Life Cycle Analysis of SSL Technologies

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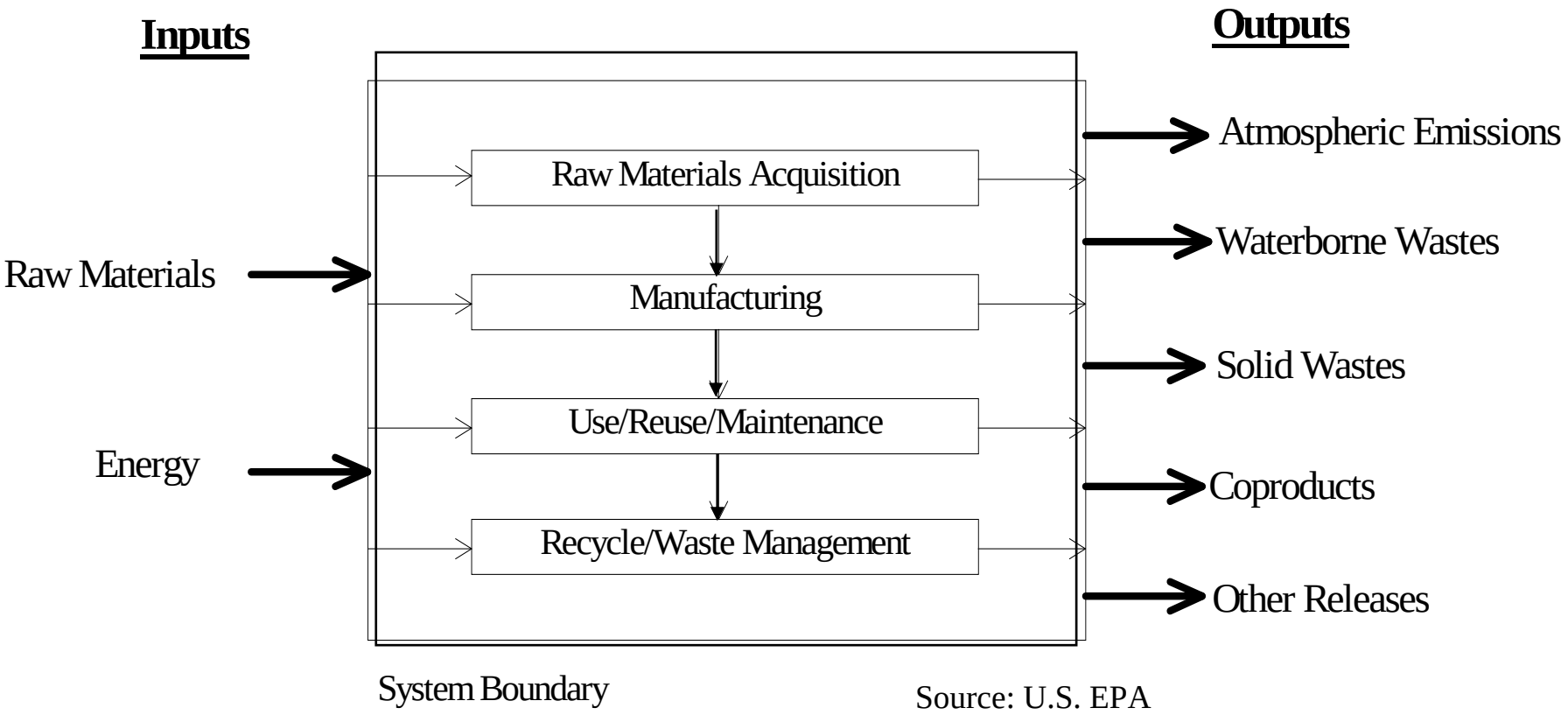
Outline

- Why an LCA is needed
- What is an LCA
- Issues for LCA of SSL

Motivation

- Data and performance driven industry
- Ensure no “surprises” in terms of net energy, material hazards or scarcity (none anticipated)
- Need to show total benefits of product in a systematic way

Stages of the Product Life Cycle



Source: U.S. EPA

Environmental Assessment – Sample Inputs and Outputs

- A life cycle analysis keeps an inventory of, for example:
- Raw materials
  - minerals, ores, chemicals, fertilizers, etc.
- Energy
  - electricity, petroleum fuels, fossil fuels
- Greenhouse Gases
- Other Wastes

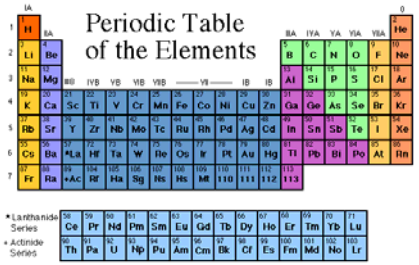
Data Sources in LCA

- Company data
- Consultants, labs, academia
- Public:
  - U.S.: EPA data, e.g., Toxics Release Inventory (TRI)
- Data sources and accuracy are often the biggest problems

The Boundary Issue

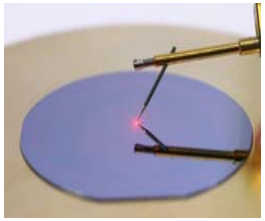
- Where to set the boundary of the analysis?
- What parts of the life cycle will be included or excluded by default, or during the course of the study as data gaps are realized?

Precursor Gases

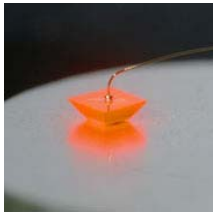


Materials

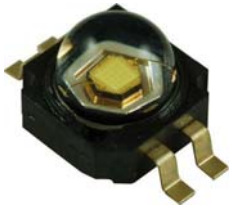
Reactors/Epitaxy



Wafers



Die

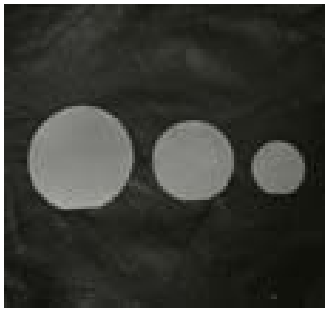


Package

Array

Luminaire

Energy



Substrates

Source: Kevin Dowling, Philips SSL

Proposed Study – Phase 1

- Identification of key energy, substance issues
- Identification of available and relevant data sources
  - equipment manufacturers, upstream manufacturers, final assembly)
- Finalization of LCA scope and boundary

Proposed Study – Long Term

1. Compare SSL to 1-2 mature technologies in same market (residential, commercial)
   - e.g., incandescent, fluorescent

2. Functional unit: 1500 lumens?

3. Scope: raw materials -> disposal
   - As far (and consistent) upstream as possible

4. Inputs/outputs: cost, total net energy, special substances

Special Substances

- Inventory as best possible the various substances used, and quantities

- Separate concern for **hazardous, toxic, or scarce** resources
  - Use toxicity weighting methods to compare

How You Can Help

- Data from manufacturers, e.g., energy or special substances needed to:
  - Produce wafers, packages, etc.
  - Assemble luminaires
- Suggest other user / implementation concerns
- Validation of our assumptions, data

Summary

- Life cycle analysis an important tool for pollution prevention and environmental decision-making
- SSL project is in planning stages, need input
- Goal is to finalize scope/etc. in months after preliminary data discussions