

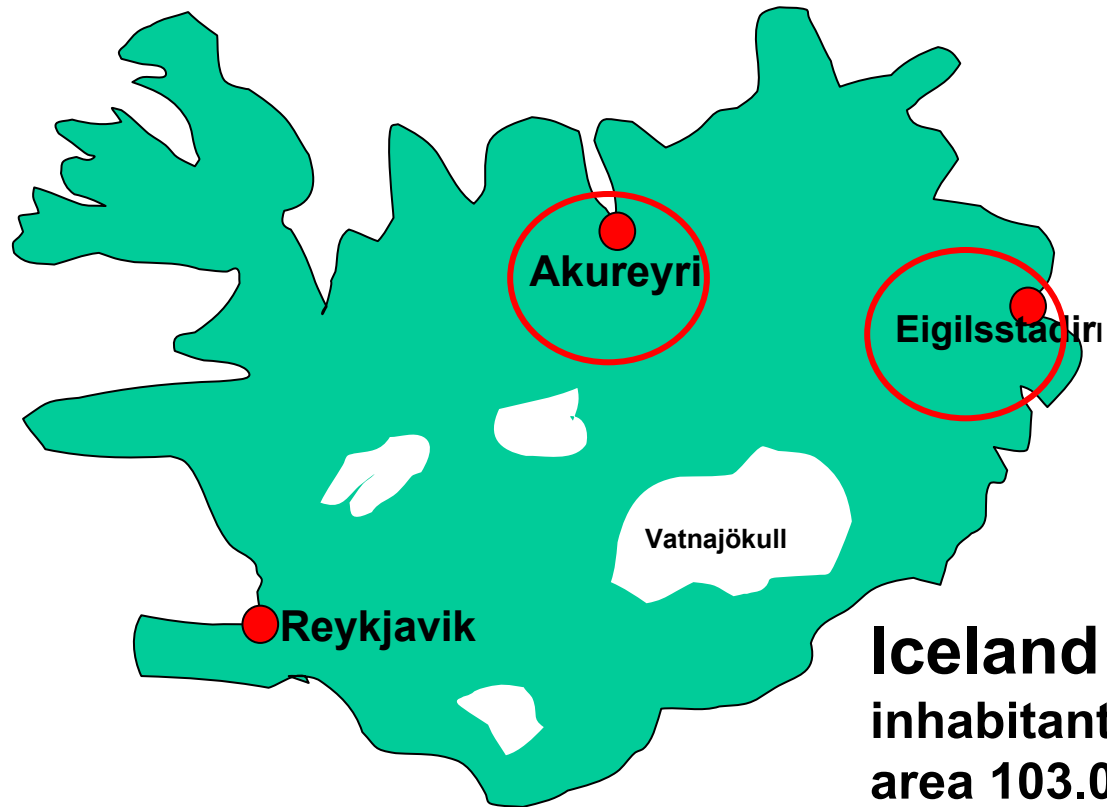


# Feasibility Study Iceland

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**Iceland**  
inhabitants 293.000  
area 103.000 km<sup>2</sup>



## Regional Wood Energy Feasibility Study ICELAND

The primary objective of the feasibility study is to promote the sustainable use of forestry and forest resources for the benefit of Hallormstadir area. It is done by identifying goals and guidelines as well as possibilities and restrictions for the use of forest energy and forest fuel resources.



# Forestry

- On Iceland there is about 140,000 ha of forest and other wooded land.



Of that,

- 100,000 ha is semi-natural birch woodland less than 5 m in height
- 20,000 ha is semi-natural birch forest greater than 5 m in height and
- 20,000 ha is planted forest of mostly conifers (larch, pine, spruce)
- Practically no forests are found in the interior highlands.
- The average age of native woodlands is not known but most are relatively even-aged and less than 100 years.
- The majority of planted forest is less than 20 years old, with only a few stands greater than 50 years old.
- A rough estimate is that less than 1% of planted forest is greater than 50 years old, about 20% is 20-50 years old and about 80% is less than 20 years old.
- Native forests and woodlands are 100% deciduous and
- planted forests 20% deciduous (birch, poplar) and 80% coniferous, mainly larch



## Average tree length and density of birch woodland units in northern Iceland

Aradottir et al. 2001.

Density, trees/ha	< 2m		2-4m		4-6m		>6m		Total	
	km <sup>2</sup>	Stands	km <sup>2</sup>	Stands	km <sup>2</sup>	Stands	km <sup>2</sup>	Stands	km <sup>2</sup>	Stands
very low < 1000	49.7	25	0.5	1	1	3	0.7	1	51.9	30
low 1000-2000	21.9	25	19.0	8	14.3	9	0.7	3	55.9	45
moderate 2000-3500	0	0	46.5	13	4.3	5	1.5	1	52.3	19
high 3500-5500	10.2	6	22.8	11	0.3	1	0	0	33.3	18
very high > 5500	12.5	4	9.5	6	0	0	0	0	22.0	10
<b>Total</b>	<b>93.4</b>	<b>60</b>	<b>98.3</b>	<b>39</b>	<b>19.9</b>	<b>18</b>	<b>2.9</b>	<b>5</b>	<b>215.4</b>	<b>122</b>



## Forest products

Almost all forest products used in Iceland are imported

The only exceptions are

- 120 tonnes annually of fuel wood (mostly birch for fireplaces in summer cabins, but also for smoking meat and charcoal),
- A small amount ( about 200 m<sup>3</sup> in 2003) of wood from thinnings used in a variety of things such as fence posts, fish-drying racks and small handicrafts
- About 500 m<sup>3</sup> of wood chips from thinnings used in foot-paths and as mulch in gardening.
- Wood available from thinning of planted stands will increase about 4-fold between 2010 and 2020 (which is still not a great deal of wood).
- Final felling of mature planted stands of larch, spruce, pine or poplar will not begin to any extent until after 2050
- 15 000 tonnes chips produced mainly out of demolition wood/recovered construction wood (unpainted, imported). This is used at the Grundartanga iron–silica factory



## Energy

### Primary energy use

Use of primary energy sources in Iceland 143,3 PJ (2003)

- geothermal      77.314      (54 %)
- hydro                      25.502                      (18 %)
- oil                              36.245                      (25 %)
- coal                              4.363                      ( 3 %)

### Electricity

#### Power generation and maximum capacities of power plants (2003)

Type	Use[GWh]	[%]	Capacity [MW]	[%]
Hydro	7.084	83,39	1.150	78,0
Geothermal	1.406	16,55	202	13,7
Fossil fuels	5	0,06	122	8,3
Total	8.495	100	1.474	100



## Increase of power production 2005 - 2007

- Geothermal energy: 210 MW (1680 GWh)
- Hydro power: 690 MW (4600 GWh)

Half of the electricity produced is used in aluminium smelters, and the additional hydro power capacity is planned for needs of new smelters.

## Heating

Almost 87 % of buildings are heated by geothermal energy.  
Other sources are electricity 11.5% and oil 1,5%.

Capacity of geothermal energy for heating is 1500 MW.

Utilisation of geothermal energy in 2003 (%)

- Space heating 59
- Power generation 17
- Fish farming 7
- Industry 5
- Swimming pools 4
- Snow melting 4
- Green houses 3



# Contents of the feasibility study

## 1. General overview of the region

- 1.1 Location, infrastructure, settlements, geothermal heat availability, climate conditions
- 1.2 Present energy market – sources, providers, systems, users, prices, policy
- 1.3 Timber markets
- 1.4 Future trends of energy market

## 2. Identification of key players and other basic facts

- 2.1 Authorities
- 2.2 Relevant organisations - forest, agriculture, transportation
- 2.3 Legislation, taxes and other normative frameworks

## 3. Assessment of woodfuel potential in the region

- 3.1 Forest resources
  - Planted areas by planting year and by species
  - Shelterbelts
  - Natural birch resources
- 3.2 Forest industry
  - Companies, products and volumes
  - Residues
- 3.6 Potential of cuttings
  - Thinnings of plantations
  - Shelterbelts
  - Natural forests





#### **4. SWOT analysis**

#### **5. Wood energy potential**

5.1 Availability analysis 2010 and 2020

5.2 Consumption potential – forest chips, other woodfuels

5.4 Potential woodfuel consumption sites – names and locations

#### **6. Feasible harvesting technology and supply chains**

6.1 Logging operations

6.2 Chipping and transportation

#### **7. Recommendation for the regional wood energy strategy**

7.1 Target for 2010 and 2020 for wood fuel use

7.2 Subsidies and other policy instruments

#### **8. Pilot case evaluations**

8.1 Forest stations Egilsstadir

8.2 Hotel

8.3 Organic Farm



## Hallormsstadir Bioenergy SWOT analysis

### ***Strengths:***

- Growing resources, need for thinnings
- Little competition for raw material of thinnings
- Willingness to participate of local forest owners
- Forests are owned by the state
- Good infrastructure / short transportation distances
- Some stand data is available
- Skilled personnel
- Easy terrain conditions for harvesting
- Close location to the sea and harbors (possibility to bring some material)
- Creative ways of Icelanders to find money/subsidies



## ***Weaknesses:***

- Lack of skilled forest workers
- Lack of experience in bioenergy business
- Lack of harvesting and bioenergy technology
- High cost levels in general
- High cost levels in forest operations
- Small markets for forest energy technology manufacturers (maintenance)
- Low price of electricity
- No subsidies
- General thinking that energy is cheap
- Lack of forest management system
- Short tradition of using bioenergy
- High transportation costs outside the area



## *Opportunities:*

- Growing market for timber and forests
- Possibility to apply for subsidies
- Participation in Northern WoodHeat project
- Short tradition of using bioenergy
- Increasing prices of competing energy sources
- Lack of geothermal energy in the area
- Egilstadir energy company could run the business if it is feasible
- We could offer them a plan so that they don't have to drill around the lake
- Good ability for cooperation and adapting new business models
- Sawmill is in the area



## ***Threats:***

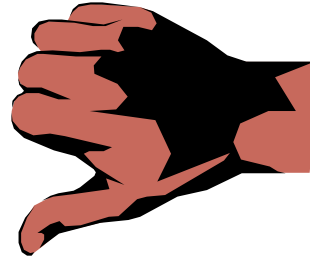
- No money for investments
- Drilling for geothermal energy is ongoing



## Pro forest station:

- In the middle of the primary thinning area
- Sawmill is there
- Clear ownership (supply chain and energy production is in one hand, forest ownership)
- Forest workers and equipment are in one site
- Good place for operation with wood chips etc..
- Heat load is even throughout the year
- Lots of visitors (annually 20 000-30 000)
- Good size for a pilot (not to big and not too small)
- Heating business is not so critical, more flexibility
- Sustainable use of natural resources





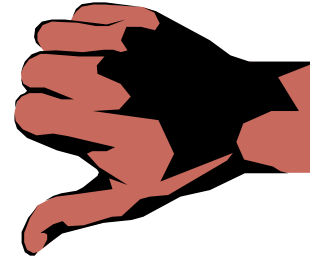
### **Contra forest station:**

- No plumbing/no heating network between buildings
- Heat demand varies during year: greenhouses in use only several months



### **Pro hotel / houses:**

- Proper size (about 300 kW / hotel)
- Location: close to forests and forest station
- Even consumption during year
- Private sector pilot example
- Possibility to enlarge the network to private house area (houses obliged to have possibility to be attached to district heating system)
- Lot's of visitors / good visibility
- Space for boiler house in the area



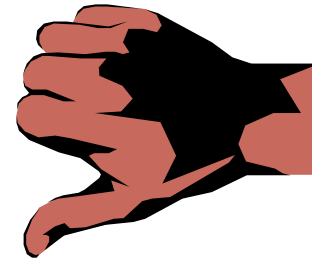
## **Contra hotel / houses:**

- Has to work without problems from the beginning
- Quite big size for a first pilot?

## Pro farm:

- Willing and cooperative owner
- Good farm / forest owner example
- Synergy in marketing the organic farm products / image benefits
- Existing installations (and facilities in buildings)
- Owner is used to have visitors and to make marketing
- Cheap labour
- Close to forest station: possibility to use services / equipment of forest station
- Lot's of shelter belts for energy wood
- Small size = small fuel demand: possibility to heat with chopped firewood
- Possibility to enlarge the green houses and to use green houses year around: bigger and more stable load





### **Contra farm:**

- Lack of (own) money
- Own forests too young for harvesting
- Difficulties in adapting the system in old buildings
- Small size for chip heating: high investment costs, safety and maintenance problems

## What happens next

- All possible forest resource data will be gathered
- Cost data will be gathered
- Sustainable level of cuttings will be estimated
- Availability analysis will be done
- Pilot plant recommendations and supply chains will be designed
- Supporting activities for forest resource assessment and forestry planning will be proposed

