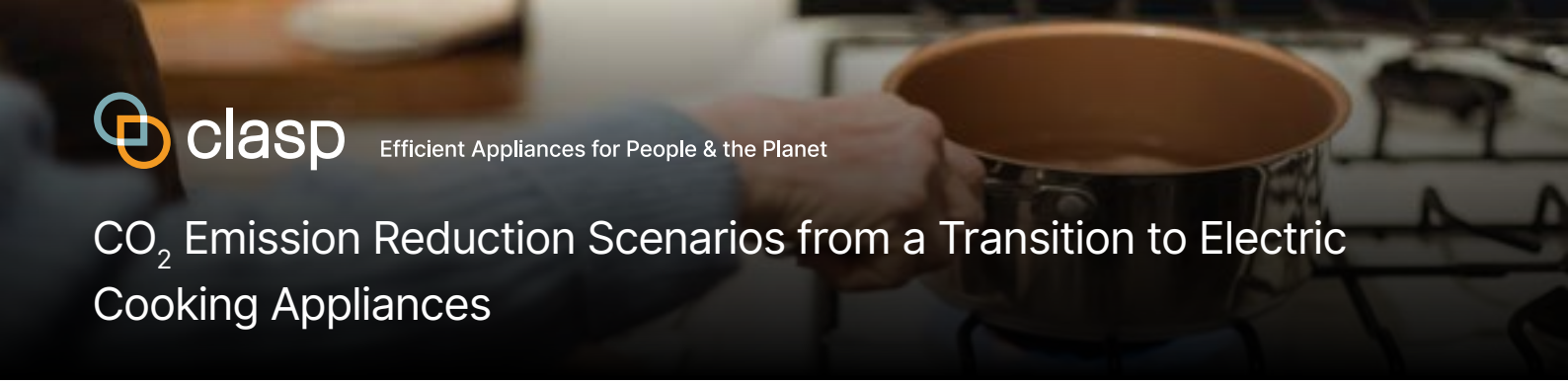

clasp Efficient Appliances for People & the Planet

CO_2 Emission Reduction Scenarios from a Transition to Electric Cooking Appliances

CONTEXT

CLASP conducted an analysis on potential reductions in CO_2 emissions resulting from an accelerated transition to electric cooking appliances, along with a general improvement of hob efficiency starting in 2027. The transition would be followed by a phase-out of gas hobs in 2030. This scenario represents the result of high public awareness of the health impacts associated with gas cooking, coupled with the implementation of Ecodesign requirements in 2030, which gas hobs would be unable to meet. For reference, CLASP also estimated the theoretical emission reductions resulting from the discontinuation of gas hob sales in 2027.

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 lower requirements for hotplates), for which the emission reduction potential seemed insignificant. Through this analysis, **CLASP seeks to highlight the potential CO_2 emission reductions from a transition to electric hobs**.

METHODOLOGY & SOURCES

To account for all CO_2 emissions linked to the use of electric or gas hobs, CLASP estimates consider:

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

The energy consumption for cooking was estimated based on CLASP's efficiency tests, using a volume of 1,229 liters per year, consistent with the estimates provided in the Ecodesign Impact Accounting (EIA) study. CLASP's efficiency tests employed a similar method for all technologies, using aluminum pots on gas hobs and stainless-steel pots on electric hobs. The efficiency values obtained from these tests align closely with those found in our literature review.[1,2]

The leakage rate used in this model represents the average of levels measured by CLASP on a sample of six hobs, amounting to 56mg/h. This rate is comparable to the findings from a study on gas cooker leakage rates in the USA.[3] The evolution of the CO_2 emissions per kWh electricity were sourced from the EIA, in line with official European objectives and modeling. CO_2 emissions linked to non-use phases were extracted from the 2022 JRC study, while the business as usual (BAU) stock and sales data were taken from the Ecodesign Impact Accounting study. An average lifetime of 15 years was applied to all technologies.

RESULTS

According to CLASP estimates, the implementation of a progressive phase-down of gas hobs starting in 2027 (PD2027), followed by stringent requirements phasing out gas hobs in 2030 (PO2030), would represent cumulative reductions of nearly 17 $MtCO_2$ eq. by 2040 and almost 60 $MtCO_2$ eq. by 2050.

Further details are provided in Table 1.

Table 1. CO_2 emissions for BAU, PD2027 + PO2030 (gas hob phase-down from 2027 and phase-out in 2030) and PO2027 (gas hob phase-out in 2027)

SCENARIOS	2025	2030	2040	2050
CO_2 emissions ($MtCO_2$eq.)				
BAU emissions from gas + electric hobs	16.5	15.4	12.7	12.2
PD2027 + PO2030 emissions from gas + electric hobs	16.5	15.5	9.4	8.0
PO2027 emissions from gas + electric hobs	16.5	14.9	8.7	8.0
CO_2 reductions ($MtCO_2$eq.)				
Annual emission reduction from PD2027 + PO2030	0.0	-0.1	3.3	4.2
Cumulative emission reduction from PD2027 + PO2030	0.0	-0.2	16.7	58.5
Annual emission reduction from PO2027	0.0	0.5	4.0	4.2
Cumulative emission reduction from PO2027	0.0	0.3	23.8	67.3

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