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Bioenergy and Sustainable Technologies

Integration of biomass gasification into the forest-based sector in Austria

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The role of gas in Austria

- Natural gas
  - Essential energy carrier (23% of gross domestic energy consumption), in particular for industries
  - Dependency on imports, insecurity in supply
  - Good infrastructure, high storage capacity
  - Volatile prices – tripled within one year
- Political ambitions
  - Reduce dependencies
  - Decarbonization of energy sector
  - 5 TWh of natural gas consumption replaced by domestically produced green gas until 2030
- Green gas
  - Biomethane (anaerobic digestion)
  - **BioSNG (biomass gasification)**

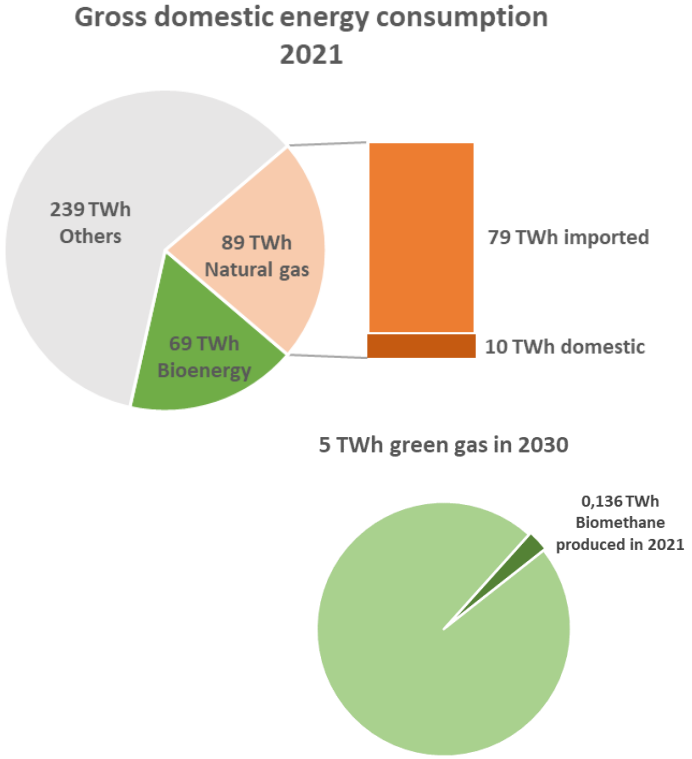


Figure I: Energy in Austria 2021 (own illustration based on BMK 2022)

BioSNG – Biomass gasification

Input: Woody biomass and residues, bark, by-products, …

Output: BioSNG → direct substitution of natural gas

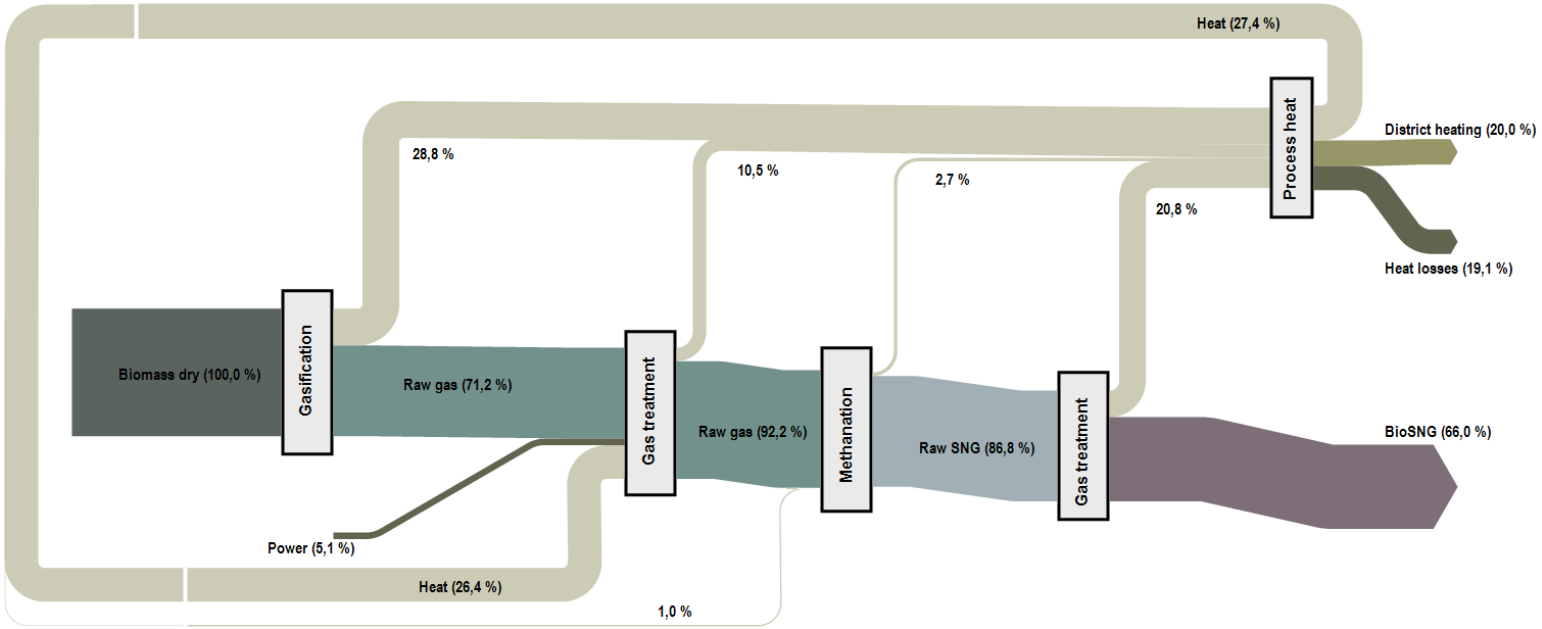


Figure II: Energy balance of BioSNG production (own illustration based on Hofbauer et al. 2020 and Rehling et al. 2011)

Integration into the forest-based sector

What is the potential contribution of BioSNG based on sawmill by-products to the political goal of 5 TWh green gas?

What are the consequences for the forest-based sector in Austria?

- Utilization of **100% sawmill by-products** (50% wood chips, 50% sawdust)
- Provision of sawmill by-products by **increased sawnwood production** → increase in **roundwood removals** → supply of co-products
- Removals compared to **annual unused increment**
  - Unused increment assumed to further decrease (like in recent forest inventory periods)
  - Limited to 80% (sustainability criteria)

    → potential of **1.8 million m³ solid wood per year**

Austrian sawmill industry: Status quo of material flows

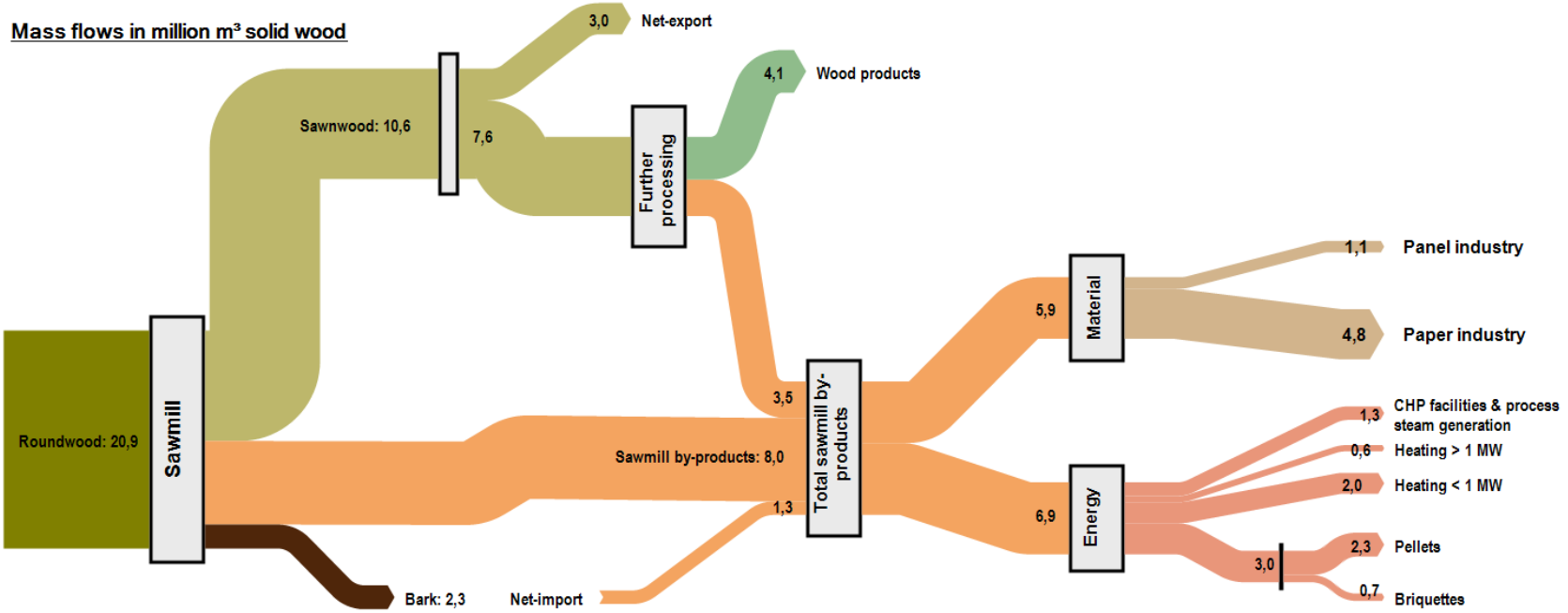


Figure III: Mass balance of the Austrian sawmill industry – status quo (Own illustration based on Strimitzer et al. 2021)

Scenarios for biomass gasification 2030

- **Scenario 1:**
  - Establishment of a 42.8 MW BioSNG plant
  - Feasible based on current state of the art
- **Scenario 2:**
  - Establishment of a 100 MW BioSNG plant
  - Still realistic, but connected to logistic challenges
- **Scenario 3:**
  - Utilization of currently unused wood increment and resulting sawmill by-products, forest wood chips and bark (co-products) for BioSNG production
- **Scenario 4:**
  - 50% of 5 TWh goal provided by BioSNG
  - Residual 50% from anaerobic digestion

Scenario 1 – 42.8 MW BioSNG plant

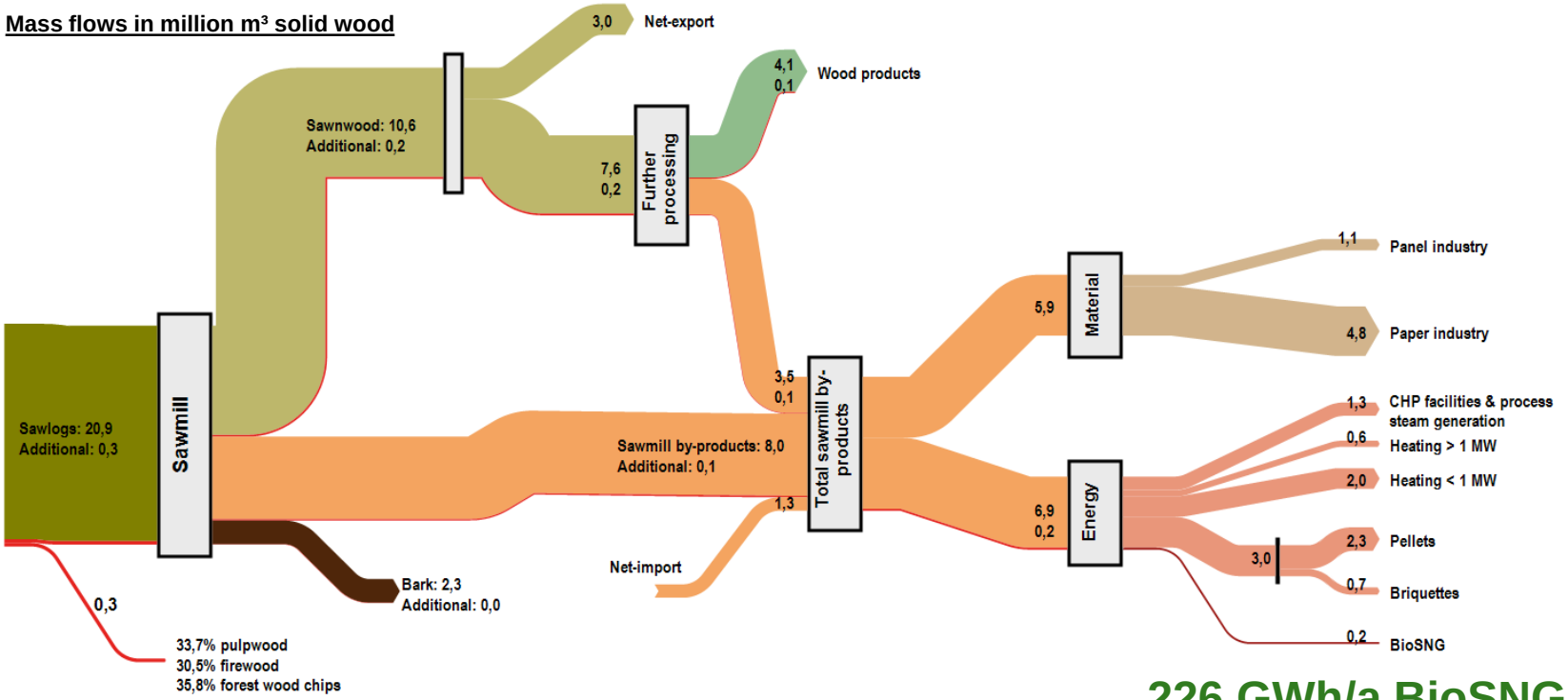


Figure IV: Mass balance of the Austrian sawmill industry – scenario 1
(Own illustration based on Strimitzer et al. 2021)

226 GWh/a BioSNG
(5% of 5 TWh goal)

Scenario 2 – 100 MW BioSNG plant

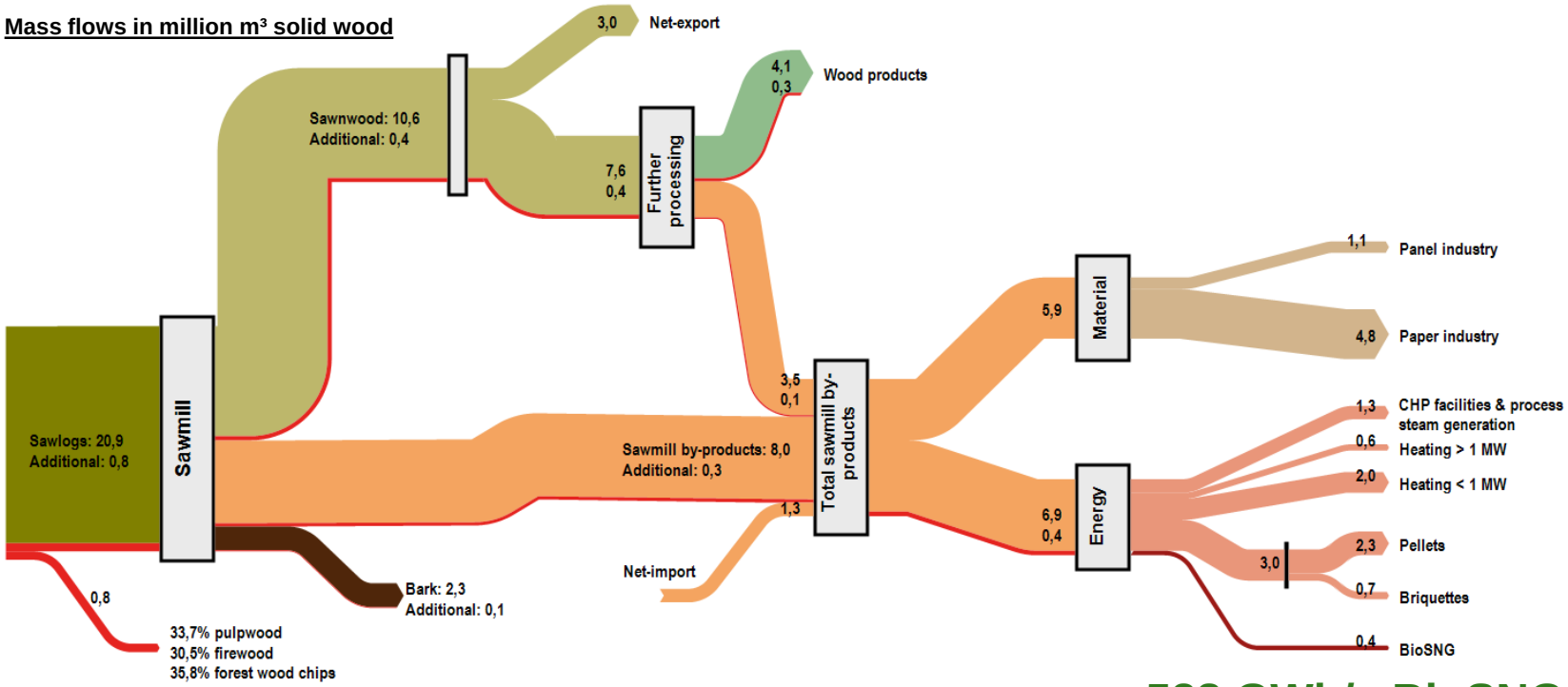


Figure V: Mass balance of the Austrian sawmill industry – scenario 2
(Own illustration based on Strimitzer et al. 2021)

528 GWh/a BioSNG
(11% of 5 TWh goal)

Scenario 3 – utilization of unused wood increment

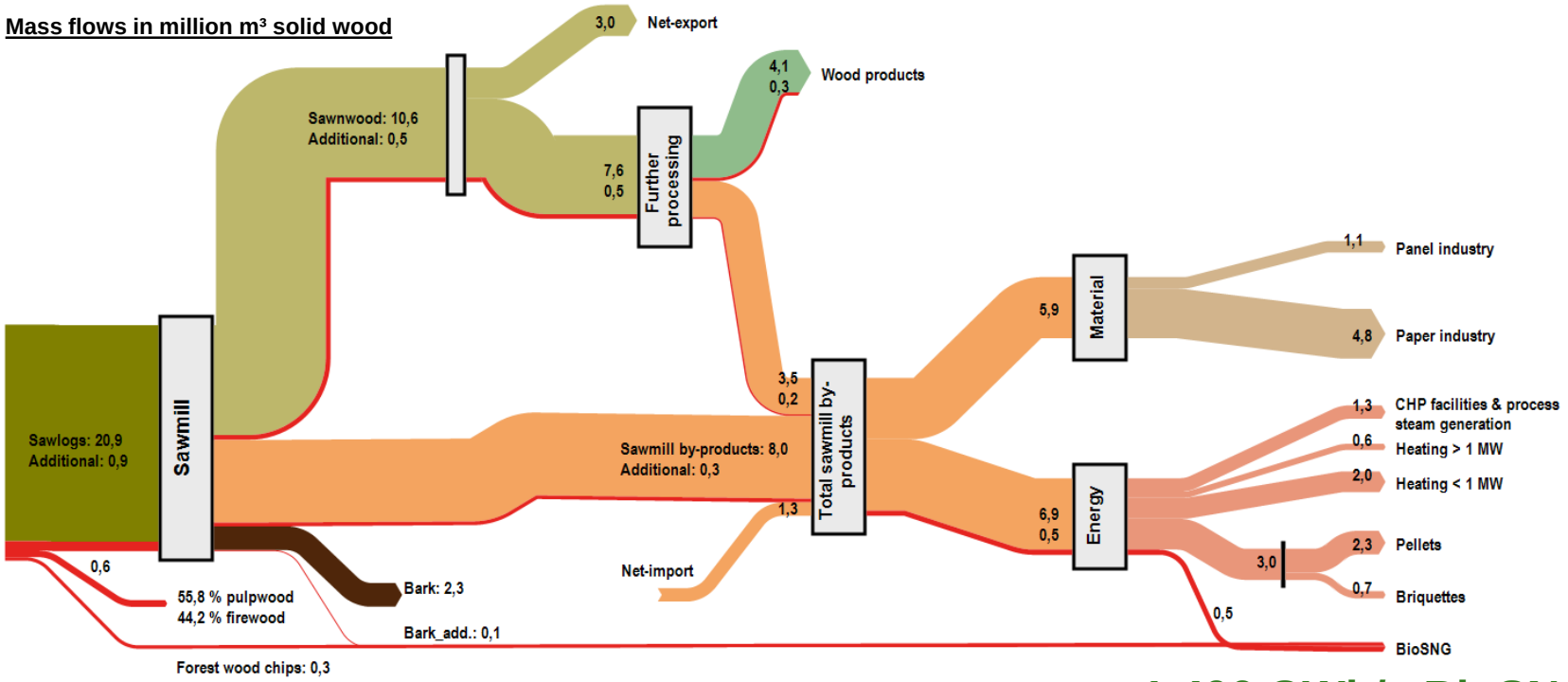
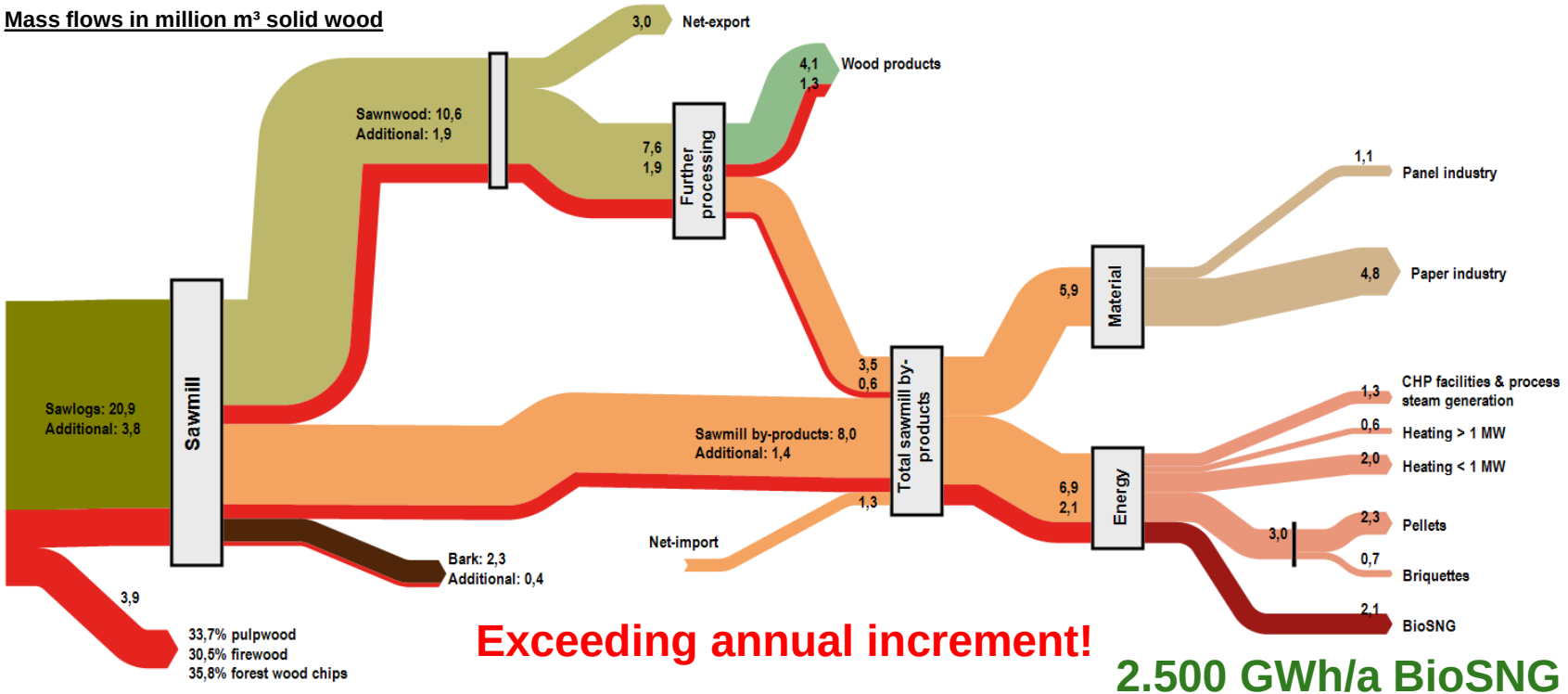


Figure VI: Mass balance of the Austrian sawmill industry – scenario 3
(Own illustration based on Strimitzer et al. 2021)

1.406 GWh/a BioSNG
(28% of 5 TWh goal)

Scenario 4 – 50 % of 5 TWh target



Exceeding annual increment!

2.500 GWh/a BioSNG (50% of 5 TWh goal)

Figure VII: Mass balance of the Austrian sawmill industry – scenario 4
(Own illustration based on Strimitzer et al. 2021)

Summary

Scenario 1	Scenario 2	Scenario 3	Scenario 4
42.8 MW plant	100 MW plant	Unused increment	50% of 5 TWh goal
5% of 5 TWh goal	11% of 5 TWh goal	28% of 5 TWh goal	Exceeds currently available forest based resources

Conclusion – biomass gasification

- Technically feasible, but not operated on a commercial scale yet

Upscaling

Expanding feedstocks

→ 1 MW pilot plant in Vienna, „Waste2Value“

- BioSNG production based on sawmill by-products limited

- Logistic and economic challenges

Appropriate measures to overcome market barriers

Higher ambitions for green gas production

- Demand for natural gas still much higher than 5 TWh

- Competition with other established and new technologies

Identify most efficient feedstocks and utilization pathways

Thank you for your attention!

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