FC-Hy Guide

Training Course

Guidance Document

29 September 2011, Bologna

ENEA

Research Centre

E. Clementel

Content

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

FC-Hy Guide

Introduction to the project

The overall goal of the call "SP1-JTI-FCH.2009.5.5 LIFE CYCLE ASSESSMENT (LCA)" is to develop a specific guidance document for application to hydrogen and fuel cell technologies and related training material with courses for practitioners in industry and research.

This is to be based on and in line with the International Reference Life Cycle Data System (ILCD) Handbook, co-developed by the European Commission's JRC-IES.

- A guidance document – based on the ILCD handbook – that is scientifically sound, industry accepted and quality assured (reviewed)
- LCA study reporting template, tailor-made to hydrogen and fuel cell technologies
- Broad dissemination among LCA practitioners and industry,
- A website, as a central information point and as fully integrated component of the ILCD data network, with public and restricted access areas.

Project timeline

	Apr		May		Jun		Jul		Aug		Sept	
Preparation and consultation of guidance document												
Public consultation												
Revision of the advanced document												
Review and finalization of the document												
Dissemination, external communication and training courses												
2 Training courses												
Case studies												
Case studies												
Review of the case studies												

Public
ENEA/ PE
PE/ENEA together with advisory board/review panel

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Project partners

HyGuide:

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

University of Stuttgart
Chair of Building Physics (LBP)
Life Cycle Engineering (GaBi)

KIT
Karlsruher Institut für Technologie

JRC ie
EUROPEAN COMMISSION Institute for Energy

FAST
Federazione delle associazioni scientifiche e tecniche
fondata nel 1897

EHA
EUROPEAN HYDROGEN ASSOCIATION

FC-Guide:

ENEA
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

FCB

Università degli Studi di Napoli Parthenope

TU Graz
Graz University of Technology

PLANET
GbR

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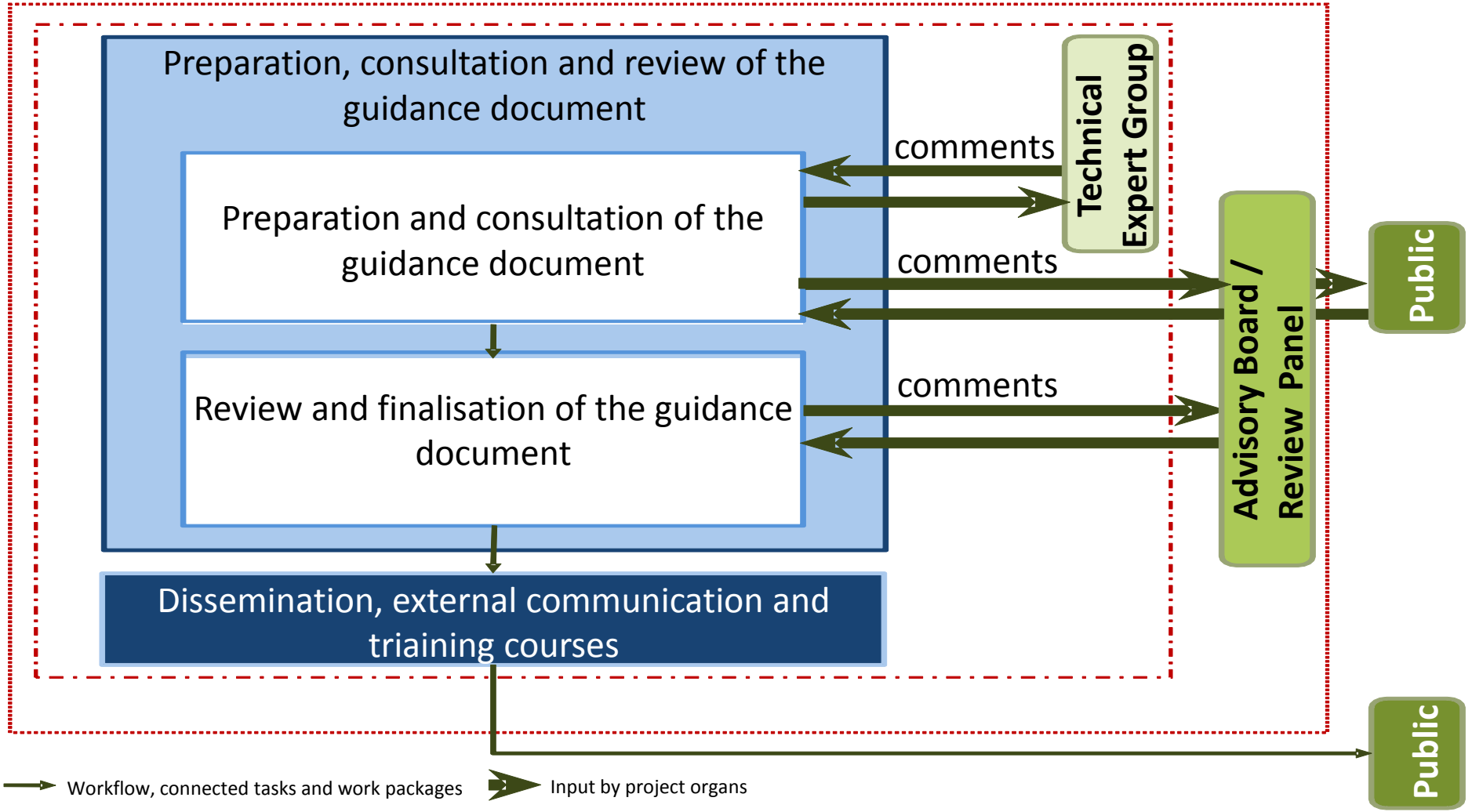
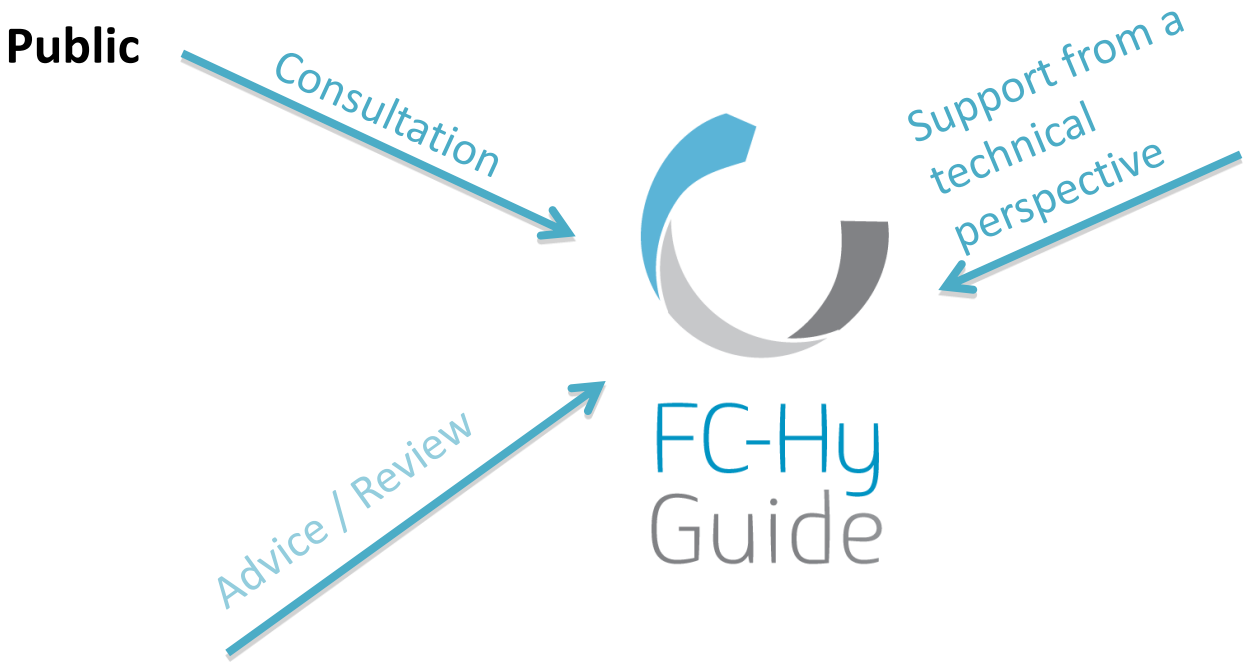
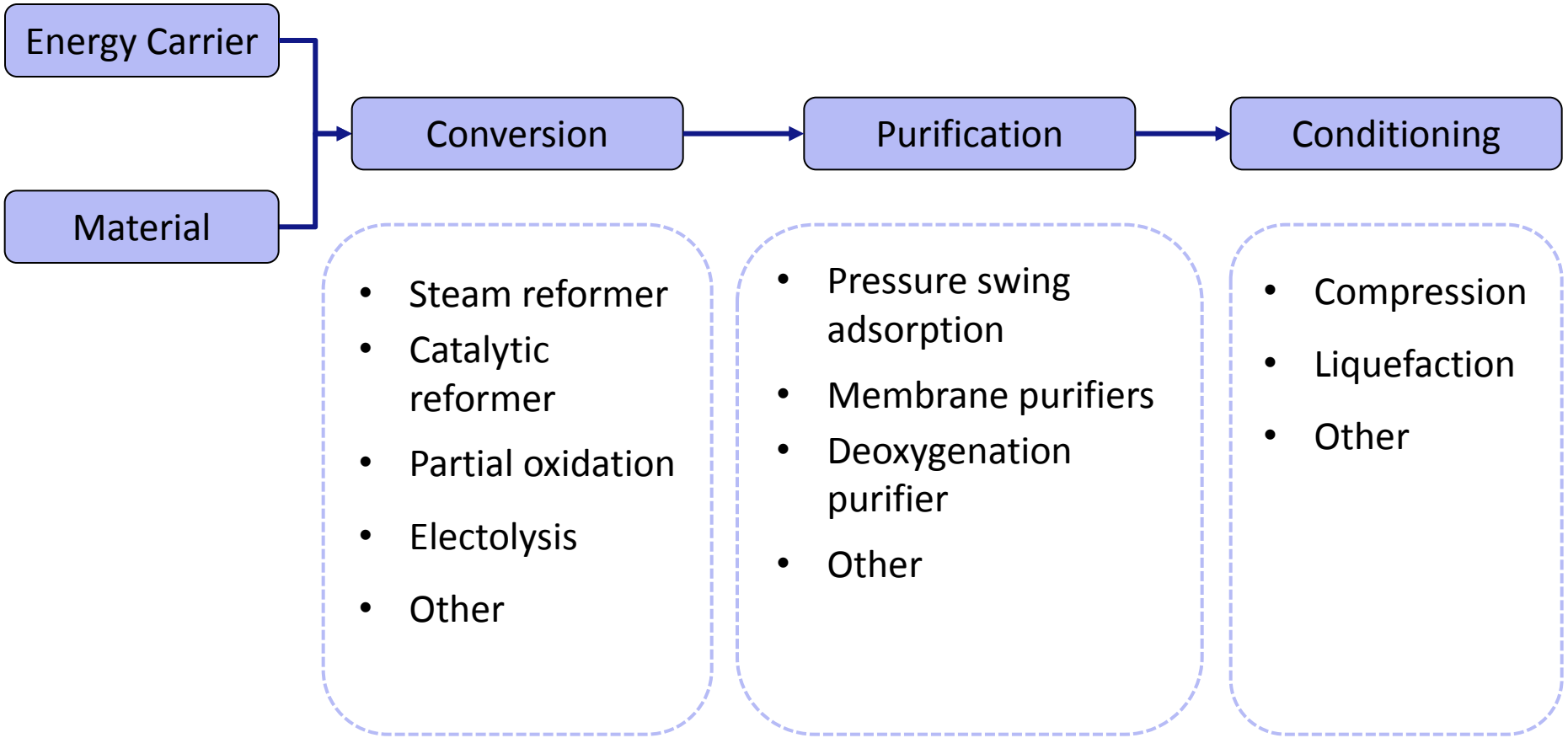
Project Structure



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: Reporting template

Annex II: Documentation according to ILCD

Annex III: Data collection template

Annex IV: Review reporting template

Annex V: Example from case study

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Part I - General Information

1. About this document

2. How to use this document

3. Introduction to Life Cycle Assessment

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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

- Product group
- Product related information
- Description of producer

LCA specific

- Goal and Scope
- Functional unit and reference flow
- System boundaries
- Cut-Off criteria
- Inventory Analysis
- Multifunctional processes
- Data collection
- Impact assessment categories and methods

Reporting

- 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

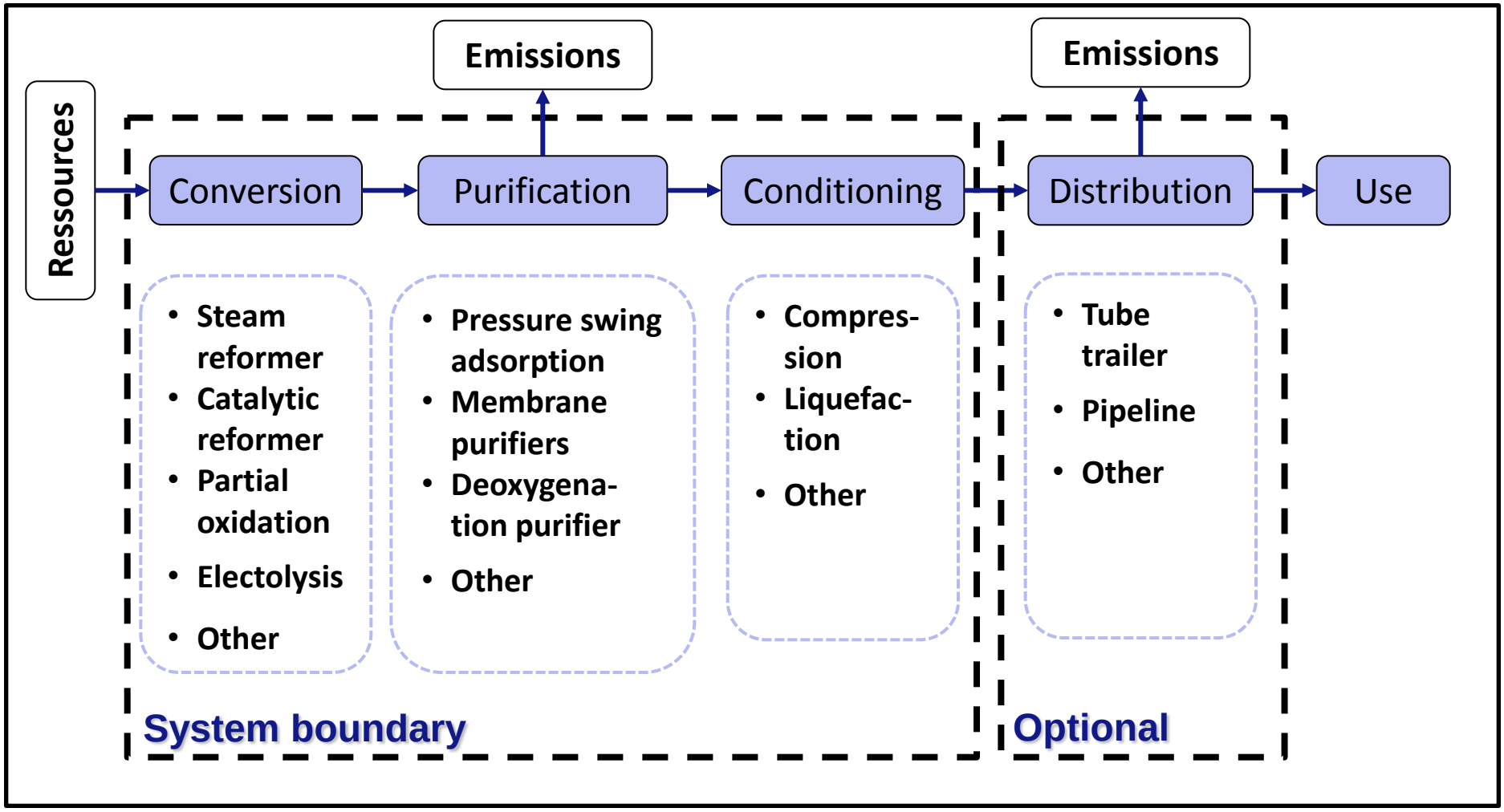
- Stack : power capacity of the manufactured stack expressed in kW_{ex}
- FC System: production of a certain amount of electricity and useful thermal energy in a given number of years expressed in MJ_{ex}

Reference Flow

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

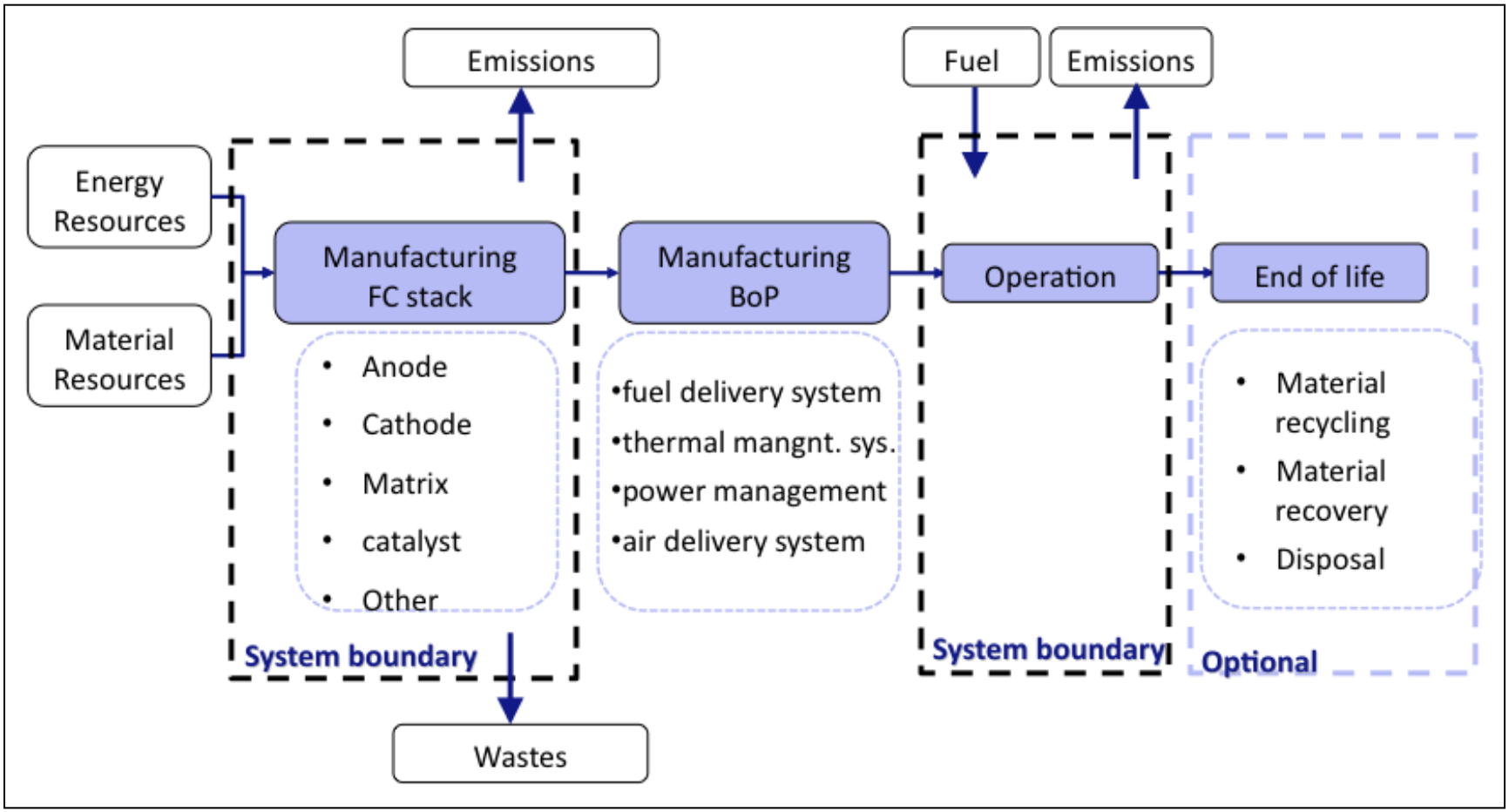
Part II – System Boundaries

Hydrogen



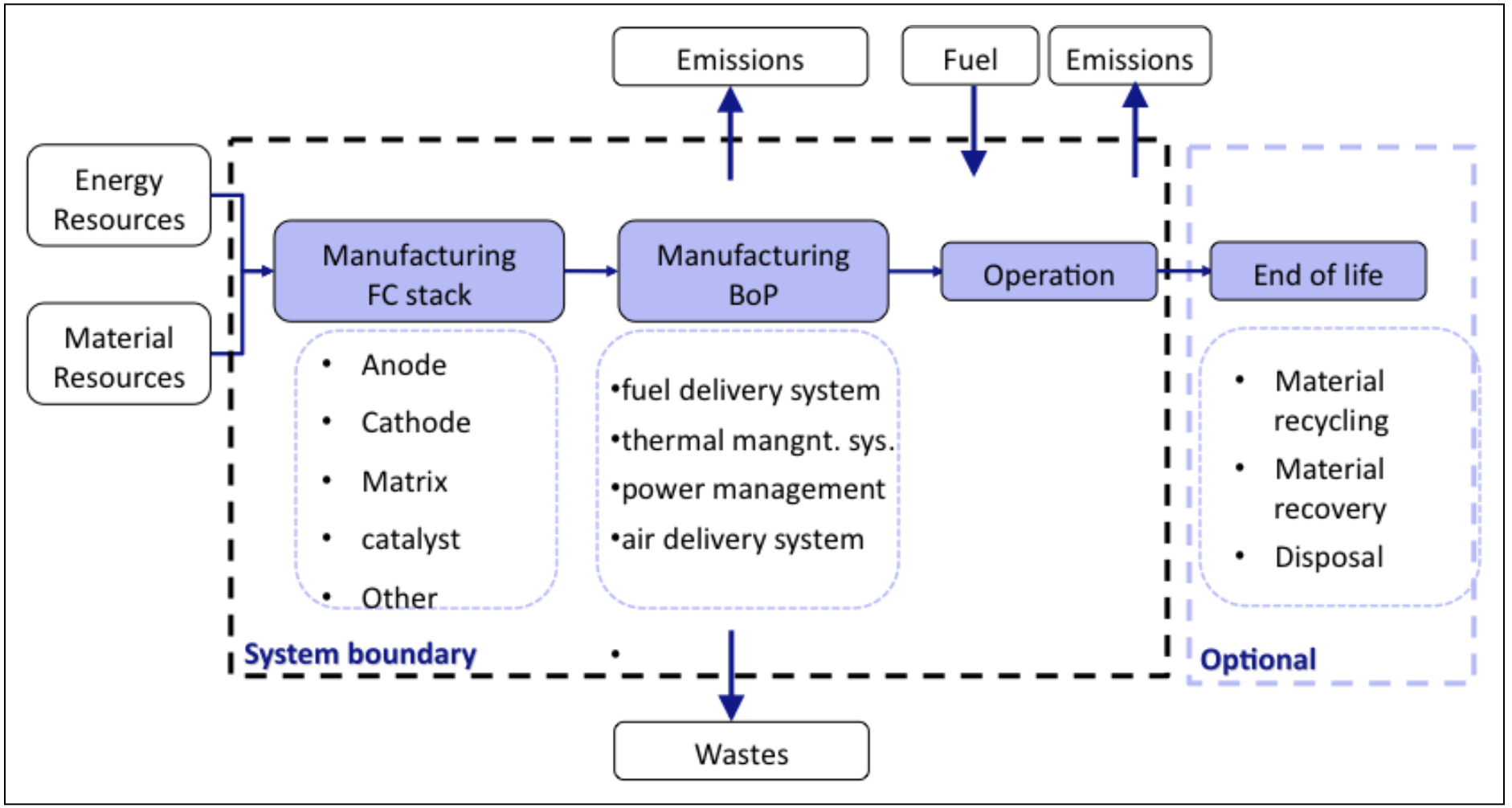
Part II – System Boundaries

FC: Stack

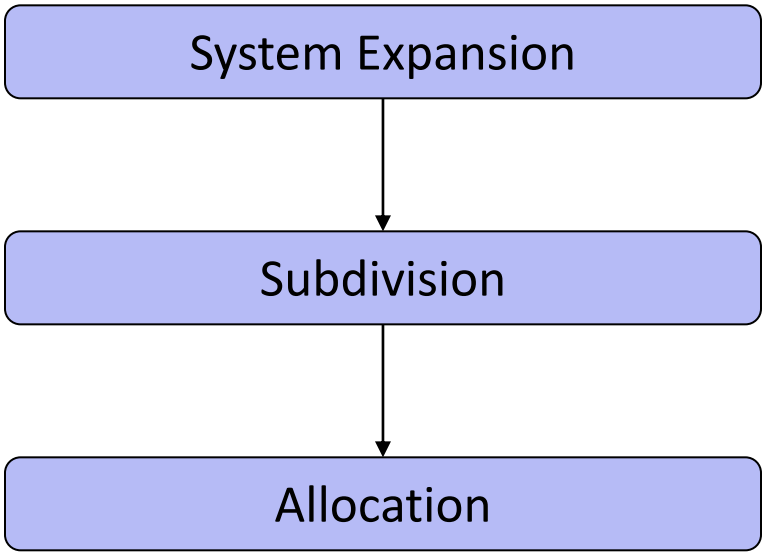


Part II – System Boundaries

FC: System



Part II – Multifunctional processes



If possible

Point out if the subdivided process is suitable

a) Physical properties

b) Economic properties

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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

JRC impact categories 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

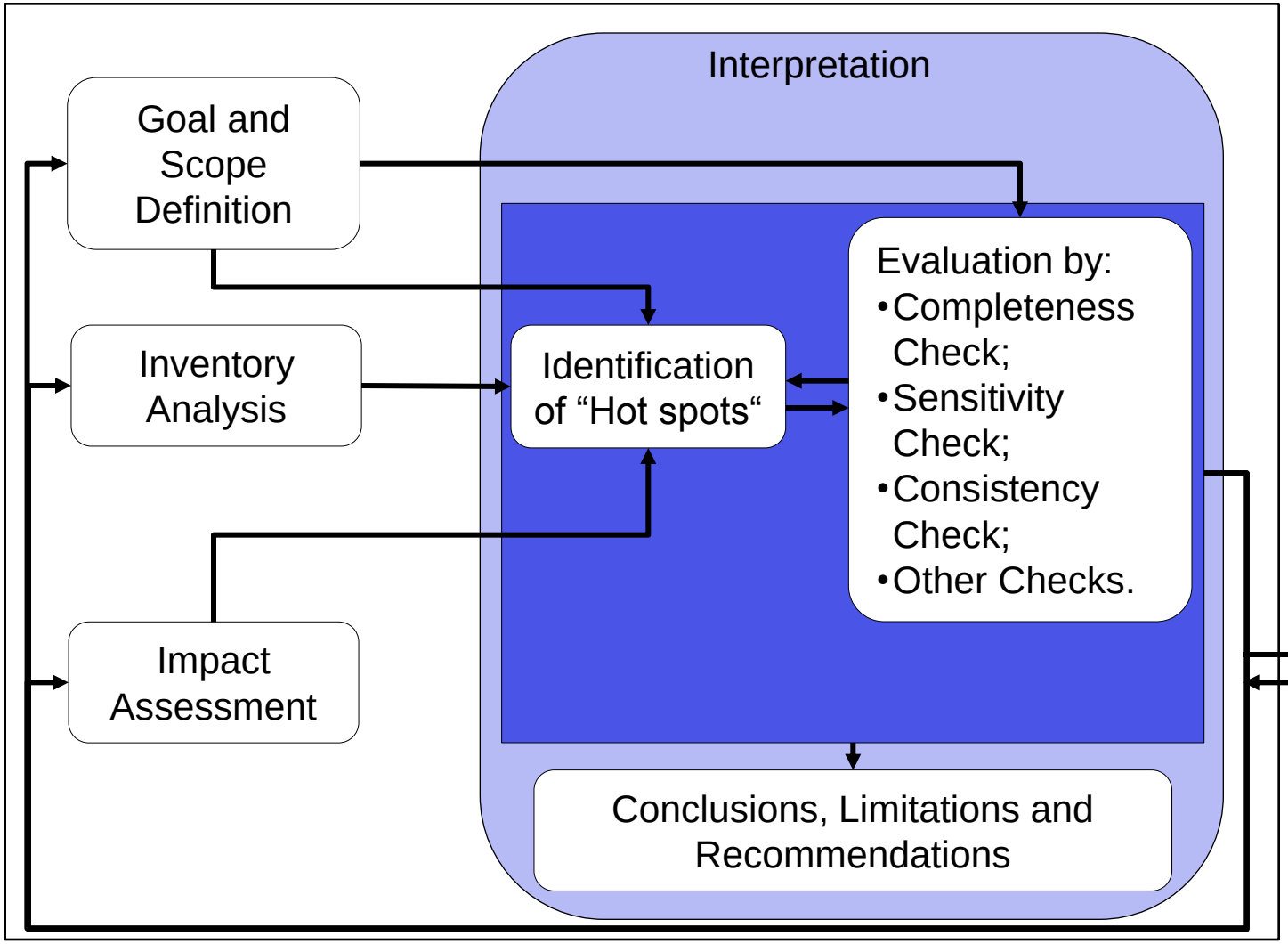
Should: The following impact categories could be used additionally

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



Direct Applications:

- Product Development and Improvement
- Strategic Planning
- Public Policy Making
- Marketing
- Other

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

Acknowledgment

The research leading to these results has received funding from the Fuel Cells and Hydrogen Joint Undertaking under grant agreement n° [256850].