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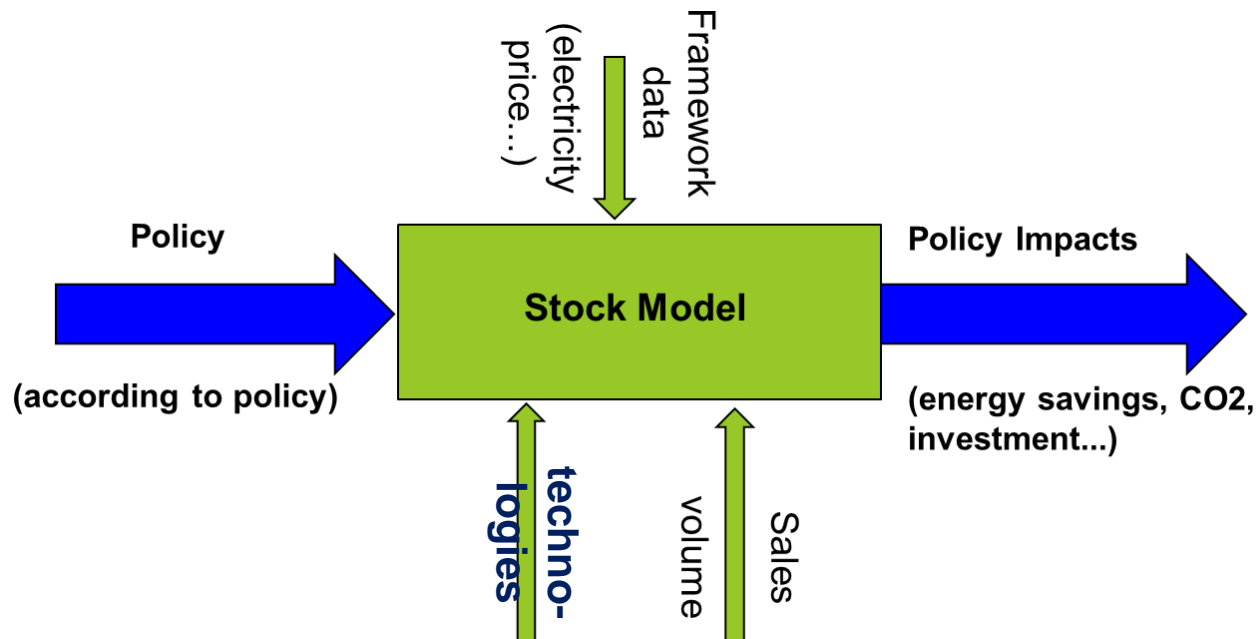
# **BASELINE REPORT: MODEL TO ASSESS THE POTENTIAL IMPACTS OF EE TECHNOLOGIES**

**ECREEE / GIZ**

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# METHODOLOGY

## Simplified Overview of the Model



- › Similar model used for Ecodesign / Energy Labelling projects for the European Commission

# SALES AND STOCK

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**Sales:** number of new appliances placed on the market in year Y

**Stock:** total number of appliances in use on the market in year Y

$$stock_{BC_i,y} = \sum_{j=y-lifetime_i+1}^y sales_{BC_i,j}$$

$$sales_{BC_i,y} = stock_{BC_i,y} - stock_{BC_i,y-1} + sales_{BC_i,y-lifetime_i+1}$$

Where:

Y = year

lifetime = lifetime of the BC

BC = Base Case

i = index of the BC

# FRAMEWORK DATA

- Electricity price: end-user price (incl. VAT) for households
- CO2 emissions: based ECOWAS 2015 (only one year was available)
- Overall Electricity demand in the region: based on ECOWAS 2018

Note: If data related to job creation are available, job impact can be assessed with the model

Year	Medium electricity rate	Electricity GHG emission	Overall Electricity Demand in the region
	[€/kWh]	[kCO2eq/kWh]	TWh/a
2019	0.11	0.705	70.43
2020	0.11	0.705	78.29
2021	0.11	0.705	87.03
2022	0.11	0.705	96.75
2023	0.11	0.705	107.56
2024	0.11	0.705	119.57
2025	0.11	0.705	132.92
2026	0.11	0.705	147.76
2027	0.11	0.705	164.26
2028	0.11	0.705	182.60
2029	0.11	0.705	202.99
2030	0.11	0.705	225.65
2031	0.11	0.705	250.85
2032	0.11	0.705	278.86
2033	0.11	0.705	310.00
2034	0.11	0.705	344.62
2035	0.11	0.705	383.10

# ASSUMPTIONS

- **BAU:** Business as Usual (average product on the market)

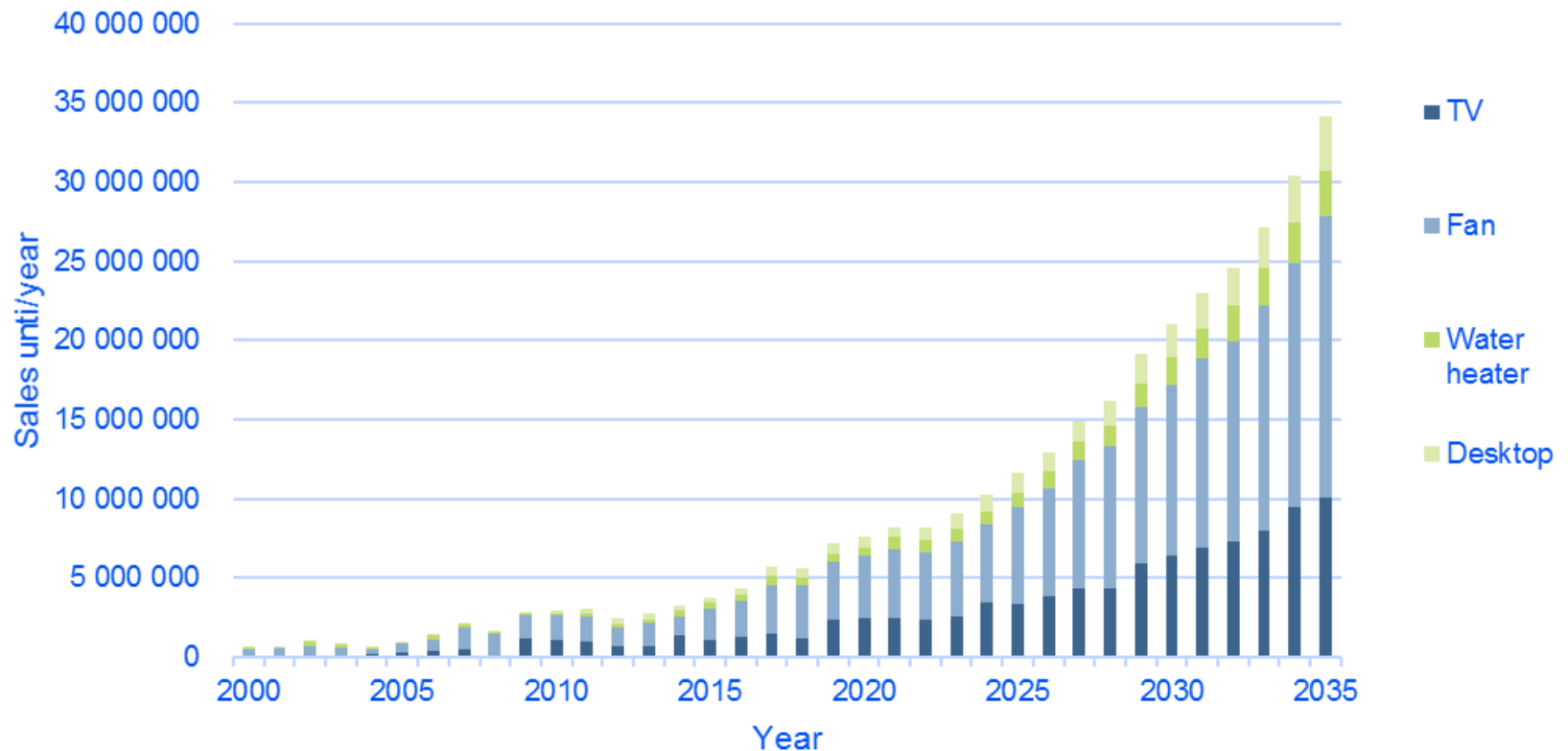
*Note: preliminary figures (national survey not completed)*

- **BAT:** Best Available Technology ( $\neq$  MEPS)

Appliance	EE Level	Technology	Size	Lifetime [a]	total year energy consumption [kWh/a]	Purchase Cost [Euro]
TV <sup>1</sup>	BAU	LCD	42"	10	285	314
TV <sup>2</sup>	BAT	LED	42"	10	95	377
Fan <sup>3</sup>	BAU	Standing	250 mm	10	115	15
Fan <sup>4</sup>	BAT	Standing	250 mm	10	45	63
Water heater <sup>5</sup>	BAU	Resistive	100 L	15	584	157
Water heater <sup>6</sup>	BAT	Resistive	100 L	15	181	188
Computer <sup>7</sup>	BAU	Desktop	Medium Performance	6	109	765
Computer <sup>8</sup>	BAT	Desktop	Medium Performance	6	68	841

# SALES

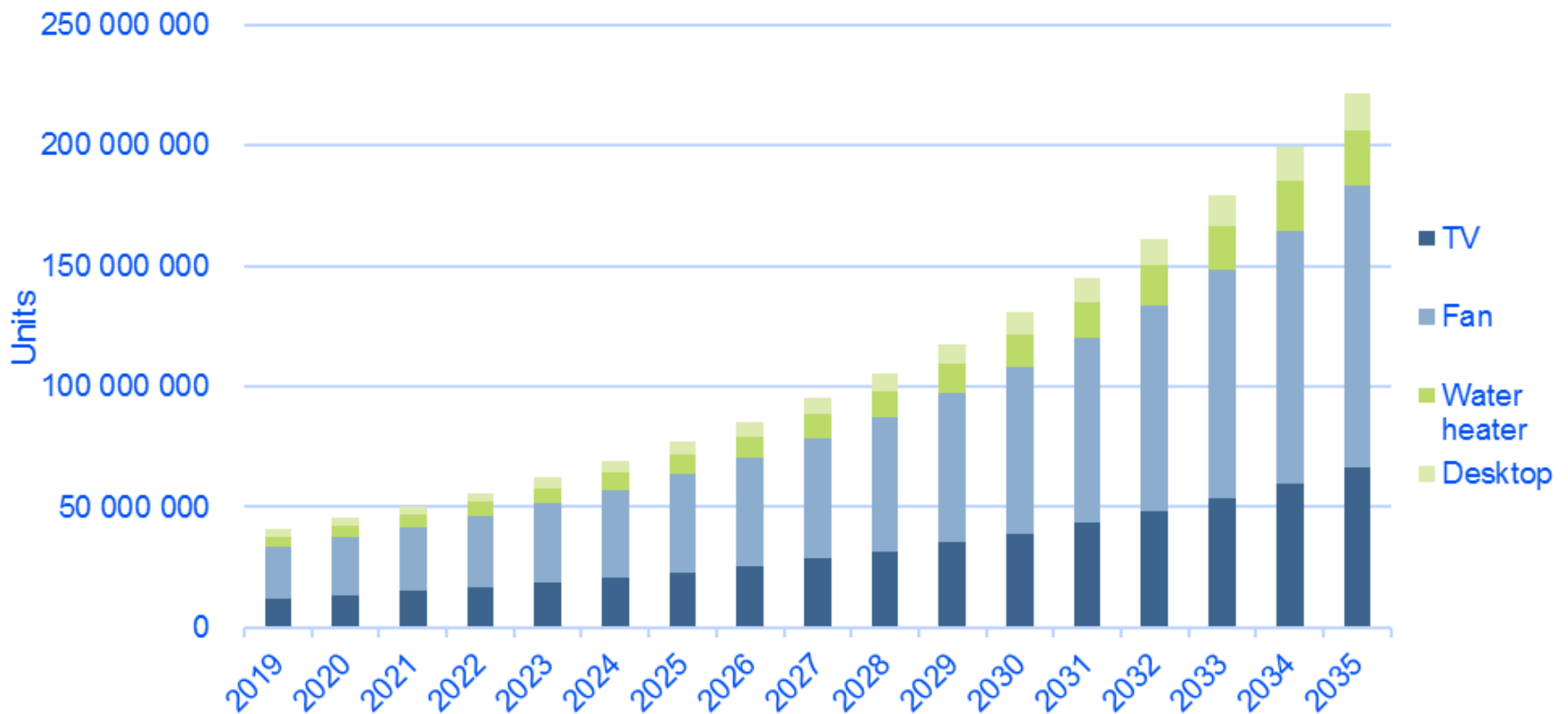
## Estimated Sales Of Appliances In The Region Until 2035



› Historical data: statistics from UN TRADECOM database

# STOCK

## Estimated Stock Of Appliances In The Region Until 2035



# SCENARIOS

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Definition:

- **Business As Usual (BAU)** scenario: the products placed on the regional market have the same level of performance as the BAU
- **Best Available Technology (BAT)** scenario: from year 2020, all new appliances placed on the market are BAT

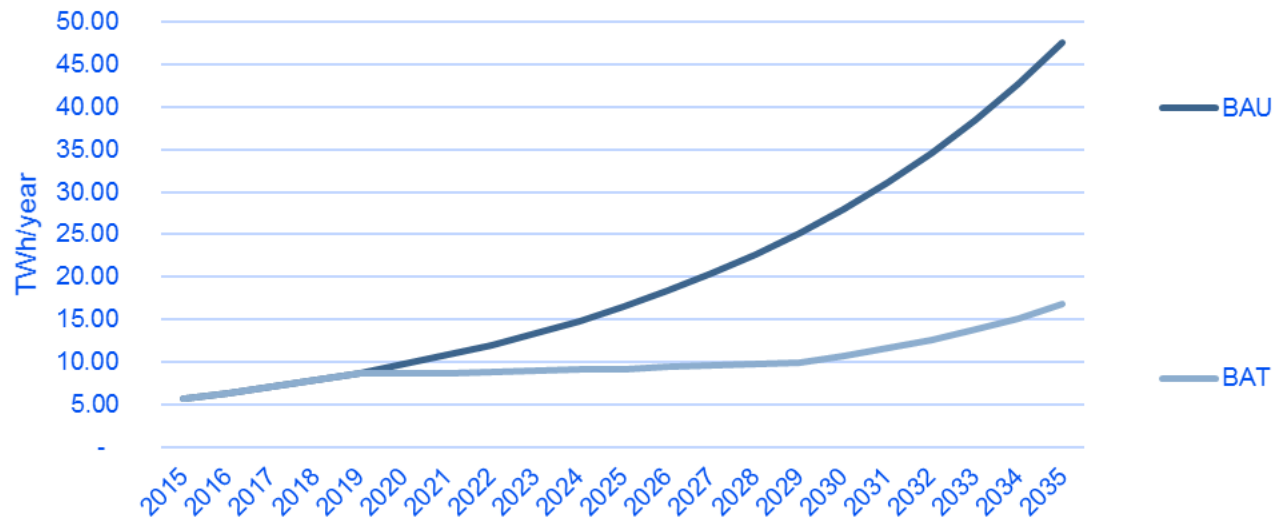


# SCENARIOS

## Energy Consumptions

→ BAT: 17 TWh vs. 47 TWh in BAU

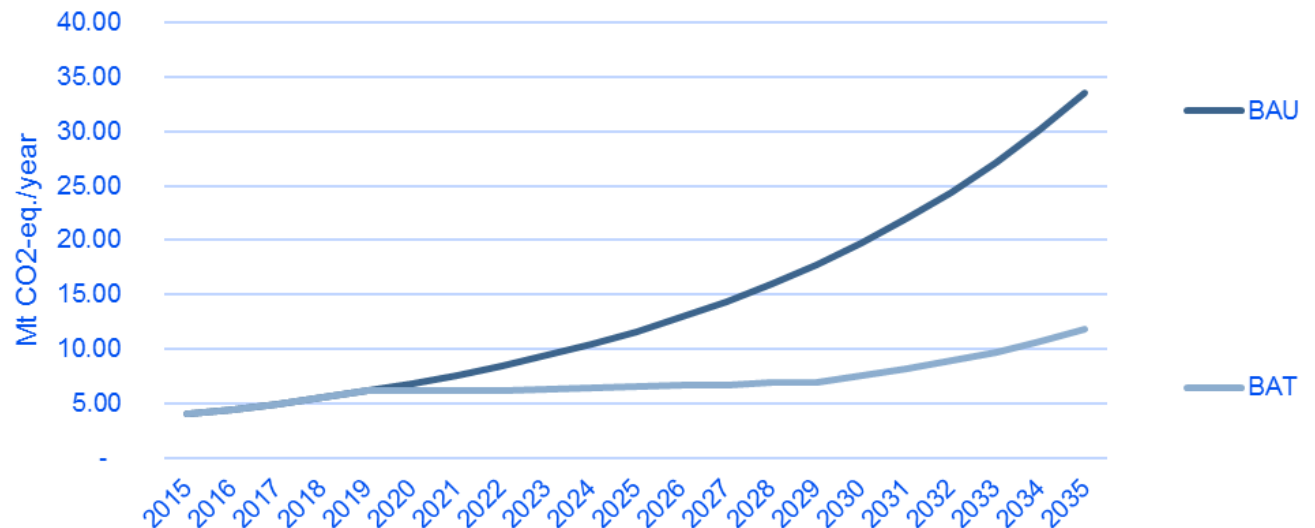
→ 2/3 savings possible in year 2035



# SCENARIOS

## GHG emissions

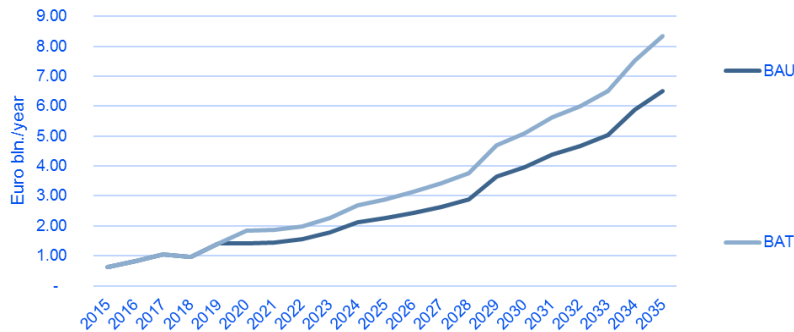
- BAT: 12 MtCO<sub>2</sub>eq vs. 33 MtCO<sub>2</sub>eq in BAU
- 2/3 savings possible in year 2035



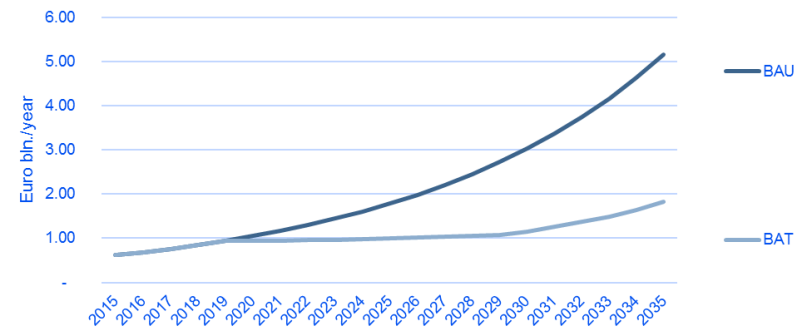
- › Note: 0,705 kgCO<sub>2</sub>eq/kWh constant (preliminary assumption)

# SCENARIOS

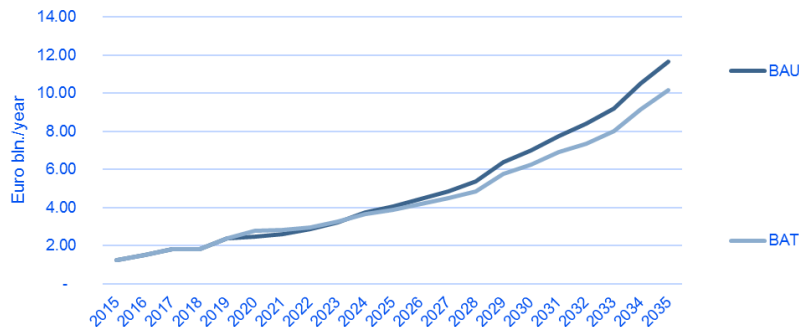
## Purchase Costs



## Energy Costs



## Total Costs (Energy + Purchase)



➔ BAT: cost benefits for the end user

# SCENARIOS

## Overall Impact On The Regional Market By 2035

		TV			Fans			Water heaters			Computers			All 4 appliances		
		BAU	BAT	Diff.	BAU	BAT	Diff.	BAU	BAT	Diff.	BAU	BAT	Diff.	BAU	BAT	Diff.
<b>ENVIRONMENT</b>																
Electricity	TWh/year	19.0	6.3	-67%	13.4	5.2	-61%	13.4	4.2	-69%	1.7	1.1	-38%	47.5	16.8	-65%
GHG	Mt CO2-eq./year	13.4	4.5	-67%	9.4	3.7	-61%	9.5	2.9	-69%	1.2	0.7	-38%	33.5	11.8	-65%
<b>CONSUMER</b>																
Expenditure	Euro bln./year	5.2	4.5	-14%	1.7	1.7	-2%	1.9	1.0	-48%	2.8	3.0	7%	11.6	10.2	-13%
of that: purchase	Euro bln./year	3.2	3.8	20%	0.3	1.1	320%	0.4	0.5	20%	2.6	2.9	10%	6.5	8.3	28%
of that: energy	Euro bln./year	2.1	0.7	-67%	1.5	0.6	-61%	1.5	0.5	-69%	0.2	0.1	-38%	5.2	1.8	-65%
Sales (regulated)	000	10 096			17 753			2 853			3 411			34 113		
Product price	Euro	314.0	377.0	20%	15.0	63.0	320%	157.0	188.4	20%	764.5	841.0	10%	190.3	244.2	28%
Energy costs	Euro/year	30.9	10.3	-67%	12.5	4.9	-61%	63.4	19.6	-69%	11.8	7.4	-38%	22.1	8.0	-64%
<b>BUSINESS</b>																
Manufacturers	Euro bln./year	3.2	3.8	20%	0.3	1.1	320%	0.4	0.5	20%	2.6	2.9	10%	6.5	8.3	28%
Electricity	Euro bln./year	2.1	0.7	-67%	1.5	0.6	-61%	1.5	0.5	-69%	0.2	0.1	-38%	5.2	1.8	-65%
Companies	Euro bln./year	0.4	0.5	20%	0.0	0.2	320%	0.1	0.1	20%	0.4	0.4	10%	0.9	1.2	28%

# PRELIMINARY CONCLUSIONS

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Based on the current assumptions (national surveys still on going)

- Computers have the lowest energy consumption and energy saving potential
- BAT level is cost effective for TVs, fans and water heaters

➔ preliminary results of the model show, that TVs, fans and water heaters are the most relevant household appliances for MEPS



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# SCENARIOS

## Overall Impact On The Regional Market By 2035

MAIN IMPACTS IN 2035			4 pre-selected appliances		
			BAU	BAT	BAT vs. BAU
ENVIRONMENT					
	Electricity	TWh/year	47.51	16.79	-65%
	GHG	Mt CO2-eq./year	33.50	11.84	-65%
CONSUMER					
Region totals	Expenditure	Euro bln./year	11.65	10.15	-13%
	of that, purchase costs	Euro bln./year	6.49	8.33	28%
	of that, energy costs	Euro bln./year	5.16	1.82	-65%
Per product sold	Sales (regulated)	000	34 113	34 113	0%
	Product price	Euro	190.31	244.21	28%
	Energy costs	Euro/year	22.13	7.97	-64%
BUSINESS					
Turnover	Manufacturers	Euro bln./year	6.49	8.33	28%
	Electricity Companies	Euro bln./year	5.16	1.82	-65%

# SCENARIOS

## Impact On The Regional TV Market By 2035

MAIN IMPACTS IN 2035			TV		
			BAU	BAT	BAT vs. BAU
ENVIRONMENT					
	Electricity	TWh/year	18.98	6.33	-67%
	GHG	Mt CO2-eq./year	13.38	4.46	-67%
CONSUMER					
Region totals	Expenditure	Euro bln./year	5.23	4.49	-14%
	of that, purchase costs	Euro bln./year	3.17	3.81	20%
	of that, energy costs	Euro bln./year	2.06	0.69	-67%
Per product sold	Sales (regulated)	000	10 096	10 096	0%
	Product price	Euro	314.00	377.00	20%
	Energy costs	Euro/year	30.92	10.31	-67%
BUSINESS					
Turnover	Manufacturers	Euro bln./year	3.17	3.81	20%
	Electricity Companies	Euro bln./year	2.06	0.69	-67%



# SCENARIOS

## Impact On The Regional Fans Market By 2035

MAIN IMPACTS IN 2035			Fan		
			BAU	BAT	BAT vs. BAU
ENVIRONMENT					
	Electricity	TWh/year	13.40	5.24	-61%
	GHG	Mt CO2-eq./year	9.45	3.70	-61%
CONSUMER					
Region totals	Expenditure	Euro bln./year	1.72	1.69	-2%
	of that, purchase costs	Euro bln./year	0.27	1.12	320%
	of that, energy costs	Euro bln./year	1.45	0.57	-61%
Per product sold	Sales (regulated)	000	17 753	17 753	0%
	Product price	Euro	15.00	63.00	320%
	Energy costs	Euro/year	12.48	4.88	-61%
BUSINESS					
Turnover	Manufacturers	Euro bln./year	0.27	1.12	320%
	Electricity Companies	Euro bln./year	1.45	0.57	-61%

# SCENARIOS

## Impact On The Water Heaters Market By 2035

MAIN IMPACTS IN 2035			Water heater		
			BAU	BAT	BAT vs. BAU
ENVIRONMENT					
	Electricity	TWh/year	13.43	4.16	-69%
	GHG	Mt CO2-eq./year	9.47	2.93	-69%
CONSUMER					
Region totals	Expenditure	Euro bln./year	1.90	0.99	-48%
	of that, purchase costs	Euro bln./year	0.45	0.54	20%
	of that, energy costs	Euro bln./year	1.46	0.45	-69%
Per product sold	Sales (regulated)	000	2 853	2 853	0%
	Product price	Euro	157.00	188.40	20%
	Energy costs	Euro/year	63.36	19.64	-69%
BUSINESS					
Turnover	Manufacturers	Euro bln./year	0.45	0.54	20%
	Electricity Companies	Euro bln./year	1.46	0.45	-69%

# SCENARIOS

## Impact On The Computers Market By 2035

MAIN IMPACTS IN 2035			Computer		
			BAU	BAT	BAT vs. BAU
ENVIRONMENT					
	Electricity	TWh/year	1.70	1.06	-38%
	GHG	Mt CO2-eq./year	1.20	0.75	-38%
CONSUMER					
Region totals	Expenditure	Euro bln./year	2.79	2.98	7%
	of that, purchase costs	Euro bln./year	2.61	2.87	10%
	of that, energy costs	Euro bln./year	0.18	0.11	-38%
Per product sold	Sales (regulated)	000	3 411	3 411	0%
	Product price	Euro	764.50	840.95	10%
	Energy costs	Euro/year	11.83	7.38	-38%
BUSINESS					
Turnover	Manufacturers	Euro bln./year	2.61	2.87	10%
	Electricity Companies	Euro bln./year	0.18	0.11	-38%

# STATISTICS - UN COMTRADE

Harmonized System (HS) Codes for: TVs, fans, electrical water heaters and computers

Appliance	HS	4 Digit Main Category	6 Digit Sub Category
TV	852872	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus Other, colour
Fans	841451	Fans	Table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output not exceeding 125 W
Electric Water Heaters	851610	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545	Electric instantaneous or storage water heaters and immersion heaters
Computer	847141	Other automatic data-processing machines	Comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined
	847149	Other automatic data-processing machines	Other automatic data-processing machines. Other, presented in the form of systems
	847130	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	Portable automatic data-processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display

# STATISTICS - UN COMTRADE

## Cumulated Statistics During The Period 2000 – 2018

Trade [in units]	Computer	Fan	TV	Water Heaters
Export	23901	76 198	93 892	2 267
Import	2549026	16 590 431	5 995 477	2 944 567
Export / Import	1%	0%	2%	0%

→ it is assumed that the production in the region is negligible

$\text{sales} = \text{import} - \text{export} + \text{production} \approx \text{import} - \text{export}$

# STATISTICS - UN COMTRADE

## Estimated Sales In The Region

Year	Computer	Fan	TV	Water Heaters
2000	29 386	472 389		128 351
2000	29 386	472 389		128 351
2001	35 664	555 171		84 284
2002	38 132	731 896		230 146
2003	42 700	618 936		145 273
2004	38 987	331 631		51 298
2005	51 558	574 814		71 719
2006	87 478	735 721		247 148
2007	33 364	1 368 310		227 825
2008	66 986	1 418 295	69 421	136 633
2009	52 643	1 484 332 <sup>1</sup>	1 142 143	155 217
2010	198 709 <sup>2</sup>	1 550 368 <sup>3</sup>	1 068 852 <sup>4</sup>	149 713 <sup>5</sup>
2011	344 774	1 616 405	995 560	144 208
2012	325 548	1 219 225	704 028	180 920
2013	418 373	1 446 743	695 885	232 488
2014	347 064	1 206 418	1 404 268	304 716
2015	103 320	536 691	51 822	53 499
2016	218 172	1 450 536	275 243	298 226
2017	266 657	1 609 951	460 512	213 066
2018 <sup>6</sup>	24 319	621 101	102 703	37 283