

DEVELOPMENT OF THE WOOD-BASED BIOENERGY-SECTOR IN AUSTRIA

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РАЗВИТИЕ СЕКТОРА БИОЭНЕРГЕТИКИ ИЗ ДРЕВЕСИНЫ В АВСТРИИ

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Austria is a forest-rich country and its wood resources are managed sustainably. In order to achieve national climate mitigation targets and to foster regional development and welfare, the use of wood for energy production has been greatly expanded over the last 15 years, notably with public support. This was accompanied by positive effects on the Austrian economy. In recent years the growth of the bioenergy market has slowed down, but the climate treaty of Paris (COP 21) and the promotion of the transition towards a bioeconomy could be major chances to further growth.

Almost half of Austria's national territory (83,879 km²) is covered with forests. In contrast to many Eastern European Countries, Austrian forests are managed above all by private forest owners. Half of the forest area is managed by small holdings <200 ha, the other half is managed by about 1,500 enterprises (>200ha), communities, provinces as well as the Austrian Federal Forests and other publicly owned forests (in total 15% of forest area, 546,489 ha). Since the 1960ies the Austrian Forest Inventory (ÖWI) is carried out and provides profound monitoring data on forests, their status and developments using sample surveys, exhaustive surveys as well as estimations. The forest area grew continuously from 3.69 million ha in 1961 to 3.99 million ha in 2010, largely due to natural succession. Moreover, the development of the growing stock has reached a record level (1.135 billion m³ over bark in 07/09, compared to 0.78 billion m³ o.b. in 1961). Incremental growth (30.4 million m³ o.b.) clearly exceeds annual utilization (26 million m³ o.b.) (BFW, 2014). A major reason for this is that great structural changes have been taken place in forestry. The number of urban forest owners who are less willing to work in forests is steadily increasing since decades. Moreover, 21.5% of the total forest area is protected in accordance with Forest Europa criteria. Despite its ability to provide great amounts of wood as raw material and for energy production, Austrian forests are – due to topographical conditions – also very important for the protection against natural hazards (avalanches, rockfall, mudflow etc.). Therefore, sustainable forest management has a very long tradition and is secured inter alia in the Austrian Forestry Act 1975. Commercial forests are dominated by coniferous trees (2,139,000ha), above all spruce (81%), followed by pine (8%), larch (7%) and fir (4%). Broadleaved species (821,000ha) are dominated by beech (41%), other hardwoods like maple, ash or chestnut (34%), 17% softwoods and 8% oak. However, there is a trend that spruce is declining considerably in favor of broadleaved forests, shrubs in forest stands and fillers in smaller gaps (BFW, 2014).

Against this background, Austria has also a very productive wood processing industry, notably sawmills (using 16.1 million m³ of wood [2014]), pulp and paper production (8.1 million m³) as well as particleboard industry (3 million m³). Since 2005, the Austrian Energy Agency monitors the wood flows on behalf of the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW). The analysis provides an overview on mass flows of the various forms of usage for different wood assortments, starting from their production to their wide range of application. The results show that approx. 24 million m³ of wood have been used for energy production in 2014, about half of it relates to sawmill co products, black liquor and bark. The wood flows illustrate that wood resources are used in a very cascading way. The Austrian sawmill industry tra-

ditionally imports great amounts of roundwood (5.8 million m³ or 36% of its resource need) and exports sawnwood (5 million m³). As a result, notable amounts of sawmill co-products are used for energy production in Austria (5.4 million m³, thereof 1.8 million m³ pellets). About 20% of the fresh wood supply is used directly for energy production, mainly wood chips (5.7 million m³) and firewood (6.1 million m³) (Strimitzer et al., 2016). Despite being a very important wood assortment in the Austrian economy, the use of traditional firewood has been in a slight but steady decline over the last decades.

The use of wood for energy production has seen a rapid development in the last 15 years (see figure 1). This is mainly due to the political aspiration to foster bioenergy applications in various matters of law, as well as in standards etc. Austria is obliged to fulfill its goals according to EU regulation (Renewable Energy Directive 2009/28/EC) and committed itself to reduce fossil greenhouse gas emissions. Austria's Energy Strategy (2010) focuses on renewable energy and energy efficiency and a new Climate and Energy Strategy is expected to be published during 2017. Due to these efforts, the current share of renewables in final energy consumption has already reached the target value for 2020 (34%), with bioenergy being the most important renewable source (see figure 2). For bioenergy production, wood is by far the most important resource, especially in the heating sector. According to recent data of Statistics Austria (Energy Balance 2015), wood fuels (excl. black liquor) accounted for 26,044 GWh in space heating and additional 9,224 GWh in district heating. As an example for state support, the Austrian Green Electricity Act and the supportive feed-in tariff scheme came already into force in 2002 and provided necessary conditions for the development of production biomass cogeneration (CHP) capacities. Currently, 40% of all wood chips from forests are used in cogeneration plants. The growth in the bioenergy sector is also linked to the development of new innovative technologies and the built-up of Austrian know-how.

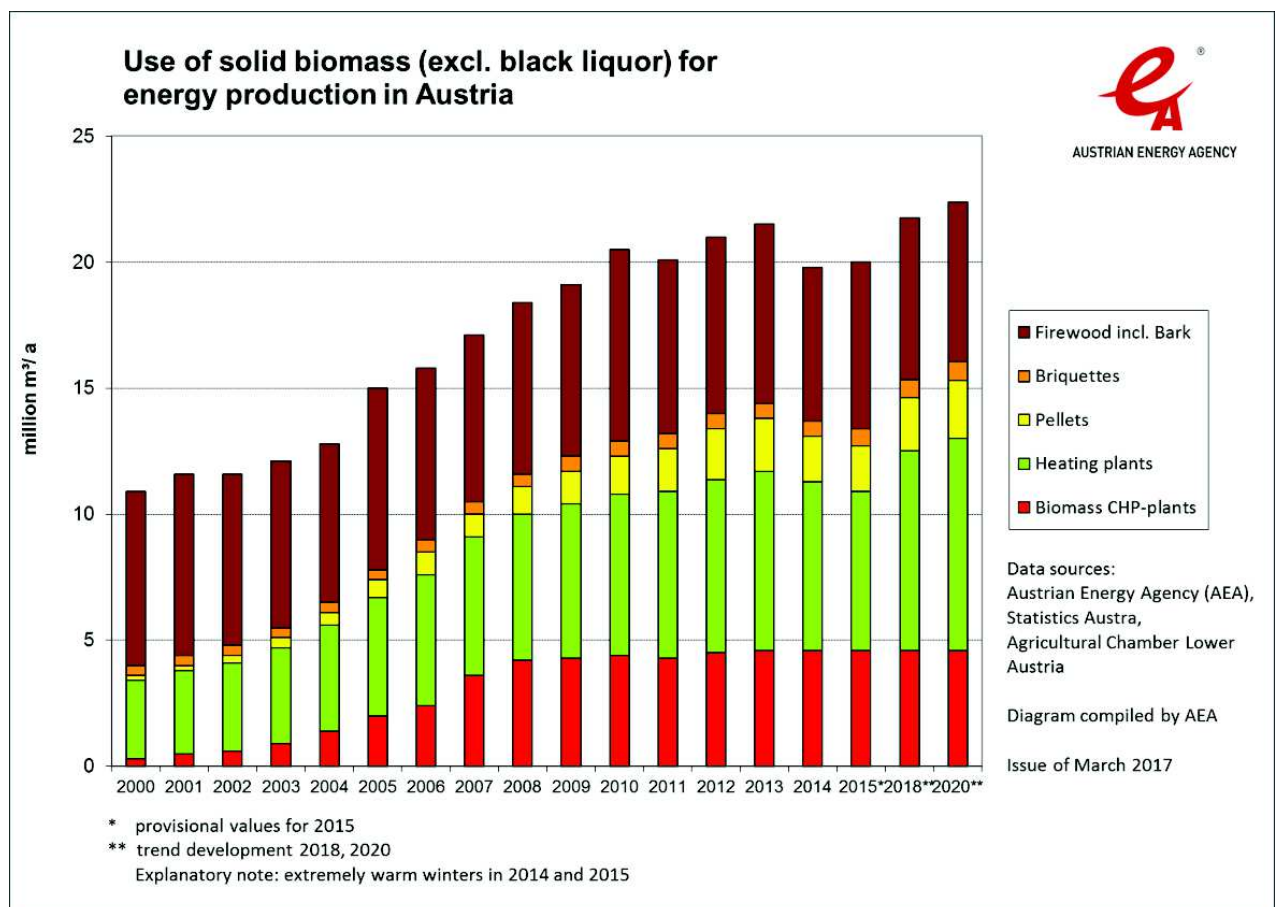


Figure 1 – Use of solid biomass for energy production in Austria

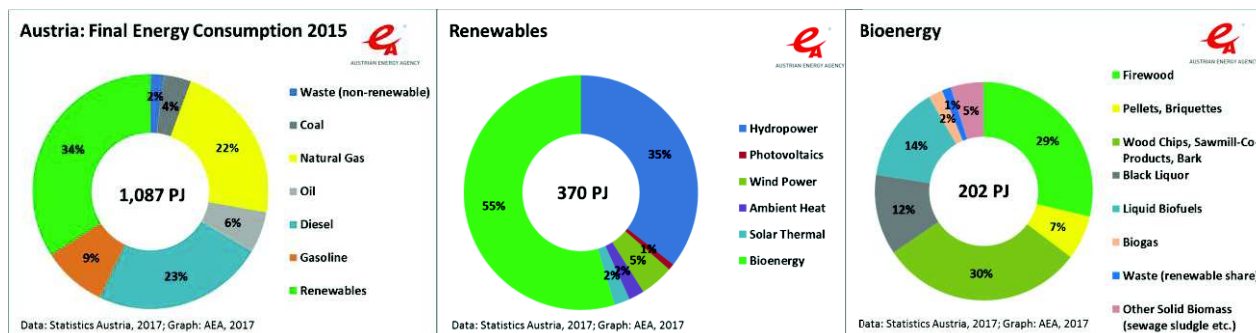


Figure 2 – Final energy consumption in Austria in 2015, highlighting renewables and bioenergy

Despite the development of biomass cogeneration, the use of pellets increased from 0.2 million m³ in 2000 to 1.8 in 2014. The Austrian pellet industry continuously developed innovative, clean and more efficient boilers, and developed its production capacities. Austrian boiler manufacturers are now amongst the world technology leaders, pellet plant construction companies are active globally and high quality pellets are produced in 40 production plants. Additionally, a wide range of standards have been developed in order to secure highest fuel quality and quality of technologies and applications. In the last years, the domestic pellet production (1 million tons in 2015) clearly exceeded the domestic consumption (850,000 tons) (ProPellets, 2017). In the last years, there has been a considerable uptake in biomass district heating, partly due to investment subsidies. From 1993-2015, 18,084 projects in the field of renewable energies have been subsidized in total with 640 million Euros in the framework of the Environmental Support in Austria. In 2015, inter alia 13.6 million have been spend for biomass district heating systems, 3.7 million for biomass micro-grids and 3.7 million for individual biomass plants. The corresponding, environmental-related investment volume of the projects in these three sectors amounted to 136 million Euros or 29% of the total environmental-related investment volume (BMLFUW, 2016). In order to further increase technical quality and efficiency of biomass district heating systems, a binding, nation-wide quality assessment program (“QM Heizwerke”) has been implemented on behalf of BMLFUW. Currently, there are more than 2,100 biomass heating plants in operation (1,860 MW total capacity, 4,650 GWh heat p.a.), 111 biomass CHP-plants according to green electricity act (313 MWel; 2,128 GWh power p.a.; 4,457 GWh heat p.a.[excl. CHP plants from wood processing industry]) as well as 22 wood-gas-CHP plants (ÖBV, 2017).

The expansion of bioenergy and increased use of wood assortments was accompanied by positive effects on the Austrian economy. A case-study assessing regional effects of bioenergy use has shown that it secures seven times more jobs than a fossil reference system. Moreover, the direct regional value added is roughly six times higher (AEA, 2015). Data for biomass cogeneration plants also reveal great revenues in the fuel production sector (mainly in rural areas) as well as added value generated by investment and operating costs (AEA, 2017). The use of wood for energy production increases domestic security of fuel supply and reduces the dependence on fossil fuel imports. Moreover, the use of renewable energy creates approx. 40,000 full-time jobs, half of it relating to bioenergy. 75% of the biomass boiler production is currently exported, the total turnover of the 75 Austrian biomass boiler and stove-producers amounts to 1.1 billion Euros p.a., the revenues in the total bioenergy sector amount to 2.8 billion Euros (ÖBV, 2016). Moreover, the production value of the whole forestry, wood processing- and paper industry amounts to 12 billion Euros p.a., while the average export surplus of these sectors is approx. 3.5 billion Euros p.a. (FHP, 2012)

However, recent developments show a slowdown in bioenergy growth. Cogeneration plants according to the Green Electricity Act are facing expiring feed in tariffs (originally limited to 13-15 years); a new regulation is currently under negotiation. Boiler sales were in decline since 2012, the

number of newly installed pellet boilers (incl. boilers > 100kW) dropped from 12,067 in 2012 to 5,069 in 2015. Also the number of newly installed logwood was in decline and fell to 3,453 (2012: 6,887), same applies to wood chip boilers (2012: 4,264; 2015: 2,308) (Haneder, 2016). This is due to the combination of several factors: warm winters (especially 2014 and 2015), reduced private investments, and – above all – low oil prices were major obstacles for the bioenergy market. Moreover, there is a growing competition to other renewable energy technologies like heat pumps, especially for small capacity units for households. Furthermore, better insulation of houses effect in decreasing heat demands (e.g. “passive” houses). Major challenges also include replacing current boilers and stoves with more efficient ones and also promoting the use of waste heat in existing CHP plants (Panoutsou et al., 2016). Nevertheless, also several new possibilities for woody biomass exist, including various bio-refinery concepts, power to gas with biomass as carbon source, future uses of biomass as energy-storage to match consumer demands, as well as the production of diverse, high value chemicals and materials from woody biomass. Anyway, future biomass markets are expected to be situated there where biomass is available in sufficient amounts (Hofbauer, 2017). The ratification of the climate treaty COP 21 can be seen as major chance for wood based bioenergy, if biomass can further be established in the heating sector, especially replacing old oil boilers. Austrian and Central European forests are able to meet potentially increasing demands for wood raw materials for industrial and energetic applications under the precondition of sustainability. In Austria, incremental growth exceeds annual wood utilization by 4.4 million m³. A recent study has also shown that the transformation of Austria to a bioeconomy (replacement of fossil-based materials and energy by biomass) could be accomplished without additional biomass imports (Kalt et al., 2016). Especially the substitution of carbon-intensive materials with long-lived wood products is a highly efficient way to mitigate greenhouse gas emission (Kalt et al., 2015). The intensified use of wood is therefore able to play a substantial role to ensure achievements of the national targets regarding climate change mitigation.

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REFERENCES

1. AEA (2016): Regionale Wertschöpfung und Beschäftigung durch Energie aus fester Biomasse. Forschungsbericht im Auftrag des Klima- und Energiefonds, Wien, März 2015.
2. AEA (2017): Volkswirtschaftliche Bedeutung von Ökostromanlagen auf Basis fester Biomasse in Österreich. Forschungsbericht im Auftrag der IG-Holzkraft, Wien, Jänner 2017.
3. BFW (2014): Austrian Forest Inventory of the Federal Research and Training Center for Forest, Natural Hazards and Landscape.
4. BMLFUW (2016): Umweltinvestitionen des Bundes 2015. Bericht zu den Umweltförderungen gemäß UFG und zur Schutzwasserwirtschaft gemäß WBFG, Kommunalkredit Public Consulting GmbH, Wien, April 2016.
5. Directive 2009/28/ EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
6. FHP (2012): Leistungsbericht Wertschöpfungskette Holz. Kooperationsplattform Forst-Holz-Papier, Wien, 2012.
7. Haneder (2016): Biomasse – Heizungserhebung 2015. Landwirtschaftskammer Niederösterreich, Abteilung Betriebswirtschaft und Technik, St. Pölten, Mai 2016.