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POTENTIAL ENVIRONMENTAL IMPACTS OF THE PRODUCTION OF A REPRESENTATIVE STATE-OF-THE-ART AIRCRAFT CABIN STRUCTURE

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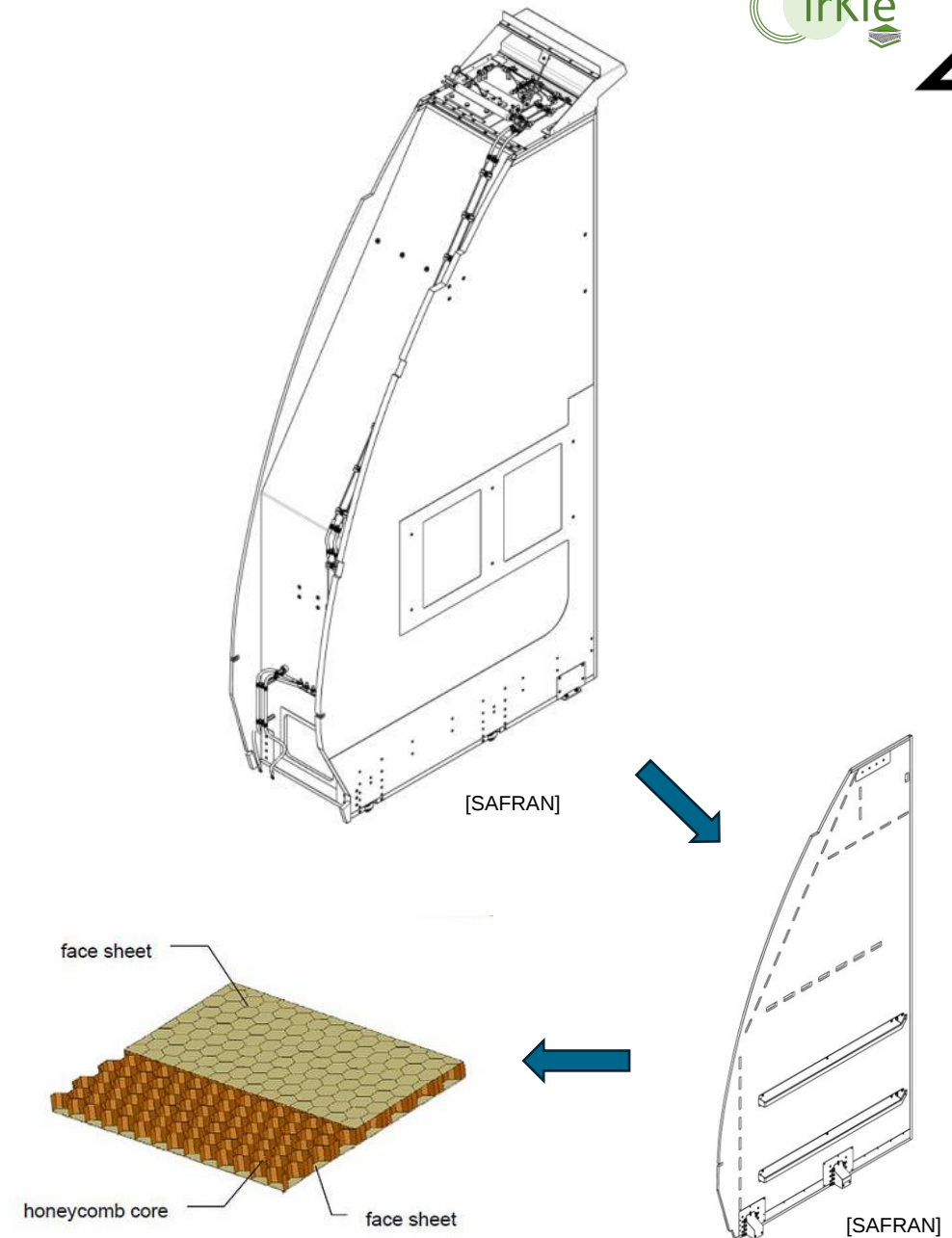
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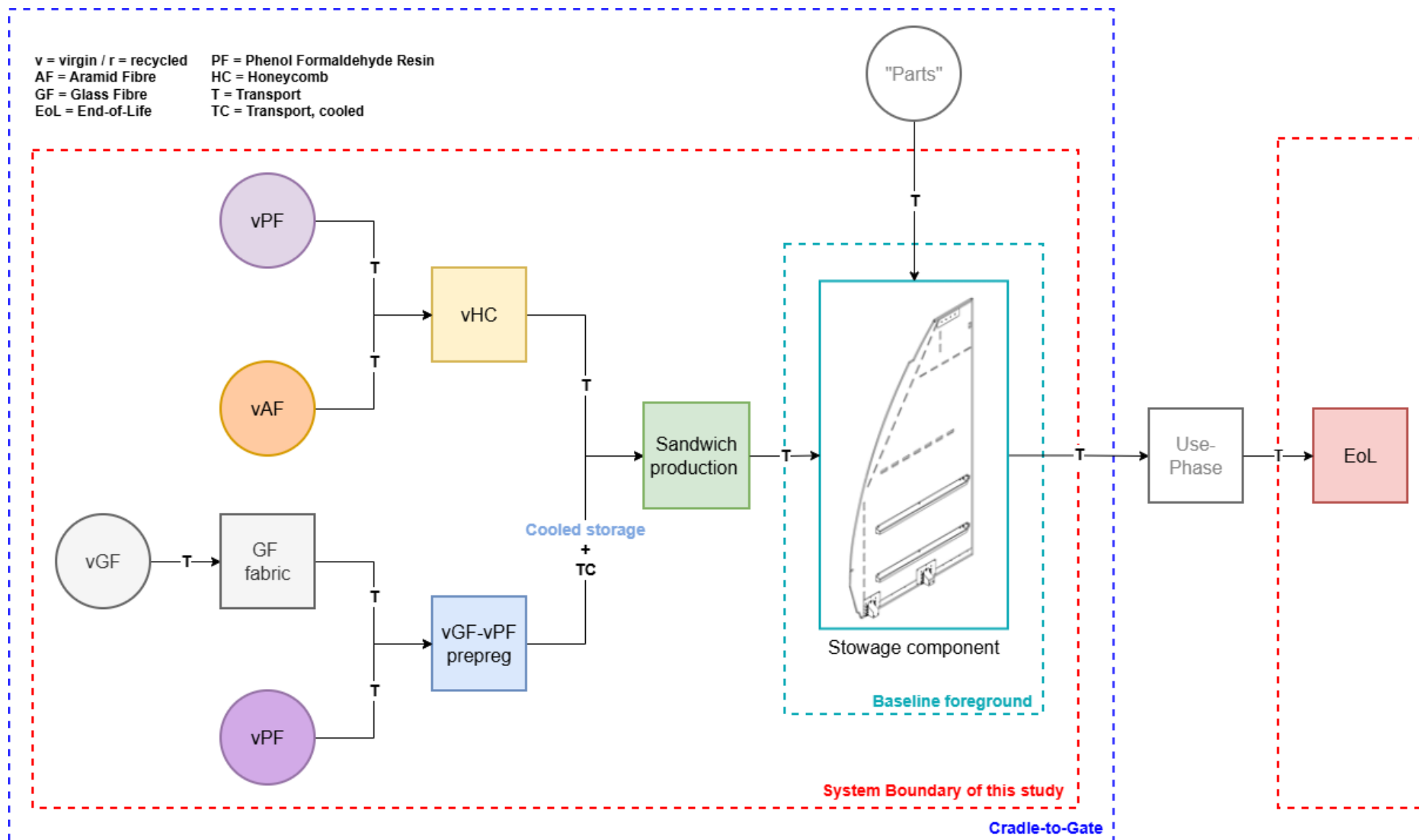
Preliminary Life Cycle Assessment Goal and Scope

- Baseline for later LCA comparison with recycling composites in CirKle project
- What are the potential environmental impacts of the production and EoL phase of a representative stowage component?
- (Simplified) FU: one aircraft state-of-the-art stowage component
- Sandwich structure
 - Core = honeycomb (aramid fibre + phenolic resin)
 - Face sheets = prepreg from glass fibre fabric + phenolic resin (+ FR)



Goal and Scope

System Boundaries



Life Cycle Inventory (LCI)

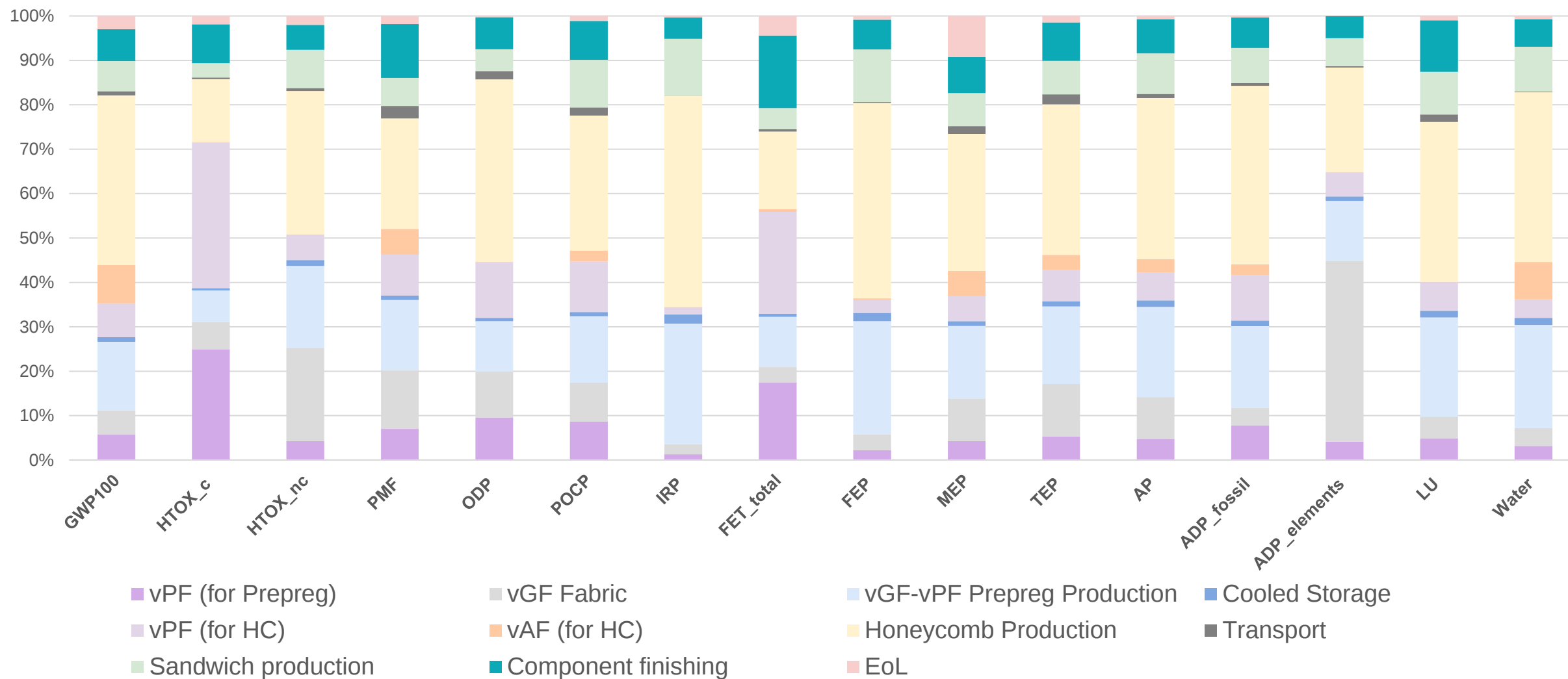
Included / Excluded Processes

included	excluded
• Aramid fibre production • Phenolic resin • Glass fibre production • Glass fibre fabric production • Honeycomb core production • Prepreg production • Refrigerated transport, prepreg • Transport, other intermediates • Cool storage of prepreg • Honeycomb / prepreg cutting • Sandwich production • Sandwich cutting / milling • EoL	• Adhesive • Screws • Inserts • Shim plates • Equipment / Tools • Infrastructure • Air condition • (use phase) • (recycling)

Life Cycle Impact Assessment (LCIA)

Relative Impacts

EF3.1 stowage component baseline, default values



LCI Uncertainty

Aramid Honeycomb Production

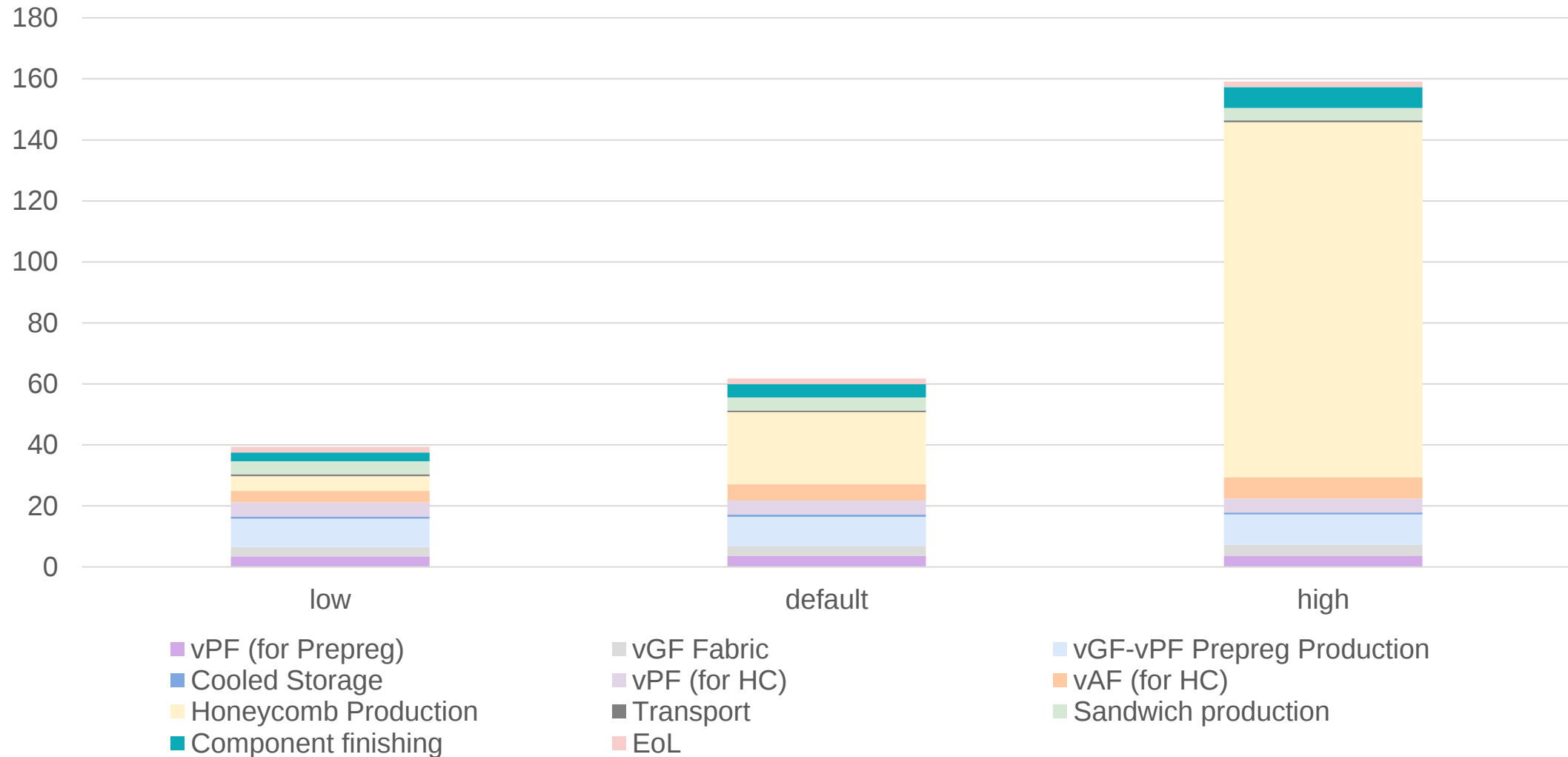
- Aramid fibre and phenolic resin
- Energy intensive production process
- No data in any LCA database
- Literature survey
 - Proxy fibre: Nylon 66
 - Other processes usually neglected!
 - Recent source for full HC production ~ 5 kWh/m³ [Chaudhury2023]
- CirKle: Additional interviews with industry experts

Parameter	low	default	high	unit	sources
Aramid Honeycomb Production Energy Consumption (rounded)	20	100	500	kWh/kg	Chaudhury2023, expert interview

LCIA

Sensitivity Analysis

EF3.1 stowage component baseline, Sensitivity Analysis, GWP100 [kg CO₂-Eq]



Conclusions and Outlook

- Preliminary Baseline LCA of representative stowage component made of FRP honeycomb sandwich from cradle-to-gate + EoL perspective.
- Honeycomb production energy consumption dominates most LCIA categories and the sensitivity analysis.
- Resin and fibre production relevant in specific LCIA categories
- Majority of the potential environmental impacts identified in the preliminary LCA stem from the materials and processes addressed in the **CirKle** project.
- ***This highlights the potential of using recycled and/or recyclable materials for the production of aircraft interior components.***
- **Outlook**
 - Compare Baseline stowage to CirKle materials and technologies
 - Close data gaps and included Data Quality Rating (DQR)
 - Full life cycle perspective including use-phase and recycling / circularity

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