clasp Efficient Appliances for People & the Planet

CO_2 Emissions Savings from a Phase-Out of Gas Cooking Appliances

CONTEXT

CLASP has estimated the potential CO_2 savings from a progressive phase-out of gas hobs from the market from 2025 to 2029. This scenario represents the effect of an energy label that compares hobs starting in 2025, followed by the implementation of Ecodesign efficiency requirements in 2029, which gas hobs would not be able to meet.

The policy options and scenarios proposed in the 2022 JRC study only consider incremental improvements of each technology (i.e., gas hobs, radiant and induction, with an exemption of hotplates). With this analysis, CLASP wanted to put forward the CO_2 emission reduction potential of shifting from gas to electric hobs.

METHODOLOGY & SOURCES

In an attempt to account for all CO_2 emissions linked to the use of electric or gas hobs, our estimates take into account:

- Energy used during cooking
- Leaks
- The rate of CO_2 emissions per kWh electricity
- CO_2 emissions linked to non-use phases

The energy used for cooking on electric hobs was estimated based on the load and efficiency values given by the Ecodesign Impact Accounting study (EIA). For gas hobs, while we used the load given in the EIA, we revised the efficiency of gas hobs to 35%, according to our literature review and the numbers found in studies testing gas and electric hobs in comparable conditions[1,2].

The leakage rate used in this model is the average of the levels measured by CLASP on a sample of six cooktops, equalling 56mg/h. This rate is comparable to the findings of a study of gas cooker leakage rates in the USA[3]. The evolution of the CO_2 emissions per kWh electricity was taken from the EIA. CO_2 emissions linked to non-use phases were taken from the 2022 JRC study. The stock and sales data were taken from the Ecodesign Impact accounting study. An average lifetime of 15 years was used for all technologies.

RESULTS

According to our estimates, the implementation of an energy label in 2025 (EL2025) and Ecodesign measures in 2029 (ED2029) would represent cumulative savings of 1 $MtCO_2$ eq. by 2030, 30 $MtCO_2$ eq. by 2040 and 85 $MtCO_2$ eq. by 2050. More detailed results are presented in Table 1.

Table 1. CO_2 emissions and savings for BAU and EL2025+ED2029 scenarios

SCENARIOS	2025	2030	2040	2050
CO_2 Emitted				
BAU Emissions from gas + electric hobs	17.8	16.6	13.9	13.2
EL2025+ED2029 emissions from gas + electric hobs	17.8	16.0	9.0	7.8
CO_2 Avoided				
Annual emission reduction from EL2025+ED2029	0.0	0.6	4.8	5.4
Cumulative emission reduction from EL2025+ED2029	0.0	1.0	30.2	85.1

1. Sweeney et al., 2014, Induction Cooking Technology Design and Assessment Micah Sweeney, Jeff Dols, Brian Fortenbery, and Frank Sharp Electric Power Research Institute (EPRI), aceee 2014 proceedings. https://www.aceee.org/files/proceedings/2014/data/papers/9-702.pdf 2. Lebel et al., 2022.

2. Frontier Energy, 2019, Residential Cooktop Performance and Energy Comparison Study Frontier Energy Report # 501318071-R0 July 2019. https://cao-94612.s3.amazonaws.com/documents/Induction-Range-Final-Report-July-2019.pdf

3. Eric D. Lebel, et al., 2022. Methane and NOx Emissions from Natural Gas Stoves, Cooktops, and Ovens in Residential Homes. Environmental Science & Technology 56 (4), 2529-2539. https://pubs.acs.org/doi/10.1021/acs.est.1c04707