

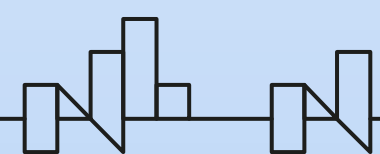
Geothermal District Heating and good practices in Iceland



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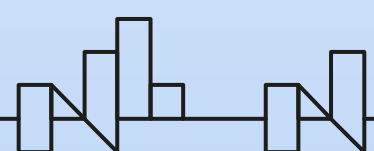


Useful Knowledge

- Icelandic homes use on average 4-5 tons/m² of hot water each year.
- 90% is house heating
 - 60% from ovens, rest is:
 - solar radiation
 - appliances
 - body temperature
- Air temperature-controlled oven valves most suitable to equalize indoor temperature.
- More ideal to use larger/massive ovens where the inflow temperature is rather low.
- Arrangement of furniture is important – don't hide the ovens!
- 5-7% increase in heating cost can be expected for each degree above 20°C indoor temperature.
- Rule of thumb: The consumption is too high if the ratio between cubic meters of hot water used and size of household in cubic meters is higher than 1,5.

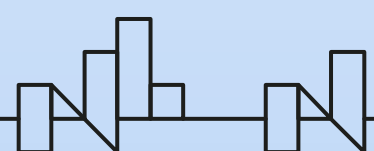
Type of housing	Usage index (m ³ /m ³)
Large apartment buildings	1,0 - 1,4
Small apartment buildings	1,1 - 1,5
Single houses	1,2 - 1,8
Commercial houses	0,6 - 0,8
Office space	0,5 - 0,8
Industrial houses	0,4 - 1,0
Warehouses	0,3 - 0,8

Source: Veitur ohf.



Consumer Price Rates

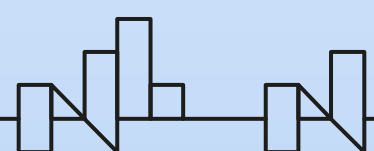
- Three main types of metering
 - **Flow control meters**
 - Housing heat systems set at a certain flow rate, usually minimum 3 liters per minute.
 - Mainly found in smaller and rural areas where there is more need to keep minimum flow and pressure in the network to deliver sufficient temperature of the hot water.
 - Price rate is ISK/min.liter/day, ISK/min.liter/mth or ISK/min.liter/yr.
 - **Flow meters**
 - Amount of hot water used metered in cubic meters.
 - Most common metering in Iceland.
 - Reading of the meter is done at least once a year and estimation made for the year – split in monthly invoices. Corrections made on next reading.
 - Price rate is ISK/m³.
 - **Energy meters**
 - Amount of energy in the hot water metered.
 - Difference between inflow and outflow temperature of the hot water used to calculate the used energy.
 - Regulation in Iceland states that the outflow temperature of the metering shall set to 30°C.
 - Price rate is ISK/kWh



Consumer Price Rates

Heating Utility	Water Fee			Fixed Fee	Inflow Temperature	Energy Price	
	Tariff without VAT					VAT incl.	
	<i>[ISK/m³]</i>	<i>[ISK/min.l/annum]</i>	<i>[ISK/kWh]</i>	<i>[ISK/annum]</i>	<i>[°C]</i>	<i>[ISK/kWh]</i>	<i>[c€/kWh]</i>
Hitaveita Grímsnes- og Grafningshrepps (GOGG)		27.564		14.736	60,0	3,66	2,64
Hitaveita Húnaþings vestra (HHV)			2,90	14.597	55,0-92,0	3,77	2,72
Veitur	131,32			15.805	71,0	3,75	2,70

Source: Orkustofnun Data Repository: OS-2020-T010-01



Technological Changes

Regarding metering

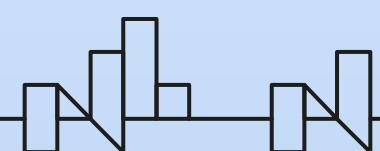
- District heating companies (DHC) have slowly been switching from cubic meters to energy meters in last years.
 - Ensures fairness between consumers.
 - Increased pace in switching within companies.
- New meters offer remote and live readings



Source: Mannvit

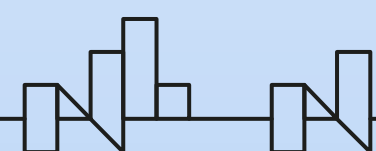
Regarding housing heating systems

- New heating systems and system parts with digital and remote controlling options
 - Consumers in more control and aware of their usage.
 - Increased efficiency
- New houses installed with e.g. floor heating and more focus on isolation.
 - Input temperature requirements are lower - around 30°C instead of around 60-80°C.

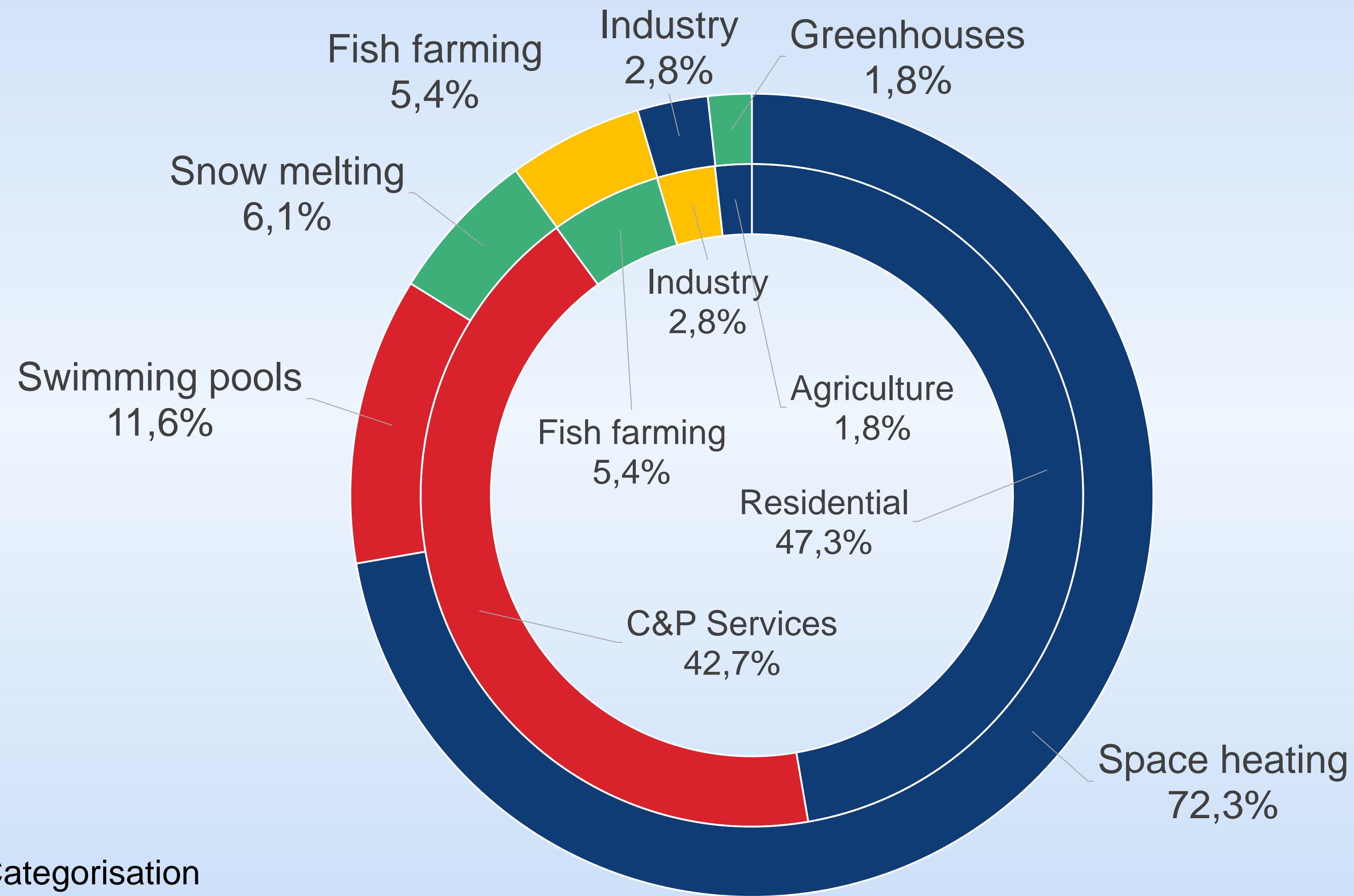


Increased Knowledge and Awareness

- In later years, the knowledge and awareness regarding energy efficiency and use has been constantly increasing.
- More and more consumers reuse their return water:
 - snow melting (1,3 PJ = 4% of total heat use)
 - outdoor sport fields
 - fish farming
 - Blue Lagoon & Mývatn Nature Baths
 - DHC often deliver return water back to pumping stations to cool the hot water before it enters the network.
- Other indirect use of geothermal
 - Carbfix method - a process where water with dissolved CO² is injected into subsurface favourable rock formations where natural processes transform the CO² solid carbonate minerals within a couple of years.
- Other
 - Experiments have showed that switching between hot water from boreholes and CHP (Combined Heat & Power) is possible within same network.
 - Depends on the chemical composition of the hot water.
 - Provides the opportunity to rest boreholes.



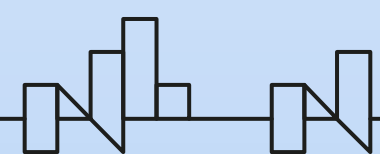
Total Heat Use 2019



Total Heat Use: 33,7 PJ
Geothermal: 97,4%

Inner ring - Eurostat Categorisation
Outer ring - IGA Categorisation

Orkustofnun Data Repository: OS-2020-T010-01



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



Thank You

