



Resource Efficiency in Car Body Painting - the Challenges

Herausforderung Ressourceneffizienz in der Karosserielackierung

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www.lcslcs.de



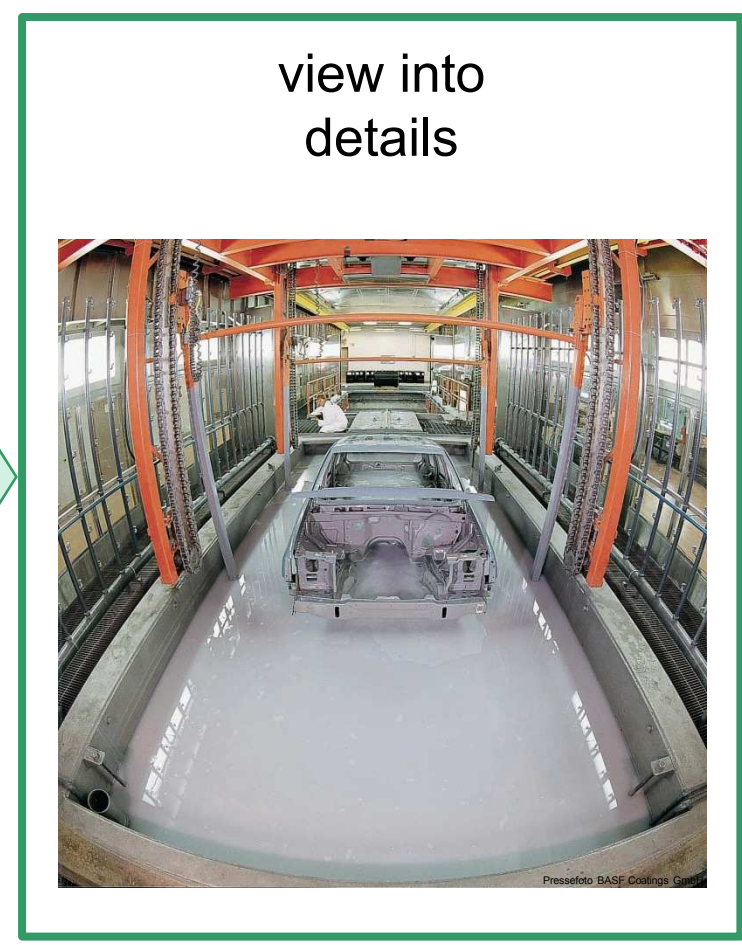
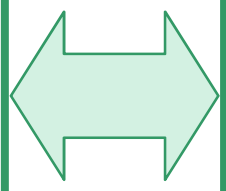
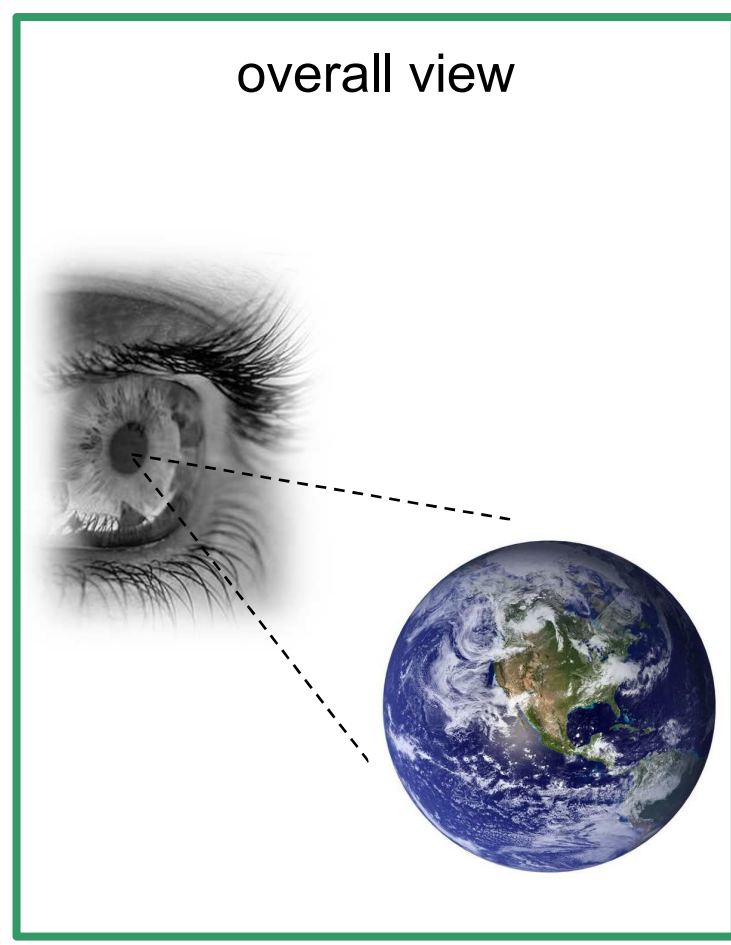
Resource Efficiency in Car Body Painting - the Challenges

Overview

- **Resource Efficiency - Introduction**
- **Resource Efficiency - Status Quo**
- **Resource Efficiency - the Challenges**
- **Outlook**

Resource Efficiency - Introduction

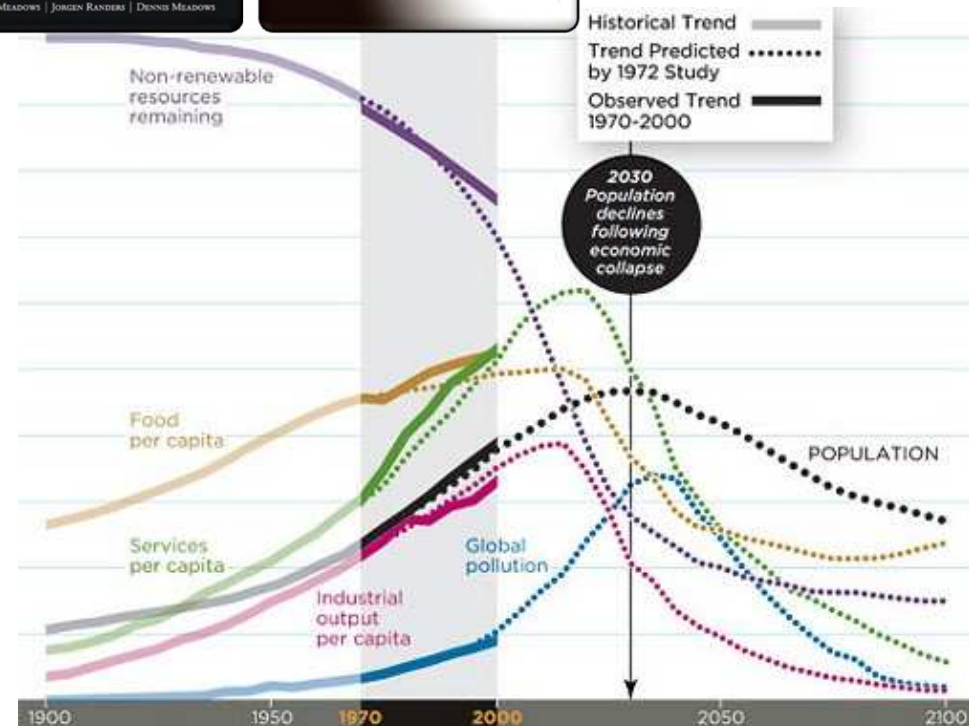
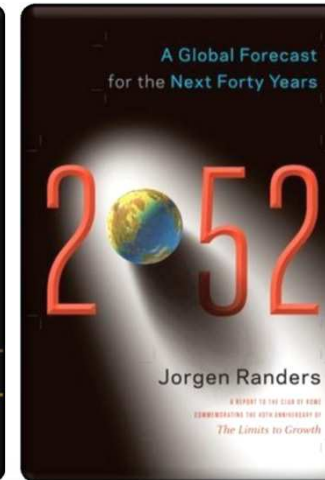
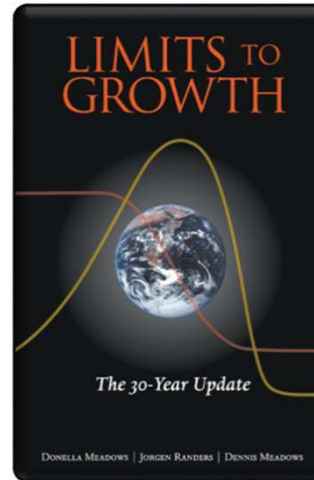
Viewing Angle



Resource Efficiency - Introduction

Central Statement of the Club of Rome

- In 2040 the population will reach a record high (8,1 billion)
- Climate change will persist (global warming, decline in species diversity, reduction of the ice in the Arctic, etc.)
- Focus on short-term purposes prevent wise decisions for long-term wellbeing
- “Business as usual is not an option if we want our grandchildren to live in a sustainable and equitable planet”



Source: 2052: A Global Forecast for the Next Forty Years, 2012
The Limits of Growth: The 30-Year Update, 2004

Resource Efficiency - Introduction

WWF Living Planet Report 2012

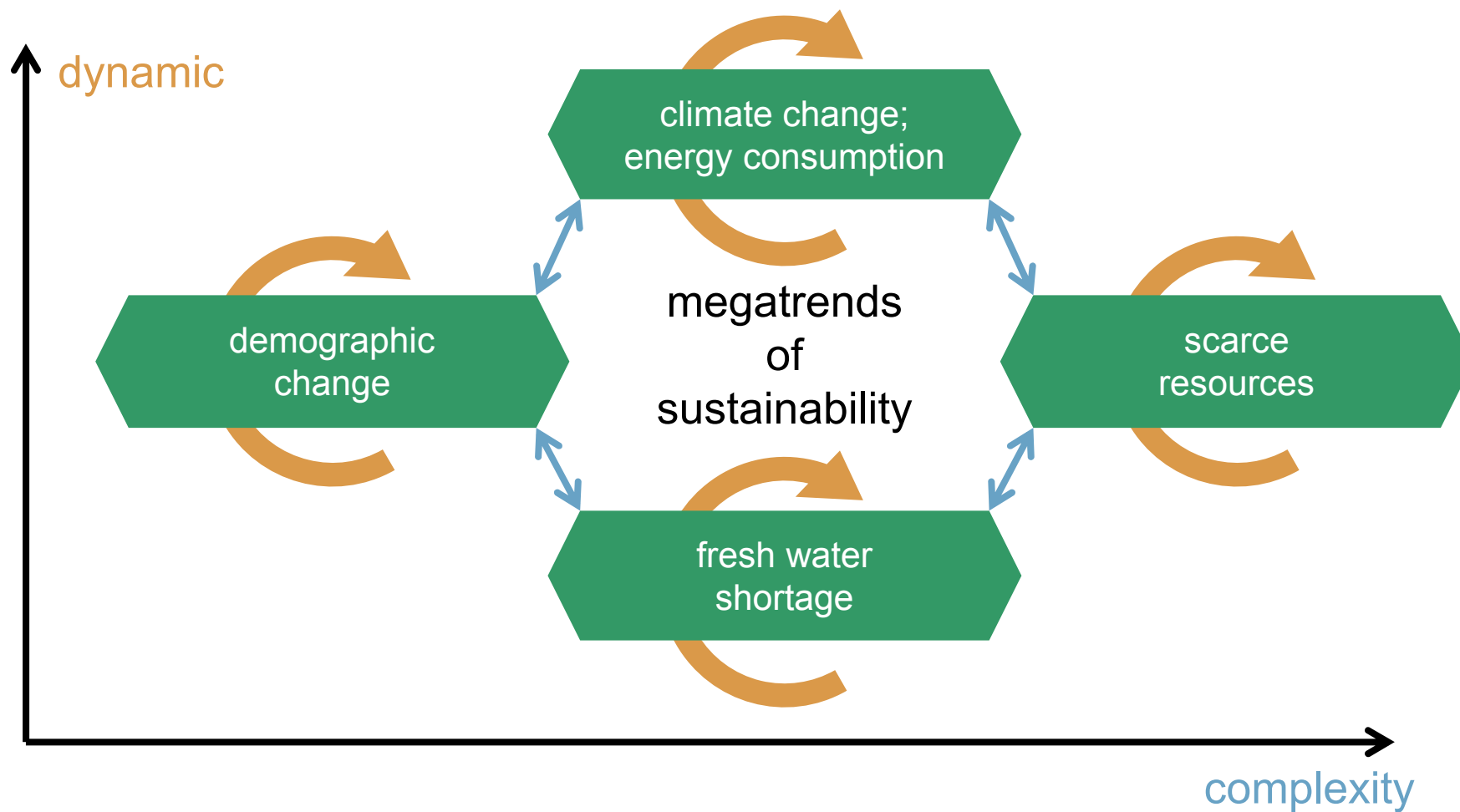
- The state of the planet: biodiversity has declined globally, human demand on the planet exceed supply, water scarcity
- Rising greenhouse gas emissions and global temperature have significant impacts on biodiversity, water, ecosystems, food and human wellbeing in general
- „Do Nothing“ scenario is not an alternative. WWF proposes to manage, govern and share natural capital within the earth's natural boundaries





Resource Efficiency - Introduction

Challenges for a Sustainable Future



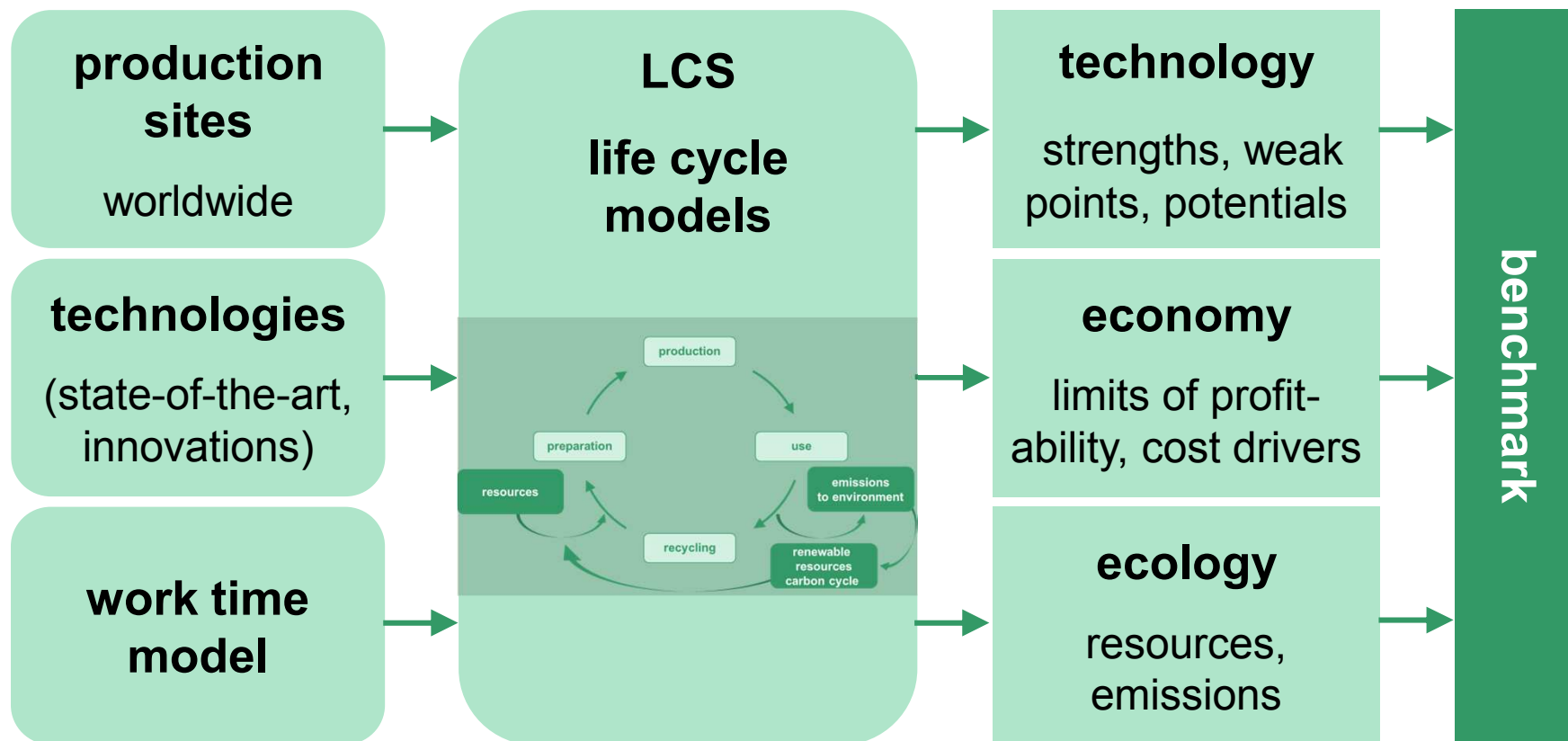
Knowledge management of increasing "dynaxity*"

*Dynaxity = Dynamics + Complexity
Source: megatrends of sustainability, Bundesministerium für Umwelt, Berlin, 2008



Resource Efficiency - Introduction

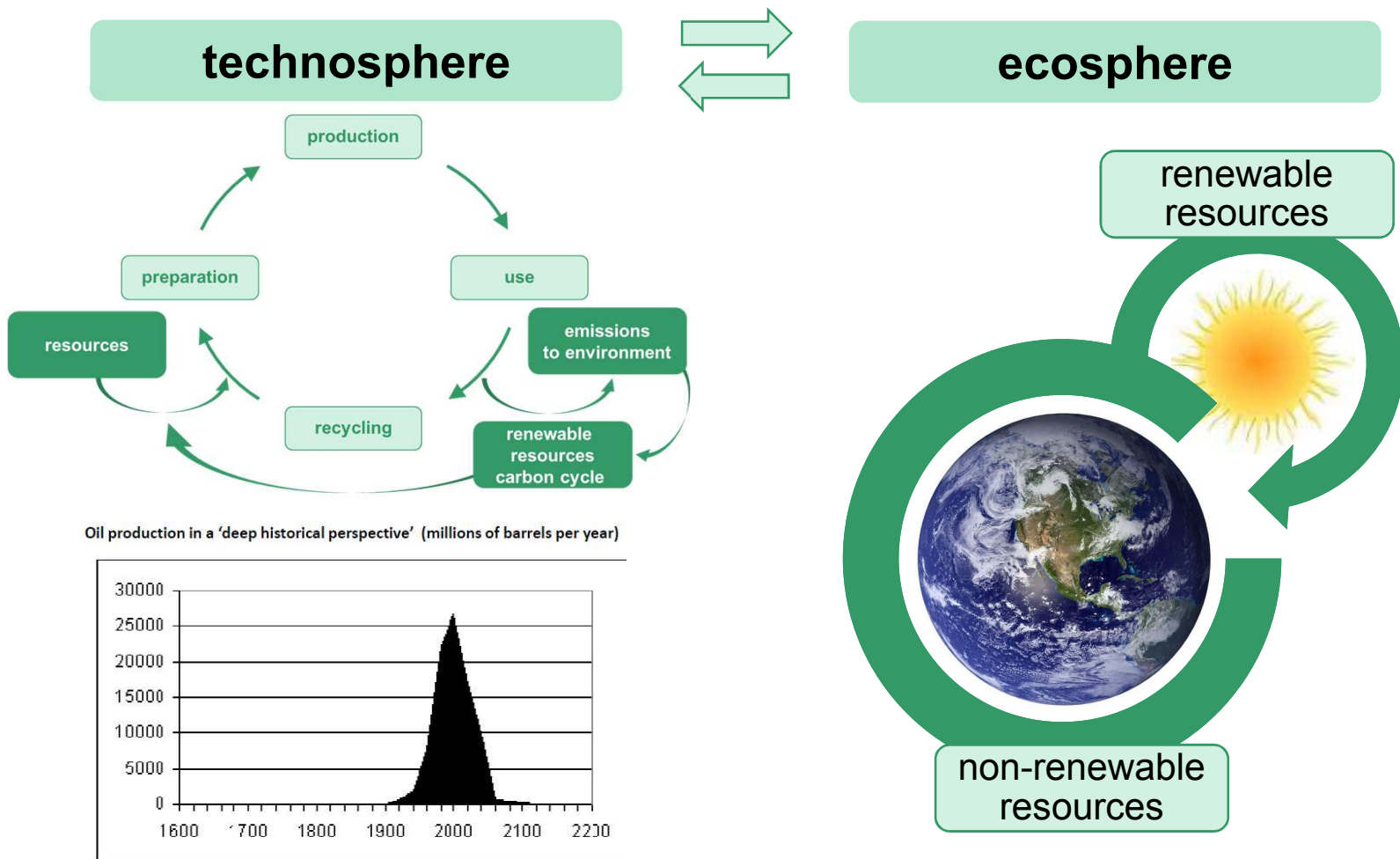
Knowledge Management - Part of LCS Services



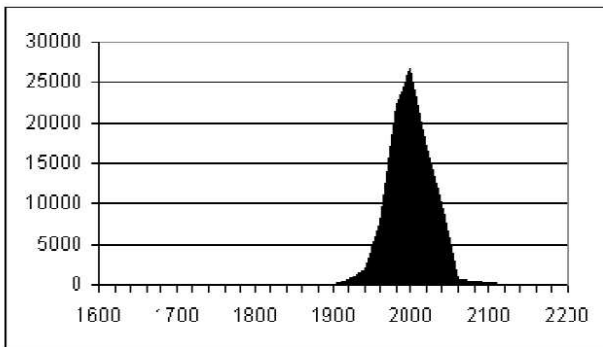
Understand (transparency) – rearrange – evaluate – implement

Resource Efficiency - Introduction

Interaction between Technosphere and Ecosphere



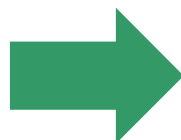
Oil production in a 'deep historical perspective' (millions of barrels per year)



React to permanently changing boundary conditions

Resource Efficiency - Introduction

Resource Efficiency in Europe



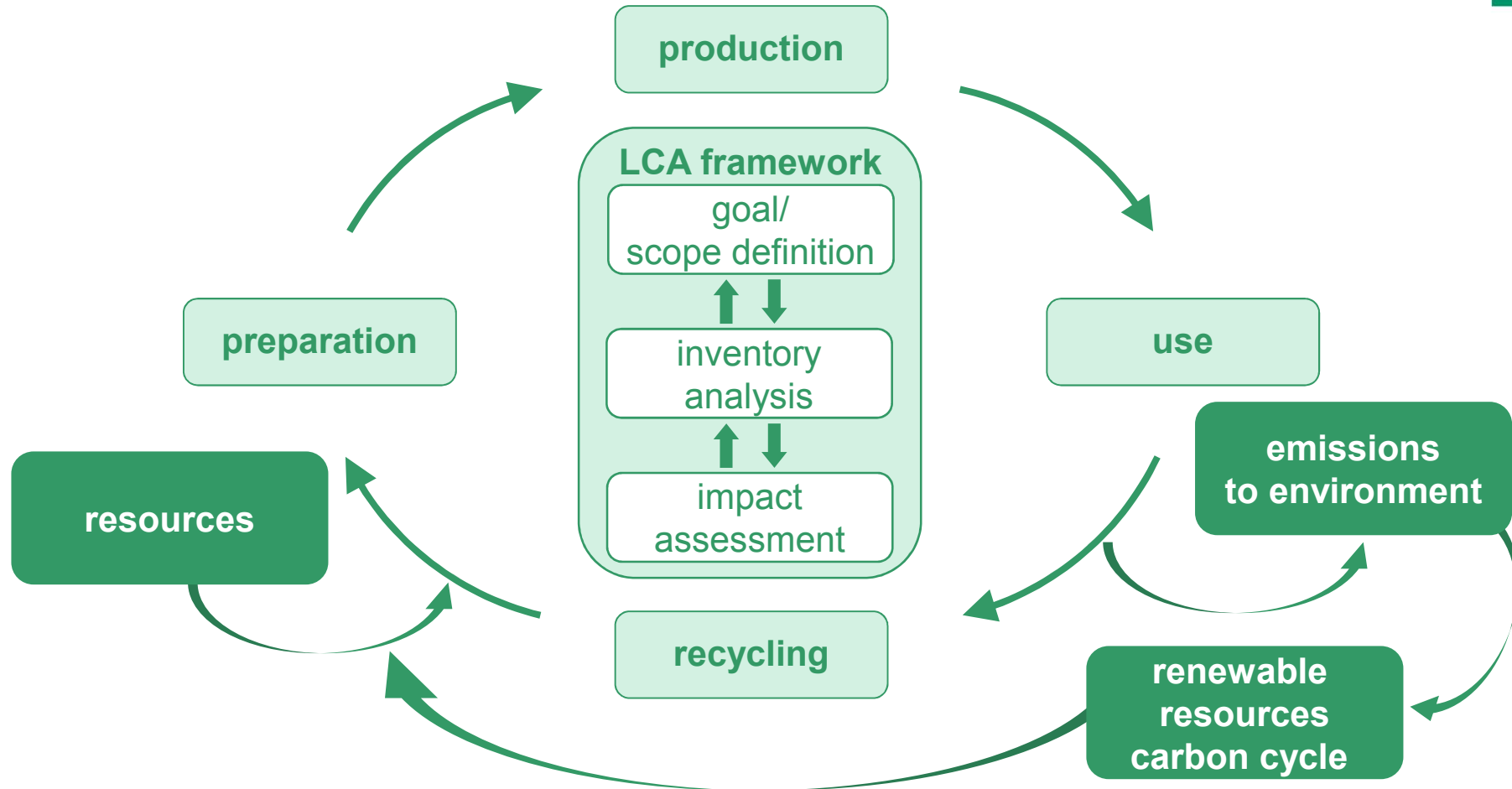
No standardised definition of resource efficiency within the EU

Source: European Environment Agency (EEA), 2011



Resource Efficiency - Introduction

Tool for Measuring Resource Efficiency: Life Cycle Assessment (LCA)



Life Cycle Assessment (ISO standards 14040 & 14044):
The measure of resource efficiency



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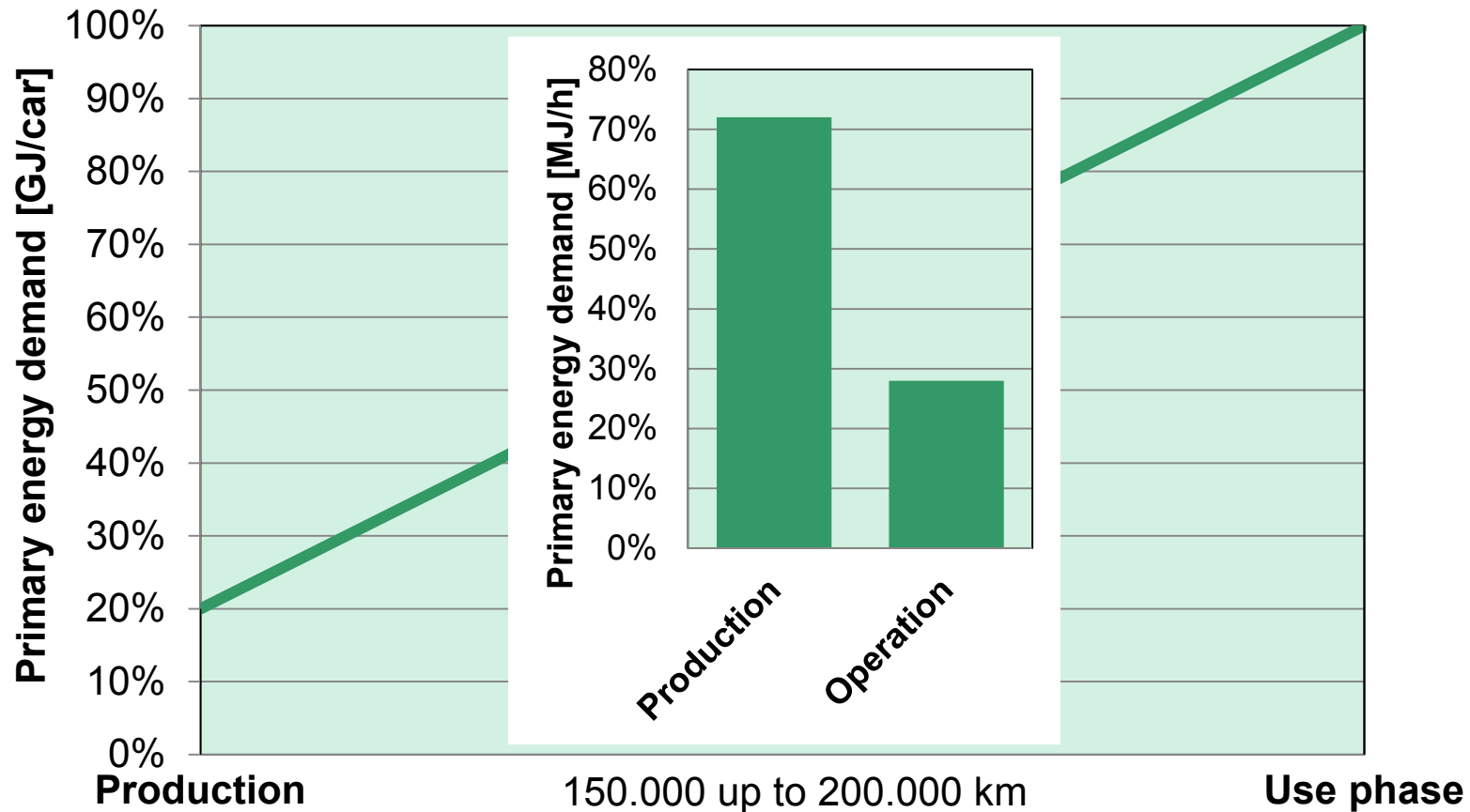


Resource Efficiency - Status Quo

Life Cycle Perspective

Graphic does not show energy requirement per time

LCS estimations: total production: 240 h/car; operation: 3.333 h/car (60 km/h, 200.000 km)

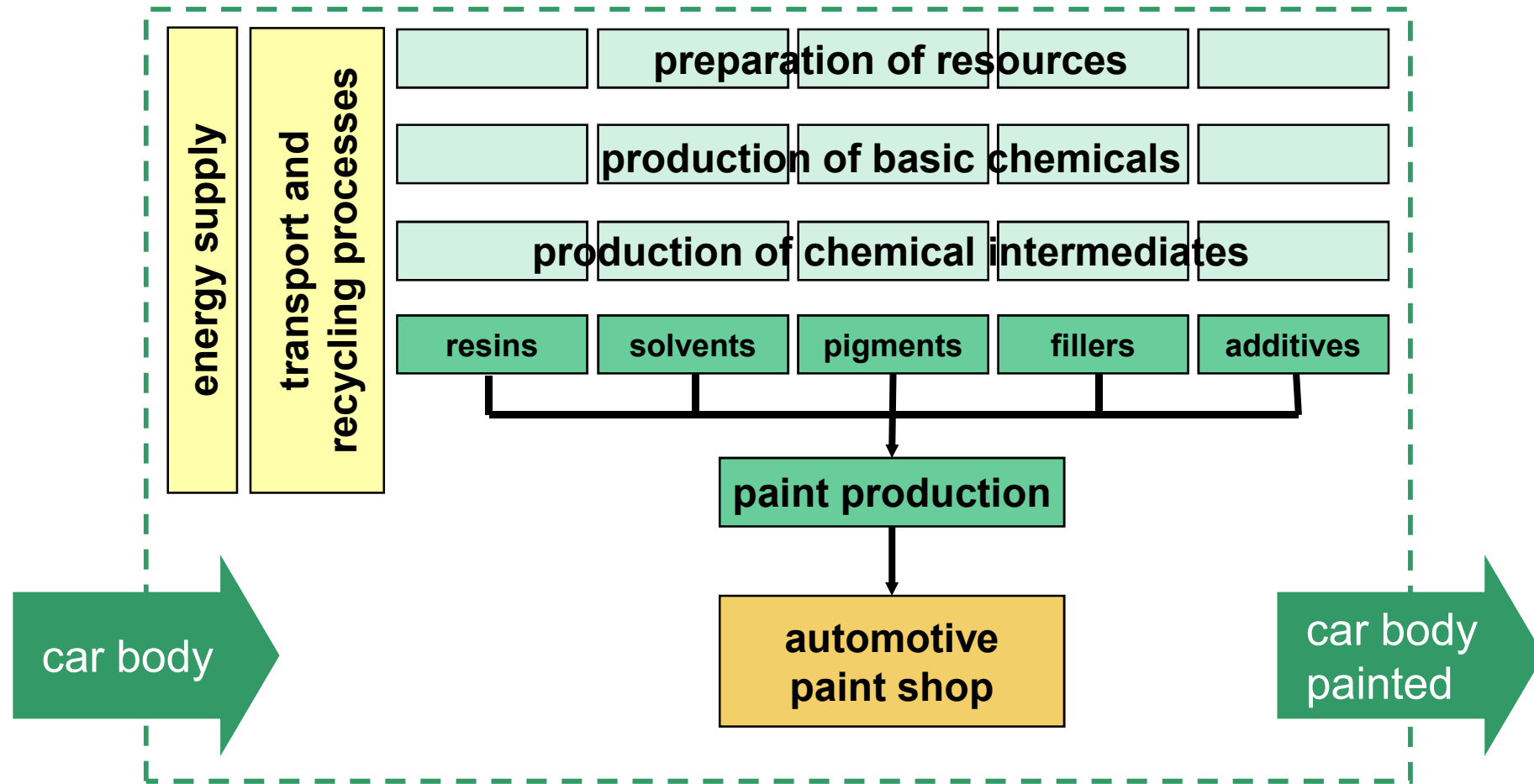


Resource efficiency in production is important



Resource Efficiency - Status Quo

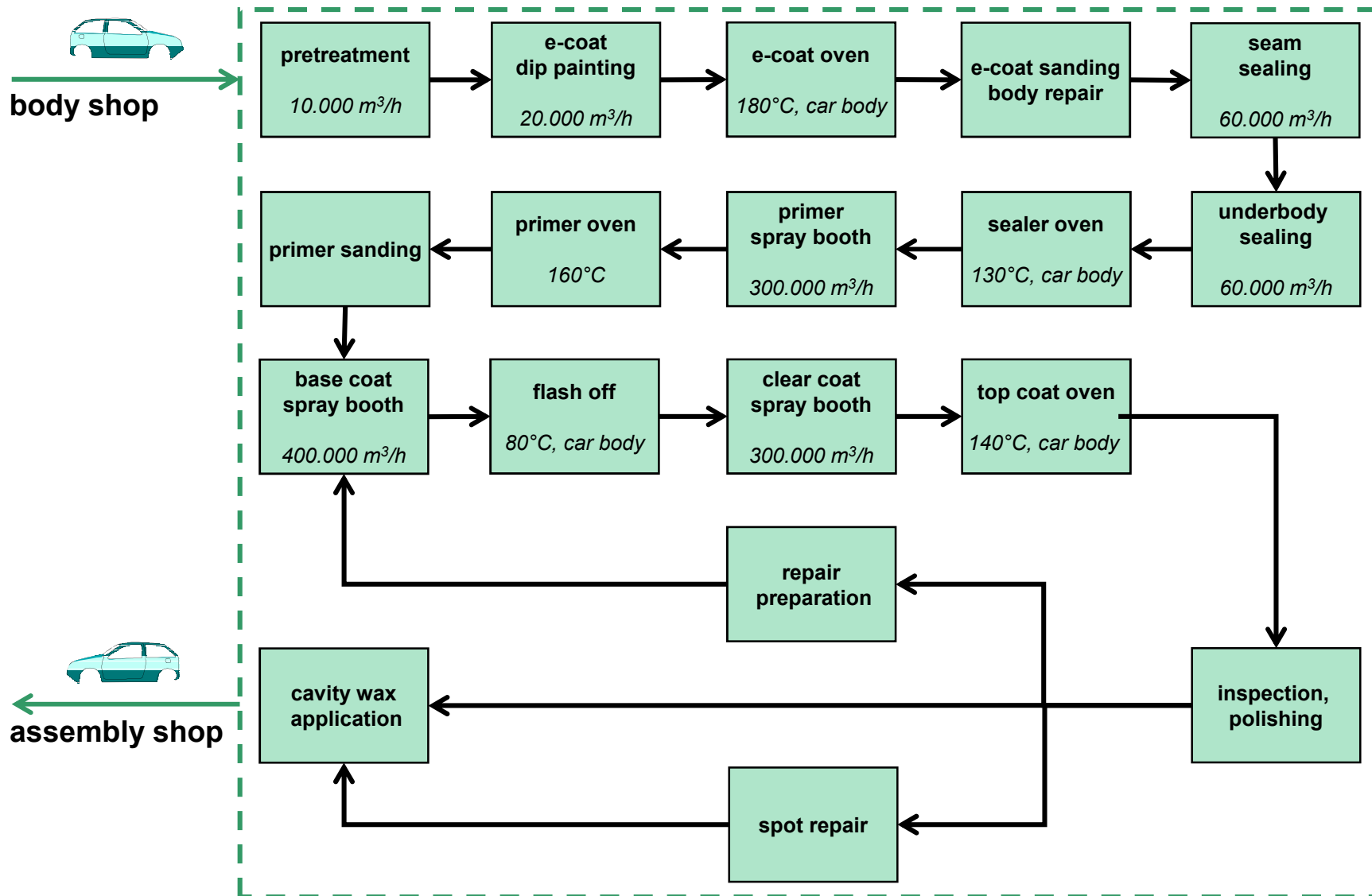
Standard Automotive Painting Process - System Boundary for Comparison





Resource Efficiency - Status Quo

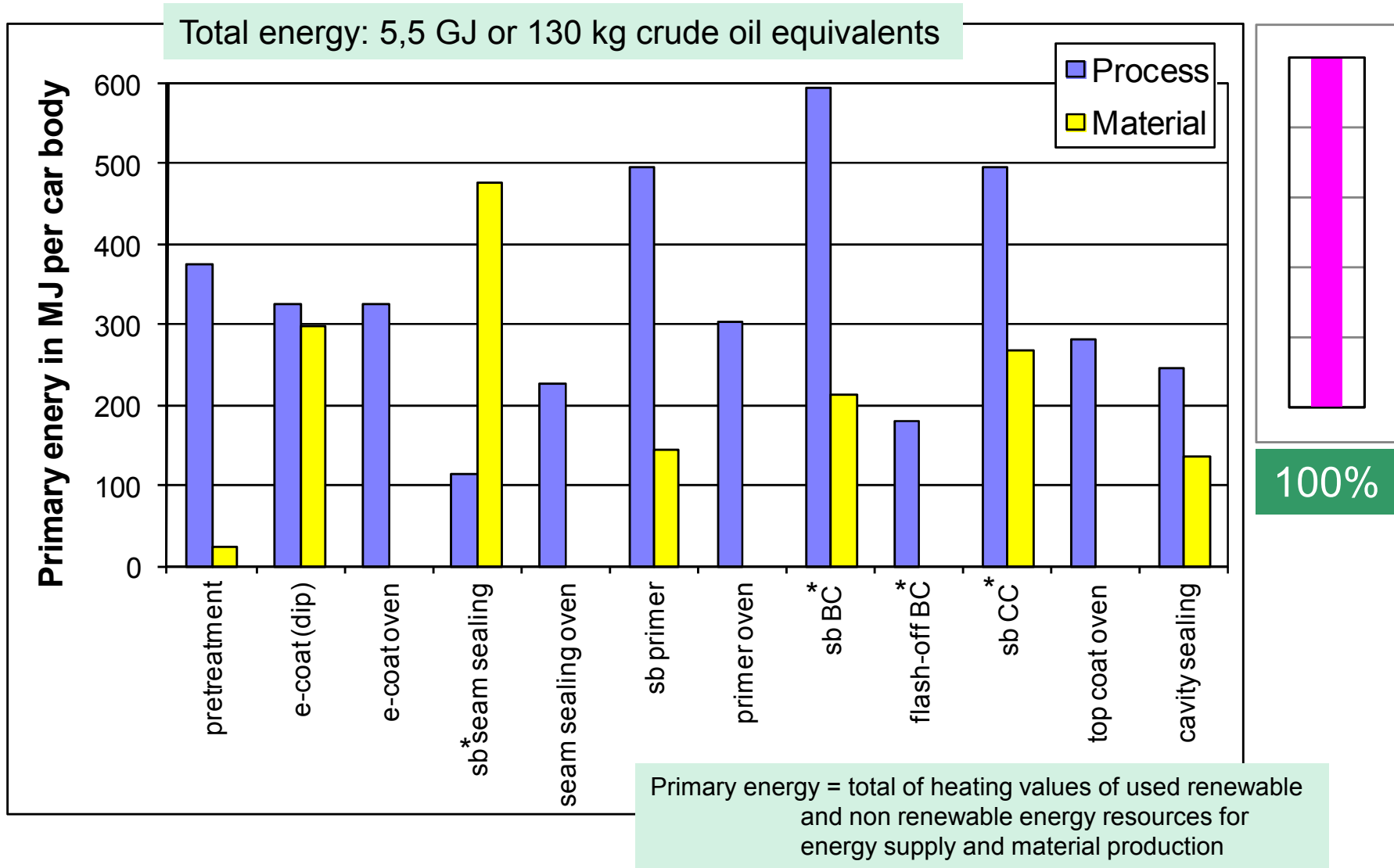
Standard Automotive Painting Process - Overview Process Steps





Resource Efficiency - Status Quo

Standard Automotive Painting Process - Starting Point

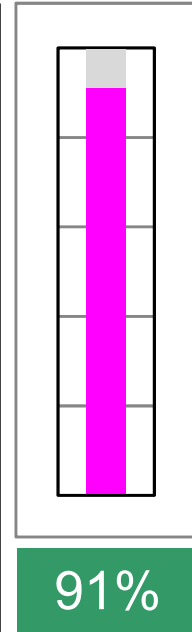
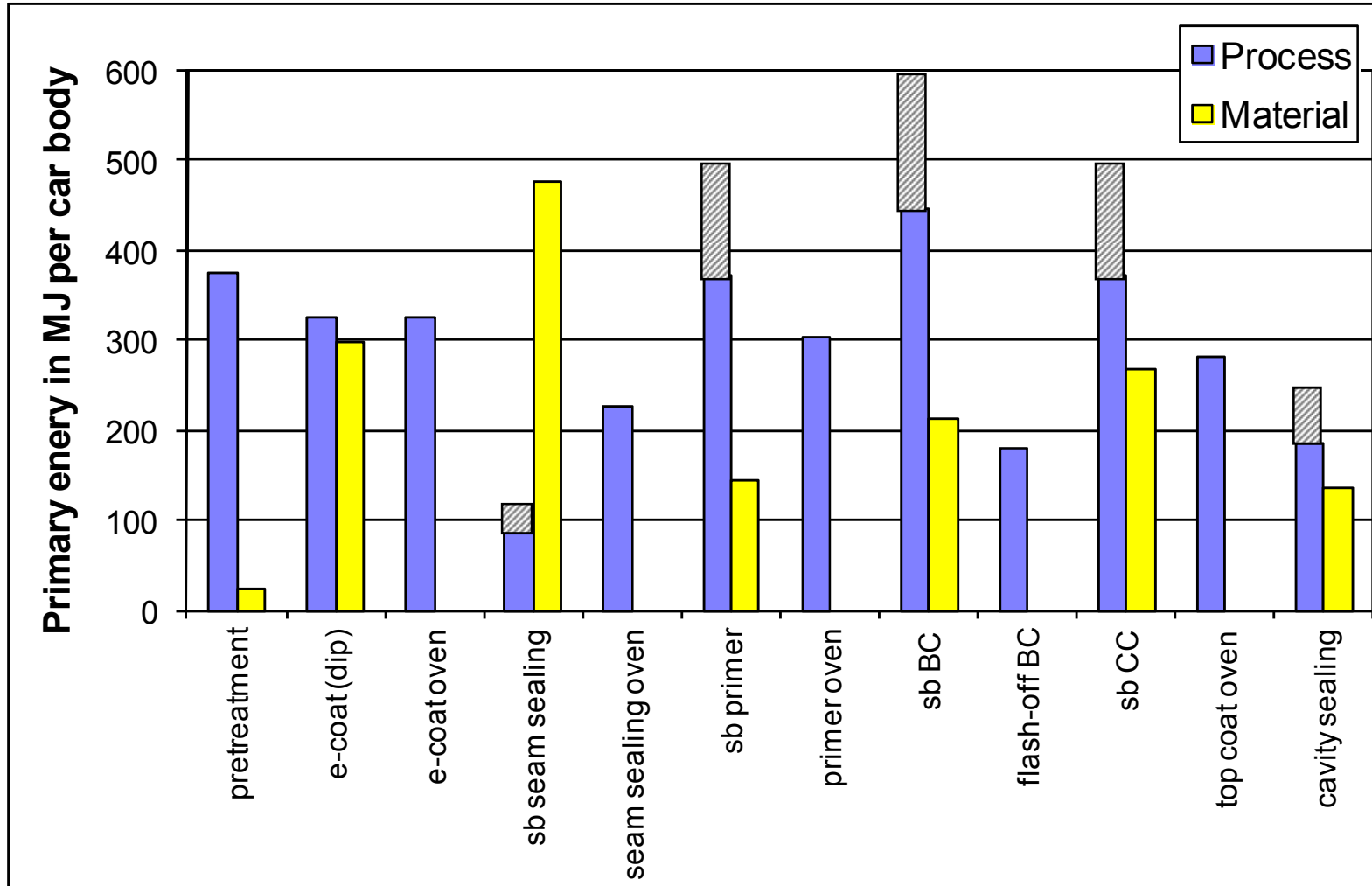


*sb = spray booth, BC = base coat, CC = clear coat



Resource Efficiency - Status Quo

Standard Automotive Painting Process - Optimization Step 1

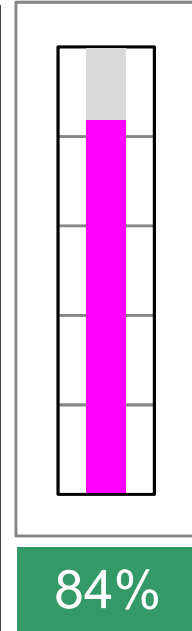
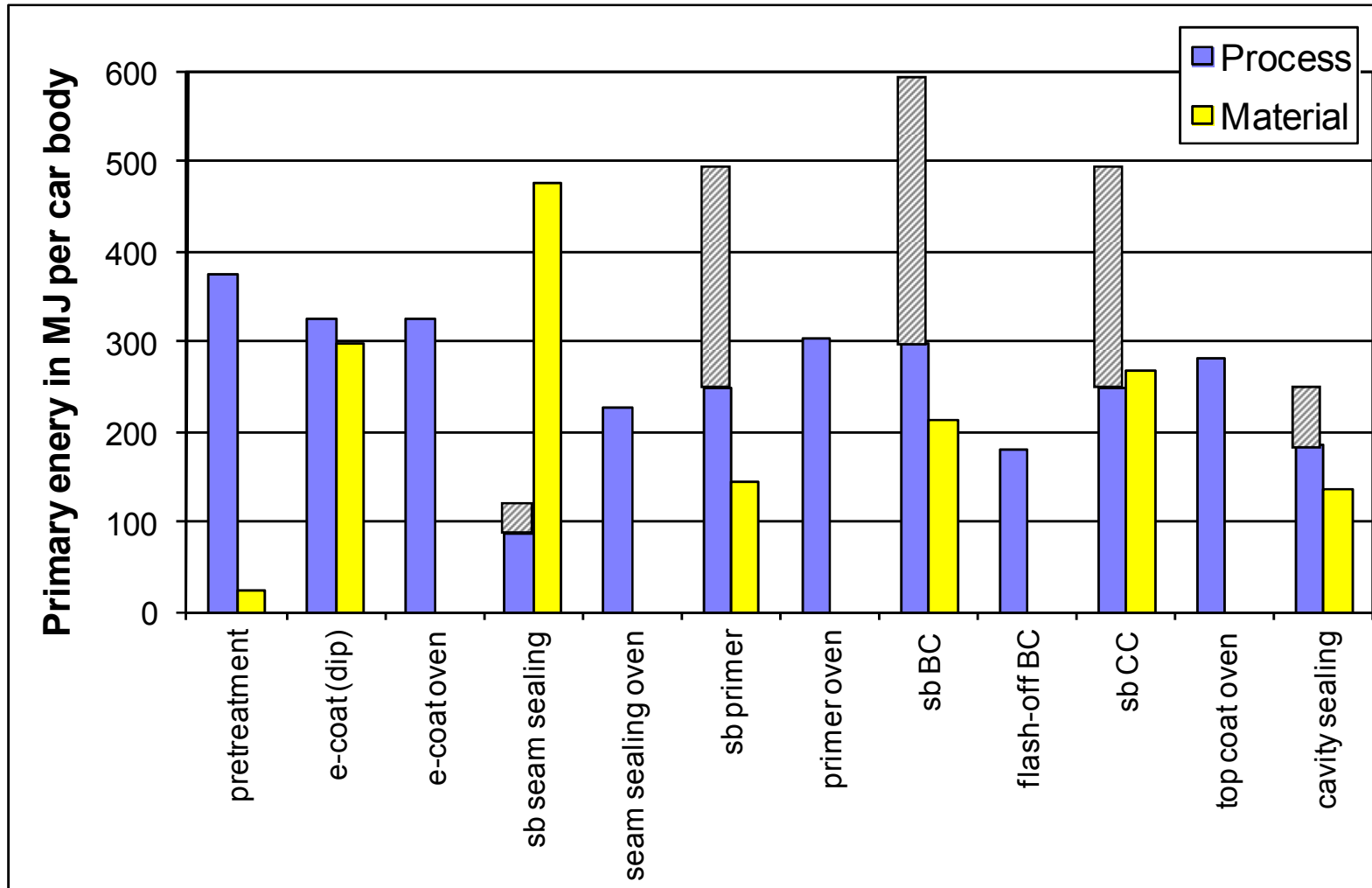


heat recovery in spray booths



Resource Efficiency - Status Quo

Standard Automotive Painting Process - Optimization Step 2

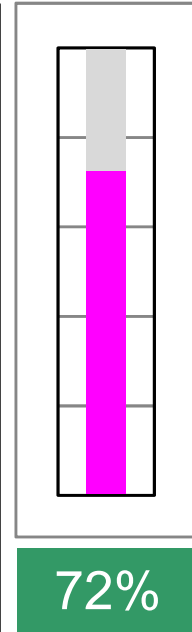
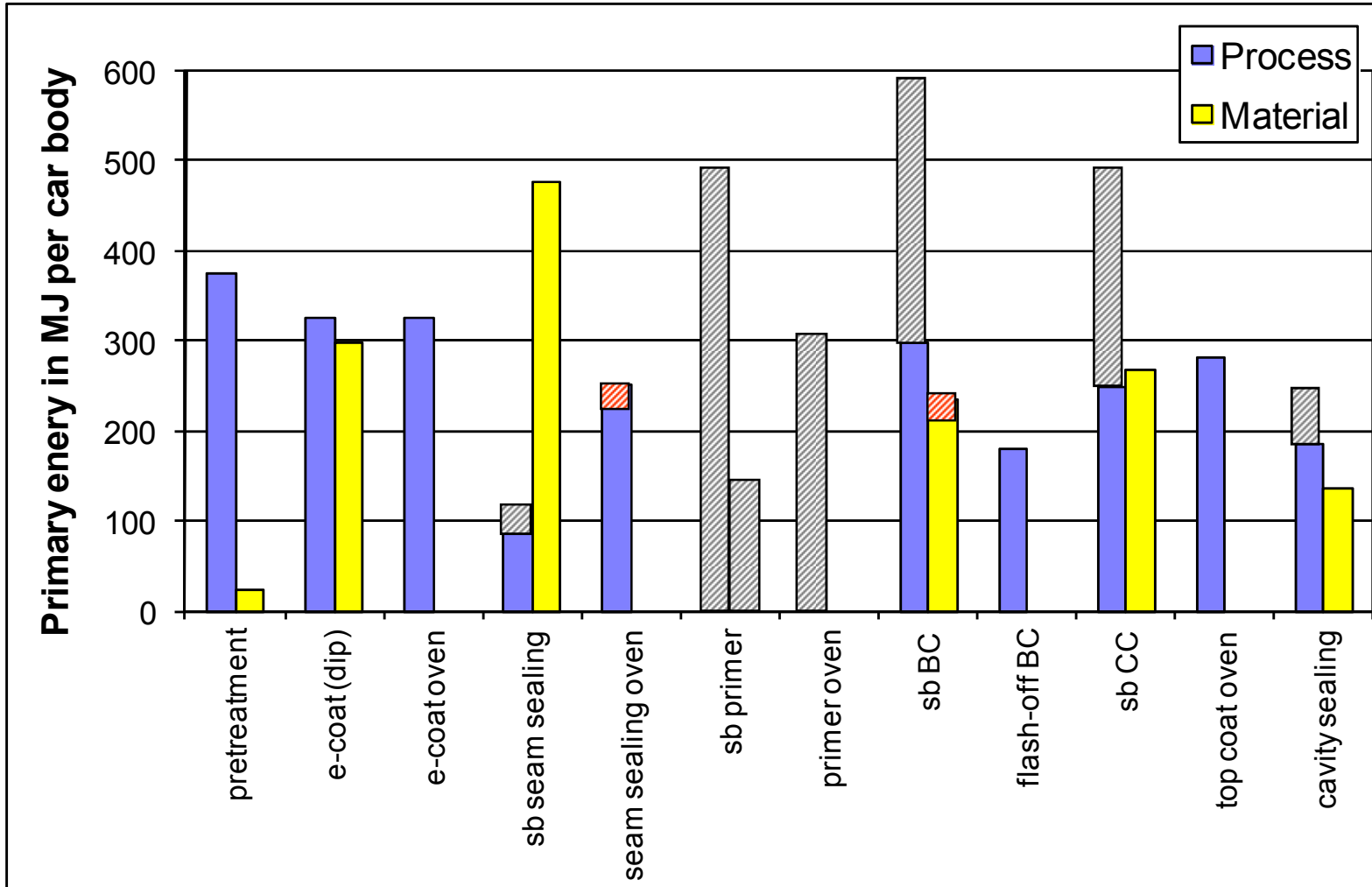


heat recovery in spray booths + dry scrub



Resource Efficiency - Status Quo

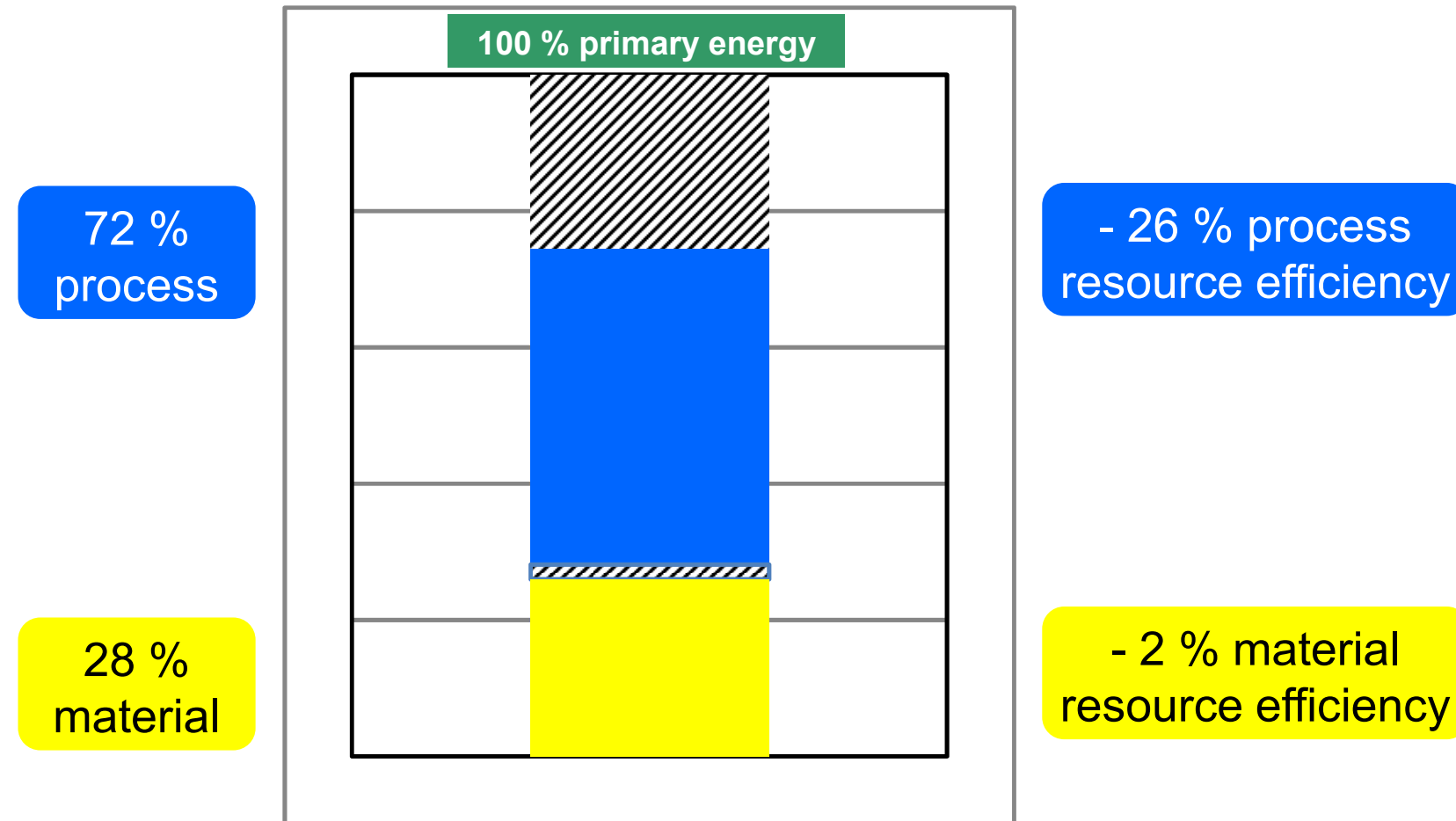
Standard Automotive Painting Process - Optimization Step 3



heat recovery in spray booths + dry scrub + primerless

Resource Efficiency - Status Quo

Standard Automotive Painting Process - Summary Optimization Steps



New high-tech materials and processes improve resource efficiency



Resource Efficiency in Car Body Painting - the Challenges

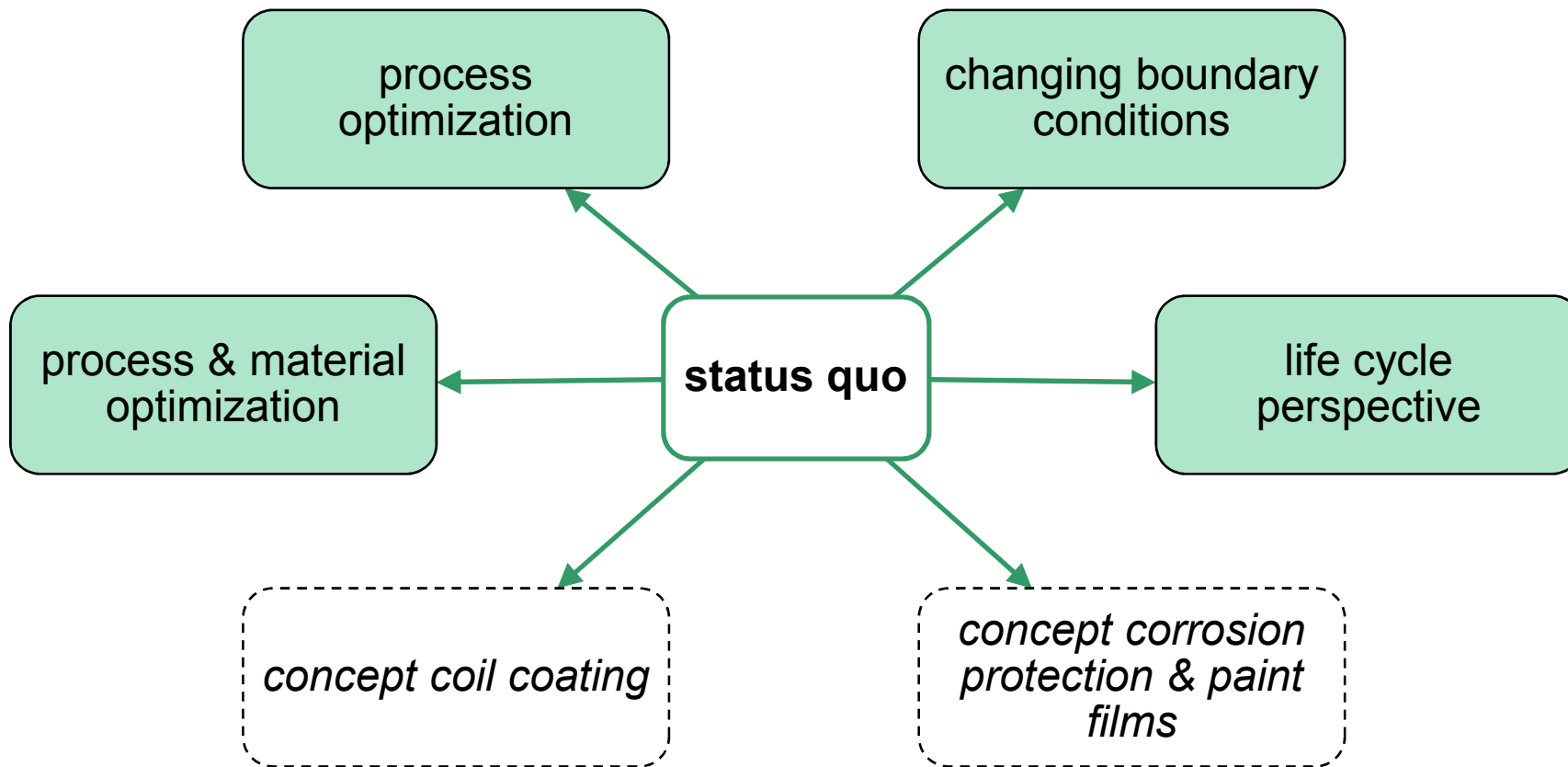
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Resource Efficiency - the Challenges

Further Optimization Steps - Selection

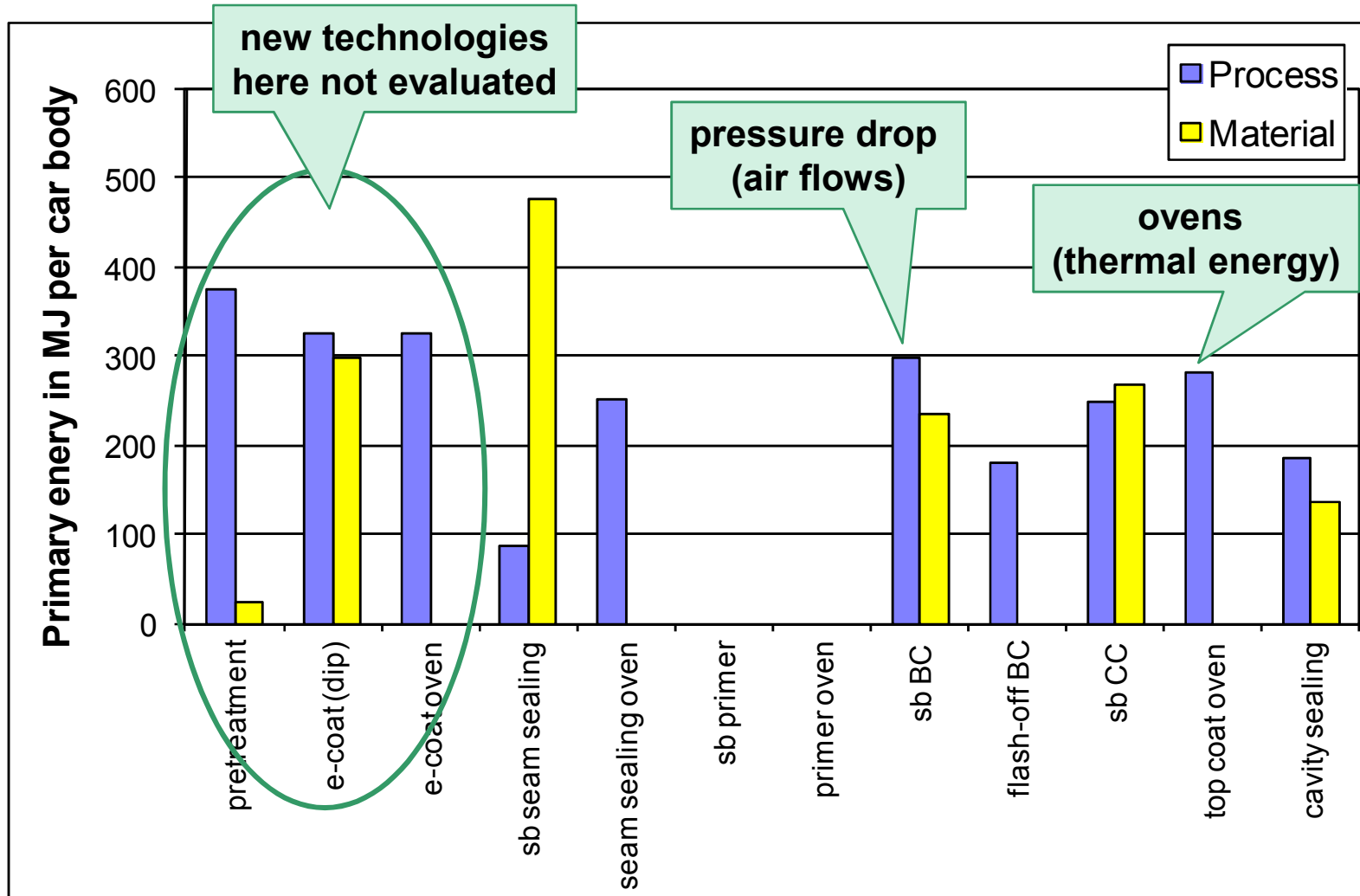
Requirement: quality and competitiveness





Resource Efficiency - the Challenges

Standard Automotive Painting Process - further Optimization Possibilities



Resource Efficiency - the Challenges

On Going Public Research Activities - 2 BMBF Projects



Federal Ministry
of Education
and Research



- new paint shop concepts
- new process technology

http://www.ipa.fraunhofer.de/Green_Carbody_Technologies.1053.0.html

ENSIKOM

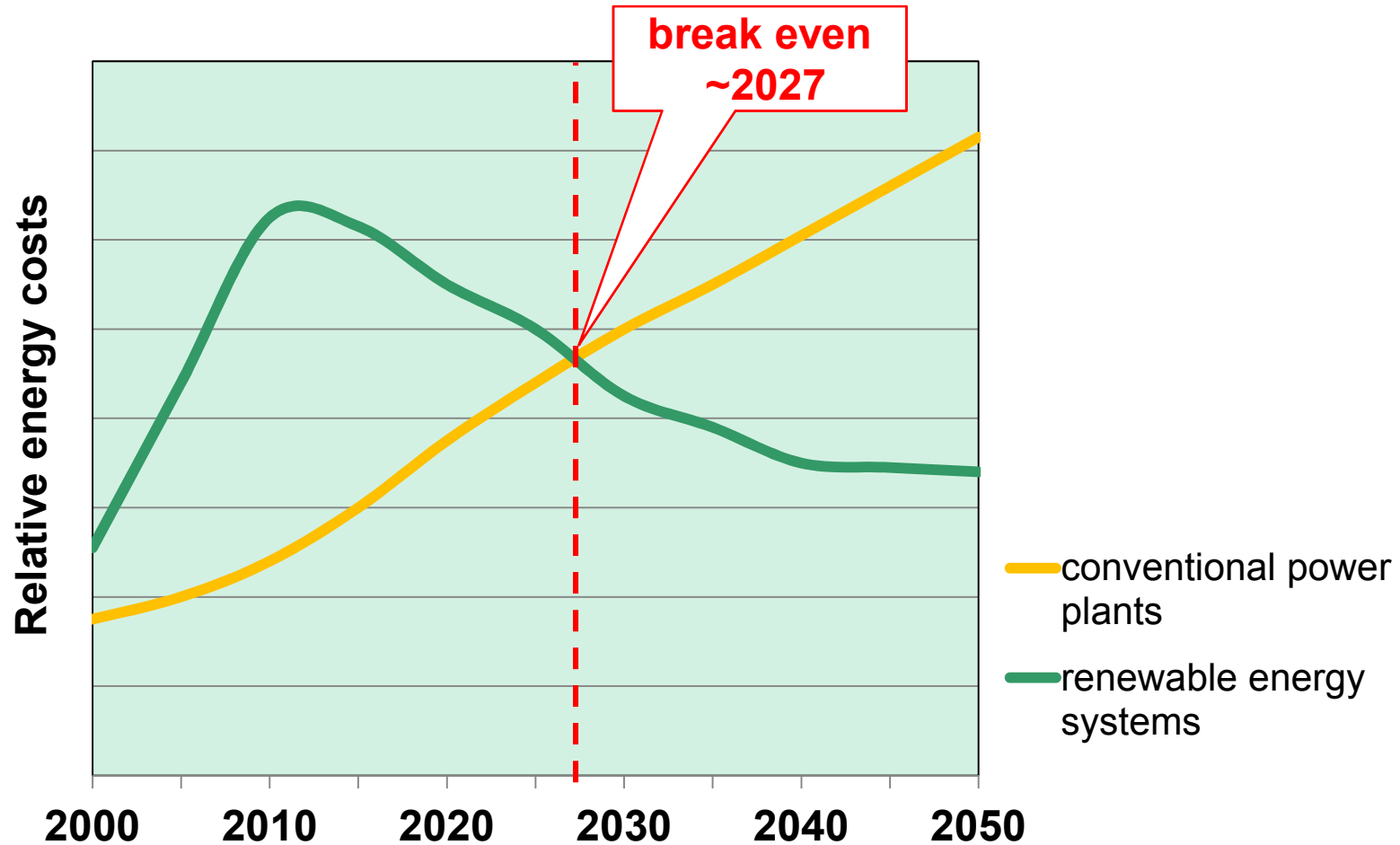
- new 3D UV concepts
(materials & processes)

www.r-zwei-innovation.de/de/673.php



Resource Efficiency - the Challenges

Changing Boundary Conditions - Example Electricity Costs in Germany

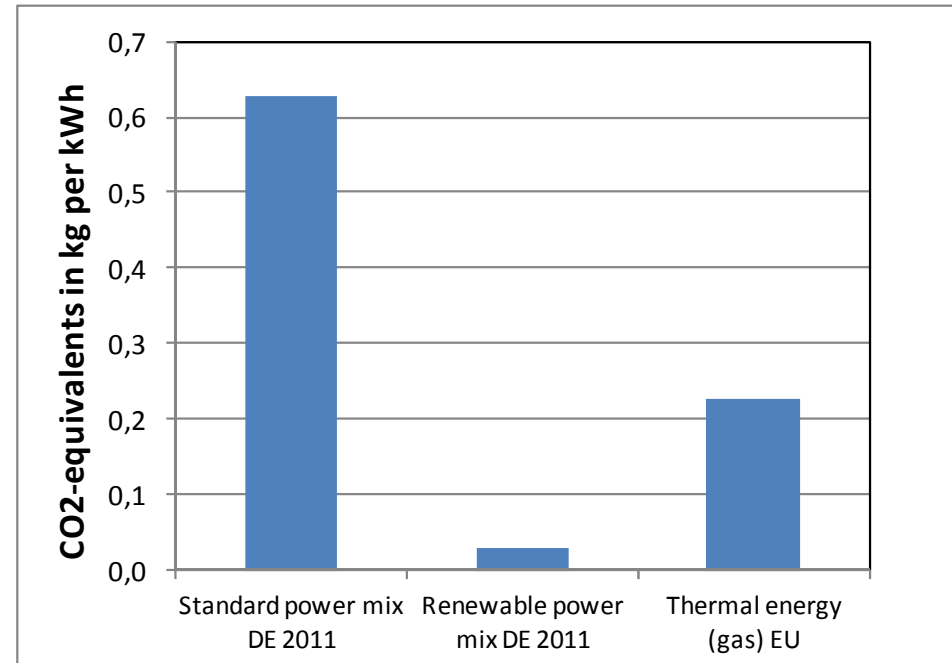
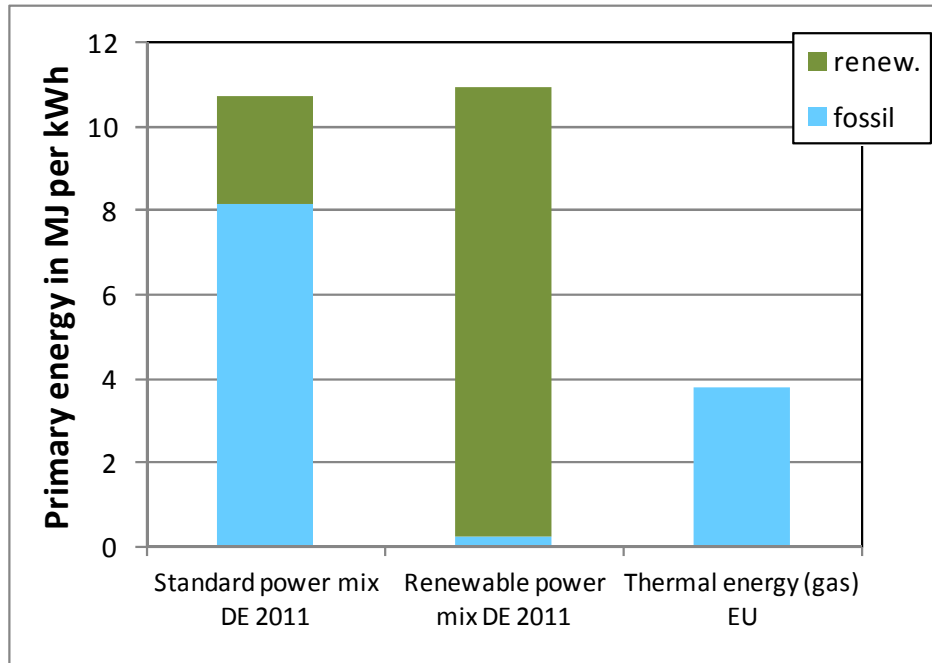


Changing boundary conditions require technology modifications

Source: Arbeitsgemeinschaft DLR, IWES, IFNE, 2011

Resource Efficiency - the Challenges

Changing Boundary Conditions - Example Ecoprofiles for Energy Supply



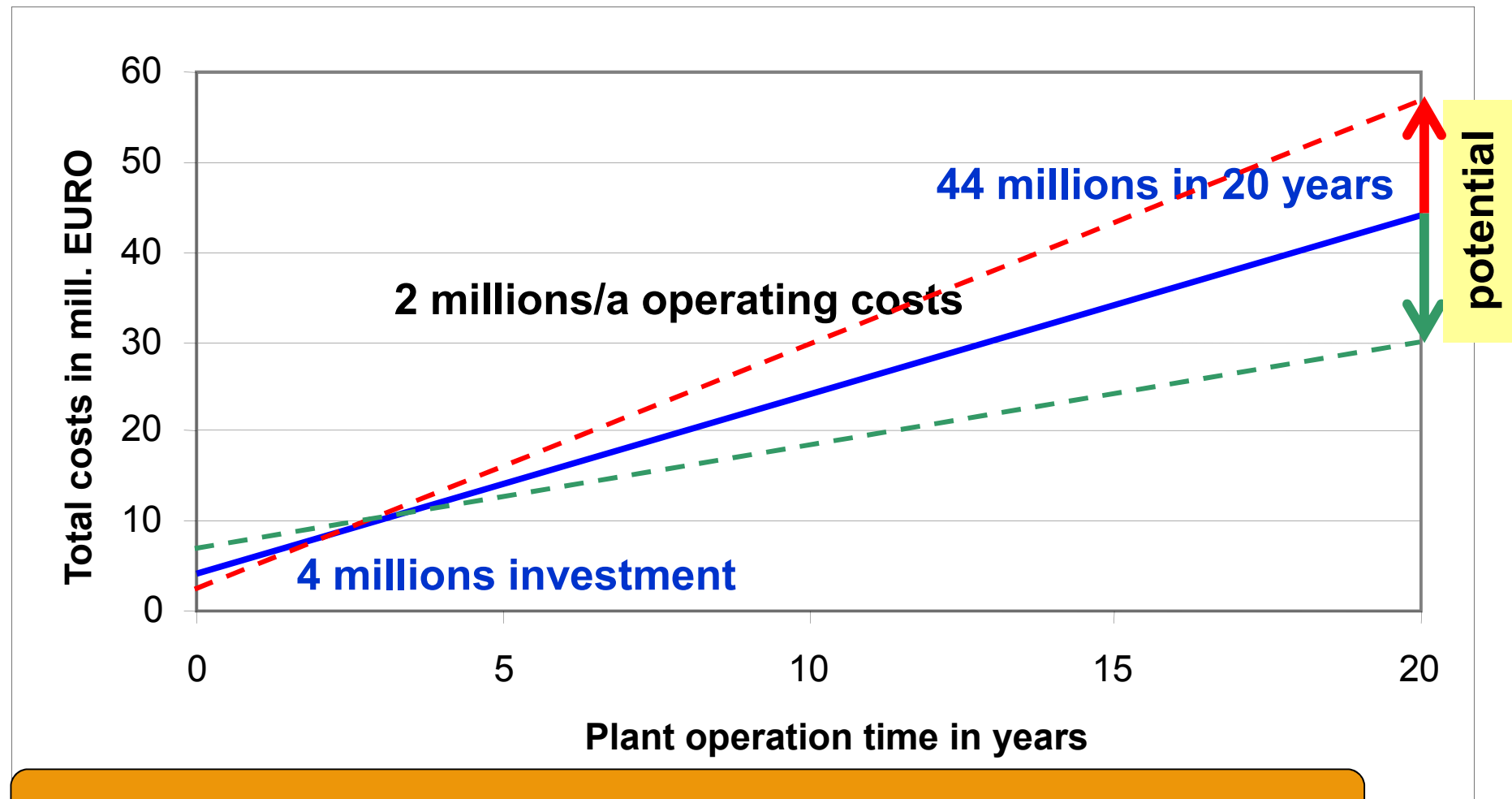
Possible technology modification in paint shops,
e.g. electricity for heat generation



Resource Efficiency - the Challenges

Investment and Development of Operating Costs

Example: medium-sized painting plant



Long plant operation time → consider the life cycle costs



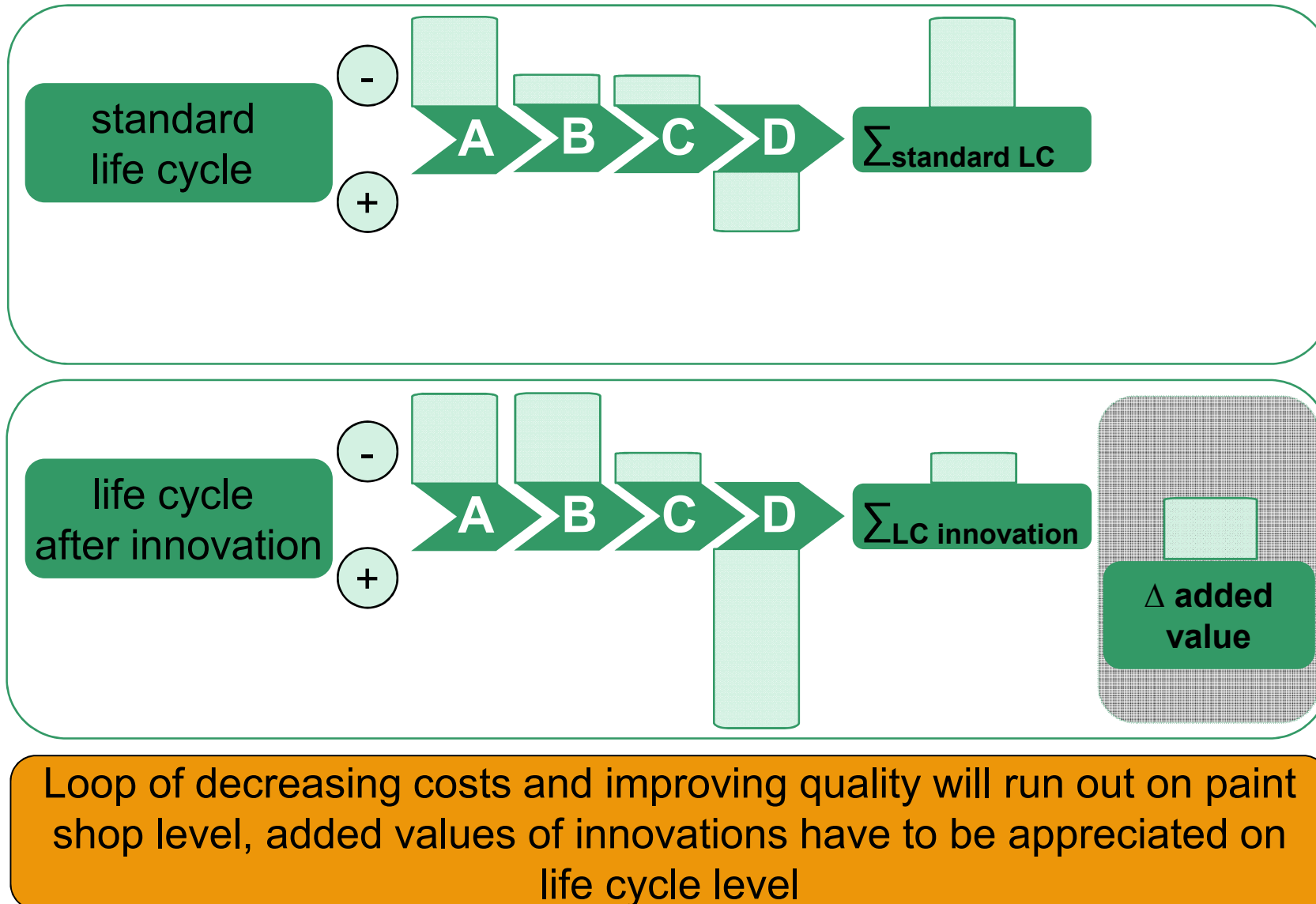
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Resource Efficiency - Outlook

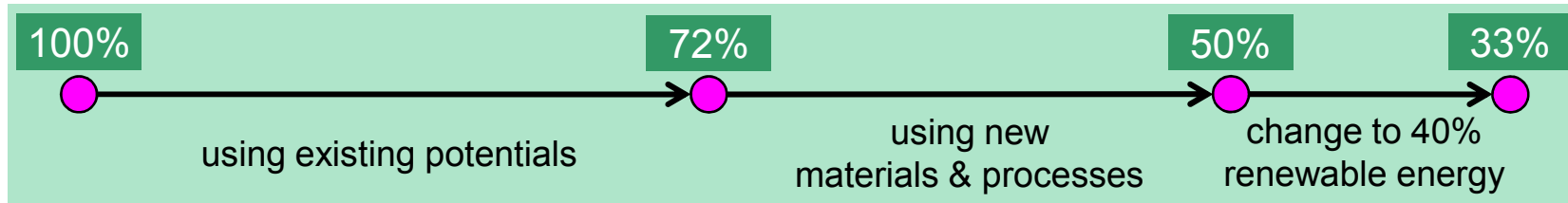
Life Cycle Perspective Required for Evaluation of further Optimization Potentials





Resource Efficiency - Outlook

Life Cycle Optimization Potential - Estimation



boundary conditions: complete world wide automobile production (2011: 65,4 millions)
savings: difference standard to optimized and renewable energy



3,0 million tons crude oil equivalents per year
53 oil tanker á 56,000 tons net load per year



6,1 million tons CO₂ equivalents per year
50,7 bn. km at 120g CO₂ per km
250.000 cars with 200.000 km mileage



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