



Training Course
Guidance Document

29 September 2011, Bologna



Research Centre

E. Clementel

FC-Hy
Guide

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

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.

	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

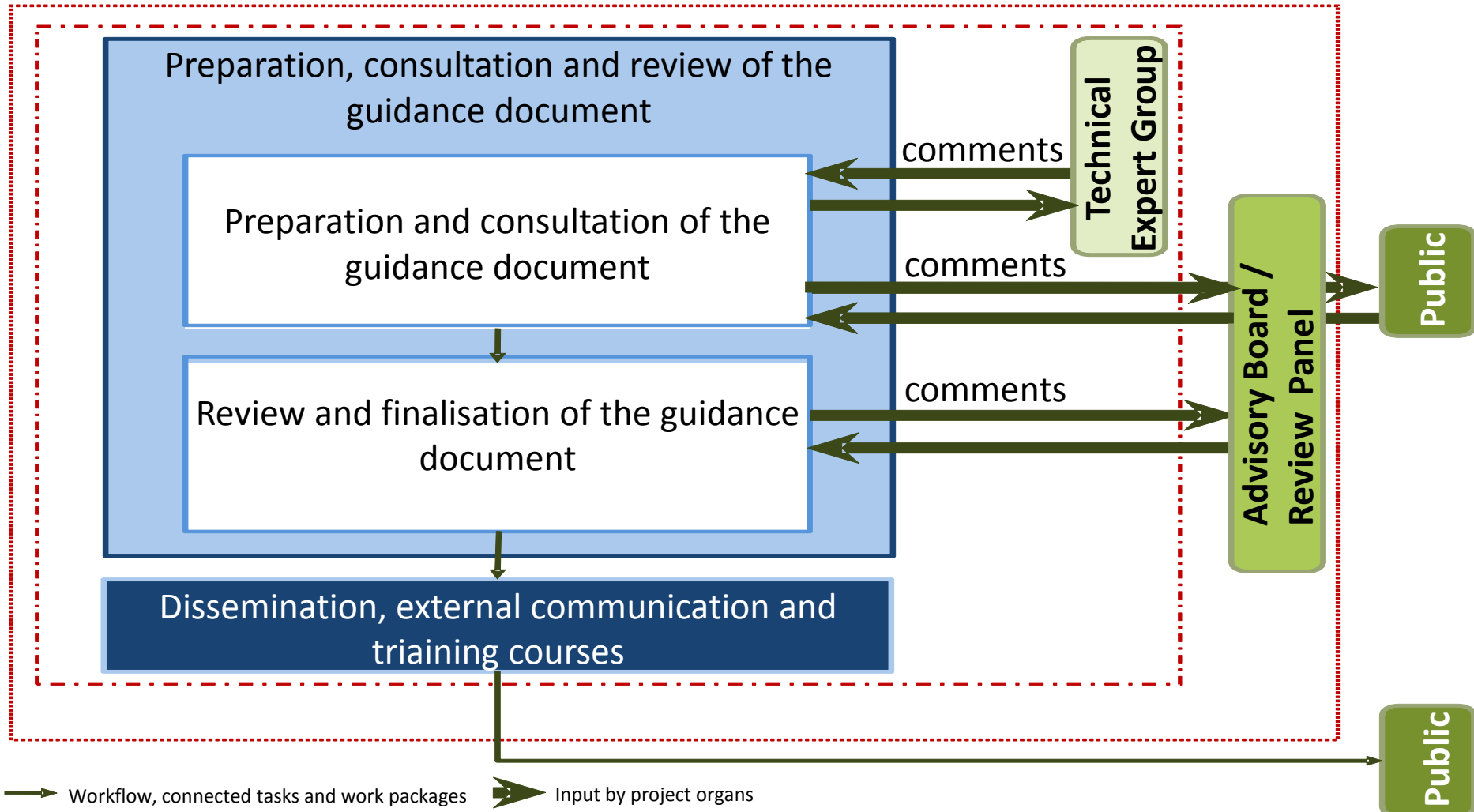
PE/ENEA together with advisory board/review panel

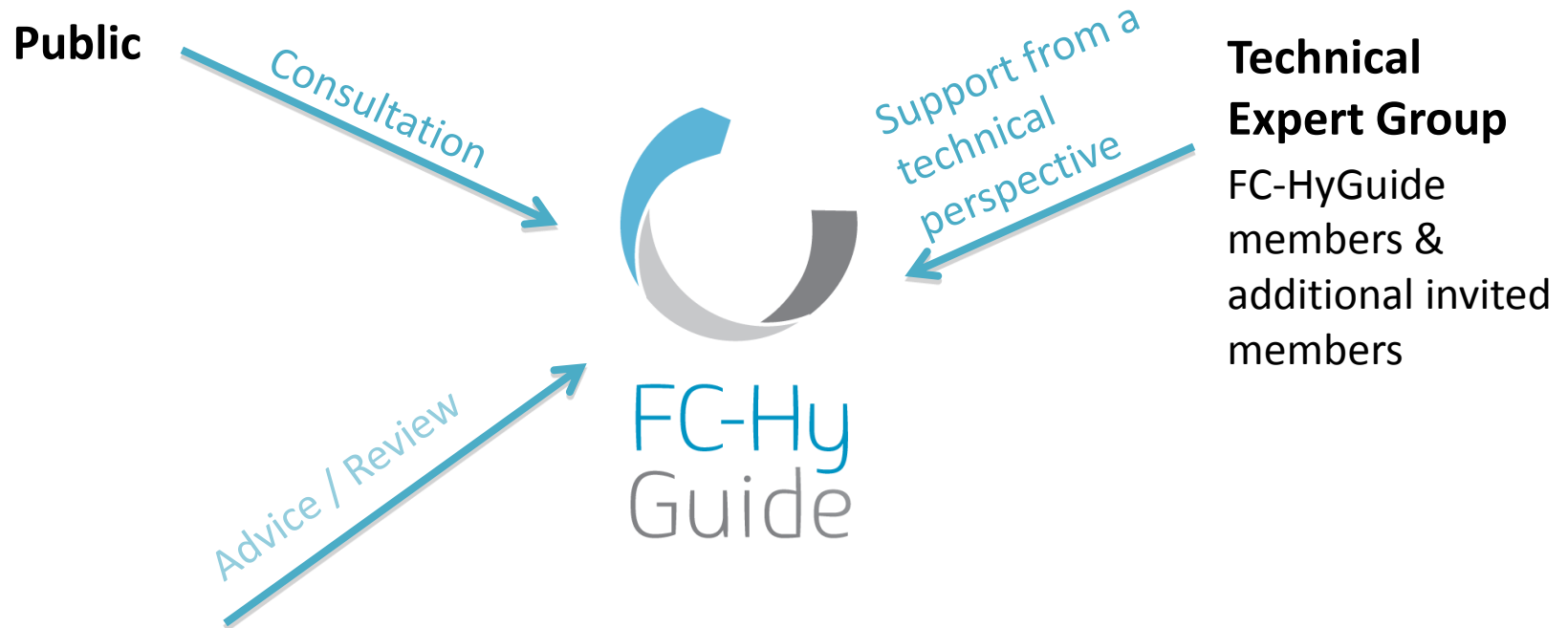
HyGuide:



FC-Guide:







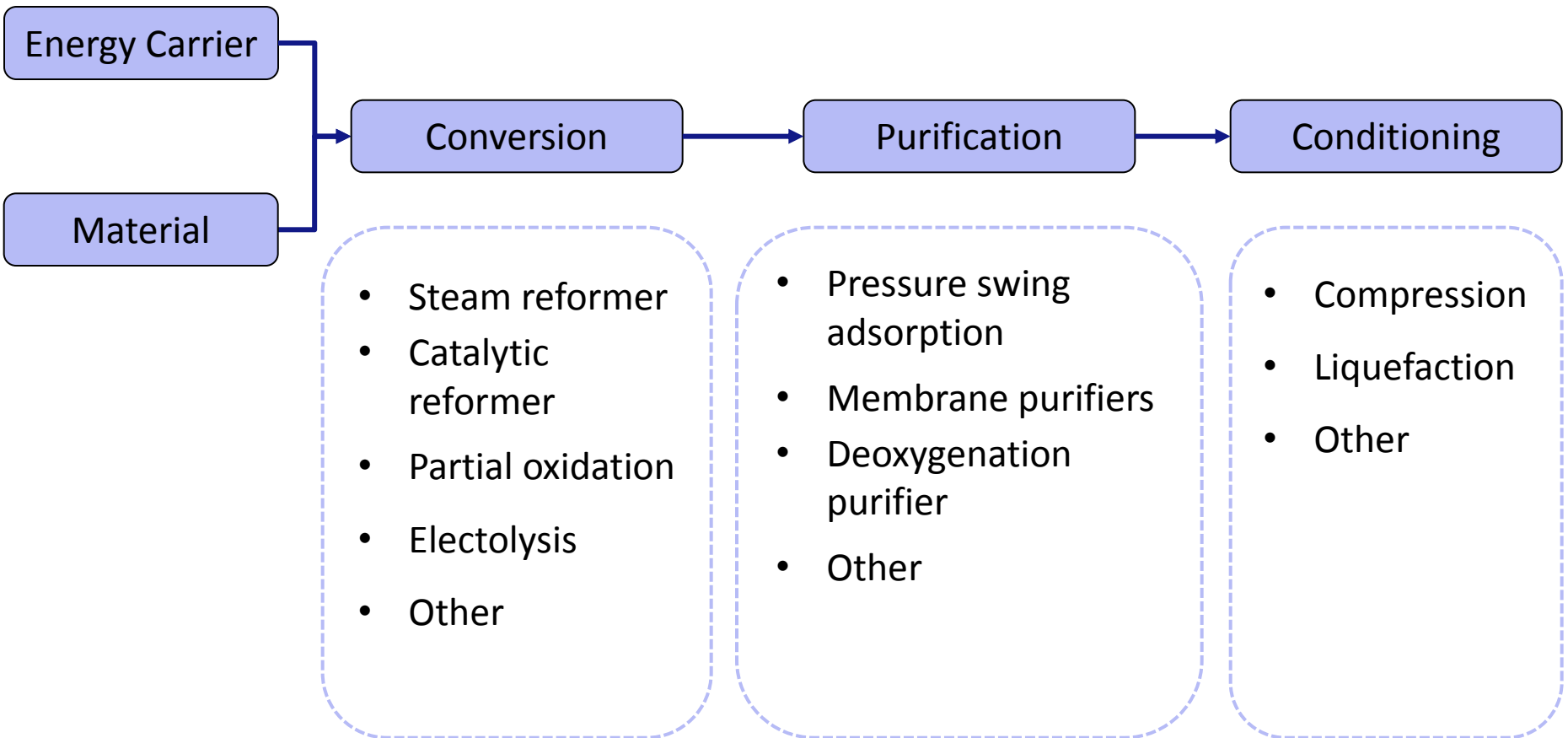
Advisory Board / Review panel

JRC –IES Platform for LCA: Kirana Chomkamsri (advisory board only)

TU Berlin: Prof. Dr. Matthias Finkbeiner

GIGA: Dr. Pere Fullana

MiBo Consult: Michael Bode



FC stack
FC system

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

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

- 1. About this document**
- 2. How to use this document**
- 3. Introduction to Life Cycle Assessment**



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



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

Product related information

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

Description of hydrogen producer

- Overall H₂ 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

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”

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

Product related
information

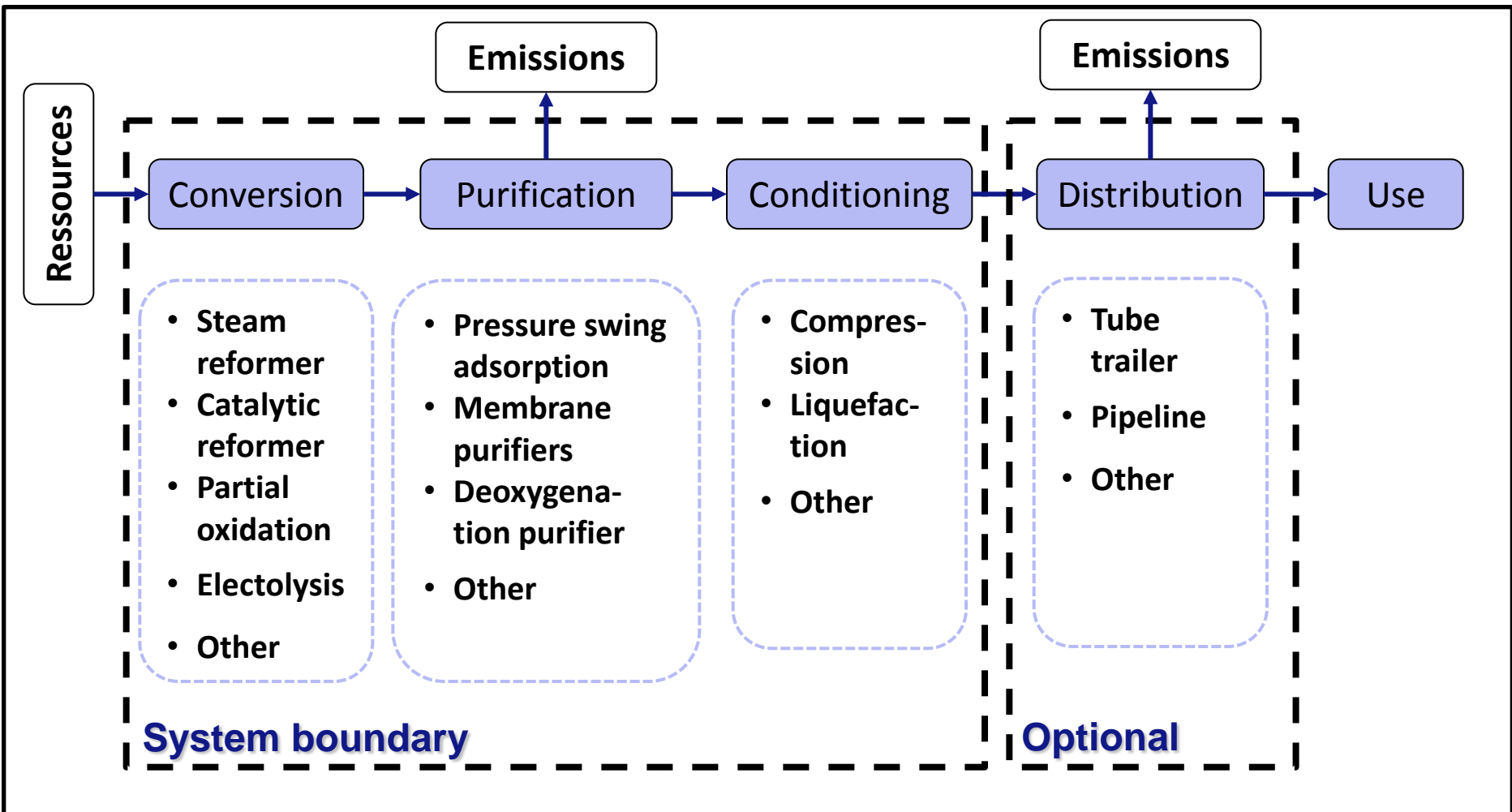
- trade name
- type of electrolyte used
- primary functions
- electrical power
- thermal power
- efficiency
- rated voltage
- rated current
- range of temperatures and operating temperature
- weight
- dimensions
- fuel used and its technical specifications
- expected service life
- description of the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

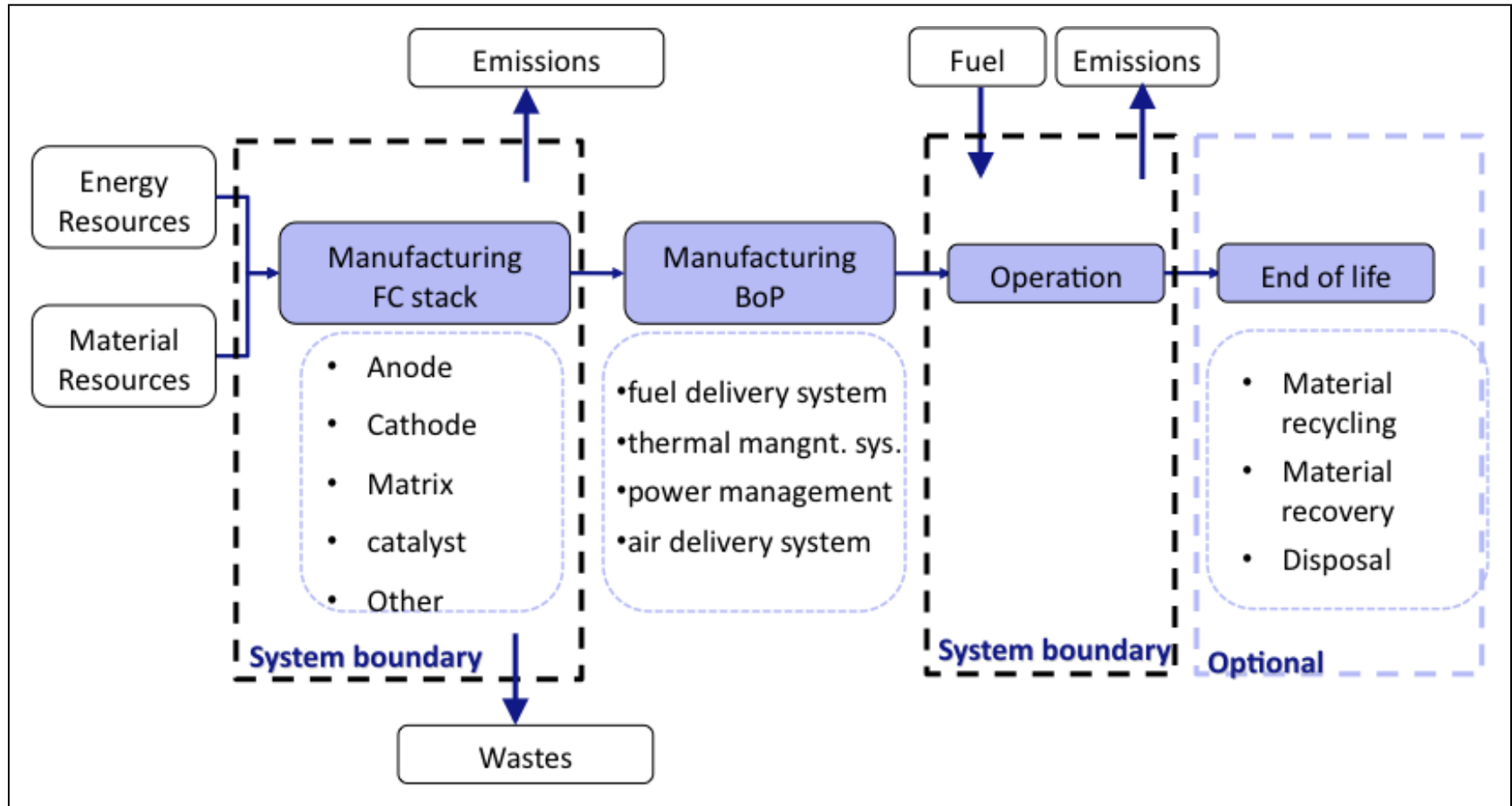
Functional unit

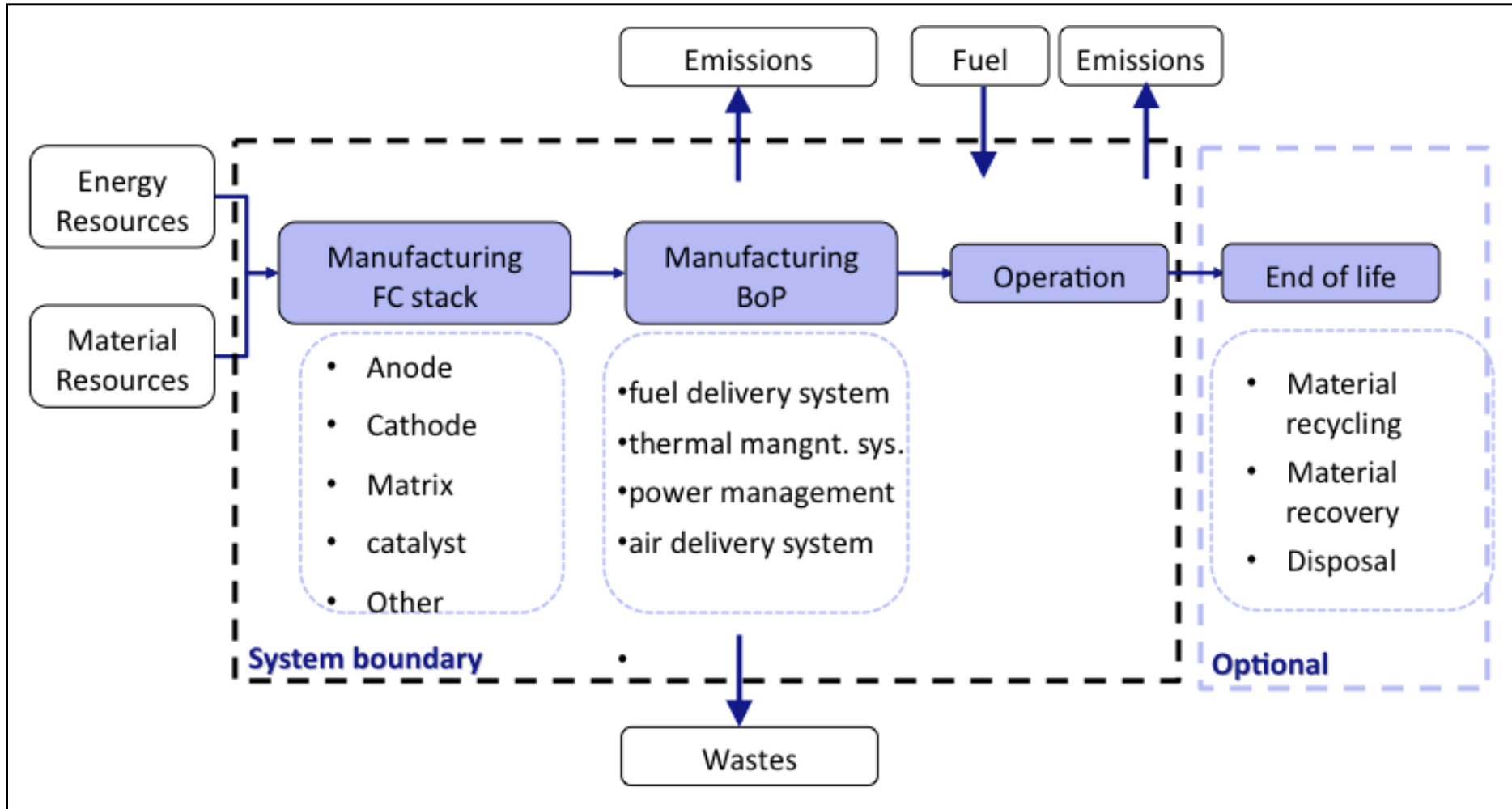
- Stack : power capacity of the manufactured stack expressed in kW_{ex}
- FC System: production of a certain amount of electricity and useful thermal energy in a given number of years expressed in MJ_{ex}

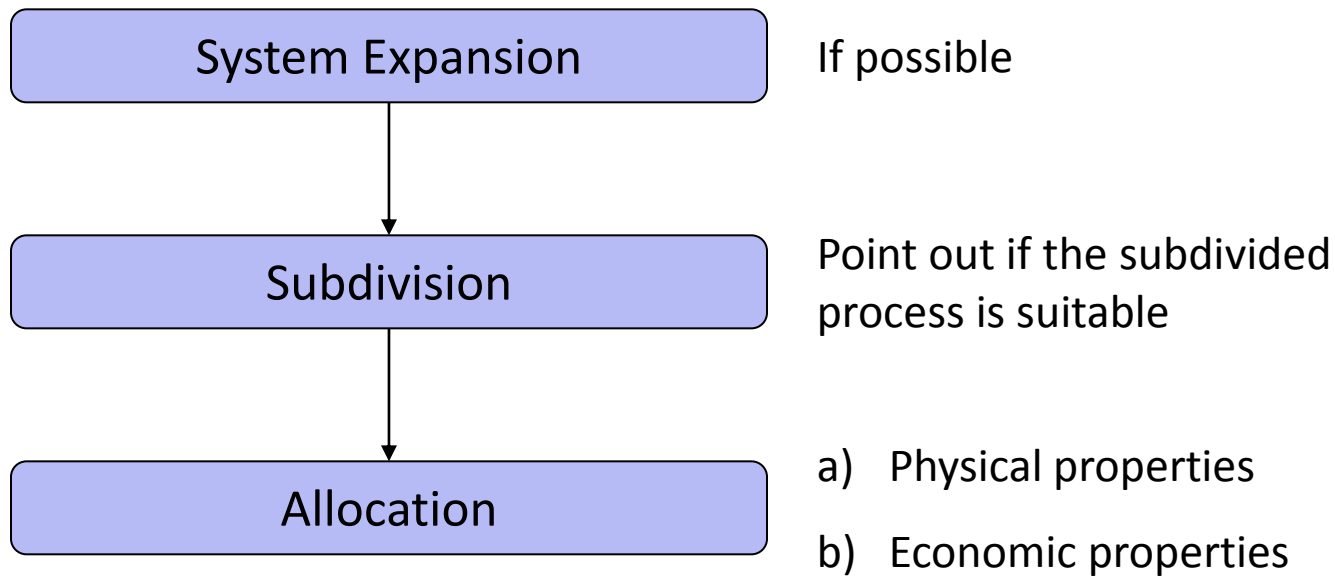
Reference Flow

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









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



Shall: Use the following impact categories:

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

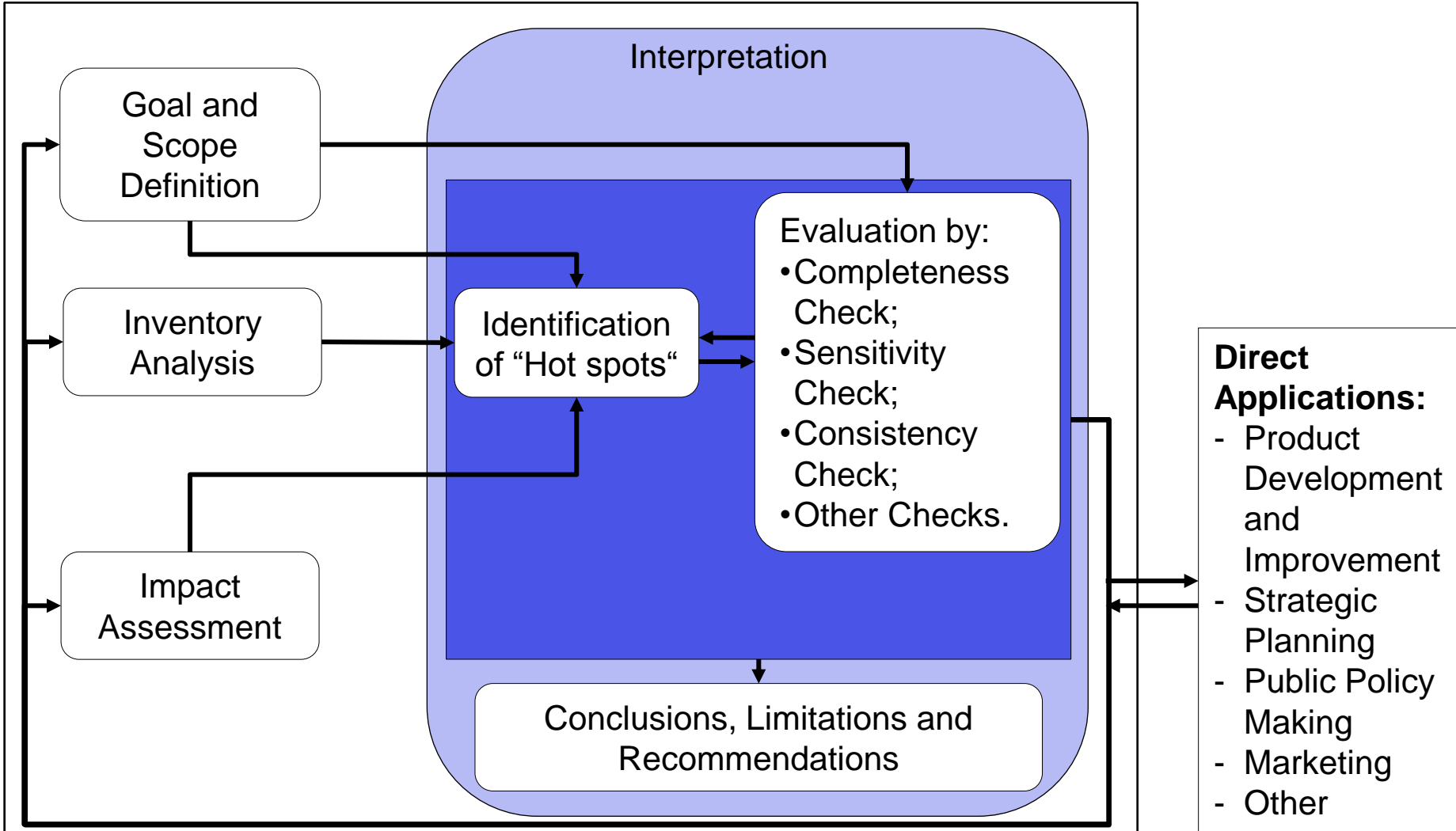
Shall: In addition to these environmental impact categories use the following environmental indicators:

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

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

- 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)



- Executive Summary
- Technical Summary
- Main content
- Annex

- **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

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