Byrå Kommunikationsbyrå, March 2013

It´s all bioenergy
- in the end

![Skogs Industrierna logo]

Diagram: Forestry bioenergy flow

Raw material from forestry

Wood raw material

170 TWh

Slash, fuel wood

25 TWh

60 TWh of energy is used in the production

Production of paper, paperboard & wood products

Production value is SEK 200 billion

Pellets, wood chips **10 TWh**

Heat, **2 TWh**

Bio-energy in society

Forest-based fuels converted to: 5 TWh electricity • 25 TWh heat • 10 TWh firewood/pellets

Enough to heat 2 million single-family homes

10 TWh

Used products in material recycling

25 TWh

8 TWh

85 TWh

Export of paper, paperboard & wood products

Export value is SEK 130 billion

Consumption of paper, paperboard & wood products in Sweden

After material recycling. Recycled an average of 6-7 times

Material that can be recovered as material and used as energy in other countries

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It´s all bioenergy - in the end

When the forest is used to produce pulp, paper and wood products, forestry and the forest industry simultaneously produce bio-energy. Residual products from forestry are used as fuel in CHP plants to generate bio-based electricity and heat. The forest industry utilizes the residual products generated from its own production to make electricity, heat and pellets. This bio-energy is used in the industrial processes and delivered to CHP plants and households.

The industry's processes consume approximately 60 TWh of energy; in addition, about 35 TWh are used in forest-based bio-fuels to produce electricity and heat for the community. The largest source of energy generated from the forest industry is perhaps not as self-evident. Naturally, Paperboard, paper and wood products also contain large amounts of bound bio-energy.

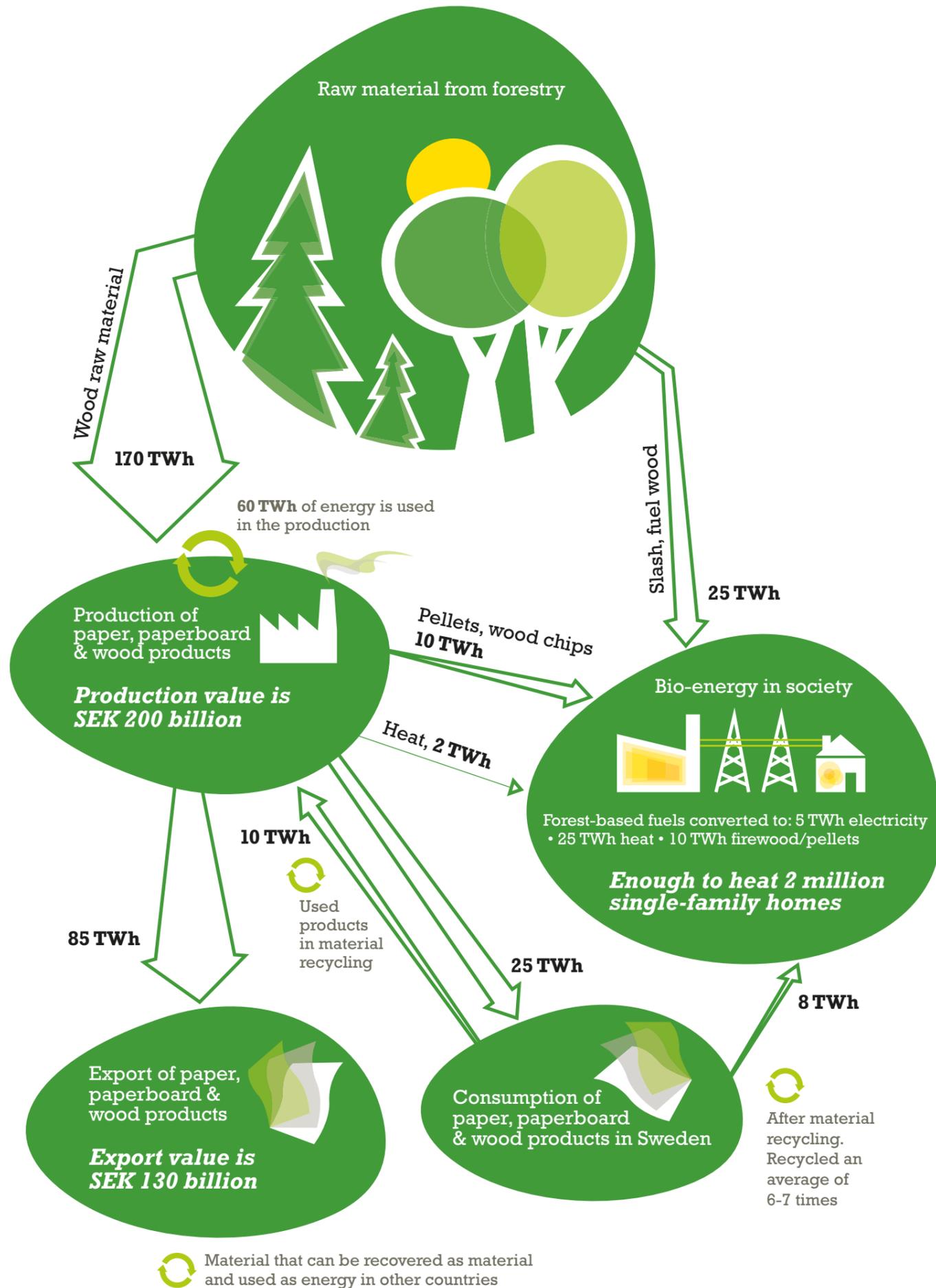After consumption (preferably to replace fossil-based products) and material recycling, the energy content of these products may ultimately be utilized for heating and electricity production when CHP plants burn such products as waste or recycled wood.

In total, the forest industry's products have an energy value of 110 TWh. A major portion of the products is exported; the export revenue totals approximately SEK 130 billion. After consumption and material recycling, the energy value of the exports, about 85 TWh, can be utilized as bio-energy in other countries.

In the Swedish CHP system, approximately 8 TWh of bio-based waste from forest industry products is currently used. As the products that end up in the waste system are increasingly recycled for energy, through for example, biogas production, even more bio-energy that originates from the forests is being utilized. The forest industry is the only sector that can accurately state – *It´s all bioenergy - in the end.*

Recycled paper and recovered wood

About 70-80% of the paper products used in Sweden are recovered to make new products (corresponding to 10 TWh of the energy content for material recovered). Finally, the paper residual in waste becomes biofuel for combustion in CHP plants (we have estimated that the energy content of the consumed paper products that are eventually recycled as energy corresponds to 4 TWh). The residuals from wood products are often called ''recovered wood'' and it is used as biofuel in combustion in a CHP plant (today, this corresponds to energy recycling of 4 TWh).

How to use bio-energy most efficiently

Residual products from forestry, in the form of bark, branches and tree tops (slash), contain energy; this bio-energy is currently suitable for direct energy use. In the future, this range may also be used for new products with higher value. The biomass in wood also has built-in energy content. This is best used by firstly making bio-based products. When the products have been consumed and recycled, their energy content can eventually be used for energy production. If electricity and heat are produced simultaneously in a CHP plant, or in industrial processes, up to 90% of the fuel's energy content will be utilized. The approximately 45 TWh of bio-energy supplied by the forest industry and forestry to society generates 40 TWh of electricity, heat and fuelwood to end consumers.

Energy consumption of the pulp and paper industry

TWh	1970	2010	2020*

Legend:
- Purchased electricity
- Self-produced electricity
- Bio-fuels
- Oil
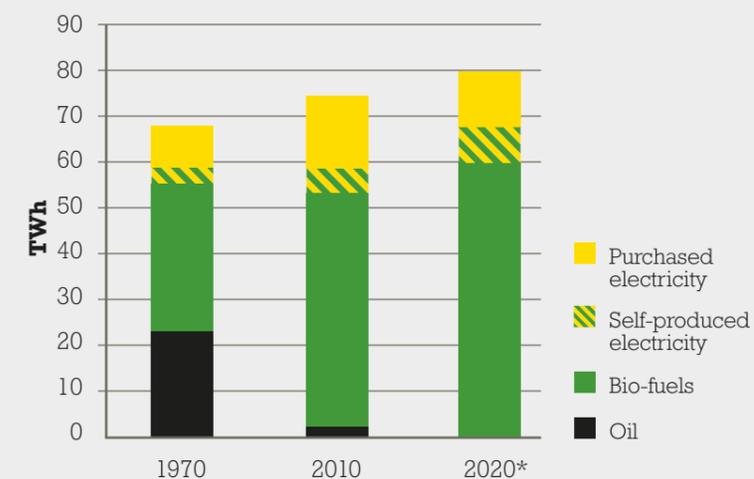
* The bar chart is based on the industry's zero vision for fossil-based fuels and the goals to increase electricity production and energy-efficiency enhancement. The bar chart is based on a higher production volume of approximately 1.5% per year.

What is 1 TWh?

- Energy as heat and electricity can be measured in TWh – terawatt hours (billions of kilowatt hours kWh)
- An average single-family home consumes approximately 0.00002 TWh per year for heating and household electricity
- A nuclear reactor in Sweden produces approximately 6 TWh annually
- Approximately 300 wind turbines are required in Sweden to produce 1 TWh annually