

HYDROPOWER IN ICELAND

Impacts and adaption in future climate



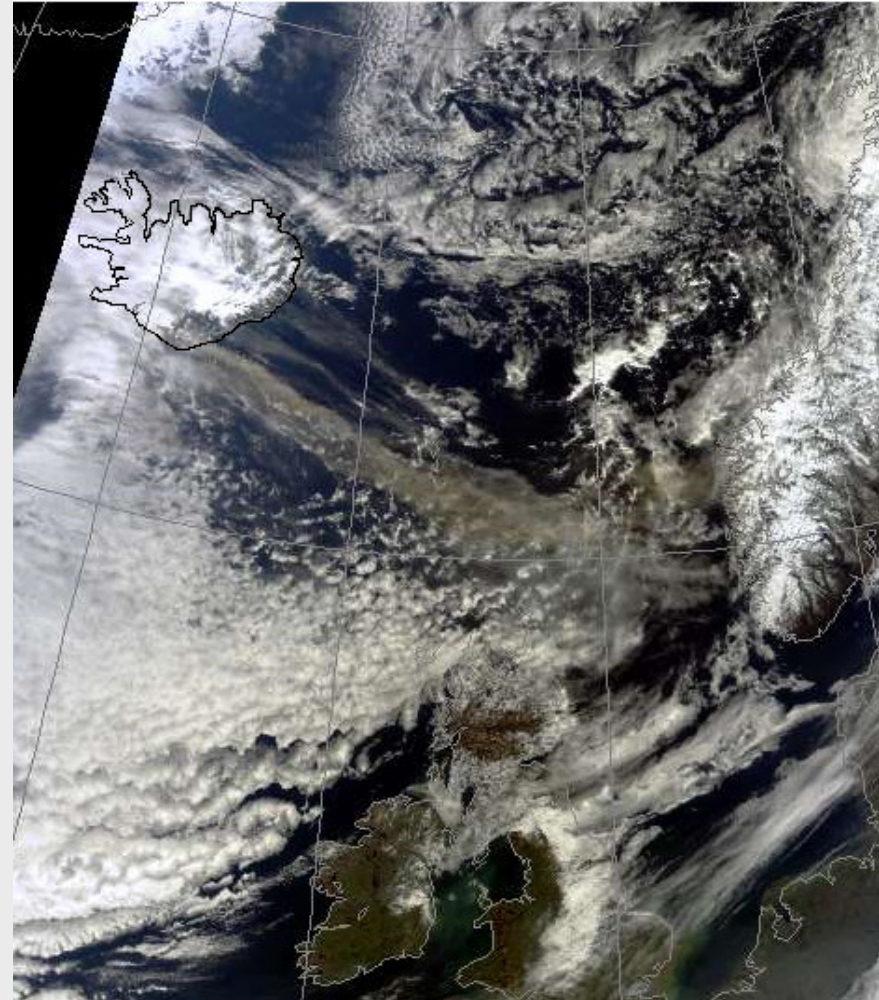


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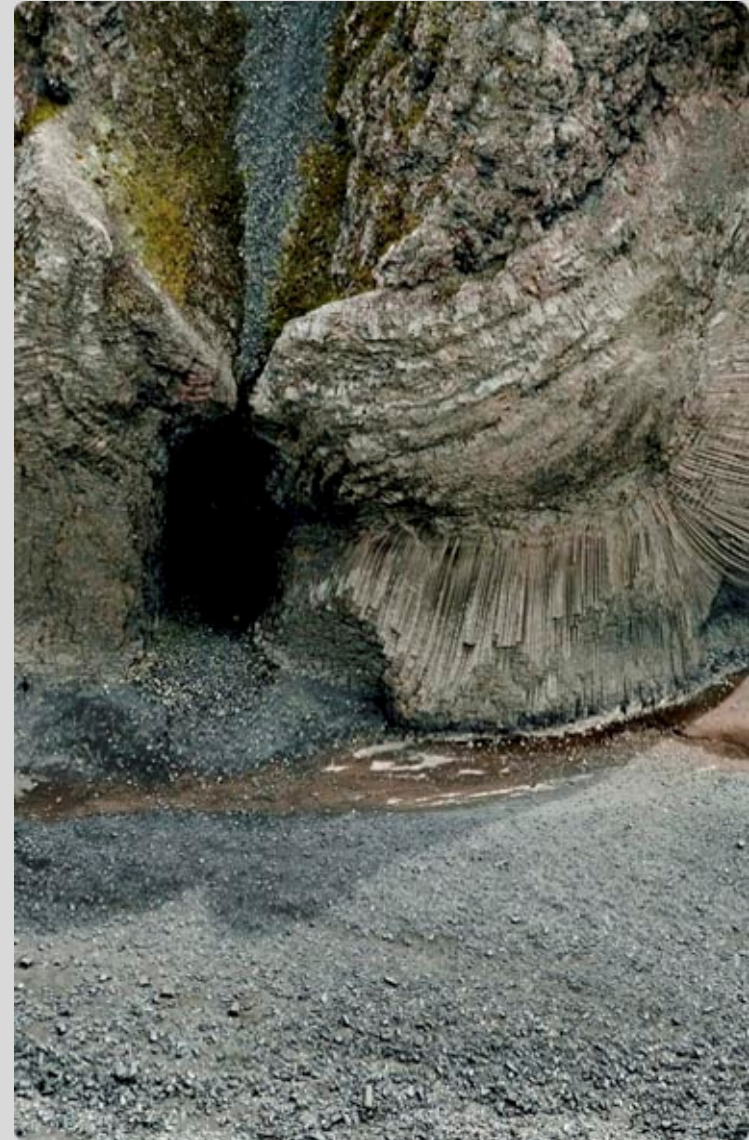
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- Installed power 1850 MW
 - 96 % Hydroelectricity
 - 4% Geothermal
- Production capacity 13 TWh/a
- Customer base
 - 86 % Large industries
 - 14 % Small businesses / Household
- No connection to other countries
- Reliability a major concern



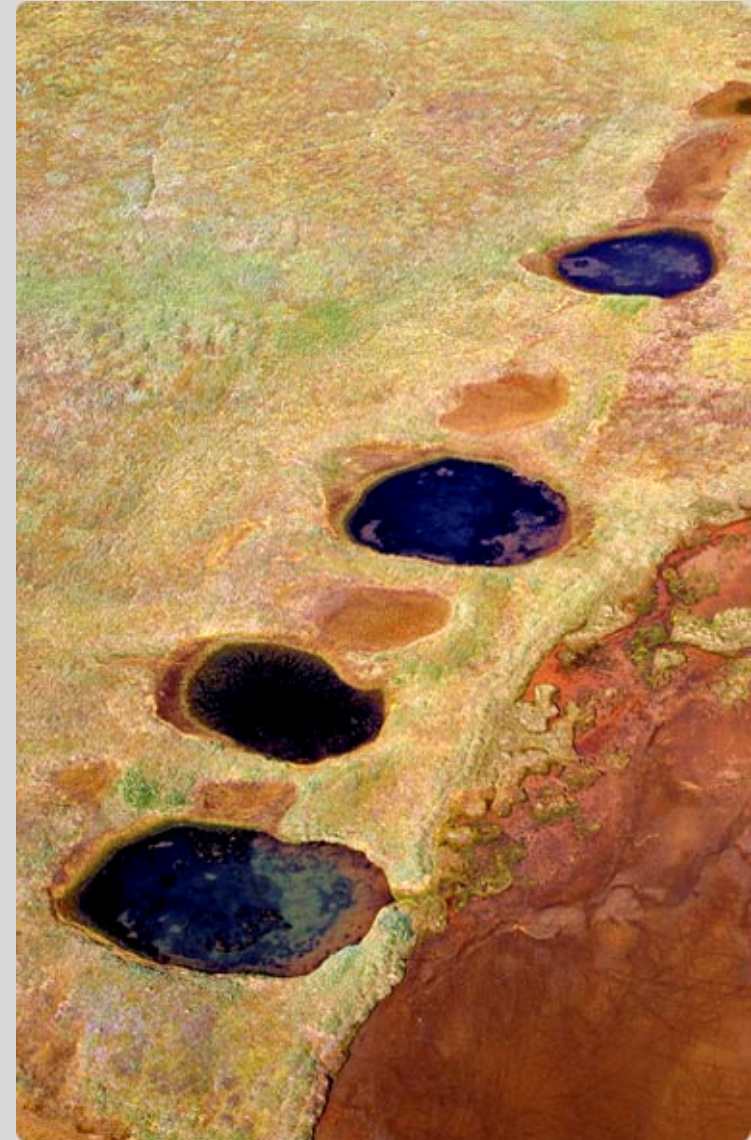
- Every autumn reservoir content is forecasted one year into the future
- When designing or reviewing design of new units. Reservoir size and installed capacity are based on reservoir inflow.
- For long term contracts a due diligence study is performed
- Larger research projects. For instance connecting Iceland to Europe with a submarine power cable.



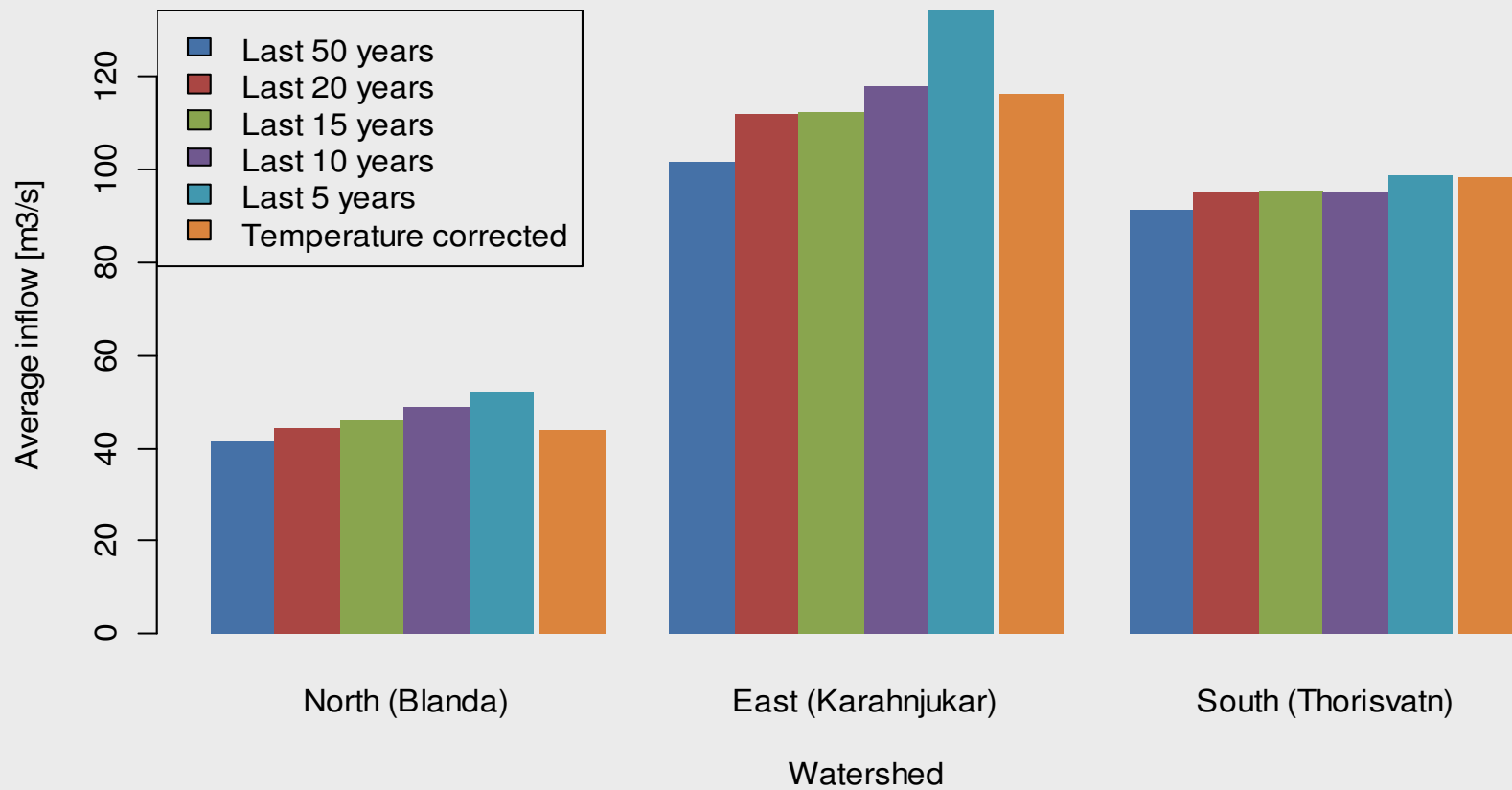
- Operational planning: A set of inflow series is selected for determination of the generation capacity.
- New Development: A set of inflow series is selected for estimation of energy production, installed capacity and reservoir storage capacity ...etc.
- These tasks require an ongoing review of expected inflow, both for present and the future.



- River flows from 1950 to 2008 have been simulated using a hydrological model
- These series were used to determine generation capacity and for new development
- Since the start of CWE, CE, CES the use of these historical series has been questioned and is now abandoned
- Currently 2010 series are being used for operational planning and 2010 and 2025 series for design
- New series have been made for 2010, 2015, 2025, 2035 and 2050



Change in average inflow to the main storage reservoirs



- Change in temperature

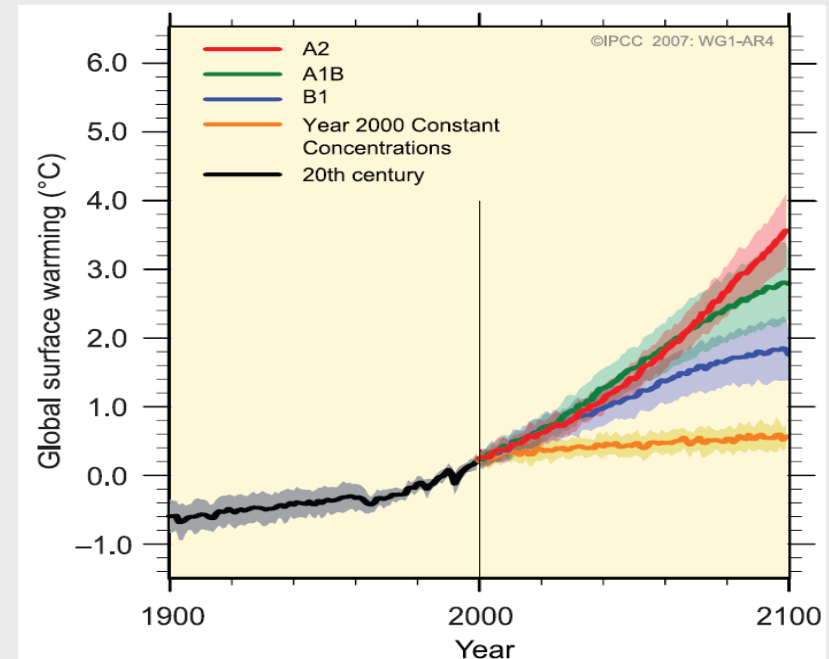
- 0.75 °C/100y 1950-1975
- 1.55 °C/100y 1975-2000
- 2.35 °C/100y 2000-

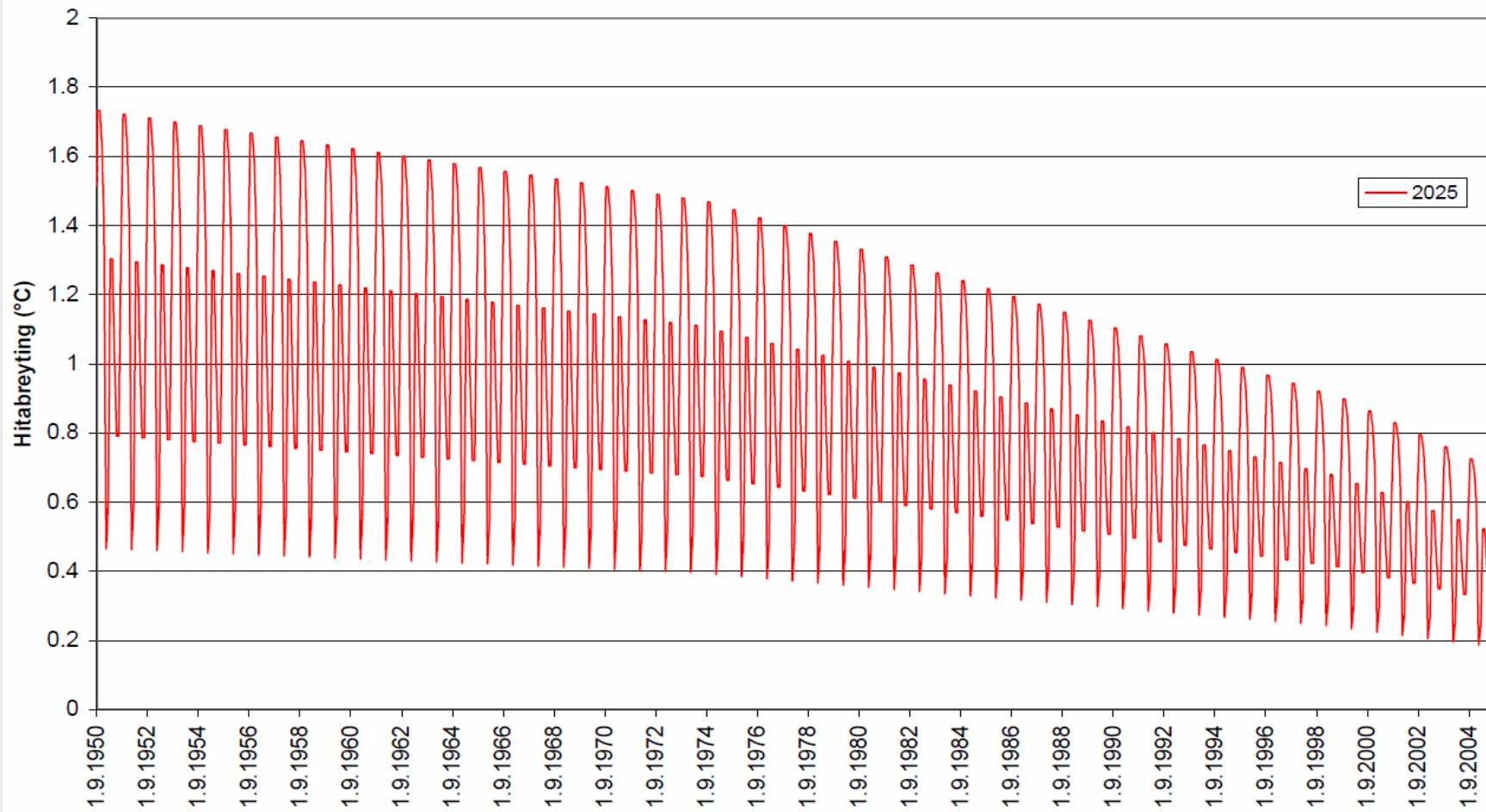
- Change in precipitation

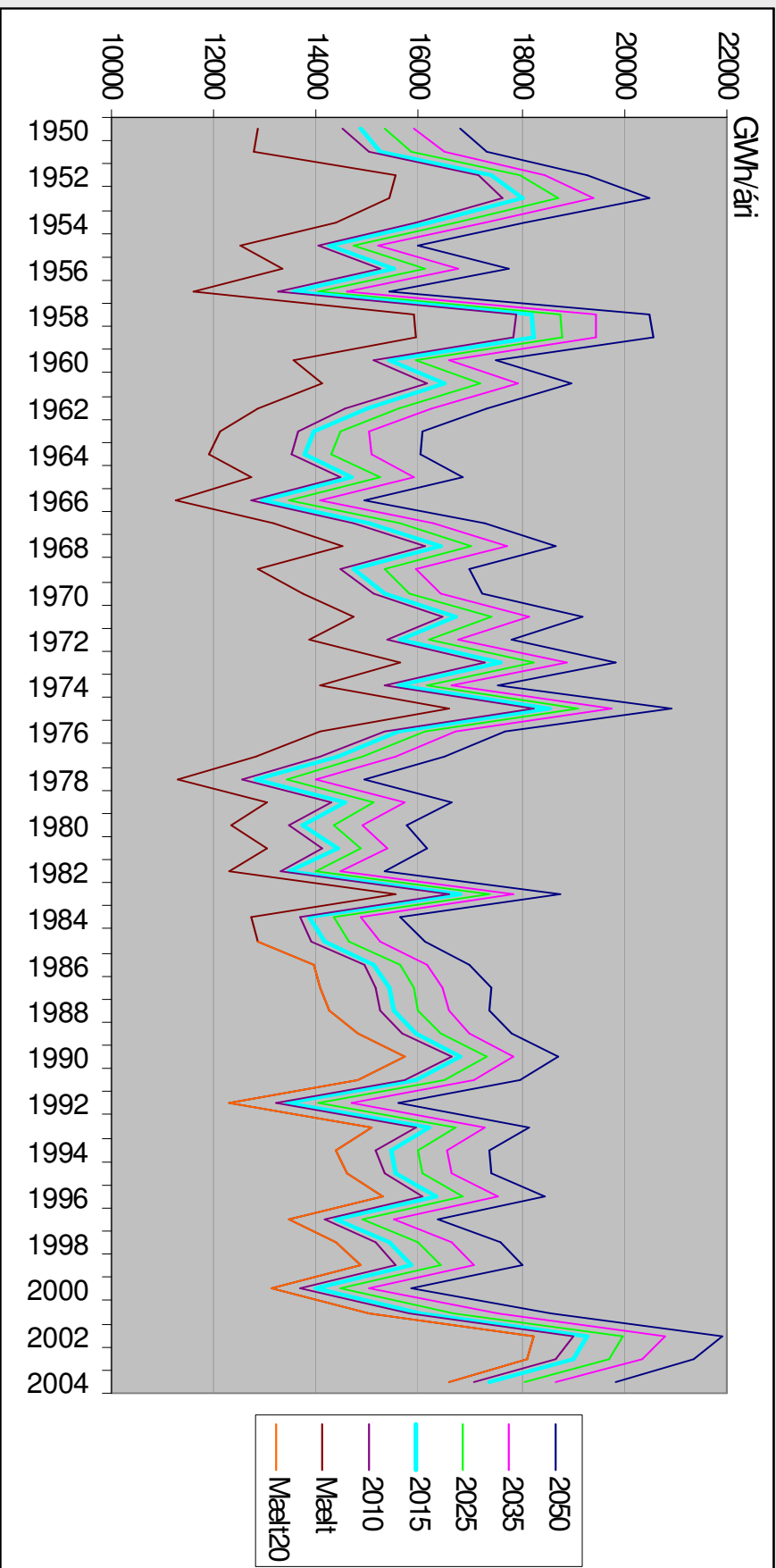
- Average increase 4.8% / 100 y
- Range 3.3 – 7.2 %

- Glaciers

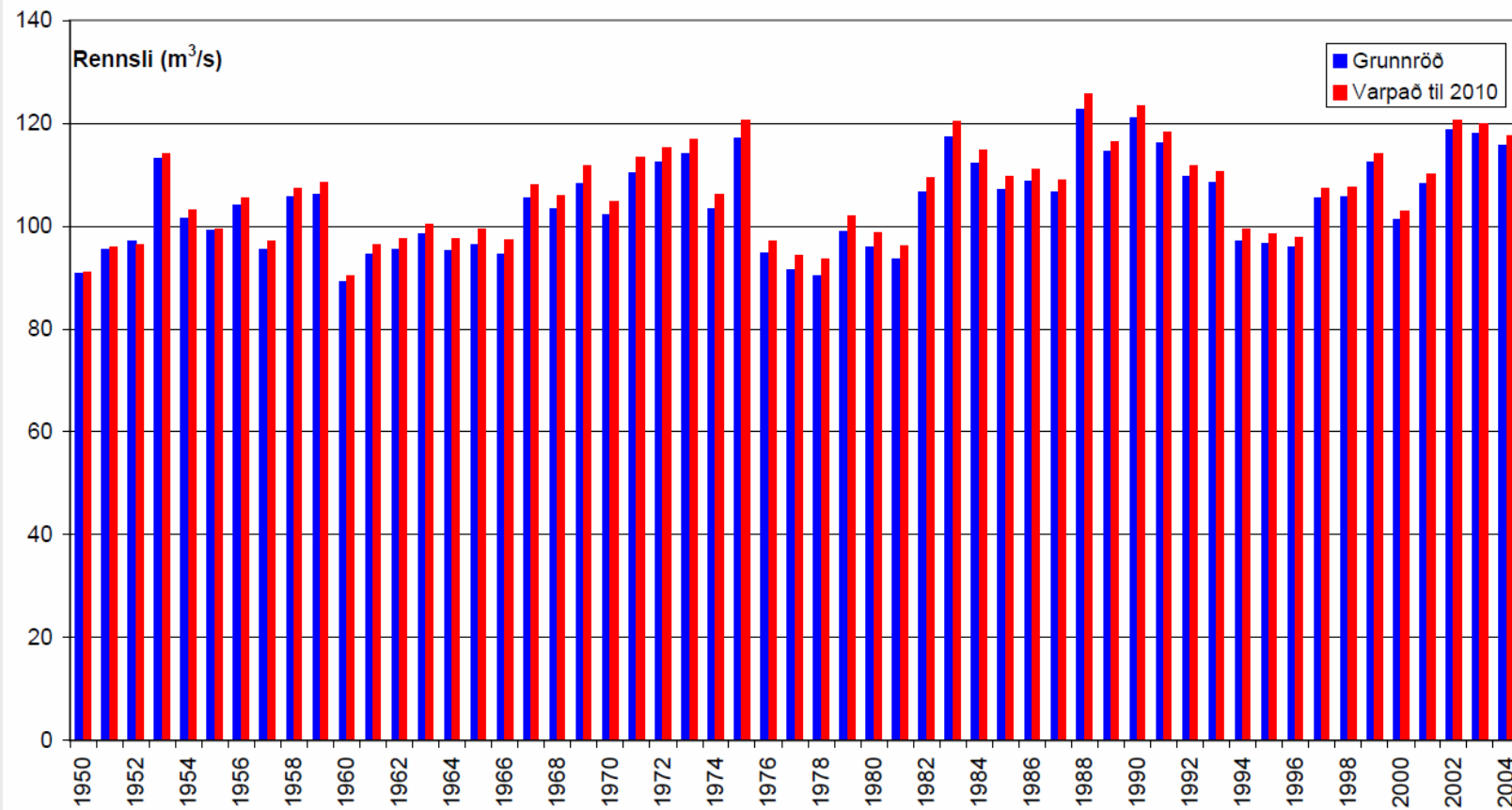
- Results from CES
- 25% decrease in volume from 2000 to 2050



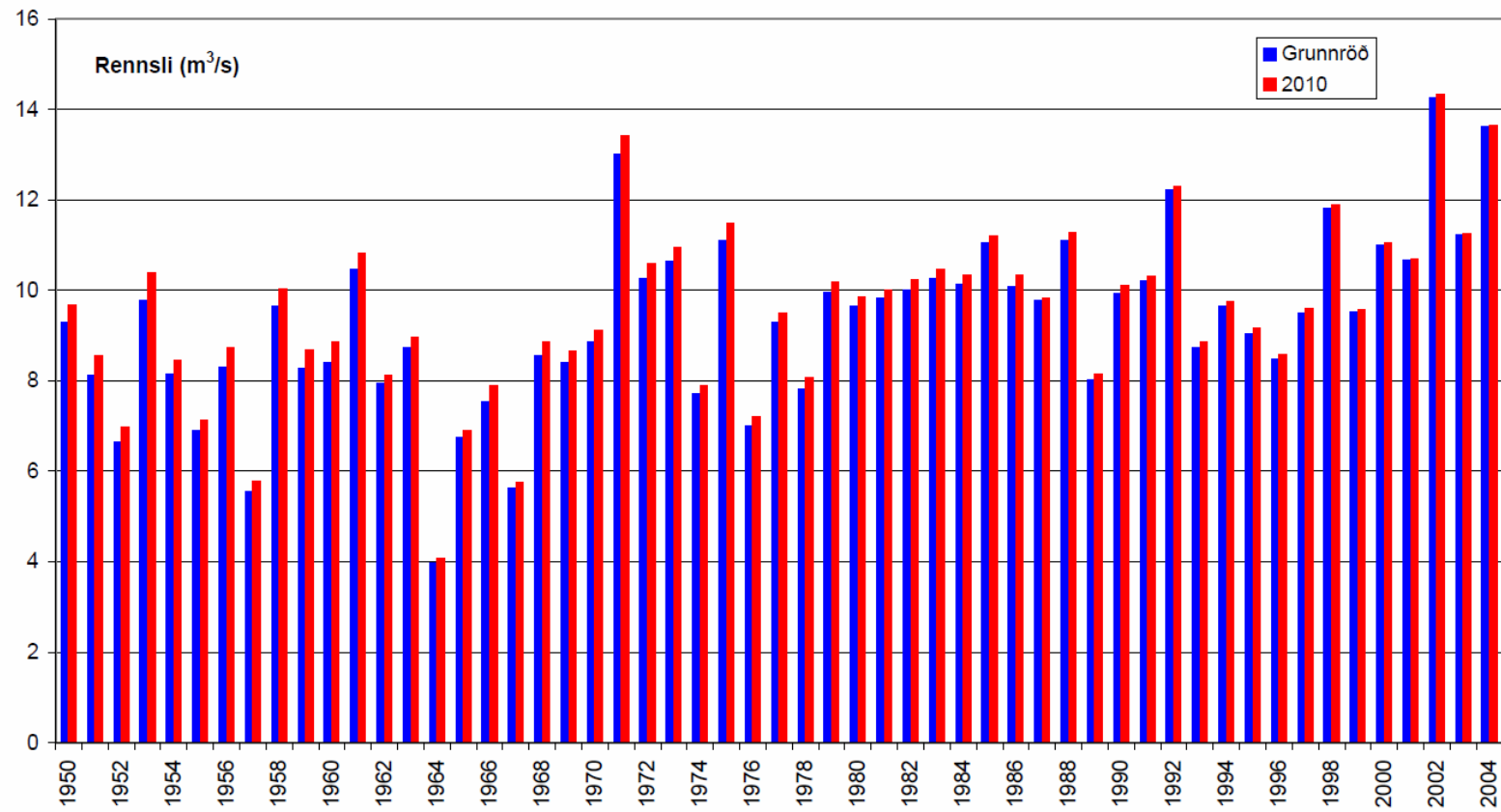




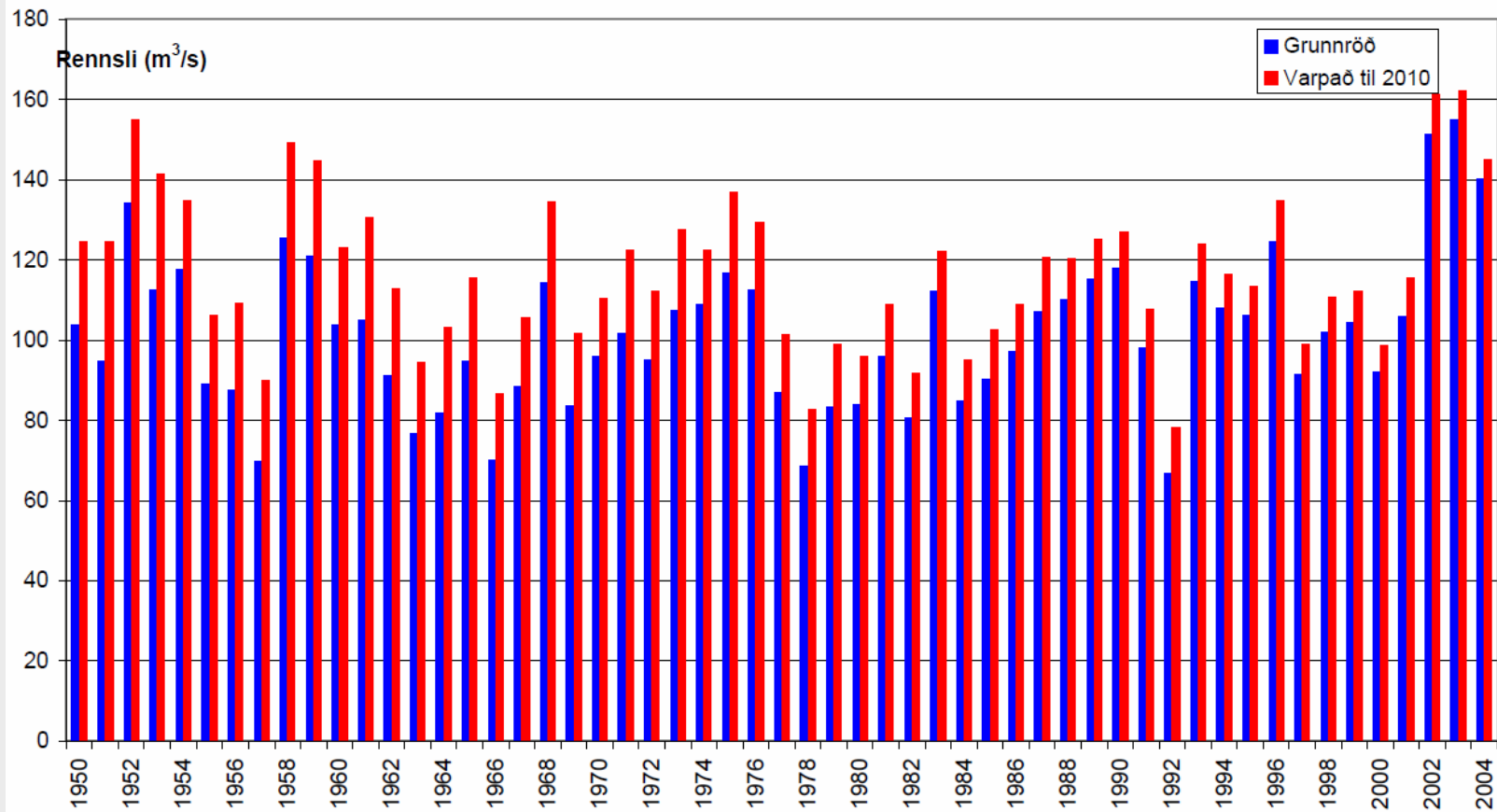
R267 Sog við Ásgarð, viðmiðunarár 2010
Ársmeðalrennsli



Kelduá, meðalrennsli vatnsára
Viðmiðunarár 2010 og grunnröð



R198 Jökulsá á Dal, innrennsli í Hálslón
Viðmiðunarár 2010 og grunnröð

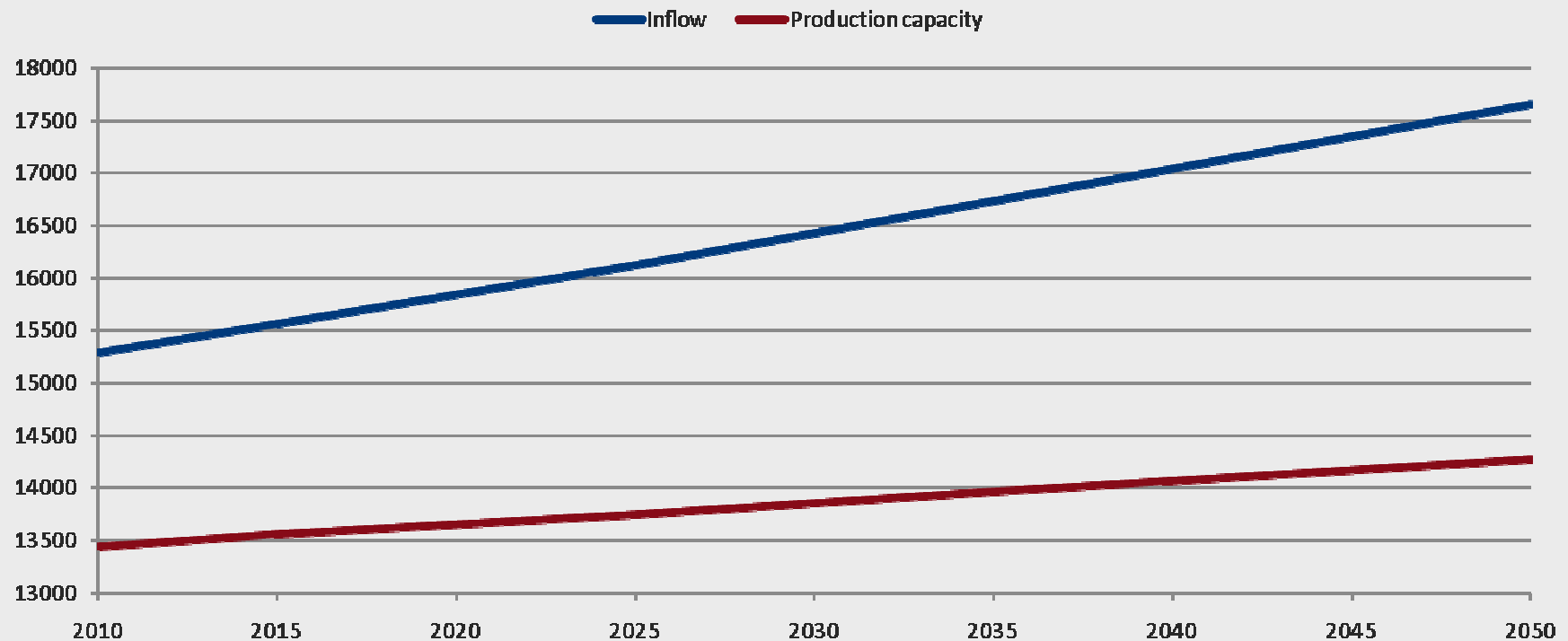


- Difference between historical series (1950 to 2004) and 2010 series
- Direct runoff and spring fed
 - 2 – 3 % increase
- Glacier rivers
 - 10 - 30 % increase
 - 15 % on average
- 2010 series are stationary

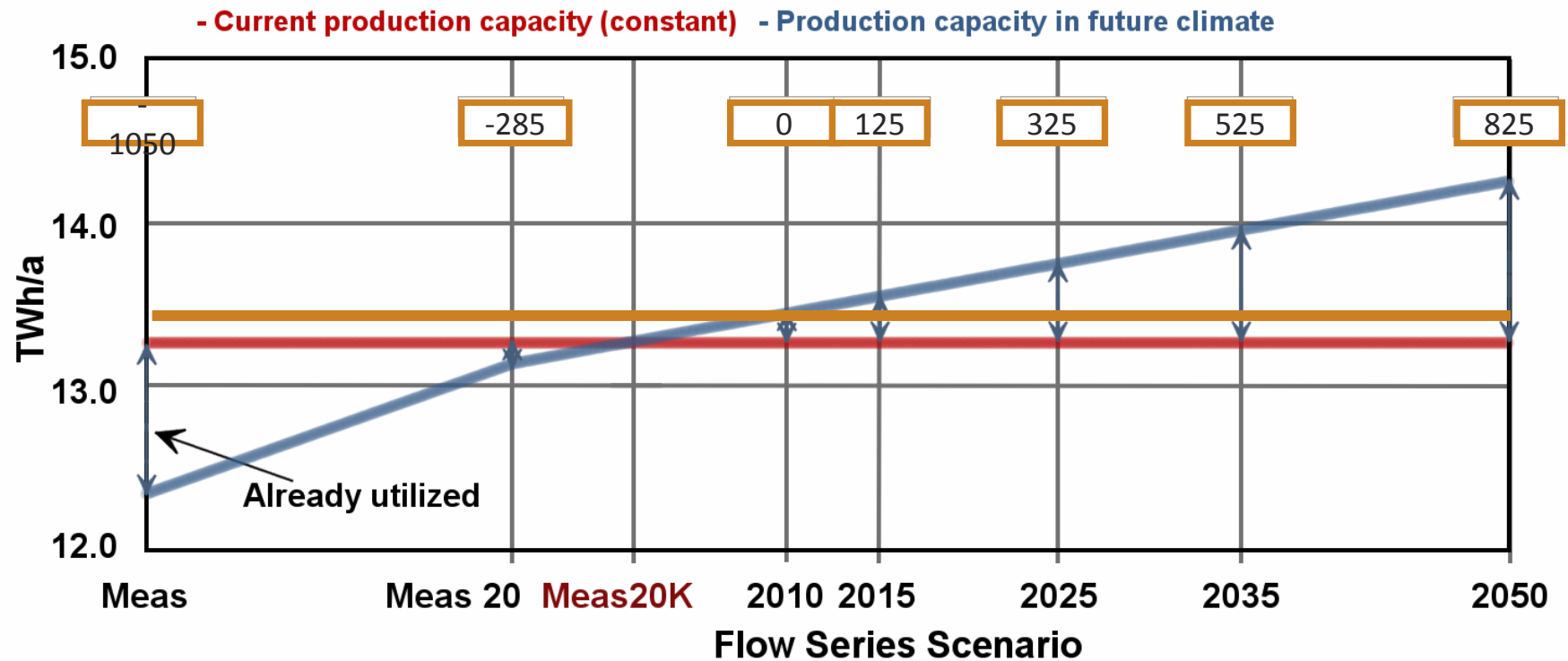


- Difference between historical series (1950 to 2004) and 2050 series
- Direct runoff and spring fed
 - 5 – 6 % increase
- Glacier rivers
 - 25 - 84 % increase
- 2050 series are stationary





- By the year 2050 inflow has increased by 16 %
- At the same time production capacity has only increased by 6 %
- Utilization of the runoff decreases from 84 % to 78 %





- CWE, CE, CES have changed how Landsvirkjun works
- Landsvirkjun would not have been able to get similar results on it's own
- The size of the project and number of participants made it possible to make changes faster