FWC ESPR – SR1

Preparatory Study and Impact Assessment on Industrial & Commercial Laundry Appliances

Stakeholder Interaction on preparatory study report
Task 6 and Task 7 – 15 September 2025

Öko-Institut, Ecomatters, Fraunhofer ISI, Trinomics, Fraunhofer IZM and VITO

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Welcome

Kathrin Graulich – Öko-Institut

Agenda

Agenda

10:00-10:10: Welcoming, presentation of the agenda and objectives of the meeting
10:10-10:50: Presentation and discussion of **Task 6** report on Design Options

10:50-11:00: Coffee break

11:00-11:45: Presentation and discussion of **Task 7 report** in Policy Options and Scenarios
11:45-12:00: Concluding remarks and planning of the next stages

An additional half hour is planned until 12:30 as a buffer.

Life cycle assessment (LCA)
Life cycle costing (LCC)
(Task 5 - update)

Kathrin Graulich – Öko-Institut

LCA results summary – Washing machines

Base Cases WM1, WM2, WM3, WM4, WM5

- All Base Case results show similar trends:
  - Majority (>90%) of the lifetime impact is from the **Use phase** followed by the **Raw materials** production for most impact categories
  - End-of-life modelling shows a **credit for avoided impacts** due to **recyclability** of certain raw materials such as stainless steel, galvanised steel, aluminium, electronics (controller board)

- Major contributor in the **use phase** differs per impact category:
  - **Energy** consumption: climate change etc
  - **Detergent** consumption: ozone depletion, resource use, eutrophication etc
  - **Water** consumption: water use, human toxicity

- Major contributor of **raw materials** are **electronics** (controller board)
  - Additional high contributing raw materials are **stainless steel**, **polypropylene** and **copper** depending on the impact category

LCA results summary - Dryers

Dryers D1, D2, D3, D4

- All base case results show similar trends:
  - Majority (>90%) of the lifetime impact is from the **use phase** followed by the **raw materials** production for most impact categories
  - End-of-life modelling shows a **credit for avoided impacts** due to **recyclability** of certain raw materials such as stainless steel, galvanised steel, aluminium, electronics (controller board)

- Major contributor in the **use phase** is energy use (mostly electricity) for all impact categories

- Major contributor of **raw materials** are **electronics** (controller board)
  - Additional high contributing raw materials are **stainless steel**, **polypropylene** and **copper** depending on the impact category

Conclusions

LCA

- The LCA shows that the **use** and **raw material** stages contribute the most to environmental impact across all Base Cases.
  - Product **utility consumption** and weight are directly correlated with environmental impact.
  - **Heavier products** and those with **larger nominal capacity** have the highest environmental impact.
    - Per kg laundry, **smaller machines** have a higher environmental impact, due to combination of lower amount of laundry handled & lifetime

- The **contribution analysis** identified key contributors to environmental impact:
  - In the **use phase**, the main contributors are **detergent and energy consumption**
  - In the **production phase**, the main contributors are **electronics** (controller board), **stainless steel**, **polypropylene** and **copper**

Conclusions

LCC

- The **LCC assessment** identifies the following as the highest cost contributors across most Base Cases:
  - **Detergents**
  - **Energy use**

- For **dryers**, the dominant cost contributor depends on usage type:
  - **Electricity** or **heat** consumption.

- In general:
  - **Running costs** exceed the **initial purchase and installation costs** across all base cases
  - **Sales volume** has a significant effect on stock-level impact

Data collection and quality

- **Data collection**
  - Data consultation rounds
    - 1st Consultation: May - June 2024,
    - 2nd Consultation: July - August 2024,
    - 3rd Consultation after 1st meeting: October - December 2024
  - Data gaps: filled with data from 2011 report
  - Consolidated Task 1-4 as basis for T5/T6 at SHM April 25

- **Data quality assessment**

Source	Data quality assessment
Stakeholder input, Scientific literature	High quality
Expert judgement, Literature, Previous study	Medium quality
Web research/Googling	Fair quality

- **Stakeholder input / revised data on WM1-4 and D1-3 after 2nd stakeholder meeting April 2025**
- Although a sensitivity analysis conducted for Base Cases WM1-4 and D1-3 shows some considerable changes in the specific results due to different assumptions on rated capacities, lifetimes and consumption parameters, the overall conclusions (use phase as largest contributor to environmental impacts, raw material contributions to the impacts and overall contribution of the specific product categories) still apply to the revised data. Considering the broad range of products within the categories and the data quality scoring approach which ranks stakeholder input as higher quality than the initial Base Case data based on the 2011 preparatory study results, expert judgement and literature information, the study used these inputs as the revised Base Case information for subsequent tasks.

Design options (Task 6)

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Task 6 Design options – background

Goal Task 6: identify and evaluate design options for the Base Cases

- Calculate environmental and economic performance of each design option to reach policy recommendations that are both environmentally beneficial and cost-effective

Methodology:

- Due to limited stakeholder input, the choice of and data on design options was based on the Task 1-5 results of the current study, previous results of the 2011 preparatory study, and complemented by literature research on emerging technologies, components and processes that could deliver environmental improvements.
- The parameters used in the Task 6 analysis represent a hypothetical range of potential improvement. Concrete calculations can only be performed once data is available from performance test results that follow the available standards.
- For each design option, changes to input data were assumed for:
  - Bill of Materials
  - Resource use (energy, water, detergent)
  - Lifetime
  - Purchase price
- For each Base Case, LCA and LCC results of the design options were calculated using the ERT. As no input was provided regarding costs of Design Options, LCC calculations could not be undertaken based on primary data.

Design options WASH – Overview

Design option no.	Short title	Applicable to WM categories
WM-DO1	Heat recovery	WM1 to WM4;
WM-DO2	Load control	WM1
WM-DO3	Smart detergent dosing	WM1 to WM4,
WM-DO4	Ozone technology	WM2 to WM4;
WM-DO5	Drum construction / perforation design	WM1 to WM4;
WM-DO6	Extended time of spare part availability and repair support	WM1 to WM5
WM-DO7	Ultrasonic cleaning technology	WM1 to WM5
WM-DO8	Nano-fibre filtration systems	WM1 to WM5; not considered in the LCA / LCC analysis

For technical reasons, WM-DO8 is not parameterised for LCA because the main purpose of this design feature is the removal of microplastic from wastewater at the source. This environmental aspect is not adequately addressed in LCA on the one hand and on the other hand, there is currently no data available regarding the performance of such filters in practice.

Design options DRY – Overview

Design option no.	Short title	Applicable to WM categories
D-DO1	Heat pump	D1, D3
D-DO2	Smart load control	D1, D3
D-DO3	Modulating gas dryers	D4;
D-DO4	Drum construction / perforation design	D1, D2
D-DO5	Extended time of spare part availability and repair support	D1 to D4

Design options WASH – input parameters

- Main input data changes: Base Case WM1 Light duty washer extractor

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	73.86	WM-DO1: **+3 kg stainless steel** (a)
Lifetime (years)	10	WM-DO6: +5 **= 15** (a)
Average price (€)	2,000	**2,100** (a)
Annual sales (mln units per year)	0.0243	0.0162
Energy consumption wash (kWh/cycle)	1.28	**= 1.02** non-cumulative average of -20 % due to: WM-DO1: -30 % to -90 % (b) WM-DO2: -14 % to -25 % (c) WM-DO5: -10 % to -30 % (a) WM-DO7: -30 % to -50 % (e)
Water consumption (m^3/cycle)	0.07	**= 0.06** non-cumulative average of -15 % due to: WM-DO2: -15 % to -25 % (c) WM-DO3: approx. -50 % (d) WM-DO7: approx. -30 % (e)
Detergent consumption (kg per cycle)	0.088	**= 0.07** non-cumulative average of -20 % due to: WM-DO2: -20 % to -30 % (b) WM-DO3: up to -20 % (a) WM-DO7: -30 % to -50 % (e)

Design options WASH – input parameters

- Main input data changes: Base Case WM2 Washer extractor

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	211	WM-DO1: **+8 kg stainless steel** (a)
Lifetime (years)	10	WM-DO6: +5 **= 15** (a)
Average price (€)	9,000	**9,500** (a)
Annual sales (mln units per year)	0.05	0.036
Energy consumption wash (kWh/cycle)	7.25	**= 6.53** non-cumulative average of -10 % due to: WM-DO1: -15 % to -50 % (b) WM-DO2: - 5 % to -30 % (c) WM-DO4: -30 % to -50 % (d) WM-DO5: -10 % to -30 % (a) WM-DO7: -30 % to -50 % (a)
Water consumption (m^3/cycle)	0.26	**= 0.23** non-cumulative average of -10 % due to: WM-DO2: -10 % to -30 % (e) WM-DO4: -10 % to -45 % (f) WM-DO5: -40 % to -80 % (g)
Detergent consumption (kg per cycle)	0.319	**= 0.255** non-cumulative average of -20 % due to: WM-DO2: -20 % (a) (h) WM-DO3: -20 % to -40 % (i) WM-DO4: -30 % to -50 % (j)

Design options WASH – input parameters

- Main input data changes: Base Case WM3 Washer dryer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	475	WM-DO1: **+10 kg stainless steel** (a)
Lifetime (years)	10	WM-DO6: +5 **= 15** (a)
Average price (€)	13,000	**13,500** (a)
Annual sales (mln units per year)	0.000405	0.000270
Energy consumption wash (kWh/cycle)	11.16	**= 8.9** non-cumulative average of -20 % due to: WM-DO3: up to -5 % (a) WM-DO4: -50 % to -90 % (d) WM-DO7: -30 % to -50 % (a) only for drying: D-DO1: -10 % to -20 % (b),(c) D-DO3: 14 % average gas savings (k)
Water consumption (m^3/cycle)	0.18	**= 0.144** non-cumulative average of -20 % due to: WM-DO3: -30 % to -50 % (e) WM-DO4: -20 % to -30 % (f) WM-DO5: -20 % to -30 % (g) WM-DO7: up to -30 % (h)
Detergent consumption (kg per cycle)	0.198	= **0.158** non-cumulative average of -20 % due to: WM-DO3: -20 % to -30 % (i) WM-DO4: -20 % to -30 % (j) WM-DO5: -5 % to -10 % (a) WM-DO7: -30 % to -70 % (a)

Design options WASH – input parameters

- Main input data changes: Base Case WM4 Barrier washer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	850	WM-DO1: **+8 kg stainless steel** (a)
Lifetime (years)	10	WM-DO6: +5 **= 15** (a)
Average price (€)	35,000	**36,000** (a)
Annual sales (mln units per year)	0.001215	0.000810
Energy consumption wash (kWh/cycle)	4.8	**= 4.32** non-cumulative average of -10 % due to: WM-DO1: -10 % to -30 % (a) WM-DO4: -60 % to -80 % (b) WM-DO5: - 5 % to -15 % (a) WM-DO7: -40 % to -60 % (a)
Water consumption (m^3/cycle)	0.43	= **0.387** non-cumulative average of -10 % due to: WM-DO1: -50 % to -70 % (b) WM-DO3: -20 % to -30 % (a) WM-DO4: -10 % to -25 % (b) WM-DO5: -10 % to -30 % (c) WM-DO7: -30 % to -50 % (a)
Detergent consumption (kg per cycle)	0.352	**= 0.28** non-cumulative average of -20 % due to: WM-DO3: -20 % to -30 % (a) WM-DO4: up to -30 % (a) WM-DO7: -30 % to -50 % (a)

Design options WASH – input parameters

- Main input data changes: Base Case WM5 Continuous tunnel washer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	12,120	WM-DO1: **+35 kg stainless steel and +5 kg copper** (a)
Lifetime (years)	13.7	WM-DO6: +5 **= 23.7** (a)
Average price (€)	585,000	**590,000** (a)
Annual sales (mln units per year)	0.00025	0.000145
Energy consumption wash (kWh/cycle)	382.5 (19.125 kWh/hour)	**= 363.4** non-cumulative average of -5 % due to: WM-DO1: -50 % to -65 % (b) (c) WM-DO4: -50 % to -70 % (a) (h) WM-DO5: up to -40 % (d) WM-DO7: -30 % to -40 % (e)
Water consumption (m^3/cycle)	7.0	**= 6.7** non-cumulative average of -5 % due to: WM-DO3: up to -5 % (a) WM-DO5: up to -5 % (f)
Detergent consumption (kg per cycle)	10.2	**= 9.18** non-cumulative average of -10 % due to: WM-DO3: -10 % to -25 % (g) WM-DO4: -20 % to -30 % (a) WM-DO5: -10 % to -25 % (a) WM-DO7: up to -50 % (a)

Design options DRY – input parameters

- Main input data changes: Base Case D1 Light duty tumble dryer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	57	D-DO1: **+5 kg stainless steel and +1 kg copper** (a)
Lifetime (years)	10	D-DO5: +5 **= 15** (a)
Average price (€)	1,600	**1,650** (a)
Annual sales (mln units per year)	0.016	0.00896
Energy consumption drying (kWh/cycle)	2.16	**= 1.73** non-cumulative average of -20 % due to: D-DO1: -40 % to -60 % (b) D-DO2: -10 % to -30 % (c) D-DO3: 14 % average gas savings (d) D-DO4: -10 % to -25 % (e)

Design options DRY – input parameters

- Main input data changes: Base Case D2 Tumble dryer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	290	**unchanged**
Lifetime (years)	15	D-DO5: +5 **= 20** (a)
Average price (€)	6,000	**6,500** (a)
Annual sales (mln units per year)	0.051	0.03825
Energy consumption drying (kWh/cycle)	23.3	**= 22.1** non-cumulative average of -5 % due to: D-DO3: 14 % average gas savings (b) D-DO4: -5 % to -15 % (a)

Design options DRY – input parameters

- Main input data changes: Base Case D3 Cabinet dryer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	128	D-DO1: **+5 kg stainless steel and +1 kg copper** (a)
Lifetime (years)	10	D-DO5: +5 **= 15** (a)
Average price (€)	2,000	**2,500** (a)
Annual sales (mln units per year)	0.01	0.0067
Energy consumption drying (kWh/cycle)	4.2	**= 3.8** non-cumulative average of -10 % due to: D-DO1: -30 % to -50 % (b) D-DO2: -10 % to -30 % (a)

Design options DRY – input parameters

- Main input data changes: Base Case D4 Pass-through tumble dryer

Description	Base Case	Parameters: Change due to DO
Product weight (kg)	2,871	D-DO1: **+35 kg stainless steel and +5 kg copper** (a)
Lifetime (years)	25	D-DO5: +5 **= 30** (a)
Average price (€)	50,000	**55,000** (a)
Annual sales (mln units per year)	0.0012	0.001
Energy consumption drying (kWh/cycle)	272	**= 223** average of -18 % due to: D-DO1: -9 % to -22 % (b)

LCA Results – WASH

PEF Impact category / Consumption	WM1 - DO	WM2 - DO	WM3 - DO	WM4 - DO	WM5 - DO
Total electricity consumption	-20 %	-10 %	-20 %	-10 %	-5 %
Water (use phase)	-15 %	-10 %	-20 %	-10 %	-5 %
Detergent (use phase)	-20 %	-20 %	-20 %	-20 %	-10 %
Climate change, total	-20 %	-9 %	-21 %	-23 %	-7 %
Ozone depletion	-19 %	-19 %	-20 %	-18 %	-10 %
Human toxicity, cancer	-20 %	-15 %	-21 %	-25 %	-21 %
Human toxicity, non-cancer	-18 %	-13 %	-22 %	-19 %	-8 %
Particulate matter	-21 %	-17 %	-23 %	-29 %	-14 %
Ionising radiation, human health	-20 %	-11 %	-20 %	-18 %	-7 %
Photochemical ozone formation, human health	-20 %	-14 %	-22 %	-27 %	-10 %
Acidification	-21 %	-17 %	-24 %	-31 %	-15 %
Eutrophication, terrestrial	-20 %	-15 %	-22 %	-27 %	-11 %
Eutrophication, freshwater	-18 %	-15 %	-20 %	-15 %	-8 %
Eutrophication, marine	-20 %	-16 %	-21 %	-24 %	-10 %
Ecotoxicity, freshwater	-20 %	-15 %	-21 %	-23 %	-10 %
Land use	-27 %	-20 %	-26 %	-30 %	-20 %
Water use	-16 %	-11 %	-20 %	-12 %	-6 %
Resource use, minerals and metals	-26 %	-27 %	-31 %	-33 %	-25 %
Resource use, fossils	-20 %	-9 %	-21 %	-22 %	-7 %

LCA Results – DRY

PEF Impact category / Consumption	D1 - DO	D2 - DO	D3 - DO	D4 - DO
Total energy consumption	-23 %	-5 %	-10 %	-18 %
Climate change, total	-21 %	-5 %	-11 %	-18 %
Ozone depletion	-24 %	-5 %	-10 %	-18 %
Human toxicity, cancer	-25 %	-8 %	-8 %	-17 %
Human toxicity, non-cancer	-28 %	-5 %	-14 %	-18 %
Particulate matter	-20 %	-6 %	-15 %	-18 %
Ionising radiation, human health	-26 %	-5 %	-10 %	-18 %
Photochemical ozone formation, human health	-28 %	-5 %	-13 %	-18 %
Acidification	-25 %	-6 %	-16 %	-18 %
Eutrophication, terrestrial	-23 %	-5 %	-13 %	-18 %
Eutrophication, freshwater	-25 %	-5 %	-11 %	-18 %
Eutrophication, marine	-24 %	-5 %	-13 %	-18 %
Ecotoxicity, freshwater	-10 %	-5 %	-12 %	-18 %
Land use	-22 %	-8 %	-5 %	-14 %
Water use	-32 %	-5 %	-11 %	-18 %
Resource use, minerals and metals	-22 %	-17 %	-31 %	-18 %
Resource use, fossils	-23 %	-5 %	-11 %	-18 %

LCC Results – WASH

BC		Total costs (EUR/year)	Difference (%)
WM1 Light duty washer extractor	Reference	973	
	DO	738	**-24 %**
WM2 Washer extractor	Reference	8,882	
	DO	7,153	**-19 %**
WM3 Washer dryer	Reference	12,322	
	DO	9,385	**-24 %**
WM4 Barrier washer	Reference	13,076	
	DO	10,011	**-23 %**
WM5 Continuous tunnel washer	Reference	450,004	
	DO	356,470	**-21 %**

LCC Results – DRY

BC		Total costs (EUR/year)	Difference (%)
D1 Light duty tumble dryer	Reference	524	
	DO	391	**-25 %**
D2 Tumble dryer	Reference	9,703	
	DO	8,894	**-8 %**
D3 Cabinet dryer	Reference	3,489	
	DO	3,204	**-8 %**
D4 Pass-through tumble dryer	Reference	77,166	
	DO	62,139	**-19 %**

Conclusions

- Concerning the environmental impact of the majority of the considered Design Options, quantification is generally impeded by the absence of primary data with regard to the performance parameters of the respective base cases, in addition to the uncertainty of the improvement potentials of each Design Option in the context of each appliance categories.

- Literature data on BAT and emerging technologies are seldom sufficiently specific to distinguish between the results of their implementation in different appliance categories.

- Nevertheless, the examined design options seem to have the potential to generate environmental benefits, associated with cost savings over the lifetime.

Policy options (Task 7) – starting at 11:00

Antoine Durand – Fraunhofer ISI
Robin Barkhausen – Fraunhofer ISI

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Policy Analysis

Opportunities: Use phase is dominant

- LCA: Contribution to the LCA impact (PEF single score) over the total lifetime of the product, on product level

Use phase	WM1	WM2	WM3	WM4	WM5	D1	D2	D3	D4
Energy consumption	62.6%	71.5%	84.1%	29.2%	74.3%	77.3%	99.4%	94.6%	99.8%
Water consumption	8.6%	6.4%	2.7%	8.8%	5.1%	n.a.	n.a.	n.a.	n.a.
Detergent consumption	23.3%	17.8%	6.8%	16.6%	17.0%	n.a.	n.a.	n.a.	n.a.
Total use phase	**94.5%**	**95.7%**	**93.6%**	**54.6%**	**96.4%**	**77.3%**	**99.4%**	**94.6%**	**99.8%**

>77% of the LCA due to the use phase

- LCC: Relevance of the use phase in the LCC, at product level

Use phase	WM1	WM2	WM3	WM4	WM5	D1	D2	D3	D4
Energy consumption	25 %	38 %	58 %	11 %	21 %	67 %	96 %	92 %	97 %
Water consumption	15 %	15 %	8 %	17 %	8 %	n.a.	n.a.	n.a.	n.a.
Detergent consumption	38 %	36 %	22 %	37 %	60 %	n.a.	n.a.	n.a.	n.a.
Total use phase	**78 %**	**89 %**	**88 %**	**65 %**	**88 %**	**67 %**	**96 %**	**92 %**	**97 %**

>65% of the LCC due to the use phase

Policy Analysis

Opportunities: Large saving potentials

- Improvement potentials, on product level

	WM1	WM2	WM3	WM4	WM5	D1	D2	D3	D4
Energy consumption	-20 %	-10 %	-20 %	-10 %	-5 %	-20 %	-5 %	-10 %	-18 %
Water consumption	-15 %	-10 %	-20 %	-10 %	-5 %	n.a.	n.a.	n.a.	n.a.
Detergent consumption	-20 %	-20 %	-20 %	-20 %	-10 %	n.a.	n.a.	n.a.	n.a.
Yearly life cycle costs	**-24 %**	**-19 %**	**-24 %**	**-23 %**	**-21 %**	**-25 %**	**-8 %**	**-8 %**	**-19 %**

- LCC: Contribution of each BC to the achievable savings of the whole market

Savings	WM1	WM2	WM3	WM4	WM5	D1	D2	D3	D4
Total energy savings	1 %	**23 %**	1 %	0 %	3 %	1 %	**29 %**	3 %	38 %
Total water savings	7 %	**84 %**	1 %	3 %	6 %	n.a.	**n.a.**	n.a.	n.a.
Total detergent savings	4 %	**86 %**	0 %	2 %	7 %	n.a.	**n.a.**	n.a.	n.a.
Total costs savings (LCC/a)	**3 %**	**45 %**	**1 %**	**2 %**	**13 %**	**1 %**	**23 %**	**2 %**	**10%**

Policy Analysis

Barriers:

- **Limited uptake of EN standards**: Although most of the relevant EN test standards have been established, they are not yet in widespread use (also leading to a limitation of the Task 6 analysis)
- **Testing results:** To ensure comparability between competing products, all similar products (in the same category) should be tested under the same programme
- **Reduced competitive pressure**: Due to the lack of comparable data on energy, water, and detergent consumption across products, two key risks emerge:
  - Lack of transparency for high-performing products
  - Weak innovation incentives
- **Unclear product classification**
- **System-level efficiency considerations:** For industrial products

Policy Analysis

ESPR Framework (Art. 5)

Source: https://environment.ec.europa.eu/events/information-session-new-ecodesign-sustainable-products-regulation-espr-2024-05-22_en

Policy Analysis

Potential policy: Scope

Scope

- In terms of scope, it would be meaningful that a potential regulation covers **both commercial and industrial laundry appliances**. The table below provides an overview of the scope and the corresponding standards (displaying their current status) to be applied.

Standards

- Overview of the scope and standards (displaying their current status) to be applied.

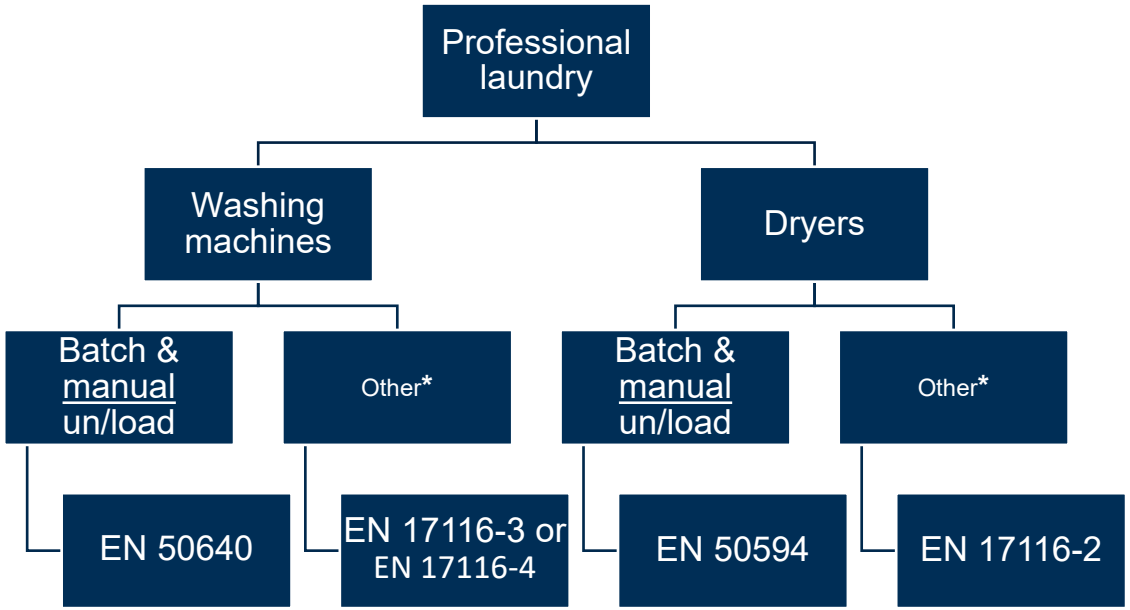
	Commercial	Industrial
Washers	EN 50640:2018 (washing machines and washer-dryers)	EN 17116-4 (washer extractors)
		EN 17116-3 (continuous tunnel washer)
Dryers	EN 50594:2018 (tumble dryers)	EN 17116-2 (batch drying tumblers)
	No standard (cabinet dryers)	

- However, as already mentioned in Task 1, a **clear definition between what is a commercial and an industrial product is not yet available**.

Policy Analysis

Potential policy: Scope and standards

- Suggested EN standards to be applied in a possible ESPR regulation according to the product to be tested



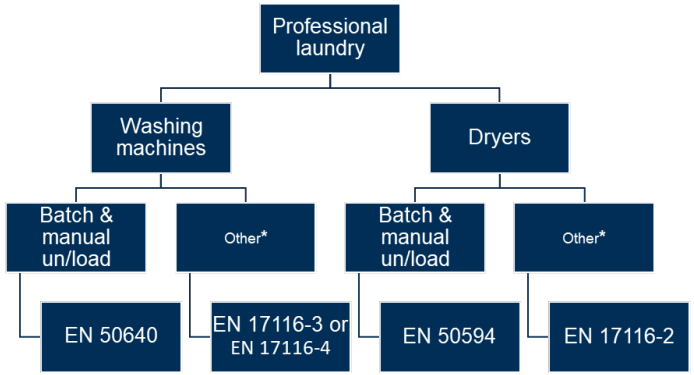
*: “Batch AND automatic un/loading" or "continuous" machines

Policy Analysis

Potential policy: Scope and standards

Question to the stakeholders:

Do you support the approach presented in the last slide?



If not, please provide a clear definition of products to be tested according to:

- EN 50640
- EN 50594
- EN 17116-4
- EN 17116-2

The situation for EN 17116-3 is clear.

Policy Analysis

Potential policy: Standards and test method

Washing machines

In addition to the test standard, a “reference programme” for the test should be provided in the regulation, with following requirements on:

- Wash performance: > 0,93
- Remaining Moisture Content (RMC) after extraction (except for continuous tunnel washer as extraction is not part of the test in EN 17116-3:2019): 50%
- Rinse performance: t.b.d.
- Max. programme time (cap): 70 min
- For professional barrier washers: it could be relevant that the standard programme includes compliance to hygiene standards.

When testing, following parameters should be measured and reported:

- electricity consumption,
- steam consumption,
- gas consumption,
- detergent consumption,
- water consumption,
- duration information,
- wash performance.

Policy Analysis

Potential policy: Standards and test method

Dryers

In addition to the test standard, a “reference programme” for the test should be provided in the regulation, with following requirements on:

- Final moisture content (fmc): 9 % (± 2 %) and 2 % (± 0.5 %)
- Max duration: 130 min

When testing, following parameters should be measured and reported:

- electricity consumption,
- gas consumption,
- duration information,
- fmc

Policy Analysis

Potential policy: Scope and standards

Question to the stakeholders:

Do you have any suggestions for a pragmatic approach for quantifying the energy consumption and the energy efficiency of a cabinet dryer?

Critical question:

Since there is some overlap between commercial and industrial laundry appliances, would it be realistic and reasonable to base a future regulation for commercial and industrial laundry appliances on:

- One testing method for all tumble dryers (independently of the size). If so, which one?
- One testing method for all washers (independently of the size), except for tunnel washers (EN 17116-3). If so, which one?

The testing method should allow in-situ testing, when testing in the lab is not possible.

Policy Analysis

Potential policy: Performance requirements and the way towards mininum requirements

- Main issue: lack of data

- Data available to assess performance requirements.

	Commercial	Industrial
Washers	EN 50640:2018 • no reference programme • data of products tested according to the standard not available	EN 17116-3 and EN 17116-4 • no reference programme • some products have been tested (average performance available)
Dryer	EN 50594:2018 • no reference programme • data of products tested according to the standard not available	EN 17116-2 (batch drying tumblers) • fmc defined • some products have been tested (average performance available)

Policy Analysis

Potential policy: Performance requirements and the way towards minimum requirements

	Approaches	Feasibility
1	The performance requirements could be formulated as a relative figure in the regulation (similar to the TopRunner approach in Japan): e.g. "***minimum performance is set at the level reached by [x%] of the models on the market***".	Not possible within the ESPR framework
2	The regulation would mention by when the requirements would be mandatory, but not which level of the requirement is foreseen. "*The Commission is **empowered to adopt a delegated act** in accordance with Article XX to supplement this Regulation by providing the Ecodesign requirement YY*"	Not possible within the ESPR framework, as a ESPR product regulation would be already a delegated act
3	The forthcoming regulation would only include an information requirement. The minimum requirements would be elaborated later within the **review of the forthcoming regulation** including an improved process-based analysis, i.e. for machines not based on "batch process".	Possible, but savings would be delivered with a considerable delay
4	Minimum requirements to be assessed **before** the regulation is published, based on a sample of data reflecting the market.	➔ **Preferred approach** However, it entails some challenges: • It would require a **rapid and intensive testing campaign** • In particular, **commercial products should be prioritised**, as: - No relevant test report results have been made available to the study team. Moreover, due to the absence of a reference programme, the tests conducted to date may have limited relevance and comparability. - The **largest saving potentials are expected for the base cases WM2** (professional washer extractor designed for extra-long durability) and **D2** (professional tumble dryer designed for extra-long durability).

Policy Analysis

Potential policy: Performance requirements and the way towards mininum requirements

What could be regulated?

- Dryers: only energy efficiency
- Washing machines: energy efficiency, specific detergent use and water consumption (see relevance in the LCA and LCC). Set specific minimum requirements on:
  1. each parameter: energy, detergent, and water consumption in the use phase as measured in line with the EN standard for the reference programme, or
  2. a parameter combining the three aforementioned parameters and reflecting the environmental impact of each one as follows:

$$performance = \frac{w_e \times E + w_d \times D + w_w \times W}{M}$$

With:

- E: energy consumption in the use phase (in kWh or MJ)
- D: detergent consumption in the use phase (in kg)
- W: Water consumption in the use phase (in m³)
- w: weighting factor
- M: mass of the laundry washed

Suggested weighting factor to convert specific consumption in PEF single score:

Consumption in the use phase	Quantity	Corresponding PEF single score
Electricity	1 kWh	1.174E+01
Heat	1 MJ	1.113E+00
Water	1 m³	3.659E+01
Detergent	1 kg	1.260E+02

Policy Analysis

Potential policy: Performance requirements and the way towards minimum requirements

Important remark:

- Article 6(2) of the ESPR mentions:

> "2. The performance requirements shall be based on the relevant product parameters referred to in Annex I and shall, as appropriate, include either or both of the following:
>
> (a) minimum or maximum levels in relation to a specific product parameter or a combination thereof;
>
> (b) **non-quantitative requirements** that aim to improve performance in relation to one or more of such product parameters"

➔ This means that, in cases where no metric or threshold can be defined for a relevant product parameter, an alternative approach would be to set mandatory requirements based on the analysis conducted in Task 6.

➔ For example, regarding energy efficiency: if no specific criteria or minimum performance level can be determined, then **design options (e.g. exhaust air heat pump DO-02) identified as contributing to reduced environmental impact and lower lifecycle costs may be set as non-quantitative requirements** for new products.

Policy Analysis

Potential policy: Information requirements

At least, the following information should be reported:

- electricity consumption,
- steam consumption,
- gas consumption,
- detergent consumption (for WM),
- water consumption (for WM),
- duration information,
- wash performance (for WM)
- drying performance (for D)
- general information such as:
  - nominal capacity,
  - loading:
    - manual / automatic
    - batch / continuous
- noise level
- SoCs: see SoC analysis

Labelling requirement:

- Given that professional laundry appliances are Business-to-Business (B2B) products purchased by professionals who typically prioritise operating costs (directly linked to energy, detergent, and water consumption), it is assumed that robust information requirements alone would be sufficient to guide purchasers towards more sustainable choices

➔ no label proposed

Policy Analysis

Potential policy: DPP

Why is a DPP required?

- Professional laundry appliances are not covered by EPREL (EU Product Database for Energy Labelling) established under the Energy Labelling Framework Regulation (EU) 2017/1369
- The exemption clause in ESPR Article 9(4)(b), which allows DPP exemptions for products already covered by EPREL, does not apply to professional laundry appliances
- ➔ **DPP is mandatory for this product group**

The way to a DPP:

- There is **no official or harmonised approach to elaborate on the DPP requirements**, yet; the harmonised methodology is expected to be delivered in September 2025 by the European Commission's Joint Research Centre (EC-JRC) under the service contract *Technical assistance in defining requirements for the inclusion of data and information in the Digital Product Passport (DPP)*.
- The **scope** covers both **technical aspects** (e.g. data carrier, layout, granularity, accessibility, governance, and update arrangements) and **information aspects** (e.g. sustainability-related data fields, access rights for different actors, and traceability requirements.
- From an **implementation perspective:**
  - it may not be necessary at this stage for every individual actor who puts a product on the market to build and maintain a fully independent DPP system or to deeply engage with every regulatory detail.
  - **DPP integration in this product group could be facilitated through third-party service providers or industry associations**.
  - Third-party providers already offer DPP-compliant services that can handle data storage, validation, and access rights in line with ESPR requirements. Alternatively, a centralised DPP platform could be hosted by sectoral industry associations, which are typically familiar with regulatory obligations and have both technical and organisational capacity for data management. This centralisation can streamline compliance, especially for small and medium-sized enterprises, and enhance interoperability across actors involved in the product life cycle.

Policy Analysis

Potential policy: Green Public Procurement GPP (ESPR Art. 65)

Why a GPP?

- In Task 2, no specific data could be collected regarding the market share of products purchased by public authorities. However, the European Commission indicates that **public procurement represents 14 % of the European Union's GDP**, highlighting its substantial impact on the economy. Professional laundry machines are operated in or by various public entities, including hospitals, nursing homes, prisons, and similar facilities. **Thus, it is reasonable to assume that Green Public Procurement (GPP) could have a meaningful impact on the EU market for professional laundry machines.**

- **ESPR Article 65**: “the minimum requirements shall be based on the **two highest performance classes, the highest scores, or, when not available, on the best possible performance levels** as set out in the delegated act adopted pursuant to Article 4 applicable to the product groups in question.”

Requirements

➔ Setting GPP requirements close to the Best Available Techniques (BAT) level appears to be **justified**, as Task 6 indicated that the **BAT level** corresponds to the lowest life cycle cost (LCC) level

Policy Analysis

Potential policy: Circular Economy

Spare parts

- **Type of requirements:**
  - **Delivery**: **5-day timeframe** should refer specifically to the handover of spare parts to an express logistics provider, rather than final delivery to the end user
  - **Availability**: minimum of **10 years** following the placement of the last unit of the model on the market

- **Scope:**
  - Parts of the dosing system
  - Parts related to the water circulation system e.g. circulation pump, piping
  - Electronics and dosing pumps
  - Pumps, heating elements, printed circuit boards (PCBs)
  - Temperature sensors and boiler heating elements
  - Tumble drums, motors, parts of the ”traction systems”

Policy Analysis

Potential policy: Circular Economy

Critical raw materials

- Washing machines and dryers are already explicitly mentioned in the scope of Article 28 of the CRM Act Regulation (EU) 2024/1252:
  - Art. 28 (Recyclability of permanent magnets)
  - Art. 29 (Recycled content of permanent magnets)

- *Furthermore, the CRM Act mentions in Article 29, Point 3: "After the entry into force of the delegated act adopted pursuant to paragraph 2, and in any event by 31 December 2031, the Commission shall adopt **delegated acts supplementing this Regulation by laying down minimum shares** for neodymium, dysprosium, praseodymium, terbium, boron, samarium, nickel and cobalt recovered from post-consumer waste that must be present in the permanent magnet incorporated in the products referred to in paragraph 1."*

➔ **No specific need to regulate additional CRM aspects under ESPR has been identified.**

Policy Analysis

SoCs in ESPR Art. 2(27)

a) Appears in the Regulation on the registration, evaluation, authorisation and restriction of chemicals (REACH) (EC No1907/2006)Annex XIV (**Substances of Very High Concern, SVHC**) Candidate List.

b) Falls under one or more **hazard classes** in **Annex VI of the Classification, Labelling and Packaging of chemicals** (CLP) Regulation (EC No 1272/2008):

- (i) carcinogenicity categories 1 and 2;
- (ii) germ cell mutagenicity categories 1 and 2;
- (iii) reproductive toxicity categories 1 and 2;
- (iv) endocrine disruption for human health categories 1 and 2;
- (v) endocrine disruption for the environment categories 1 and 2;
- (vi) persistent, mobile and toxic or very persistent, very mobile properties;
- (vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties;
- (viii) respiratory sensitisation category 1;
- (ix) skin sensitisation category 1;
- (x) hazardous to the aquatic environment — categories chronic 1 to 4;
- (xi) hazardous to the ozone layer;
- (xii) specific target organ toxicity — repeated exposure categories 1 and 2;
- (xiii) specific target organ toxicity — single exposure categories 1 and 2.

c) Is regulated as a **Persistent Organic Pollutant (POP)** (EU 2019/1021).

d) **Negatively affects the reuse or recycling** of materials in the product.

Policy Analysis

SoCs: Information requirements Art. 7(5)

Proposed to cover:

- Only Intentionally Added Substances (IAS)
- SoC present in the product (including its components and spare parts) (e.g. part of the bill of materials)

Proposed to exclude:

- Non-Intentionally Added Substances (NIAS)
- Substances used in the lifecycle of the product but not present in the product itself

Exemptions:

- No specific information/views gathered on substance specific exemptions

Required to share information

- The exact **name** or numerical **identifier** of each substance, **location** within the product, the **concentration** (concentration range/maximum value), location in the product, clear instructions for safe use, and guidance on environmentally sound end-of-life treatment

Policy Analysis

SoCs: Tracking thresholds for information requirements

Proposed tracking thresholds (derived from draft JRC guidance):

Art 2(27) SoC:

a) REACH Annex XIV SHVC: 0.1 % weight (w)/weight (w)
b) CLP hazard classes/categories:
   - UN Globally Harmonized System (GHS): generic contraction limits (GCL): 0.1 % w/w
   - CLP Annex I GCL: 1.0 % w/w or 0.1 % w/w depending on hazard class/category
c) POP: 0.1 % w/w
d) Negatively affects the reuse and recycling: 0.1 % w/w

In case of meeting multiple categories, the lowest threshold is followed

Policy Analysis

SoCs: further requirements

Implementation

Three implementation scenarios are proposed:

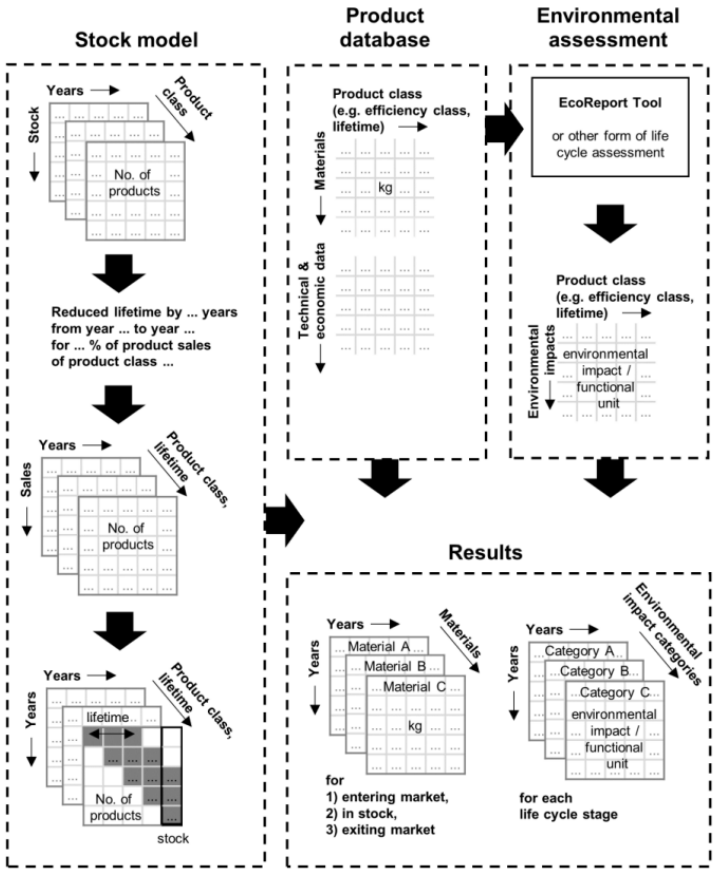
- **Ambitious**: covering all **SoCs without exemptions**;
- **Intermediate**: **case-by-case exemptions** for substances based on solid justification; and
- **Limited**: **tracking only Art. 2(27)(a–c) substances** with broader approach towards exemptions within the flexibilities offered by the legal text, coupled with a **targeted study to identify additional Art. 2(27)(d)** candidates for selected regulation through amending the delegated act.

A **five-year roll-out** is recommended across all scenarios to allow for supplier engagement, data gathering, and Digital Product Passport integration. An assessment of feasibility and administrative burden should be undertaken as part of the impact assessment.

Finally, **performance requirements** under Art. 6 of the ESPR **need not be imposed** at this stage

Scenario analysis

scenario logic →

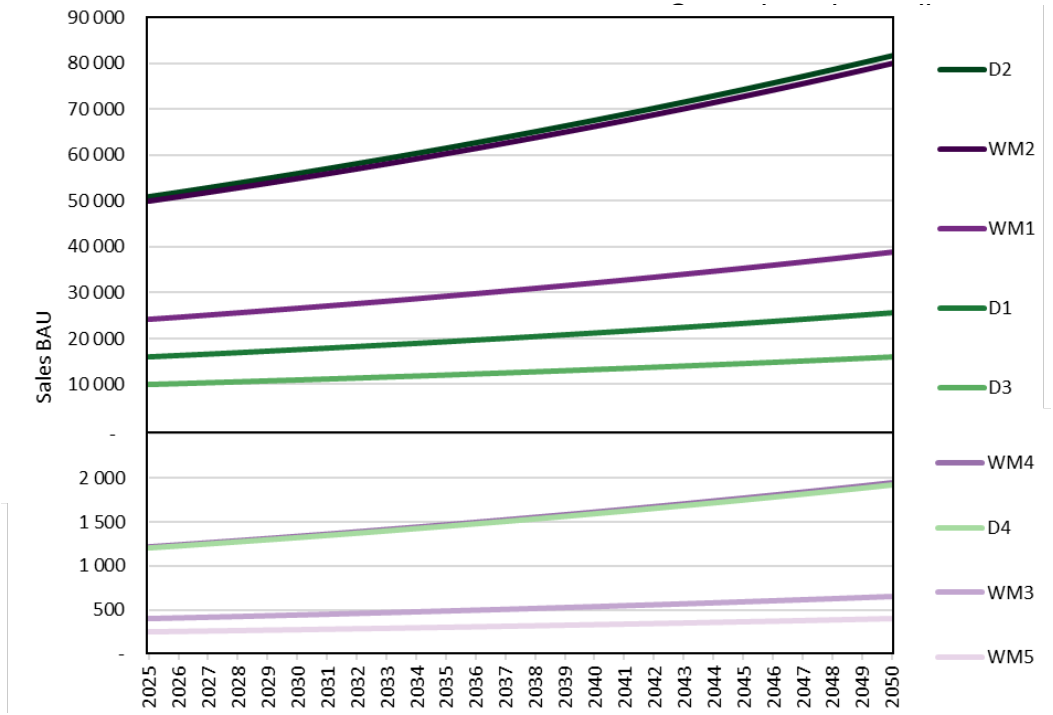


- BAT compared to BAU
- Roll-out in 2028
- Market growth assumptions (based on Task 2):
  - 2015-2025 → constant growth rate of +3.8% / year
  - > 2025 → more moderate linear growth, with average increase of 1% per year
  - different values for individual market segments if more detailed information available (see Task 2)
- Scenarios for prices development and greenhouse gas intensity of electricity mix based on EU reference scenario (PRIMES)
- Escalation rates:
  - costs of water (0.16%), electricity (1.62%), natural gas (2.15%) and detergent (1.21%).
  - Investment costs for new products and repair costs are considered with an inflation rate of 2%.

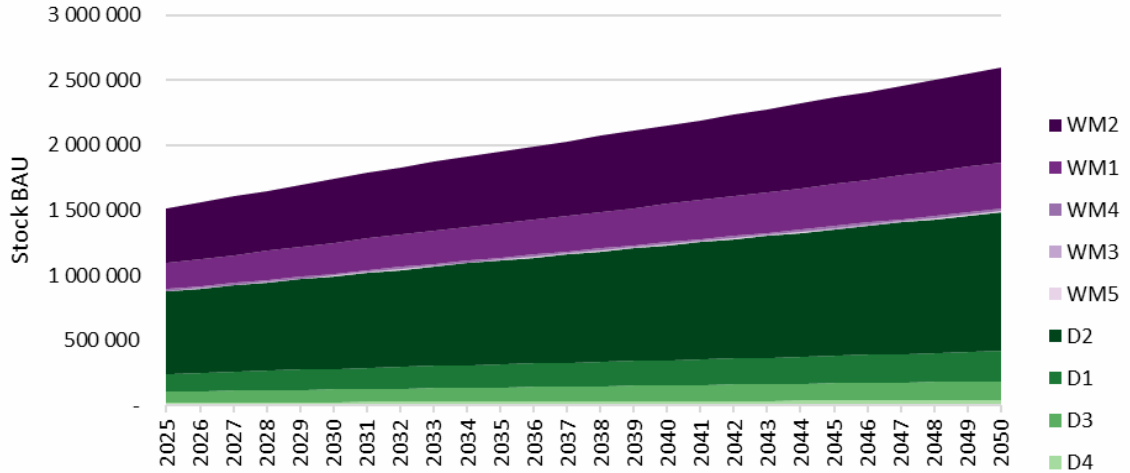
Scenario analysis

- Sales:
  - raises from a total of **0,15M** in 2025 (**76k** washing machines, **78k dryers**) to **247k** in 2050 (**122k** washing machines, **125k** dryers)

- Stock
  - stock is dominated by base cases D2 and WM2.
  - total stock in 2050 is made up to **69%** from **base case D2 und WM2** (**D2: 1,1M** corresponding to **72%** of dryer market; **WM2: 0.7M**, corresponding to **66%** of washing machine market).



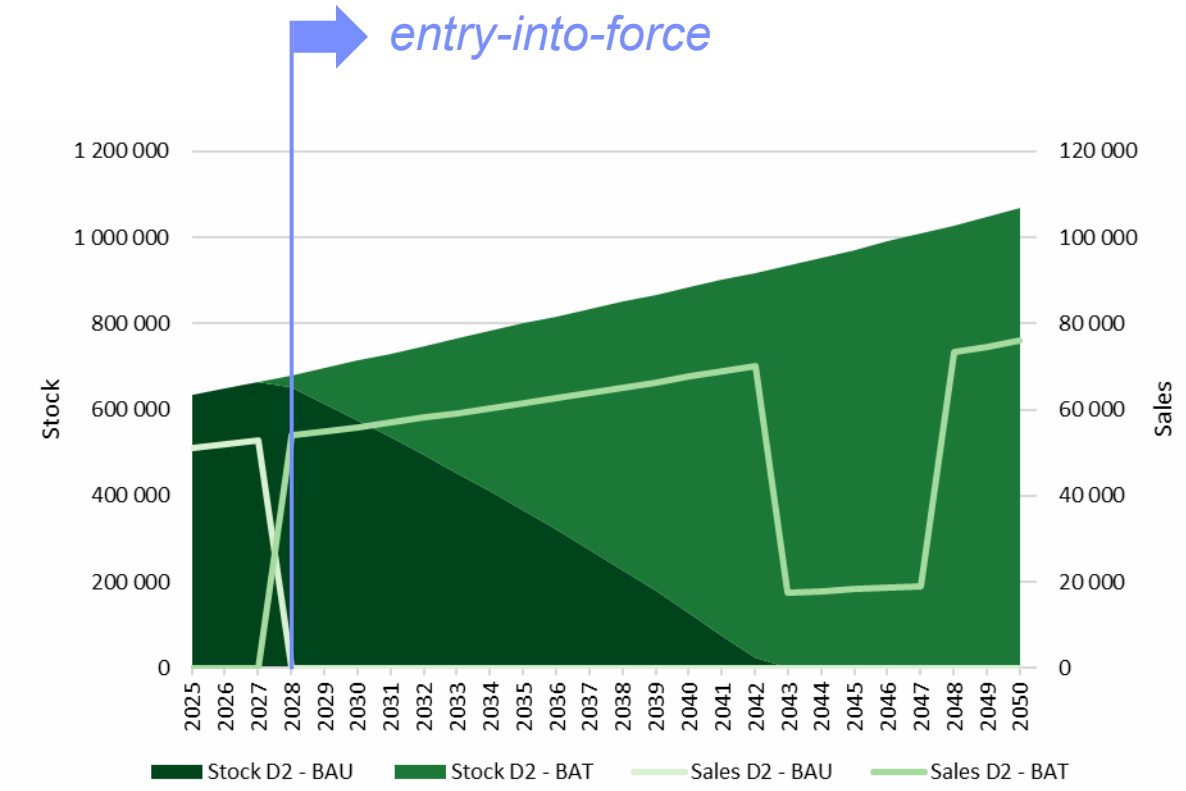
Sales in the BAU scenario



Calculated stock in the BAU scenario

Scenario analysis

- Change in stock:
  - As BAT products are introduced to the market, they **replace BAU sales from 2028 onwards** and induce a **transformation** in the stock that is **completed** in year **2043**, when 100% of the D2 market is made up of the BAT.
  - The **drop in sales** that can be observed in **2043** stems from the **changes in lifetime between the BAU and the BAT**. The lifetime is increased by five years (15 to 20 years), resulting in a **five-year period** (2043-2047) in which **zero replacement sales** are occurring since the products do not yet exit the stock. The sales that are remaining are those that represent the new sales.



Changes in the stock of the BAT scenario for base case D2 due to BAU and BAT product sales

Scenario analysis – summary of results (stock level)

		energy consumption (TWh)		emissions (Mt CO2)		auxiliary materials		costs (million Euro)						
		electricity	gas	electricity	gas	water (million m³)	detergent (kt)	product price	repair costs	electricity costs	natural gas costs	water costs	detergent costs	Total costs
Total 2025	BAU	33,074	34,755	13,854	2,878	416	516	1,159	84	7,739	2,878	795	2,117	14,772
	BAT	33,074 (+0%)	34,755 (+0%)	13,854 (+0%)	2,878 (+0%)	416 (+0%)	516 (+0%)	1,159 (+0%)	84 (+0%)	7,739 (+0%)	2,878 (+0%)	795 (+0%)	2,117 (+0%)	14,772 (+0%)
Total 2035	BAU	37,533	39,424	9,290	3,264	549	681	1,705	123	10,781	4,038	1,066	3,149	20,862
	BAT	36,965 (-2%)	38,678 (-2%)	9,150 (-2%)	3,203 (-2%)	509 (-7%)	586 (-14%)	1,809 (+6%)	139 (+13%)	10,618 (-2%)	3,962 (-2%)	989 (-7%)	2,712 (-14%)	20,229 (-3%)
Total 2050	BAU	56,277	60,721	7,501	5,028	729	904	3,043	220	21,094	8,557	1,449	5,008	39,371
	BAT	52,346 (-7%)	53,928 (-11%)	6,977 (-7%)	4,465 (-11%)	659 (-10%)	738 (-18%)	2,713 (-11%)	164 (-25%)	19,621 (-7%)	7,600 (-11%)	1,311 (-10%)	4,088 (-18%)	35,497 (-10%)

Overall: transitioning to BAT products supports both **environmental sustainability and economic benefits**.

Energy savings

- introduction of BAT products starts in 2028,
- **2025 to 2050: energy savings of 4.75% in electricity** and **6.62% in gas consumption** from 2025 to 2050, equating **to 54.80 TWh** and **81.33 TWh**, respectively.
- **2050:** savings are **3.93 TWh for electricity** and **6.79 TWh for gas**.

Greenhouse gas

- **2025 to 2050:** emissions are reduced by **9.51 Mt CO2eq.**, **a 3.72% decrease** compared to the BAU scenario.
- **2050:** emissions are reduced by **0.52 Mt CO2eq**. **for electricity** and **0.56 Mt CO2eq. for gas**.

Resource consumption

- **2025-2050**
  - water savings of **1,074 million m³ (7.18%** reduction)
  - detergent savings of **16,001 kt (13.78%** reduction).
- **2050**
  - water savings accumulate to **70 million m³ (9.56%** reduction)
  - detergent savings reach **166 kt (18.38%** reduction).

Costs

- **2025 to 2050:** BAT scenario leads to total savings of **17.98 billion Euro in electricity costs**,
- **2050:** overall savings of **3.88 billion Euro** compared to BAU.

Sensitivity analysis → 2050:

- electricity price fluctuations significantly impact total costs,
- expenses ranging from **15.70 billion Euro** in a **low-price scenario** to **23.54 billion Euro** in a **high-price scenario**.

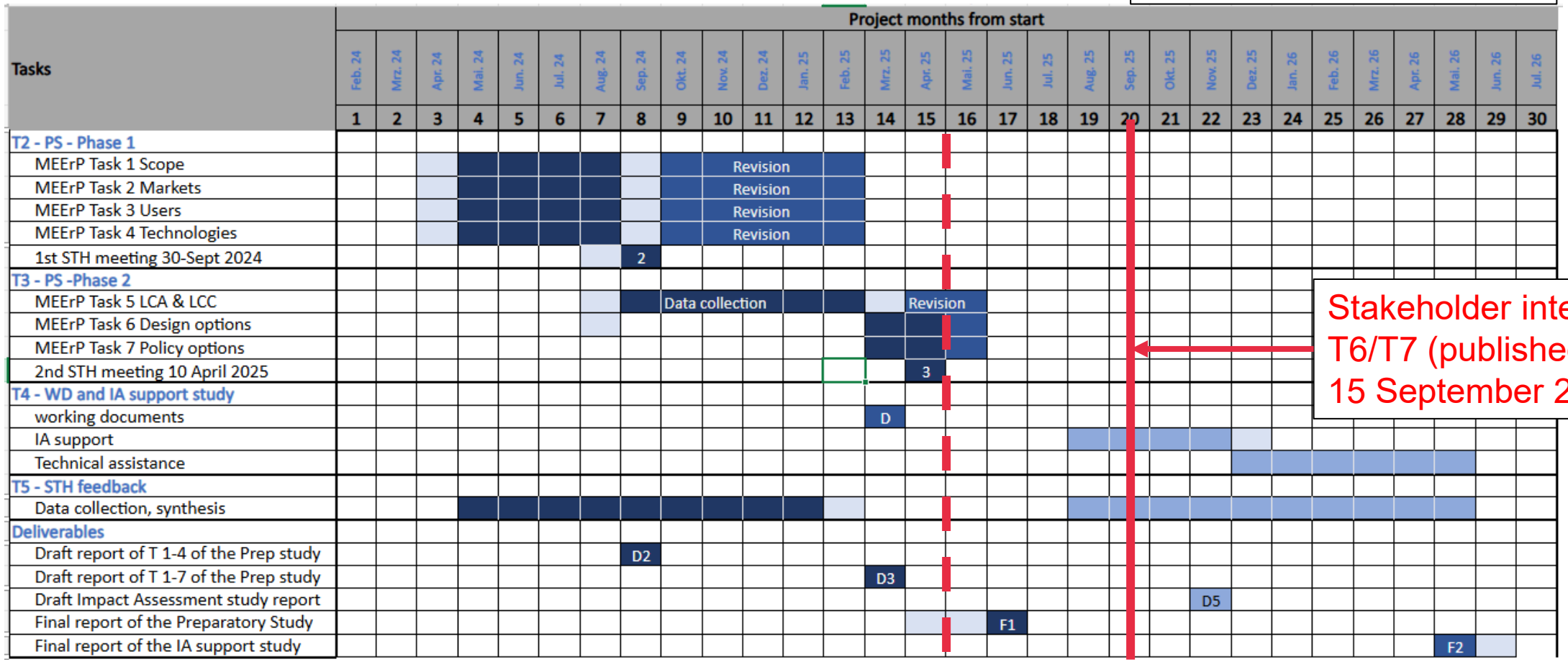
Outlook: Next steps

Oeko

Study schedule

Overall project duration: February 2024 – July 2026

Deadline for Stakeholder Feedback on T6/T7:
5 October 2025



Stakeholder interaction T6/T7 (published 4 Sep): 15 September 2025

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Thank you very much for your contribution!