



Best practices on domestic heating

Overview

- What is our project about?
- Problems and best practices(?)
 - New appliances: Strict emission limit values
 - Getting rid of old appliances
 - Technical potential
 - Promotion of alternatives
 - Air quality: local bans
 - User behaviour and fuel used

What is Clean Heat about? (1)

- Overall objective: Reduction of PM/BC from wood burning/domestic heating
- Information campaign in Germany, Denmark, Hungary, Slovakia and Czech Republic



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Holzöfen

Gemütlich und gefährlich

Langsam steigen die Temperaturen, viele Holzöfen bleiben nun für immer kalt. Wegen der Emissionen naht das Ende einer Heiztechnik.

What is Clean Heat about? (2)

- **Our goals:**
 - Increase awareness (consumers/policy makers)
 - Press ahead with climate-friendly alternatives/development of appliances with fewer emissions
 - Emission reduction by providing information on better operation
 - Exchange of best practices and promotion of ambitious legal requirements

New stoves and boilers (1)

	Ecodesign requirements (in mg/m ³)*	Legal requirements in Germany (in mg/m ³)
Local space heaters (firewood stoves)	CO 1500 PM 40	CO 1250 PM 40
Local space heaters (pellet stoves)	CO 300 PM 20	CO 400 PM 30/20 (with accumulation tank)
Solid fuel boilers	CO ≈360 PM ≈30 (converted to 13% O ₂)	CO 400 PM 20

**as of 2020 for boilers and 2022 for local space heaters*

- Minimum standard for funding schemes
- Emission limit values are based on type approval

New stoves and boilers (2)

Blue Angel (Germany)	Nordic Ecolabel (Scandinavia)	EU-Ecolabel	Flamme verte (France, classification: 5-7 stars)	Classification of Lombardy region (<35kW, classification: 2-5 stars)
<ul style="list-style-type: none"> • (for firewood stoves: in progress) 	<ul style="list-style-type: none"> • Firewood stoves: 50 mg/m³ 		<ul style="list-style-type: none"> • Firewood stoves: 40 mg/m³ 	<ul style="list-style-type: none"> • Firewood stoves: 25 mg/m³
<ul style="list-style-type: none"> • Pellet stoves: 15 mg/m³ 	<ul style="list-style-type: none"> • Pellet stoves: 15 mg/m³ 		<ul style="list-style-type: none"> • Pellet stoves: 30 mg/m³ 	
<ul style="list-style-type: none"> • Pellet/wood chip boilers: 15 mg/m³ 	<ul style="list-style-type: none"> • Boilers: 30 mg/m³ (at 10% O₂) 	<ul style="list-style-type: none"> • Boilers: 20 mg/m³ (at 10% O₂) 	<ul style="list-style-type: none"> • Boilers: 20 mg/m³ (at 10% O₂) 	<ul style="list-style-type: none"> • Pellet boilers: 10 mg/m³ • Other boilers: 15 mg/m³

New stoves and boilers (3)

- **Measurement procedure for stoves doesn't reflect reality:**
 - Ignition + 1st burnup are ignored
 - Only best burnups are considered
 - Optimal fuel/combustion air
 - Only nominal load and constant draught
 - Particle number not considered (in contrast to vehicles)
 - **More realistic measurement procedure required** (see <http://www.bereal-project.eu/>)

New stoves and boilers (4)

- **Market surveillance: Prevent cheating similar to the diesel scandal!**
 - emission tests (laboratory) on a random basis by authorities
 - Example: emission tests with chain saws done by market surveillance authority in the state of Baden-Württemberg
 - in-service-conformity: emission tests on site (see recurring measurements of boilers in Germany done by chimney sweeps every two years)
 - effective penalties needed!

Old appliances

- Emission limit value for old stoves (Germany): 150 mg/m³ (for old boilers: 60/100 mg/m³)

Date of type approval (stoves)	Retrofitting/shutdown
Before 01/1975	31.12.2014
01/1975 - 12/1984	31.12.2017
01/1985 - 12/1994	31.12.2020
01/1995 - 03/2010	31.12.2024

- Local solid fuel regulations with stricter emission limits for old stoves and earlier retrofitting/shutdown (e.g. Munich, Aachen)



Technical potential

- Wood chip boiler (wood gasification): 1 mg/m³
- Pellet/wood chip boiler with particle separator: <10 mg/m³

Promotion of renewable energies

- **Market incentive programme (Germany):** about 1,6 mio appliances/components financially supported since year 2000
 - Type of appliances: solar heat, heat pumps, pellet/wood chip/firewood boilers
 - Extra funding for exhaust cleaning technology (750-5.250€), not mandatory!
- **„Renewable Heat“ law in the state of Baden-Württemberg:** insulation, renewable heat sources or district heating, if heating system is to be replaced (problem: tilted/storage stoves without exhaust cleaning also allowed to meet requirements)
- **EU funding for renewable energy/heat sources**

Air quality: local bans



Type of ban	Region
temporary	<ul style="list-style-type: none">• Stuttgart (Germany): ban to use room heaters (stoves) during „Feinstaubalarm („PM alert“ if $>50 \mu\text{g}/\text{m}^3$ PM_{10} expected), many exemptions!• Graz (Austria): ban to use room heaters (stoves), if daily mean is above $75 \mu\text{g}/\text{m}^3$ on more than three days, fewer exemptions
permanent	<ul style="list-style-type: none">• Krakow (Poland): ban on solid fuel appliances from 09/2019• Berlin (Germany): particle emissions of heating systems have to be on a par with oil/gas (only applies to new construction development plans)

User behaviour

- **Information campaigns:** Leaflets, roll-ups, initiatives for smoke-free residential areas, local seminars for stove owners (e.g. city of Reutlingen/Germany: „driving license“ for stoves)
- **Quality of fuel:** max. moisture content of fuel (see 1. BImSchV); certified pellets and wood chips (i.a. ENplus -> moisture, ash content, etc.)
- **Misuse of fuel/waste burning (Switzerland):**
 - About 27.000 ash tests (laboratory) since 2008 (about 3000/year)
 - Level of complaint: dropped from over 30% to less than 10%

Conclusions

- Just installing new appliances is not the optimal solution (high emissions of stoves in real life)
- Sustainable alternatives to wood/coal burning and better building efficiency have to be promoted
- Biomass is only a viable alternative if emission reduction technology is considered and if it is used efficiently (mainly large-scale)
- Best practices/solutions for improved domestic heating are available: Further action is needed to meet air quality guidelines (WHO) and 2030 target for PM_{2,5} of the revised NEC



Thank you!

Patrick Huth, Deutsche Umwelthilfe (DUH), huth@duh.de

Website: www.clean-heat.eu



The project Clean Heat is co-financed by the LIFE program of the European Commission. Clean Heat started in late 2015 and will run until 2019.