Consequences of changing modelling choices on complex data systems

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May 4th 2015

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System models in ecoinvent

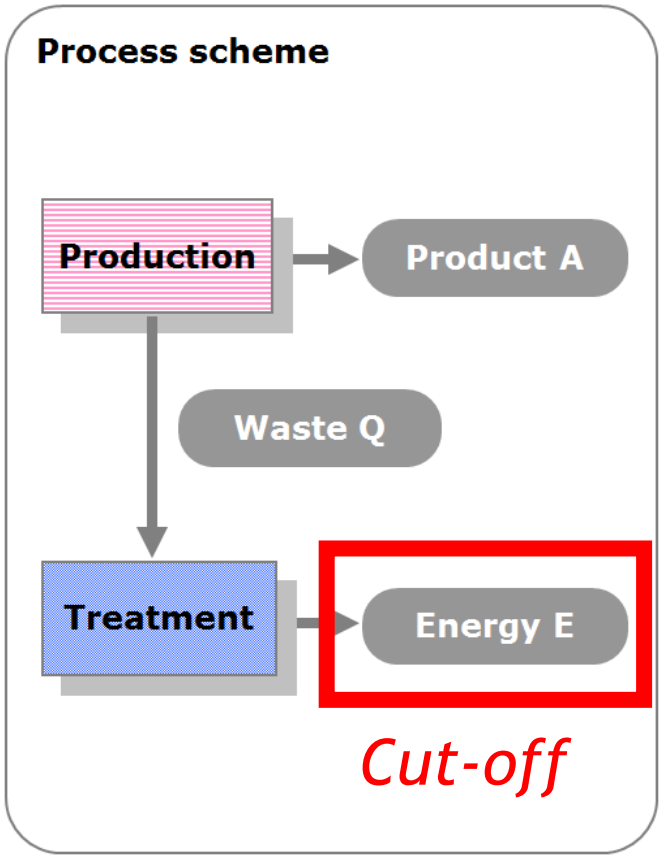
- A **system model** is a collection of modeling choices made for the database
  - Solving the allocation problem – allocation or substitution
  - Recycling and waste streams – cut-off? 50/50? … ?
  - Handling constraints in suppliers
- Different applications have different needs
  - Attributional vs. Consequential
  - Modelling needs of standards (e.g. End-of-Life modelling)
  - Regulatory needs (Swiss standards, PEF)

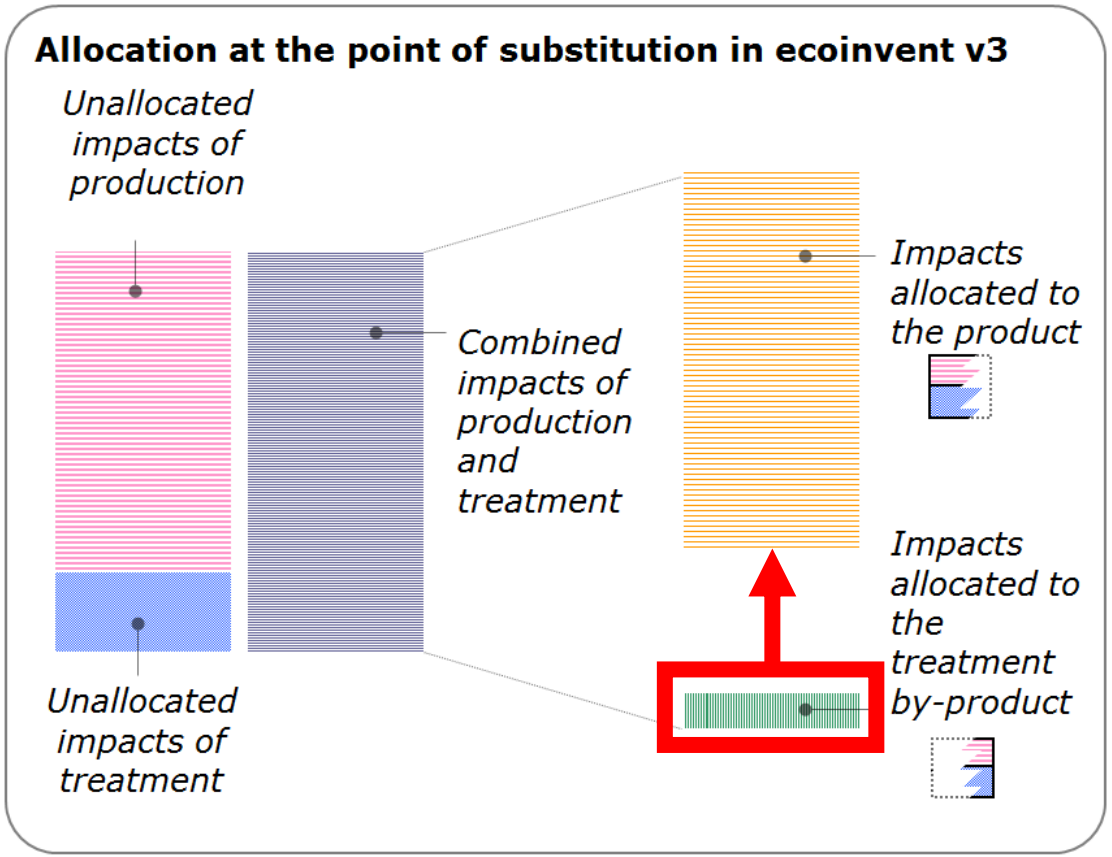
System models in ecoinvent v3

- 3 System models implemented:
  - Recycled Content (Cut-off)
  - Allocation at the point of Substitution (APOS)
  - Consequential, small-scale long-term

- Over 11000 datasets for almost 2700 products

Allocation at the point of substitution



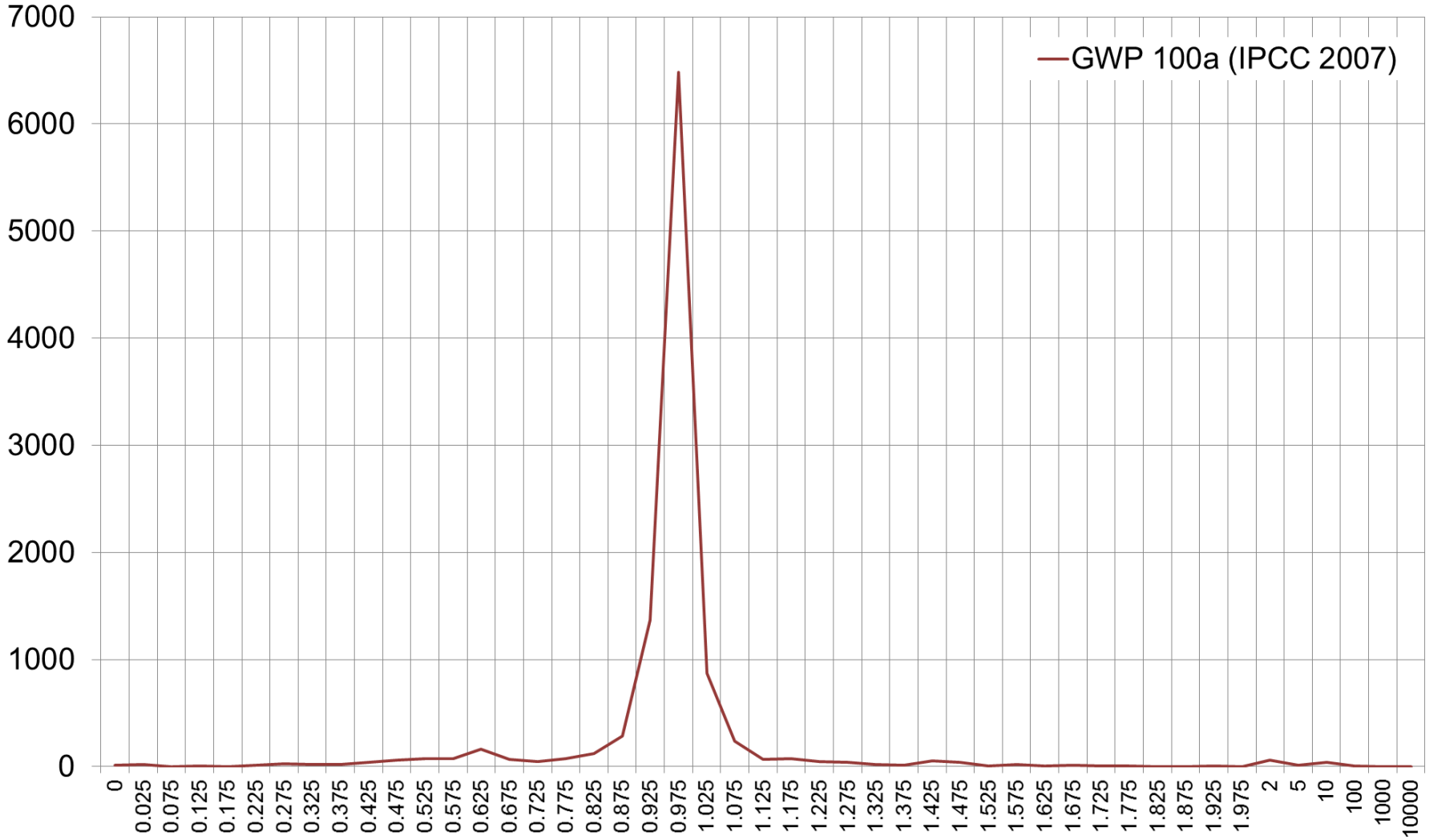


Graph: G. Doka

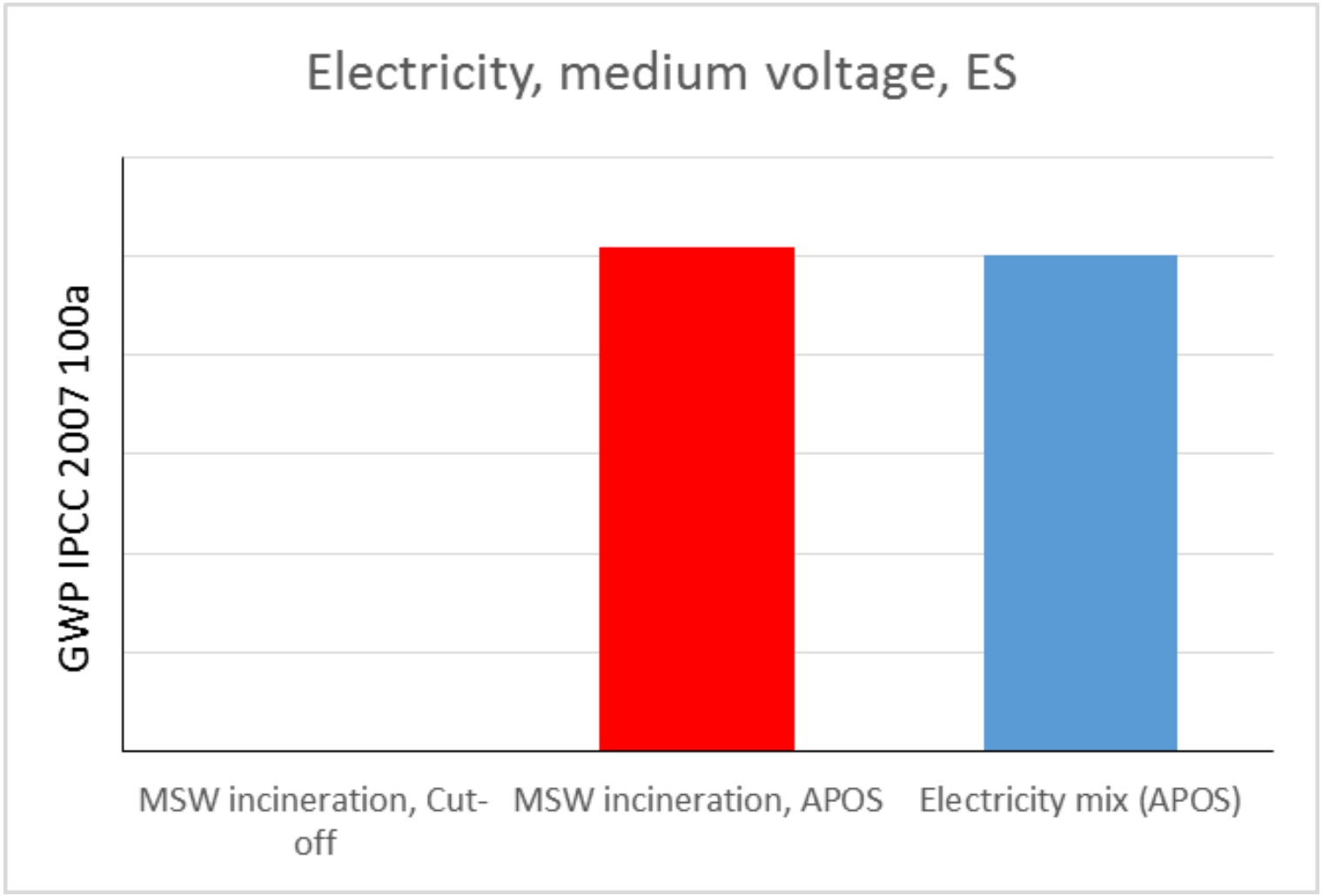
Cut-off vs APOS

- Difference in allocation of **wastes treatment products** and **recyclable materials**
  - No other differences in the models
- Differences **only for these products**
  - 8% of products in the database are wastes, few have significant by-products in treatment
  - 2% of products in the database are recyclable materials

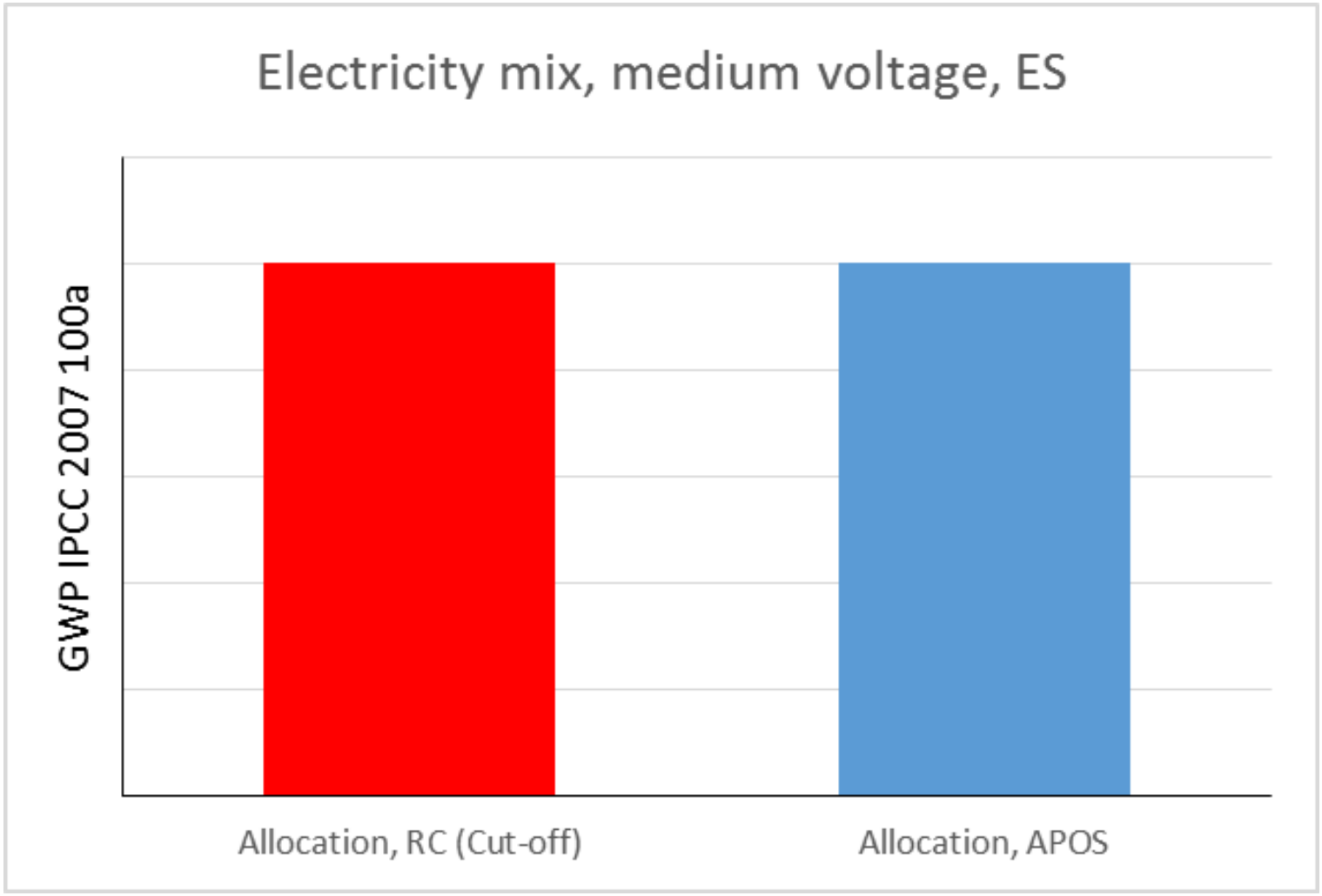
Cut-off vs APOS



Cut-off vs APOS



Cut-off vs APOS



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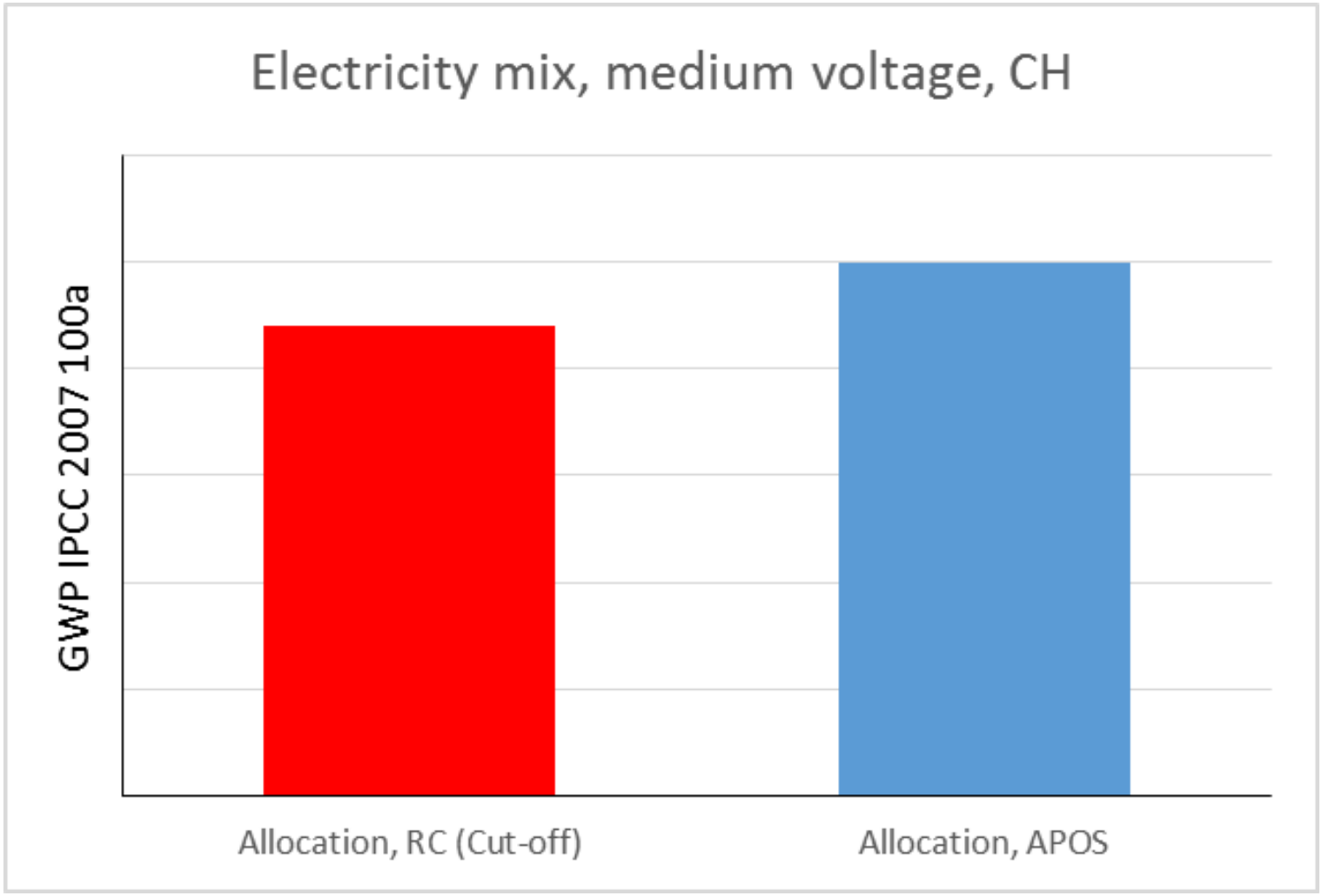

Cut-off vs APOS

- Slightly **lower impacts** for most products in the database **in APOS**
- **Non-zero impacts** for products no longer cut off
- Impacts are **shifted** between products, but of course not created or removed
- Two available system models allow a **sensitivity analysis** in cases where recycling or cut materials are important

Attributional vs Consequential

- Consequential modelling assesses **changes**
- Use of **Substitution** has major effects on results of productions with significant by-products
- Consequential uses **marginal suppliers**
  - may be an improvement or more impactful than average suppliers
- **Consumption of by-products** creates demand for **primary production** in consequential

Attributional vs Consequential

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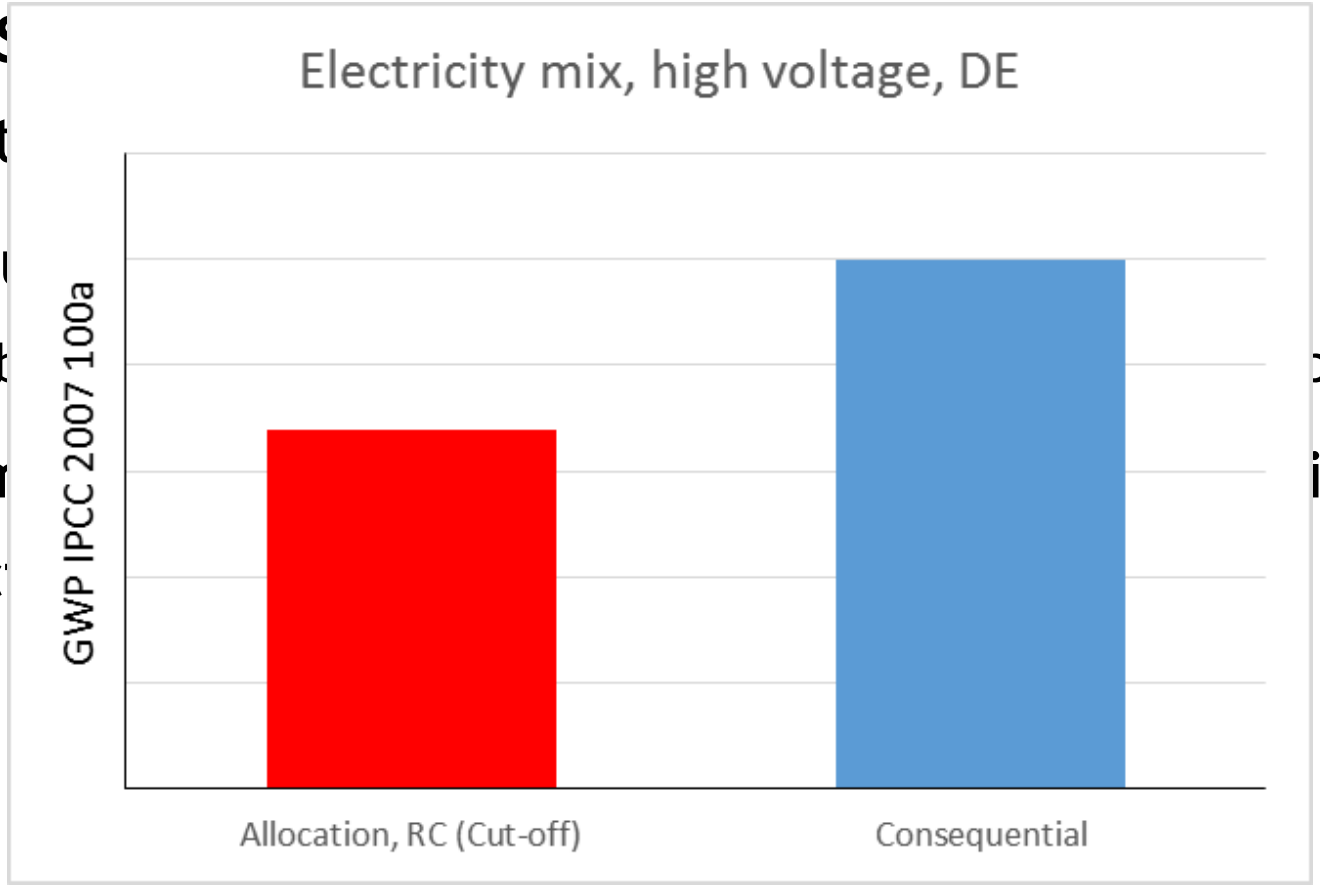

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Conclusions

- **APOS** and **Recycled Content (Cut-off)** offer a **similar** perspective with **differences** in their assessment of waste treatment and recycling products
- **Attributional** and **Consequential** are very different approaches and significant **differences in results** should be expected

Why are v3 results different then?

- **Not** due to the **system model** (Cut-off in v2.2)
- Comparison of **Cut-off results** v2.2 vs v3.1
- **Globalized supply chains** more relevant in v3.1
  - Impacts in e.g. China more accurately reflected
- More detailed **transport data**
  - Impacts from transport on average from ~3% to ~7%
- Changes in **allocation method**
  - Switch from mass to economic allocation
- **Data updates** in v3.0 and v3.1

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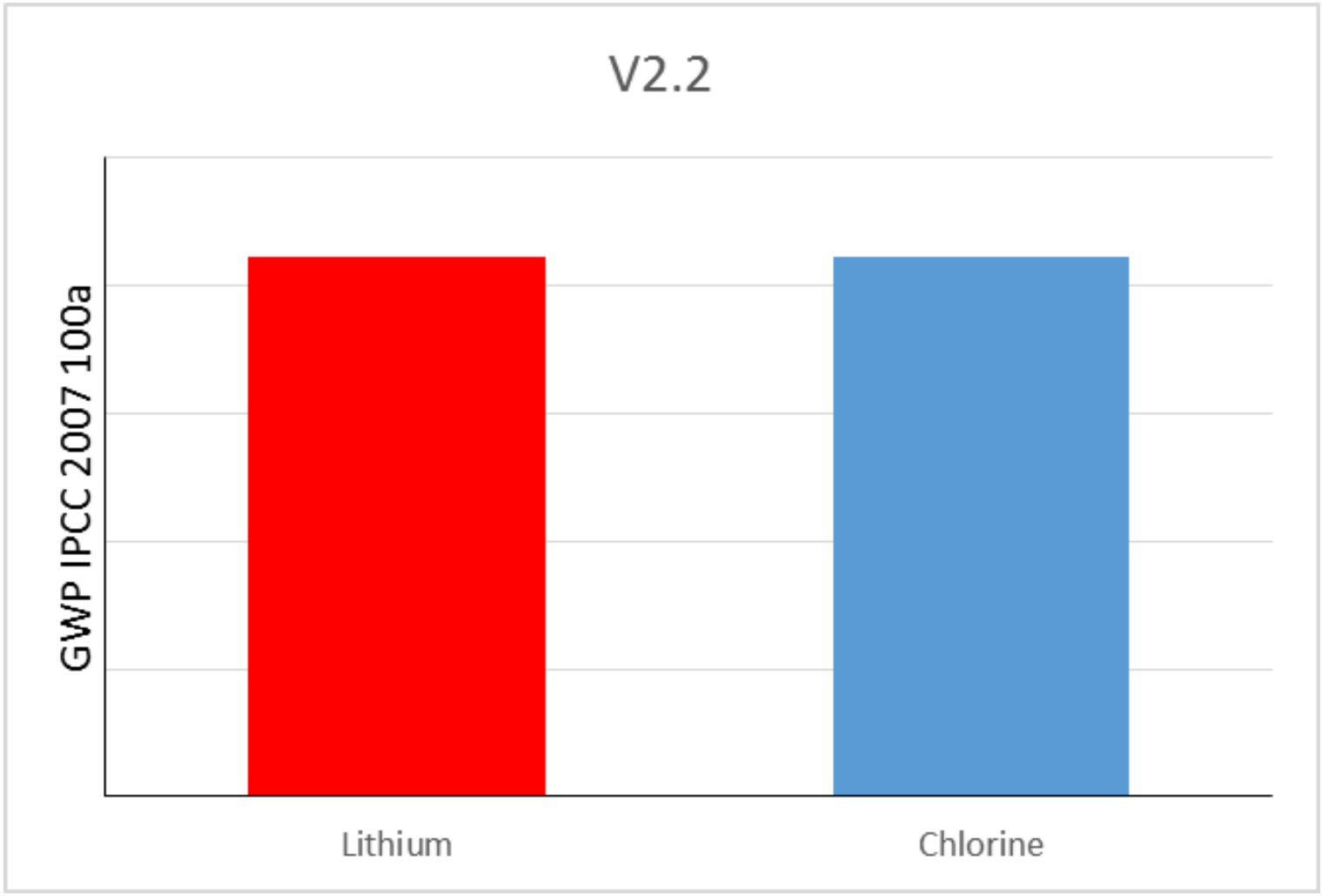

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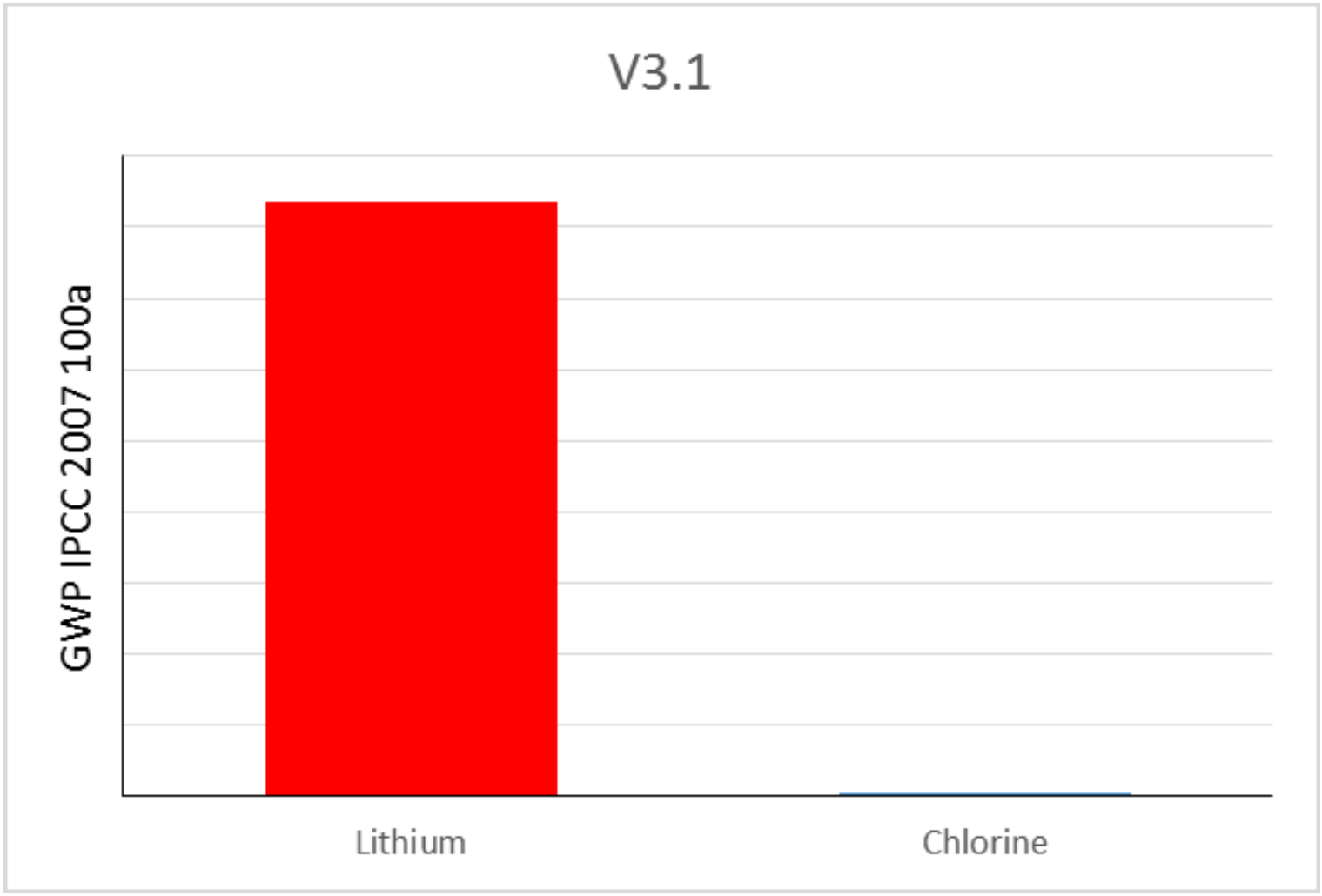

Thank you for your attention – Any questions?

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