



Transportation Plugs into Alternative Energy Sources

CRISIS AS A CATALYST

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Reykjavik

- In 870 AD Iceland's first settler saw the steam from hot-springs and called his settlement Reykjavik or Steamy Bay
- Reykjavik has a long history of employing geothermal energy
- Systematic use for district heating since 1930



A Multi-utility Company – Various Services



 **Water**



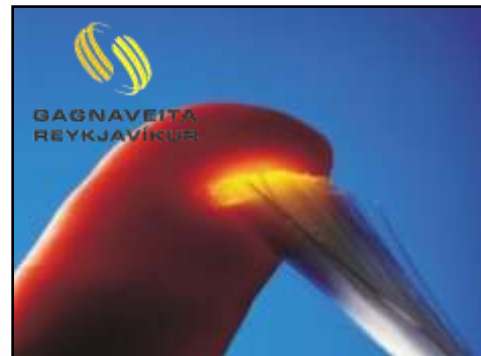
 **Electricity**



 **Hot water**



 **Sewerage**



 **Fiber optics**

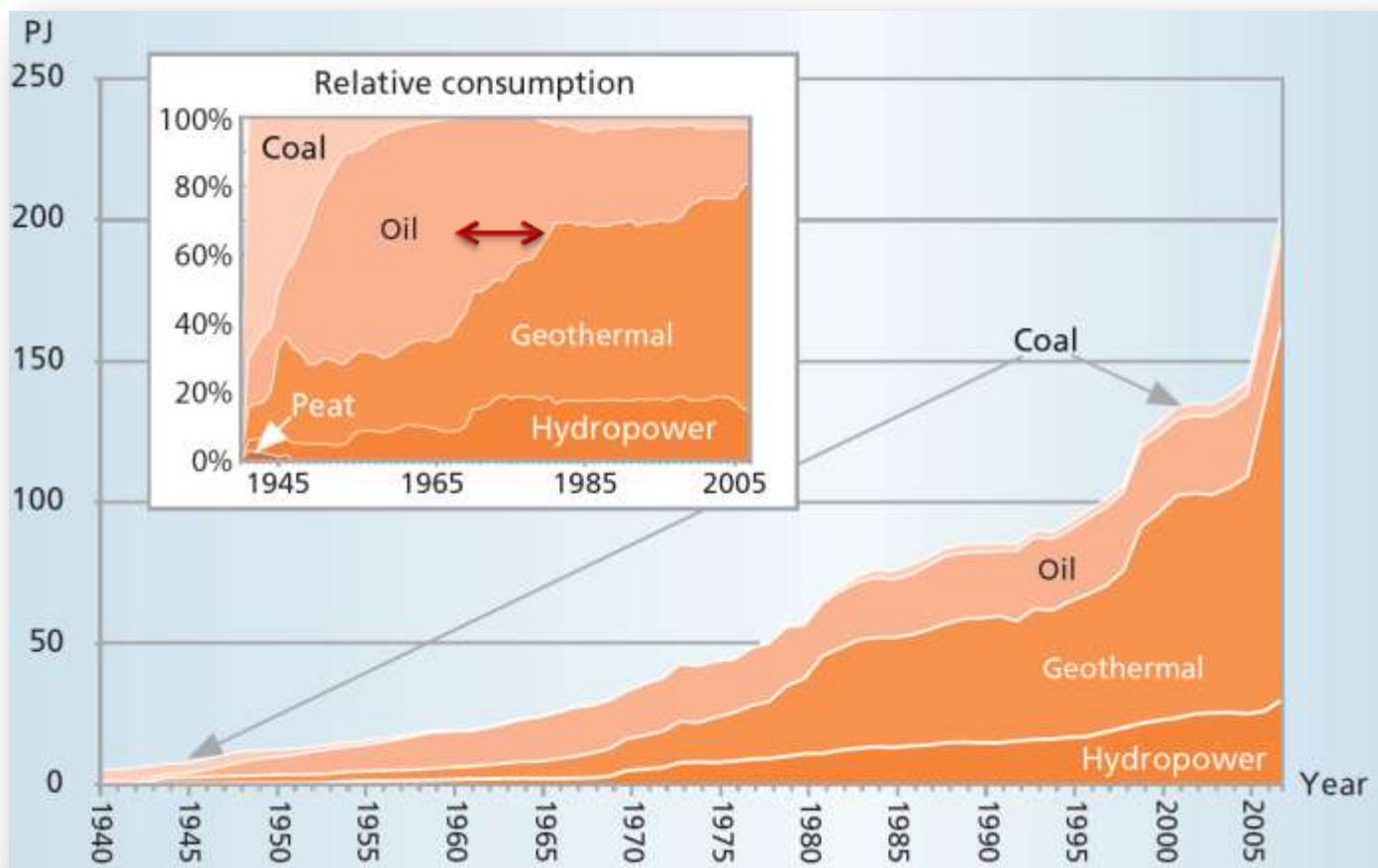
Coal Smog in Reykjavik 1932



Investment in Infrastructure



Primary Energy Use in Iceland



Source: National Energy Authority 2008

Unsustainable use of Resources

1968-1969

- The herring virtually disappears from Icelandic waters.
- Many move abroad.

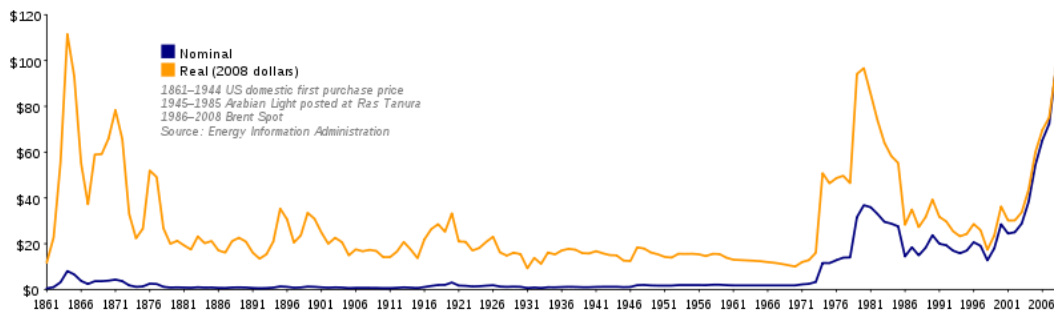


Photos: siglo.is

Geopolitical Event

1973

- The international oil crisis.



Natural Disaster

1973

- Volcanic eruption in the Westman Islands
- Relocation of 3% of the population



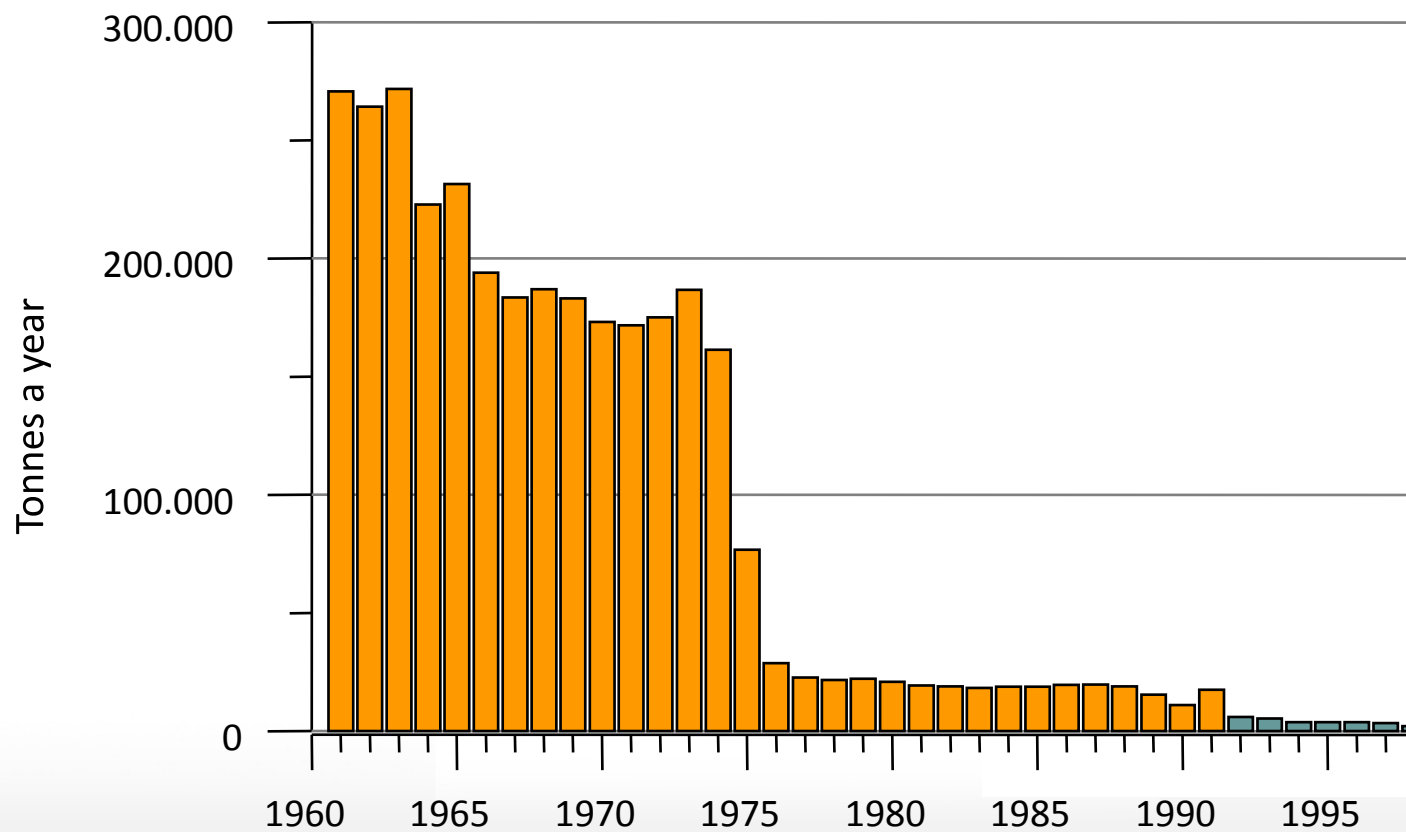
Photo: Guðmundur Sigfússon

Reykjavík District Heating 2009

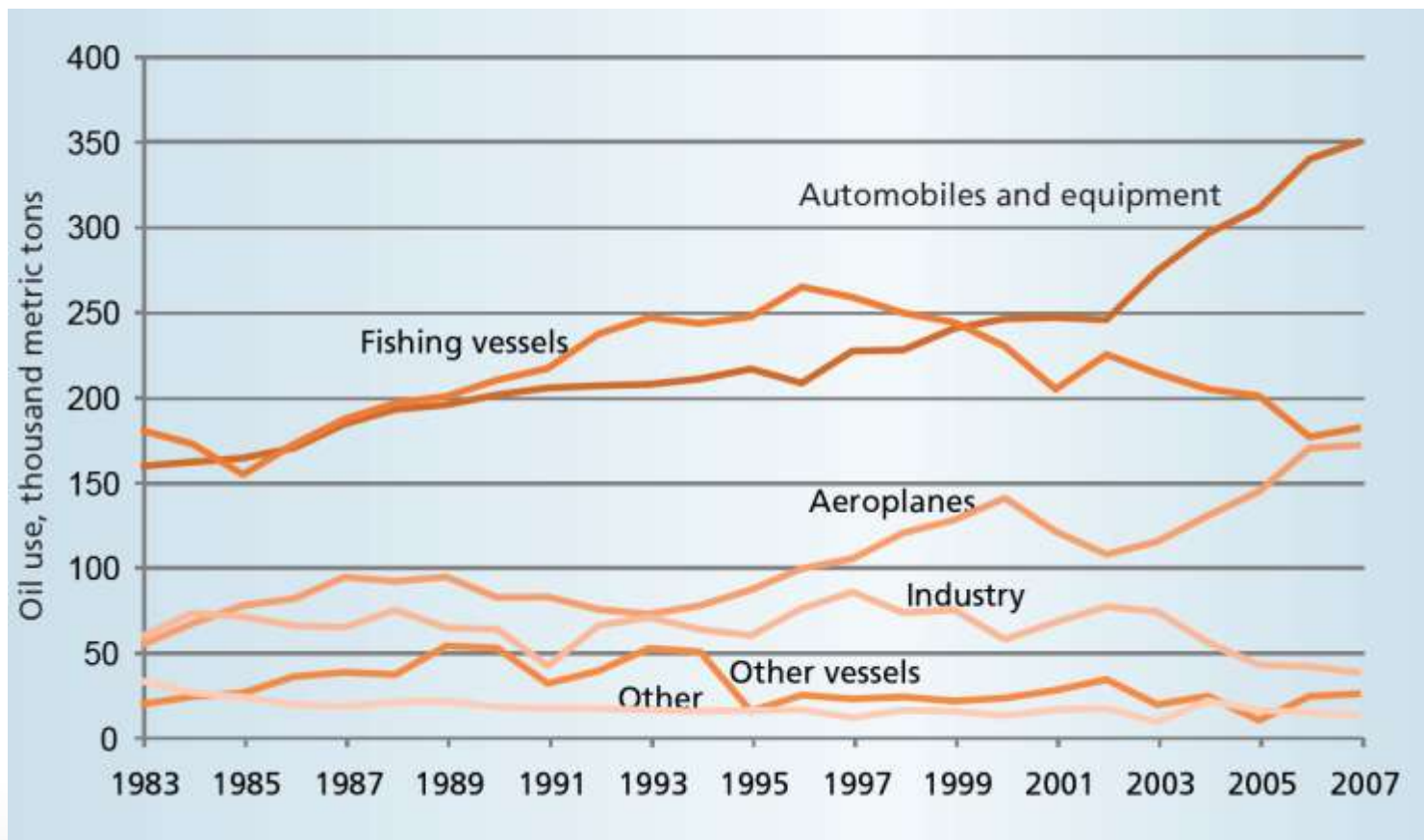
- World's largest geothermal district heating system
 - Annual production 72,700,000 m³
 - Maximum capacity 18,000 m³/hour
 - Total length of distribution pipelines 2,700 km.
- Supply
 - 50% from low-temperature areas within the city
 - 50% from Nesjavellir CHP plant in high temperature area



CO₂ Emissions in Reykjavik by Space Heating



Oil Consumption in Iceland 1983-2007



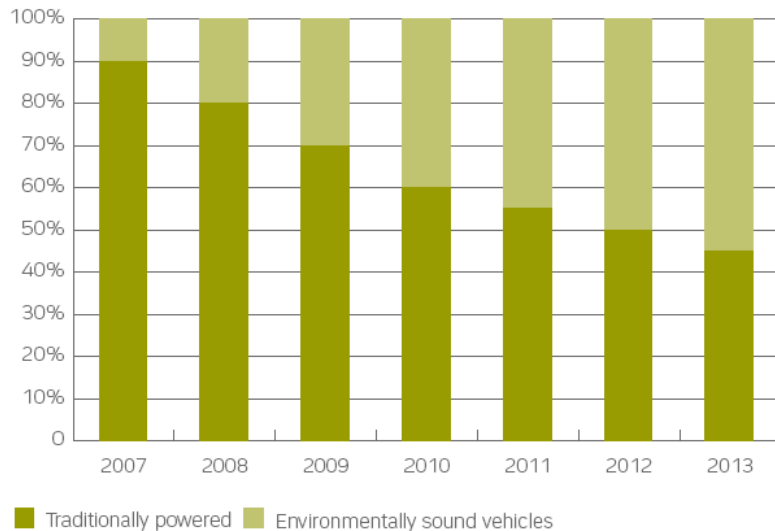
Source: National Energy Authority 2008

Reykjavik Energy and Green Transportation

- First electric car bought in 1998
- Participates in research programs for hydrogen in transportation
 - Buses 2003-2007
 - Sedans in service fleet 2007-
- Do not put all our eggs in the same basket
 - Methane from landfill is the only market-proven choice of alternatives
 - DME production from geothermal gases
 - Electricity, direct or through hydrogen
 - Use of excess heat in geothermal plants for bio-diesel production



Reykjavik Energy's Environmentally Sound Vehicles



RE Vehicles	179	
Methane	22	
Hydrogen	4	
Electric	2	
Total ESV	28	16%

Green Vehicles



Some Financial Parameters – per annum

The Republic's Turnover	ISK 400 bin.	
Savings by geothermal heating	ISK 40 bin.	10,0%
Import of oils	ISK 35 bin.	8,8%
-Thereof for cars	ISK 10 bin.	2,5%



Prices and Efficiency

Prices (all incl. VAT)		<i>Equaling per liter of gasoline</i>		
<i>Home electricity</i>	9,45 ISK/kWh	ISK 11		
<i>Methane</i>	98 ISK/Nm³	ISK 88		
<i>Hydrogen</i>	1.121 ISK/kg	ISK 168		

The current average price of gasoline is ISK **186** per litre

To-the-axis Efficiency				
<i>gasoline</i>	<i>hydrogen</i>	<i>twin-cars</i>	<i>diesel</i>	<i>electricity</i>
14-30%	26-38%	26-45%	30%	85-95%

How do They Compare?

Energy Shift in Transportation 2010s	Energy Shift in District Heating 1970s
Renewable and sustainable domestic energy source	Renewable and sustainable domestic energy source
Increases GDP	Increases GDP
Saves foreign currencies	Saves foreign currencies
Decreases dependency on imported fuels	Decreases dependency on imported fuels
Less GHG emissions	Less GHG emissions
Various alternative vehicles on their way to the market	Refurbishment of heating systems needed
Costs 10% of fossil fuels (no road-taxes on electricity ... yet)	Did initially cost more than oil-heating
Production and distribution in place, may need enhancement	Only primitive production and distribution in place

Crisis can be a Catalyst!

Iceland, in Financial Collapse, Is Likely to Need I.M.F. Help



Iceland's Government Collapses

By JUDY GARAPSEY
Published: January 20, 2010

BERLIN — Iceland's coalition government collapsed Monday, the latest fallout from a global financial crisis that has set off angry demonstrations against governments across Europe.



Icelanders, angry about soaring unemployment and rising prices, have been protesting for weeks in the capital, Reykjavik.



Prime Minister Geir Haarde of Iceland at the parliament in Reykjavik on Monday.

Prime Minister Geir Haarde said he was unwilling to meet the demands of his coalition partners, the Social Democratic Alliance Party, which had insisted upon getting the post of prime minister to keep the coalition intact. The Associated Press reported from Reykjavik, the Icelandic capital.

Last week, Mr. Haarde called elections for May, bringing forward a vote originally scheduled for 2011, after weeks of protests by Icelanders angered by soaring unemployment and rising prices. But Mr. Haarde said he would not lead his [Independence Party](#) into the new elections because he needed treatment for cancer.

Iceland has been in crisis since the collapse of its banks because of large debt in September and October, with its currency, the krona, plummeting. The government has negotiated \$10 billion in loans from the [International Monetary Fund](#) and other countries, but the standard of

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