

Innovative Energy Technologies in Austria, Market Development 2021

Presentation of results

Vienna, 20 June 2022

Project team



Authors:

P. Biermayr, C. Dißbauer, M. Eberl, M. Enigl, H. Fechner, B. Fürnsinn,
M. Jaksch-Fliegenschnee, K. Leonhartsberger, S. Moidl, E. Prem, S. Savic, C. Schmidl,
C. Strasser, W. Weiss, M. Wittmann, P. Wonisch, E. Wopienka;

Commissioned by BMK

Contents of the presentation

- Project targets
- Framework conditions of the market development 2021
- Results of the investigated technologies
- Summary
- Conclusions

Investigated technologies

- Photovoltaics
- Battery storages in Photovoltaic systems
- Solid biomass – fuels
- Solid biomass – boilers and stoves
- Solar thermal systems
- Large scale heat storages in heat grids
- Wind power
- Heat pumps
- Thermal activated building parts

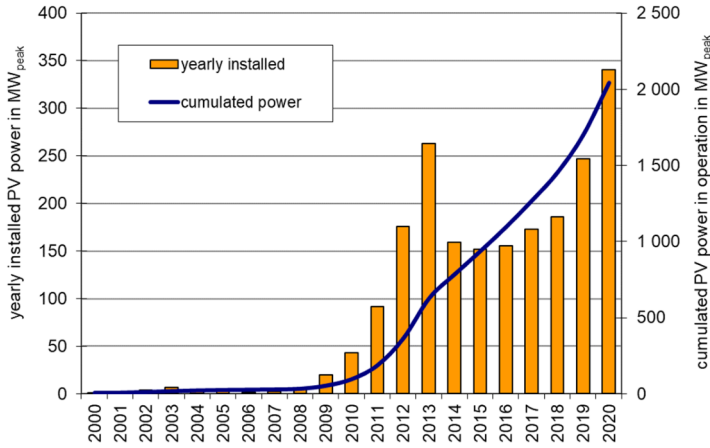
Project targets

- Empirical survey and documentation of the market development
- Information processing and analysis
 - Energy output
 - GHG-emission savings
 - Economic effects
 - Innovations and trends
 - Market diffusion compared to roadmaps
- Deriving of conclusions
- Target groups: Energy-, research- and environmental policy, industry, R&D institutes

Framework conditions for market development 2021

- Binding climate and energy targets 2030/2040 for AT, EU and globally
- Low to moderate fossil energy prices
- GDP growth AT: 4.6 %, euro area: 5.2 %
- Unemployment rate AT: 6.2 %, euro area 7.7 % (def. Eurostat)
- Heating market AT 2021: 40 % natural gas + 2 % heating oil
- Average weather

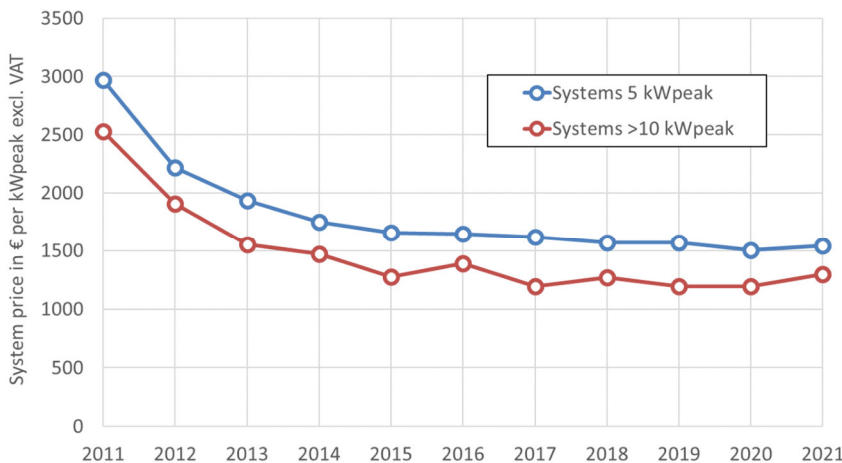
Photovoltaics: Market development 2021



Source: Technikum Wien

- New installations: 740 MW_{peak}
- 2020→2021: +117 %
- Stock: 2.8 GW_{peak}
- 2020→2021: +36 %

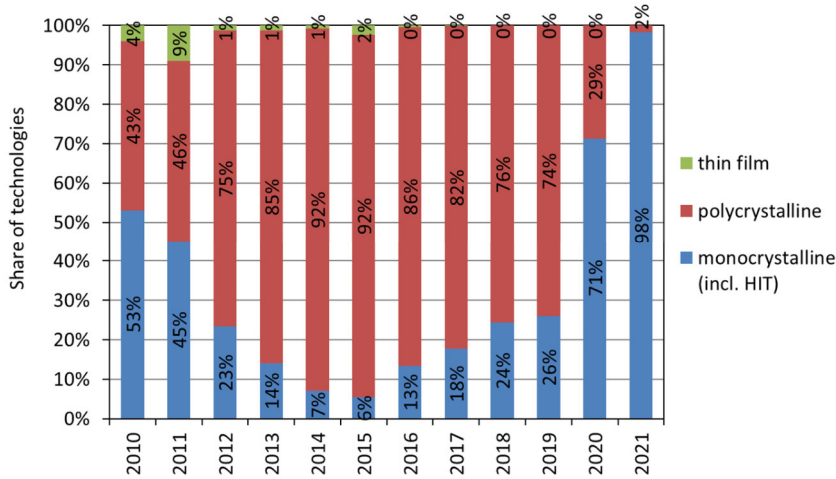
Photovoltaics: System prices



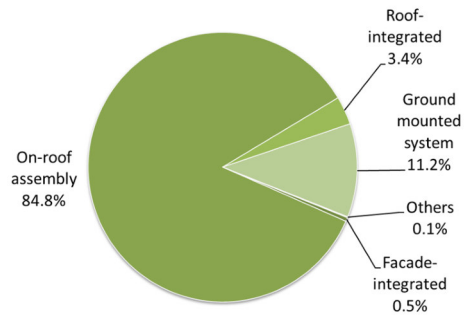
Source: Technikum Wien

- System prices of 5 kW_{peak} systems increased by 2.4 %
- System prices of >10 kW_{peak} systems increased by 8.8 %
- A further increase in system prices is to be expected
- Limitation of diffusion through availability?!

Photovoltaics: Technology and type of assembly

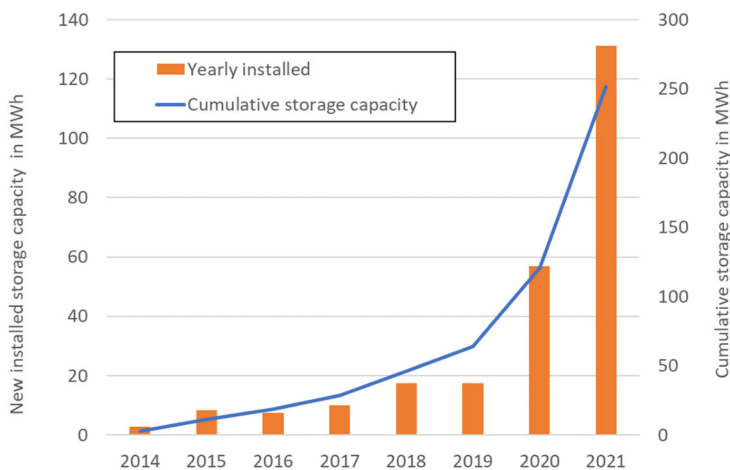


New installations 2021



Source: Technikum Wien

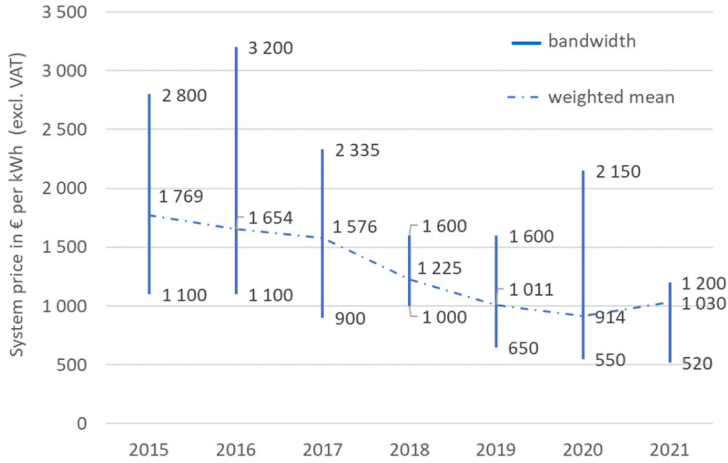
PV battery storages: market development 2021



- New installations: 131 MWh
- 2020→2021: +131 %
- Stock: 252 MWh
- 2020→2021: +109 %

Source: Technikum Wien

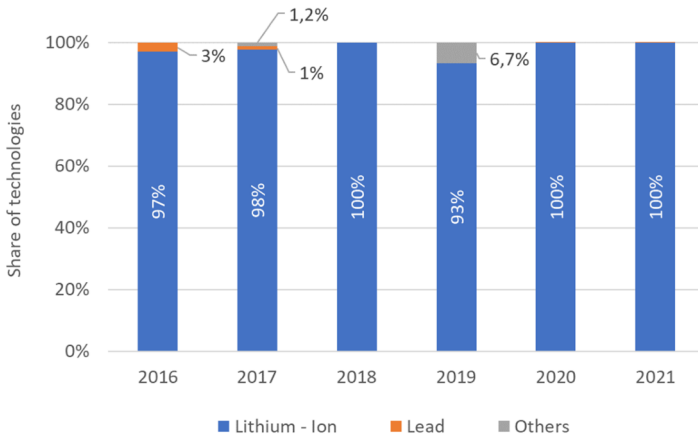
PV battery storages: system prices



Source: Technikum Wien

- End customer system price 2021: 1.030 €/MWh
- 2020 → 2021: +12,7 %

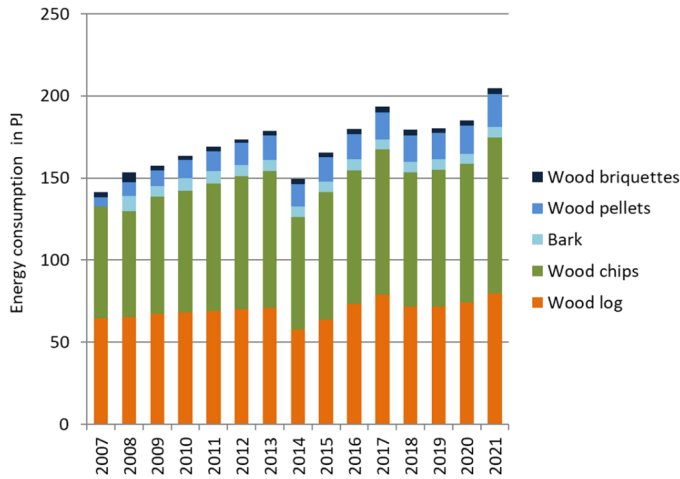
PV battery storages: share of technologies



Source: Technikum Wien

- Lithium-ion dominant technology
- Significant increase in DC-coupled systems
- Continued high proportion of new installations

Solid biomass – fuels: Market development 2021

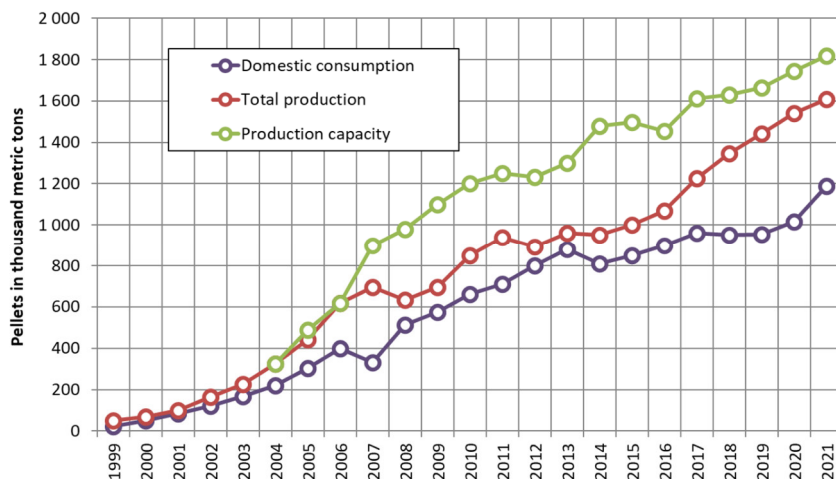


Source: BEST

2020 → 2021:

Briquettes:	+13.3 %
Pellets:	+17.2 %
Bark:	+0.0 %
Wood chips:	+12.6 %
Logs:	+7.6 %
Total:	+10.6 %

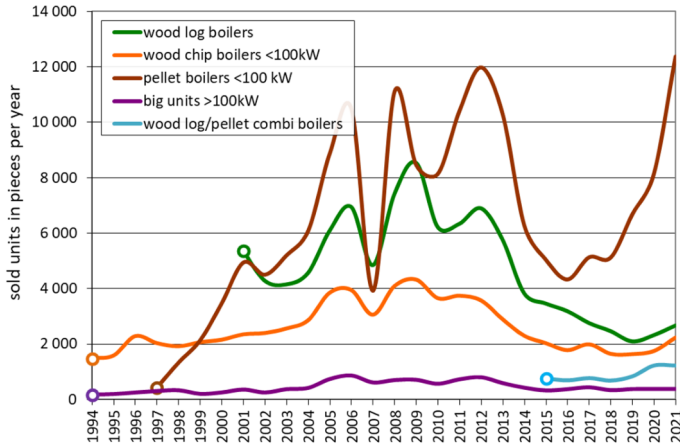
Solid biomass – fuels: Production of pellets



Source: ProPellets Austria

- Constant expansion of production capacities
- Securing domestic production
- Pellet production linked to the sawmill industry

Solid biomass – boilers: Market development 2021



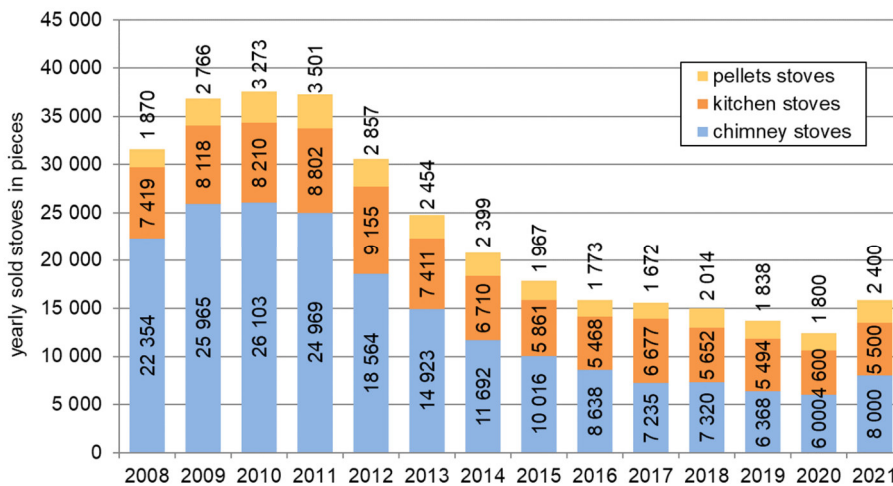
Source: BEST

2020 → 2021:

in total 19,285 pieces

Pellet boilers:	+50.6 %
Combined pellet boilers:	+26.0 %
Log boilers:	+14.8 %
Wood chips to 100 kW:	+28.2 %
Wood chips >100 kW:	+64.8 %
Total:	+40.0 %

Solid biomass – stoves: Market development 2021

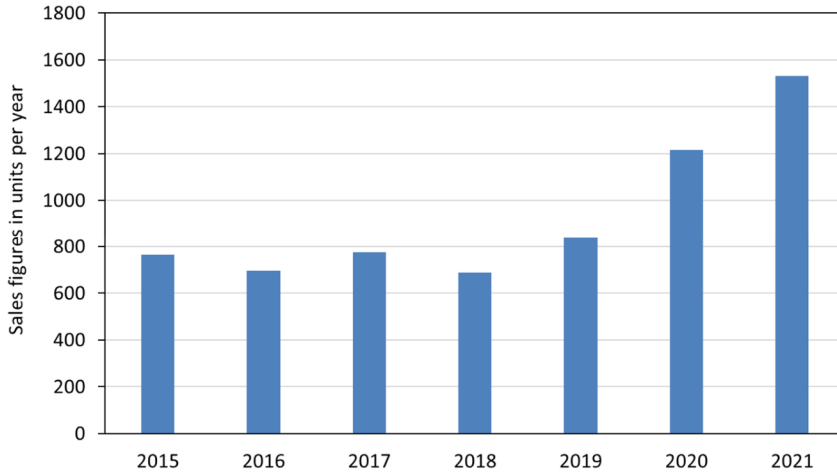


Source: BEST

2020 → 2021:

Pellet stoves:	+33,3 %
Kitchen stoves:	+19.6 %
Chimney stoves:	+33.3 %
Total:	+28.2 %

Solid biomass – boilers: Combined pellet boilers

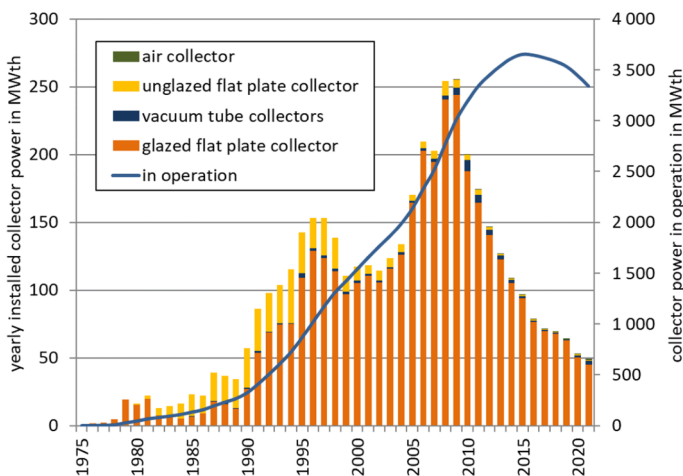


Source: LK NÖ

- 2020 → 2021: +26.0 %
- Strong growth compared to log boilers (+14.8 %)
- Automation trend plus need for self-sufficiency

17

Solarthermics: Market development 2021



Source: AEE INTEC

Standard collectors

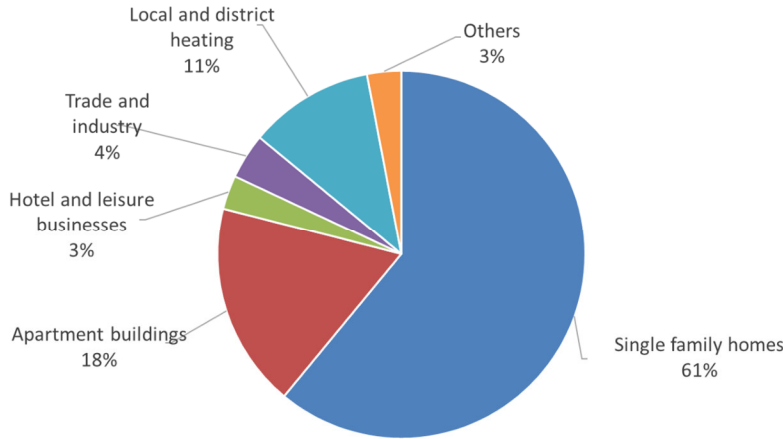
- New installations: 49.3 MW_{th}
- 2020→2021: -7.4 %
- Stock: 3.4 GW_{th}
- 2020→2021: -3.0 %
- Export: 351.3 MW_{th}
- 2020→2021: +22.6 %

Solar hybrid collectors (PVT)

- New installations: 1,014 m²
- 2020→2021: +274 %

18

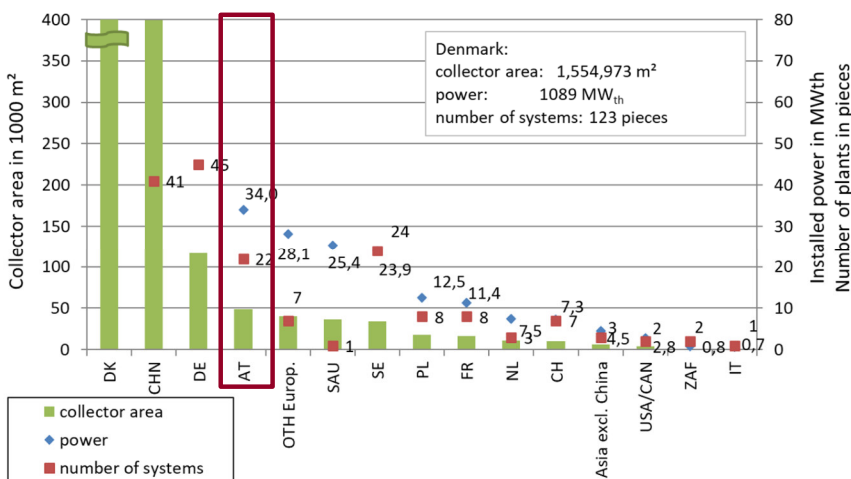
Solarthermics: Areas of application



Source: AEE INTEC

Newly installed solar thermal systems in 2021 by area of application

Solarthermics: Solar district heating

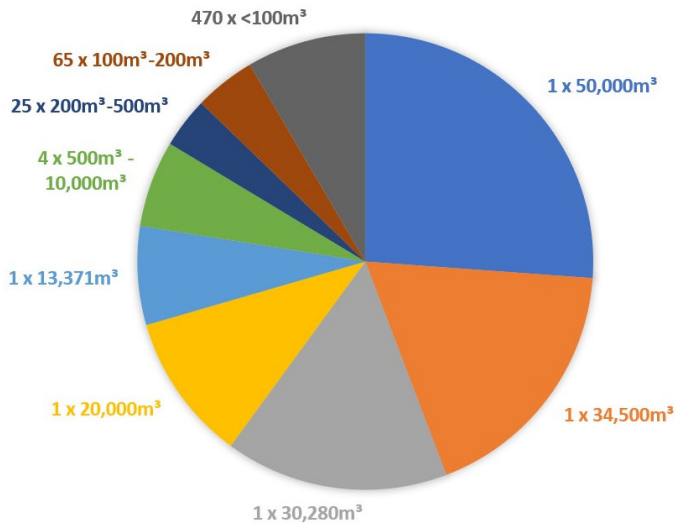


Source: AEE INTEC

Solar district heating
>0,35 MW_{th}

- New installations: 5.5 MW_{th}
- 2020→2021: +18 %
- In total: 22 plants, 34.5 MW_{th}

Large heat storages in heat grids



Source: AEE INTEC

- Water heat storage at the end of 2020: 840 storage tanks with 191,150 m³ (7.8 GWh) installed
- Geothermal probe fields at the end of 2020: 53.3 km of probe length installed
- 2021: So far, 63 new water heat storage tanks with a volume of approx. 4,000 m³ have been surveyed
- Survey 2021 still ongoing

21

Large heat storages in heat grids



Source: Guggenberger Engineering



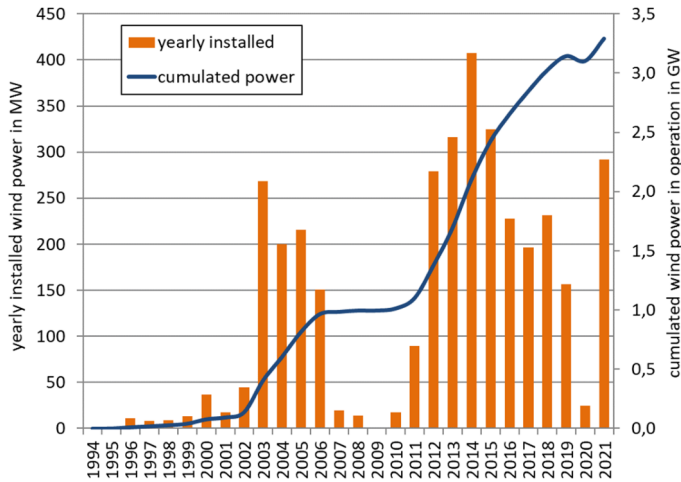
Source: AEE INTEC

Largest storage installed in 2021:

- Local heating network Friesach 1,000 m³ (40.6 MWh)
- Spot welded
- Use of storage: solar thermal, load management

22

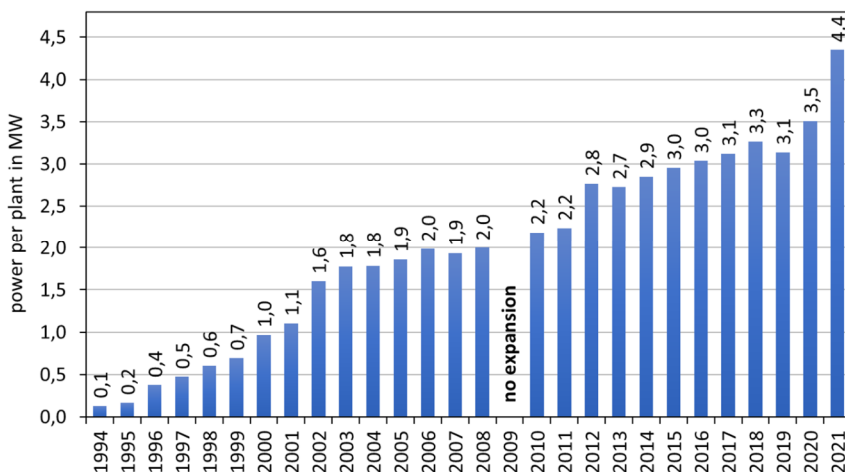
Wind power: Market development 2021



Source: IG Windkraft

- New installations: 292 MW
- 2020→2021: factor 11 (!)
- Stock: 3.3 GW
- 2020→2021: +6.1 %
- Wind power 2021: ca. 7.6 TWh

Wind power: Development of plant size 2021



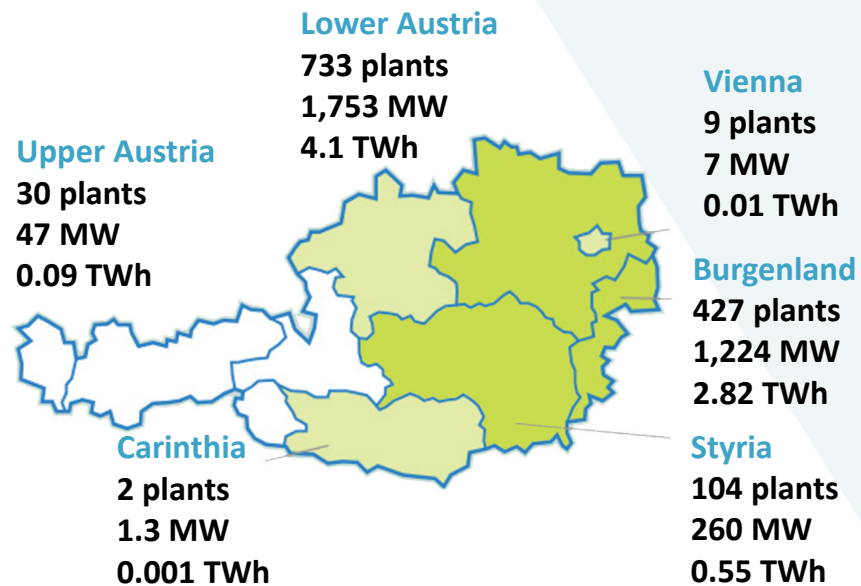
Source: IG Windkraft

- Significant leap in development!
- Until two years ago: limited to 3 MW per wind turbine (corresponds to 2,000 households).
- Current state of the art: Output of 5 MW to 6 MW per wind turbine (corresponds to 4,000 households). Doubling the power generation per wind turbine!

Wind power: Development of plant size 2021

Austria in total

1.305 plants
3.294 MW
7,6 TWh



Source: IG Windkraft

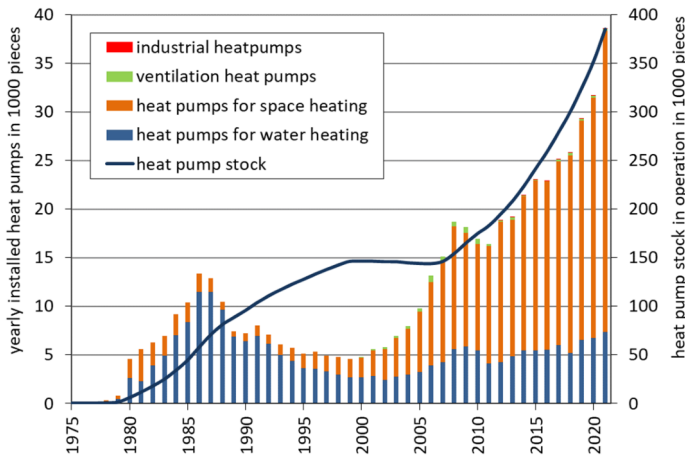
25

Wind power: Outlook for Austria

- Around 4 GW of installed wind power by 2025 (made possible by the remaining funding from the green electricity amendment 2019)
- By 2030 around +120 wind power plants and +550 MW necessary for the target of the Renewable Energy Expansion Act
- Expansion currently in Lower Austria, Burgenland, Styria
- Up to 2030 use of potentials necessary throughout Austria (EAG, zoning, permits, grid expansion,...)
- Technical advancement from 3MW to 6 MW output

26

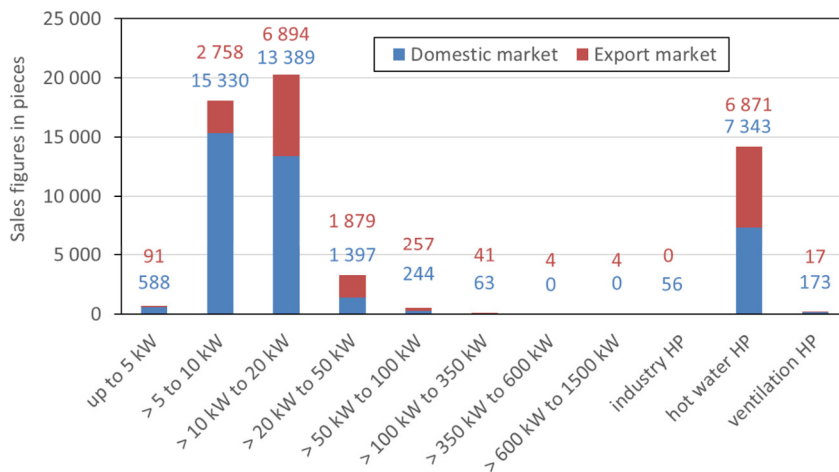
Heat pumps: Market development 2021



Source: ENFOS

- New installations: 38,583 pieces
- 2020→2021: +21.6 %
- Stock: 385,171 pieces
- 2020→2021: +9.4 %

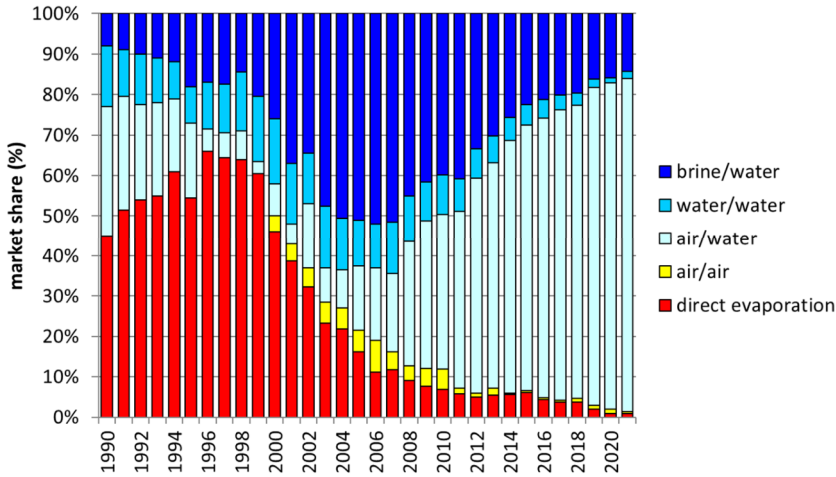
Heat pumps: Sales by type and market 2021



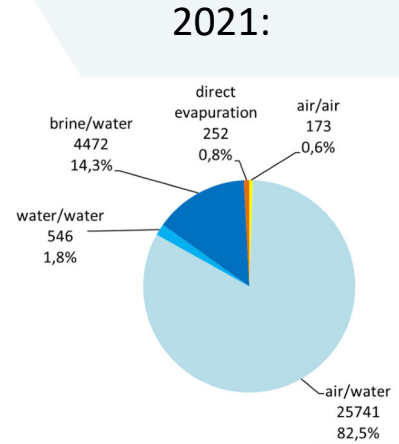
Source: ENFOS

- Export rate heat pumps for space heating : 27.8 %
- Export quota domestic water heat pumps: 48.3 %

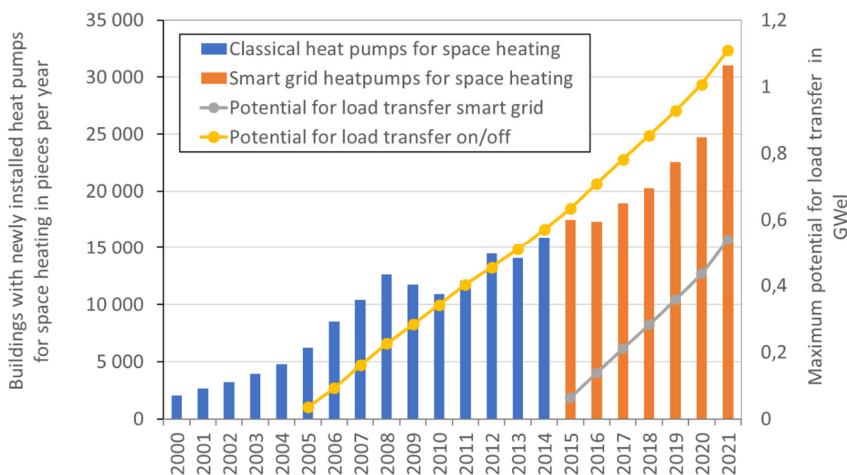
Heat pumps: Sales by type and market 2021



Source: ENFOS



Activation of buildings: Market development 2021

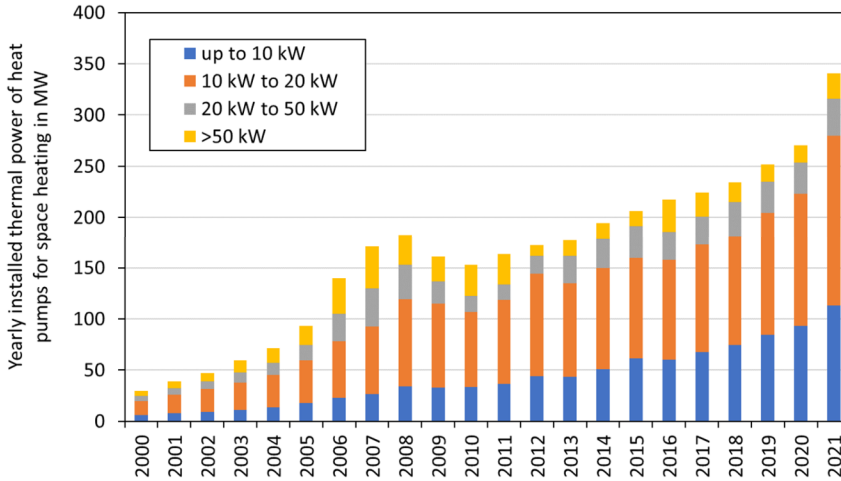


Source: ENFOS

Grid-friendly load shifting potential:

- Ripple control: max. 1.11 GW_{el}
- 2020→2021: +10.2 %
- Smart Grid HP: max. 0.54 GW_{el}
- 2020→2021: +23.5 %

Activation of buildings: Distribution of power classes



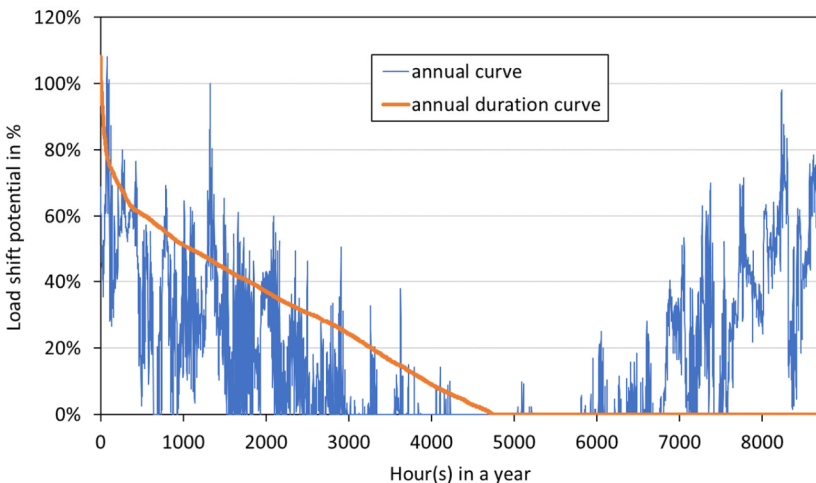
Source: ENFOS

Power classes:

- bis 10 kW: +21.2 %
- >10 kW – 20 kW: +28.4 %
- >20 kW – 50 kW: +19.3 %
- >50 kW: +45.7 %

→ **Swarm solution necessary**

Activation of buildings: Success factors



Source: ENFOS

Success factors:

- Critical mass of smart grid heat pumps
- Comprehensive availability of smart meters
- High control energy prices
- Business models for network operators

Summary: Key figures 2021

(Sums of biomass, photovoltaics, solarthermics, heat pumps and wind power)

- **Renewable energy:** 269 PJ (\cong 74.6 TWh)
- **CO₂equ-savings:** 15.0 million tons
- **Turnover** (primary, gross): 7.7 billion €
- **Employees:** 39,200 full-time equivalents

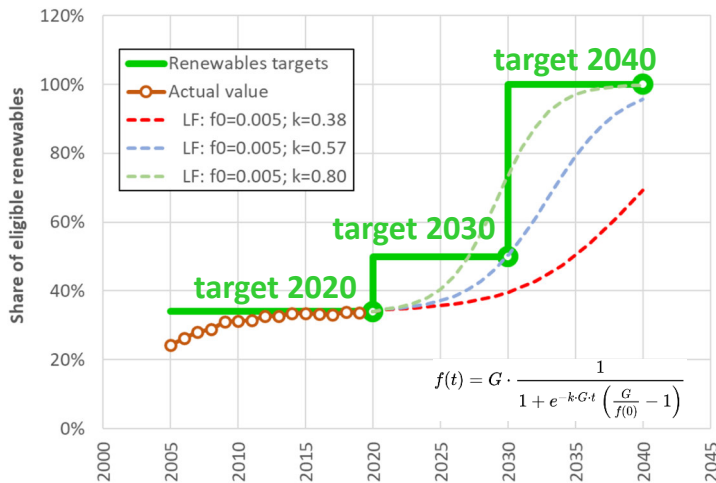
33

Summary: Trends

Trend	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Biomass solid	↘	↘	→	↘	↗	↗	↗
Biomass liquid	↗	↘	↘	→	→	↘	(→)
Biomass gaseous	→	→	→	↘	↘	↘	(→)
Deep geothermal	→	→	→	→	→	→	→
Photovoltaics	↘	→	↗	↗	↗	↗	↗
Solarthermics	↘	↘	↘	↘	↘	↘	↘
Heat pumps	↗	→	↗	↗	↗	↗	↗
Hydro power	→	↗	↘	↗	↘	↘	↗
Wind power	↘	↘	↘	↗	↘	↘	↗

34

Conclusions (1)



Sources: Statistik Austria, ENFOS

- For achieving the goals the **historical market development is by far insufficient!**
- Necessary are:
 - Energy services ↓
 - Energy efficiency ↑
 - Renewables ↑

35

Conclusions (2)

- **The inertia of the energy system is tremendous.** Long life cycles of plants, high investment costs and cultural aspects are the cause of long time constants for changes.
- To reach the targets of 2030/2040 **established technologies for the use of renewables have to be implemented without delay** and problematic fields have to be treated with **forced R&D**.
- In order to attain the targets **all nine available lines of technology** for the use of renewables in Austria will be required.

36

Conclusions (3)

- The **current frame conditions** as "No more oil and natural gas" as well as strongly rising prices of fossil energy accelerate the energy transition.
- "Innovators" and "early users" have already been served. **The attributes of new users are a challenge.**
- "**low hanging fruits**" in the sense of potential-cost curves **have already been harvested** in many areas.
- **Delivery problems, inflation and increasing investment costs** become new diffusion restraints.

Conclusions (4)

- Electricity: – The targets can only be reached with a working "EAG".
– Grid development plan and grid expansion have to be compatible with the target path.
- "No more oil" bears fruit already. **"No more fossils" is unavoidable to reach the target.**
- **Attention: Lock-in effects!** In 2021 49,000 new gas-fired boilers and 2,600 new oil-fired boilers have been sold (approximately 42 % of the domestic heating market)
- **A coordination of targets and measurements** among the federal government and the federal states is important.

Acknowledgement

We are thankful for the productive cooperation of:

- The Austrian companies
- The associations
- The places of support of the federal states and federal government
- The energy departments of the federal states
- The employees of the R&D-institutions

The final report is on the Internet:
<https://nachhaltigwirtschaften.at/de/iea/publikationen/>



Thank you for your attention!