Finlands peat resources, use of peat and after-use of cut-away peatlands

Vapo Oy Jyväskylä 17.8.2011

Olli Reinikainen

Vapo´s head office

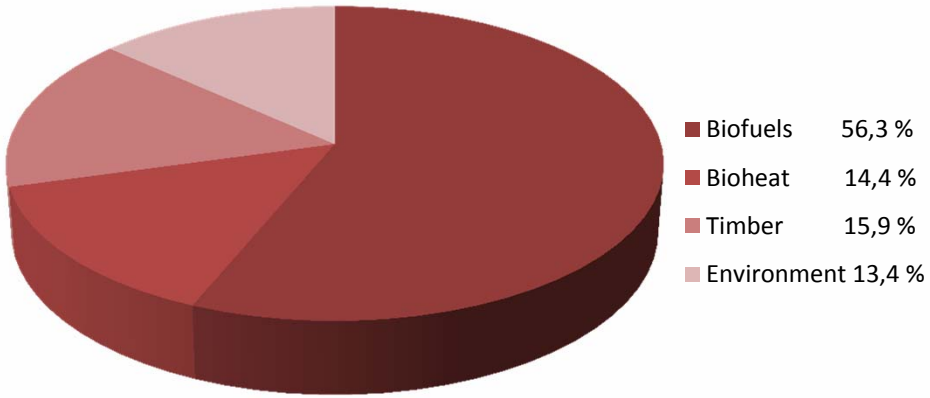
Vapo´s head office moved from Helsinki to Jyväskylä in 1973.

Protection of the peatlands is important. Less than one per cent of the total peatland area is used for peat production.

Vapo Group

- **The Vapo Group consists of the parent company Vapo Oy and it's four business areas are:**
  - **Vapo Biofuels**
  - **Vapo Bioheat,**
  - **Vapo Timber Oy**
  - **Vapo Environment**

- **The parent company Vapo Oy is owned by the Finnish State (50,1%) and the Suomen Energiavarat Oy (49,9%).**



Vapo`s operations

Peat secures our energy self-sufficiency – in all circumstances.

From firewood forests to sawmills and peatlands

1945 Finland was heated by logs, made and transported by 30 000 men and 12 000 horses.

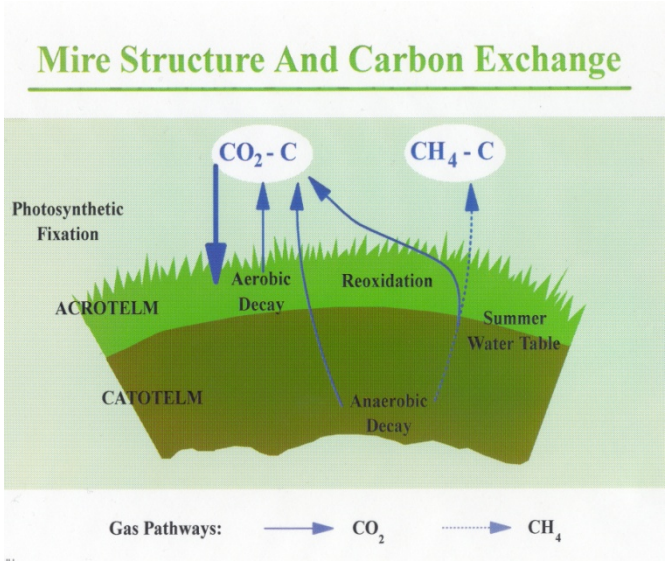
Today peat has a major role in guaranteeing the production of power and district heat in Finland.

Peat contributes to reaching the bio energy targets of EU.

VAPO

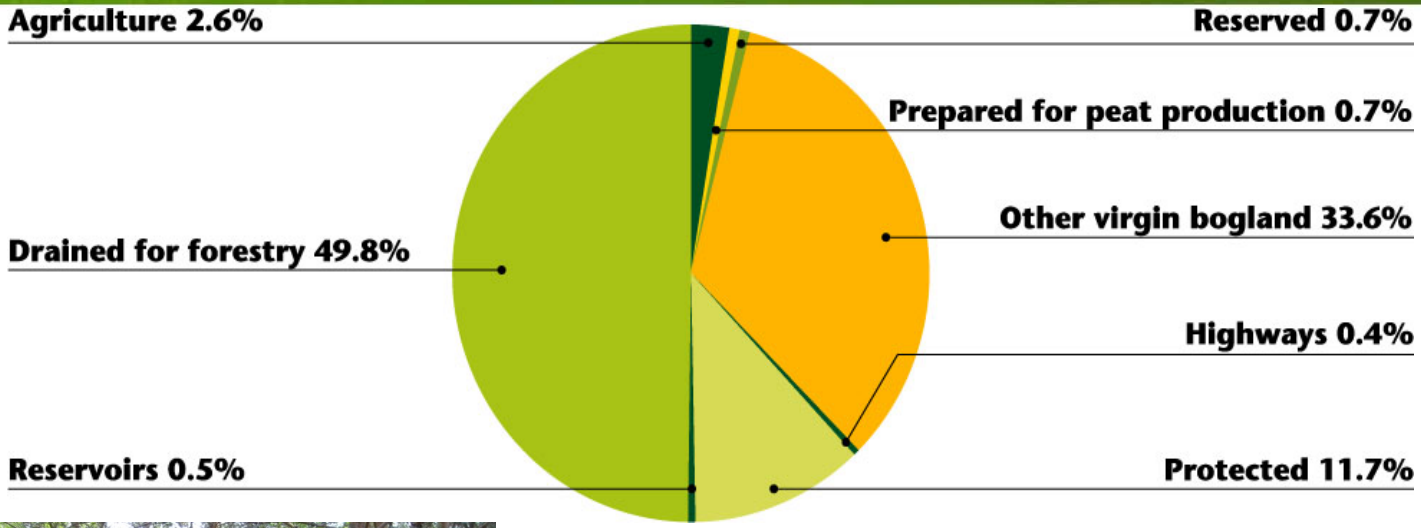
Peat and its' characteristics

Peat is biomass which is formed on mires where annual growth of plants only partially decays and remaining part accumulates as peat.



Use of peatlands in Finland

Total area 9.39 million ha



Peat produces heat for a million Finns.

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Characteristics of peat
Peat layers and their age

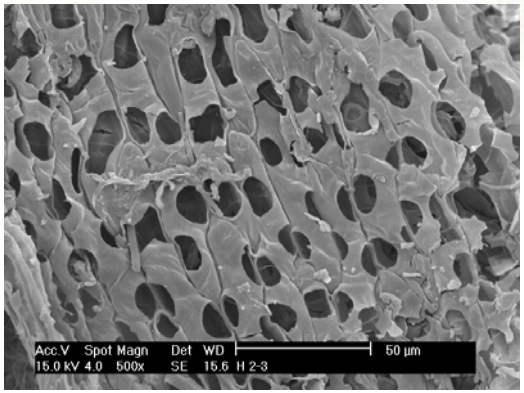
Surface layer
- ✓ slightly decomposed moss peat
- ✓ age 0-1000 years

Central layer
- ✓ moderately decomposed peat
- ✓ age 1001-5000 years

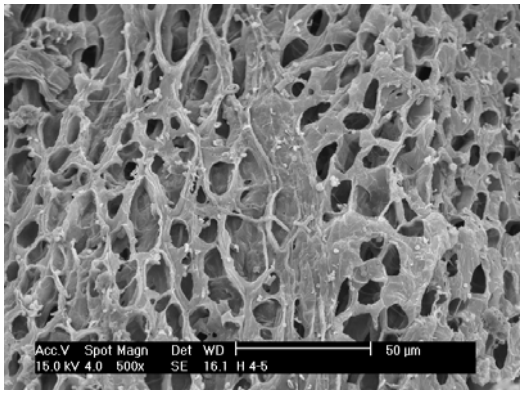
Bottom layer
- ✓ well decomposed peat
- ✓ age 5001-8000 years

Influence of decomposition to visual appearance and microstructure

H 2-3



H 4-5

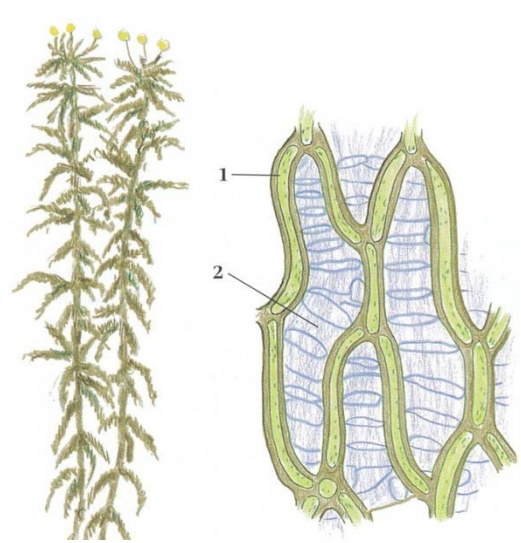


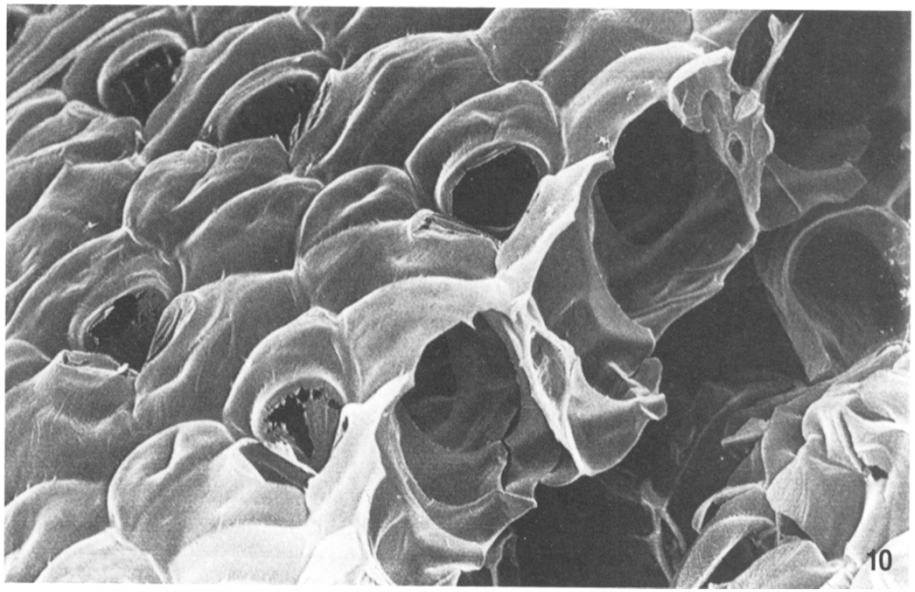
H 6-7

Characteristics of white peat

Physical properties

Strongly based on the structure of Sphagnum moss





Characteristics of white peat
Physical properties:

- **Total porosity, about 95%**
- **Big specific surface area, about 200 m^2/g**
- **High liquid binding ability, 600-800 l/m^3**
- **Low volume weight, about 200 kg/m^3**

Characteristics of white peat

Chemical properties:

- **Organic material; ash content < 5%**
- **Carbon content about 50%, C/N 30-50**
- **Contains organic compounds with high molecular weight**
  →humus compounds -- → biologically active compounds
- **Low pH, about 4**
- **Low electrical conductivity (water soluble salts, nutrients)**
- **High gas absorbing capacity (e.g. ammonia, malodours)**
- **High nutrient binding capacity**
- **High buffer capacity**

Characteristics of peat

different peat qualities → different uses

- Peat is fibrous, porous, organic material which has low ash content and volume weight

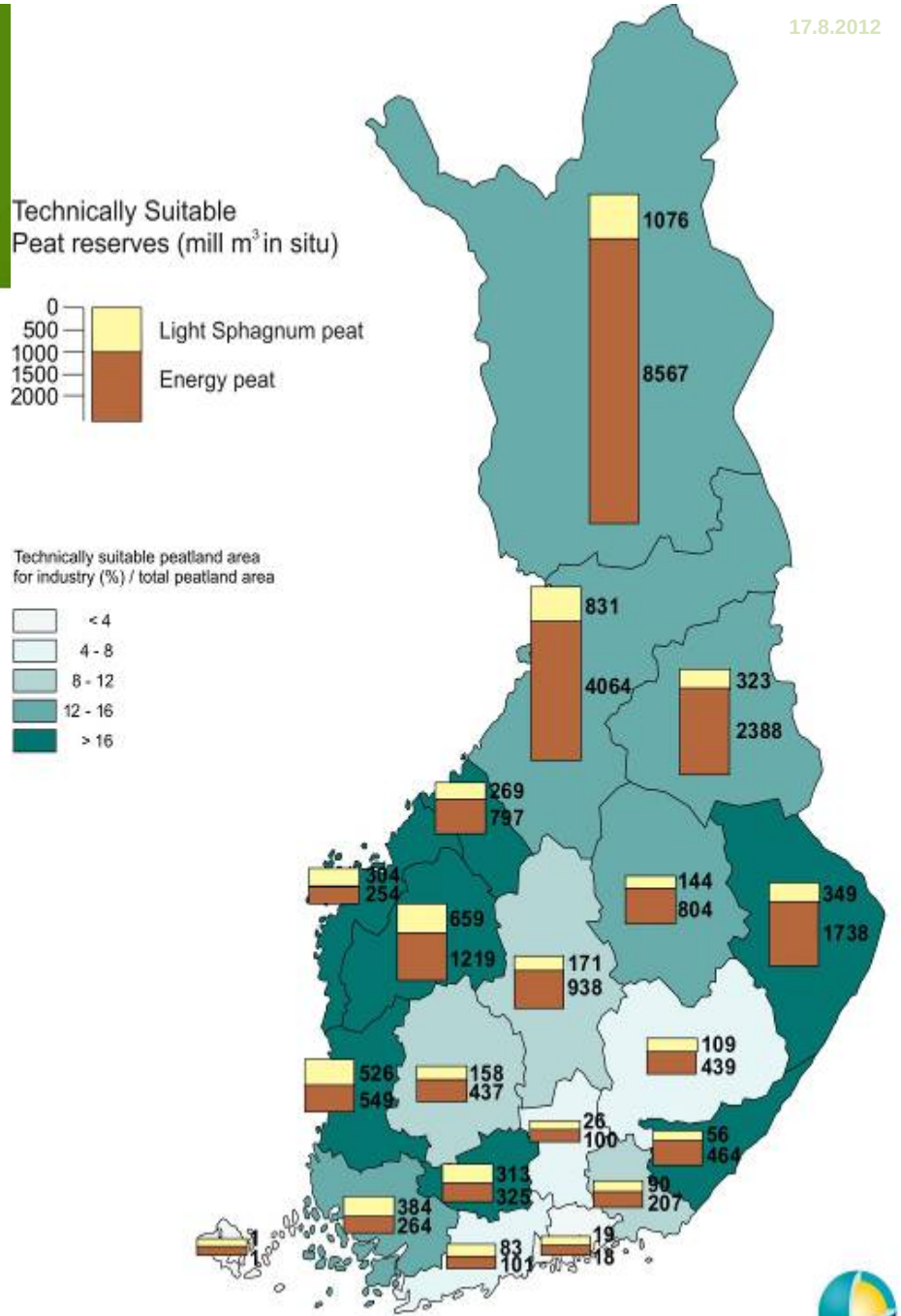
Decomposition of peat increases

Peat resources in Finland

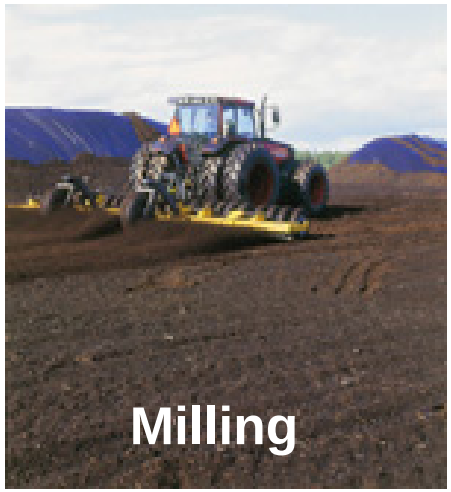
ENERGY PEAT IN FINLAND (Potential)
* 23.7 billion m3 *in situ*
* energy content is about 12 800 TWh (GTK 2010)

OIL RESERVES IN NORWEY (Drilled)
* 1008 million tonnes crude oil
* energy content of about 11 700 TWh (World Energy Council 2009)

LIGHT PEAT TYPES
* 5.9 billion m3 *in situ*



Stages in Peat Production



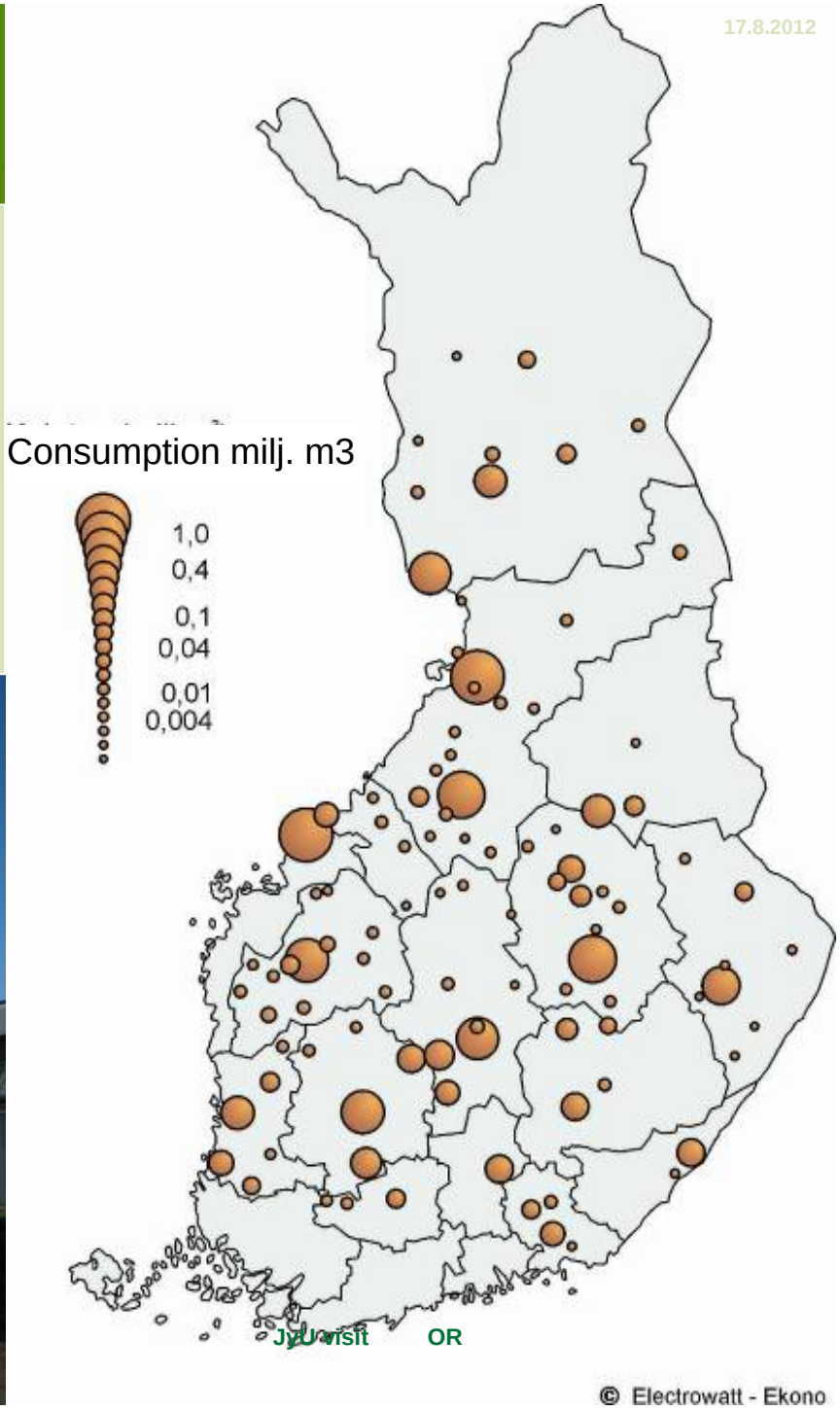
Peat contains energy as much as the oil reserves in the North Sea.

Use of energy peat

In Finland peat is used about in 100 power plants

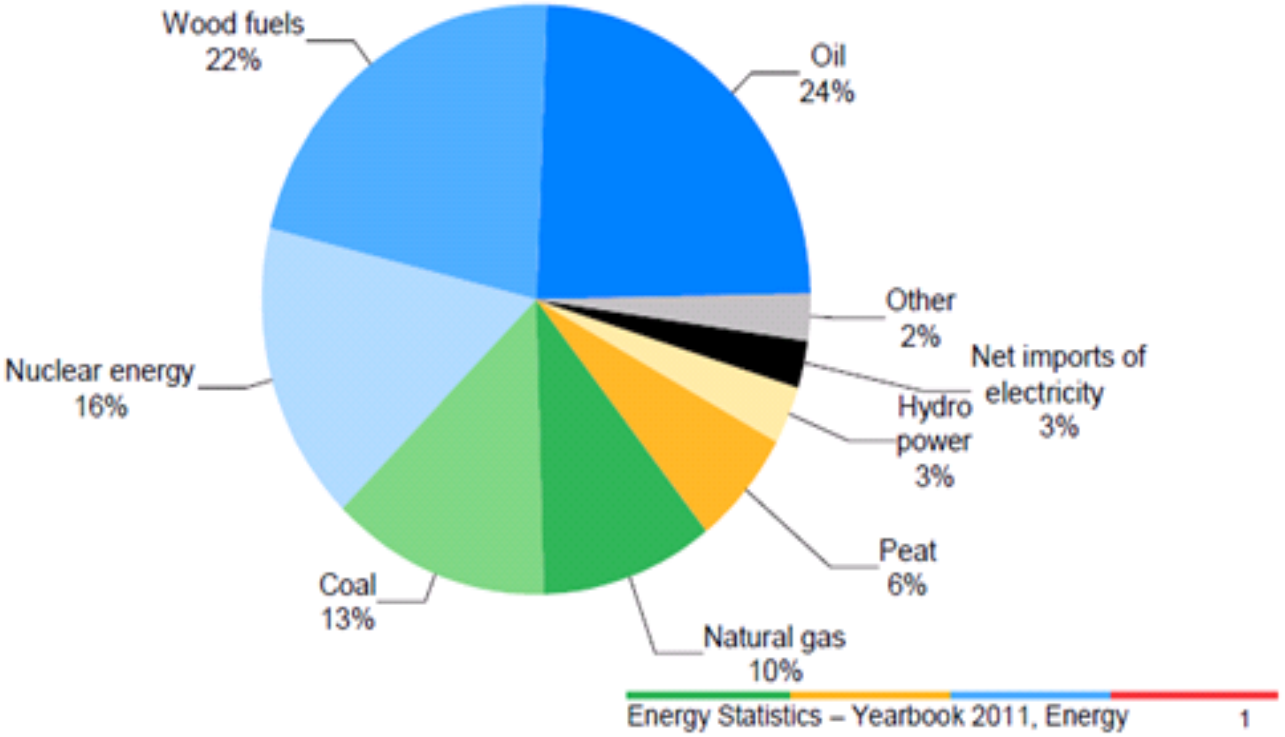
Peat is used in electric production and heating of society

Homes of 1 million people is heated by peat and wood



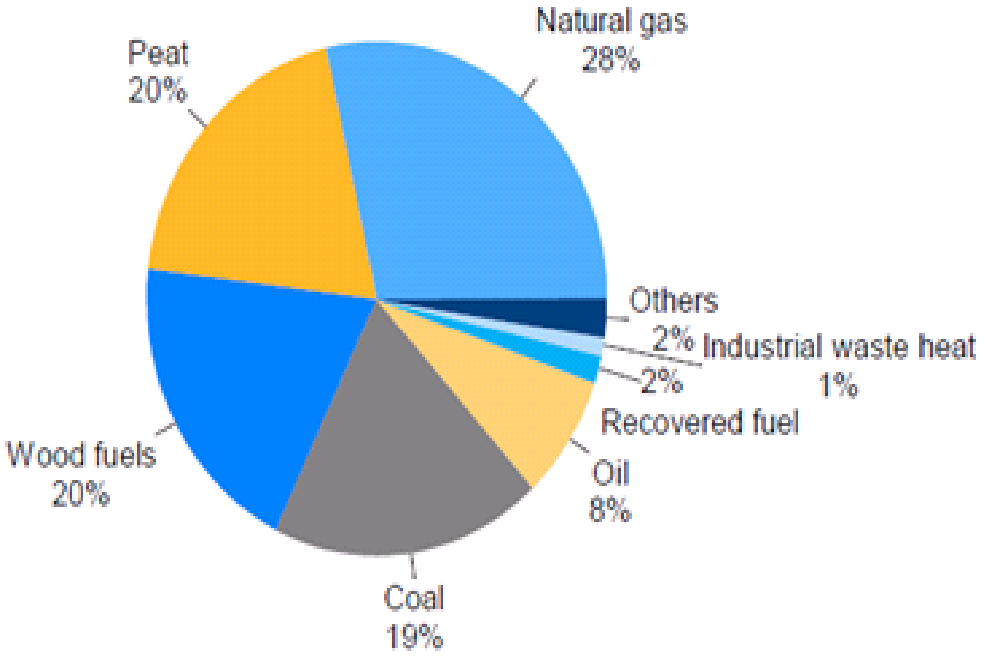
Sources of total energy in Finland

Total energy consumption 2010



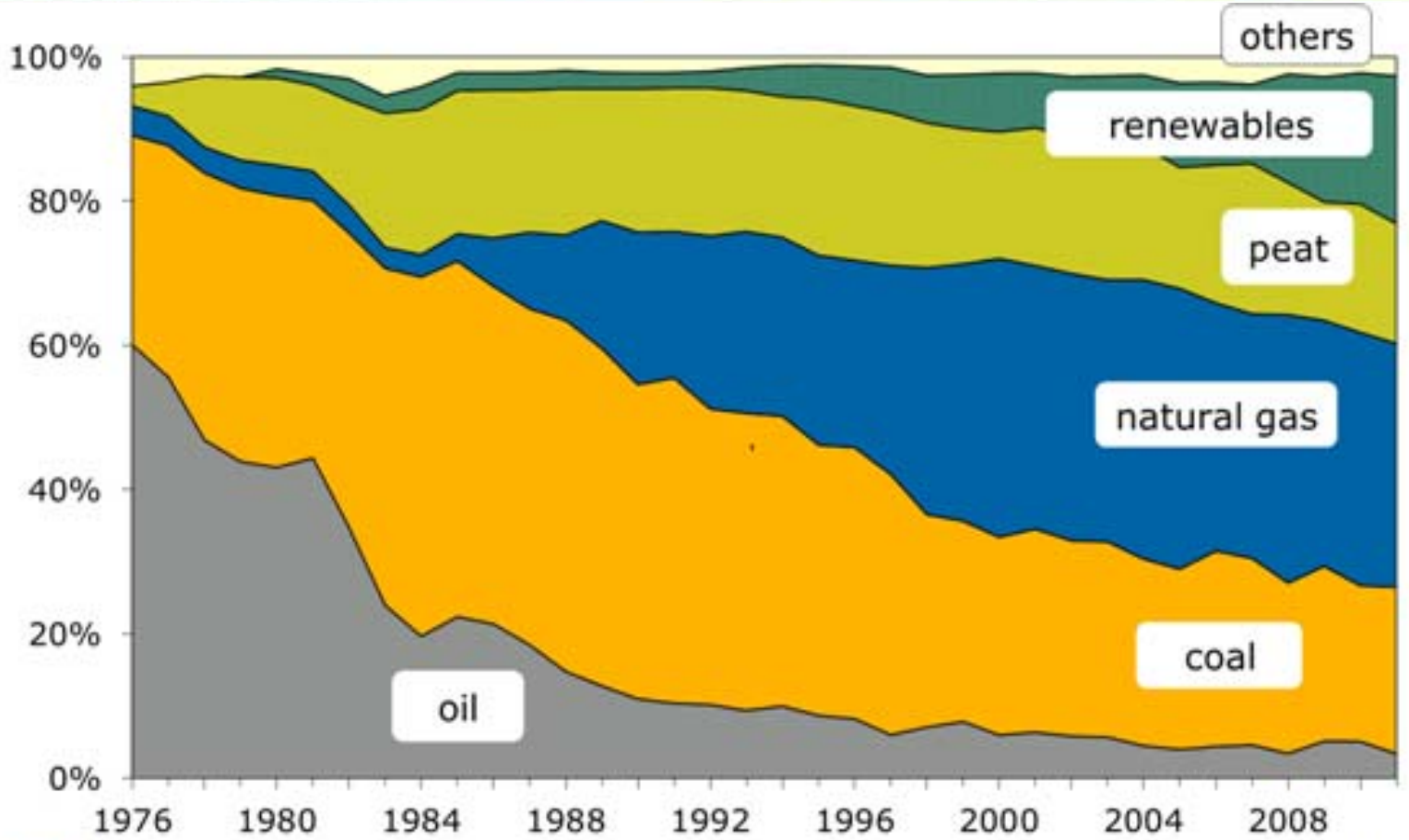
District heat production

Fuels used in district heat production 2010



Energy Statistics – Yearbook 2011, Energy 19

Development of fuel consumption in production of district heat and CHP



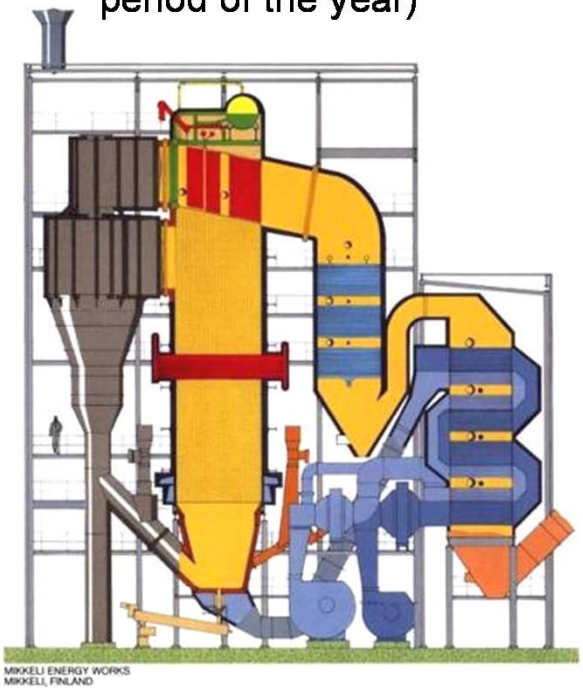
Finnish Energy Industries

J.Leskelä
5.2.2012
8

The advantages of co-firing biomass and peat

- When biomass is co-fired, calculated **CO_2- emissions** are lower
- The ash of biofuels captures sulphur and decreases **SO_2-emissions**
- Treatment of biofuels on power plants is challenging compared to traditional systems

- Better control in **fuel availability** (different conditions during different period of the year)



- **ash quality →utilization**

- Peat is balancing the fluctuation of biofuels **quality** (combustion technical properties, eg. moisture, calorific value, characteristic of the ash etc.)
- Peat reduces the **fouling of the boiler** (cleans heating surfaces), **hot-corrosion risks** and ensures **fluidicing properties** (decreasing substantially the maintenence and operating costs of the plant)

Peat moss — versatile applications, other than energy






Peat in agriculture

- **Crop husbandry cultivation**
  - Peat as soil improver
- **Animal husbandry**
  - **Solid manure** →Bedding material for cattle, poultry, pigs and horses
  - **Animal slurry**→Absorbent for animal slurry (Lietu-apparatus)
  - **Composting of manure**

What is the mutual factor for these pictures?

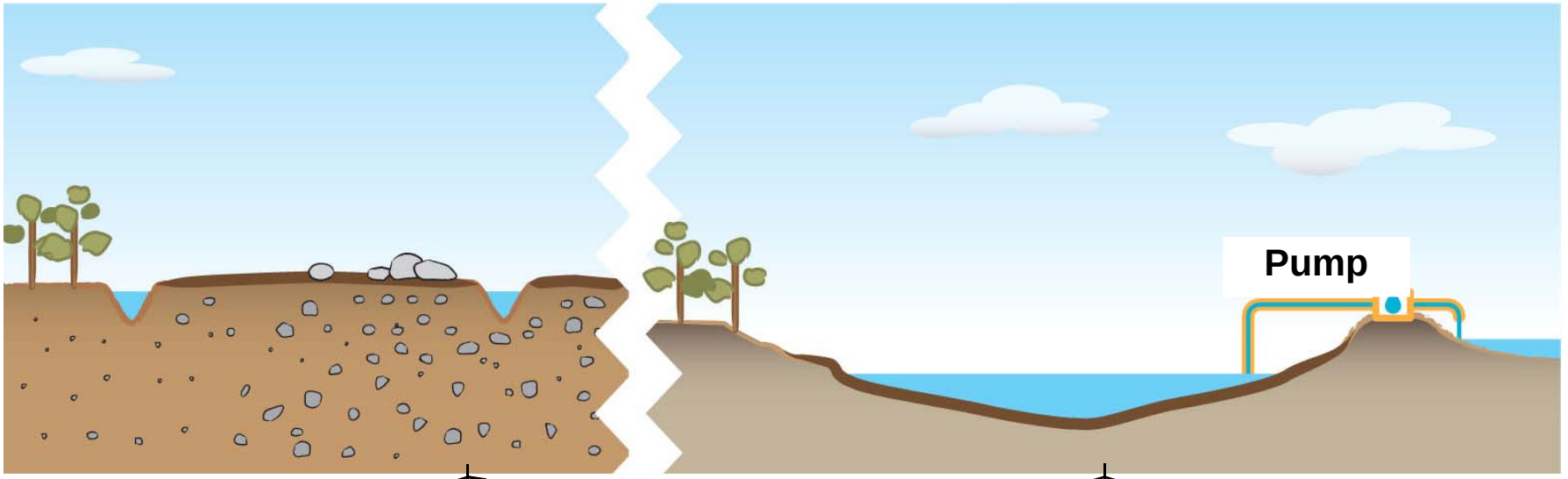
The answer is:

All are former peat production sites

What after peat harvesting?

The influence of topography and hydrology on the after-use of cut away-peatlands

Drainage by gravitation **Pump-drainage**



Arable farming

Forestry

Sphagnum farming

Mire regeneration

Wetland/ bird sanctuary

Further landuse of cut-away peatlands

Wet conditions, the mire bottom lower than surrounding watercourses

Rewetted former peat harvesting field

A lake in a former peat harvesting field

Sphagnum growth 55 years after peat harvesting

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Further landuse of cut-away peatlands

Wet conditions, the mire bottom lower than surrounding watercourses

Wetland and bird lake in Hirvineva

Mire regeneration of a former peat production area

At the end of peat harvesting

Damming of the area

Same area 5 years later

Mire regeneration on former peat extraction site

Extraction site

1 year after extraction

2 years after extraction

3 years after exrtaction

Mire regeneration,
Shagnum moss production

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Further landuse of cut-away peatlands

Dry conditions, even, stonefree area → arable farming

Further landuse of cut-away peatlands

Dry conditions, the number of boulder (stones) can be high

Just after peat production

Same area 11 years later

25 years old forest

(different place)

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Cut-away peatland → afforestation
examples

Hirvineva peatland

7 years after ash fertilization
front: no ash applied

The same area 3 years later

Cut-away peatland → afforestation

examples

Hirvineva peatland

Area after peat harvesting

The same area 7 years later

Intensive production of energy wood on cut-away peatland

25.5.2010

Establishment

Natural afforestation with ash fertilization

Willow

15.8.2012

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Thank you!