Proceedings World Geothermal Congress 2020+1
Reykjavik, Iceland, April - October 2021

Economic Development of District Heating with Public Support

Jón Vilhjálmsson

EFLA Consulting Engineers, Lynghálsi 4, 110 Reykjavik, Iceland

jon.vilhjalmsson@efla.is

Keywords: Geothermal, space heating, public support,

ABSTRACT

Iceland has developed geothermal energy for direct use over many decades. The development was driven by financial support from public authorities and resulted in geothermal heating in over 85% of houses in the year 2000. This had resulted in very economical heating in areas with geothermal resources and in public support for other types of heating in areas without geothermal resources. The government has in recent years set up a program to further expand geothermal heating based on a support scheme from the government which has resulted in over 90% market share of geothermal energy in 2018. Also, better utilization of electricity for heating has been of interest and received public support. All support schemes applied to district heating in Iceland and its economy are discussed and also influence on energy consumption.

1. INTRODUCTION

Development of geothermal district heating system started about 90 years ago in Iceland and authorities have supported the development in many ways. Early on in the development of the energy system in Iceland, the Governmental Energy Fund was active in supporting the development of both the district heating system and also the rural distribution of electricity. The first geothermal district heating systems in Iceland, such as in the Reykjavik area, have resulted in very economical space heating and other type of heating in Iceland have for a long time been more expensive. All governments in Iceland over the last four decades have considered that there should be little difference in the cost of space heating of homes between areas in Iceland and have therefore set up a system of subsidy for other methods of space heating of homes than geothermal. There are no direct subsidies for other types of houses than homes. Recently, new district heating system for homes have been supported by the government as the most economical geothermal district heating systems were first developed and new systems are much more expensive. Those support mechanisms were firmly established with laws from Althingi (parliament of Iceland) no. 78/2002 on subsidy for space heating and financial compensation for new district heating system.

The main governmental activities for supporting district heating in Iceland as will be discussed in this paper are as follows:

1) Subsidy on electricity for space heating of homes and on hot water from district heating utilities utilizing electric and oil boilers for heating water.
2) Subsidy on oil used for space heating of homes in areas not served by district heating utilities and where electrical space heating is not available.
3) Financial compensation for new geothermal district heating utilities.
4) Financial compensation for the development of electrical distribution system in rural areas.
5) Variable value added tax (VAT) for space heating.

2. SPACE HEATING IN ICELAND

Over 90% of houses in Iceland are heated with geothermal energy today but that has not always been the case as half a century ago less than half of the houses were heated with geothermal and the other half was mostly heated with oil as can be seen in figure 1. To have this high penetration of geothermal energy in space heating has required the government of Iceland to be very focused on the development of the space heating sector.

Many geothermal district heating utilities are operating in Iceland and each has its own tariff that must be approved by the Ministry of Industry according to the Energy Act from 1967. Also, the geothermal energy resource is different from one area to another such as temperature of the water. Energy price is therefore different from one area to another and in figure 2 price without tax for a few geothermal district heating systems are shown and for two system with electric/oil boilers. Also, the price of space heating with electricity (without subsidy) is shown for four areas, two urban areas and two rural areas were the price is the highest. Electrical heating of homes is subsidized and for the user the price they pay is little bit higher than for the most expensive geothermal district heating systems. For other houses than homes it is much more expensive to heat with electricity than geothermal energy as they do not receive subsidies from the government.

Vilhjálmsson.

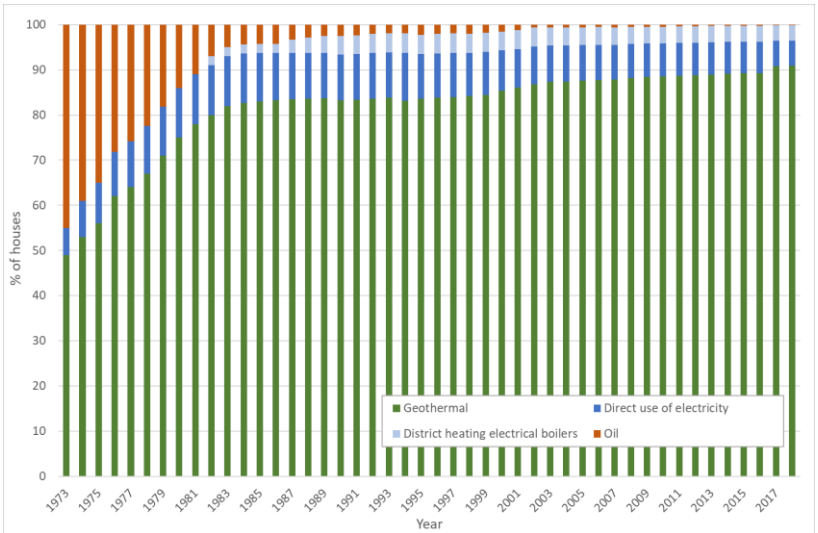

Figure 1: Heating method for houses in Iceland as percentage of heated space.

COMPARISON OF ENERGY PRICES FOR SPACE HEATING WITHOUT TAXES AND SUBSIDIES
Month: 2019.01

Utility	Energy price kr./kWh	Fixed price kr./ár
Veitur þéttbýli	2,72	15.805
RARIK Siglufjörður	3,99	31.487
RARIK Dalabygð	4,23	33.439
RARIK Blönduós	4,23	33.439
OV Reykhólar	3,31	30.015
NO Akureyri	2,56	23.360
NO Ólafsfjörður	2,35	23.360
NO Reykjaveita	4,93	23.360
NO Hólkotsveita	4,57	23.360
Hitaveita Dalvíkur	2,99	12.877
Skagafjarðarveita, Sauð	2,55	11.748
Hitaveita Húnaþings ve	3,05	14.597
RARIK kynt veita	6,89	34.232
OV kynt veita	8,45	30.015
RARIK rafhitun þéttbýli	11,81	18.340
OV rafhitun þéttbýli	12,10	17.988
RARIK rafhitun dreifbýli	15,42	29.116
OV rafhitun dreifbýli	14,82	28.891

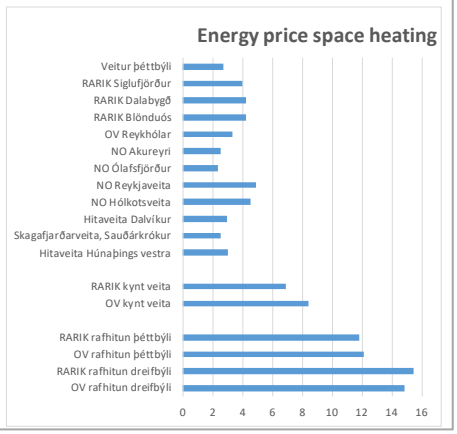

Figure 2 Prices for space heating in utilities tariffs (tariffs with two components, fixed item and energy item) in January 2019 (kynt veita: district heating with electric boiler, þéttbýli: urban areas, dreifbýli: rural areas).

3. LOANS FOR THE DEVELOPMENT OF GEOTHERMAL RESOURCE FOR DISTRICT HEATING

As geothermal resources are in most cases only accessible through drilling deep into the earth the uncertainty of success can be high. Therefore, it can be difficult to finance the first development of geothermal area. The government of Iceland set early on up a loan program where utilities could receive loans for 60% of the cost of drilling to support the development of geothermal heating in Iceland. If the result of the resource development was negative such that the resource could not be harnessed then the loan was written off but otherwise it was paid back over a long period with interest rate below the market. This support helped the development of many small and medium geothermal district heating utilities but also there were some cases were the resource could not be utilized.

4. GOVERNMENTAL TAKE OVER OF DEBTS OF DISTRICT HEATING UTILITIES

In the 1970's and 1980's, many new district heating systems were developed in Iceland as earlier systems had shown to be very economical and the oil crises of 1973 and 1979 put increased emphases on utilizing the large renewable resources of Iceland for space heating. In some cases the geothermal resource was not as economical as in the earlier development due to difficulty in harnessing the resource and/or large distance from the resource to the utilization area. This resulted in financial troubles and high tariffs compared to other district heating utilities due to high level of debts. As a result some municipal owned utilities asked the government of Iceland for financial help. Each individual case was discussed and Althingi (parliament of Iceland) then decided to take over some part of their debt. In the years 1983 to 1990, eleven district heating utilities were supported in this way resulting in lower tariffs for space heating for all user of the district heating systems and therefore not only homes were the receiver of this compensation as is the case for many other subsidies (see report from EFLA for further detail).

5. VARIABLE VALUE ADDED TAX FOR SPACE HEATING

In the year 1992 the Government of Iceland decided to subsidize the VAT on energy for space heating in Iceland based on the price of water from each utility and electricity for space heating. The plan was to levelize the tax so that all users should have similar VAT in absolute numbers (kr./kwh) on their bill for space heating. The author of this article calculated the VAT percentage for all utilities

in Iceland and it was published in a regulation 484/1992, see also report from AFL Consulting Engineers. According to this regulation the VAT should never be higher than 11% of the weighted average price for all space heating in Iceland and resulted in subsidized VAT of up to 62%. This subsidy was in effect for more than two decades and new district heating utilities were added as needed. This subsidy is no longer in effect.

6. FINANCIAL COMPENSATIONS FOR NEW DISTRICT HEATING SYSTEMS

Houses to be connected to new district heating systems are currently almost always heated with subsidized electricity and that price is lower than price needed to cover the cost of new district heating system but is lower than real price of electricity without any subsidy. Consumers are therefore not interested in buying hot water from district heating system for heating purposes if the energy price is higher than what they are currently paying for energy for space heating. This stopped further development of geothermal district heating system although further development was good for Iceland in the macro economic sense. A system for financial compensation for new district heating utilities was therefore started in 1999 based on a policy from Althingi (parliament of Iceland) for development of rural areas in Iceland 1999-2001. This compensation was put into legal framework in the legalization of subsidy on energy for space heating in laws 78/2002. The subsidy in those law is for the cost of energy for space heating of homes.

In the beginning the financial compensation was set equal to the sum of five years of current subsidy of electricity for space heating of homes in rural areas based on the energy consumption for heating of homes that would be connected to the new district heating system. As the marginal cost of new development increased, the financial compensation was also increased to the sum of eight years of subsidy as defined for electricity in the period 2004-2011, twelve years of subsidy for the period 2012-2016 and currently they are equal to sixteen years of subsidy of electricity. Current financial compensation is equal to 140 kr./kWh/year.

This financial compensation has been in effect for two decades and in that period about 2.6 billion ISK (January 2019 price level) have been allocated to new district heating utilities. In figure 1, the amount allocated each year is presented and this compensation peaked in 2008 and 2009 but for the last seven years a similar amount has been allocated or about 150 million ISK per year. About 70% of the amount has been allocated to utilities in Northern Iceland. The district heating system that have obtained the compensation over the last two decades have connected about 2000 apartments which is almost 2% of apartments in Iceland.

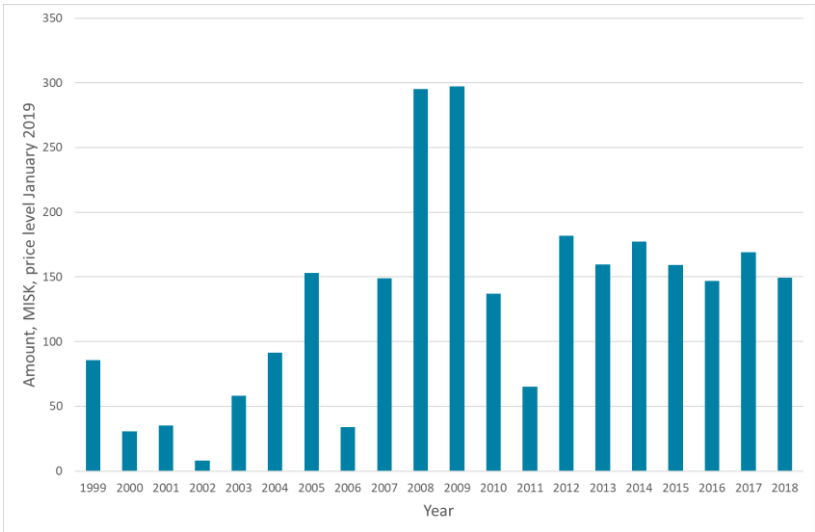

Figure 3: Yearly amount of financial compensation for new geothermal district heating systems in Iceland.

7. OTHER SUBSIDIES FOR SPACE HEATING

In north west and east part of Iceland there are few geothermal resources available for space heating and therefore most houses in that area are heated with electricity. As the cost of electricity is much higher than for geothermal energy in the main urban areas of Iceland this has created worse living conditions for people in those so called “cold areas” of Iceland. Therefore, electricity for space heating of homes has been subsidized for almost four decades in areas where geothermal energy is not available. On the average the government has spent about 1.3 billion ISK per year on electricity subsidy for space heating as can be seen in figure 4. Today about 9% of houses in Iceland are heated with electricity or with hot water from electric boilers.

During the last few decades some special cases concerning space heating have come up and one such case is a large scale heat pump that utilize sea water in Vestmannaeyjar and in the years 2017 and 2018 it received financial compensation of 300 million ISK which equals four years of subsidy for the electric boiler used in the island of Vestmannaeyjar.

According to the laws on subsidies it is also possible for individual home owner to receive financial support for any action for utilizing renewable energy or for energy conservation if the house is heated with electricity and therefor receives subsidy.

Vilhjálmsson.

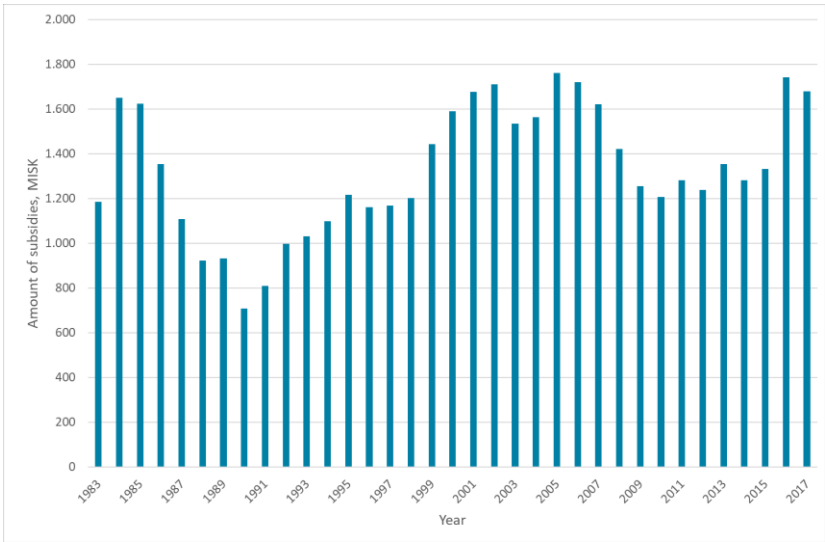

Figure 4: Subsidy for electrical space heating, price level in January 2019.

8. CONCLUSION

Today space heating in Iceland is almost fully with renewable energy sources and geothermal has about 91% share. This is both economical for the Icelandic society and is also good for the environment. The government of Iceland has been very active in supporting this development which has resulted in this good situation today.

REFERENCES

AFL Consulting Engineers/Jón Vilhjálmsson. Orkunotkun við hitun húsnæðis og meðalverð. Report prepared for Ministry of Industries (1992).

EFLA Consulting Engineers/Jón Vilhjálmsson: Mat á þjóðhagslegum áhrifum stofnstyrkja hitaveitna. Report prepared for Ministry of Industries and Innovation (2019).

Governmental regulations: Reglugerð um endurgreiðslu virðisaukaskatts af sölu á heitu vatni og rafmagni til hitunar húsa og laugarvatns. Regulation no. 484/1992.

Icelandic laws: Lög um niðurgreiðslur húshitunarkostnaðar (Laws on space heating subsidies) no. 78/2002.

Icelandic laws: Orkulög (Energy Act) no. 58/1967.