ISOR – Iceland GeoSurvey

Geothermal exploration and development

ISOR - Iceland GeoSurvey

- Owned by the Icelandic government.
- Provides specialist services to the Icelandic power industry, the Icelandic government and international companies.
- Operates on the free market on competitive basis.
- Profit goes exclusively into scientific research and to strengthen the company.



History of Iceland GeoSurvey

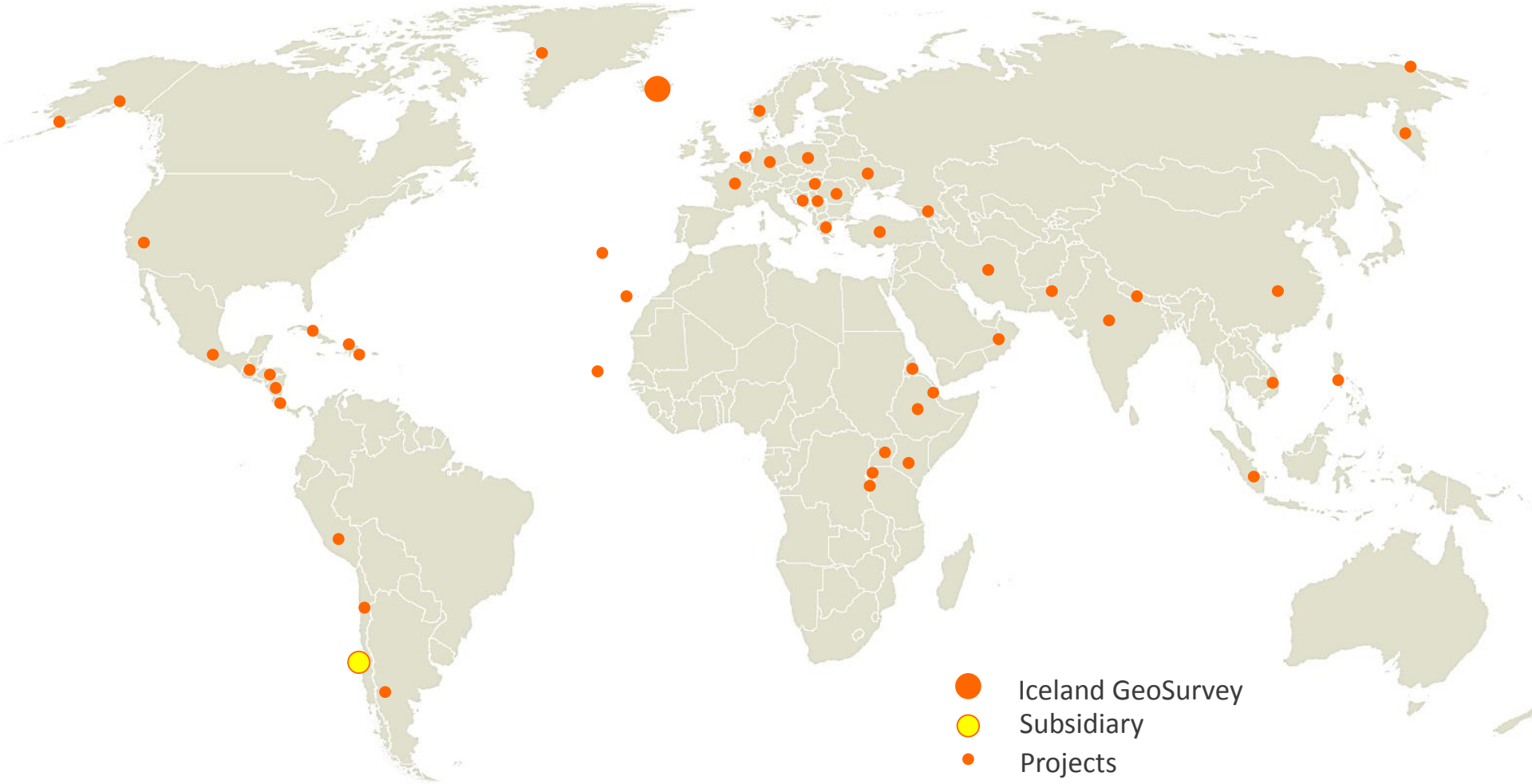
- It is based on almost seven decades of continuous experience in the field of geothermal and hydropower research and development.
- Established in 1945 as a part of the State Electrical Authority
- A division in the National Energy Authority (Orkustofnun) 1967-2003.
- Independent company from 2003.

72 employees 2013

In Reykjavik and Akureyri. Approximately 20 students each summer.

- **26** Geologists
- **18** Physicists and Geophysicists
- **5** Chemists and Geochemists
- **8** Engineers and Tecnologists
- **10** Other Academic Education
- **5** Other Education

Activities abroad

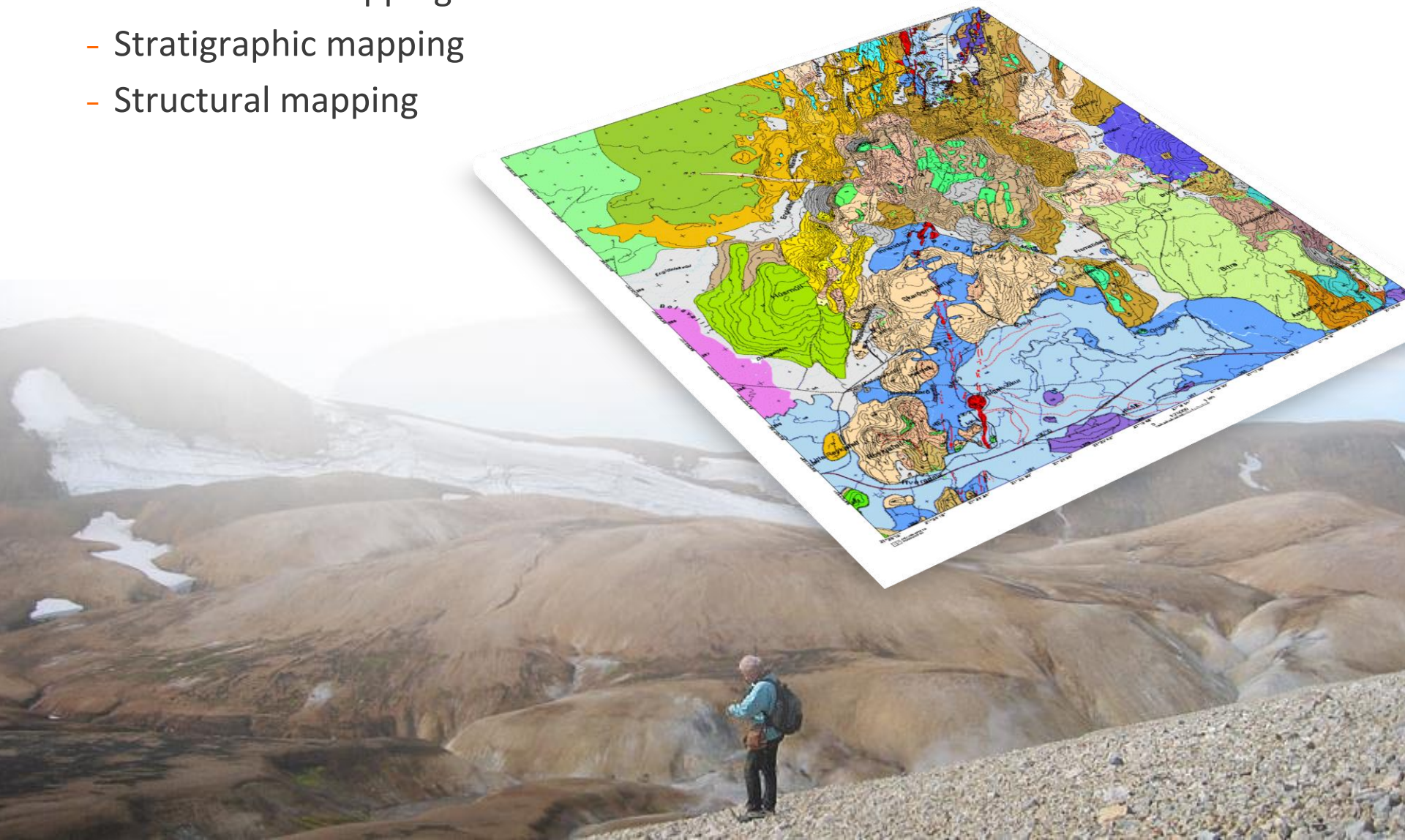


Fields of expertise

- Geothermal Exploration
  - Geological, Geophysical, Geochemical
- Drilling Consultancy
  - Well Logging and Mud Logging
  - Well Testing and Evaluation
- Resource Assessment and Management
- Environmental Studies
- Groundwater Studies
- Engineering Geology
- Marine Geophysics
- Geothermal Training

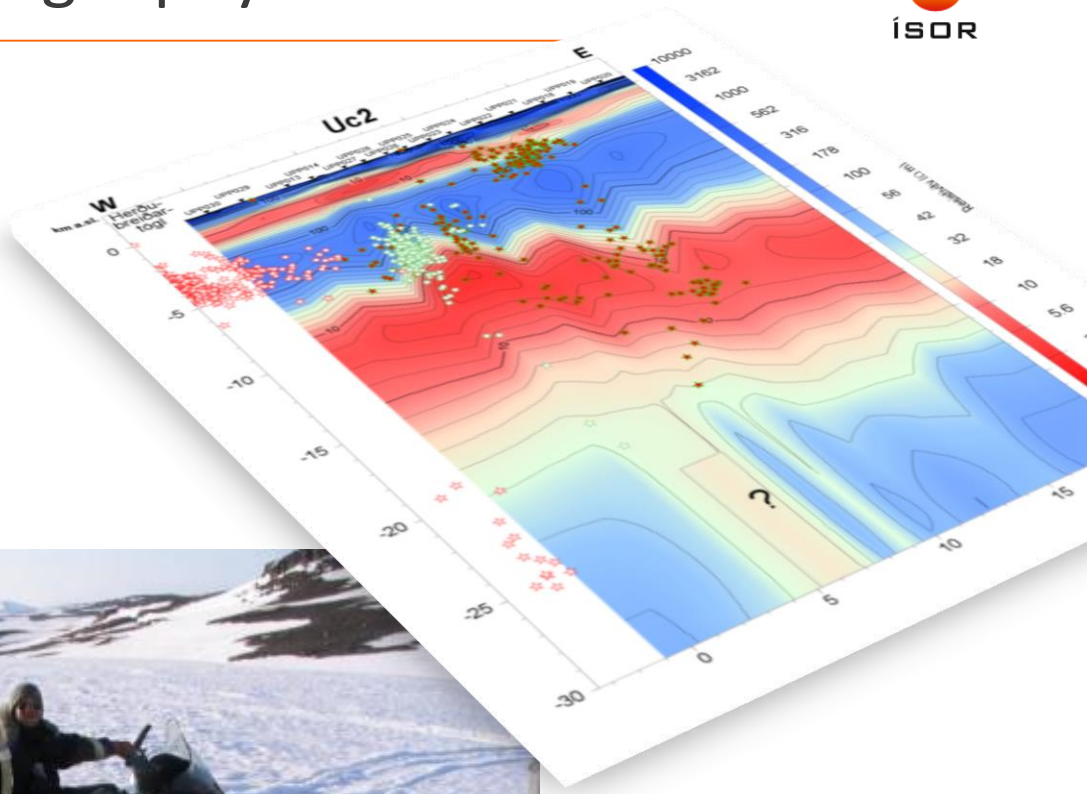
Geothermal exploration - geology

- Geothermal mapping
- Stratigraphic mapping
- Structural mapping



Geothermal exploration - geophysics

- Resistivity measurements, processing and interpretation
- Seismic surveys
- Seismic monitoring
- Gravimetric measurements
- Surface GPS measurements

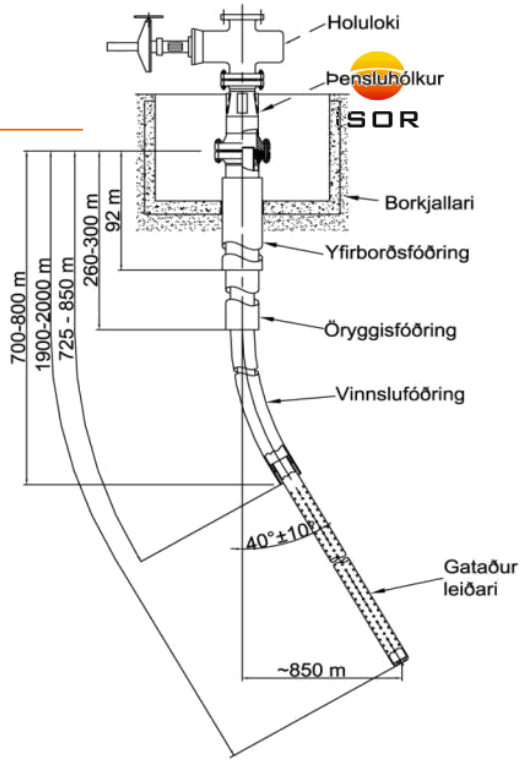


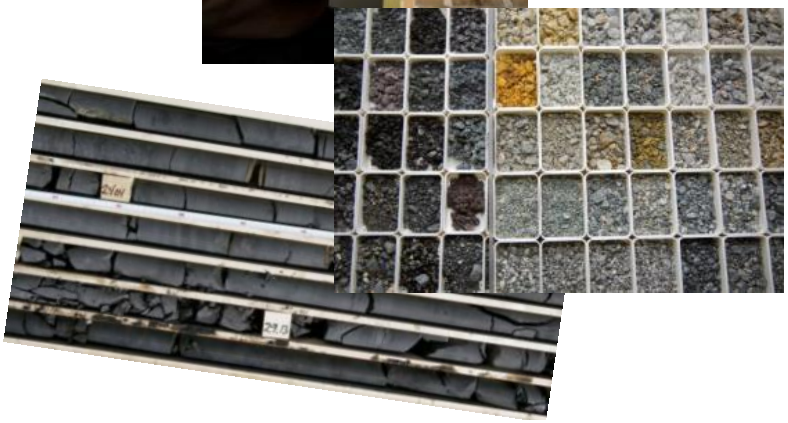
Geothemal exploration - geochemistry

- Geothermal water
- Ground water
- Gas
- Steam
- Cuttings/cores
- Scaling
- Corosion
- Rocks

Drilling consultancy

- Well siting
- Well design
- Drilling supervision

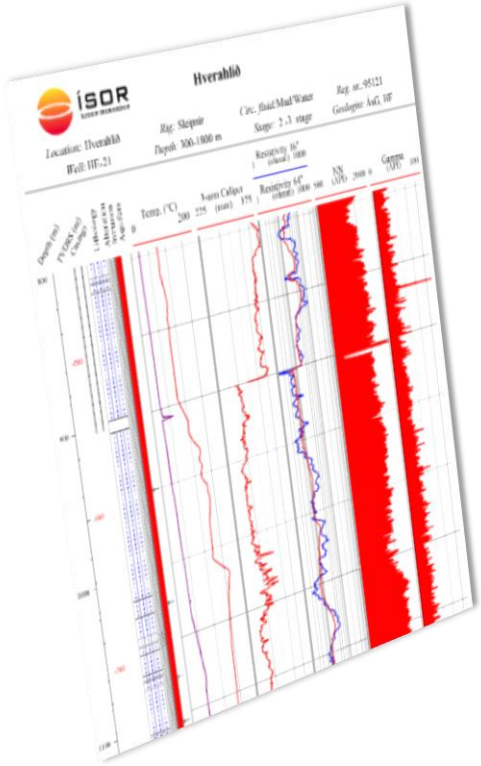




- Mud logging services
- Well logging services
- On site geological consultancy

Well logging and testing of exploration wells

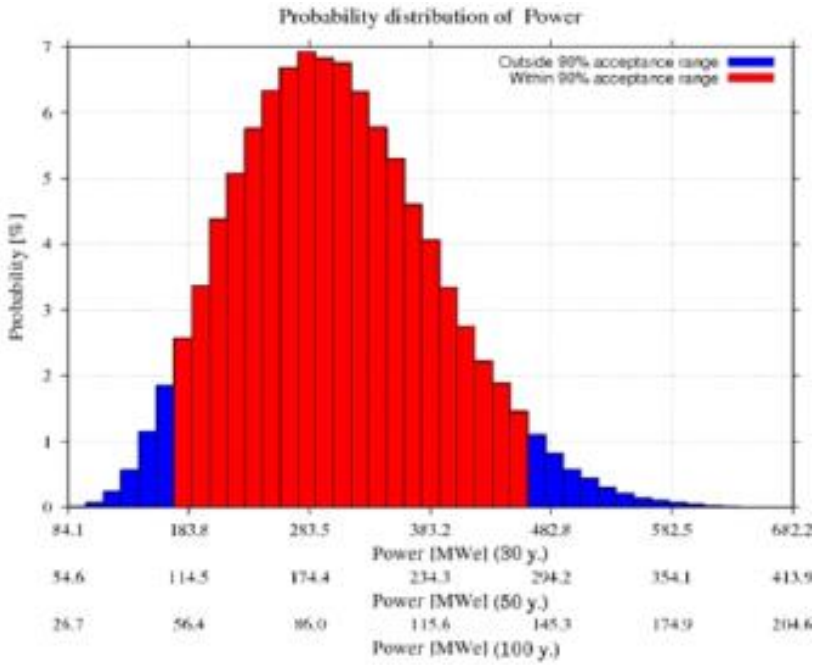
- Geophysical logging (T, P, GR, NN, SP, Res, Cal etc)
- Injection- and flow testing
- Chemical sampling and analysis
- Well stimulations
- Tracer- and interference testing



Reservoir estimate and management

Volumetric assessment

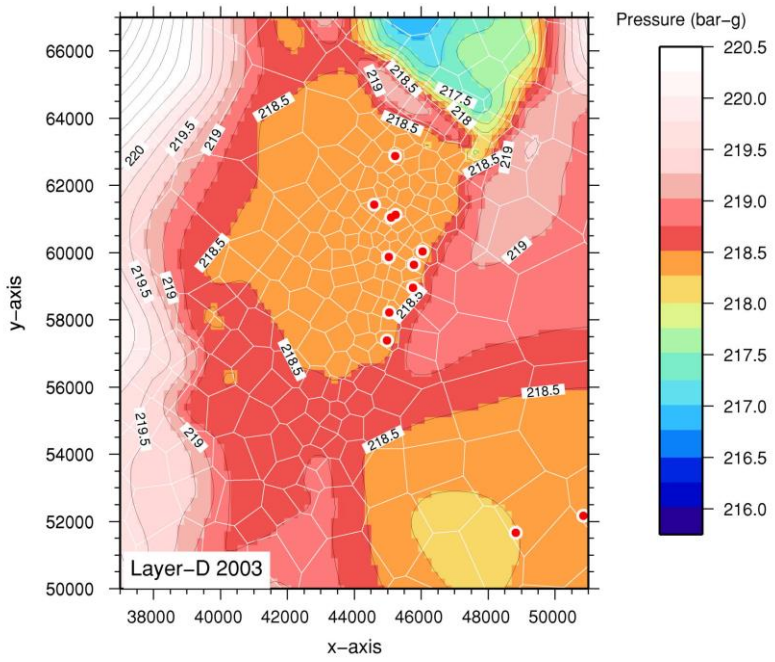
- The first step in reservoir potential estimation.
- Using the Monte Carlo method



Reservoir modelling is the key to optimised reservoir management:

- 3D models of the geothermal fields where all availible data are used as input.
- Predicts the pressure and temperature decline of the reservoir with time.

3D model



Geothermal Training

In Iceland and specialized courses worldwide

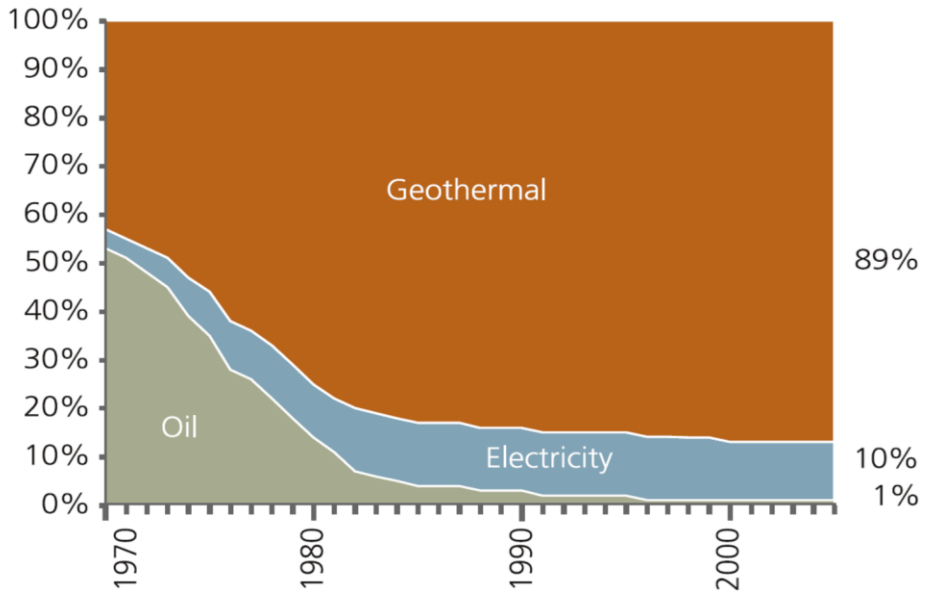
- United Nations University Geothermal Training Programme
- University of Iceland
- University of Reykjavík
- Iceland School of Energy (ISE)
- Keilir
- Icelandic International Development Agency (ICEIDA)

Activities in Iceland – electricity production

Exploration, drilling consultancy, resource assessment and management

Geothermal District Heating in Iceland

Iceland GeoSurvey has been key actor in the development of district heating in Iceland since 1930.



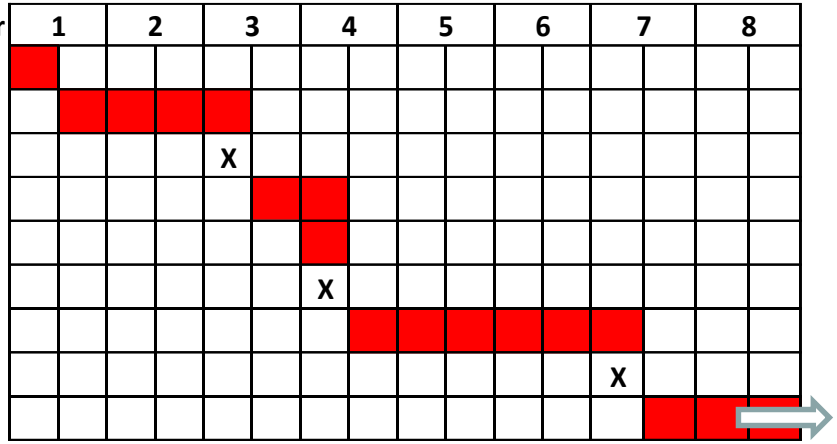
Geothermal district heating systems:

- Reykjavík: 1000 MW_{th}
- HS Orka: 150MW_{th}
- Akureyri: 80 MW_{th}
- Hverageröi: 65 MW_{th}
- Húsavík : 40 MW_{th}

Geothermal Project Development

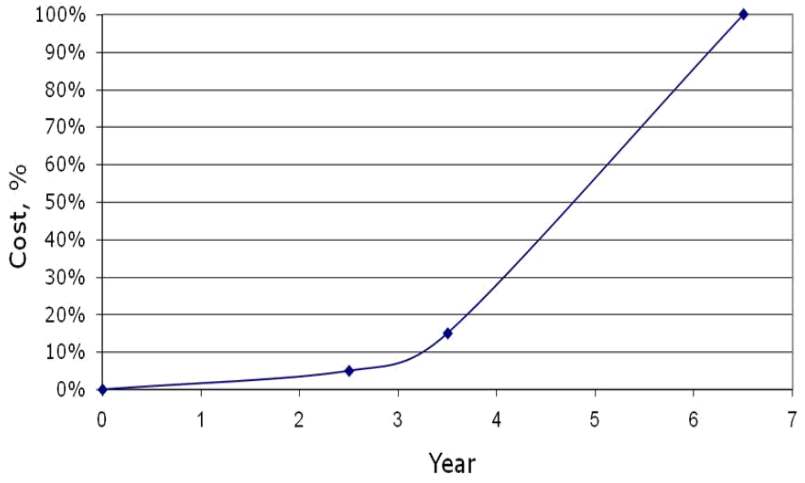
- Step 1: Gathering and evaluation of existing data
- Step 2: Surface Exploration and Exploration drilling
- Step 3: Pre-feasibility report
- Step 4: Drilling and testing of add. exploration/confirmation wells
- Step 5: Concept design, EIA assessment
- Step 6: Feasibility report
- Step 7: Detailed design, construction, drilling, supervision
- Step 8: Testing, commissioning, training
- Step 9. Operation

Project Development Time and cost



Geothermal Power Plant
Exploration and Construction Cost

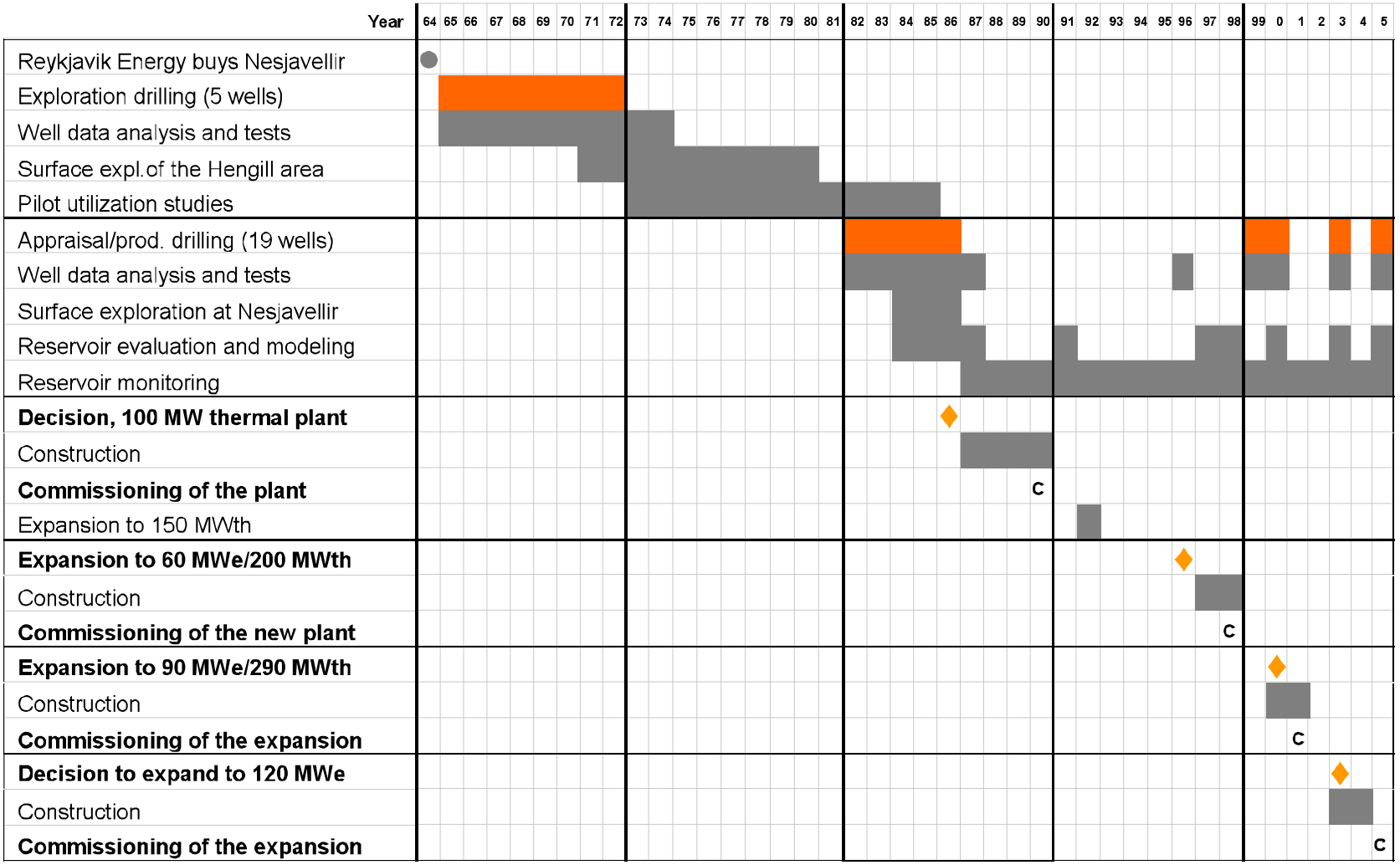
On average:
Flash power plant, the cost is 3.5 – 4.5 MUSD/MW installed,
Binary, the cost is 6 – 7 MUSD/MW installed



The Nesjavellir Co-Generation Power Plant
120 MWe, 290 MWth

Mats Vibe Lund

The Development History of the Nesjavellir Field 1964 - 2005



Development of Hellisheiði Power Project started in year 2000

Year	Hot water		Electricity
	L/s	MWth	MWe
2006			90
2007			33
2008			90
2010	750	133	
2011			90
Total		**133MW$_{th}$**	**303 MW$_{e}$**


ÍSOR
THANK YOU
www.isor.is