Chapter 9
Continued growth expected for wood energy despite turbulence of the economic crisis: Wood energy markets, 2008-2009[53]

Highlights

- The economic crisis has not reduced the demand for wood energy, which is expected to continue to grow.
- The downturn in sawmill production caused a shortage of raw material supply for wood pellet producers.
- With decreased demand for pulpwood-quality roundwood for wood and paper products in 2009, some pulpwood is being converted into wood energy.
- Economies of scale are being increasingly utilized in both production and logistics to further expand the market volume.
- The pellet production level in Russia is gradually rising again, after stagnation in 2008.
- An ambitious policy of the Russian Government on the use of renewable energy sources is contributing to the development of the domestic wood biomass market.
- North American wood pellet production is increasing swiftly and is primarily focusing on the European market.
- Canada continues to be the world's largest wood pellet exporter, shipping large amounts to power stations primarily in western Europe, but also in Japan.
- A proposed phase-out of electricity generation from coal in Ontario, Canada, is expected to increase domestic demand for biomass as power stations are converted from coal to biomass.
- While the energy debate highlights electricity and transportation fuels, space and water heating make up perhaps the majority of energy demand in the UNECE region.

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Secretariat introduction

While the economic crisis in late 2008 and early 2009 reduced the demand for energy, as evidenced by a steep decline in the price of oil, government policies to promote renewable energy sources have kept the wood energy market strong. With oil prices rising in mid-2009, market demand for alternative fuels, including wood, is growing. Government policy measures enacted to counter economic recessions often include funding to improve energy independence from fossil fuels. Subsidies aimed at improving the environment are part of what is termed the green new deal. This includes, for example, building infrastructure to produce and use carbon-neutral wood-based fuels. During its session scheduled for 12-16 October 2009, the UNECE Timber Committee will hold a policy forum entitled "The forest sector in the green economy". Wood energy will be an important topic during the forum.

The UNECE/FAO Timber Section has other activities in the field of wood energy in addition to this chapter. We are conducting a second Joint Wood Energy Enquiry in the UNECE region and expect to publish results in 2009. We held a workshop on "Estimating potential sustainable wood supply"[54] in March 2009; this subject was driven by the need to produce more wood fibre to meet energy policy targets while satisfying wood industry needs. Together with partner organizations and Governments, we conducted a workshop in June 2009 on "Strategies for increased mobilisation of wood resources from sustainable sources."[55] We are embarking on a new long-term outlook study for the forest sector, which will include scenarios for wood-energy supply and demand, something not included in the 2005 outlook study.

We express our sincere appreciation to the collective work of the authors and contributors to this chapter. It was coordinated, again, and partly written by Mr. Olle Olsson,[56] Ph.D. student and his advisor Dr. Bengt Hillring,[57] Associate Professor, Department of Energy and Technology, Swedish University of Agricultural Sciences (SLU). They were joined for the first time by Dr. Johan Vinterback,[58] Researcher, SLU.

Once again we benefited from the Canadian analysis by Dr. Warren Mabee,[59] Assistant Professor, Energy & Environmental Policy, Queen's University, Ontario, Canada. Dr. Christopher Gaston,[60] National Group Leader, Markets and Economics, FPInnovations-Forintek Division, Vancouver, British Columbia, reviewed the chapter. Ms. Antje Wahl,[61] Scientist, FPInnovations-Forintek Division, Vancouver, joined the team for the first time.

For the update of the US analysis, we once again thank Dr. Kenneth Skog,[62] Project Leader, Economics and Statistics Research, USDA Forest Service, Forest Products Laboratory. He was joined again by Mr. Henry Spelter,[63] Research Scientist, Economics and Statistics Research, USDA Forest Service, Forest Products Laboratory. Mr. Spelter was previously an author for sawn softwood and panel chapters of the *Review*.

For the first time the Russian energy section was written by Dr. Rens Hartkamp,[64] Project Leader, SMK (formerly Stichting Milieukeur). He has experience in Russian wood-energy markets and policies. We welcome him to the *Review* and thank him for the insight which he brought to the chapter. Dr. Hartkamp works together with our colleague at UNECE, Mr. Hans Jansen, in Cooperation in Biomass Enterprise Development and Trading.

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9.1 General energy-market developments

The financial turbulence began to affect the real economy in the second half of 2008, and substantially slowed down global economic activity. The resulting decrease in energy demand led to a sharp drop in energy prices (IMF, 2009). The price of oil dropped from the all-time high at $147/barrel in July 2008, to below $40/barrel in late 2008, and a similar development could be seen for coal (graph 9.1.1). During the first half of 2009, the price of oil slowly recovered and in May 2009, the price of oil is about $60/barrel. Although this is less than half the peak price of summer 2008, it is a high price level in a long-range perspective, which will continue to favour alternative energy sources, including woody biomass.

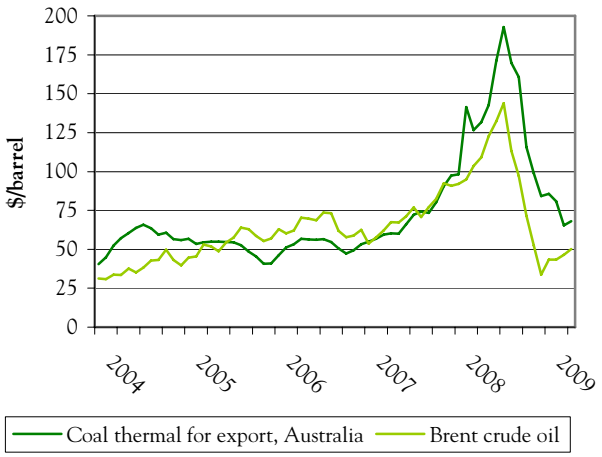
As the seriousness of the economic crisis began to become clear in late 2008, there were fears that this would lead to a lower priority being given to the mitigation of climate change (Kanter, 2008). However, many argued that the "green economy" would prove less vulnerable to the economic crisis and that the political weight behind the efforts to mitigate climate change would ensure continuing demand for renewable energy. As it turns out, many Governments, as well as the European Union (EU), have indeed included large programmes focused on renewable energy and energy efficiency in their economic recovery packages (European Commission, 2008).

The economic downturn has had severe effects on most sectors in the global economy. However, it seems that the wood energy sector – as an important share of the renewable energy sector – is currently strongly influenced and supported by energy policies. These energy policies aim at mitigating climate change and diversifying the national energy portfolio to enhance energy security. The Russo-Ukrainan dispute, focused on the transfer tariffs for Russian gas being transported over Ukrainian territory, again increased the sense of urgency of European Governments and consumers for diversifying their energy supply.

A probable consequence of the financial crisis is an increased consolidation in the renewable energy industry. This would be a possible development as small companies have difficulties obtaining financing – especially in the form of venture capital – and thus instead may have to form different kinds of alliances with big energy companies.

GRAPH 9.1.1

Brent oil price and Australian coal export price, 2004-2009



Sources: IMF, US Department of Energy, 2009.

9.2 European wood energy developments

9.2.1 *Europe: Policies driving markets*

9.2.1.1 *EU agrees on long-term energy and climate package*

Some of the most important developments in European policy measures regarding wood energy since last year's *Review*, have been affiliated with the EU energy and climate package. The process towards an agreement on the EU's future energy and climate policy has been several years in the making since being initiated with a Green Paper in March 2006 (COM(2006) 105). In early 2008, the European Commission put forward several proposals for measures to promote renewable energy, EU limits for greenhouse gas (GHG) emissions and the post-2013 structure of the EU Emission Trading System (EurActiv.com 2008a; EurActiv.com 2008b).

During the second half of 2008, the policy package was heavily debated, but in mid-December, the European Parliament endorsed the package, thereby in practice removing the final obstacle for its entry into EU legislation. The aim of the package is to reach the so-called "20/20/20" goals – a 20% reduction of GHG emissions, a 20% increase in energy efficiency, and 20% of energy from renewable sources – by 2020.

Wood energy and other forms of bioenergy constitute an important part of the package, especially in the so-called renewables directive (European Commission, 2008). Apart from being included indirectly as an important tool to reach the 20/20/20 goals, details on energy from biomass are dealt with explicitly. The

directive sets a goal for 10% of energy in transportation to be from renewable sources by 2020, of which a large share probably will consist of biofuels; however, the directive also specifies that biofuels must save 35% of GHG emissions compared with fossil fuels, a limit that will be increased to 50% starting in 2017 (AEBIOM, 2008). There was speculation as to whether the directive would also include similar conditions for biomass used as fuel for heat and electricity production, but in the end this was not included.

9.2.1.2 *Increased market transparency*

An enduring problem with wood-energy markets is the lack of transparency resulting from the relative immaturity of the market. Market information such as available resources, trade flows and price statistics is often either not available at all or of less-than-superior quality. Research projects and initiatives such as UNECE/FAO's Joint Wood Energy Enquiry (UNECE/FAO, 2009), the EU-supported projects Pellets@las and EUBIONET, as well as the IEA Bioenergy projects, have helped to spread knowledge about international bioenergy markets, and recently quite a few companies have started to show interest, especially in the establishment of benchmark price indices for bioenergy. The Dutch company European Energy Derivatives Exchange (ENDEX) established a price index for industrial wood pellets in late 2008 which was recently used as a reference in a large wood pellet contract (Endex, 2009; Platts, 2009). Additionally, the Finnish company FOEX is also in the process of establishing price indices for wood pellets as well as for cutting residues. The company expects to begin publishing a Nordic wood pellet index before summer 2009 (Prezioso, 2009). Finally, it can also be mentioned that Argus Media, which for a long time has been publishing business reports and other types of studies on energy markets, has begun publishing a weekly report on bioenergy markets, including price data (Argus Media Website, 2009).

It is also worth mentioning that a project aiming to establish a global standard for solid biofuels – such as pellets – has been initiated. A global standard could be in place by 2011 (Norrby, 2008).

Another important step towards increased market transparency in wood energy is the establishment of a Combined Nomenclature (CN) code for wood pellets (44013020, "Sawdust and wood waste and scrap, agglomerated in pellets"). CN codes are used to represent different goods in international trade within the EU as well as in imports and exports to and from the EU. The revised CN will be implemented in 2009, so that data on trade in pellets will be available in 2010. The CN code for pellets greatly increases the possibility for wood-pellet trade patterns to be tracked through official statistics.

9.2.2 *Europe: Market developments*

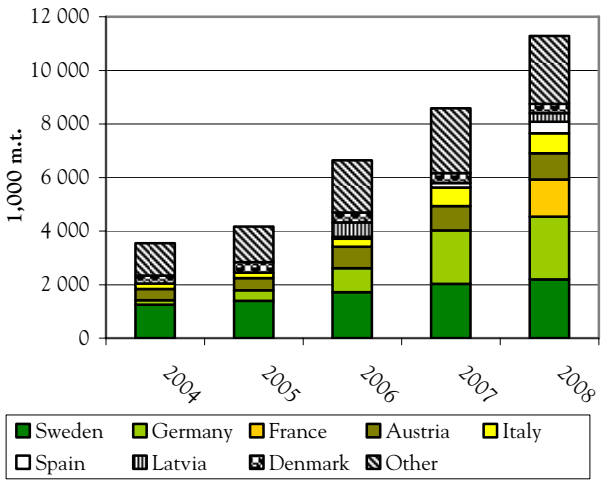
9.2.2.1 *Wood-pellet market size and growth potential*

Demand for wood pellets has grown remarkably in Europe in recent years, and market analysts expect it to continue to grow rapidly in the coming decade (Wild, 2009). The current size of the world wood-pellet market is around 10 million tons, but at the current growth rate of over 20% per annum, the market will double in four years (Wild, 2009; Wood Resources International, 2009).

Europe remains the largest consumer of wood pellets, and production capacity is also expanding fast. From 2005 to 2008 European wood pellet production capacity almost tripled, in particular due to large capacity growth in Germany (graph 9.2.1).

GRAPH 9.2.1

European wood pellet production capacity, 2004-2008



Source: Pellets@las, 2009.

A major share of wood energy consumption is co-firing of wood pellets with coal in power stations. A recent study (Hansson et al., 2009) estimated the potential for co-firing of biomass with coal in Europe, reaching the conclusion that 180-320 petajoules (PJ) of electricity could be produced annually from biomass co-fired with coal. This would require a fuel input of 500-900 PJ/annum (30-50 million tons of wood pellets) at an assumed conversion efficiency of 36%. Some analysts, however, predict that in a few years East Asia will overtake Europe as the world's largest wood-pellet market (Wild, 2009). All in all, it is expected that world wood-pellet markets will continue to grow at a strong rate in the medium term.

9.2.2.2 *Economic crisis impacts on the wood energy market*

The financial crisis and the ensuing economic downturn have reaffirmed the importance of seeing wood energy not as a separate entity but as an integrated part of many other systems. The financial crisis has had a major effect on European wood pellet markets, despite the fact that demand shows no sign of slowing down. Rather, the effects on the wood pellet industry are of a more subtle nature.

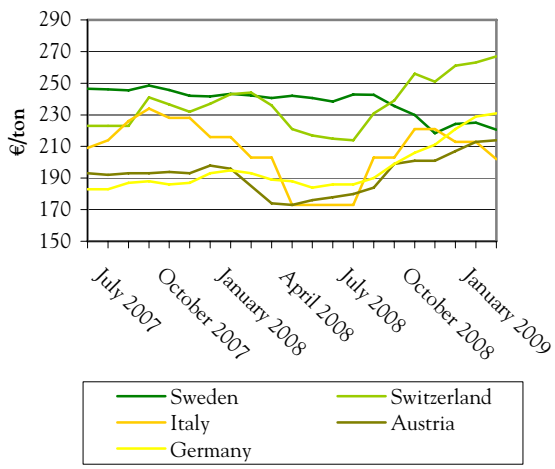
The dominant raw material for wood-pellet production has traditionally been residues from the forest products industry, especially sawdust. In the wake of the economic downturn, sawmills have decreased production, including sawdust. As a consequence, some wood pellet producers have had problems with raw material supply. Owing to lack of raw material, some pellets producers, e.g. in northern Sweden, had to stop production (Andersson, 2009).

The shortage of traditional raw material has also led to increased prices for wood pellets in most parts of Europe (graph 9.2.2). Pellet producers are increasingly looking toward non-traditional raw material sources, such as pulpwood. This has occurred as a result of strong wood energy markets and weak markets for traditional forest products such as paper and panels.

It is reported that forest owners in central Sweden in spring 2009 get more money by selling typical pulplogs as energy wood than as pulpwood (Ostelius, 2009). Pulpwood or energy wood consequently also has been adopted as a new raw material source by major pellet producers to an increasing extent.

GRAPH 9.2.2

European residential wood pellet prices, 2007-2009



Notes: Prices include value-added tax. The drop in Swedish wood pellet prices in late 2008 was heavily influenced by the weakening of Swedish currency relative to the Euro.

Source: Pellets@las, 2009.

9.2.2.3 *Economies of scale*

As the wood-pellet market continues to expand, more and more market actors are beginning to realize the potential gains made from economies of scale. This can be seen in the growing production capacity of new "supersize" wood-pellet plants, especially in North America. Currently, however, the world's largest pellet plant (located in Cottondale, Florida, and run by Swedish-owned Green Circle Bioenergy Inc.) has an annual production capacity of 500,000 tons (Ljungblom, 2008b). The raw materials used for this plant are mainly whole trees from plantation-grown southern pine. This makes the plant independent of sawmill business cycles. On the same scale, a plant opened in 2008 and run by Dixie Pellets in Selma, Alabama, has an annual production capacity of about 454,000 tons. Several other large North American projects are in various stages of development (Mill Product News, 2009). As for new European production facilities, it is worth mentioning that a plant with a planned annual production capacity of 450,000 tons currently is under construction at Averøy near Kristianssund, Norway. The raw material for the plant will consist of imported Russian aspen chips (Münter and Verma, 2008; Biowood Norway A/S, 2009).

What these new large pellet plants have in common is that they are conceived primarily for export purposes, which may also signal a new trend. The majority of plants previously built – except in Canada and Russia – have been geared towards domestic markets in Germany, Sweden and Austria.

The importance of utilizing economies of scale can also be seen in wood-pellet logistics. In order for the long-distance bioenergy trade to become economically sustainable and less vulnerable to volatility in shipping costs, it is critical that all steps in the production and distribution chain be conducted as efficiently as possible. Approximately 7 GJ or 40% of the energy content is required to produce pellets in Canada and ship them to Europe (Magelli et al. 2009). Halving of transport costs per ton would require an increase in ship size from 40,000 dead weight tons (dwt) to 120,000 dwt, assuming no change in the price of bunker fuel oil (Bradley, et al., 2009).

9.2.2.4 *Vertical integration in the wood-energy industry*

With the expected increase of wood-energy demand, competition for wood fibre is bound to become increasingly fierce. Producers of wood panels, MDF and particle boards, as well as the pulp and paper industry, have for several years been concerned about the increasing competition for wood due to the expansion of bioenergy.

Vertical integration is a well-known strategy both to increase security of supply of raw materials (backward integration) as well as to increase market power by taking control of product distribution (forward integration). An example of this is the recent expansion of Finnish-Swedish forest industry company Stora Enso into the wood pellet market. Stora Enso is planning to produce in total 330,000 tons of wood pellets annually from plants located in Sweden, Finland, Russia and the Czech Republic. The raw material for the pellets will come exclusively from Stora Enso's own sawmills, which up until now have supplied other pellet manufacturers with raw material. By being able to utilize the sawmill by-products internally in the company, Stora Enso expects to have a competitive edge over other pellet producers as competition for raw material sharpens (Englund 2009; Isaksson 2009). In these integrated operations there are also other important synergistic gains, i.e. possibilities to share heat sources for drying between sawnwood drying and drying of sawdust for pellets.

Source: Stora Enso, 2009.

Several wood-pellet producers have initiated projects aiming to increase security of raw material supply. Latvian pellet producer SIA Latgran – owned by Swedish and Finnish interests – has started planting energy crops, and a similar strategy has been pursued by the Finnish bioenergy company Vapo (Ljungblom 2008a). On a similar note, the municipally-owned Swedish energy company Jämtkraft has recently started to acquire forest land for the purpose of producing wood fuel in order to increase available fuel supply for the company's heat and power production facilities (Vestun 2009).

9.3 Russian wood-energy developments

In Russia, the general perception on using wood biomass for energy purposes has improved over the last decade. The use of bioenergy was previously regarded as a reverse development. Today, the bioenergy market is taken seriously by the federal and regional governments.

The EU, the US and several other countries have policies stimulating the use of renewable energy sources (RES). The transition to RES is subsidized, in order to decrease the ecological footprint and dependency on fossil fuel imports. In Russia, however, the interest in RES is mainly economic: Russia's goal is to cut costs and increase export revenues by increasing efficiency and by using local RES (instead of fossil fuels) which is often cost efficient by itself. Moreover, the economized volumes of fossil fuels can be exported at higher international prices, and thus revenues at the national level can be increased.

Wood biomass is the most important and promising form of bioenergy in Russia. Fuelwood, industrial waste wood and also wood pellets are increasingly used in conventional heat production installations (on a commercial basis). Combined heat and power (CHP) and other advanced technologies are hardly used yet. Practically all energy pellets are produced from industrial waste wood, i.e. sawdust and chips.

Experts expect the bioenergy sector of Russia to grow rapidly; however, these positive forecasts have not been realized yet. Often the economic crisis is considered to be the main obstacle. Indeed, many investments were put off due to the economic downturn.

9.3.1 Russia: Policies driving markets

Russia consumes about twice as much energy in relation to its GDP as its Nordic neighbours Finland and Sweden, and the US. Improving energy efficiency in Russia is estimated to be three times less expensive than increasing the extraction of fossil fuels. Moreover, payback periods are expected to be short (World Bank, 2008; Shmatko, 2009). In June 2008, President Medvedev signed a decree on improvement of energy intensity. By 2020, the ratio between energy use and GDP should have improved by 40% (Rossiyskaya Gazeta, 2008).

A decree on the use of RES for electricity production was accepted by the federal government in January 2009. Currently, less than 1% of the nation's electricity is produced using RES, excluding hydropower. RES is planned to account for 1.5% in 2010, 2.5% in 2015, and 4.5% in 2020 (Russian government, 2009). The decree recommends that the regional and municipal Governments incorporate measures into their development programmes.

Most Russian district heating utilities were built 20 to 50 years ago and have not been modernized since. They are often highly inefficient and account for 25% of Russia's total energy consumption (Fedorov, 2009). About half of the Russian population inhabit areas that are not connected to gas or oil transmission pipelines. These regions have, however, great resources of wood (Energy & Enviro Finland, 2007).

Russian energy policy aims at the rational use of local RES and wide-scale decentralization. Wood biomass is often the most cost-efficient resource (Komarova, 2009). Its use would diversify the energy market, develop know-how and new technologies, improve local employment, and increase the profitability of the forestry sector. Because GHG emissions are considerably reduced, cooperation within the framework of the Kyoto Protocol can be considered also.

National energy goals are to be implemented on the regional and municipal levels. Normative acts and regulations are to be adapted or established. Numerous regions have already started development programmes to increase the use of wood biomass for district heating. In 2009 a Russian norm on "Untraditional technologies, energy and biowaste, terms and definitions" came into effect. It mainly deals with biofuels and biogas.

A new draft law "On implementing changes in separate Russian laws, with the goal to increase the energy and ecological efficiency of the Russian economy" is now in its second reading in the Duma. The law offers economic incentives to enterprises that use RES and develop environmentally-friendly technologies. Several mechanisms of tax discounts and subsidies are considered (Komarova, 2009; Russian Parliament, 2008).

Internationally-discussed sustainability criteria related to the production of biomass are considered by the federal government. Social prosperity, and the "food versus fuel" discussion received the greatest attention. The issue of GHG reductions is less prevalent.

Export duties on unprocessed wood were increased from 20% (or a minimum of €10 per m^3) to 25% (or a minimum of €15 per m^3) in April 2008. The third phase of the tax was postponed until at least until 2010 (Russian government, 2008). The custom duties are to rise to 80% (or a minimum of €50 per m^3). The government expects this policy to influence the development of the sector for years to come. As a result, pellet producers temporarily benefit from a surplus of raw material on the market. However, this advantage could be of short duration, as the export tariffs will also contribute to the existing trend of decreasing harvest and production volumes.

Export duties for fuelwood are €4 per m^3. However, no export tariffs are levied on pellets. This exception for pellets is not specified in the customs-tariffs regulations (Federal Customs Service of the Russian Federation, 2007). A tariff on pellets would decrease production and export rates immediately. A tariff could become concordant with governmental interests in the future, as public procurement increases.

The EU RES Directive states sustainability requirements for biofuels and bioliquids. Requirements on solid biomass should be developed also in 2009. The Directive needs to be implemented by May 2010 and only "sustainable biomass" will contribute to the European goals. This will become important to Russian pellet exports, as most of the European market is dependent on subsidies provided by the member states.

In Europe several initiatives are focused on the development of a generic certification system for sustainable biomass. Some biomass certification systems, such as the Green Gold Label, already certify wood pellets. These relatively new biomass certification systems usually recognize international forestry certification systems, such as FSC and PEFC (Hartkamp, 2009). Pellets can already be marketed with a FSC or PEFC certificate. In Russia more than 19 million ha were FSC certified as on mid-2009. In March 2009, PEFC endorsed the Russian national certification system RNCFC; the first certificates are expected to be awarded at the end of 2009 (Metsälitto, 2009).

9.3.2 *Russia: Market developments*

The Russian wood-pellet market is considered to be immature and unstable. The wood-pellets sector attracted little private investment in 2008. Production capacity increased only slightly to about 1.5 million tons a year. However, at approximately 550,000 tons, the production level in 2008 remained unchanged from 2007. At the end of 2008, the export price rose to approximately €100 per ton FOB (port of St. Petersburg). In June 2009 it was at €110 per ton, and large suppliers could even realize higher prices (Ivin, 2009). Although the export price gradually rose in early 2009 it is not yet considered a trend.

Most of the exports go through the port of St. Petersburg. Relatively little is exported via the ports of the Baltic States or by road. Much is expected of the new Russian port of Ust-Luga, which is open all winter.

When assessing the possible growth rates of the Russian wood pellets sector, one needs to consider that the accessibility of forest and wood residues resources is often overestimated. Many feedstock locations are economically uninteresting to exploit because of the poor infrastructure and high transportation costs. Often the pellets need to be packed and transported in large bags first, before they can be unpacked and exported in bulk in containers or ships.

An indicator that the market could be reaching a new development stage is the increased interest in larger production capacities per enterprise (of 8, 12 and 16 tons per hour). Especially promising is the greater interest in investment shown by large wood-processing enterprises. At present there are six production plants with a capacity exceeding 220,000 tons per year, of which four are located in north-west Russia (Ivin, 2009). The planned production plant of 500,000 tons per year in Siberia,

which was mentioned in last year's *Review*, has not been built.

Oil and gas prices on the domestic market have risen gradually. This decreased the profitability of transporting and exporting pellets and increased the interest in the local use of bioenergy. However, most wood-processing enterprises with large quantities of their own feedstock and a good connection to export routes made profits on the pellet trade throughout the whole year. Advantageous for pellet exports was the devaluation of the ruble against the euro by approximately 27% between December 2008 and March 2009. Another advantage was a drop in prices for raw materials.

Governmental organizations are increasingly interested in bioenergy. They are cautiously looking for possibilities to cooperate with local business to convert central heating facilities to biomass. The domestic bioenergy market is still in development and transport distances are long. Unprocessed local wood waste is currently the easiest accessible resource for supplying this market. However, pelletizing is also profitable for this domestic use.

Wood-processing enterprises are increasingly using their own waste wood for heat production. These investments have a short payback period and low risk. Often only heat production equipment needs to be transformed. Building a pellet production line is not required. Surplus energy can be provided to the local municipality.

An increasingly large number of private consumers and enterprises are buying central boilers for waste wood, or pellets. This year, a few CHP installations using pellets (and biogas) have also been commissioned. On several important markets, the local pellet price is already higher than the export price.

In 2009, the Russian government confirmed its strategic interest in the use of RES, and wood biomass in particular. The present pellet-production capacity in Russia is about three times the actual production level. However, market infrastructure and regulation are insufficiently developed. Mostly organizational issues need development. The examples of pioneering cooperation between local Russian governments and private enterprises are therefore all the more promising.

It can be expected that the Russian domestic bioenergy and export-driven wood pellet market will continue to grow as public procurement increases and the investment climate improves in the long run.

9.4 United States' wood energy developments

9.4.1 *United States: Policies driving markets*

Although aggregate wood use for energy has remained relatively constant over the last several years, legislative initiatives and projections of high or moderate fossil fuel prices could potentially increase wood use for liquid fuels, power and heat.

United States Department of Energy (USDOE) projections indicate, for example, how fossil fuel prices could influence the amount of biofuels production. USDOE projections for world oil prices in 2030 range from $50 to $200 per barrel (2007 dollars) with a reference case projection of $130 per barrel. For the reference case, biofuels production would fall short of the 136 billion litre (36 billion gallon) per year goal for 2022 (under the 2007 Energy Independence and Security Act (EISA)) but exceed the goal by 2030. For the low and high oil price projections, biofuels would reach 102 or 151 billion litres (27 or 40 billion gallons) in 2030, respectively (USDOE EIA, 2009a).

As part of the 136 billion litre per year goal for 2022, the 2007 EISA (PL 110-140) calls for 61 billion litres (16 billion gallons) of cellulosic biofuels. An assessment of feedstock supply suggests agricultural and forest biomass could meet the 61 billion litre target with feedstocks that cost about $44 per oven dry ton (odt) at roadside or farmgate, with forests supplying about 36 million odt per year and agricultural sources providing 181 million (BRDi, 2008). The assessment suggested that at $40 some of the forest feedstock could come from pulpwood sized material but most could come from currently unused small trees, tops and branches. In that assessment, short rotation woody crops are part of energy crops, which are considered generically and would likely include a combination of perennial grasses, short rotation woody crops, and annual energy crops. As such, the woody crops contribution was not specifically identified. If wood demand increases above this level and prices increase, supply from pulpwood sources and currently used mill residue sources would increase.

In 2007 renewable electricity production was 9% of total production and wood provided 11% of renewable electricity using about 38 million odt of wood and bark (USDOE EIA, 2009b, 2009c). If renewable electricity production were 15% of the 2007 level and wood provided 11%, then wood and bark use for electric power would be about 66 million odt, or approximately 70% more than the 2007 level.

A key factor that will be a driver in markets for wood feedstock for energy is the definition of "biomass" in legislation, which determines what materials can obtain

an incentive for energy use. As a result – depending on the legislation – wood from different kinds of stands and different forest ownerships will or will not qualify for incentives to produce wood-based liquid fuels, heat or power. The definition varies between the 2007 Energy Independence and Security Act; the Food, Conservation, and Energy Act of 2008 (PL 110-234, Farm Bill); and numerous pieces of draft legislation currently being debated.

EISA 2007, which promotes biofuels production, allows wood biomass feedstock only from non-federal land – with the exception of material adjacent to buildings or public places. Allowable wood from non-federal land includes previously established actively managed tree plantations and slash or pre-commercial thinnings.

The Farm Bill, which supports biomass supply for energy and investments in biomass energy production, allows use of wood from federal lands taken to reduce fire hazard or improve forest health and any wood from non-federal land available on a renewable basis.

As an example of legislation being debated, the current draft of the American Clean Energy and Security Act of 2009 (HR2454) allows some wood from federal and non-federal land with many specific permissions and restrictions. (US Committee of Energy and Commerce, 2009).

9.4.2 *United States: Market developments*

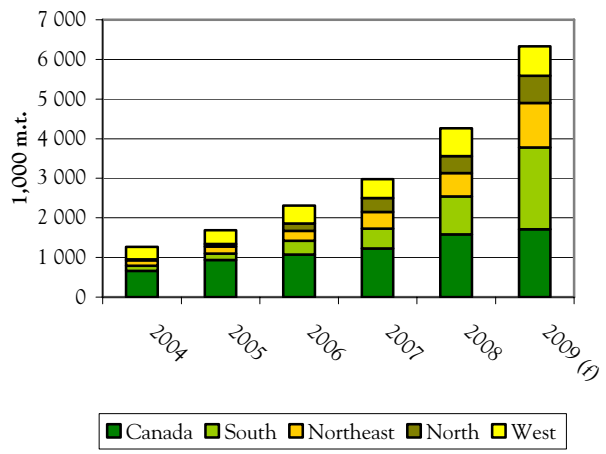
In 2008, wood biomass use for energy in the US was 2,152 PJ (approximately 237 million m^3), which is down from 2,283 PJ in 2007. Aggregate use has been relatively constant since 2001 but below the recent high of 2,848 PJ in 1985. Since 2000, wood biomass has accounted for about 3% of US energy production (USDOE, 2009b). Other sources of biomass account for an additional 1% of energy production. Wood-energy consumption declined steadily as a share of all renewable energy consumption, from 45% in 1981 to 28% in 2008. Since about 2000, wood biomass use for energy has been relatively constant in residential, commercial and industrial uses, but increasing from a relatively low level in electricity production. Wood-based electric power production increased from 137 PJ in 1990 to 194 PJ in 2008. The Energy Independence and Security Act of 2007 has set targets for biofuels production using non-corn feedstocks through 2022 that could result in substantial wood use to make biofuels.

While total wood energy use has been relatively stable overall, wood-pellet production and use has been increasing. Pellet fuel has several advantages for heat and power production. Wood in its raw state has low energy density, contains half of its weight in water and, because of its low bulk density, makes handling and transportation costly. Pelletization improves on these handicaps. Through densification, the energy content per unit volume is increased to near that of coal. In the process the moisture content is also lowered from approximately 50% to 10% (wet basis), enhancing its heating value by reducing the heat of vaporization and allowing it to burn hotter and more completely. The dewatering and increase in bulk density also make transportation more economical. Equally attractive from the end-user viewpoint is the ability to use automated systems to feed appliances because of the small, consistent size of the pellets.

The escalation of fossil fuel prices in the recent past led many consumers to search for lower-cost alternatives and found one in the form of domestically produced pelletized wood. In response to the demand surge, the industry quadrupled in size between 2003 and 2008 (graph 9.4.1) Most of these plants were small by pulp or other commercial wood-using industry standards and relied primarily on cheap waste residues (shavings and sander dust) as input.

GRAPH 9.4.1

North American pellet capacity, 2004-2009



Note: f = forecast.

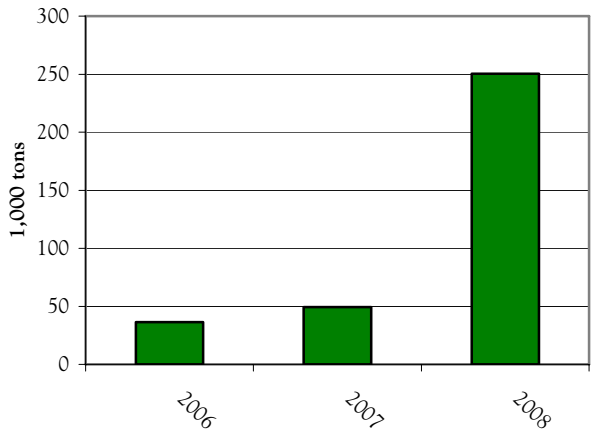
Source: Spelter and Toth, 2009.

In addition to demand from residential users, another source of demand arose from power plants seeking to cut emissions of carbon dioxide, as mandated by national Governments, particularly in Europe. Demonstrations have shown that an effective, minimally disruptive way to use biomass in power plants is as an amendment to coal. Up to about 15% of the total energy input can be substituted without incurring major equipment or modification costs (Bain, et al., 2003). Woody biomass is most appropriate because of availability, costs and operating parameters. In particular, the alkali and chlorine contents of wood are low, which minimize slagging, fouling

and corrosion. Among different forms of wood, pellets are most appropriate for larger pulverized coal-using plants because pellets also pulverize easily, unlike unprocessed wood that by its nature is stringy and non-friable. Accordingly, a second wave of investments has begun to come on stream based on much larger facilities, with raw material needs going beyond residues to roundwood or chips. The emergence of these plants coincides with escalating exports, primarily to Europe (graph 9.4.2).

GRAPH 9.4.2

US pellet and waste wood exports, 2006-2008



Source: US Department of Commerce, International Trade Commission, 2009.

At present there are over 100 pellet producing plants scattered throughout North America (figure 9.4.1). The estimated total production output of these plants in 2008 was 3.2 million tons.

FIGURE 9.4.1

North American pellet plant locations, 2009

Source: Spelter and Toth, 2009.

9.5 Canadian wood energy developments

9.5.1 *Canada: Policies driving markets*

9.5.1.1 *Liquid biofuels*

Most Canadian bioenergy policy has focused on liquid biofuels for transport. Canada has proposed a national mandate for biofuels designed to reduce total GHG emissions by approximately 4 million tons per year. In addition, several provinces have identified mandates that match or exceed the federal targets. The national mandate specifies an average of 5% renewable content in gasoline by 2010 (translating into a demand for about 2.2 billion litres of ethanol), and 2% renewable content in the diesel and distillate pool by 2012 (about 0.7 billion litres of biodiesel). Regulations to support the national mandate are currently being drafted and will likely be enacted later in 2009. Major Canadian biofuel funding programmes are in place (table 9.5.1).

TABLE 9.5.1

Major Canadian biofuel funding programmes, 2009

Funding programme	*Amount (million $CDN)*	*Programme goal*
ecoEnergy for biofuels	$1,500	Total 2.5 billion litres of renewable fuels
ecoAgriculture	$200	Liquid biofuels produced by farmers
NextGen Biofuels Fund	$500	Large-scale demo of 2nd-gen biofuels

9.5.1.2 *Wood-based heat and electricity*

Canada's ecoEnergy for Renewable Power Program was established to increase the supply of electricity from renewable sources such as biomass, by providing funding for renewable energy projects. The programme provides an incentive of 1 cent per kilowatt hour for up to 10 years to eligible low-impact, renewable electricity projects constructed between 2007 and 2011. One such funded project is a major energy project at a pulp mill in British Columbia (Mercer International Celgar Pulp), where the mill is eligible to receive incentive payments of up to a maximum of C$29.9 million over a period of ten years based on the delivery of a certain level of energy production.

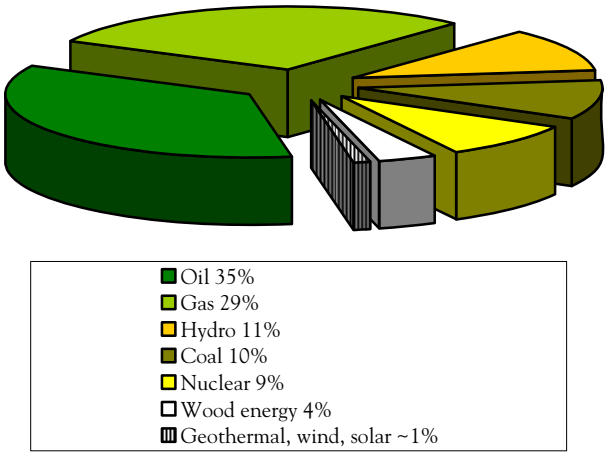
9.5.2 *Canada: Market developments*

Fossil fuels still dominate Canada's Total Primary Energy Supply (TPES); renewable energy is approximately 16% of TPES (graph 9.5.1). Canada's wood-energy generation capacity is largely linked to black liquor gasification within existing pulp and paper production facilities. Downsizing trends experienced

within the pulp and paper industry have been offset by some growth in new wood-to-energy capacity over the past few years.

GRAPH 9.5.1

Wood energy in Canada's total primary energy supply, 2009



Source: International Energy Agency, 2009.

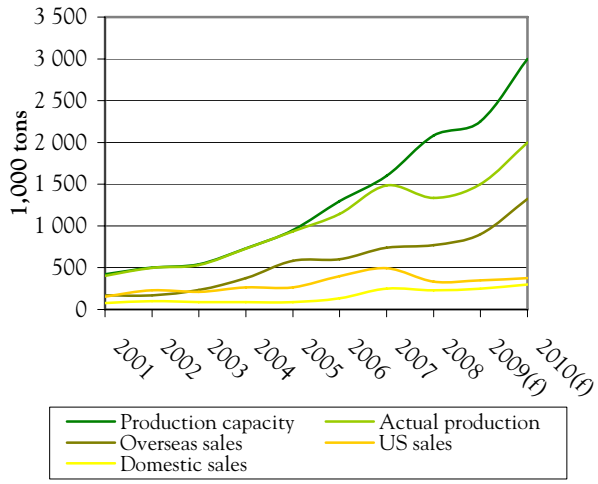
The growth in wood-pellet production in Canada is closely linked with policies in Europe and Asia that favour non-fossil-fuel energy sources. Canada is the world's largest exporter of wood pellets; this is due to a relatively abundant supply of sawmill residues, as well as the small size of the domestic pellet market. Canada produced just over 1.3 million tons of wood pellets in 2008, which represents a slight drop from the previous year (graph 9.5.2) (Wood Pellet Association of Canada, 2009). Sales to the US decreased in 2008, while overseas shipments remained strong. The severe downturn in softwood sawnwood markets has had a domino effect on pellet producers and bioenergy plants in Canada. With many sawmills curtailed, running fewer shifts or even shut down, pellet plants have trouble sourcing sufficient raw material. At the same time, installed wood-pellet production capacity has continued to grow and now stands at over 2 million tons.

While the domestic market has been increasing in recent years, Canadian wood-pellet producers still manufacture primarily for export. In 2008, over 80% of total production was exported. Europe remains the largest market, with 65% of total exports, followed by the US (30%) and Asia (5%). Demand for wood pellets from European large-scale utility power plants and smaller CHP plants remains strong. The first shipment of wood pellets to Japan took place in 2008. The Kansai Electric Power Company, one of Japan's largest utilities, started co-firing Canadian wood pellets with coal at one of its power plants.

In British Columbia, the use of trees killed by mountain pine beetle and of forest residues for wood pellet production and other energy generation has been limited to date, mainly for cost reasons. A new forest tenure form was created in 2008 to allow the retrieval of biomass from Crown land specifically for bioenergy.

GRAPH 9.5.2

Canada's wood pellet production, capacity and markets, 2001-2010



Note: f = forecast.

Source: Wood Pellet Association of Canada, 2009.

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Geneva Timber and Forest Study Paper 24

FOREST PRODUCTS ANNUAL MARKET REVIEW 2008-2009

UNITED NATIONS
New York and Geneva, 2009

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Please note that the Timber Bulletin series was discontinued in 2005. The present publication was issued under the Geneva Timber and Forest Study Paper series starting in 2006.

ABSTRACT

The UNECE/FAO *Forest Products Annual Market Review, 2008-2009* provides general and statistical information on forest products markets and related policies in the UN Economic Commission for Europe region (Europe, North America and the Commonwealth of Independent States). The *Review* begins with an overview chapter, followed by a description of government and industry policies affecting forest products markets. After a description of the economic situation and construction-related demand in the region, five chapters based on annual country-supplied statistics, describe: wood raw materials, sawn softwood, sawn hardwood, wood-based panels, and paper, paperboard and woodpulp. Additional chapters discuss markets for wood energy, certified forest products, value-added wood products and tropical timber. A new chapter is on forest sector carbon markets. In each chapter, production, trade and consumption are analysed and relevant material on specific markets is included. Tables and graphs provided throughout the text present summary information. Supplementary statistical tables may be found on the Market Information Service website within the UNECE Timber Committee and FAO European Forestry Commission website at www.unece.org/timber.

KEYWORDS

Forest products markets, wood markets, market analysis, forest policy, consumption, production, imports, exports, forestry industry, forestry trade, forestry statistics, Europe, North America, Commonwealth of Independent States, climate change, housing market, construction, timber, wood industry, pulp and paper industry, wood fuels, certification, wood products, tropical timber, forestry trade, sustainable forestry, sawnwood, sawn softwood, hardwood, lumber, wood-based panels, particle board, fiberboard, fibreboard, OSB, MDF, plywood, paperboard, cardboard, woodpulp, pulpwood, sawlogs, pulplogs, roundwood, industrial roundwood, value-added, wood energy, bioenergy, biomass, fuelwood, certified forest products and carbon.

ECE/TIM/SP/24

UNITED NATIONS PUBLICATIONS

Sales No.XX.XX.XX.XX

ISBN XX-XXXXXX-X

ISSN XXXX-XXXX