04/07/2011

Workshop Ecolizer
The methodology behind the Ecolizer 2.0

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Outline

» **Introduction**
» **Data sources**
» **Method for calculating the eco-indicators**
» **Points of attention**
  » *End of Life*
  » *Recycling*
» **Questions**

Ostend

Antwerp

Mol

VITO in a nutshell

VITO is a leading **independent** European research and consulting centre **developing sustainable technologies** in the area of **energy, environment, materials and remote sensing.**

In 2010, the total VITO budget was 90 million euro of which the contribution by contract research was 55 million euro. For 2011, VITO is counting on a budget of 95 million euro

VITO is based at three locations in Belgium

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Units overview

VITO counts > 600 highly qualified employees from diverse specialisations in 8 research units

Environmental Modelling

Energy Technology

Environmental Risk & Health

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Transition Energy & Environment

Environmental Analysis & Technology

Remote Sensing

Materials Technology

Seperation & Conversion Technology

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Energy Use & Supply

Transport & Mobility

Sustainability Assessments

Transition Energy & Environment

Transition Energy & Environment

Land Use & Climate Change

Sustainable Chemistry

Living and Building

Closed Lean Cycles

Introduction

» **Ecolizer**

  » Sheets with **eco-indicators** (EI)

    » Available on OVAM-website

    » Sheets for 10 topics (plastics, energy, transport,…)

    » Measure for environmental impact

    » Expressed in mPt/unit (kg, m, m², tonkm, etc)

    » Higher EI $\Rightarrow$ higher environmental impact

Introduction

» **Ecolizer 1.0 versus 2.0**

  » Update **method** for calculation of eco-indicators

    » ReCiPe method instead of Eco-Indicator 99 method

  » Update **LCI-databases**

    » More data available

      » Materials

      » Processes
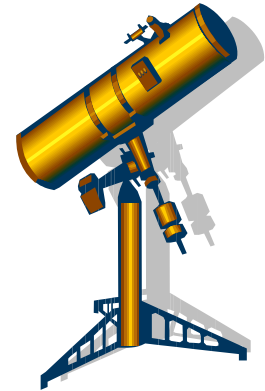
Data sources

» **LCI-database** for background data

  » **Ecoinvent 2.0** database (update)

    » Extended with a.o. biomaterials

    » Ecoinvent 1.0 used for Ecolizer 1.0

  » Data-record contain direct and indirect inputs and outputs
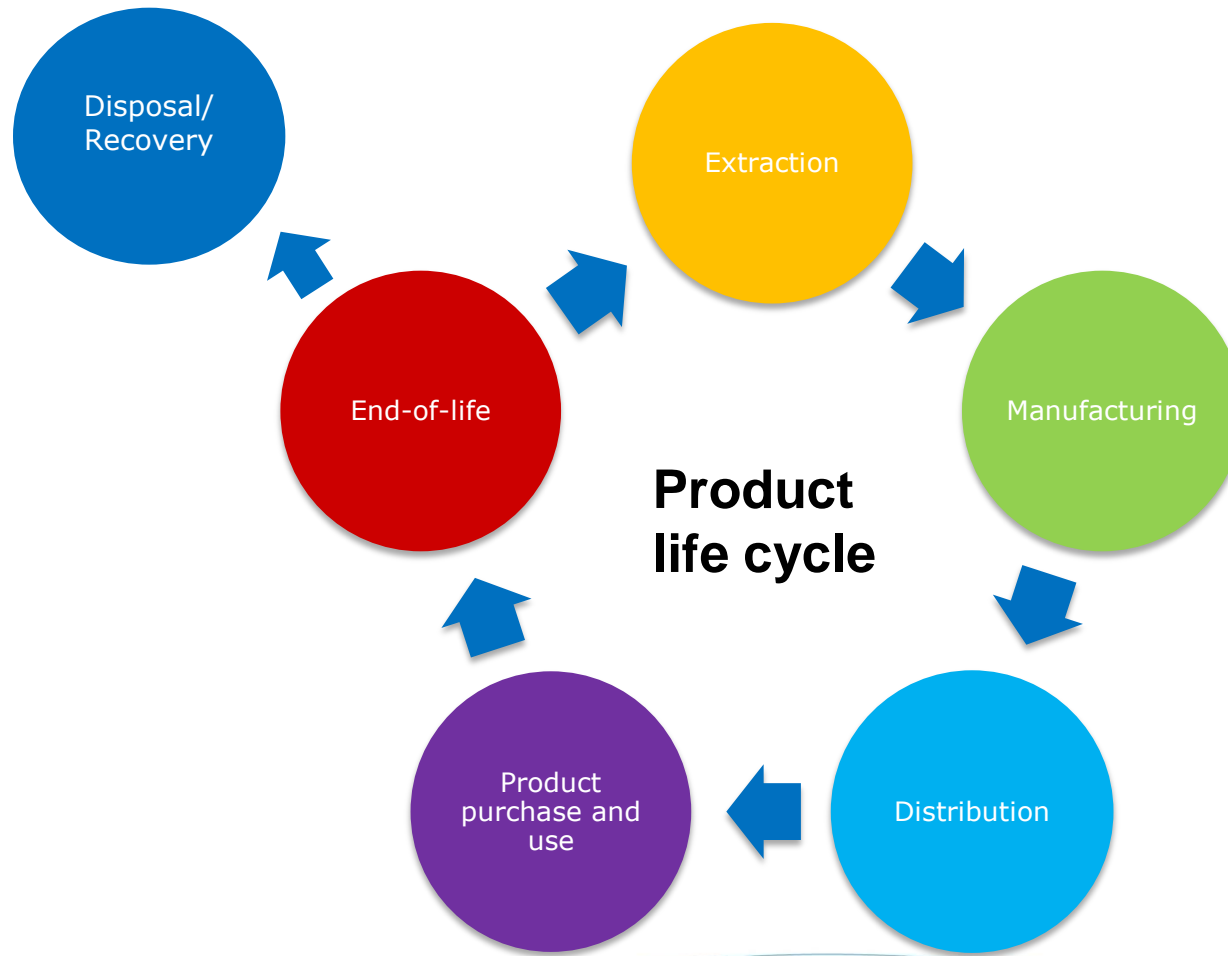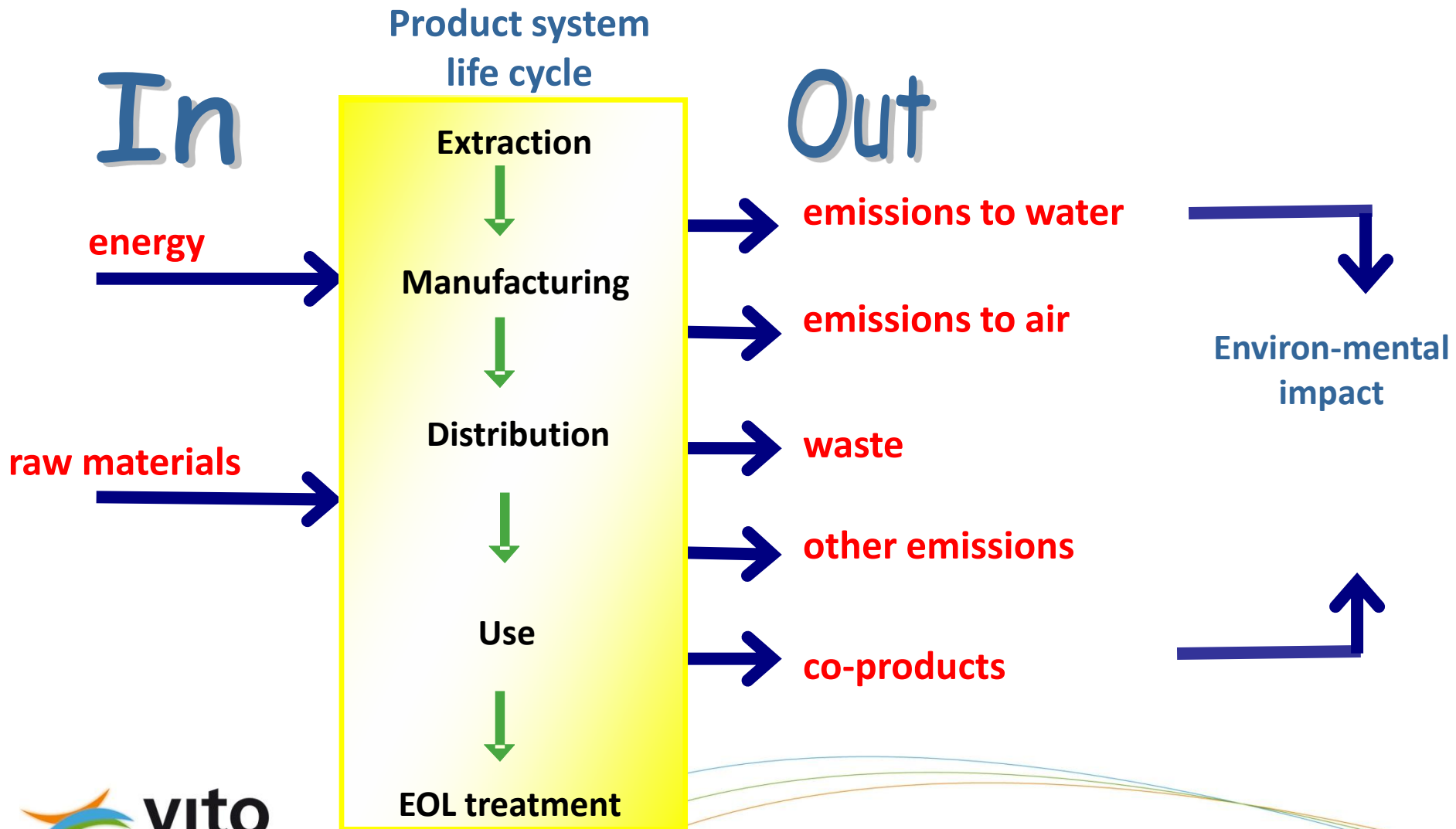
  » Additional data from Pré Consultants

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Introduction

» **Ecolizer**

  » Basis = LCA

    » **Integral** environmental impact

    » Impact categories combined in one single score

    » **Life cycle perspective:** both direct and indirect impacts

    » LCI data

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Introduction

Disposal/Recovery

Extraction

End-of-life

Manufacturing

Product life cycle

Product purchase and use

Distribution

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In

energy

raw materials

Product system life cycle

Extraction

↓

Manufacturing

↓

Distribution

↓

Use

↓

EOL treatment

Out

emissions to water

emissions to air

waste

other emissions

co-products

Environ-mental impact

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Method for calculation of eco-indicators

» **Ecolizer 1.0**
  » Eco-Indicator 99 method
    » Developed in 1999
    » No future updates

» Alternative method for update **Ecolizer 2.0**:
  » **ReCiPe**
    » Scientific basis
    » Successor of EI-99 method
    » Recently developed

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Method for calculation of eco-indicators

» **ReCiPe**
  » Developed by Pré Consultants and CML (2009)
  » Combination of EI-99 and CML 2001 method
  » **3 steps**:
    » Environmental impact categories (midpoint)
      » E.g. Climate change, acidification
    » Environmental damage categories (endpoint)
      » E.g. Damage to human health
    » One environmental indicator: eco-indicator

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Method for calculation of eco-indicators

» **ReCiPe – environmental impact categories (midpoint)**

  » Climate change
  » Ozone layer depletion
  » Acidification
  » Eutrophication (freshwater)
  » Human toxicity
  » Photochemical oxidant formation
  » Particulate matter formation
  » Ecotoxicity (terrestrial, freshwater, marine)
  » Ionizing radiation
  » Land use (agricultural, urban)
  » Depletion of resources (metals, fossil)

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Method for calculation of eco-indicators

» **ReCiPe – environmental damage categories (endpoint)**

  » Damage to human health
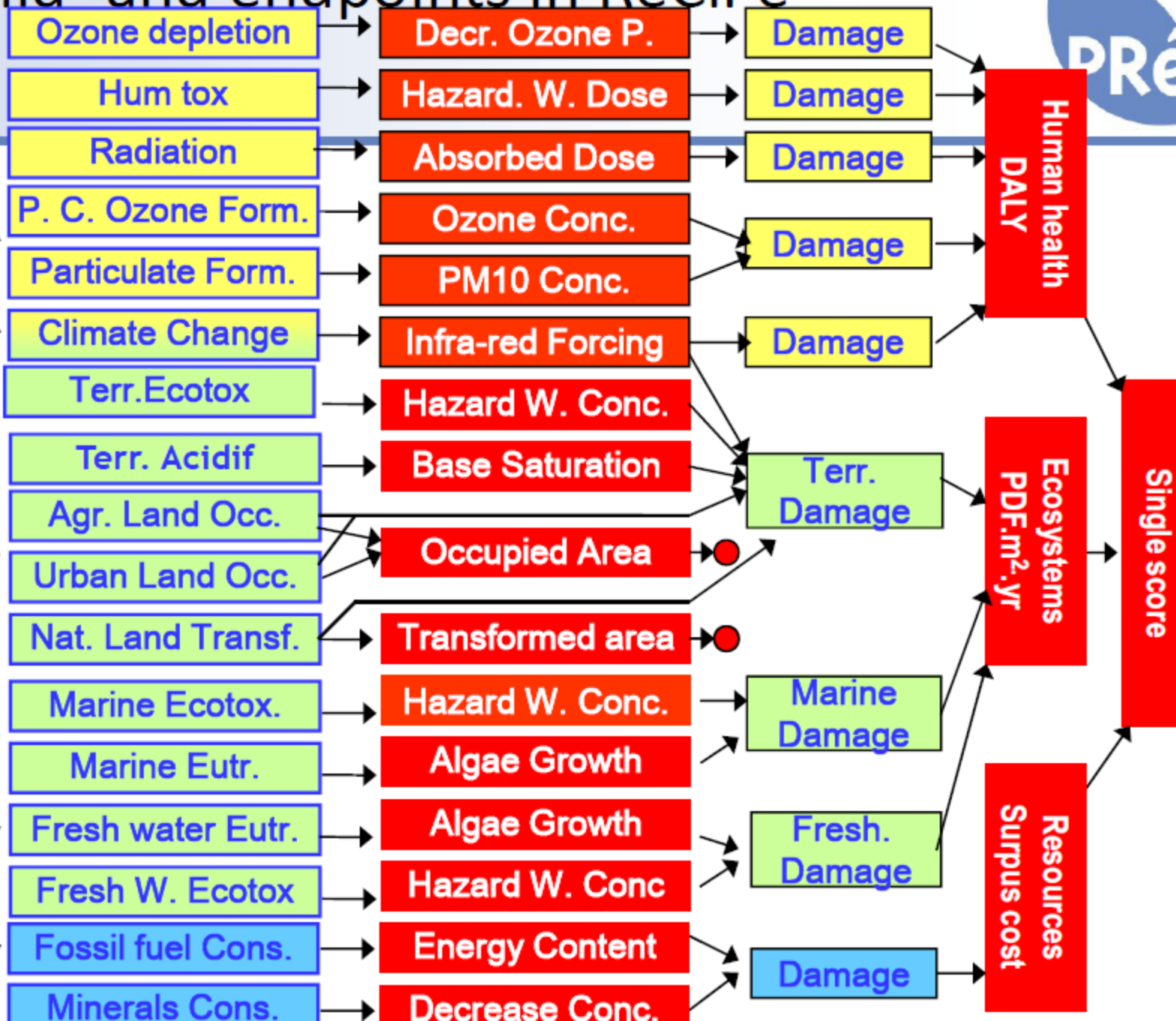 » Damage to ecosystems
  » Depletion of resources

Enviromental damage category	Weighting factor (Hierarcist/Average)
Human health	400
Ecosystems	400
Resources	200

Mid- and endpoints in ReCiPe

PRé

LCI result

Raw mat.
Land use
CO2
VOS
P
SO2
NOx
CFC
Cd
PAH
DDT

| Midpoint	Intermediate	Damage	Endpoint
Ozone depletion	Decr. Ozone P.	Damage	Human health DALY
Hum tox	Hazard. W. Dose	Damage	
Radiation	Absorbed Dose	Damage	
P. C. Ozone Form.	Ozone Conc.	Damage	
Particulate Form.	PM10 Conc.		
Climate Change	Infra-red Forcing	Damage	
Terr.Ecotox	Hazard W. Conc.		Ecosystems PDF.m².yr
Terr. Acidif	Base Saturation	Terr. Damage	
Agr. Land Occ.			
Urban Land Occ.	Occupied Area		
Nat. Land Transf.	Transformed area		
Marine Ecotox.	Hazard W. Conc.	Marine Damage	
Marine Eutr.	Algae Growth		
Fresh water Eutr.	Algae Growth	Fresh. Damage	
Fresh W. Ecotox	Hazard W. Conc		
Fossil fuel Cons.	Energy Content	Damage	Resources Surpus cost
Minerals Cons.	Decrease Conc.		

Single score

Comparison EI-99 and ReCiPe

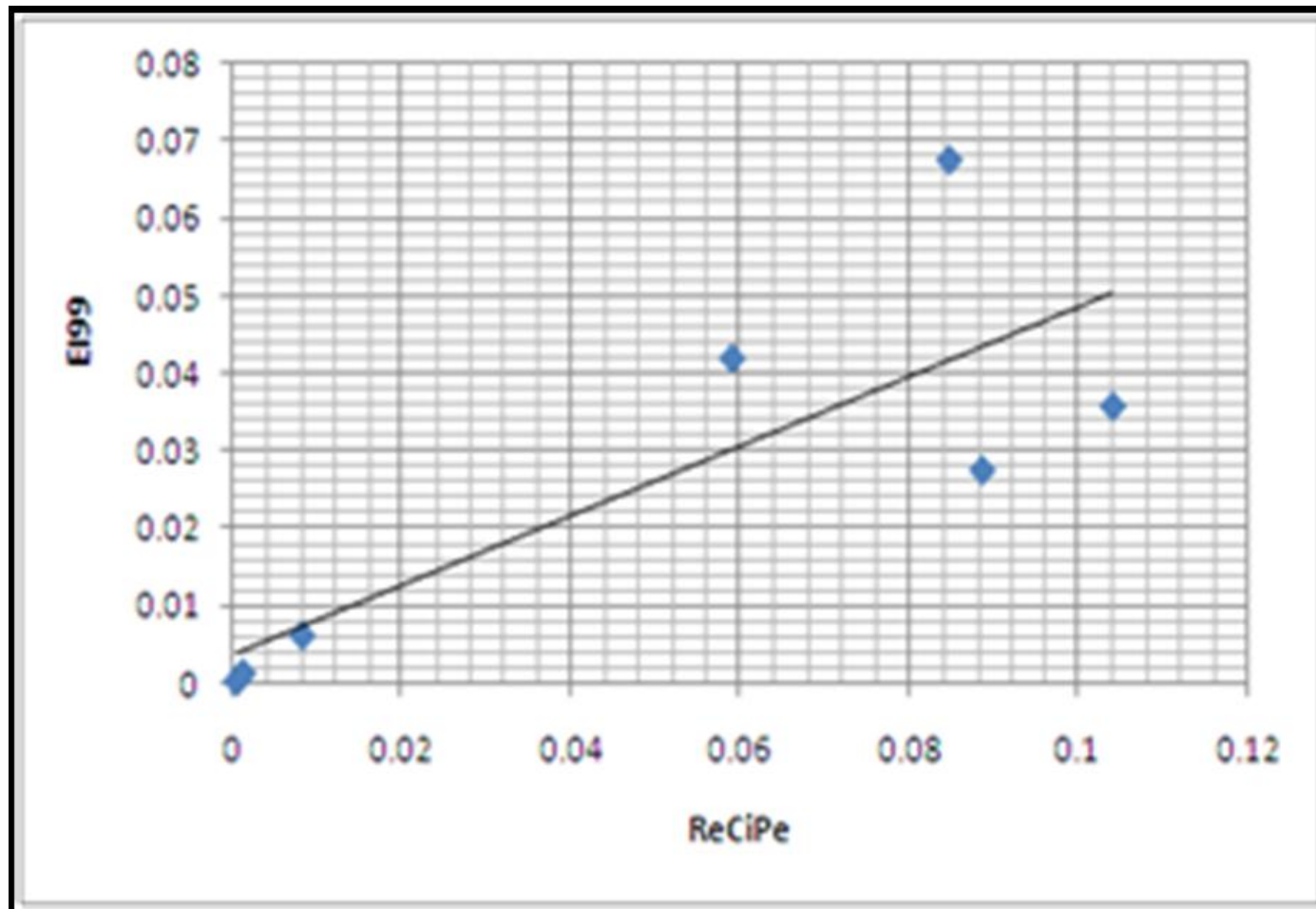**Metals *(Source: Pré Consultants, LCM2009 conference)***
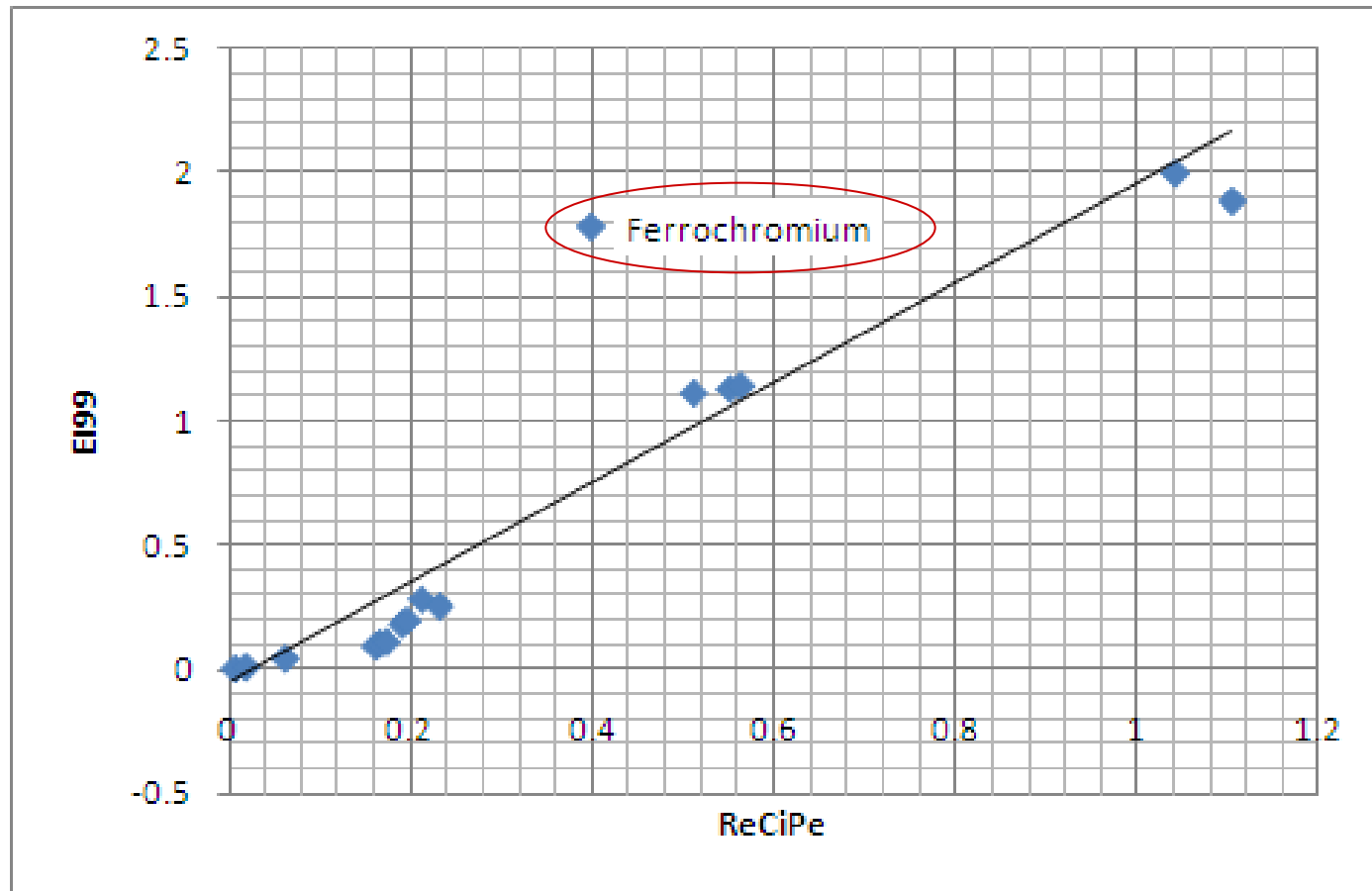
Comparison EI-99 and ReCiPe

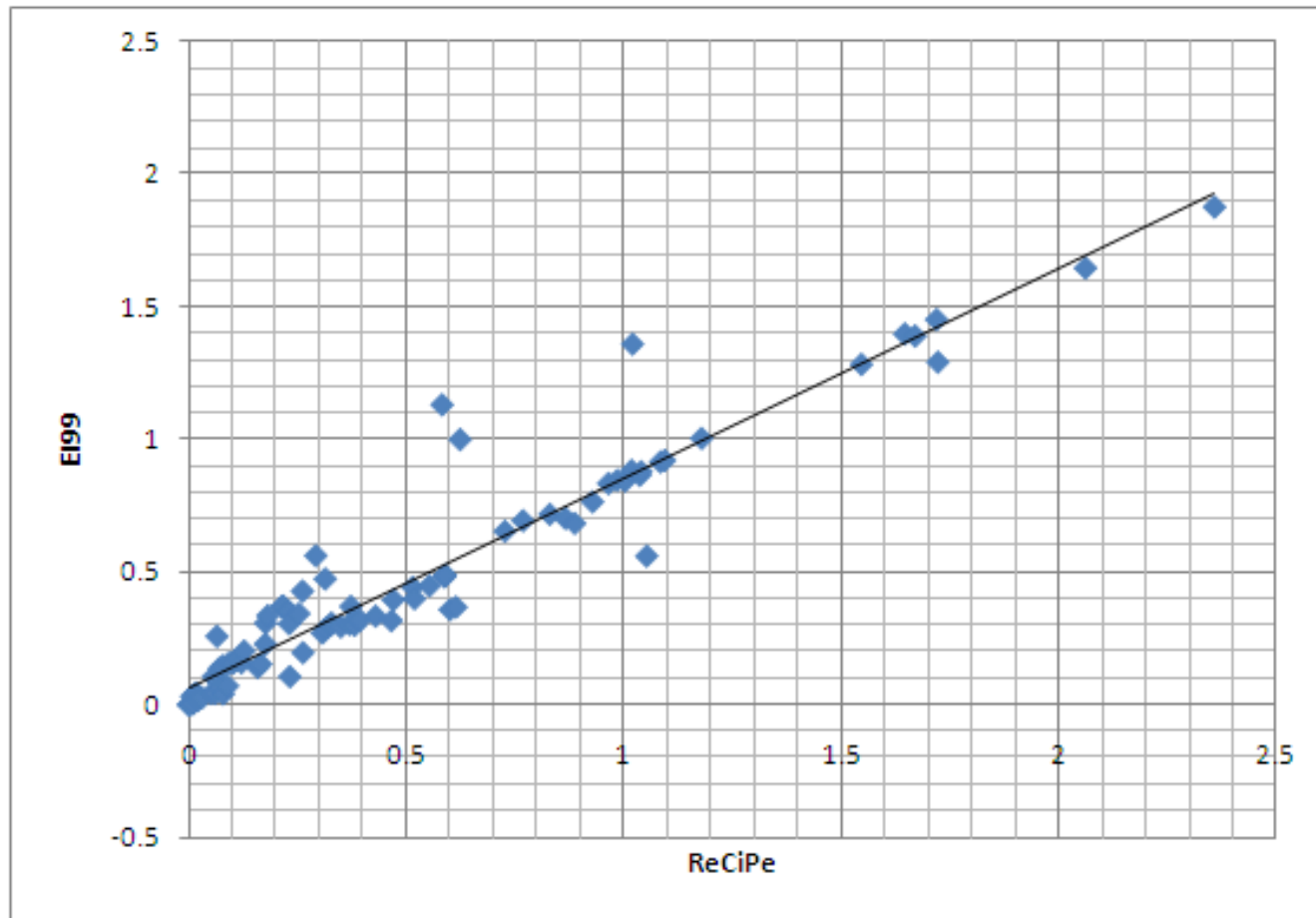**Transport** *(Source: Pré Consultants, LCM2009 conference)*
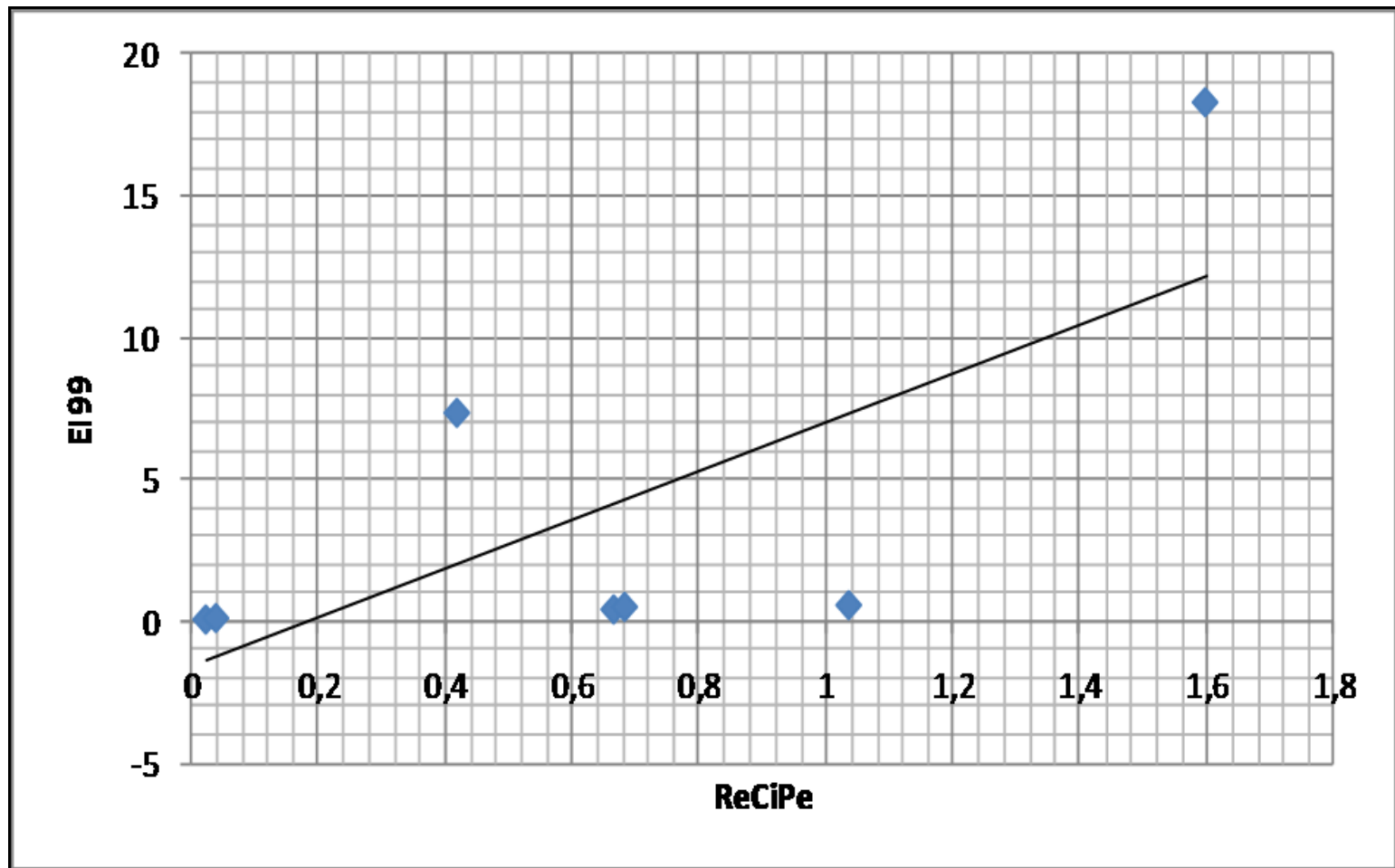
Comparison EI-99 and ReCiPe

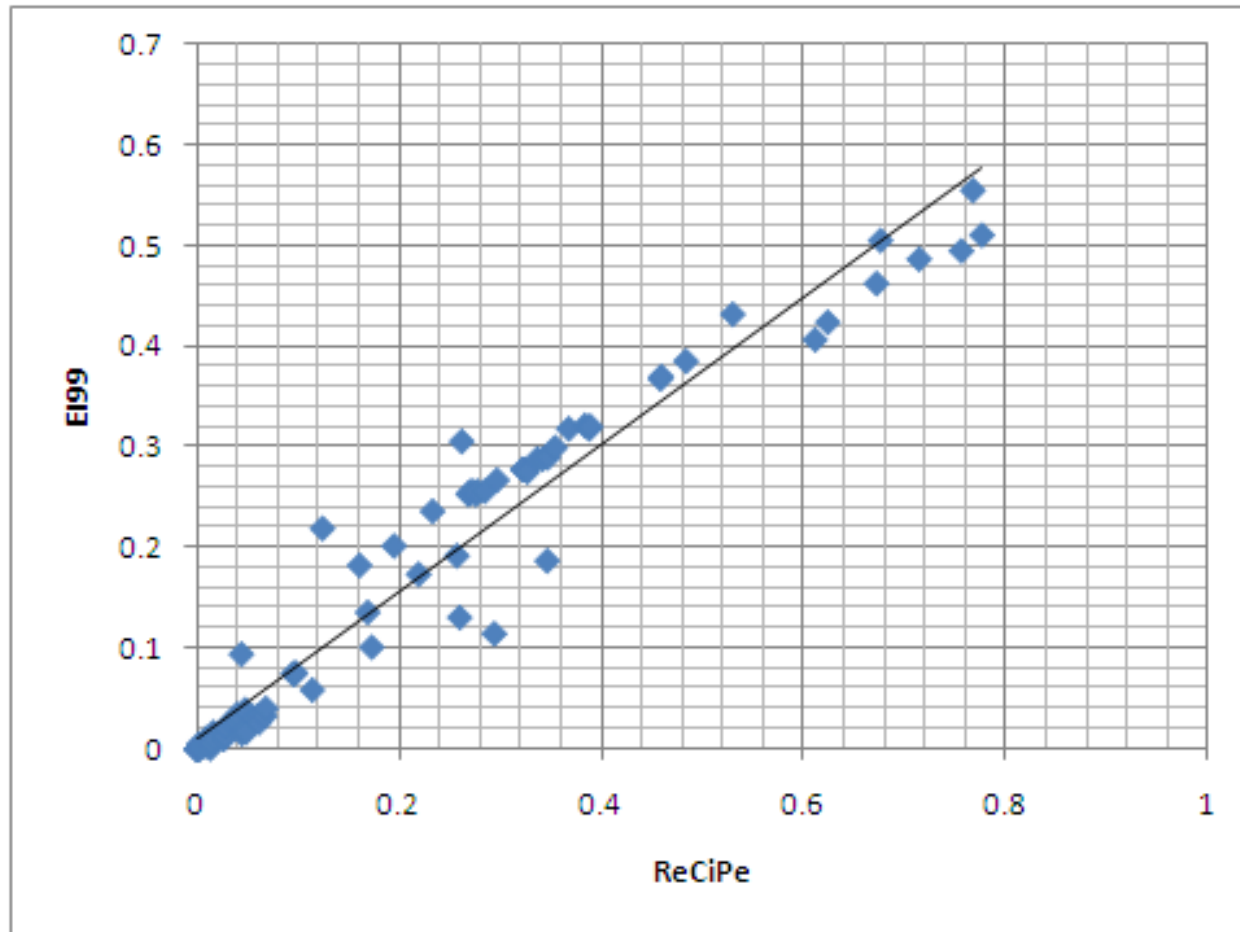**Energy *(Source: Pré Consultants, LCM2009 conference)***

Comparison EI-99 and ReCiPe

**Processes *(Source: Pré Consultants, LCM2009 conference)***

Comparison EI-99 and ReCiPe

Biofuels *(Source: Pré Consultants, LCM2009 conference)*

Comparison EI-99 and ReCiPe

» **Difference** between eco-indicator score according to EI-99 and ReCiPe method

  » Relative difference is **not always consistent**

  » **Order of ranking and ratio remain** more or less the same when comparing different materials/processes
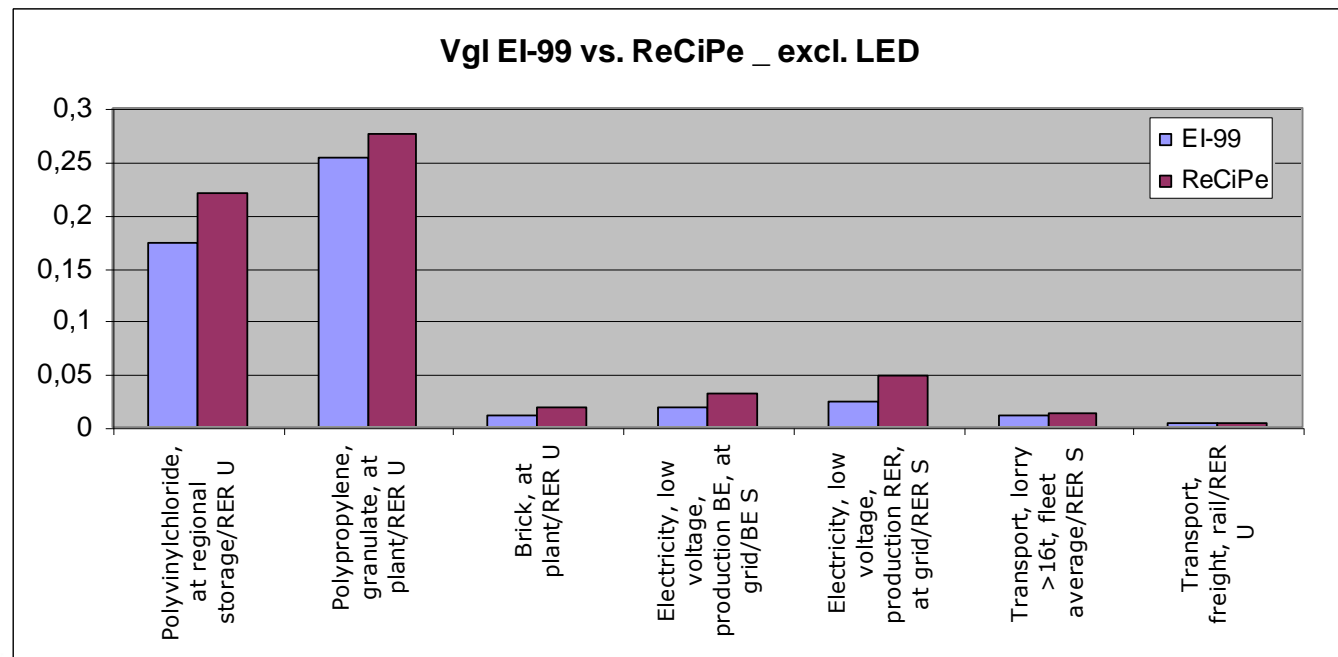
Points of attention

» **Data quality**:

  » **Black:**

  » Based on reliable data

  » **Grey:**

  » Based on limited dataset

  » Less reliable

  » **! Exclamation mark:**

  » Uncertain, based on estimations

  » generic data, not specific for the material

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Points of attention
End of Life

» Per material sheet:

  » **Recycling**
    » Impact of recycling process
    » Credits of avoided material production
    » Total

  » **Waste scenario EU**
    » 80% disposal – 20% incineration

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Points of attention
EoL - incineration

» Only combustible flows go to incineration: no indicator for incineration of ferro, non ferro and inert materials

» Own calculations

» **Emissions** and **avoided emissions** to air**, auxiliary materials** taken into account

» Type of energy recovery: **electricity**

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Points of attention
Recycling

» **2 approaches**:

  » **"end of life recycling approach"**
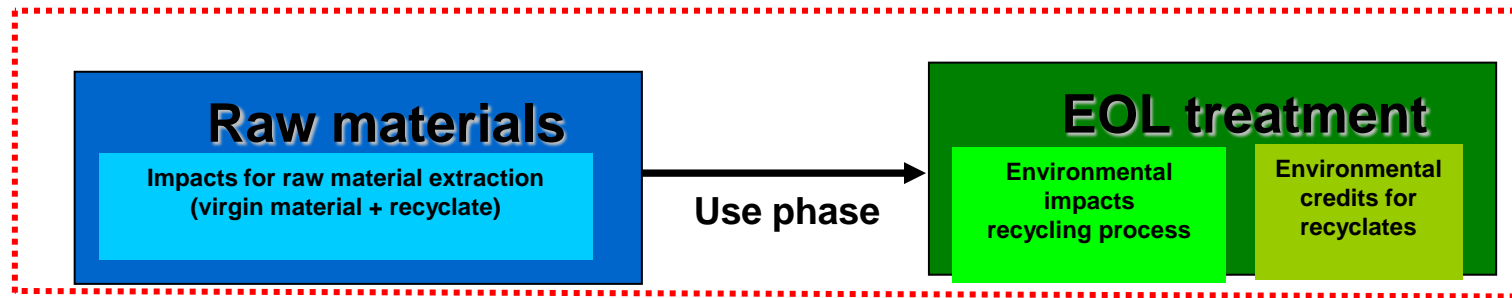
    » Take into account the <u>recycling scenario at end of life</u>

      » *Use indicator for recycling process*

    » <u>NO input of recycled material</u>

  » **"recycled content approach"**

    » Take into account the effective input of <u>recycled material</u>

      » *Use indicator for production of recycled material*
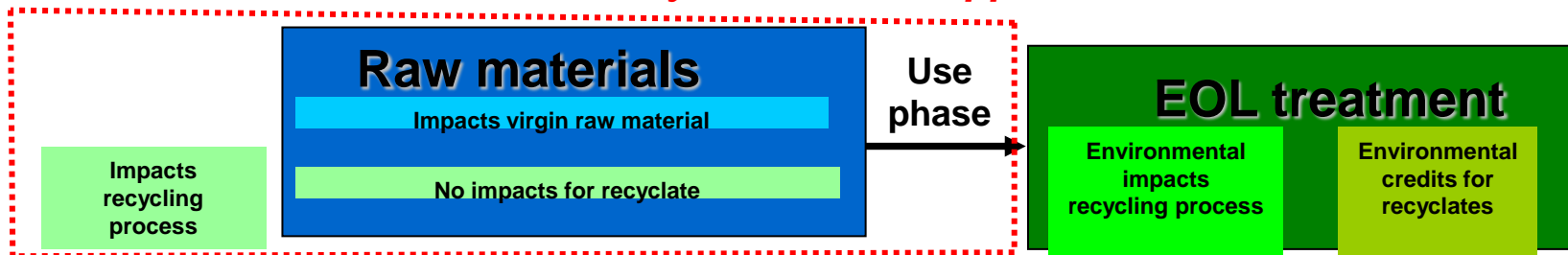
    » <u>NO recycling</u> at <u>end of life</u>

Points of attention
Recycling

Raw materials

Impacts for raw material extraction
(virgin material + recyclate)

Use phase

EOL treatment

Environmental
impacts
recycling process

Environmental
credits for
recyclates

EOL recycling approach (avoided burdens)

Recycled content approach

Impacts
recycling
process

Raw materials

Impacts virgin raw material

No impacts for recyclate

Use phase

EOL treatment

Environmental
impacts
recycling process

Environmental
credits for
recyclates

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Questions?

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