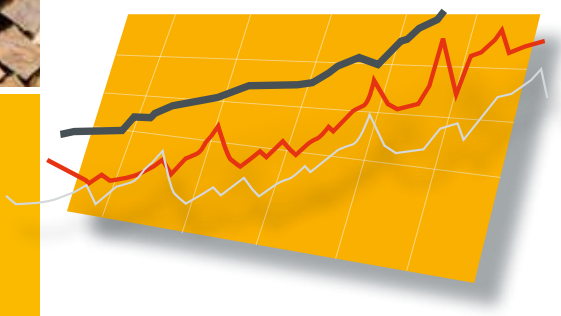
Fuel data
Firewood, Wood Chips, Pellets, Miscanthus

... my heating system

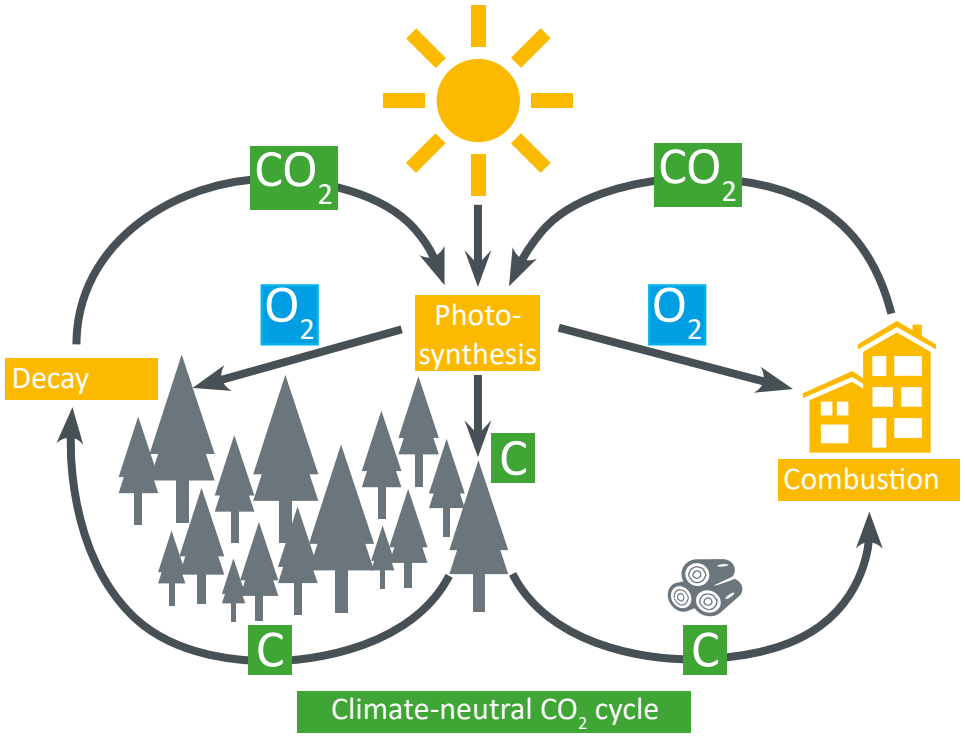


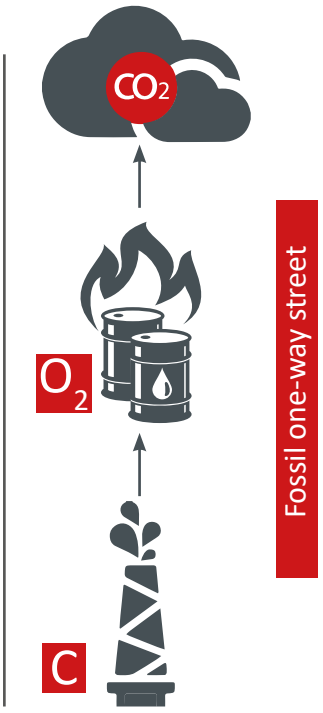


Heat from Biomass

A passion for perfection.

www.eta.co.at





Source: Austrian Biomass Association

Heat from the forest

Why heating with wood is so advantageous

What is biomass?

Everyone has heard the term biomass by now. But what does it really mean? Biomass refers to all organic substances which are biogenic and non-fossil. Examples of biomass include waste wood, shrub cuttings, biowaste, animal manure and many more organic substances. Energy can be derived from all of these raw materials. For heating, wood in its various forms is the standard and most frequently used energy source.

Heating with wood

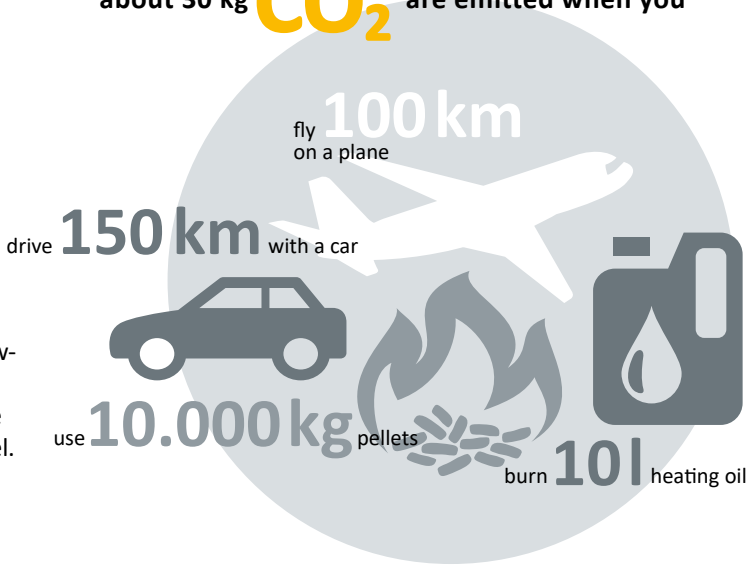
Wood as fuel has proved its worth in the heating sector against other biomass raw materials for various reasons. On the one hand, the energy requirement and the effort for the further processing and transport of the wood are very low, even with pellets. Another reason why wood is an established fuel is its chemical composition with low-emission combustion. Compared to other biomass raw materials, availability and climate neutrality are important factors in the popularity of wood as a fuel.

Environmentally friendly and CO_2-neutral

Everyone knows by now why burning fossil fuels, such as oil and gas, is not preferable. The procurement of crude oil and gas is very energy- and cost-intensive, as is the further processing of the final heating medium. Moreover, fossil fuels are not climate-neutral. This means they intensify the greenhouse effect and contribute to climate warming.

The natural raw material wood is CO_2-neutral, which means that during its combustion no more CO_2 will be released than the tree took in during its growth. The same amount will also be released if the wood rots in the forest. So heating with wood doesn't burden our climate.

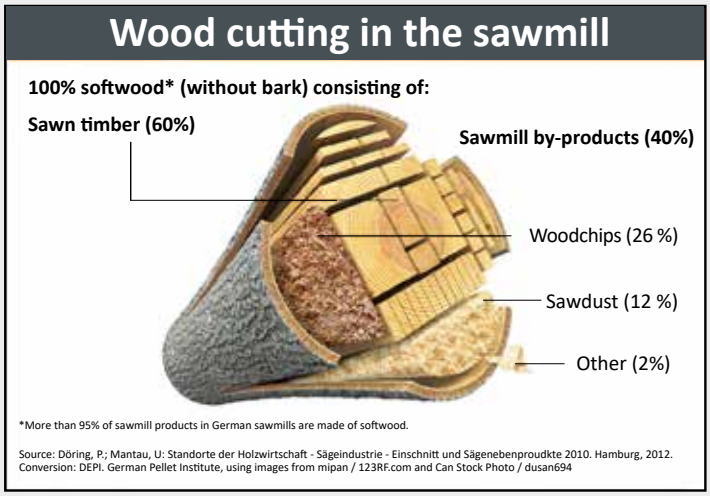
about 30 kg CO_2 are emitted when you



Strengthen the local economy

Wood not only keeps our homes warm, but also creates jobs and added value in the region. From forestry to transportation to the production of firewood, wood chips or pellets - people along the entire value chain are working on refining wood into valuable fuel. And not only the production, but also the distribution of heat to multiple households from biomass district heating plants create jobs in the region. Oil by comparison also creates employment, but for the most part in distant parts of the world.
Wood continuously regrows in our domestic forests, thus it is crisis-proof and impervious to the stark fluctuations of international markets. Currently, forested areas are increasing across the whole of Europe, for more solid cubic metres of wood are being produced each year than consumed. This means that the potential is not sufficiently exhausted and there is still room to improve our economy and the climate.

Wood cutting in the sawmill



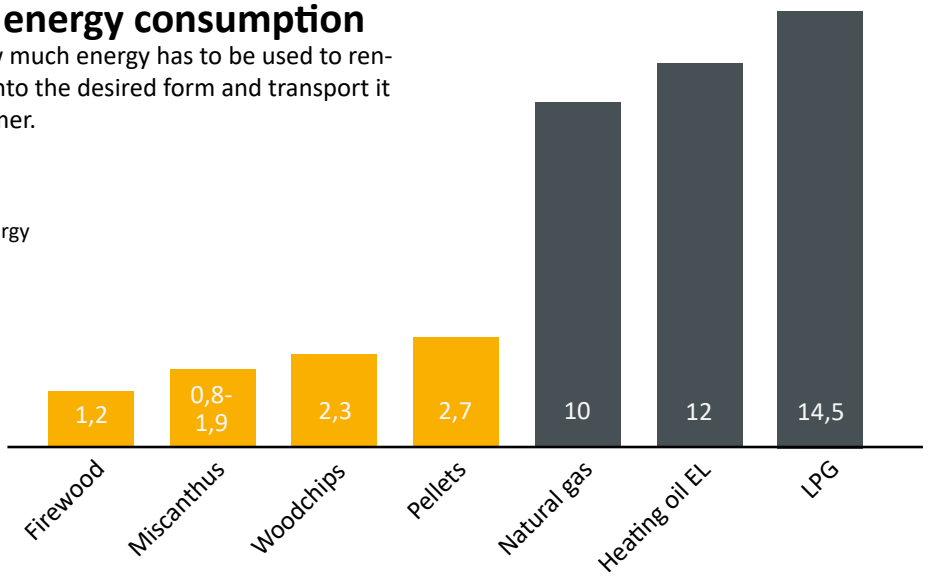
No extra trees have to be felled to produce pellets, because the wooden briquettes consist mainly of sawdust, a waste product of the wood industry.

By the way: Did you know that trees are not felled to produce firewood, but mainly for sawmill and industrial wood production (e.g. furniture and paper production)? The fear that heating with wood means diminishing forests is, therefore, unfounded, since the production of firewood mainly uses wood from the forest, such as branches and timber, as well as leftovers from the sawmill industry.

Primary energy consumption

Indicates how much energy has to be used to render the fuel into the desired form and transport it to the consumer.

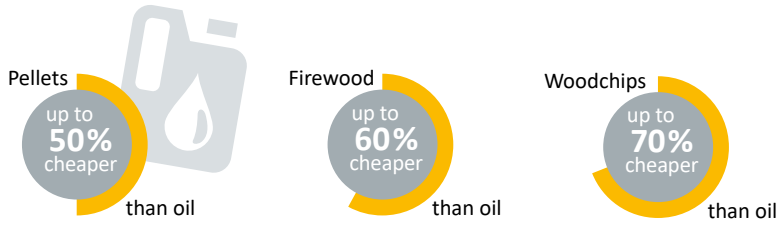
In % of final energy



Switching over is worthwhile

While the price of fossil fuels such as oil and gas is subject to heavy fluctuations in the international markets and will certainly rise long-term, the price of wood and pellets is reliable.

Calculation period: 5 years



Looking back 15 years

I heated with oil and that was really expensive...

3,200 litres of oil per year

€ 2,200 per year

... if I would have heated with pellets...

5,800 kg pellets per year

€ 1,200 per year

... me and my family would still have available...

after 1 year	~€ 1,000
after 7 years	~€ 7,000
after 10 years	~€ 10,000
after 15 years	~€ 15,000

This fuel comparison takes into account the following efficiencies: old oil boiler 80%, pellet boiler 90%

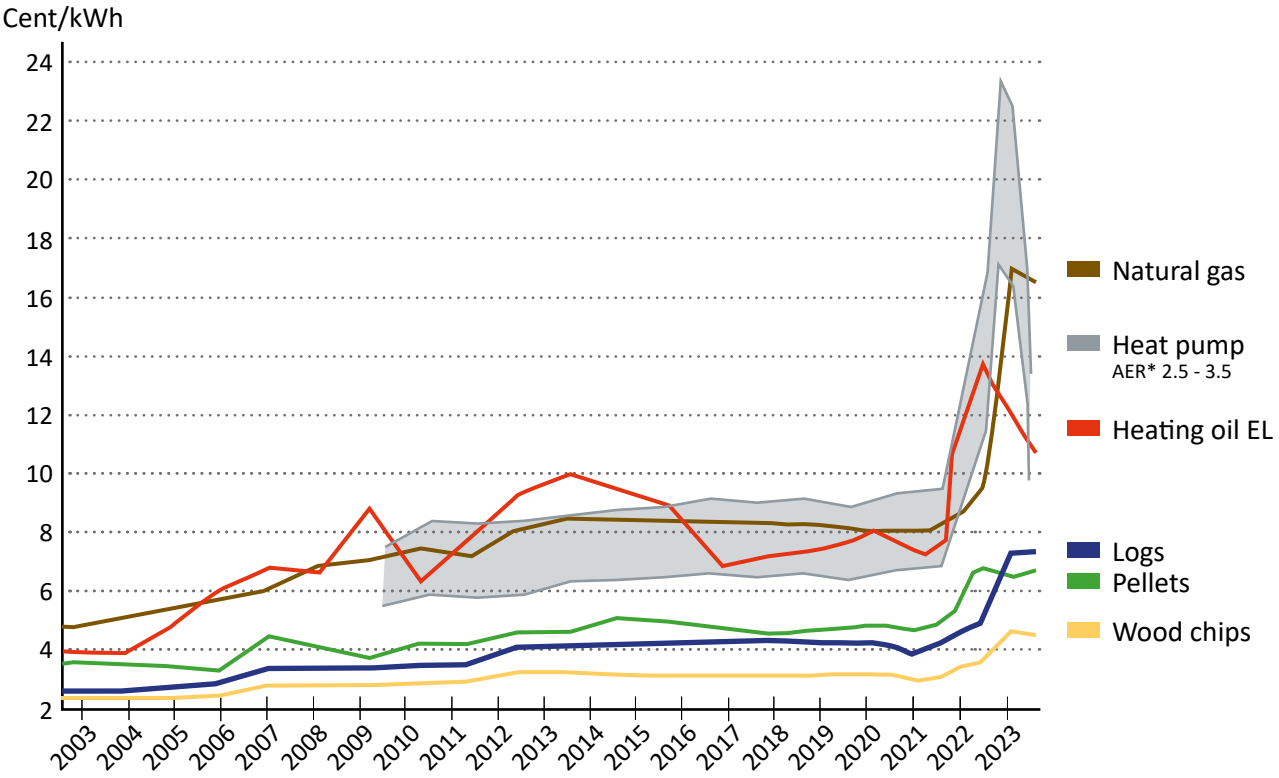
Average price of heating oil	**6.8 cent/kWh**
Average price for pellets	**4.19 cent/kWh**

Average prices of the last 15 years
Source: IWO, BMWFW, Treibstoffpreismonitor, Genol, proPellets Austria

Calculate your savings: https://www.eta.co.at/en/products/heating-costs-in-comparison/a-change-is-worthwhile/

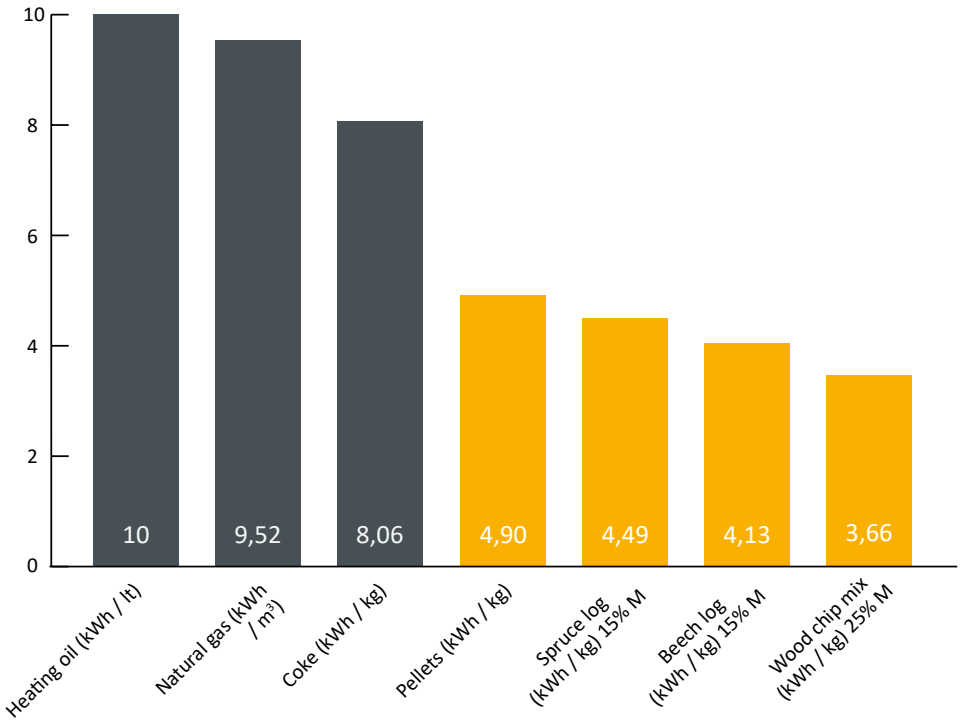
Price development of energy sources

for households 2002 - 2023



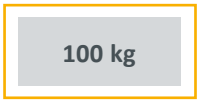
Calorific values of different fuels

Source: proPellets Austria



WARNING danger of confusion!
Moisture is not the same as water content

Water content (M) in relation to the total mass



Water content: $(\frac{20}{100}) \times 100 = 20\%$ M

Moisture (u) in relation to the dry mass (pure wood mass without water)

Moisture: $(\frac{20}{80}) \times 100 = 25\%$ u

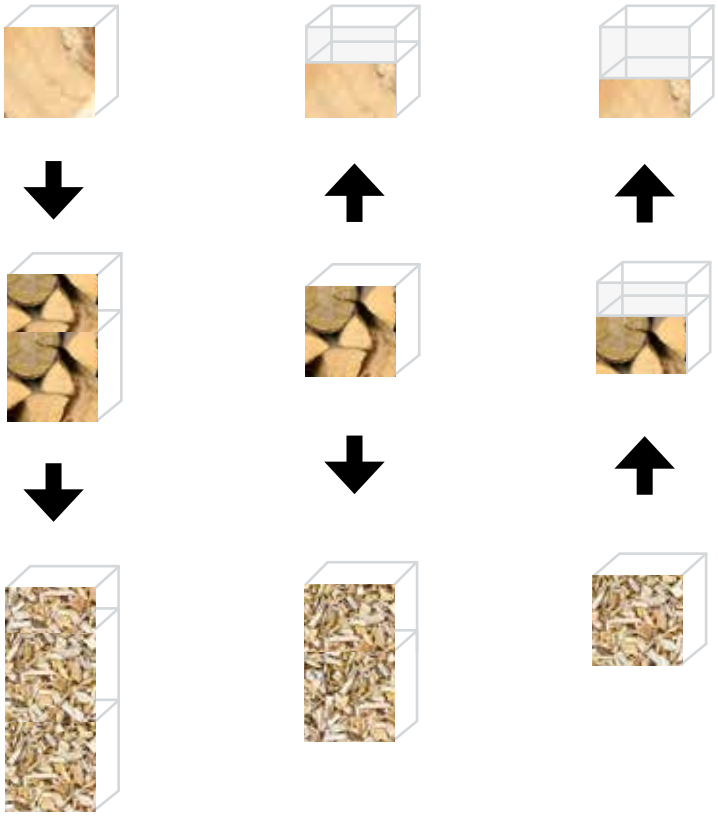
Comparison	
Moisture	**Water content**
15%	13%
17.6%	**15%**
20%	16.7%
25%	**20%**
30%	23.1%
33.3%	**25%**
40%	28.6%
42.9%	**30%**
50%	33.3%
53.8%	**35%**
60%	37.5%
66.7%	**40%**
70%	41.2%
80%	44.4%
81.8%	**45%**
90%	47.4%
100%	**50%**

Ratios of the room dimensions

Solid cubic metre (fm)

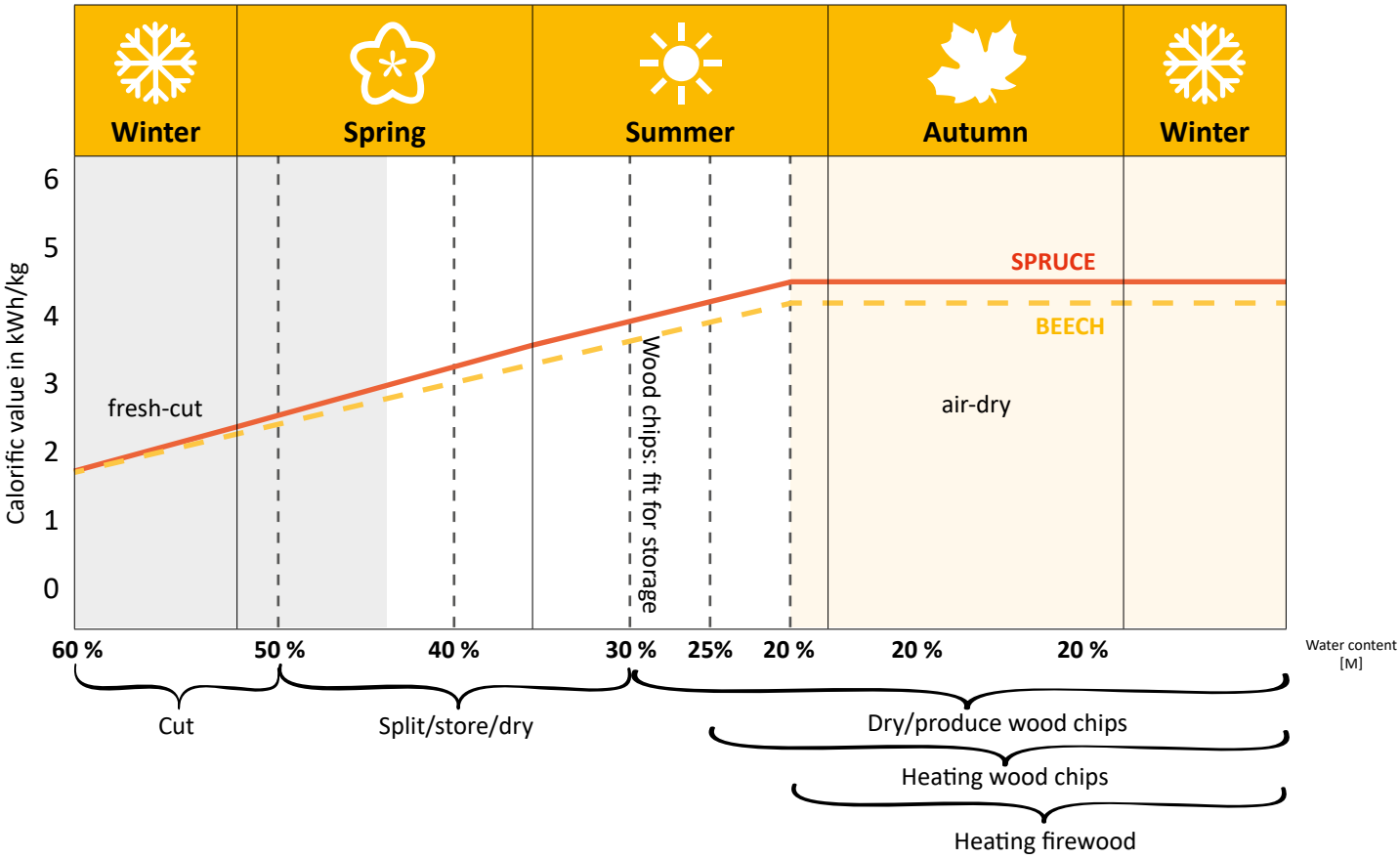
Cubic metre (rm) or stacked cubic metre
stacked split logs

Loose cubic metre (srm)
Poured wood chips



For more detailed conversion factors for the dimensions of round and split logs, see: www.tfz.bayern.de > Festbrennstoffe > Publikationen > Umrechnungsfaktoren verschiedener Raummaße für Scheitholz

Optimal wood drying and recycling process in Central Europe



Calorific values depending on water content and size

	Calorific value based on weight		Cubic metre **half-metre log**				Loose cubic metres **P16S wood chips**				Loose cubic metres **P31S wood chips**			
			Weight		**Calorific value**		Weight		**Calorific value**		Weight		**Calorific value**	
M	M = 15%	M = 30%	M = 15%	M = 30%	M = 15%	M = 30%	M = 15%	M = 30%	M = 15%	M = 30%	M = 15%	M = 30%	M = 15%	M = 30%
Unit	kWh / kg	kWh / kg	kg / rm	kg / rm	kWh / rm	kWh / rm	kg / srm	kg / srm	kWh / srm	kWh / srm	kg / srm	kg / srm	kWh / srm	kWh / srm
Softwood														
Fir	4.40	3.51	276	317	**1,210**	**1,110**	178	205	**780**	**720**	148	171	**650**	**600**
Spruce	4.49	3.58	293	337	**1,310**	**1,210**	189	218	**850**	**780**	157	181	**710**	**650**
Douglas fir	4.43	3.53	319	368	**1,410**	**1,300**	206	237	**910**	**840**	172	198	**760**	**700**
Pine	4.32	3.44	360	414	**1,550**	**1,420**	232	267	**1,000**	**920**	193	223	**830**	**770**
Larch	4.27	3.39	370	426	**1,580**	**1,450**	239	275	**1,020**	**930**	199	229	**850**	**780**
Hardwood														
Poplar	3.99	3.16	256	295	**1,020**	**930**	174	200	**690**	**630**	145	167	**580**	**530**
Willow	3.76	2.97	320	369	**1,200**	**1,100**	217	250	**810**	**740**	181	208	**680**	**620**
Alder	4.06	3.23	313	361	**1,270**	**1,160**	212	245	**860**	**790**	177	204	**720**	**660**
Maple	4.04	3.21	384	443	**1,550**	**1,420**	260	300	**1,050**	**960**	217	250	**880**	**800**
Birch	4.01	3.18	391	450	**1,570**	**1,430**	265	305	**1,060**	**970**	221	254	**890**	**810**
Ash	4.10	3.25	429	494	**1,760**	**1,610**	291	335	**1,190**	**1,090**	242	279	**990**	**910**
Oak	4.10	3.25	429	494	**1,760**	**1,610**	291	335	**1,190**	**1,090**	242	279	**990**	**910**
Beech	4.13	3.28	435	502	**1,800**	**1,640**	302	347	**1,220**	**1,110**	251	289	**1,010**	**930**
Robinia	4.11	3.27	467	538	**1,920**	**1,760**	317	365	**1,300**	**1,190**	264	304	**1,090**	**990**

Pellets – locally sourced energy bricks

This natural raw material is predominantly made from saw-cutting by-products. Producible from any type of wood, the cost of pellets is currently about half the price of oil. Unlike oil, however, this fuel comes from the region and creates domestic jobs. Heating with pellets not only protects the environment affordably, but also strengthens the local economy.

Always space for pellets
Pellets are delivered – like oil – with tank trucks. Every common oil tank can be converted without any problems and holds enough pellets for an entire winter. In new buildings, because of the small amount of energy required, only 2 m² are needed to accommodate a year's supply of pellets.

Fact sheet about wood pellets ISO 17225-2 Class A1

manufactured from trunk wood without bark (forest wood), planing or saw dusts chips (chemically untreated)		
Calorific value (Q)	from 4.9 kWh/kg softwood from 4.6 kWh/kg hardwood	
Bulk density (BD)	≥ 650 kg/m³ (spruce)	
Diameter (D)	6.0 mm ± 1.0 mm	
Length (L)	3.15 < L ≤ 40 mm	
Water content (M)	≤ 10%	
Mechanical strength (DU)	≥ 97.5 %	
Fine material portion from plant (F)	max. 1.0%	smaller than 3.15 mm
Ash content (A)	≤ 0.7%	
natural pressing aids (e.g. maize starch) max. 2% of the mass		
Energy required for manufacture approx. 2 - 2.5% of the energy content		

Before buying the pellets, please note: **the quality is crucial, not the price.**
Preferably pellets according to ISO 17225-2 Class A1, EN plus A1.

When moving from another energy source to pellets, the pellet requirement can also be determined based on the previous consumption. 1 ton of pellets roughly corresponds to:

- 500 l heating oil
- 520 m³ natural gas
- 750 l LPG
- 600 kg Coke
- 1,400 kWh current for geothermal heat pumps (practical coefficient of performance 3.4)
- 2,700 kWh current for air heat pumps (practical coefficient of performance 1.8)

How big does the store room have to be?
Heating value of the pellets = 4.9 kWh/kg
Weight of the pellets = 650 kg/m³

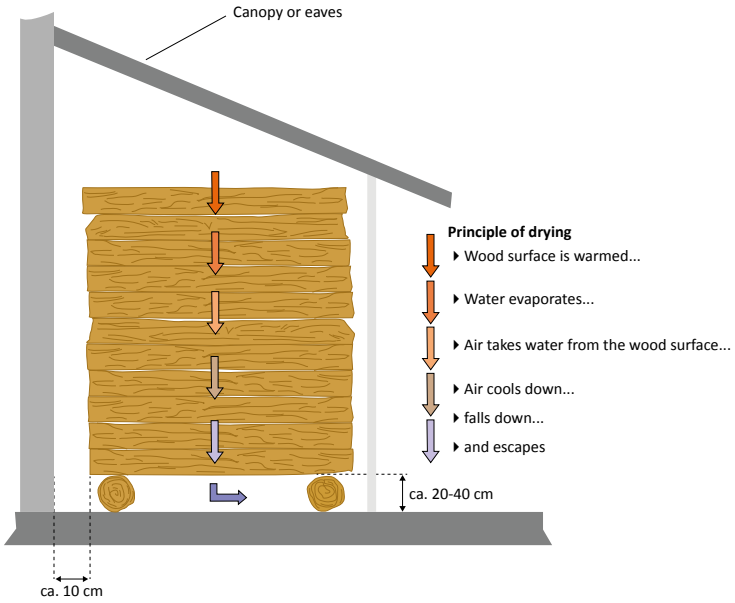
Rule of thumb for the pellets required
9 kW heating load / 3 = 3 tonnes pellets annually
9 kW heating load / 2 = 4.5 cubic metres annually

Firewood – the world's oldest fuel

From camp fires in the Stone Age cave to modern wood gasification boilers, firewood has always provided heat in our homes. Especially when wood is available from our own forests, firewood is the most favourable form of energy for heating. Even if wood has to be purchased, it can be up to 60% less expensive than oil.

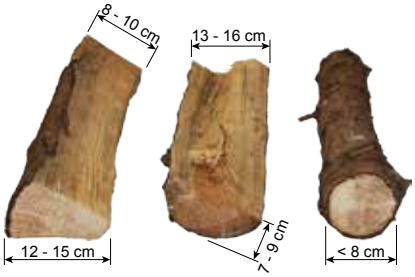
Firewood can be stored outdoors, but it must be protected from the elements. Temporary storage in the house near the boiler is nevertheless an advantage when it comes to convenience.

Drying principle



Suitable fuel

The firewood must be air-dry, i.e. it must have dried for at least one year and have a water content under 20%. We recommend using half-metre split logs with an average diameter of 10 cm.



Estimating your wood requirements

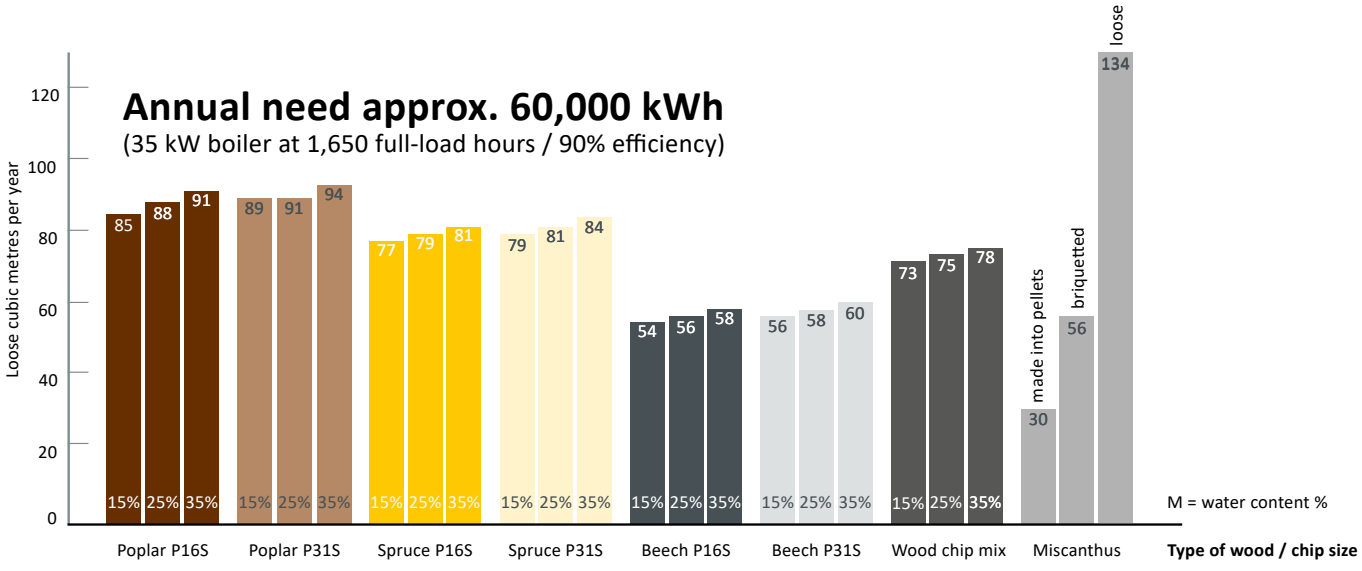
Each kilowatt of heat output requires 0.9 cubic metres of half-metre split beech logs or 1.3 cubic metres of split spruce per year.

Wood chips – versatile and affordable

Cost-effective wood chips are available from the thinnings of forests and from sawmills.
This versatile fuel is excellently suited for automatic burning in boilers of all sizes. Although a larger storage space is required than for pellets, for example, this is compensated by the more favourable price.
The standardisation of this fuel type makes the purchase easier for you as a customer. You receive exactly the quality you order.

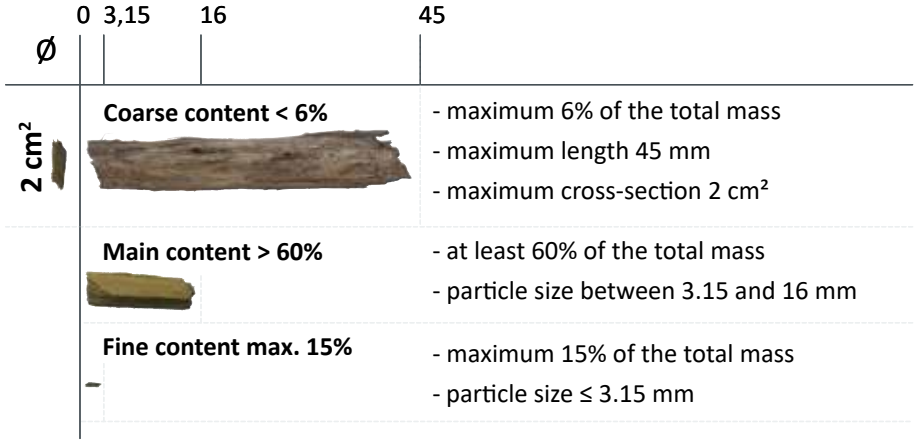
Shredded material

Unlike wood chips, the wood is torn apart with a blunt tool. This method is mainly used for waste wood. Wood prepared in this way is also suitable in most cases as fuel in wood chip plants. It is important to ensure that no long fibres are produced which could hinder the flow of the fuel. Since, however, nails and other metal parts can often be present, the use of a magnetic separator during shredding is recommended.



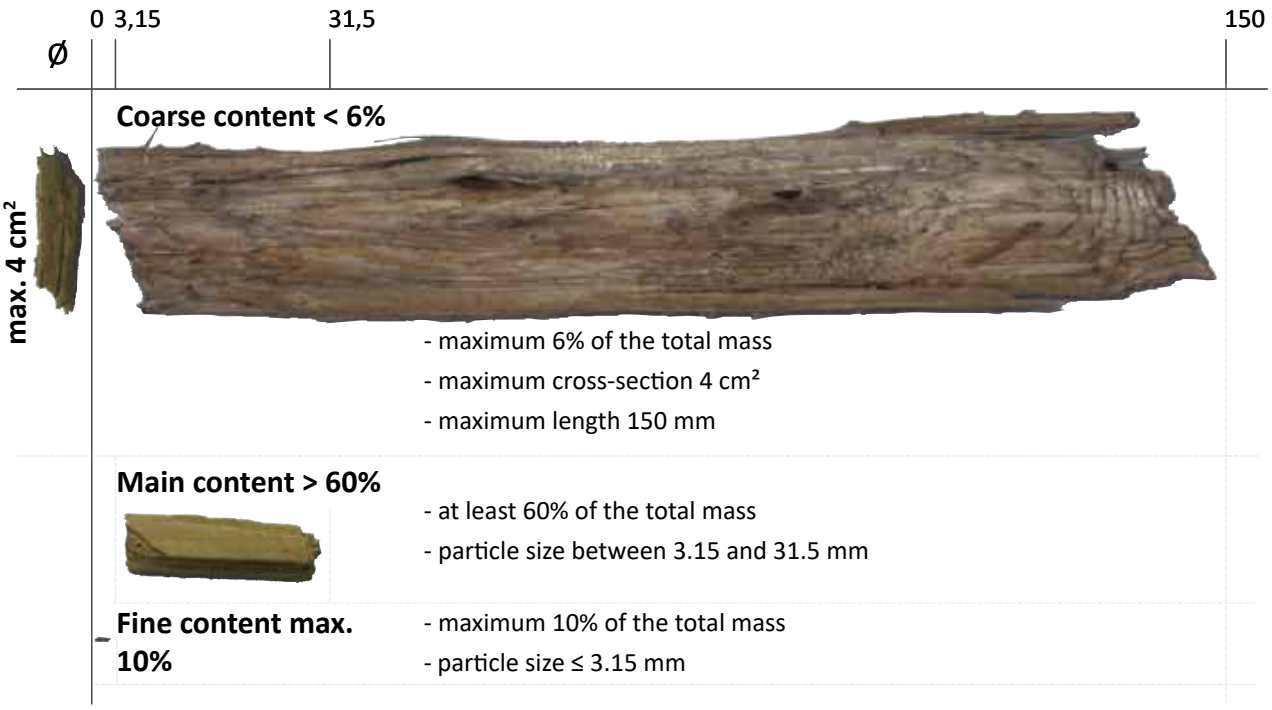
P16S wood chips according to ISO 17225-4

largely correspond to G30 wood chips according to ÖNORM M 7133



P31S wood chips according to ISO 17225-4

largely correspond to G50 wood chips according to ÖNORM M 7133



Water content class M according to ISO 17225-4

The % portion relative to the total mass is called M. Up to M35 (water content less than 35%) is acceptable. M25 is preferable for storage and maximum heat output.

Ash content class A according to ISO 17225-4

the % portion in relation to the dry mass is called A. Up to A1 (ash content less than 1%) is acceptable.

Bulk density BD

The bulk density S was formerly given in ÖNORM M 7133 in water-free state (dry mass without water). In the new ISO 17225-4 the bulk density BD in delivered state (total mass including water) is given. The standardised classes with BD150 and BD200 are too vague and have no relevance for wood chips as a fuel. Bulk densities for different woods in wet state M15 and M30 are provided in a table on page 7.

Miscanthus (Chinese reed, elephant grass) – efficient yield

We have weighed the possibilities of different energy plants against one another - with the highest demands on yield and environmental compatibility. Miscanthus replaces 6,000 to 8,000 litres of fuel oil per hectare without fertilizer or spray. A further advantage is the low-maintenance cultivation of Miscanthus. From planting to harvest, no effort is required.
In order to make ideal use possible, it is necessary to pay attention to the chlorine content in the first few years. It should not exceed 0.07%.
Since Miscanthus has an increased ash content and a lower ash melting point, flue gas recirculation is necessary during combustion to reliably prevent slag formation.

Chopped material

With a maximum length of 2 cm, Miscanthus, in chopped form, is generally very free-flowing and can, therefore, be fed with fuel conveying devices from wood chip plants to the location of combustion.
However, since the density of Miscanthus is relatively low, roughly two to three times the storage volume is needed for the same heat output compared to wood chips. Therefore, Miscanthus pellets or briquettes are also often used in confined spaces.

From Hausruckviertel to the world

ETA specialises in the manufacture of biomass heating, i.e. log, pellet and wood chip boilers. The most modern technologies combined with naturally growing resources.

ETA is efficient

Technicians designate the efficiency of a heating system with the Greek letter η, pronounced „eta“. ETA boilers stand for more heat with less fuel consumption, environmental soundness and sustainability.

Wood: old but excellent

Wood is our oldest fuel - and our most modern: There is a lot of history - from open fires in front of caves to modern biomass boilers. In the middle of the 20th century, the number of wood heating systems briefly fell. Oil heating became the new, hyped option. A brief interlude in comparison to the consistency of wood. Today, we know that heating with fossil fuel has no future. It contributes to global warming and harms the environment. Supply security is also not guaranteed in the long term, as fossil fuels are being depleted, aren‘t renewable and often come from unstable regions. While wood by contrast is a cheaper, locally grown, renewable raw material that does not pollute the climate when burnt. No wonder wood heating is booming!

Comfort with many components

Since December 1998, the Upper Austrian company ETA has been designing and building a new generation of wood-fired boilers. They are full of patented technologies and the most modern control technology – making them easy to use. Convenience and efficiency make ETA products so popular around the world. With a production capacity of up to 35,000 boilers per year and a global export proportion of around 80%, ETA is one of the leading biomass boiler producers.

You get more than just a boiler

Anyone who decides on a wood or pellet boiler from ETA is choosing sustainability. This is not just in terms of fuel, but encompasses responsibility across the board, with sustainable workplaces in the region. More than 400 employees in Hofkirchen an der Trattnach have the best working conditions – including an in-house restaurant, bright assembly and storage halls, a fitness room and a sauna. There is even a free electric charging station for electric cars, which is supplied by the in-house photovoltaic system. This also covers all the power needed of a production hall and thus saves around 230 tonnes of CO2 per year.

ETA PRODUCT RANGE
Efficiency for households, commerce and industry



Renewable energy: environment, save

ETA PU PelletsUnit
7 to 15 kW

ETA *e*PE pellet boiler
7 to 36 kW

ETA *e*PE BW condensing pellets boiler
8 to 32 kW

ETA PC PelletsCompact
20 to 105 kW

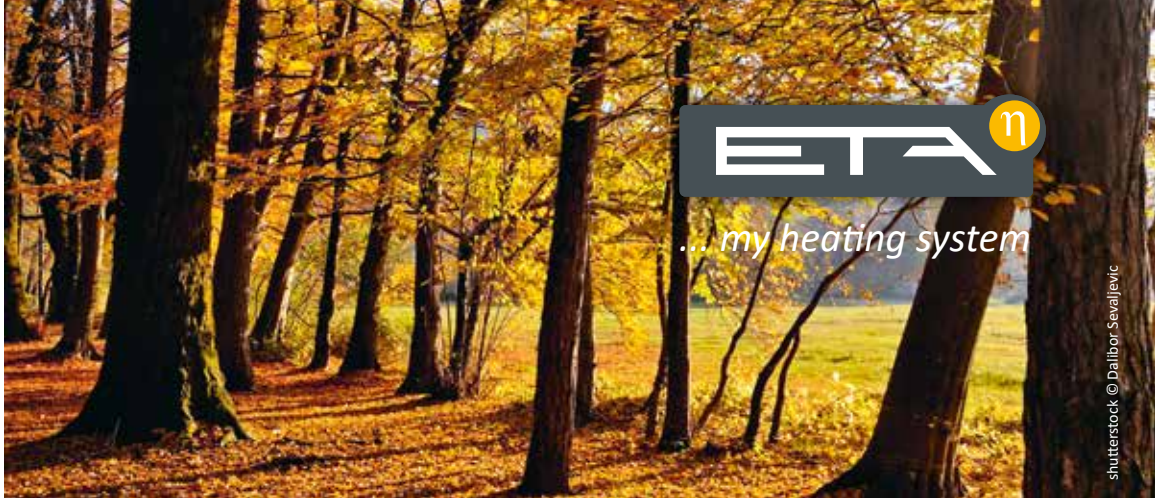
ETA *e*PE-K pellet boiler
100 to 240 kW

ETA *e*HACK wood chip boiler
20 to 240 kW

ETA HACK VR wood chip boiler with moving grate
250 to 500 kW

*Miscanthus: Compliance with country-specific regulations is mandatory.

protect the operating costs



ETA *e*SH wood gasification boiler 16-20 kW with

ETA *e*TWIN wood gasification boiler 16 kW

ETA *e*SH wood gasification boiler
16 to 20 kW

ETA SH-P wood gasification boiler
20 to 60 kW with

Pellet burner ETA TWIN
20 to 50 kW

ETA SH wood gasification boiler
20 to 60 kW

ETA stratified buffer
500 to 5,000 l

ETA hydraulic modules
for perfect heating systems

ETA Pelletboiler

ETA PU PelletsUnit	7 - 15 kW
ETA *e*PE pellet boiler	7 - 32 kW
ETA PC PelletsCompact	20 - 105 kW
ETA *e*PE-K pellet boiler	100 - 240 kW

ETA condensing heat technology

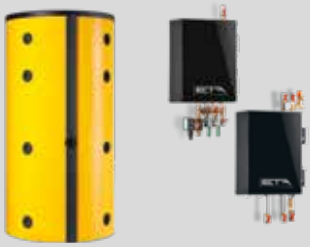
ETA *e*PE BW pellet boiler	8 - 36 kW
ETA BW condensing heat exchanger PU	7 - 15 kW
ETA BW condensing heat exchanger PC	20 - 105 kW

ETA SH log wood boiler and TWIN pellet boiler

ETA *e*SH log wood boiler	16 - 20 kW
ETA *e*SH-TWIN combination boiler	16 - 20 kW
with ETA *e*TWIN pellet boiler	16 kW
ETA SH log wood boiler	20 - 60 kW
ETA SH-P log wood boiler	20 - 60 kW
with ETA TWIN pellet boiler	20 - 50 kW

ETA wood chip boiler

ETA *e*HACK wood chip boiler	20 - 240 kW
ETA HACK VR wood chip boiler	250 - 500 kW



ETA buffer tank

ETA buffer	500 l
ETA buffer tank SP	600 - 5.000 l
ETA buffer tank SPS	600 - 1.100 l

ETA hydraulic modules

ETA fresh water module
ETA stratified charging module
ETA system seperation module
ETA mixing circuit module
ETA heat transfer module and station

Your heating specialist will be happy to advise you:

...mein Heizsystem

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94706-EN, Prospekt Brennstoffdaten ETA EN, 2024-02