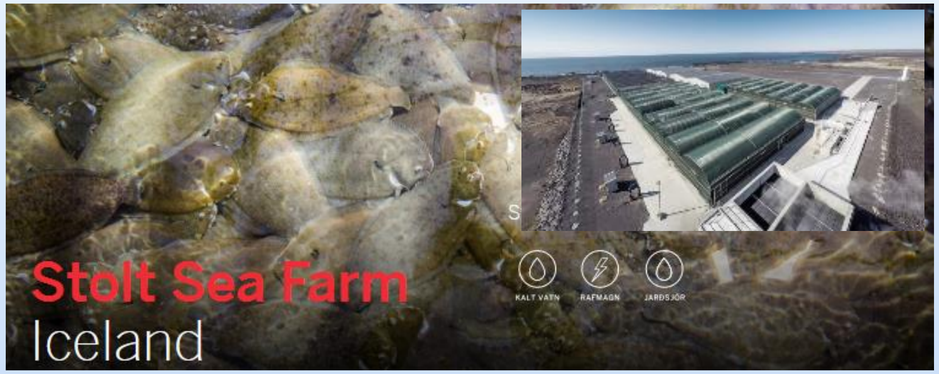
Companies within the Resources Park at Reykjanes

ORF Genetics



Hotel

Stolt Sea Farm



Carbon Recycling

Utilisation of Geothermal Energy

District heating, swimming pools, spas, greenhouses,
various industrial applications.

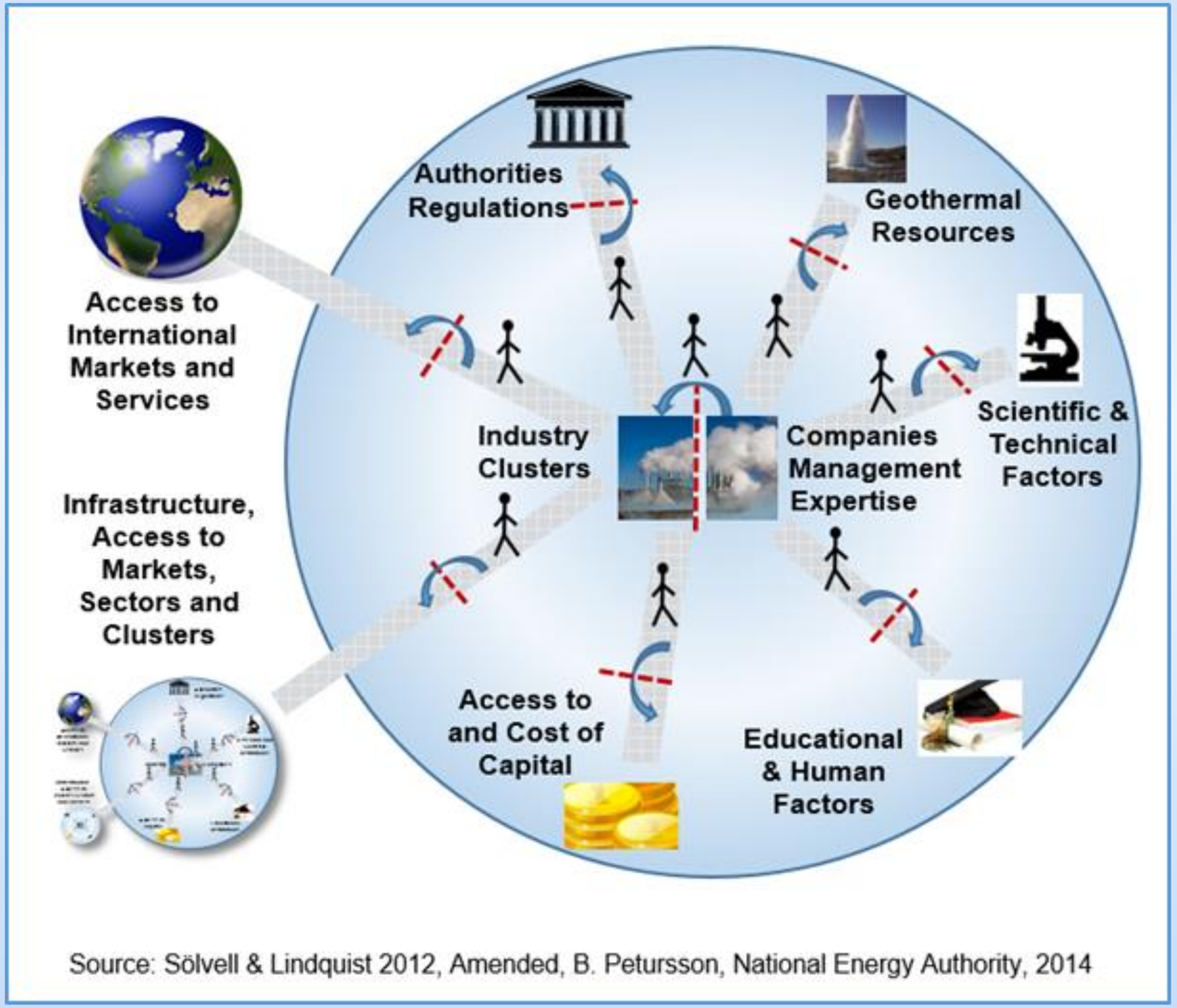
Competitiveness of the Geothermal Sector

Success of Geothermal District Heating is based on 8 Key Factors

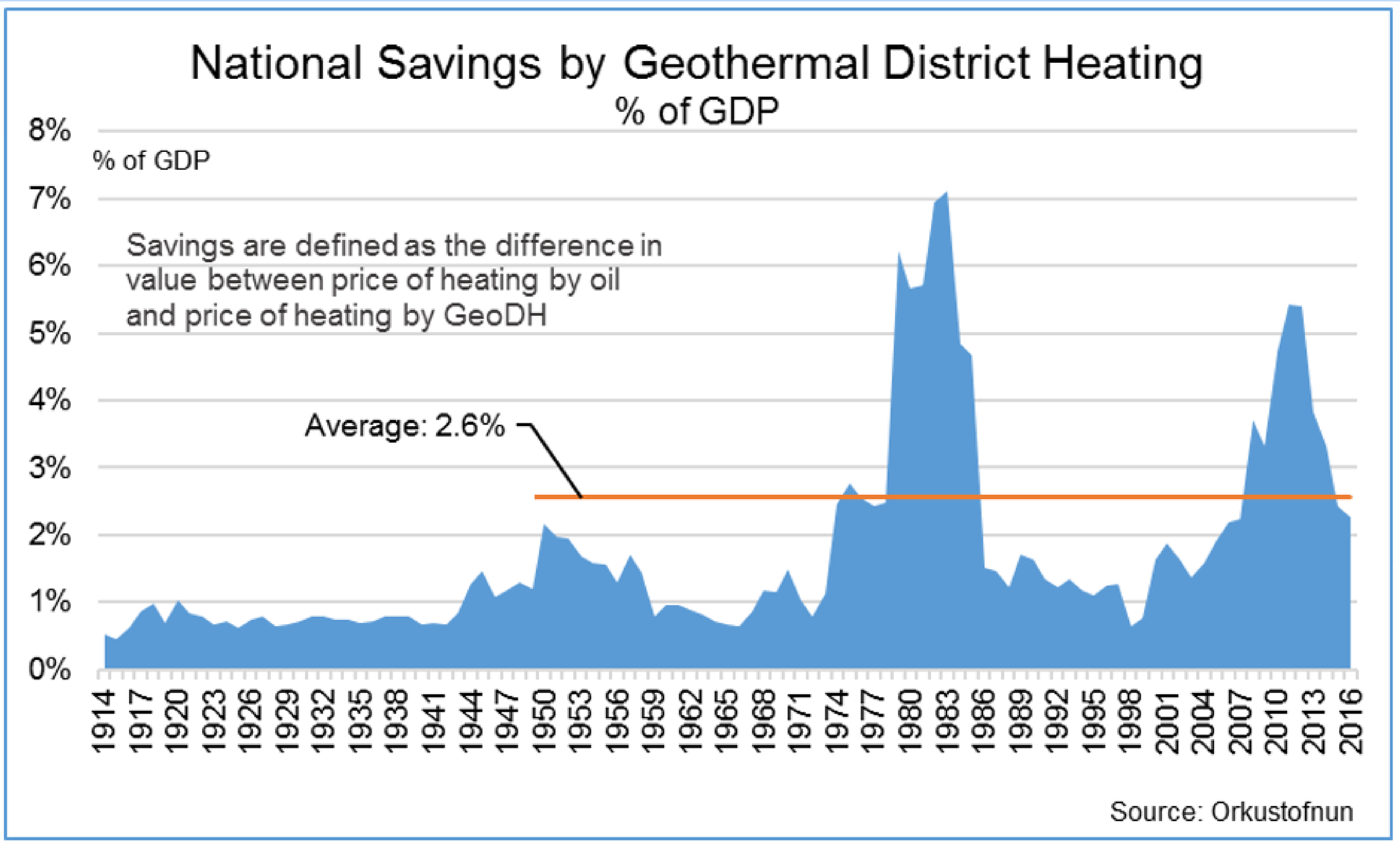
8 Key Elements of Success in the Geothermal Sector and District Heating

1. **Authorities and regulation,**
2. **Geothermal resources,**
3. **Scientific & technical factors,**
4. **Education & human factors,**
5. **Access to capital,**
6. **Infrastructure and access to markets, sectors and other clusters,**
7. **Access to international markets and services,**
8. **The company, management, expertise & industry, clusters assessment**

In cooperation with international and domestic experts, on geothermal resources, finance, legal, management and other expertise.



Source: Sölvell & Lindquist 2012, Amended, B. Petursson, National Energy Authority, 2014


National Savings by Geothermal District Heating
% of GDP
8%
% of GDP
7%
6%
5%
4%
3%
2%
1%
0%
Savings are defined as the difference in value between price of heating by oil and price of heating by GeoDH
Average: 2.6%
1914
1917
1920
1923
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
Source: Orkustofnun

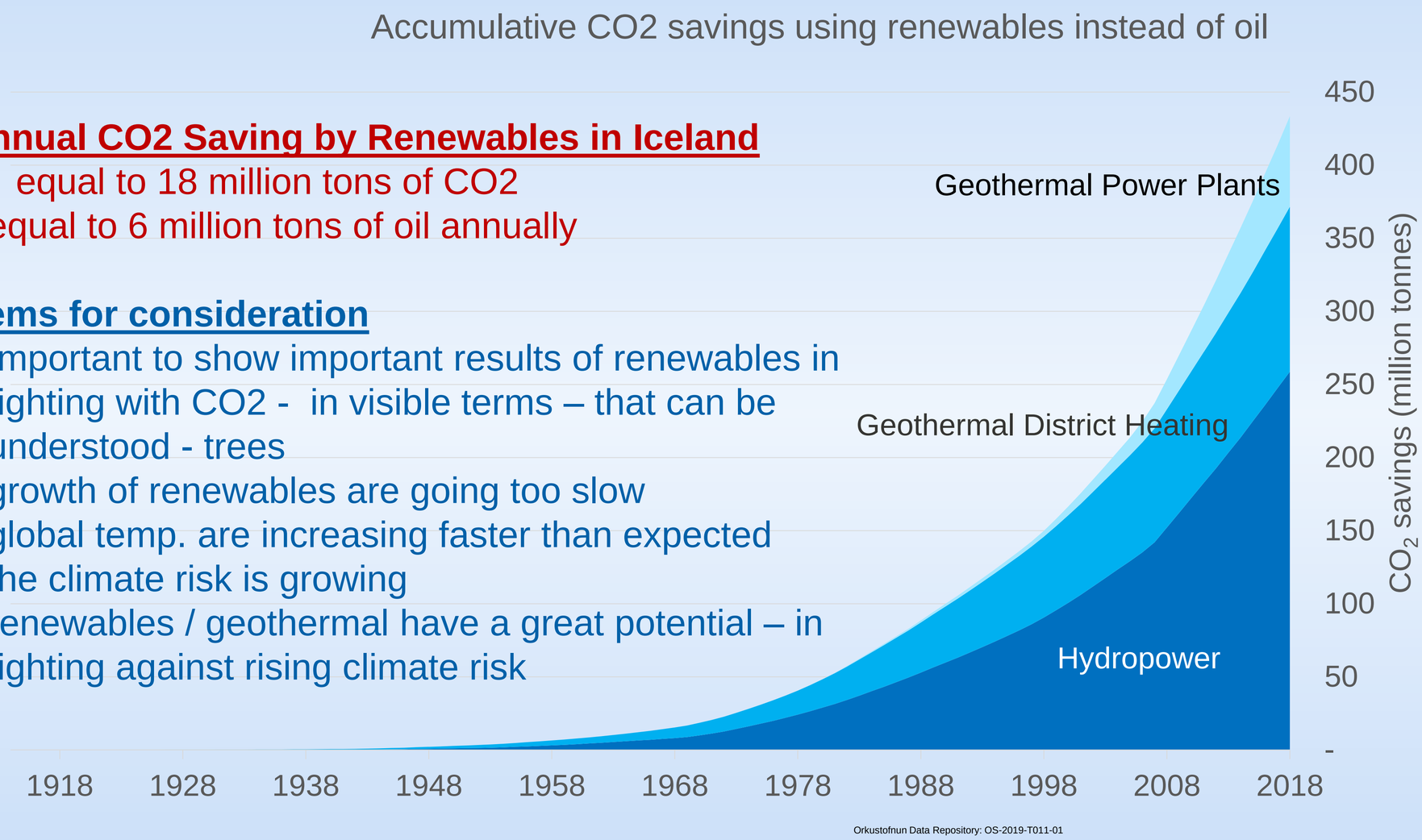
Renewable Energy - mitigate Global Warming

Annual CO2 Saving by Renewables in Iceland

- equal to 18 million tons of CO2
- equal to 6 million tons of oil annually

Items for consideration

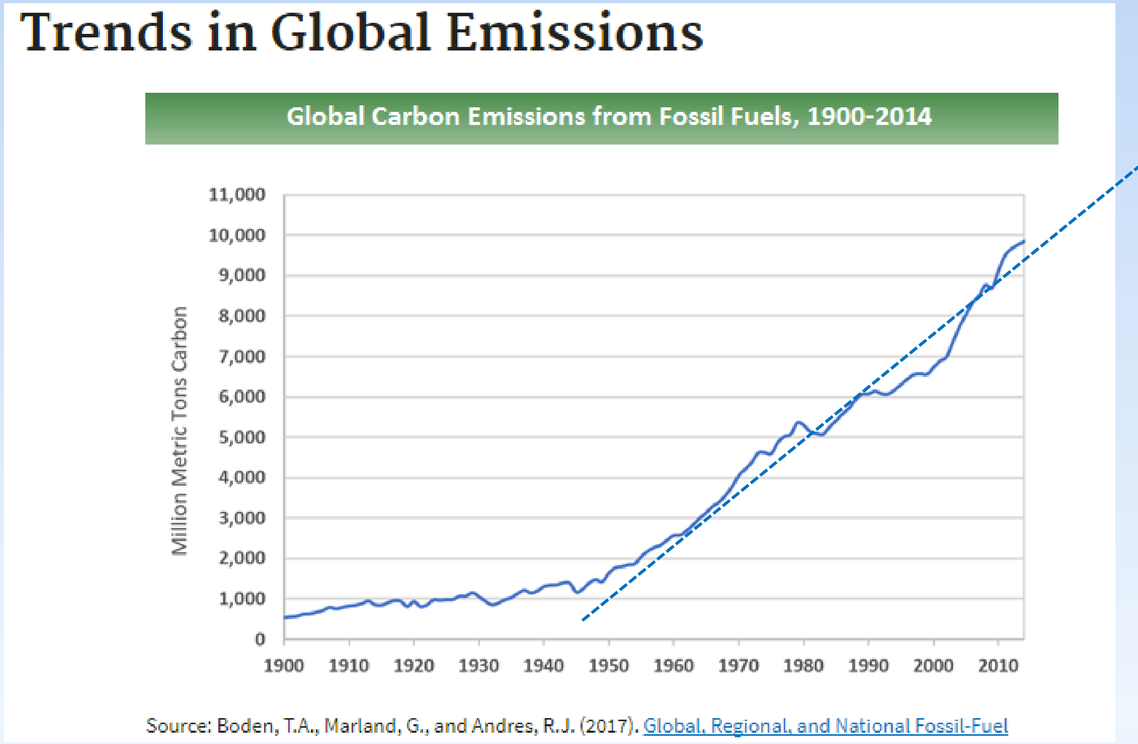
- Important to show important results of renewables in fighting with CO2 - in visible terms – that can be understood - trees
- growth of renewables are going too slow
- global temp. are increasing faster than expected
- the climate risk is growing
- renewables / geothermal have a great potential – in fighting against rising climate risk



Orkustofnun Data Repository: OS-2019-T011-01

Global Warming

More and more weather extremes



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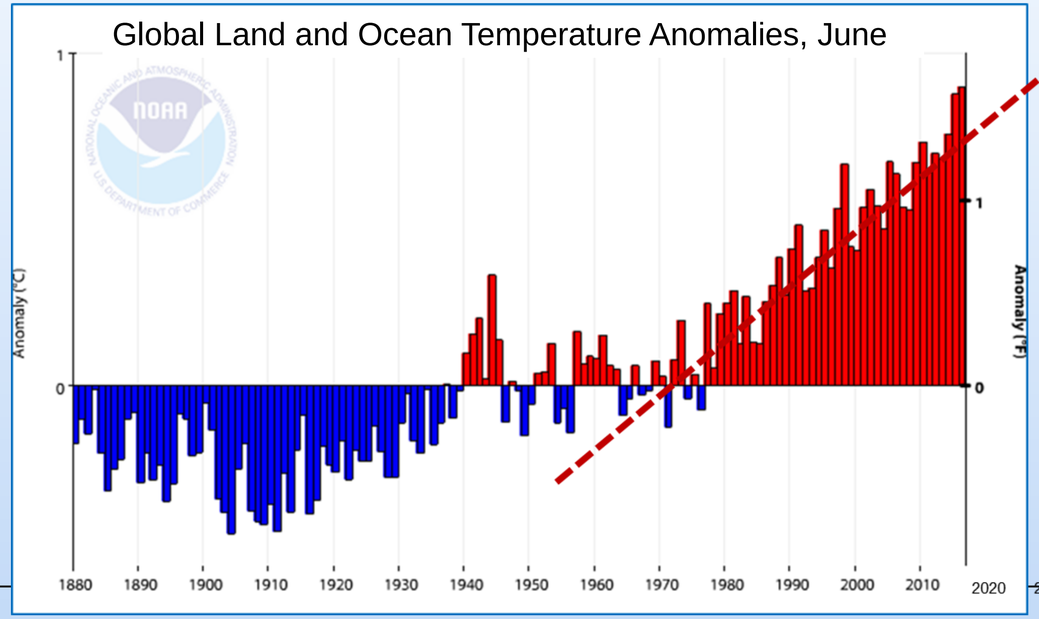

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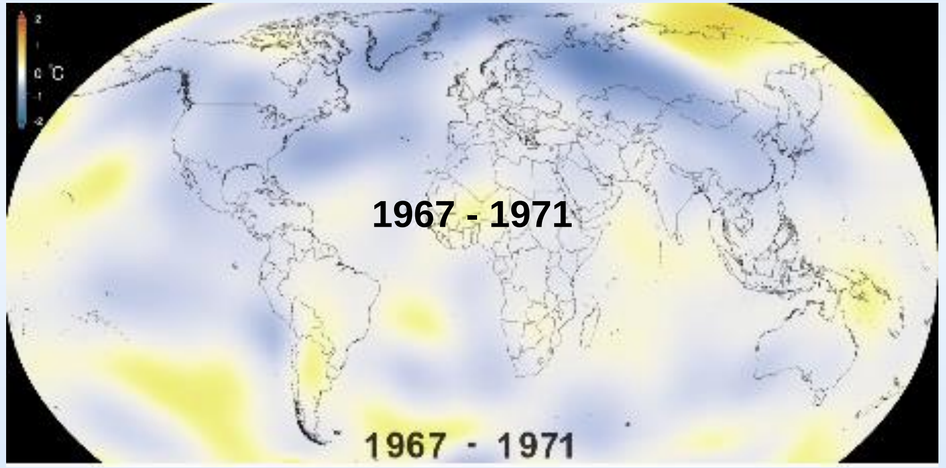
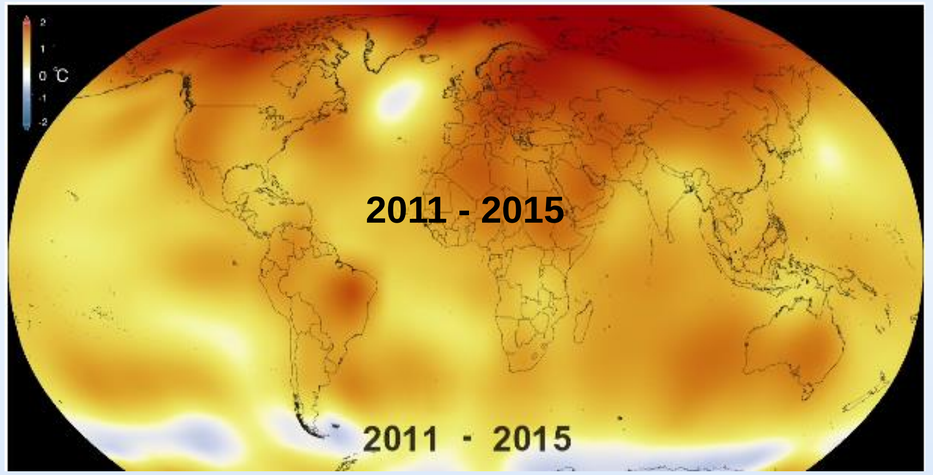
Global Warming

Five-year Global Temperature Anomalies from 1880 – 2015
1883 - 2100 (NASA)





How will the future look like

??

2050 - 2055

> 44 years >

> 44 years >

Global Warming

More and more weather extremes

Floods in Germany June 2013,
damage 3 billion € - insurance claims

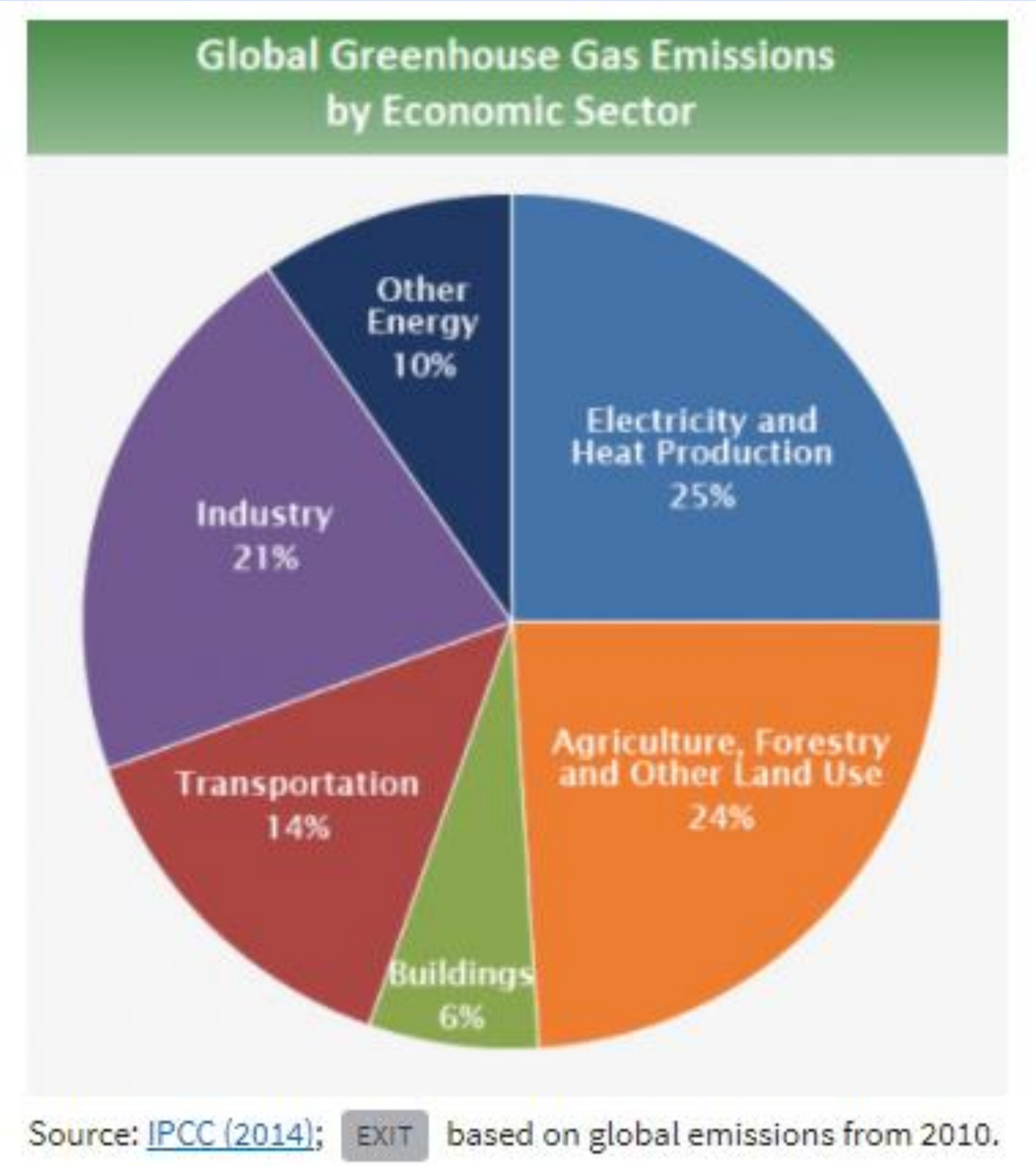
Floods in Paris 2016

Long Islands, New York “Frankenstorm”
Hurricane Sandy 2012

Philippines 2013

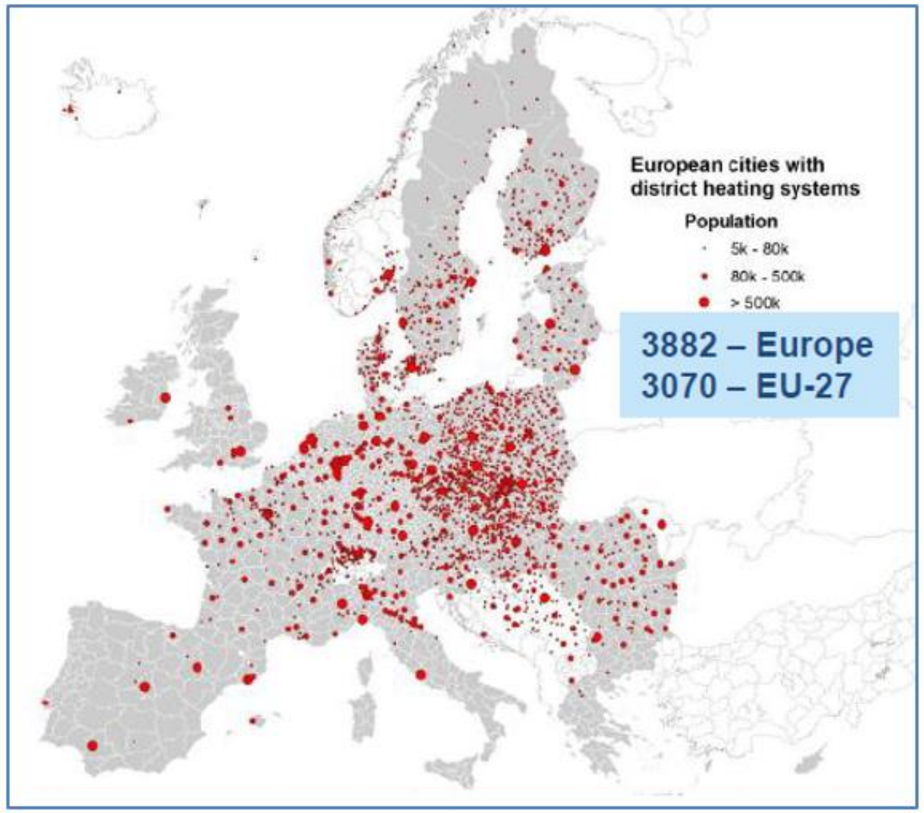
Global Warming

More and more weather extremes

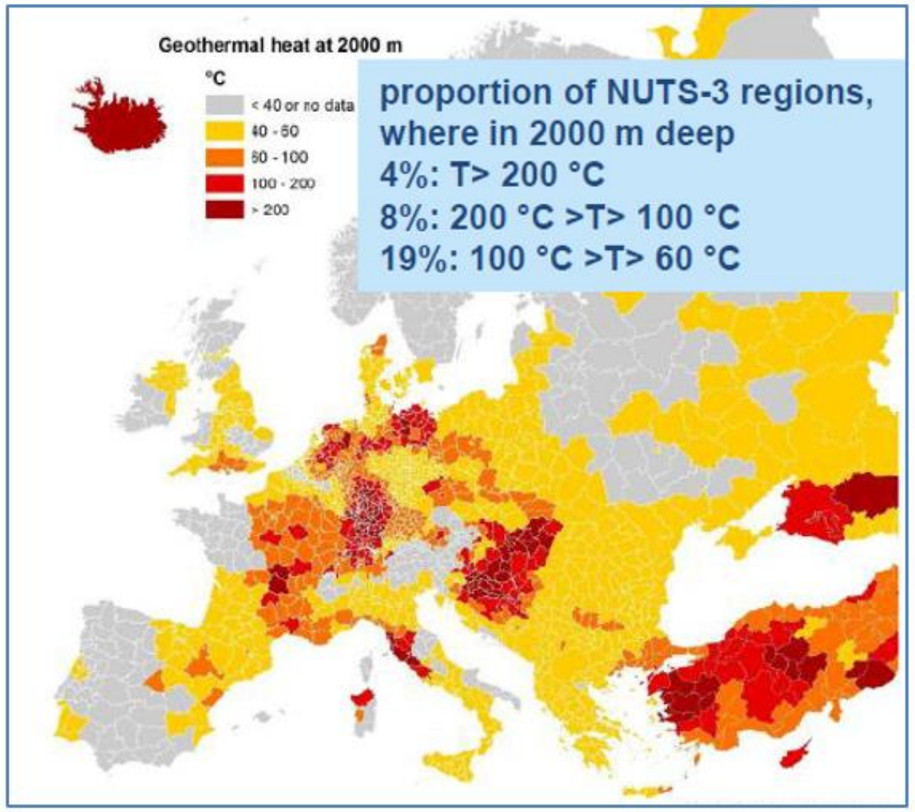


Geothermal District Heating
Options and Possibilities in Europe

Geothermal cities in Europe
with district heating systems



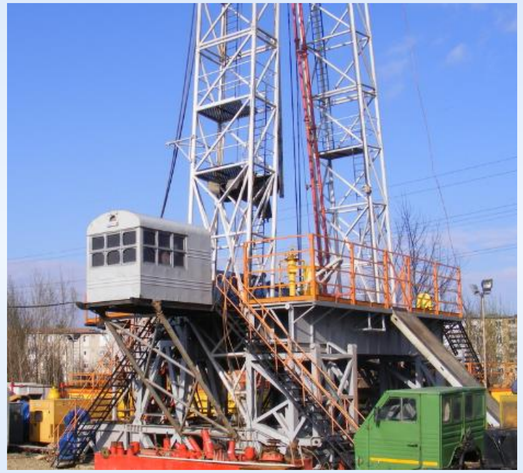
Geothermal heat
at 2000 meters



Romania

EEA Grant 2009-2014

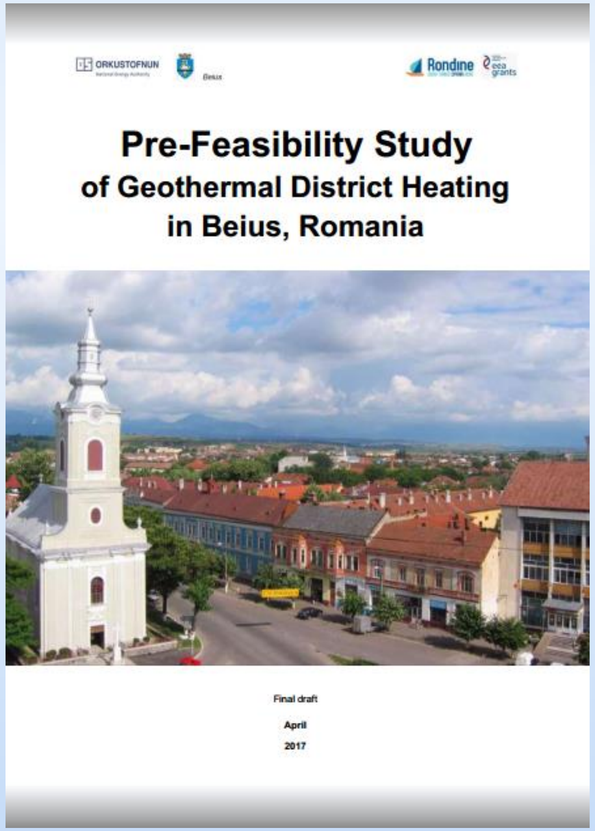
Old coal power plant in Oradea is (500 MW) – closing and replaced by gas and geothermal resources – reducing emission, mitigating climate change
and improve quality of life.

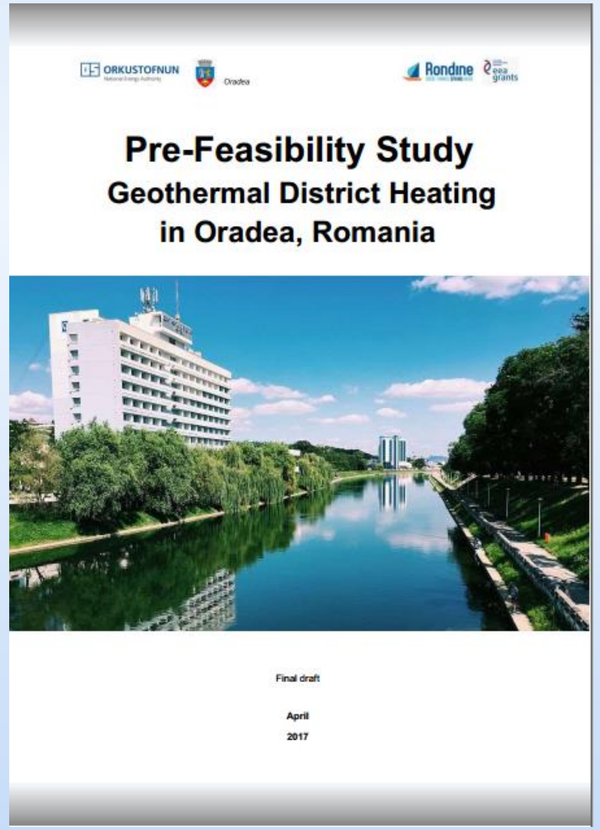


Romania

EEA Grant 2009-2014

Pre-Feasibility Studies on geothermal possibilities in cities in Romania

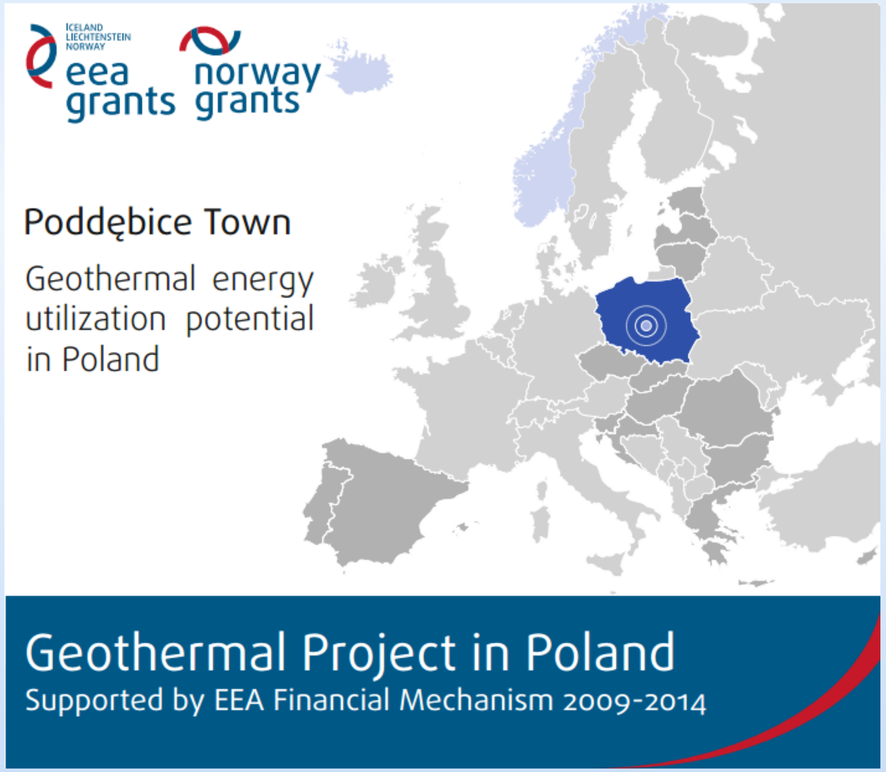


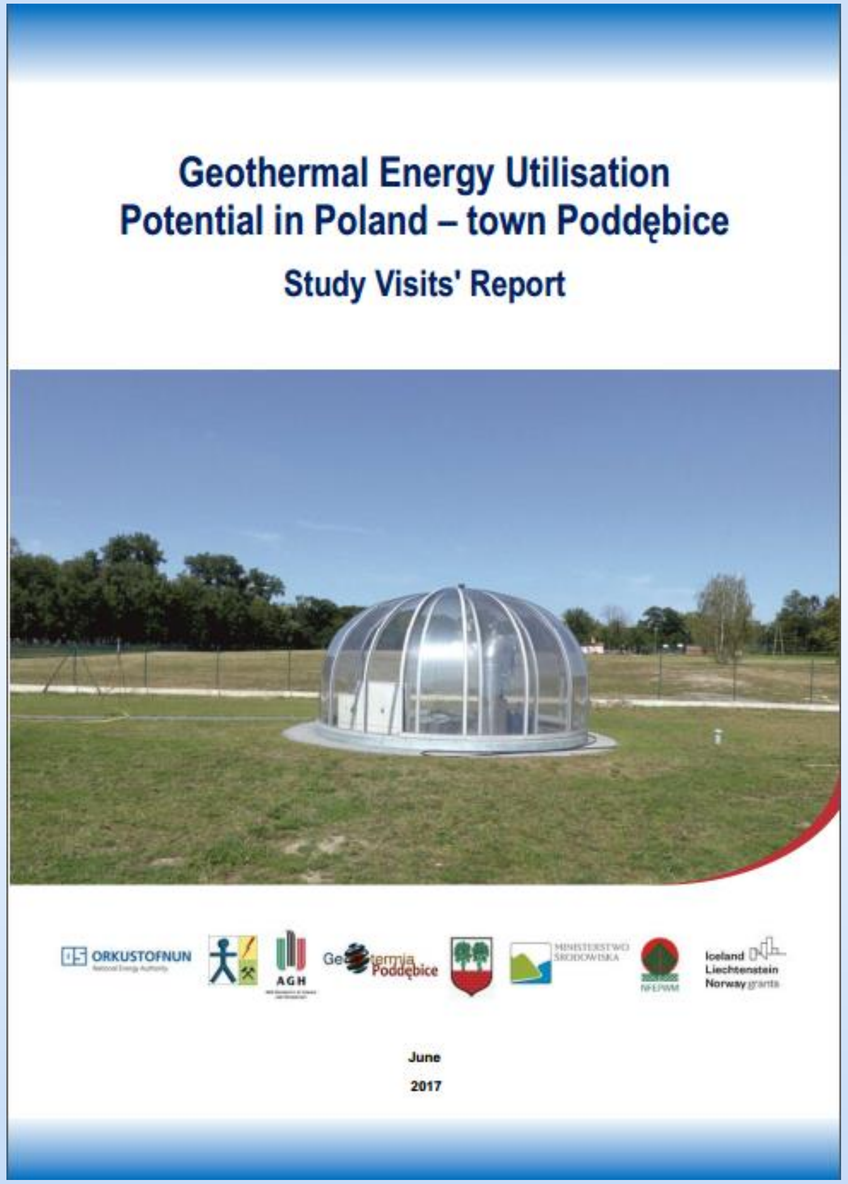


Bilateral Projects in Poland
Poddebice

Link to the report

EEA Grant 2009-2014





Bilateral Projects in Poland in 4 cities

Link to the report **Link to EEA Grant Poland Information at Orkustofnun**

The report can perhaps be used for preparation of various cooperation projects

EEA Grant 2009-2014

Project Partners and Performers

Consortium

MEERI PAS

AGH University of Science and Technology

Wrocław University of Science and Technology

Donors

Christian Michelsen Research

ORKUSTOFNUN National Energy Authority

Programme Operators

EGEC GEOTHERMAL

MINISTRY OF THE ENVIRONMENT

National Fund for Environmental Protection and Water Management

Konstantynów Łódzki

Lądek Zdrój

Sochaczew

Poddębice

Geotermia Poddębice

Uzdrowisko Lądek-Długopole SA

Some lessons from Iceland

Geothermal Options, Opportunities and Benefits
The geothermal heat generation has several advantages, such as:

1. Economic opportunity and savings.
2. Improvement of energy security.
3. Reducing greenhouse gas emissions.
4. Harnessing local resources.
5. Improve and simplify financial support.
6. Reducing dependency on fossil fuels for energy use.
7. Improving industrial and economic activity.
8. Develop low carbon and geothermal technology industry, and create employment opportunities.
9. Local payback in exchange for local support for geothermal drilling.
10. Improving quality of life based on economic and environmental / climate benefits.

District heating - is a powerful tool to fight against global warming