

# AN ANALYSIS OF WOOD PELLETS FOR EXPORT: A CASE STUDY OF SWEDEN AS AN IMPORTER

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## ABSTRACT

North America is a major producer of wood pellets, and the principal market for them is domestic residential wood heating. To date, the export market for wood pellets is small. On the other hand, several developments are occurring that maybe increasing the foreign demand for biomass fuels. A few North American companies are considering Sweden as a potential export market for wood pellets. Sweden heavily taxes fossil fuels, and plans to phase out nuclear power in the near future. This in addition to various other factors explains Sweden's use of wood pellets as an energy source. This paper briefly reviews the prospects and constraints for this international trade in wood pellets. Many factors favor North American exports, although an important constraint is that the United States does not adhere to international product standards for trade in biomass fuels.

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North America is a major producer of wood pellets. Most wood pellets are produced from sawdust and wood shavings as a by-product of wood manufacturing. The majority of pellet manufacturers undertake pellet production as an "add-on" to an existing forest products business (primary or secondary processing), agribusiness, or municipal solid waste disposal company (4). This reduces the volume of waste and earns at least some income from the pellets.

Pellet sales in the United States were 571,000 tons for the 1994-95 heating season, an increase of one-third over the preceding year (10). Most pellet production is sold in the U.S. domestic energy market for residential heating. However, exports may be attractive when the price-cost structure is favorable, and when producers can access reliable streams of "waste wood" (e. g., used pallets too costly to repair and recycle).

In Canada, a number of pellet manufacturing units are being established be-

cause new regulations prohibit wood waste disposal in landfills and other municipal dumps. The regional trade in wood pellets between Canada and the United States is affected by these regulations. Specifically, the prospect of pellet over-supply in some subregions explains why Canadian producers are considering

exports to countries besides the United States (5).

At least in principle, North American exporters of wood pellets should be studying market prospects in Europe. In recent years, the European Community has taken several steps to reduce trade barriers both internally and with the external world. Moreover, a number of European countries are undertaking projects in renewable energy with funding from the European Union. Also, the European Community is opening new trade and investment relationships with Russia, with Germany and its newly acquired eastern sector, and with Asia.

Among the European countries, Sweden offers a potentially attractive opening for North American exporters of wood pellets. Sweden is a large producer of wood pellets, and possesses the technology and infrastructure for pellet use.

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TABLE 1. — Overview of energy taxes in Sweden. <sup>a</sup>

Type of tax	Description
Carbon dioxide	Levied on oil, coal, natural gas, and liquefied petroleum used by the private and transport sector at the rate of \$45.71 per ton. The levy on industry amounts to \$11.43 per ton of carbon dioxide. In the transport sector, the taxes levied on gasoline, diesel, and air fuel.
Sulfur	Introduced in 1991, and imposed on coal, oil, and peat (\$4.29 per kg of sulfur). The sulfur tax takes the form of a fuel tax. If sulfur emissions can be abated, the tax is refunded.
Nitrogen oxides	Introduced in 1992 at the rate of \$5.71 per kg of nitrogen oxide emitted. Levied on large- and medium-sized combustion processes (>25 GWh of energy per year). The tax is refunded to industries that invest in abatement technologies and efficient energy conversion.
Value-added	Introduced in 1990, and presently levied at a rate of 25 percent in addition to the other taxes. Households and private persons pay this tax while companies, organizations, etc. are refunded the value-added tax.

<sup>a</sup>Source: Swedish Univ. of Agricultural Sciences, Dept. of Forest-Industry-Market Studies.

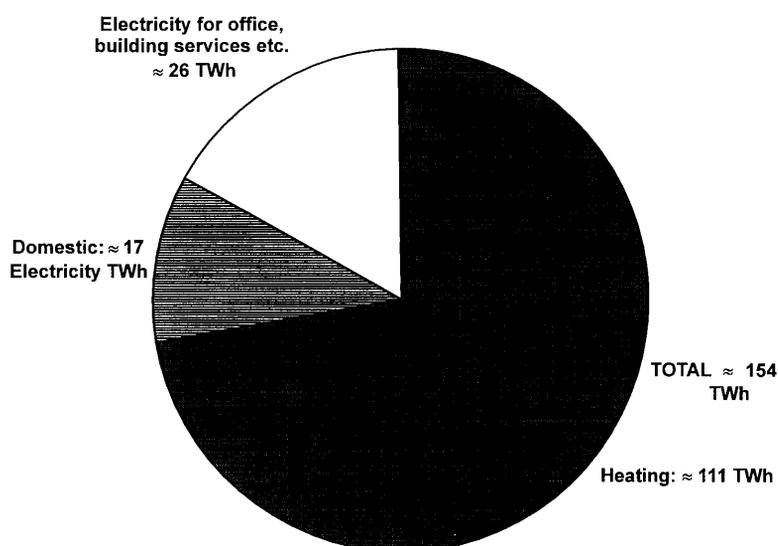


Figure 1. — Energy use in the residential, commercial, and service sectors, 1993. Source: Swedish National Board for Industrial and Technical Development.

Just as importantly, the costs of conventional energy in Sweden are high due to the country's policy to tax fossil fuels heavily. The Swedish parliament voted to phase out nuclear power by the year 2000, and to allocate electricity and fossil fuels to high-priority uses. The development and use of biomass fuels and technologies in light of increasing environmental concern is a main objective of the Swedish Energy Research Program (9).

In view of these factors, the objective

of this study was to assess conditions and trends in favor and against the export of wood pellets to Sweden. The authors relied on interviews and published data provided by several organizations in Sweden and North America (see the acknowledgments). We obtained helpful perspectives from Sweden's Energy Fuel Organization, the Swedish Agricultural University, the Swedish National Board for Industrial and Technical Development, and Stockholm Energy. Also important were the Savannah Electric and Power Company (Georgia, U.S.) and Shaw Resources (Nova Scotia, Canada), both of which are planning to export wood pellets to Sweden in the proximate future.

<sup>1</sup>An exchange rate of \$1 U.S. = 7 SEK (Swedish crowns) was used to report dollar equivalents in this document. Assume all dollar amounts to be U.S. dollars.

## SWEDEN'S ENERGY POLICIES

Sweden is focused on improving long-term conditions for efficient energy markets. The Swedish law "Aiming at Sustainable Development" (Bill No. 1993/94: 111) commits the government to follow the principles set forth in Agenda 21. Among its provisions are a recommendation that local authorities in Sweden should, by 1996, have started work on local action programs for sustainable development to carry the country into the next century. The energy question is a very important element in this agenda for Sweden (7).

Thus, the Swedish Energy Research Program aims to remodel the energy system to respond to increasing environmental and social concerns. The basic research program that promotes renewable energy, especially biofuels, was reinforced in 1991. A budget of 625 million Swedish crowns (\$89.29 million U.S.)<sup>1</sup> was established to promote technologies that make electricity from biofuels. Additionally, 1,000 million crowns (\$142.86 million) is for investment in facilities that co-produce heat and electricity from biofuels (9).

Sweden counts heavily on tax policy to reduce the demand for fossil fuels. The components of this are taxes on carbon dioxide, sulfur, nitrogen oxides, and energy value-added (Table 1). According to assumptions by the Swedish National Board for Industrial and Technical Development, these taxes will accelerate a shift to biofuels. Even then, it is not certain that biofuels will be able to compete with fossil fuels unless there is continuing intervention to support biofuels (9).

The rationale for wood pellets is defined by the preceding policy framework. Emissions of volatile organic compounds from pellets are relatively low, as are emissions of carbon and nitrogen oxides. Pellets produce a low tar content in relation to the limits for wood-fired boilers. Moreover, it is possible to convert oil and wood-fired boilers to utilize wood pellets at relatively low costs. Except for the value-added tax, there are no taxes on wood pellets, briquettes, and other biofuels (6).

## WOOD PELLETS IN SWEDEN'S ENERGY CONSUMPTION

Presently, there are an estimated 17 producers of wood pellets in Sweden. Pellet production in 1995 was 400,000 tons, and is expected to reach 500,000

tons during 1996. About 95 percent of production is consumed by district heating systems (6). The residential market is small, and consumes approximately 3,000 to 4,000 tons annually. Production of briquettes is approximately 250,000 tons and production of powdered wood is approximately 205,000 tons (6).

**Figure 1** shows a diagram of energy use in the residential, commercial, and service sectors for 1993. Total energy used in these sectors was 154 TWh<sup>2</sup>. Of this total, the majority (111 TWh) was used for heating; the rest was used for domestic electricity or electricity for office equipment. Small-scale combustion of biomass occurs mostly in single-family houses for heating purposes. Of the 111 TWh that went into heating, about 48 TWh was used in single-family houses, and the rest to heat flats and other buildings.

**Figure 2** shows energy usage by different sources in single-family houses. Electric heating is the largest, followed by oil and wood. Unlike North America, the principal demand for wood pellets in Sweden is not for residential heating. About half a million Swedish homes use electricity; approximately 200,000 homes use water-heated electric systems; another 600,000 use oil-burning systems; and 400,000 homes heat with wood (3). However, few wood-burning homes use pelletized fuel.

Rather, the principal interest in wood pellets is for district heating, e.g., by Stockholm Energy. This company heats districts within the city of Stockholm and is the largest district heating system in the world for a single city. Large centralized pellet-burning boilers are used to heat water that is channeled through underground pipes to various residential and commercial locations within the city. Its cogeneration facility produces both electricity and district heating. Stockholm Energy is the third largest energy-producing company in Sweden, and the first in Sweden to use pellets on a large scale.

Stockholm Energy's current requirements for pellets are about 200,000 to 250,000 tons per year, i.e., about half of Sweden's total production. The company

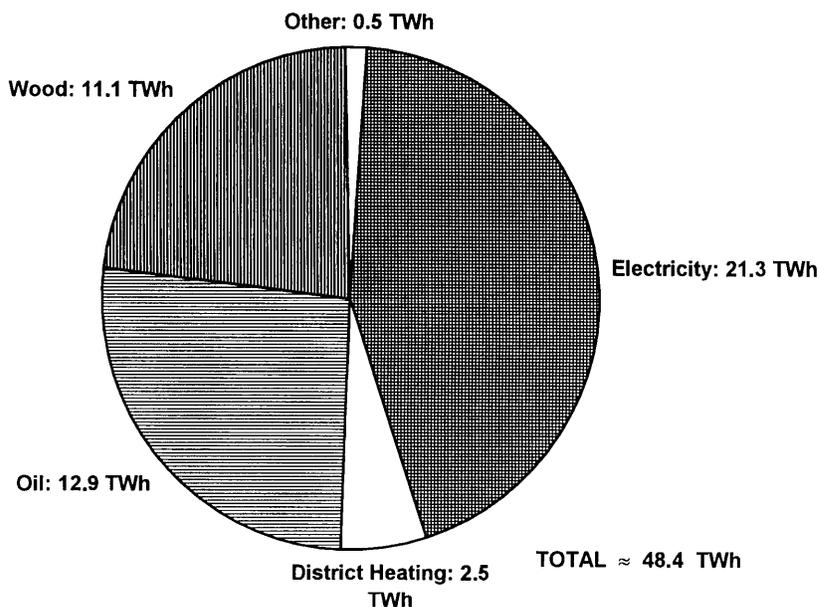


Figure 2. — Heating and hot water use in single-family houses, 1993. Source: Swedish National Board for Industrial and Technical Development.

produces about 65,000 tons annually, and procures the difference in the open market. At the same time, Stockholm Energy imports modest quantities of olive pellets from Tunisia, and wood pellets from Estonia, Holland, and Denmark. The company has been negotiating for possible imports of wood pellets from North America for the following reasons (2):

- Using fossil fuels for district heating increases energy taxes to an uneconomic level;
- North American pellets are cheaper than Swedish pellets;
- Pellets are five times more cost-effective than sawdust to transport;
- With the recent deregulation of Sweden's electric industry, future electricity prices will probably be higher than at present. In view of Sweden's support for renewable energy, electricity generated from biomass is expected to sell at a premium price.

In the long run, the cumulative impact of taxes and incentives may increase the demand for wood pellets in home heating as well. According to a recent analysis, the energy costs for a Swedish residence consuming 30,000 KWh of electricity per year is the equivalent of \$2,700. Energy costs fall to \$2,000 for oil heating, and to \$990 for wood pellets. As new residences are constructed and existing ones are remodeled, the demand for pel-

lets in residential heating could reach a few million tons annually (9).

#### SWEDEN'S TRADE IN BIOFUELS

A few European regions are predicted to have a potential net surplus of biofuels in the year 2000. The most important of them are northwestern Russia, Finland, Sweden, and Norway. Other countries are expected to have a temporary surplus due to imbalances between biofuel production and development of a domestic demand. Examples in this group are Estonia, Latvia, Lithuania, Belorussia, and Spain. The scale and structure of the trade in biofuels in the year 2000 will be determined by decisions, still to be made, regarding energy and environmental policies in Europe (9).

Presently, Sweden's trade in biofuels is insignificant in relation to its trade in other forest and agricultural products. Sweden's statistics show that fuelwood, chips, and particles are imported principally from Finland, Norway, Germany, Denmark, Poland, Latvia, Chile, and Russia. The statistics do not separate wood for energy vs. wood for pulping (12).

A separate analysis for the year 1992 estimated that less than 1 percent of Sweden's bioenergy supply was imported. Sweden has imported modest quantities of olive pellets and olive residues from the Mediterranean region during the last few years. Sweden has imported wood

<sup>2</sup>TWh = 1 tera watt-hour = 500,000 m<sup>3</sup> of solid wood. The following prefixes have been used in this document: K = Kilo (10<sup>3</sup>); M = mega (10<sup>6</sup>); G = giga (10<sup>9</sup>), and T = tera (10<sup>12</sup>).

pellets from Poland, Canada, and the United States; it has imported wood briquettes from Poland and Canada; and it has exported wood pellets to other parts of Europe (9). Sweden's net trade balance in biofuels is therefore difficult to estimate precisely.

#### TRANSPORTATION COSTS AND TRADE STANDARDS

Sea transport is the most efficient means of transporting bulky biofuels. The biomass is transported as briquettes, pellets, or pulverized biomass. Since each type of fuel requires different handling and transportation systems, transportation costs vary accordingly, Lindstrom (8) reports sea transportation costs for biofuels in the Baltic region, and makes extrapolations to the case of trans-Atlantic shipments. The transportation cost for a 35,000-ton vessel traveling a distance of 18,000 km is \$2.40/GJ<sup>3</sup>. This represents the transport costs from ports overseas to European ports. According to Dahl (2) the average delivered price of wood pellets arriving in Stockholm is about \$25 per MWh (c.i.f.).

Since most pellet producers introduce steam during the manufacturing process, it is unlikely that exported pellets would be restricted for phytosanitary reasons. Moreover, Sweden allows wood-based fuels to enter the country free of duties. They are subject to the value-added tax at the general rate, currently 25 percent, which is refundable upon sales for commercial purposes.

For pellet exporters in the United States, only one trade barrier is truly important at this time: the differences be-

tween the U.S. and Swedish measurement standards. Sweden measures pellets as an energy source in MWh, while the United States measures pellets as a weight in tons. Sweden argues that the United States does not understand the ISO (International Standards Organization) standard for biomass fuel. This creates practical problems for Swedish buyers, who need to convert to a MWh basis (1). U.S. providers must be willing to adopt the ISO standard if they want to be competitive at exporting to Sweden.

#### SUMMARY AND CONCLUSIONS

The European market offers a potential opening for North American exporters of wood pellets, even though past export activity has been minimal. Sweden illustrates a country that is moving towards increasing the share of biofuels in its energy consumption. At the moment, Sweden's demand for wood pellets is for residential and especially centralized heating, and for electric power generation. Sweden's energy taxes and environmental policies provide the framework for the expected shift towards biofuels, including biofuels from external suppliers.

Pellet producers located close to ports in eastern North America may be able to take advantage of this potential. If they can use cheap raw materials such as ground-up pallets, the exported pellets may be cost-competitive in Sweden. This proposition is soon to be tested by Savannah Electric and Power company (SEPCO) in Savannah, Ga. (11), and possibly by other North American companies. According to Swedish sources, the contracts to be arranged between

SEPCO and its Swedish buyers will help establish initial market prices for a trans-Atlantic trade in wood pellets. The main hurdle to be overcome concerns different measurement standards for biofuels east and west of the ocean

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<sup>3</sup>GJ = gigajoule = 0.278 MWh = .948 MBTU (mega British thermal unit).