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Tackling the Downcycling Issue

A Revised Approach to Value-Corrected Substitution

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1. Introduction to PEI
2. The Downcycling Issue
3. Accounting for Downcycling in LCA
4. Conclusion



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- **Global presence:** 20 PE offices in all key markets and global sales partners
- **Local experts:** > 150 people worldwide representing 20 different nationalities
- **Proven success since 1991:** founded 20 years ago in Stuttgart, Germany

Our customers succeed with our solutions

Building & Construction	
Consumer Goods	
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Automotive	
Apparel	



Inherent properties remain unchanged → full substitution of primary material

The Downcycling Issue

Open-loop recycling w/out downcycling



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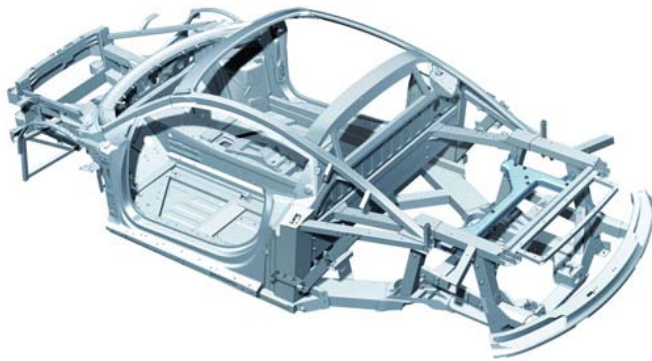
The Downcycling Issue

Open-loop recycling with downcycling

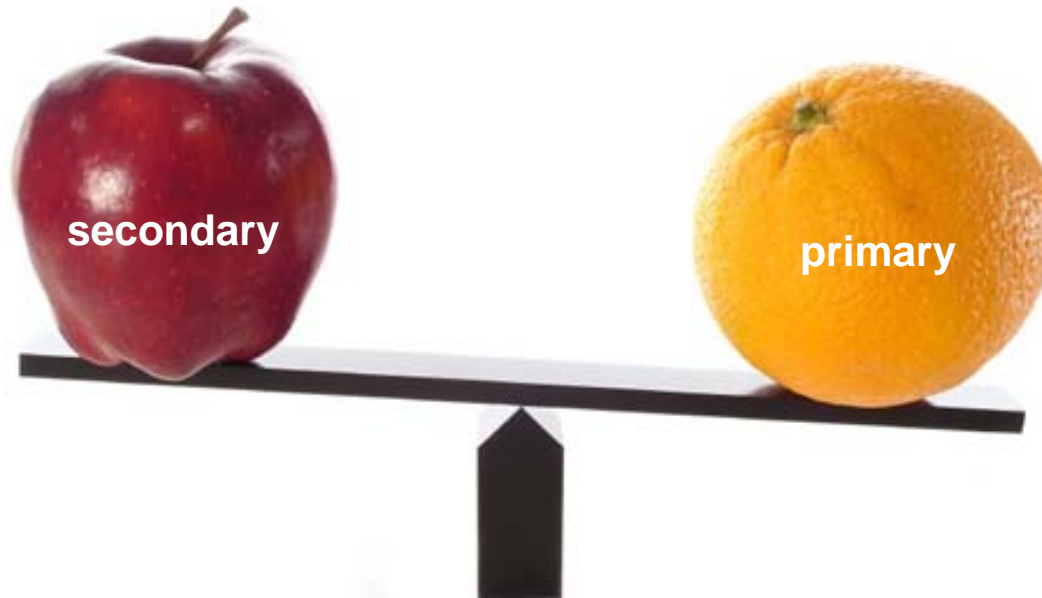


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Inherent properties change → reduced mechanical properties → full substitution of primary material justified?



- Substitution of primary material is **only partial**
- Value-correction factor β : (secondary alloy price / primary alloy price)
- No downcycling $\rightarrow \beta = 1$; downcycling $\rightarrow \beta = 0.9$

- Product composition \neq scrap composition
- ,One-price-fits-all‘ approach
- Disregard of additional primary and scrap inputs during remelting

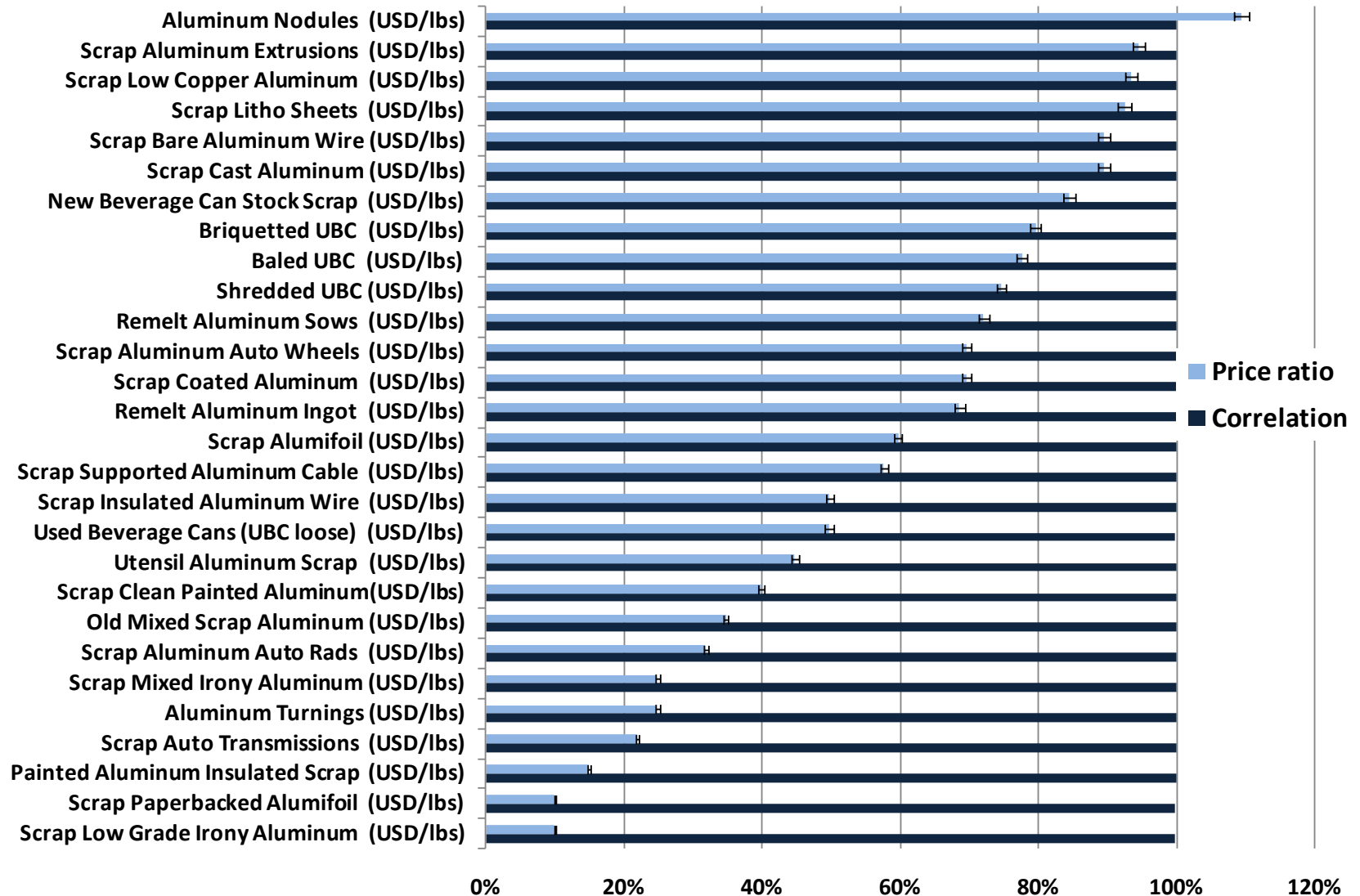




- Allocate re-melting step to the next life cycle
- Base value-correction factor on scrap value
- 28 Al scrap classes in the US
- More differentiated assessment of down- and upcycling

Revised Approach to Value-Corrected Substitution

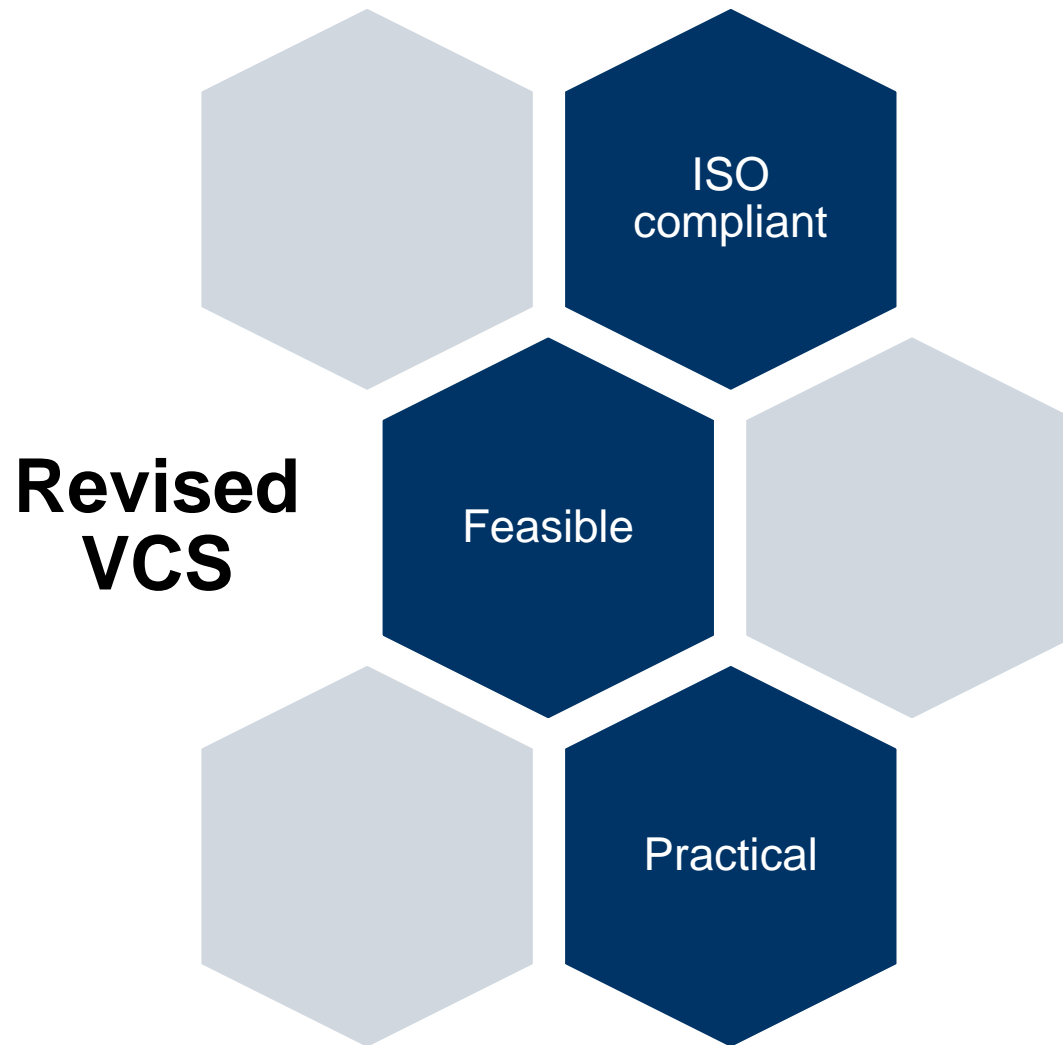
Results of AI scrap price analysis (US 2007-2010)





- Alignment of alloy contents in scrap and product necessary
- Supplementing *value-correction* by *content-correction* $c_{p,i} = a_p / a_{\min,i}$
- If $a_{\min,i}$ not defined \rightarrow case-specific evaluation or scenario analyses

$c_{p,i}$: alloy content correction factor; a_p : alloy content in product p ; $a_{\min,i}$: minimum permitted alloy content in scrap class i



Publication in peer-reviewed journal
(submitted)

Integration in
GaBi DB

Include more
materials &
regions



Thank you very much!

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