

Reuse versus recycling of electrical and electronic appliances: ecological assessment

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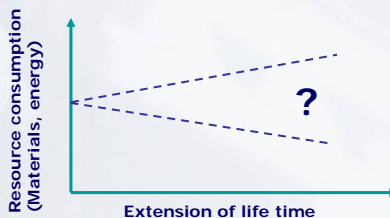
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Motivation for the study

Is reuse and repair of household appliances a contribution to environmental protection and resource conservation?

Extend use \Rightarrow less production \Rightarrow less resource consumption

Extend use \Rightarrow older products in use \Rightarrow higher energy consumption during use \Rightarrow higher total energy consumption



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➤ **Applied methods: Material Flow Analysis (MFA)
Cumulative Energy Demand (CED)**

➤ **Comparison of two scenarios:**

**Product life cycle of EEE *without* reuse (normal product life)
with reuse (extended product life)**

➤ **Eight household appliances – indicator appliances**

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Selected appliances (EEE)

EEE	Fraction Mass-%	Collection [kg/(cap.yr)]
Refrigerators, cooling units	18	0.79
Washing machines	23	1.00
Dish washers	6	0.27
TV-sets	9	0.37
Monitors (CRT)	9	0.37
PCs (excl. monitors)	2	0.09
Video-tape recorders	2	0.07
Microwaves	2	0.09
Coverage	70	3.1
EEE total	100	4.3

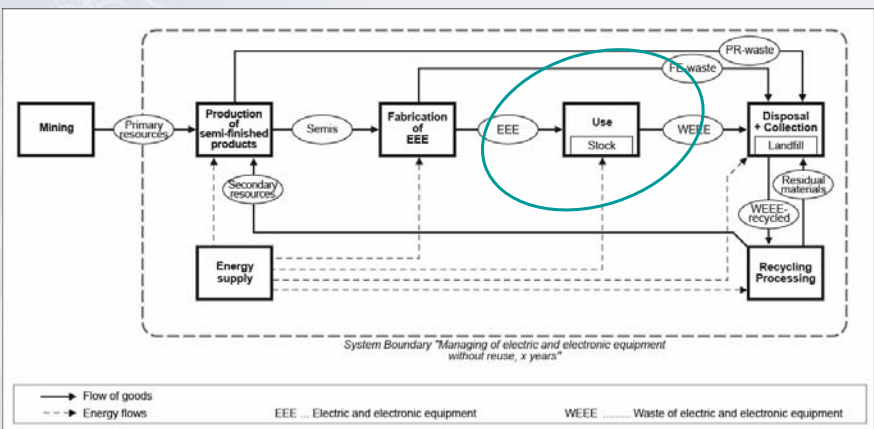
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Assumptions for life-time extensions

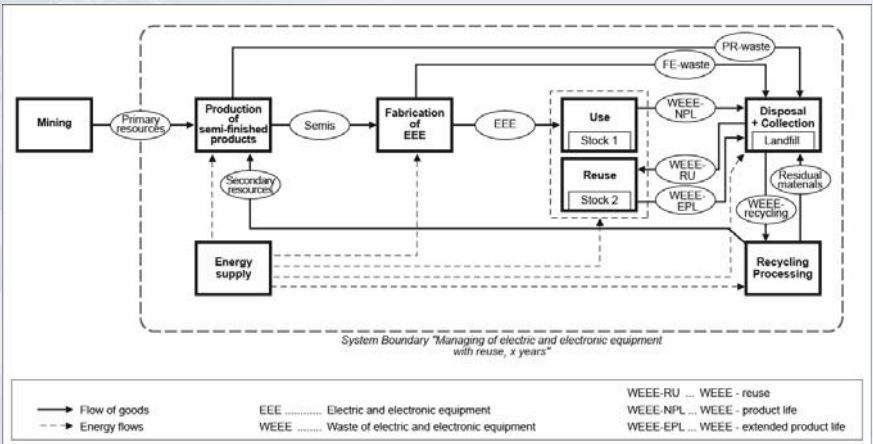
	Normal product life [years]	Extended product life [years]	Kind of appliance
Group 1	10	15	washing machine, dish washer, refrigerator, micro wave, TV
Group 2	8	12	monitor, videorecorder (DVD player)
Group 3	4	8	PC (excl. monitor)

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Scenario A



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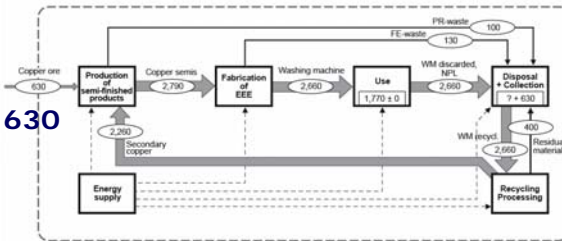
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Assumptions

- Reuse of **ALL** WEEE → Total reuse
- Appliances in use comprise a constant number (no increase by second or third acquisition)
- Chemical material composition of old and new EEE is the same
- Effects on demand of products in the economy is not considered
- Reuse has no effect on Collection, Processing and Recycling processes
- Material and energy consumption of repairing WEEE are negligible

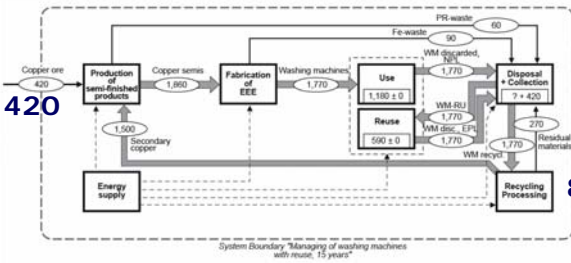
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Copper flows over 15 years, use of 1000 W



Use: 10 years

85% Recycl. efficiency



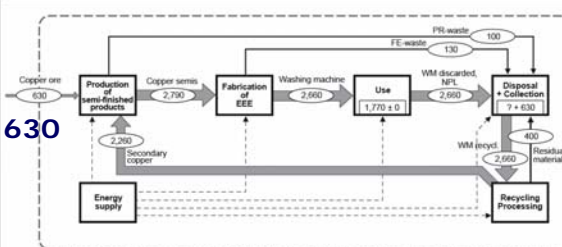
Use: 15 years

85% Recycl. efficiency

Source: Truttmann & Rechberger 2006

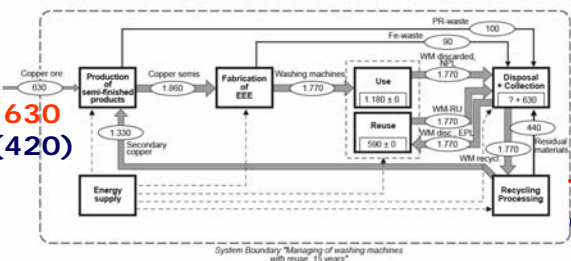
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Impact of recycling efficiency on the system



Use: 10 years

85% Recycl. efficiency



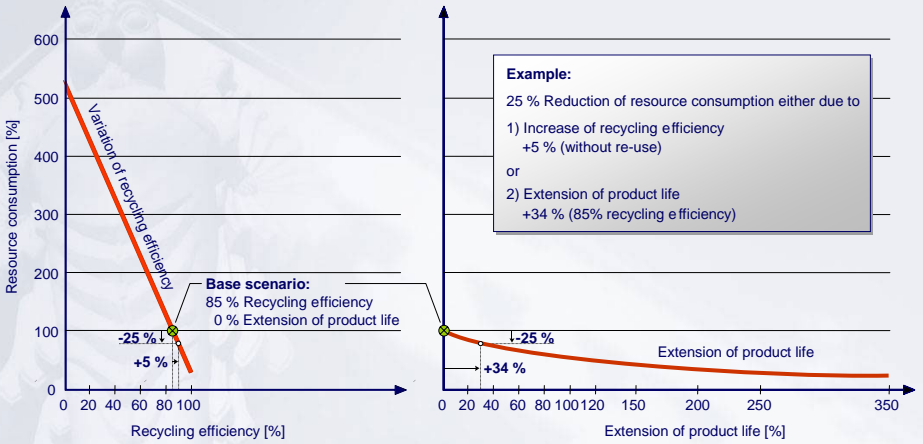
Use: 15 years

75% Recycl. Efficiency (85%)

Source: Truttmann & Rechberger 2006

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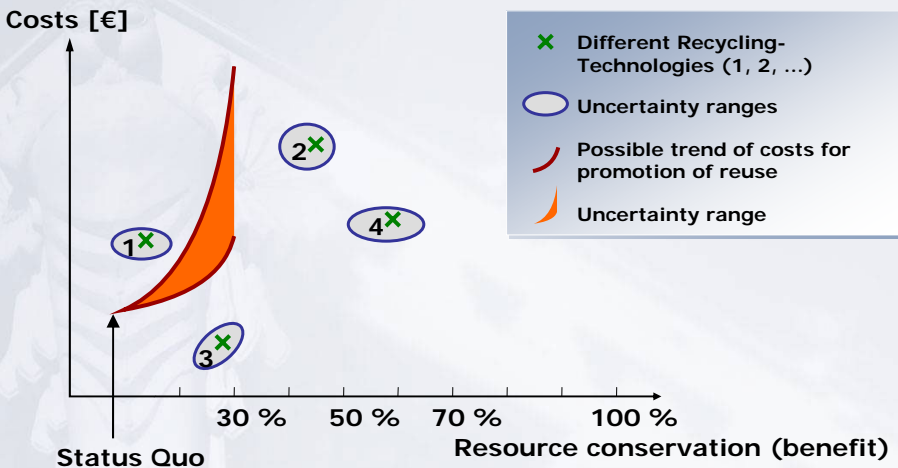
Recycling efficiency versus Reuse



Source: Truttmann & Rechberger 2006

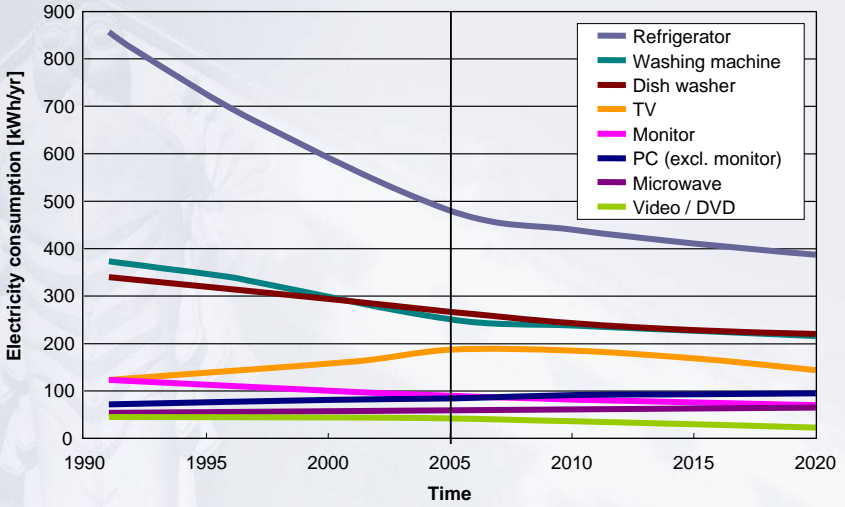
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Cost/benefit examination



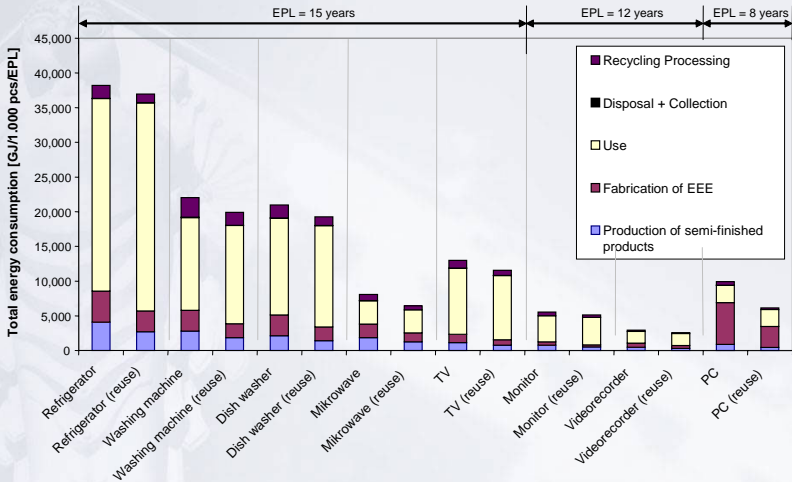
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Energy consumption of EEE



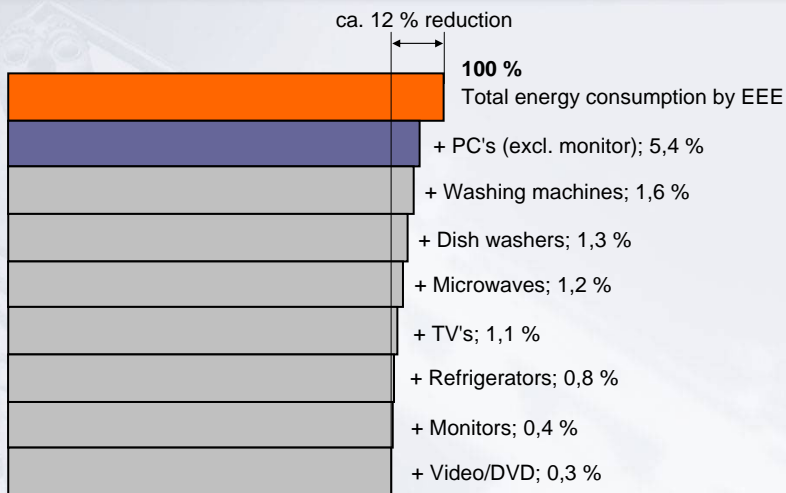
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Energy consumption of EEE

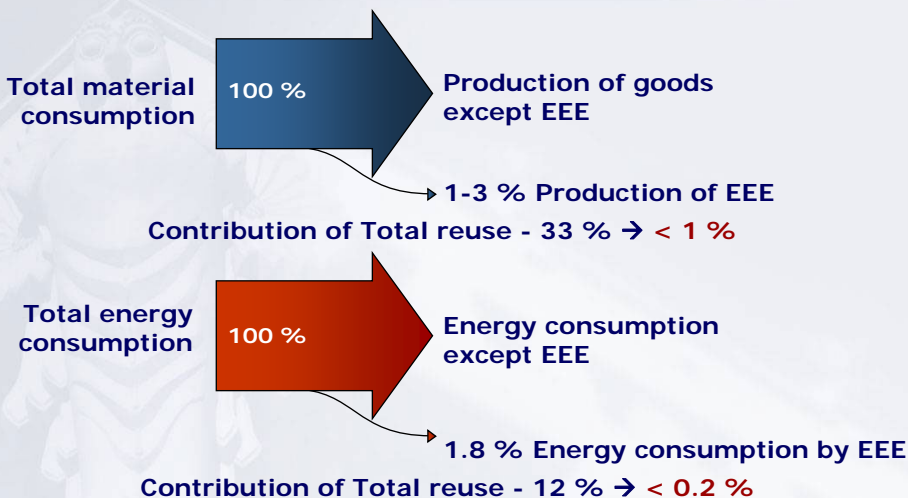


EPL .. Extended product life

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- Contribution of Total reuse on resource conservation is small < 1 %
- Recycling efficiency is more relevant
- Technological solutions more efficient than change in consumer behaviour
- CBA – Cost Benefit Analysis to decide which strategy to go

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