WG1 ‘Special Subjects’

Technical Assistance Impact Assessment
Ecodesign and Energy Label

1st WG1 meeting  13.2.2020

for review of Commission Regulation (EU) No. 814/2013 [Ecodesign] and
Commission Delegated Regulation No. (EU) No. 812/2013 (Energy Label)

The information and views set out in this study are
those of the author(s) and do not necessarily reflect the
official opinion of the European Commission
<table>
<thead>
<tr>
<th>#</th>
<th>Topics</th>
<th>Starting approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opening of meeting / approval draft agenda / introduction of project &amp; team</td>
<td>10:00</td>
</tr>
<tr>
<td>2</td>
<td>Decarbonising gas-grid, introduction</td>
<td>10:10</td>
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<tr>
<td>3</td>
<td>Augustijn van Haasteren (EC, DG ENER, Unit B2), Lecture ‘Future of Gas in the EU’</td>
<td>10:15</td>
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<tr>
<td>4</td>
<td>Paul Gelderloos (BDR Thermea), Lecture ‘Introducing the Hydrogen Boiler’</td>
<td>10:40</td>
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<tr>
<td>5</td>
<td>Albert van der Molen (Stedin), Lecture ‘The Rozenburg Project’ (100% H2 heating)</td>
<td>11:05</td>
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<tr>
<td>6</td>
<td>Decarbonising gas-grid, Discussion</td>
<td>11:30</td>
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<td></td>
<td>Lunch (13:00 - 14:00)</td>
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<td>8</td>
<td>Primary energy factor, impact on limits</td>
<td>14:00</td>
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<tr>
<td>9</td>
<td>Micro-cogeneration</td>
<td>15:00</td>
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<tr>
<td>10</td>
<td>Shared chimney problem B1, C4 and C8</td>
<td>16:00</td>
</tr>
<tr>
<td>11</td>
<td>Any other business / <strong>closure of meeting 17:00</strong></td>
<td>16:45</td>
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</table>
1 - Team

• Primary responsible: EC, DG ENER
  • Policy officer: Veerle Beelaerts
  • Assistance: VHK
    • project leader: René Kemna
    • co-ordinator: Martijn van Elburg
    • WG leaders:
      • WG1 ('hydrogen'): René Kemna
      • WG2 ('testing'): Rob van Holsteijn
      • WG3 ('calculation'): René Kemna + Leo Wierda
      • Wg4 ('water heaters'): Martijn van Elburg
  • start Oct-Nov 2019, duration 24 months
1 - Introduction project

- Review study
- IA project
- Reg. process
- Prepare
- Propose
- Rescale
- Energy - 40%
- Renew. + 32%

Timeline:
- 2017 - 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- Sep 2025
- Sep 2026
- 2027
- .. 2030

Voluntary Agreements procedure:
- Notify Voluntary Agreement & report to European Parliament & Council (no right of scrutiny)
- Adoption by European Commission of Report & VA (written procedure)
- Publication Report & Agreement & Letter to signatories

Ecodesign:
- Regulatory Committee
- Scrutiny EP & Council
- Adoption EC
- Publication in the Official Journal

Energy Labelling:
- Expert group MS
- Adoption EC
- Objection EP & Council
- Publication in the official journal

13 Feb 2020
1st WG1 meeting
# 1 - Project structure

**Part 1 of project** (WG meetings until summer 2020)

<table>
<thead>
<tr>
<th>WG1 'Special subjects'</th>
<th>WG2 'Testing'</th>
<th>WG3 'Calculation'</th>
<th>WG4 'Water heaters'</th>
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<tbody>
<tr>
<td>13 Feb 2020</td>
<td>2 Apr 2020</td>
<td>10 Mar 2020</td>
<td>20 Jan 2020</td>
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<tr>
<td>Decarbonising the gas-grid</td>
<td>Tdesign 65ºC</td>
<td>Revised calculation</td>
<td>Tech.spec. limits</td>
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<tr>
<td></td>
<td>Boiler: Oversize, bin method</td>
<td>Ecodesign / Labelling (a.o. hybrids)</td>
<td>Scope + Def's.</td>
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<tr>
<td>PEF (primary energy factor)</td>
<td>Verif.tolerances</td>
<td>Verif.tolerances</td>
<td>Storage tank</td>
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<td></td>
<td>3rd Party Conf. Assessment</td>
<td>Package label</td>
<td>PFHRD</td>
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<tr>
<td>Cogeneration</td>
<td>Scope 1 MW</td>
<td>NOx limits</td>
<td>Solar device contribution</td>
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<tr>
<td>Shared chimney (B1, C4/C8)</td>
<td>Emitters &amp; controls</td>
<td>NOx limits</td>
<td>Single WH reg.</td>
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<tr>
<td></td>
<td>Label design</td>
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</tbody>
</table>

Working Documents for CF planned: WH June 2020, SH end of 2020

**Part 2 of project**

Impact Assessment reports (internal EC, until Regulations published)
1 – Decarbonising the Gas-grid

• Introduction
  • Lectures
    • Augustijn van Haasteren (EC, DG ENER, B2), *Future of Gas in the EU*
    • Paul Gelderloos (BDR Thermea), *Introducing the Hydrogen Boiler*
    • Albert van der Molen (Stedin), *The Rozenburg Project*

• Questions

• Discussion
Introduction
POLICY GOAL: Carbon-neutral in 2050
By far the most ambitious environmental goal ever

EC vision document 28.11.2018 (for heating):
Electrification, carbon-neutral gases (hydrogen etc.), biomass, distributed heat, solar
GRID FACTS & FIGURES (EU27+UK)

Gas

- 260,000 km of high pressure pipelines (TSO-operated)
- 1.4 million km medium- and low pressure pipelines (DSOs)
- 4900 TWh = 490 bcm gas distributed, of which 1500 TWh firing el. power generation (& its useful waste heat. Firing 39% of district heat. 2100 TWh directly to space & water heating.
- ~1066 TWh (~100 bcm) storage capacity
- >110 million end-use connections (including collective heating).
- >€300 bn depreciated value. >€1 trn replacement value. >€52 bn TSOs invest in next decade (ENTSOG TYNPD 2018)
- Blue hydrogen → carbon-neutral in 2050, zero-fossil in 2075 (=extra time for transition)

Electric

- 298,092 km of high voltage power lines (TSOs)
- 10 million km medium- and low voltage lines (DSOs)
- 3220 TWh electric power generated from renewables (13% wind, 4% solar, 11% hydro, 6% biomass), nuclear (25%) gas (21%), other fossil (18%),
- 450 TWh for the energy sector & distr. losses and 2750 TWh for final consumption, of which 200 TWh to space & water heating.
- ~54 TWh storage capacity (pumped storage mainly)
- 260 million end-use connections.
- >€600 bn depreciated value. > €2 trn replacement value. €116bn TSOs + €215bn DSOs ‘smart grid’ to invest in next decade (ENTSOE TYNPD 2018)

Gas-grid decarbonisation options

**Zero-carbon** (mixed-in & eventually full where possible):

- $2H_2O + \text{electricity} \rightarrow 2H_2 + O_2$ (electrolysis by solar or wind generated electricity=‘green’)
- $CH_4 + \text{heat(no O}_2) \rightarrow 2H_2 + C$ (methane pyrolysis of methane+CU=‘blue’ $\rightarrow$ transitory solution)

**Carbon-neutral:** Prior CO$_2$ absorption from methanisation by green H$_2$ (almost) compensates for CO$_2$ emission during later combustion e.g. in a gas-fired space heater. Special benefit by using CO$_2$ during biogas production (exothermal)

methanisation absorbs $\rightarrow$ combustion emits CO$_2$

- $CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$ $\rightarrow$ $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
Methane Pyrolysis

- Photovoltaics
- Windpower
- Natural Gas
- Biogas
- Liquid Metal
- Pigments
- Lightweigthing
- Polymers
- HighTech

Graphics: Leon Kühner, KIT (no usage restrictions)
With new measures (ECO), GHG emissions
Dedicated & Combi together. Dotted line is BAU. PEF for all years 2.1 (to be corrected when consensual projections will be available).

106 MtCO₂ in 2050
extra saving from new measures → 230 Mt (-77%)
H2-ready → innovation

Gas-fired (combi) boiler

Hybrid electric HP and Gas-boiler

Gas-fired heat pumps
- absorption,
- adsorption,
- gas-engine driven compressor

Gas-fired instantaneous (‘tankless’) water heaters

Fuel-cell ICE, ECE

Gas-fired storage water heaters
H2-ready → innovation

Boiler components: gas valve, controls/software, ignition safety, possibly combustion fan

Smart ultrasonic gas flow meters for both natural gas and hydrogen

solar-to-hydrogen rooftop panels PEC (photo-electrochemical) based
Lectures
Questions
Questions: Decarbonising the grid

What Ecodesign and Labelling measures are needed to keep the option of distributing carbon-neutral energy carriers through the existing gas-grid instead of natural gas?

1. Keep the option of 100% hydrogen in selected areas open for policymakers/utilities?
2. If not, what is/are the alternative(s) for carbon-neutral gasgrid in EU 2050?
3. If yes, recommend policymakers to introduce ‘Hydrogen-ready’ or any other feature for gas-appliances (excl. cooking probably)?
4. How should measures look like: exact criteria and boundary conditions (GAR), mandatory/voluntary, label factor, icon, timing, etc..?
5. Is a gas-fired space/water heater with variable range of 30 to 100% hydrogen a technically/economically feasible option?
Discussion
Lunch
Primary Energy Factor Correction Limit Values

<table>
<thead>
<tr>
<th>Space heating energy efficiency per type</th>
<th>now**</th>
<th>pef-corrected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel (combi) boiler space heater ≤70 kW, except B1-type</td>
<td>86%</td>
<td>87%</td>
</tr>
<tr>
<td>B1 Fuel boiler ≤10 kW &amp; Fuel combi boiler ≤30 kW</td>
<td>75%</td>
<td>76%</td>
</tr>
<tr>
<td>Fuel boiler &gt;70 kW, ≤400 kW (*at P=100%; **at P=30%)</td>
<td>86%*</td>
<td>87%*</td>
</tr>
<tr>
<td>94%**</td>
<td>95%**</td>
<td></td>
</tr>
<tr>
<td>Electric (combi) boiler</td>
<td>36%</td>
<td>43%</td>
</tr>
<tr>
<td>Cogeneration space heaters</td>
<td>100%</td>
<td>See later</td>
</tr>
<tr>
<td>Heat pump (combi) space heater, except LT-type (differentiate for gasHP?)</td>
<td>110%</td>
<td>130%</td>
</tr>
<tr>
<td>LT Low Temperature heat pump</td>
<td>125%</td>
<td>150%</td>
</tr>
</tbody>
</table>

For consideration is the relatively small difference between a default HP space heater and a low-temperature heat pump. An alternative limit could be 170-175%.
Questions
PEF-correction of limit values

1. In principle, and not to suggest that this will be the last word on limits (also because WG2 and 3 will have input), is the suggested PEF-correction of the Ecodesign limits correct or is there another way to use the new PEF and not downgrade the current limits?

2. Given that it seems the prime argument against change of labelling class limits, how important –in view of realising policy goals-- is it to keep condensing fossil-fuel boilers in the ´A´ class (and not lower)?

3. Given that it seems the prime argument in favour of changing of labelling class limits, how important is it –in view of realising policy goals--to have more differentiation in classes especially for the higher A+ etc. categories?
Micro-cogeneration metrics (+suggestions Task 6)

The **TM2014sh** calculates the seasonal efficiency $\eta_s$ as

$$
\eta_s = \eta_{son} - \sum F(i)
$$

where:

$\eta_{son}$ = the seasonal heating efficiency in active mode, in %:
- $\eta_{CHP100}$ or with supplementary heater 0.85 $\eta_{CHP100+Sup0}$ + 0.15 $\eta_{CHP100+Sup100}$ ($P_{CHP}$, $\eta_{el}$ similar)

$F(i)$ = corrections F(1) to F(5), if applicable, expressed in %

- **F(1)** = Temperature controls = (3% $\cdot$ $\eta_{son}$) or more? 8%? $\rightarrow$ WG2&3
- **F(2)** = Auxiliary electricity = $2.5 \cdot \frac{f(elmax, P_{SB}, elmin)}{f(P_{CHP})}$ $\rightarrow$ 2.5$\rightarrow$2.1
- **F(3)** = Standby heat loss = $0.5 \frac{P_{stby}}{f(P_{CHP})}$
- **F(4)** = Pilot flame = $1.3 \frac{P_{ign}}{f(P_{CHP})}$
- **F(5)** = Electricity generation efficiency = $-2.5 \cdot \eta_{el}$ $\rightarrow$ $-2.5 \cdot \eta_{el} \rightarrow -2.65_{(fix)} \cdot \eta_{el}$

- $\eta_{son}$ = kW GCV gas in / kW useful heat (water) out
- $\eta_{el}$ = kW GCV gas in / kW electricity out

<table>
<thead>
<tr>
<th>examples</th>
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<tbody>
<tr>
<td>$\eta_{son}/\eta_{el}$=65/25% $\rightarrow$ $\eta_s$ = 131%</td>
</tr>
<tr>
<td>$\eta_{son}/\eta_{el}$=45/45% $\rightarrow$ $\eta_s$ = 164%</td>
</tr>
<tr>
<td>$\eta_{son}/\eta_{el}$=25/65% $\rightarrow$ $\eta_s$ = 197%</td>
</tr>
</tbody>
</table>
Questions

• Can parties agree with the proposal? If not, apart from the proposals already known to be diverging, what proposals are made to solve the issue?
Shared chimney problem

Exempted now
10 kW solo, 30 kW combi

Exemption requested: problematic mix of condensing pos. pressure and non-condensing neg. pressure in 1 chimney
Shared chimney renovation options C4

Type C4..

multiple boilers on collective air/flue duct (can be neg.pressure)

Type C(10)/(11)..

Small concentric pos. pressure tubes in collective neg.pressure chimney

Type C(14)..

Possible combinations of pos. & negative pressure
Shared chimney renovation options C8

Possible combinations of pos. & negative pressure

Type C8...

multiple boilers on collective flue duct (can be neg.pressure)

Type C(12)/(13)...

Or similar...
Questions
Shared chimney problem

1. Do Member States want to make the effort and spend the money to realize the saving through condensing boilers?

2. If so, how can the expertise from installers in other countries that already went through the chimney renovation be used to help minimize the costs in Eastern European countries?

3. If so, how could additional European funds help to realize the chimney renovation?

4. If Member States asking for the exception do not want to make the effort and spend the money, are the other Member States prepared to accept the lower savings from the loophole that is created? Do the other Member States have alternative options to meet their policy goals—in the context of effort sharing—rather than the switch to condensing boilers?
Any Other Business
Gas grid to play a role in decarbonisation (?): 

**Gas**

- **Residential:** 107M gas-fired space heating boilers (o/w 65 combi & 41 cylinder), 2M local gas heaters; 17M GIWH, 2M GSWH → 50% primary dwellings space heating & 60% water heating

- **Non-residential:** 1.4M AHF & 2M gas boilers, 1 M GSWH → 30% space heating, 90% water heating, 80% water heating, 80% cooking

- **Blue hydrogen** → carbon-neutral in 2050, zero-fossil in 2075 (=extra time for transition)

**Electric**

- **Residential:** 6 M heat pump boilers & 1 M el. CH boilers & 17M RAC ; 57 M ESWH, 8 M EIWH, 1 M HPWH → 10% primary dwellings space heating & 27% water heating

- **Non-residential:** 5.4M AC rev + 2M CAC cool only + 2.6M space chillers; 55% space heating, 20% water heating, 80% cooking

Space heating residential (1740 TWh\textsubscript{gas}, 72 TWh\textsubscript{elec} in 2020):
gas 52% electric 10%, other 17%, none 21%
Water heating residential (360 Twh$_{\text{gas}}$, 129 Twh$_{\text{elec}}$ in 2020): gas 51%-electric 29%-other 20%

- District heating hot water: 40%
- Cylinders (+ solid fuel): 27%
- Collective heat (+boilers): 29%
- Cylinders (+ other boilers): 15%
- Combi-boilers: 10%
- Dedicated water heaters: 9%

EU-27+UK, 2014, in ‘000 dwellings, 244 M dwellings, source BRG 2017