FC-Hy Guide

Training Course

Thurs. 1st September 2011, Berlin

Seminaris

Campus Hotel

Berlin

FC-Hy Guide

Guidance Document

FC-Hy Guide

Content

- Compliance
- Project structure / Development process of the guide
- Covered Technologies
- Structure of the guidance document

Compliance

ISO

- ISO 14040 describes the principles and framework for life cycle assessment
- ISO 14044 specifies requirements and provides guidelines for life cycle assessment

International Reference Life Cycle Data System (ILCD) – ILCD Handbook

- General guide for LCA which provides detailed guidance on how to conduct a LCA to quantify the emissions, resources consumed and the pressures on the environment and human health that can be attributed to a product.
- In line with the ISO standards, further specifying and complementing them.
- It has been coordinated by the JRC-IES, Platform on LCA

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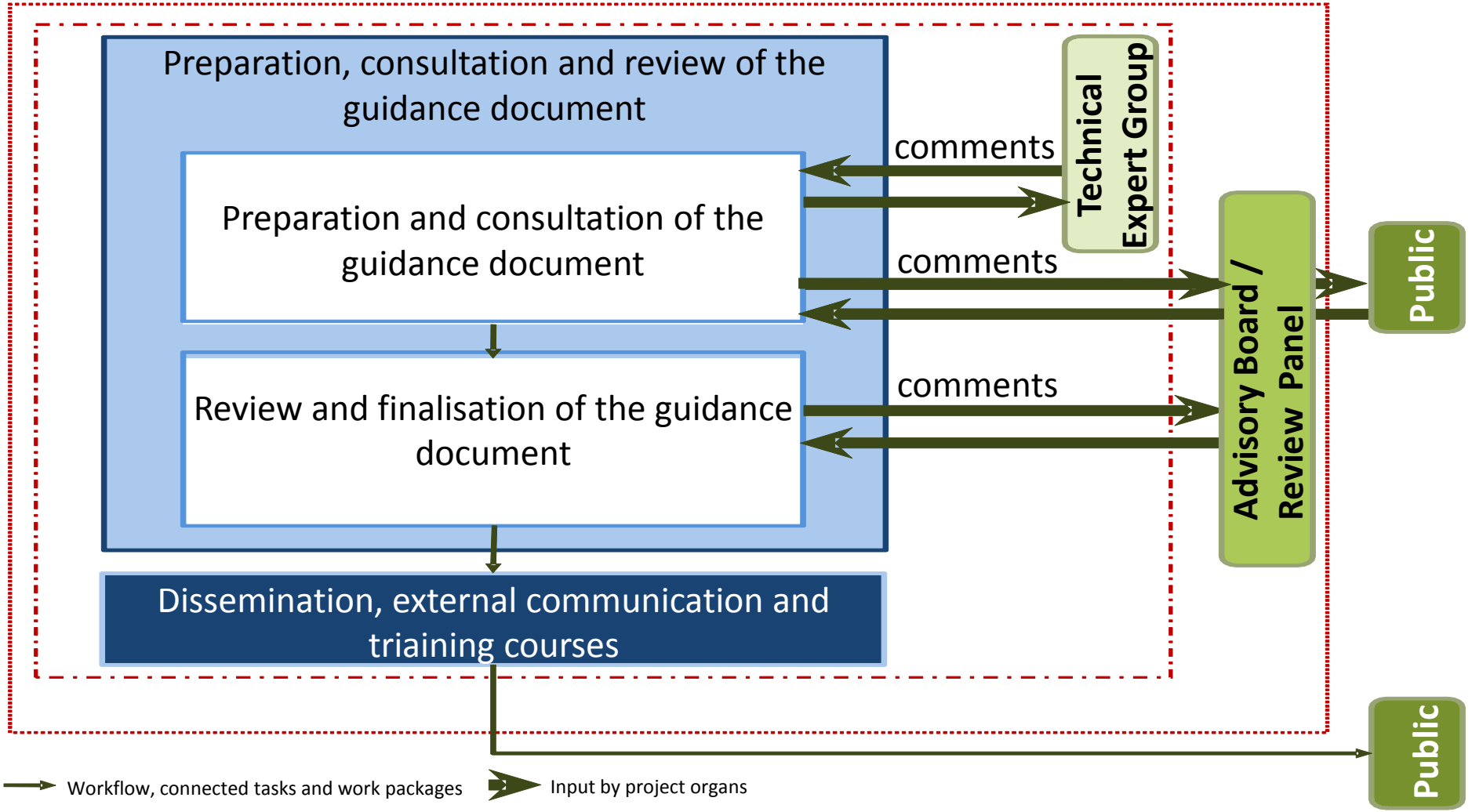
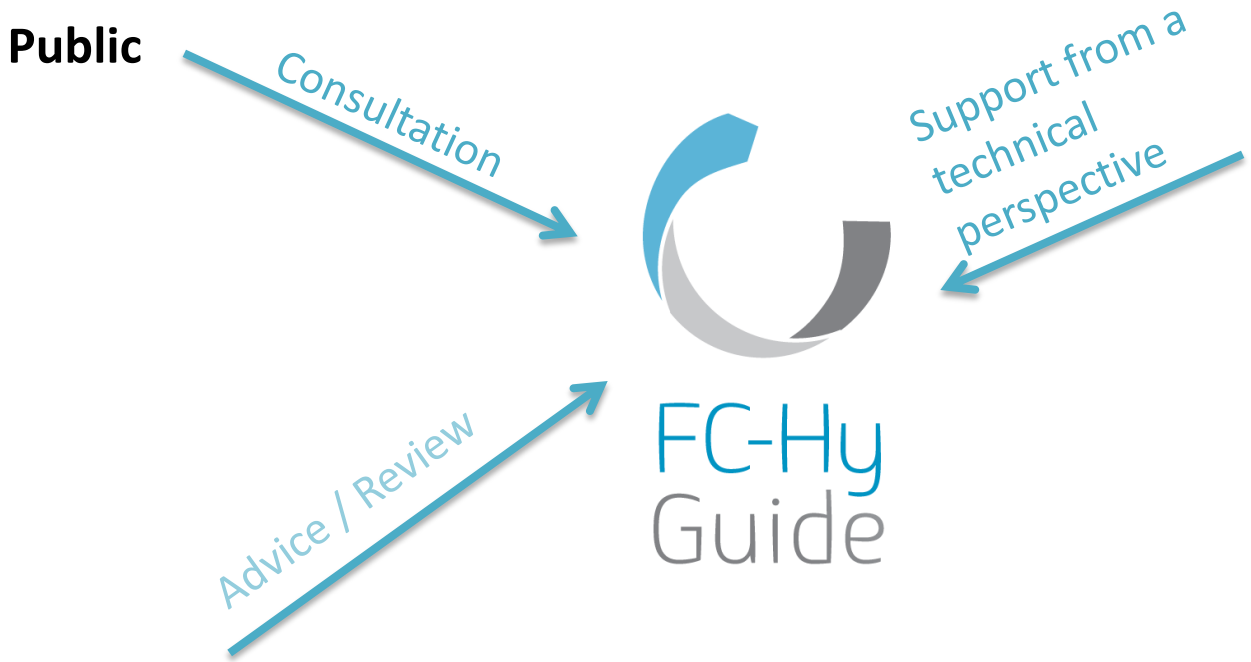
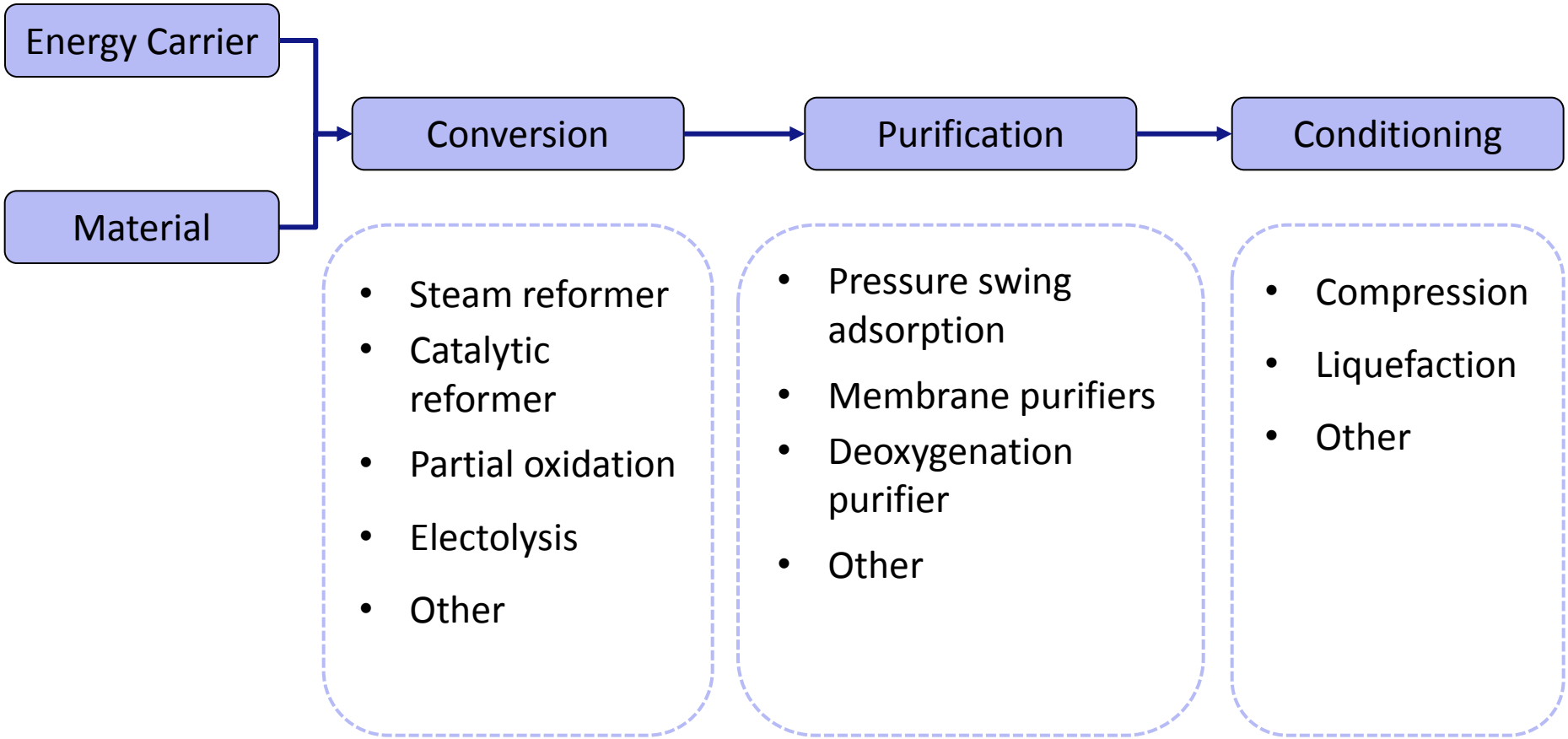
Project Structure



FC-HyGuide Management structure



Covered technologies: Hydrogen



Covered technologies: FC

FC stack
FC system

- polymer electrolyte membrane fuel cell (PEMFC)
- molten carbonate fuel cell (MCFC)
- solid oxide fuel cell (SOFC)

Structure of the guidance document

Part I: General information

Part II: Guidance on performing a Life Cycle Assessment study on hydrogen production and Fuel Cell Systems

Annex I: LCA study reporting template

Annex II: Documentation of the resulting data set according to ILCD

Annex III: Data collection template

Annex IV: LCA review reporting template

Annex V: Example from case study

Part I - General Information

1. About this document

2. How to use this document

3. Introduction to Life Cycle Assessment (LCA)

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Part II

Guidance on performing a Life Cycle Assessment study on hydrogen production and Fuel Cell Systems

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Part II – General

General information	LCA specific	Reporting
• Product group • Product related information • Description of producer	• Goal and Scope • Functional unit and reference flow • System boundaries • Cut-Off criteria • Inventory Analysis • Multifunctional processes • Data collection • Impact assessment categories and methods	• Pre-determined parameters for reporting LCA data • Additional environmental information • Report format • Period of validity of the study

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Part II – Production Specific Data: Hydrogen

Product related information

- Purity
- Aggregate state
- Pressure
- Temperature
- Impurities
- Produced quantities

Description of hydrogen producer

- Overall H_2 production capacity
- Number of sites
- Productions technologies used
- Geographical coverage by region

Product system description

- Specific production technology
- Production capacity
- Any on site electricity
- Location of site
- Construction year
- Technical service life
- Type of production site
- Storage type

Part II – Functional Unit: Hydrogen

Functional unit : "1 MJ of hydrogen (net calorific value (NCV))"

Reference Flow : "1 MJ of hydrogen (net calorific value (NCV)) with XX % purity and YY bar @ ZZ °C"

Part II – Production Specific Data: FC

Description of FC producer

- overall FC production capacity
- number of sites
- geographical coverage by region
- information on products- or management system-related certifications

Product system description

- technology used
- year of construction
- type of production site

Part II – Production Specific Data: FC

Product related information

- trade name
- type of electrolyte used
- primary functions
- electrical power
- thermal power
- efficiency
- rated voltage
- rated current
- range of temperatures and operating temperature
- weight
- dimensions
- fuel used and its technical specifications
- expected service life
- description of the intended use

Part II – Functional Unit: FC

Functional unit

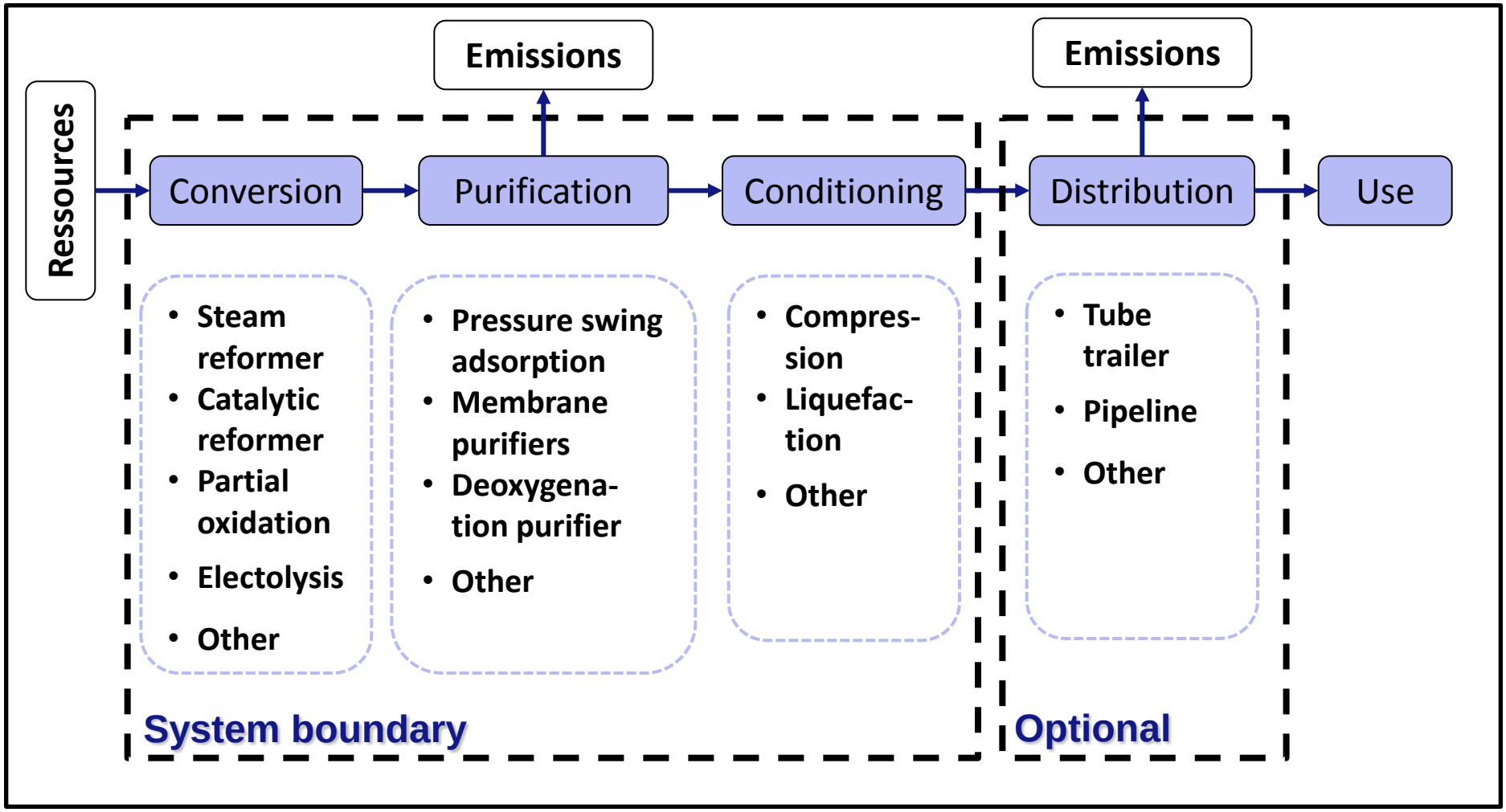
- Stack: power capacity of the manufactured stack expressed in kW
- FC System: production of a certain amount of electricity and useful thermal energy in a given number of years expressed in MJ_{ex}

Reference Flow

number of FC modules, stacks or whole systems, required to produce the amount of energy or exergy defined in the functional unit

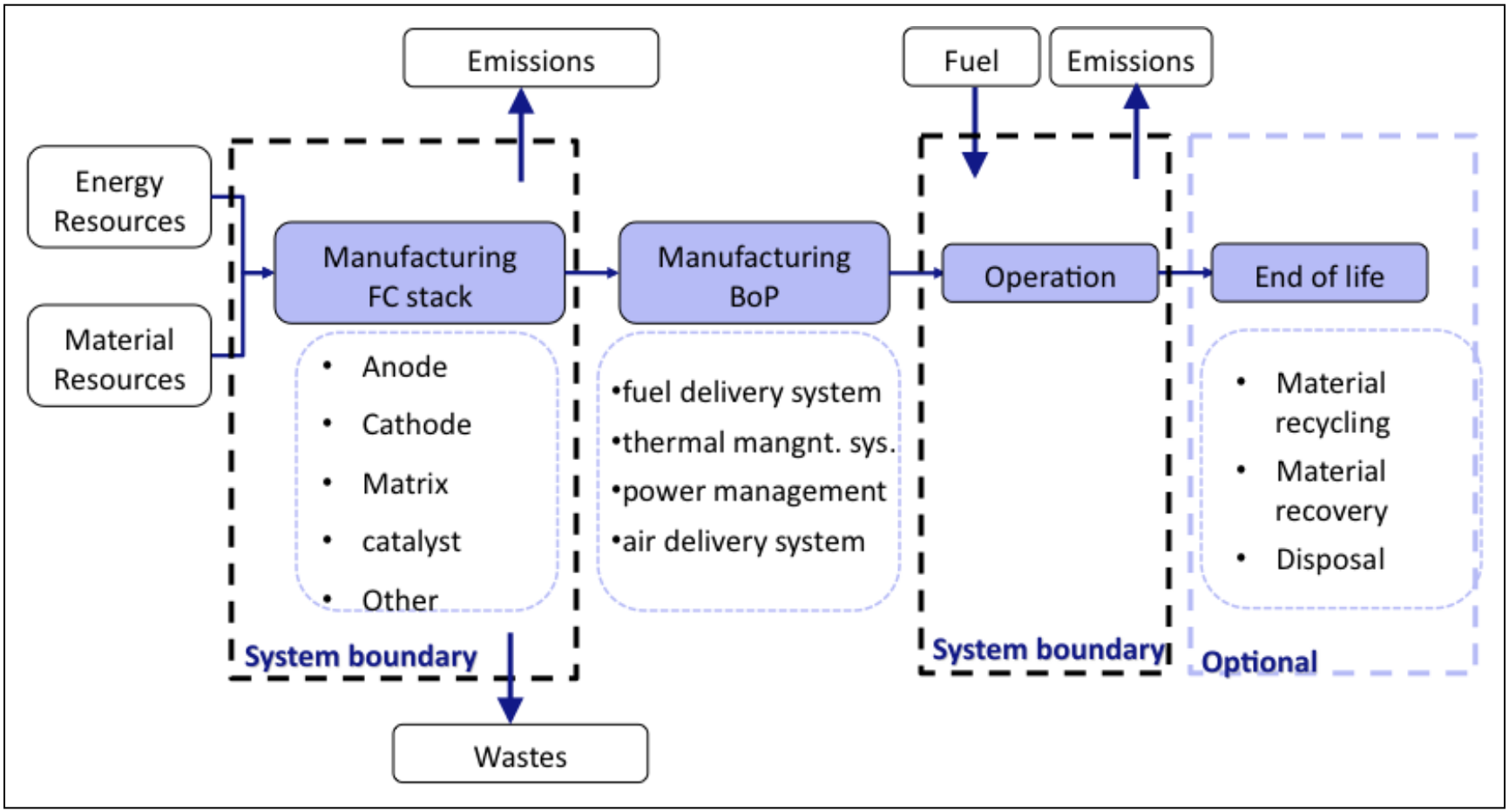
Part II – System Boundaries

Hydrogen



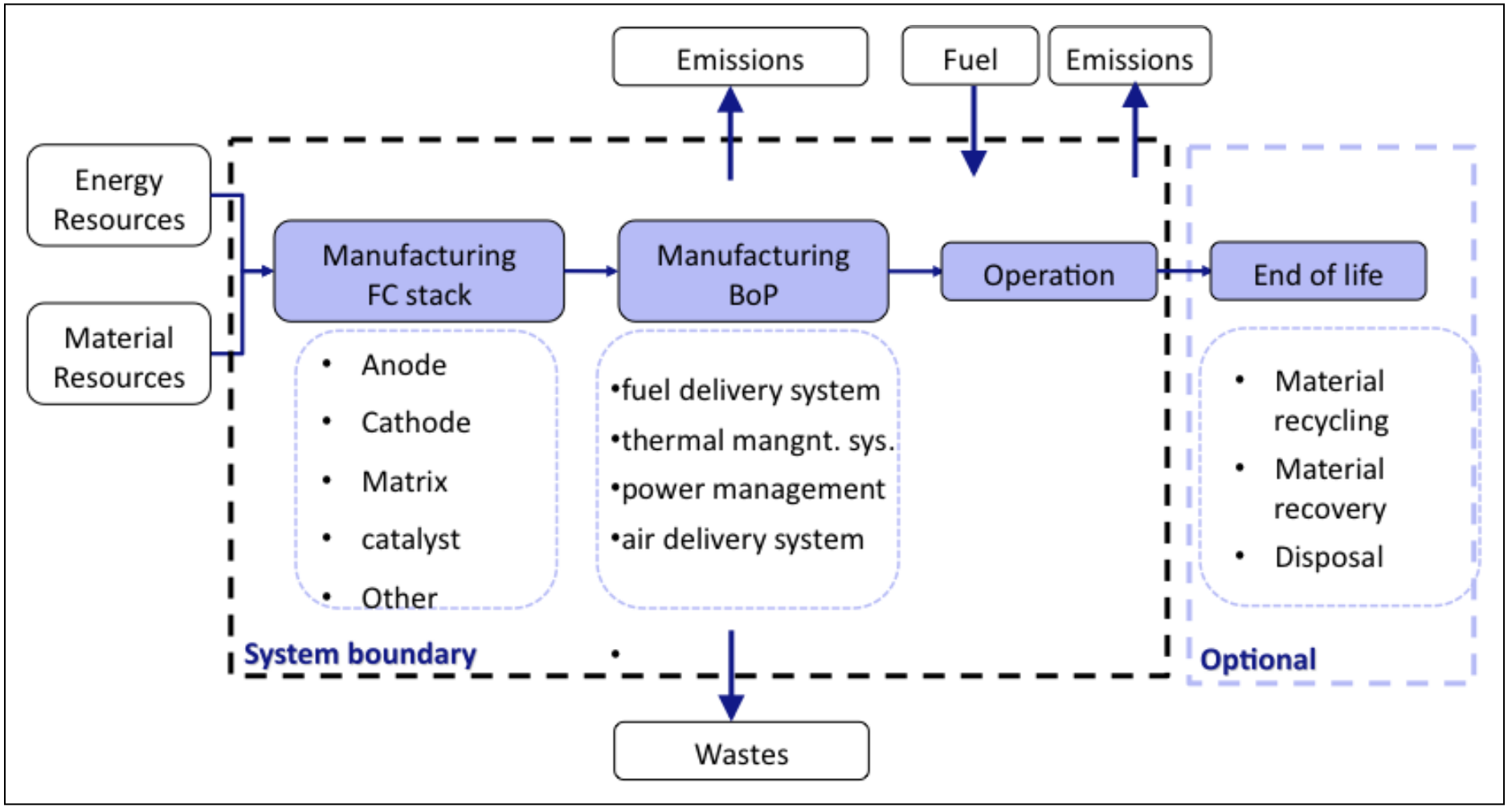
Part II – System Boundaries

FC: Stack

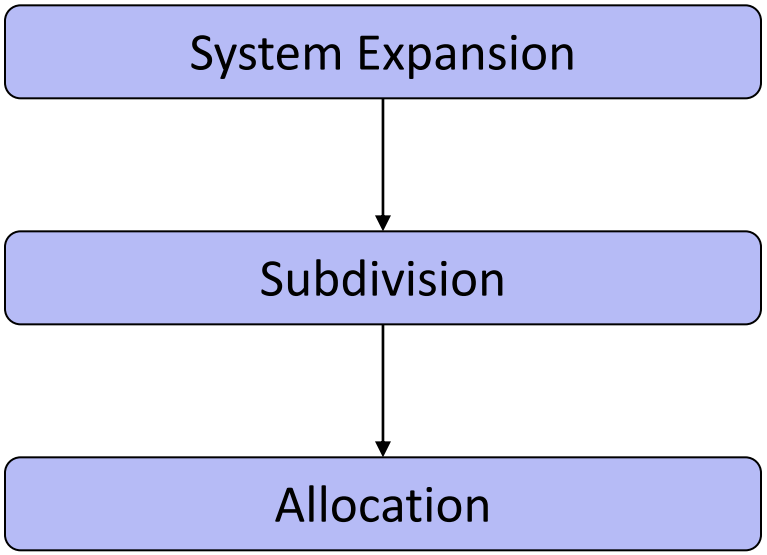


Part II – System Boundaries

FC: System



Part II – Multifunctional processes



If possible

Point out if the subdivided process is suitable

a) Physical properties

b) Economic properties

Part II – Data Collection and Cut-Off

Guidelines for data collection

- At least one start-up and shut-down sequence shall be included
- Regular maintenance shall be included
- Auxiliaries like pressurised air and so on shall be included
- If seasonal influences exist they shall be included (either measured or estimated)
- The period measured shall be long enough to cover business as usual without irregularities

→ Max. 5 % Cut-Off regarding environmental impact of the entire system

Part II - Impact assessment categories and impact assessments methods

Recommendation on impact categories by JRC-IES

If available, else

Impact categories of Centre of environmental science (CML)

recommended

Part II - Impact assessment categories and impact assessments methods

Shall: Use the following impact categories:

- Global Warming Potential (GWP)
- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Photochemical Ozone Creation Potential (POCP)

Shall: In addition to these environmental impact categories use the following environmental indicators:

- Non-renewable Primary Energy Demand (PED non-renewable)
- Renewable Primary Energy Demand (PED renewable)

Part II - Impact assessment categories and impact assessments methods

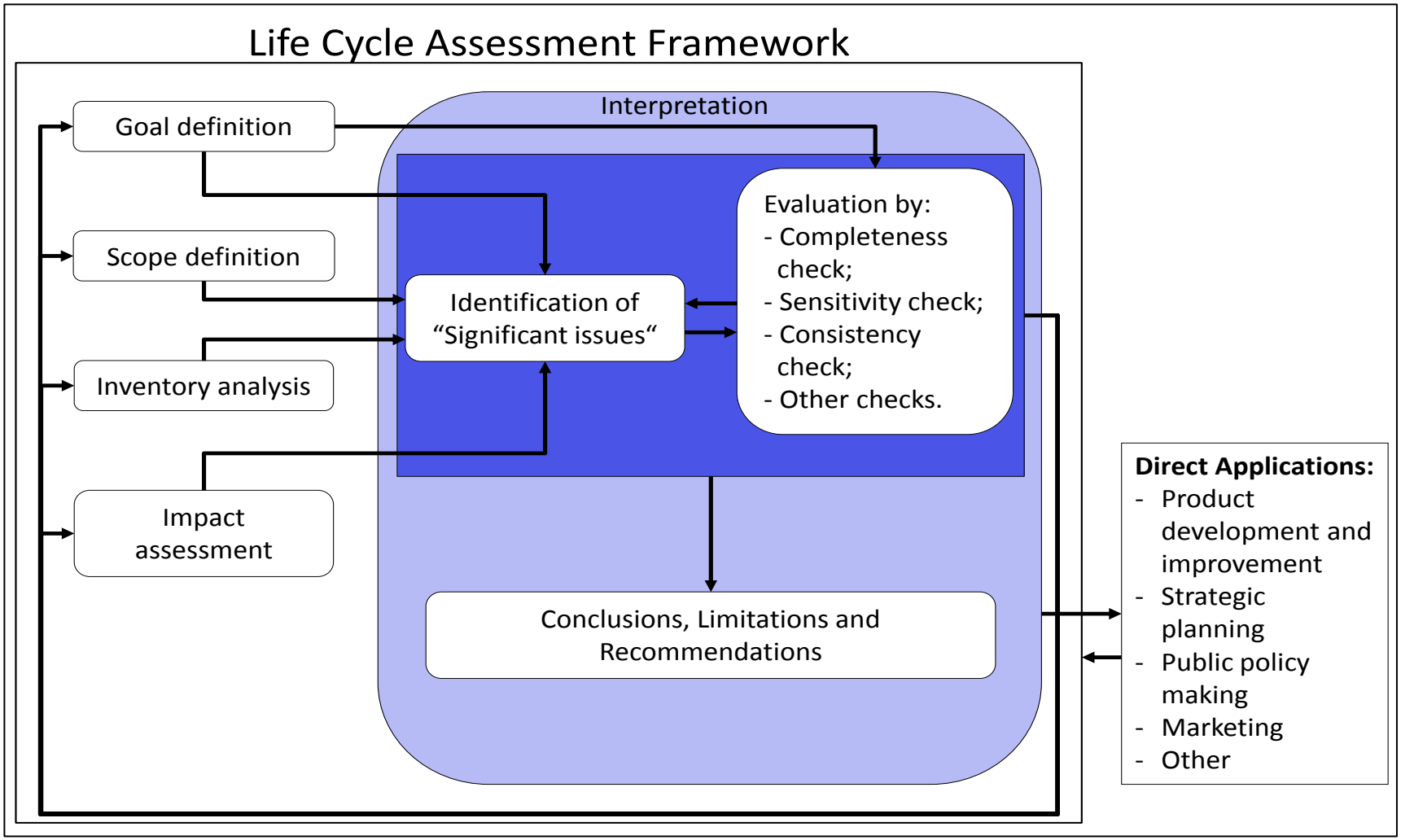
Should: The following impact categories could be used in addition

- Ozone depletion potential
- Human toxicity
- Respiratory inorganics
- Ionising radiation
- Ecotoxicity (freshwater, marine, terrestrial)
- Land use
- Ressource depletion

Part II – Additional information and reporting

- Any hazardous or toxic substances, wastes or other used or released should be mentioned in the final report either as usual or accidental release
- Any other environmental impacts that may occur and could be important, shall be reported even if they can't be quantified yet
- Results and conclusions of the LCA study shall be completely and accurately reported without bias to the intended audience
- The validity of the study shall be chosen according to the expected lifetime of the facility (e.g. laboratory scale: 2 to 5 years validity, refinery 10 to 15 years)

Interpretation and quality control



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Reporting

- Executive Summary
- Technical Summary
- Main content
- Annex

Critical review

- **Should:** For internal studies an independent internal review is recommended if an external review is not planned.
- **Shall:** A critical review is necessary if the study is intended to be disclosed to the public
- **Shall:** A critical review panel (at least 3 reviewers) is necessary if the study is comparative and intended to be disclosed to the public

Acknowledgement

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