

# How to estimate production capacity of green fields?

Héðinn Björnsson



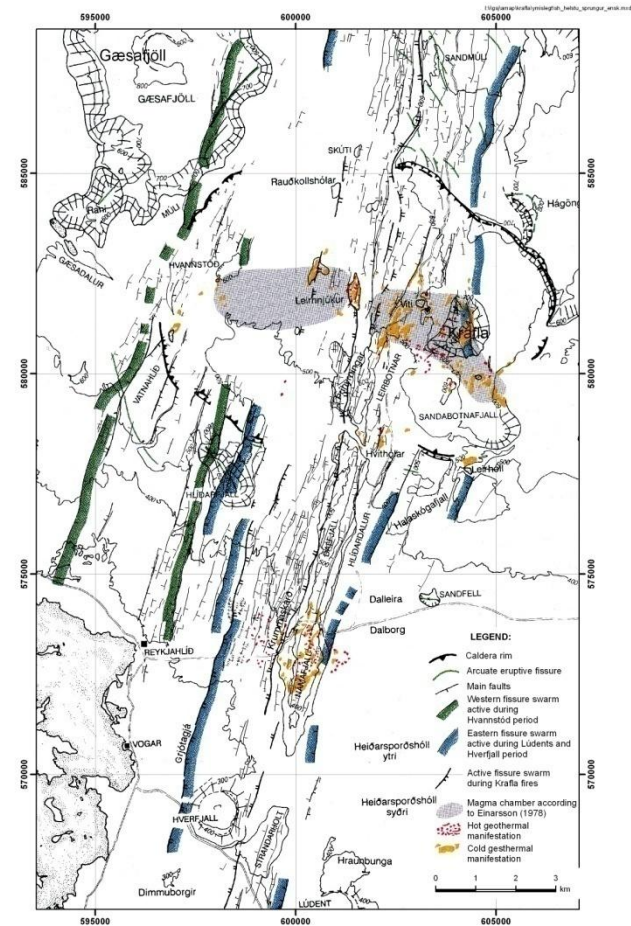
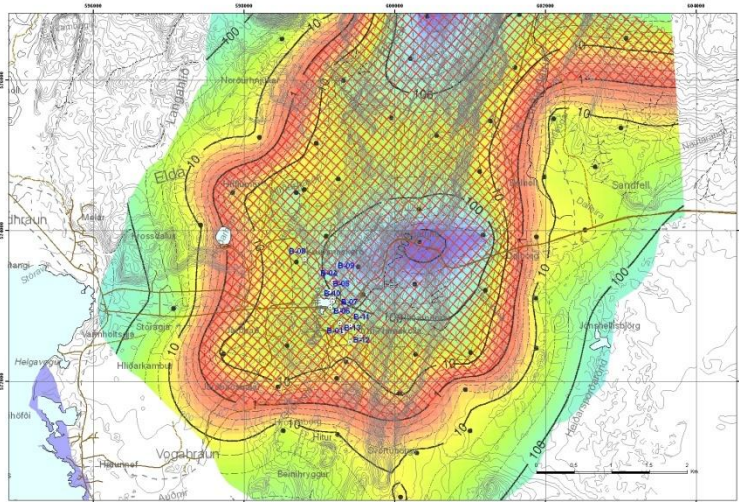
# Why?

- Economic, environmental and social cost-benefit estimates
- Energy planning
- Building plans
- Marketing



# How are we doing this today?

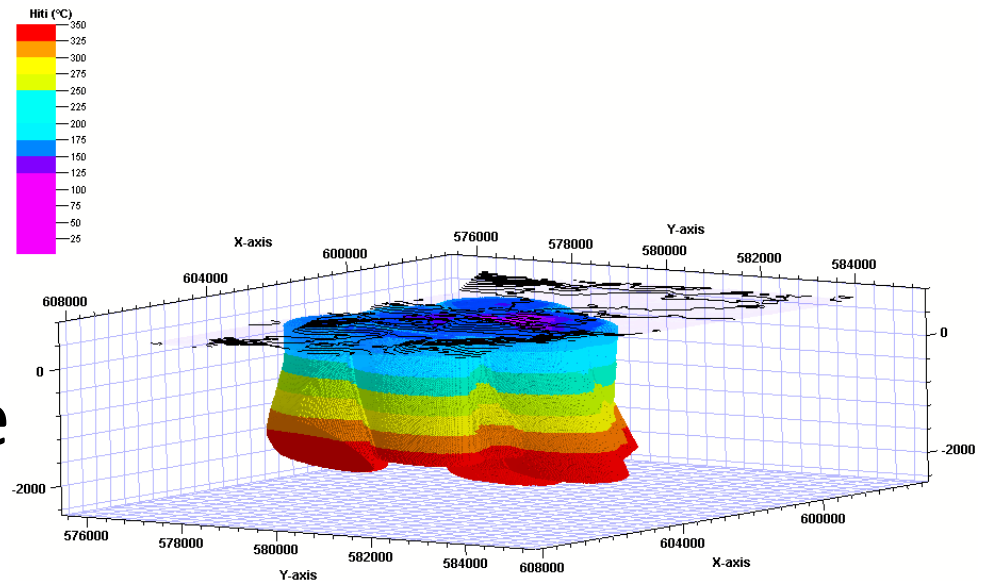
- Gut feeling
- Rule of thumb
- Volumetric method



# Volumetric method

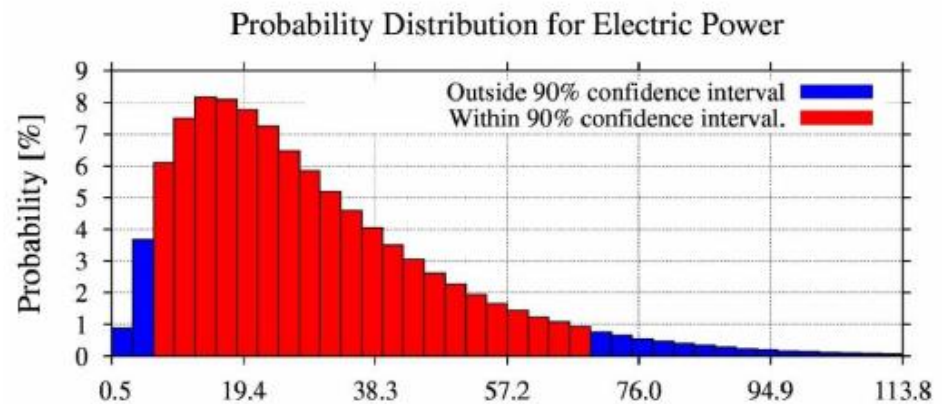
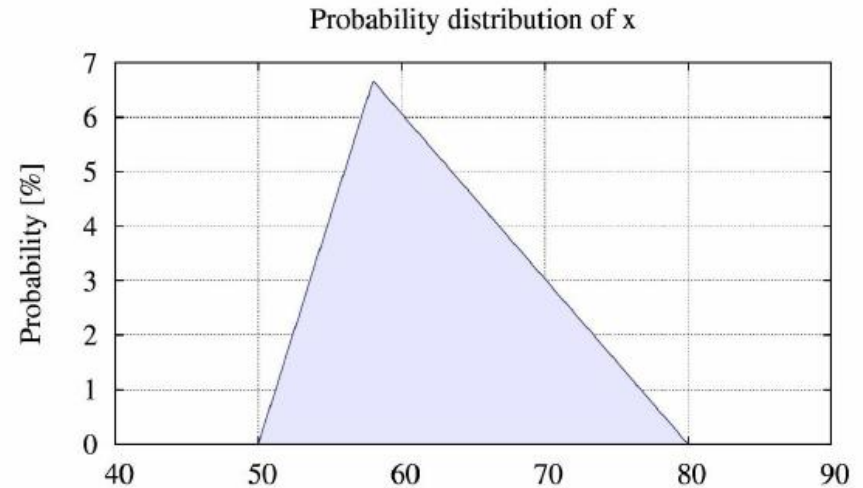
- Volume
- Recovery factor
- Temperature
- Heat capacity
- Conversion Coeff.
- Cut-off temperature

$$P = \frac{\eta_g R \int_V c[T(z) - T_0] dV}{t}$$



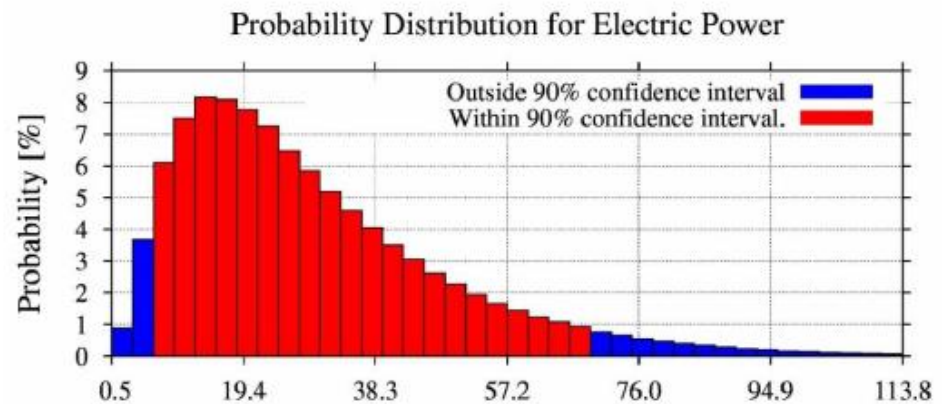
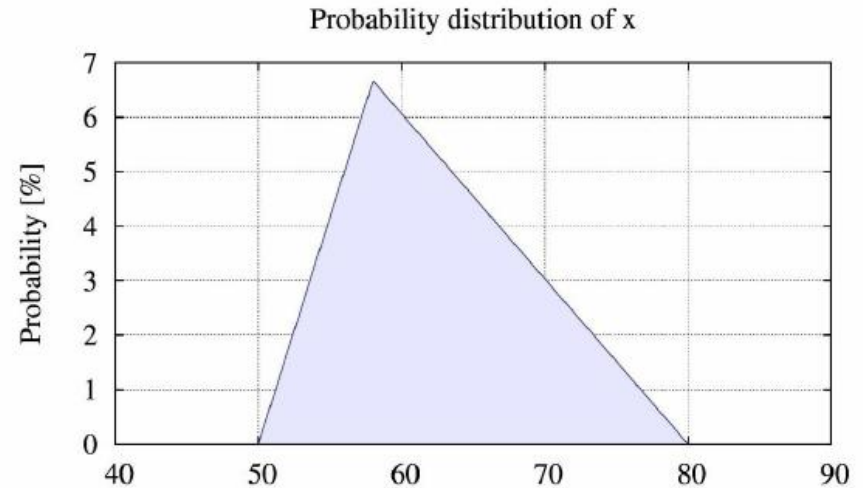
# Volumetric method

- Volume
- Recovery factor
- Temperature
- Heat capacity
- Conversion Coeff.
- Cut-off temperature



# Problems

- Dependent variables
- Estimation of variables
- Verifying model
- Over interpretation
- No inflow -> under estimates long term utilization.



# Now what?

- Drill baby, drill!
- Go with your gut
- Improved static modelling
- Dynamic models



# Problems

- Dependent variables
  - Coupling variables
- Estimation of variables
  - Constraining variables by analyzing established fields
  - Combining knowledge from various fields
  - Geostatistics
- Verifying model
  - Analysis of established fields
- Over interpretation
  - Analysis of established fields
- No inflow
  - Constant input (1%/yr ?)





# Dynamic models

- RESITOUGH2
- Resistivity measurements used to invert model
- Can incorporate well measurements
- Error estimation
- Expensive

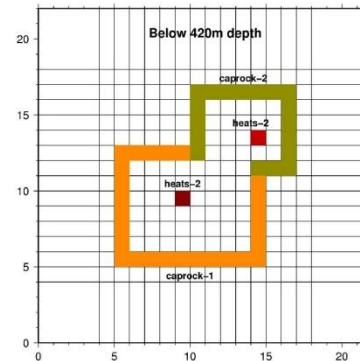


Figure 3. Horizontal slice of a model showing two types of vertical cap-rocks and two heat sources.

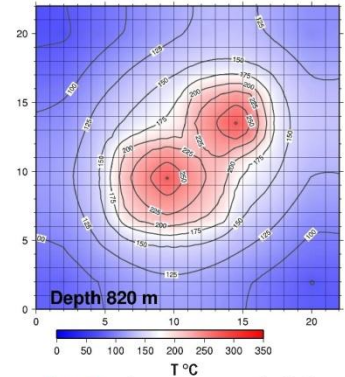


Figure 5. Steady state temperature distribution at 820 m depth.

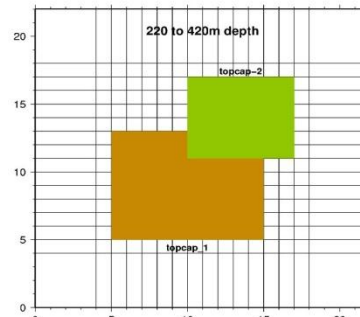


Figure 4. Horizontal slice of a model showing two types of "roof" cap-rocks.

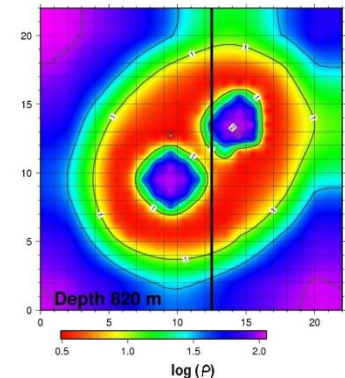


Figure 6. Calculated resistivity at 820 m depth and location of the data cross-section.



# Summary

- Important input for policy makers
- Volumetric method
  - Coupling variables
  - Analysis of established fields
  - Geostatistics
- Dynamic model
  - RESiTOUGH2
  - Other constrains