



AffordabLe Lightweight Automobiles AlliaNCE

## Impact on Cost

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723839



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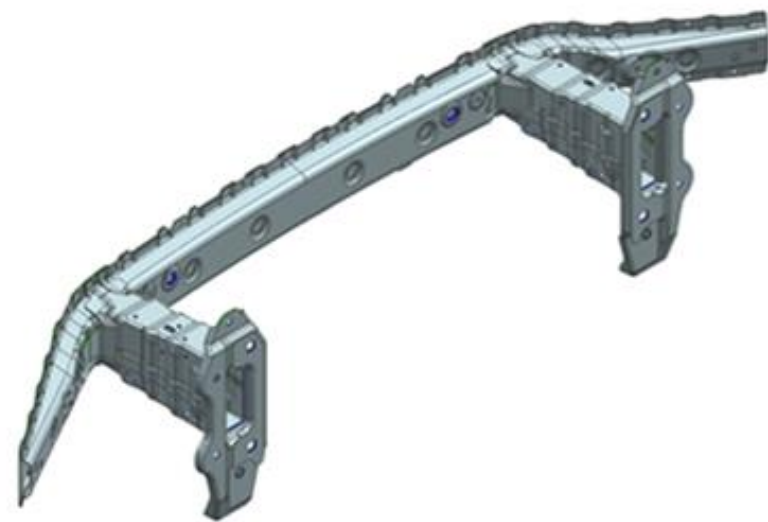
# Objectives

- provide an early estimation of **cost and environmental performance of new materials and manufacturing technologies**
- tool for **monitoring the technology developments** within the project, and whether they **comply with overall objectives**
- serve as a **preliminary decision tool** for engineers and designers working in the early stages of development of automotive components

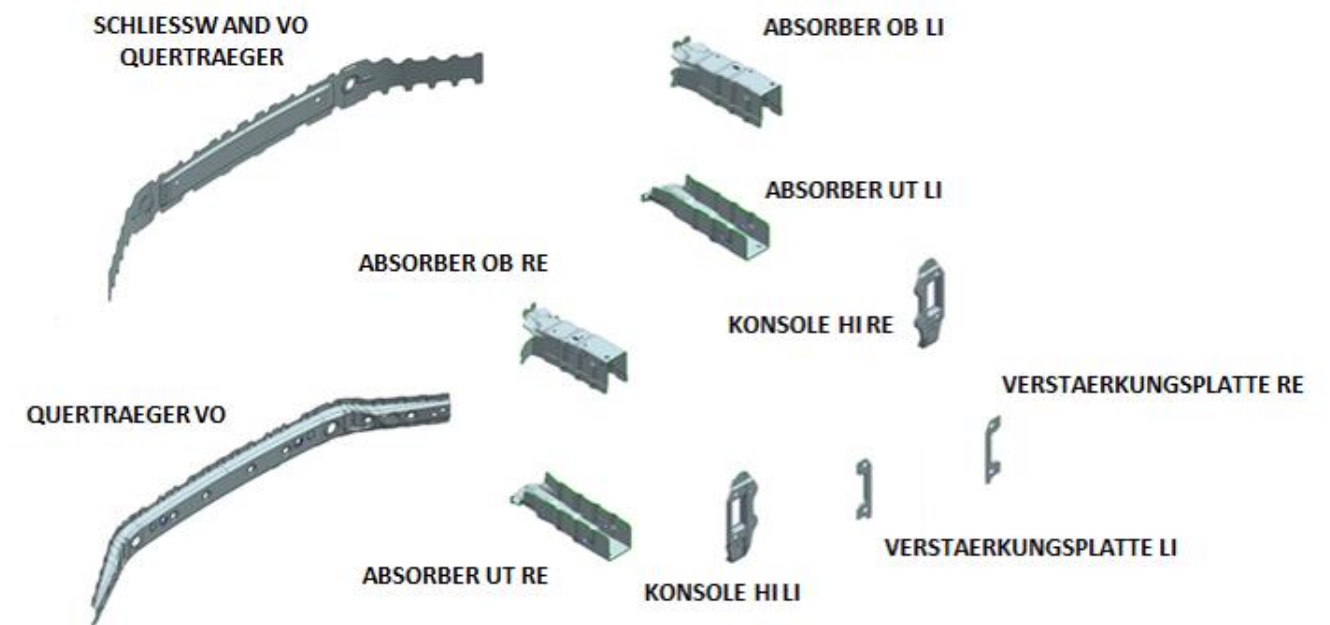
# | Approach

# Approach

## Module breakdown



Module



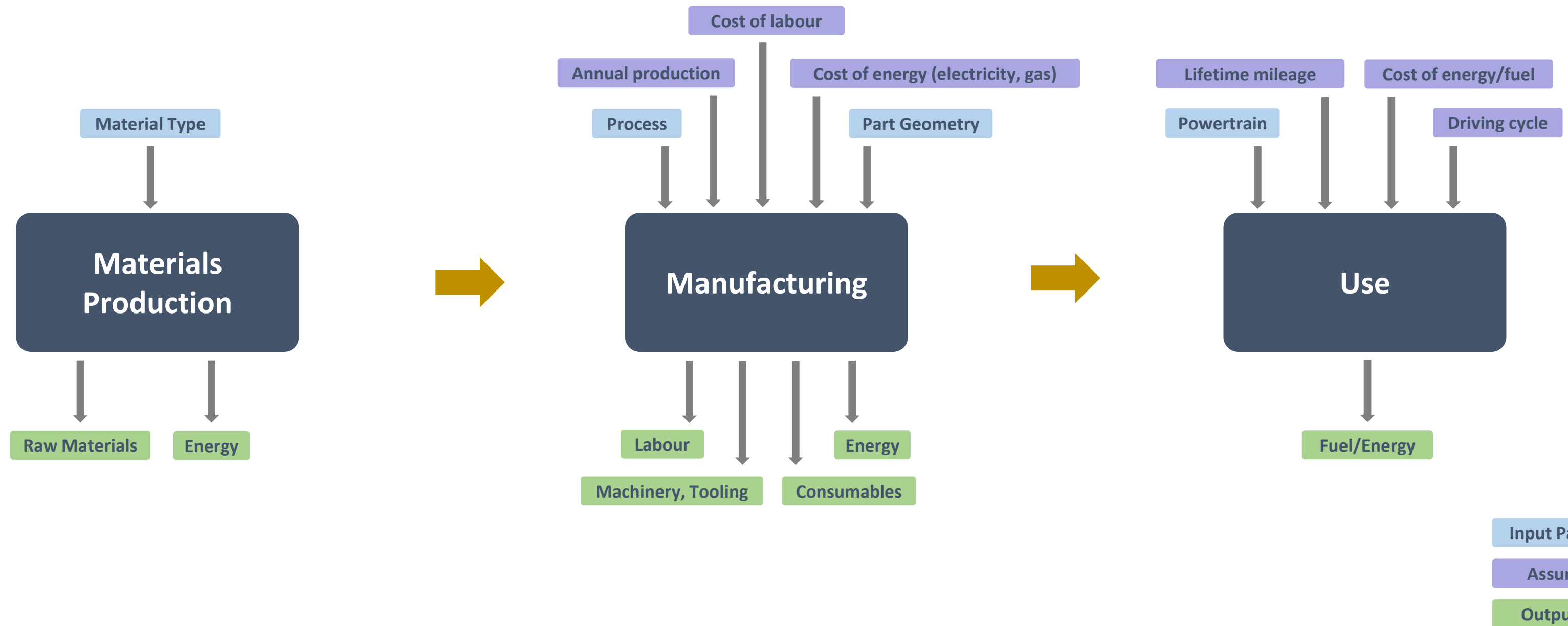
Mono-material Parts

# Approach

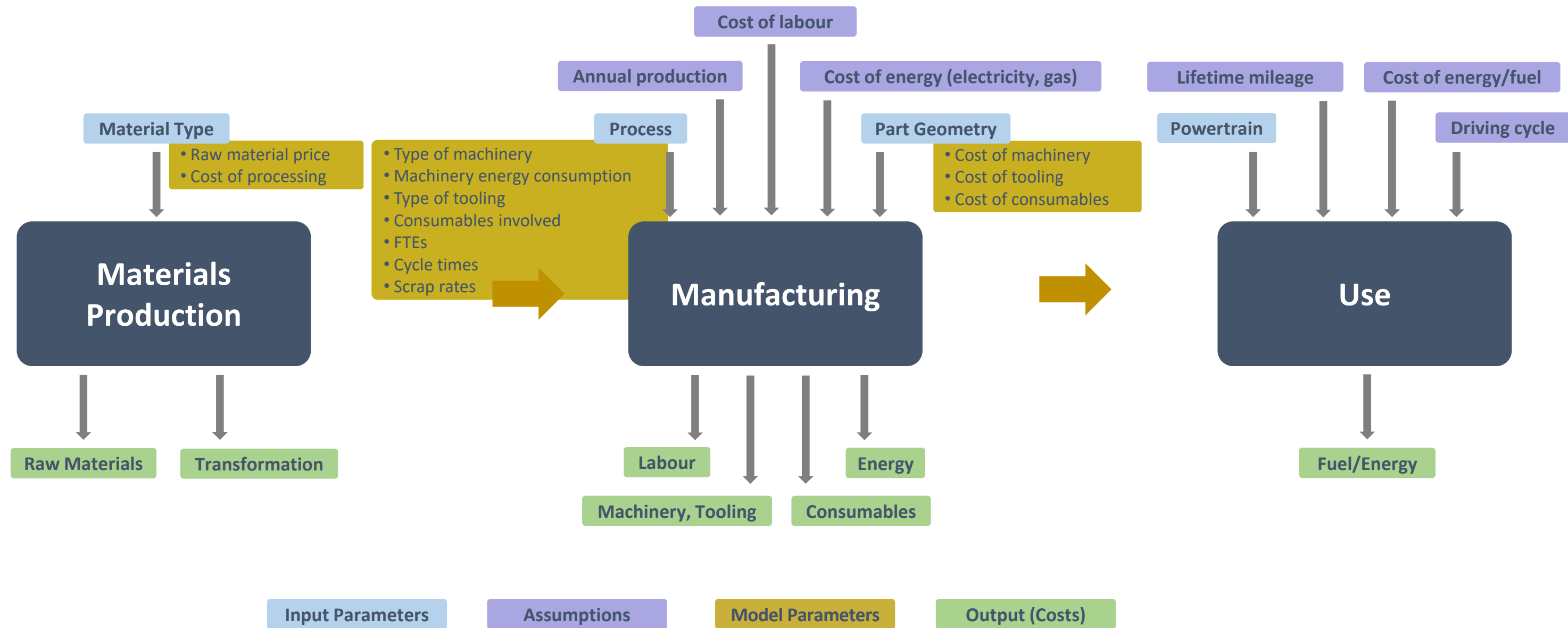
## Process breakdown



# Approach I/O



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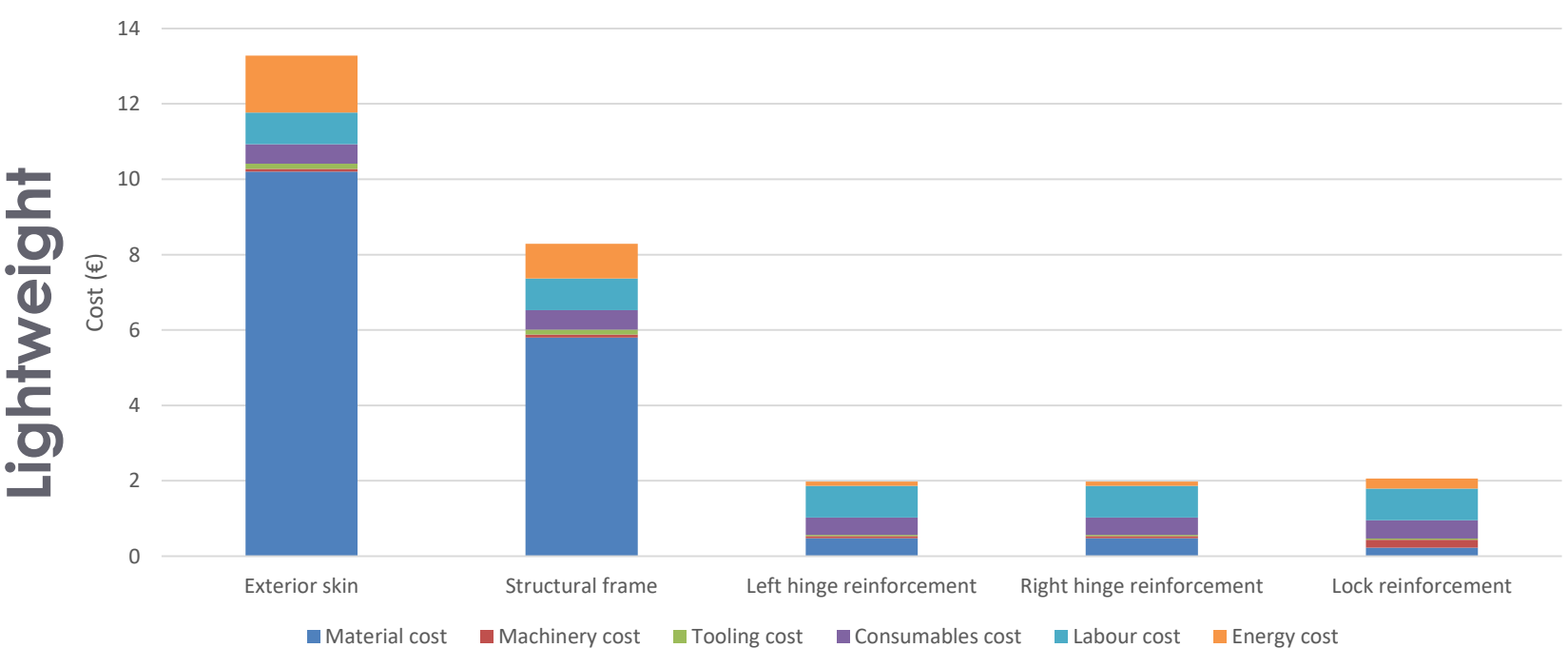
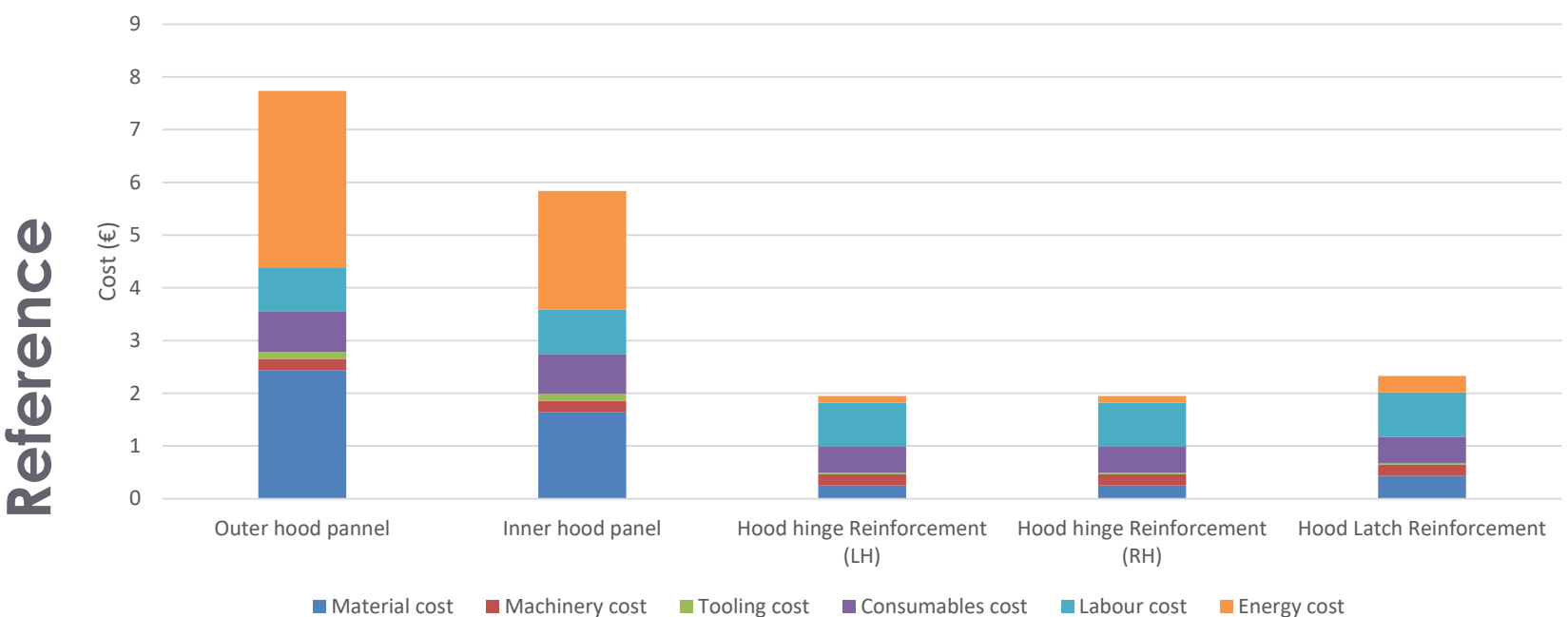




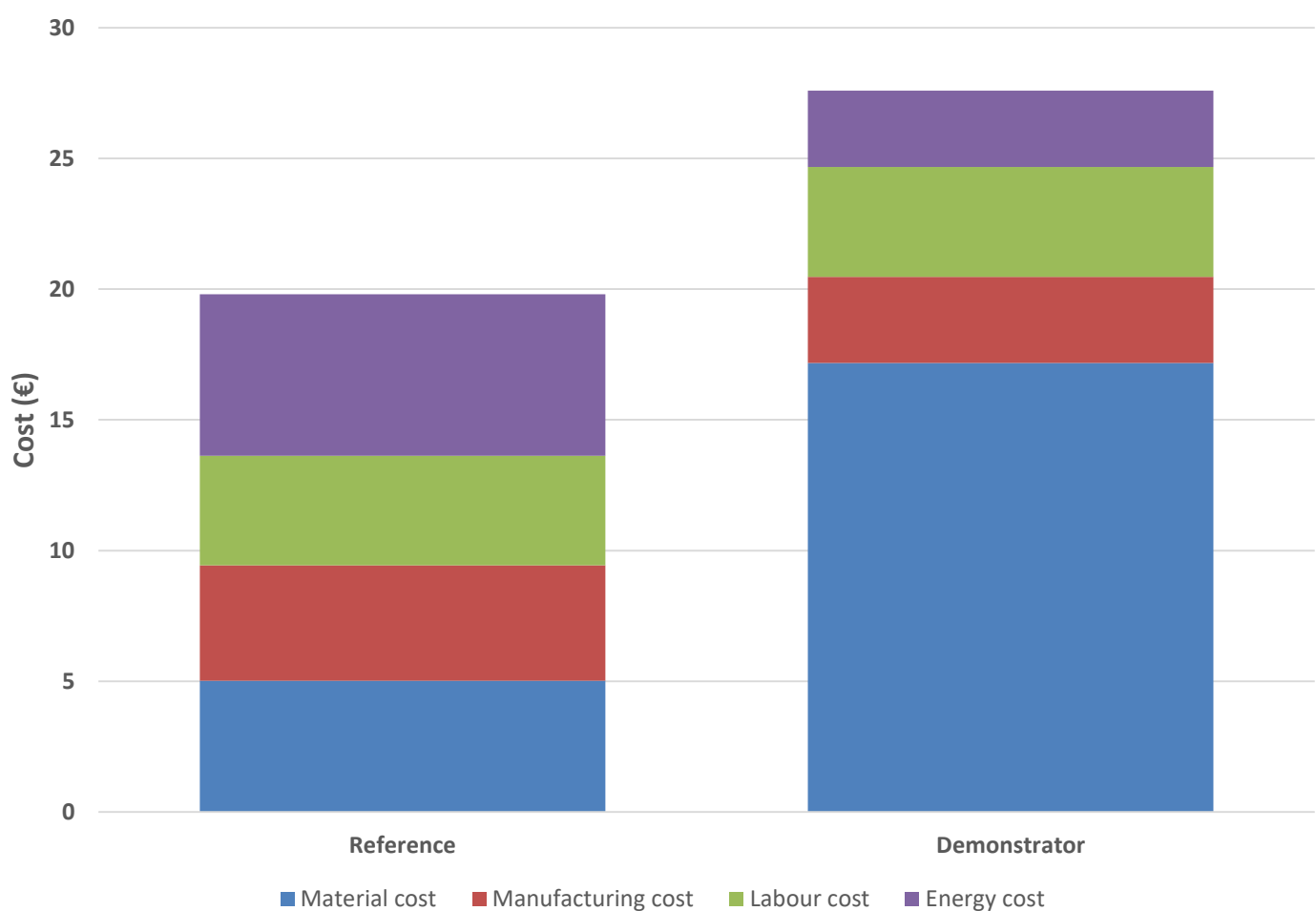
# | Results

# Results – Hood (CRF)

## Monomaterial part breakdown



## Comparative assessment



Reference design (7.5 kg)

- 100% Steel (stamping)

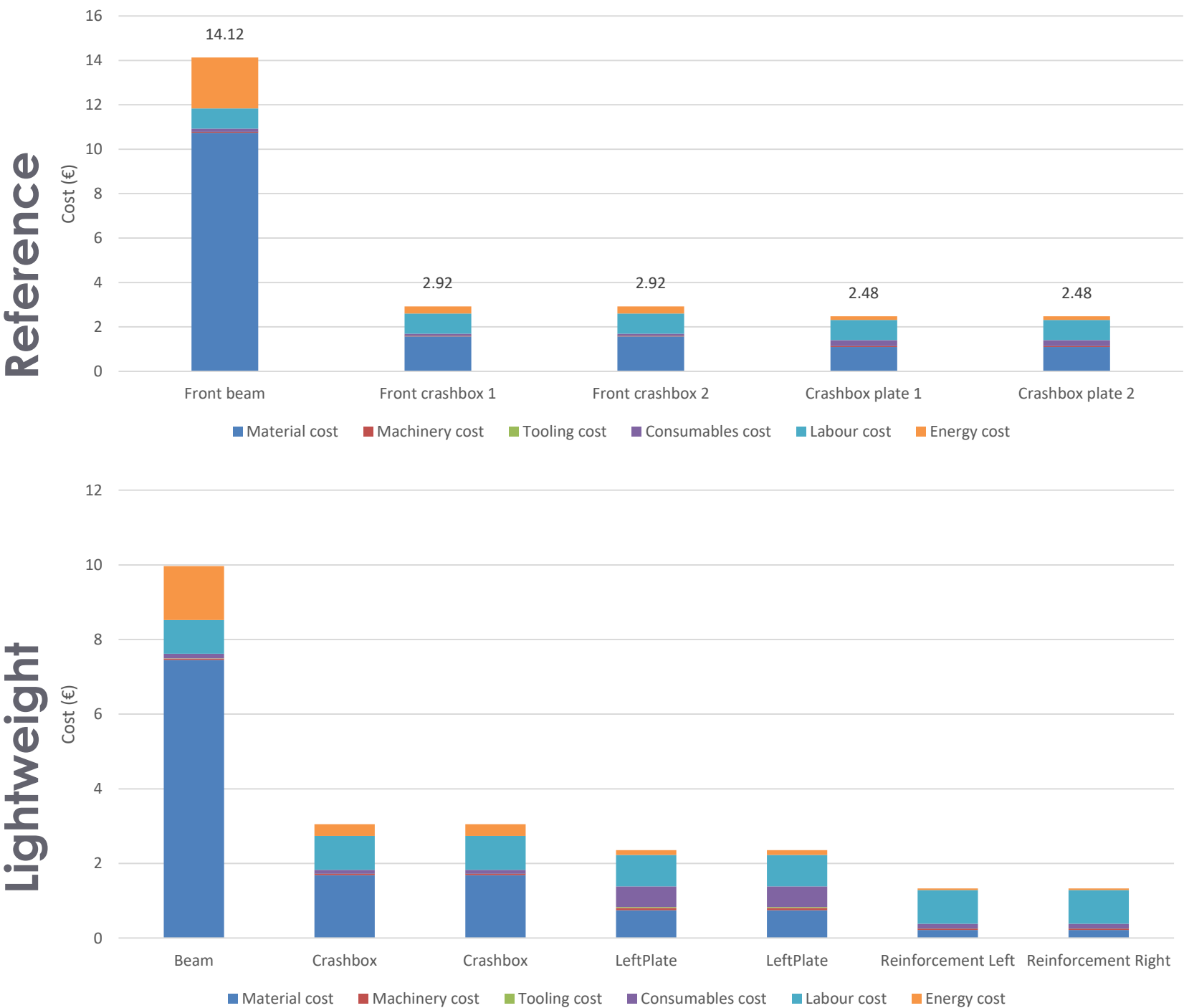
Lightweight design (3.6 kg)

- 91% Alu 5000/6000s (stamping)
- 9% Steel (stamping)

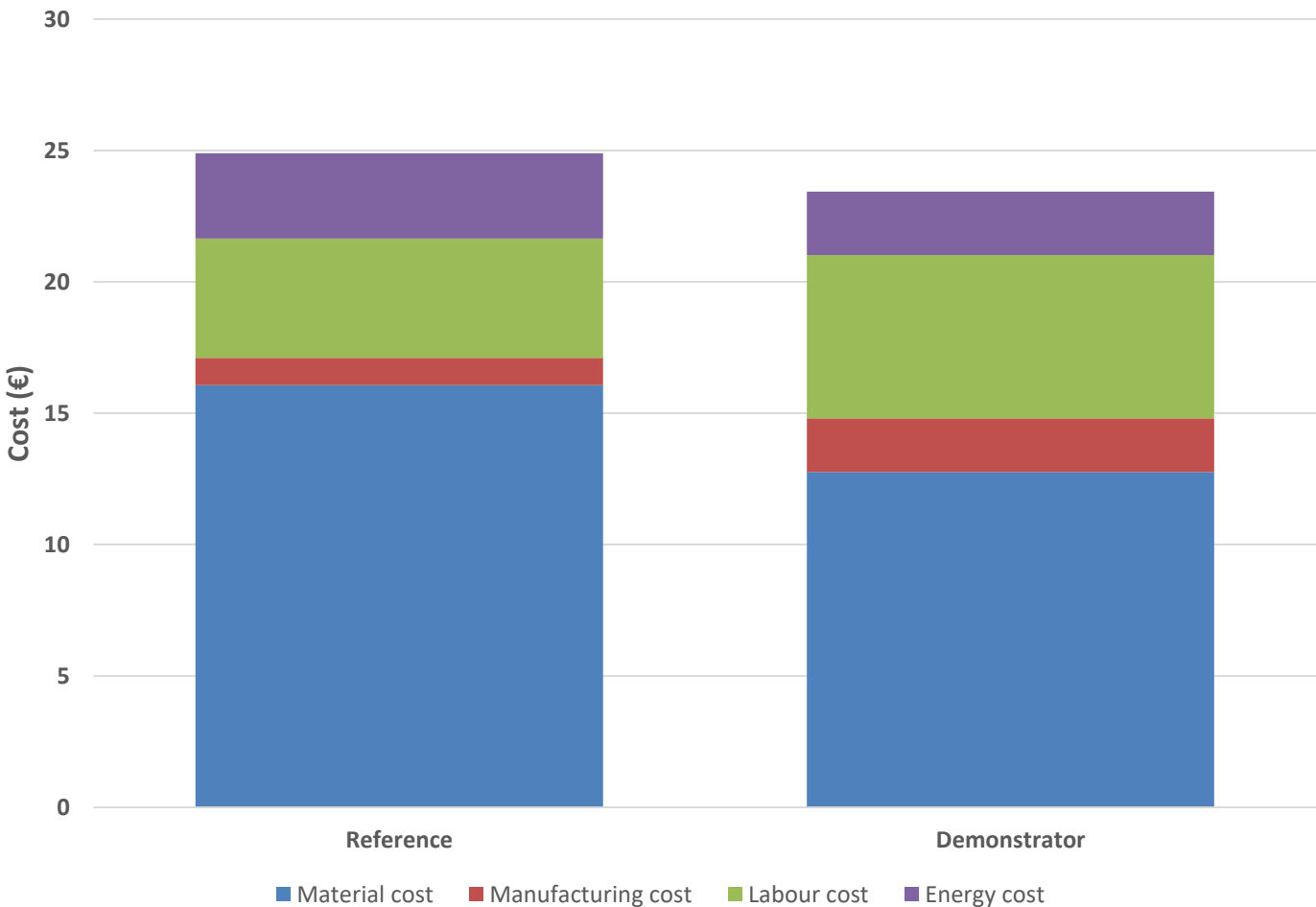
$\Delta_{mass} \sim -53\%$

# Results – Bumper (CRF)

## Monomaterial part breakdown



## Comparative assessment



Reference design (4.5 kg)

▪ 100% Alu (extrusion & stamping)

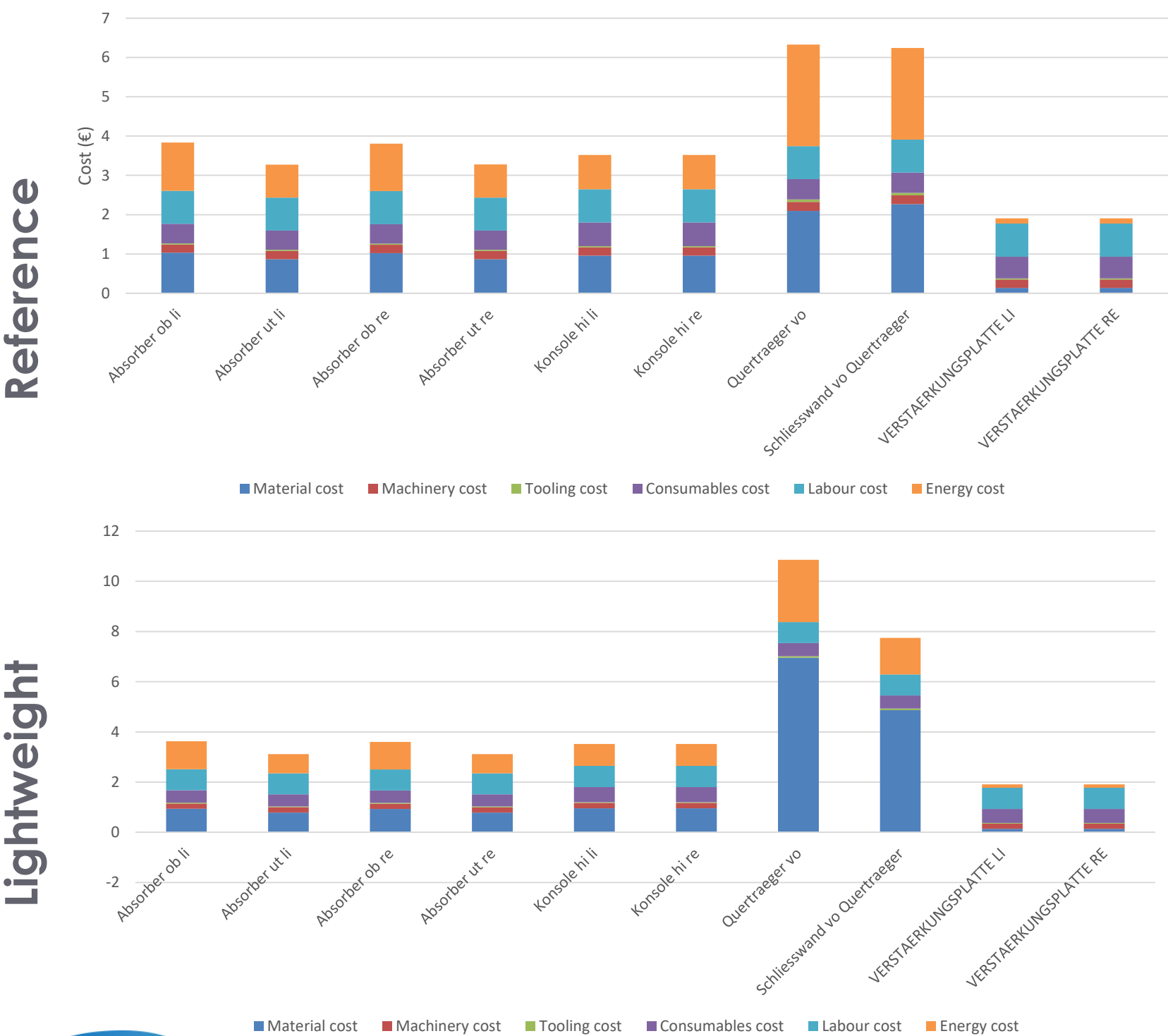
Lightweight design (3.3 kg)

▪ 100% Alu 7000s (extrusion)

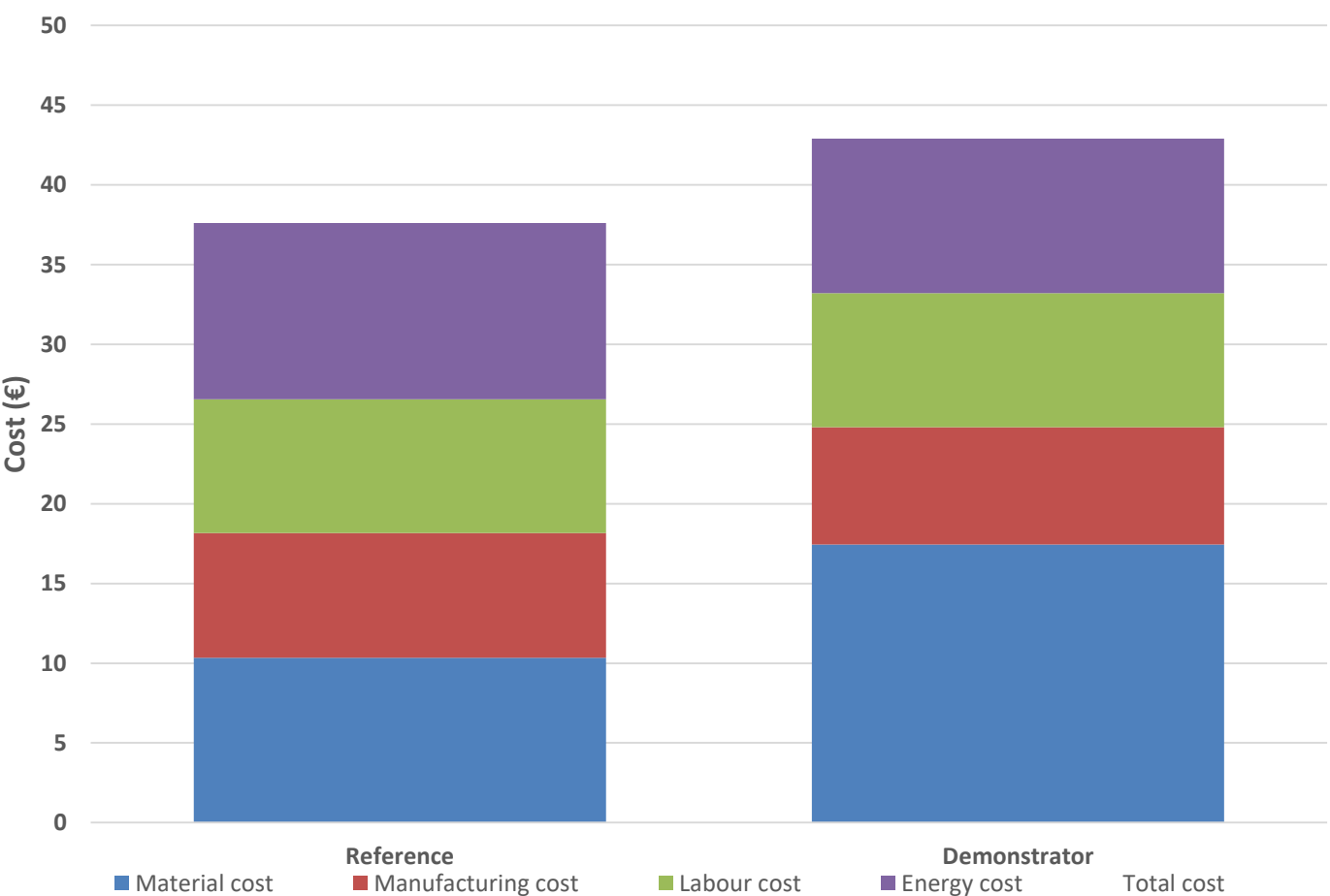
$\Delta_{mass} \sim -27\%$

# Results – Bumper system (Daimler)

## Monomaterial part breakdown



## Comparative assessment



Reference design (13.0 kg)

- 100% Steel (deep drawing)

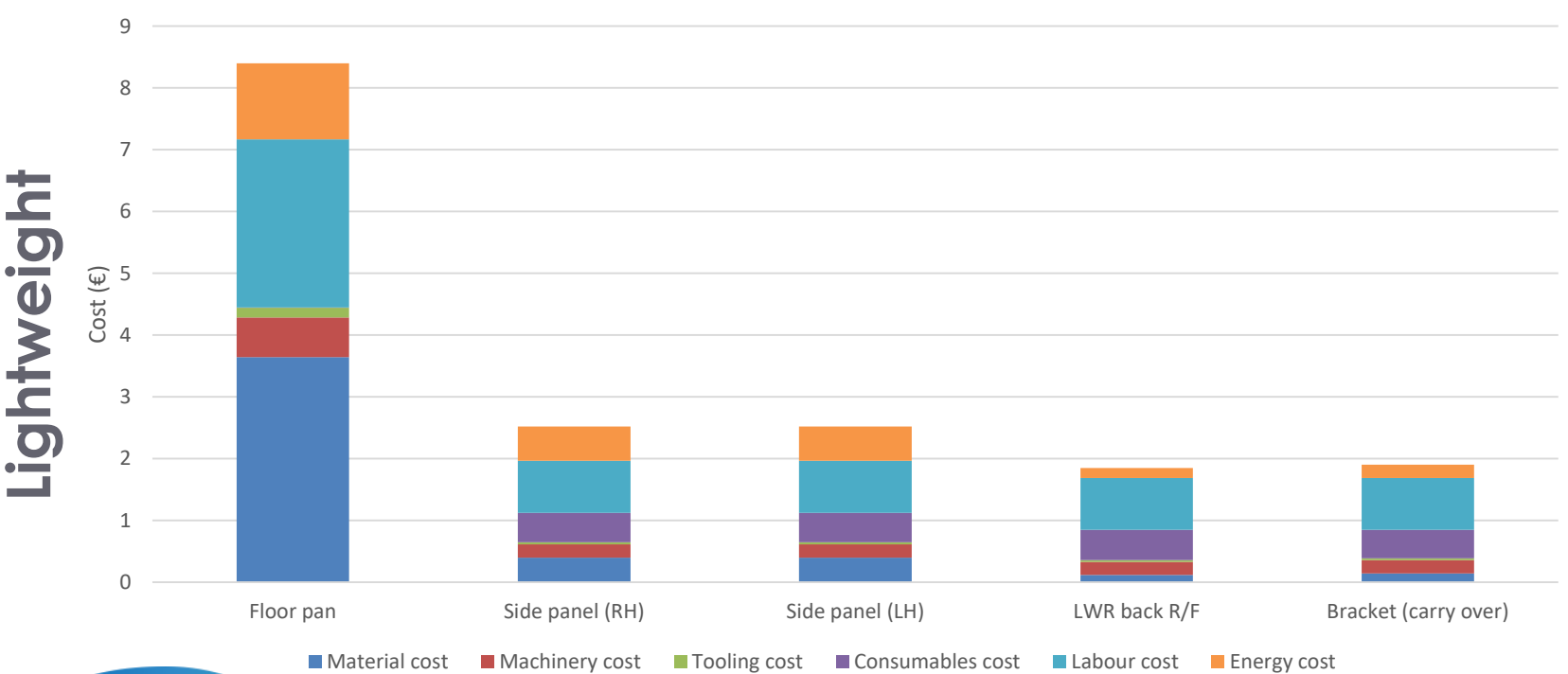
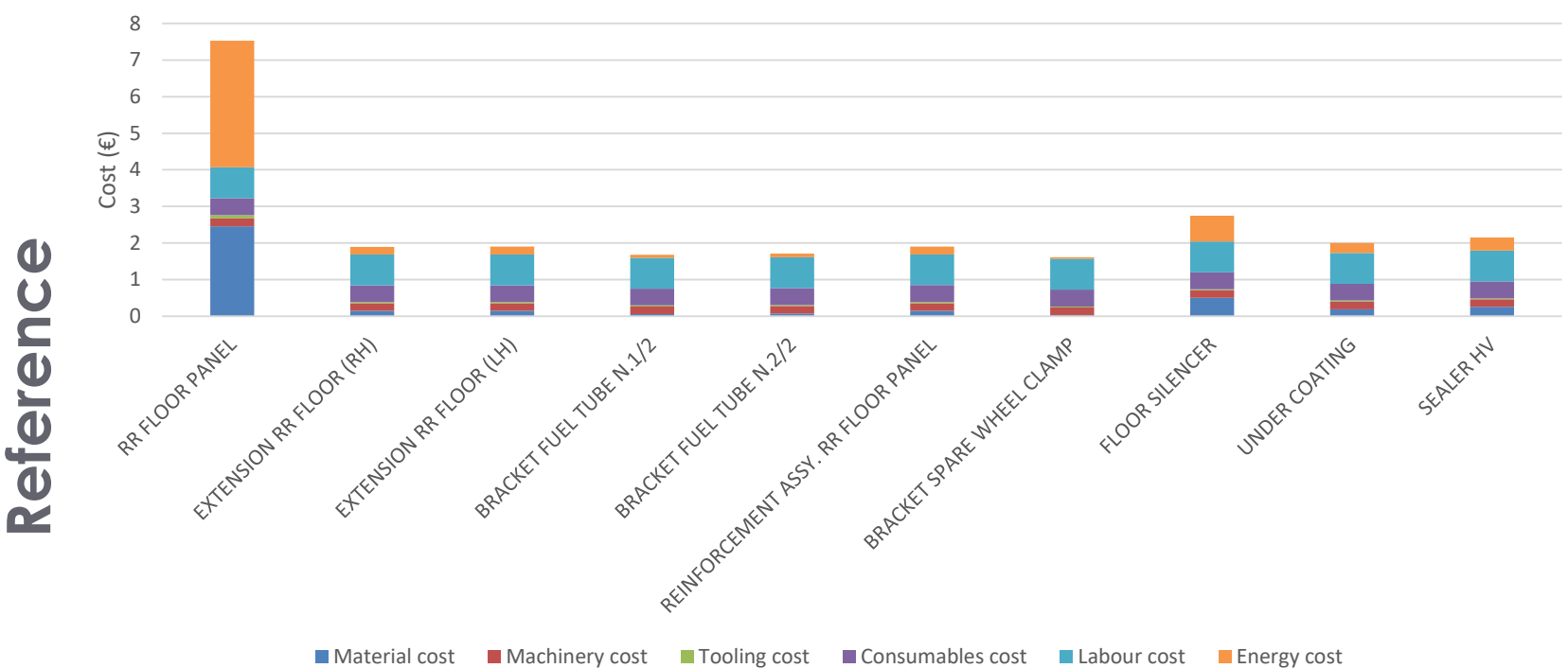
Lightweight design (11.9 kg)

- 60% Steel (deep drawing)
- 40% Steel Q&P (deep drawing)

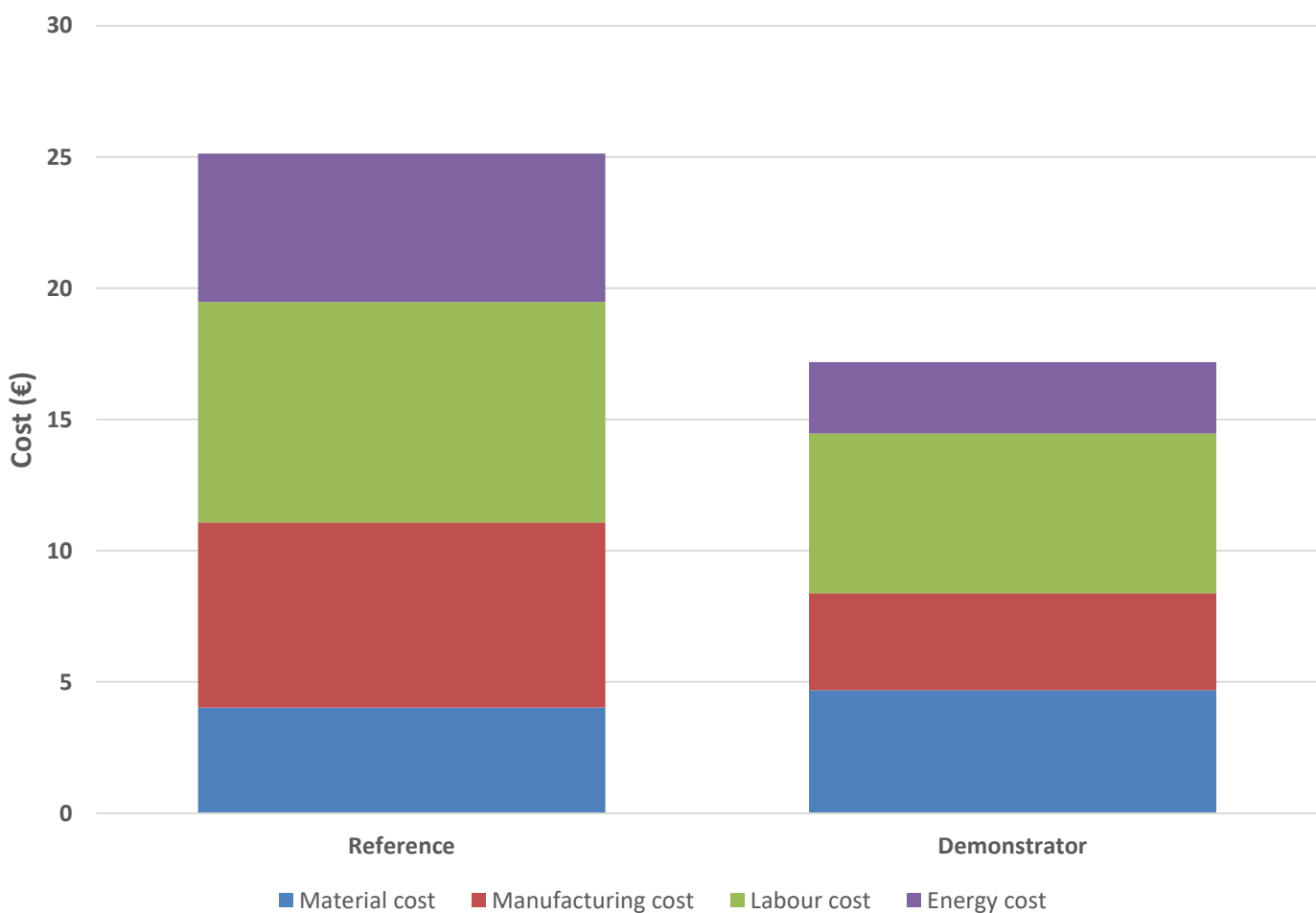
$\Delta_{mass} \sim -9\%$

# Results – Rear floor panel (TME)

## Monomaterial part breakdown



## Comparative assessment



### Reference design (6.9 kg)

- 76% Steel (stamping)
- 24% Acryl/SBR-Vynil-Urethane

### Lightweight design (5.3 kg)

- 62% PPGF40
- 34% Steel (stamping)
- 4% Urethane

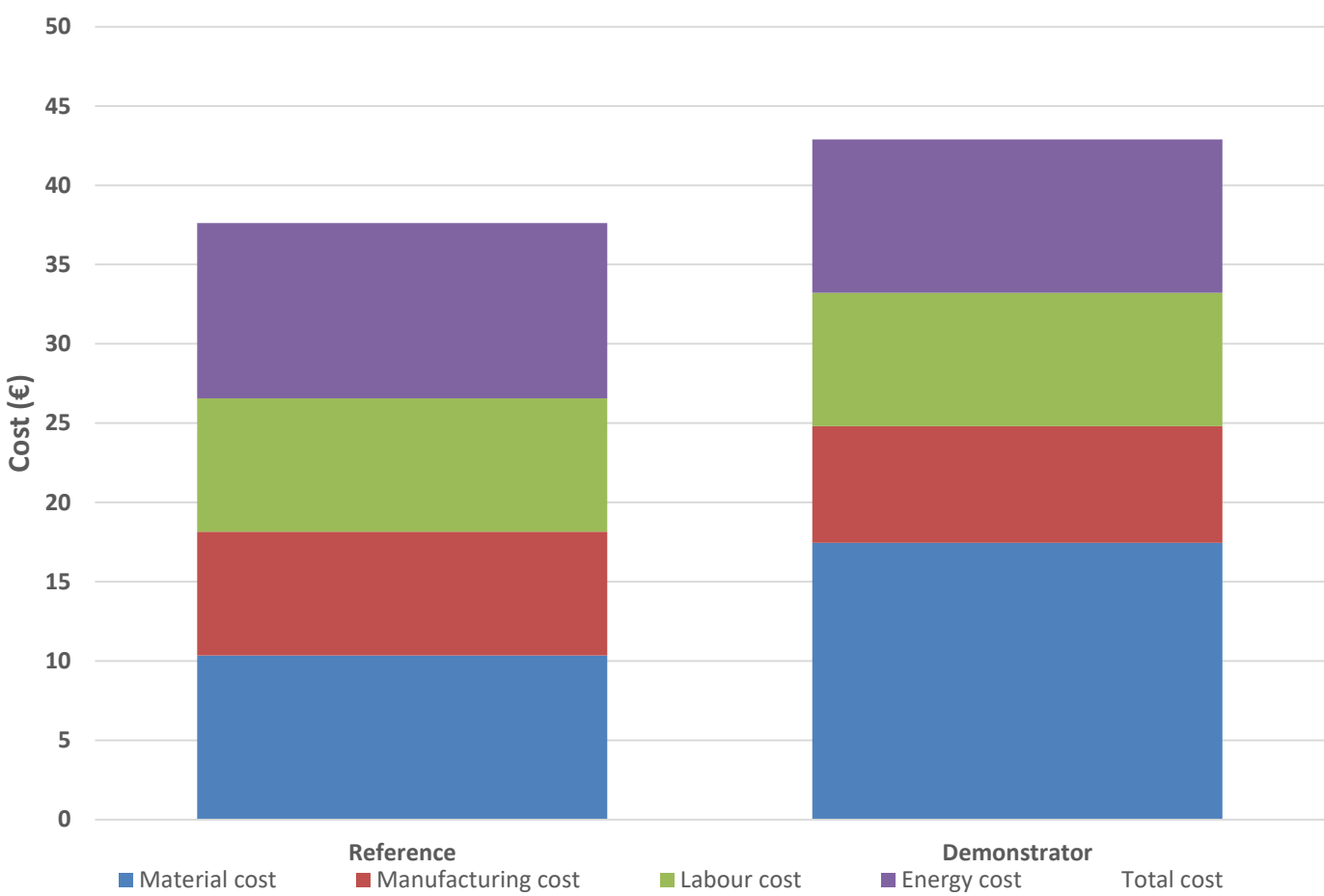
$\Delta_{mass} \sim -23\%$

# Results – Rear bumper system (TME)

## Monomaterial part breakdown



## Comparative assessment



Reference design (4.0 kg)

- 100% Steel (deep drawing)

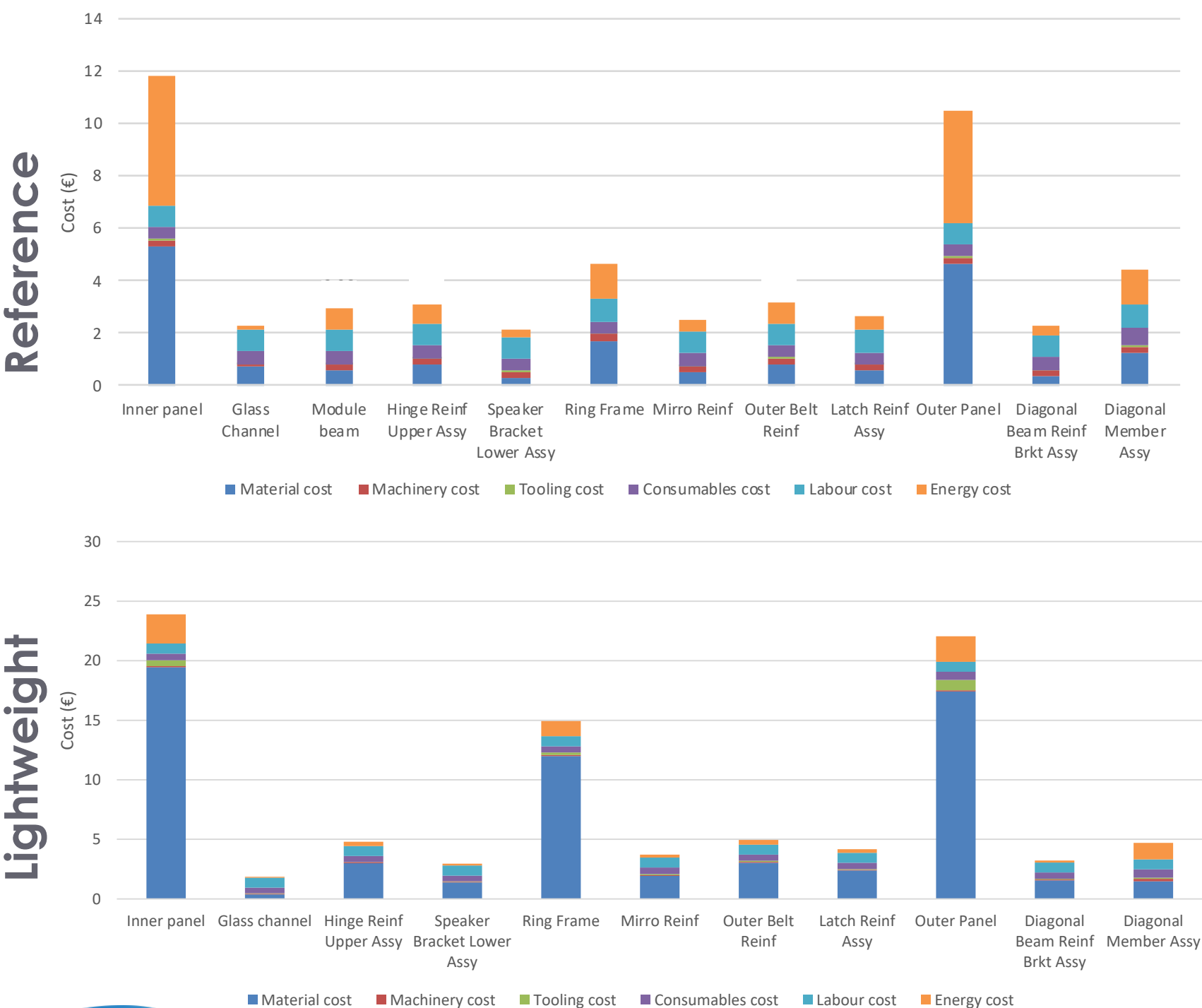
Lightweight design (2.4 kg)

- 100% Alu 6000/7000s (extrusion)

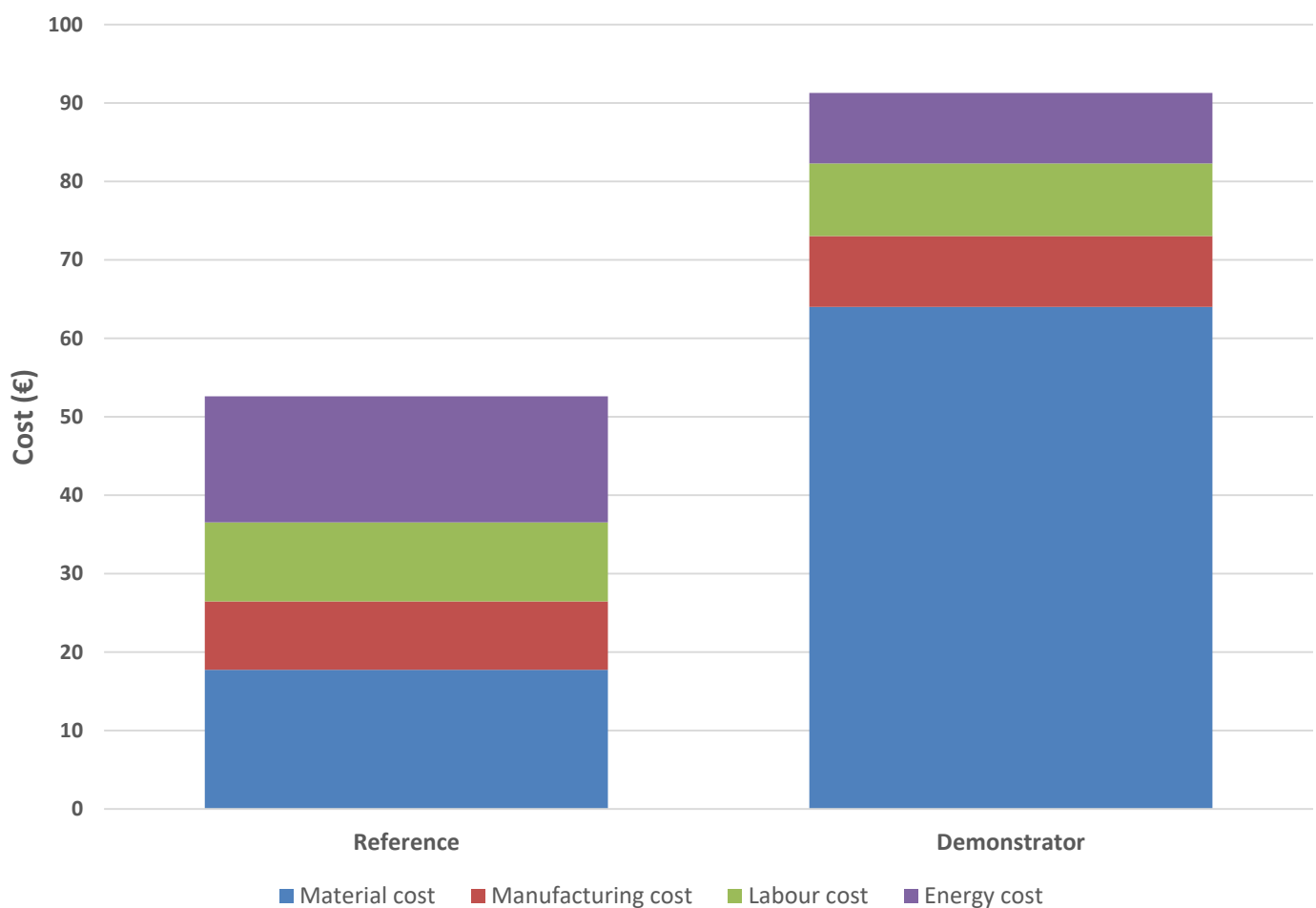
$\Delta_{mass} \sim -40\%$

# Results – Door structure (Volvo)

## Monomaterial part breakdown



## Comparative assessment



Reference design (19.7 kg)

- 99% Steel (deep drawing)
- 1% Alu 6000s (deep drawing)

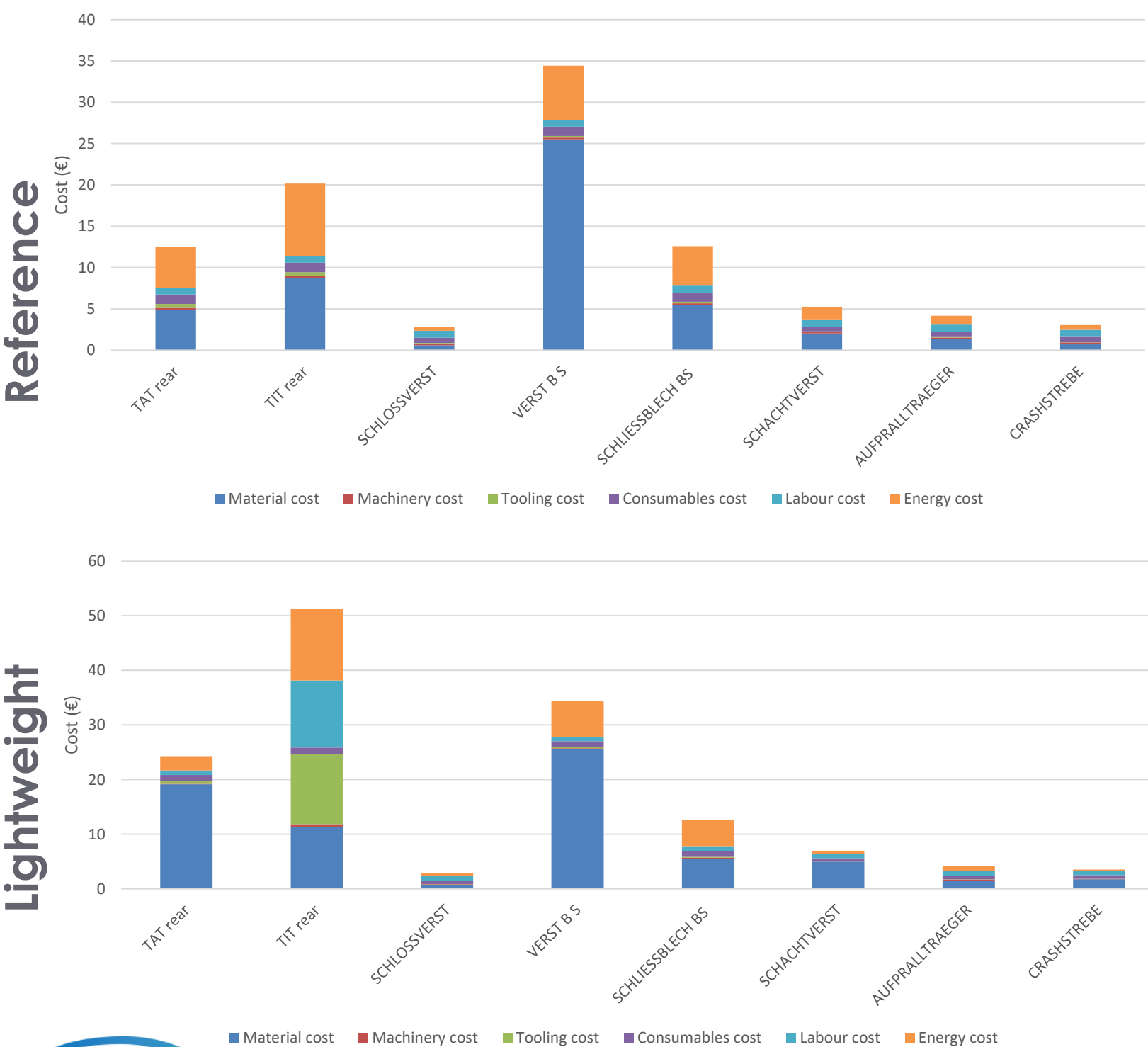
Lightweight design (11.0kg)

- 85% Alu 6000s (deep drawing)
- 15% Steel (deep drawing)

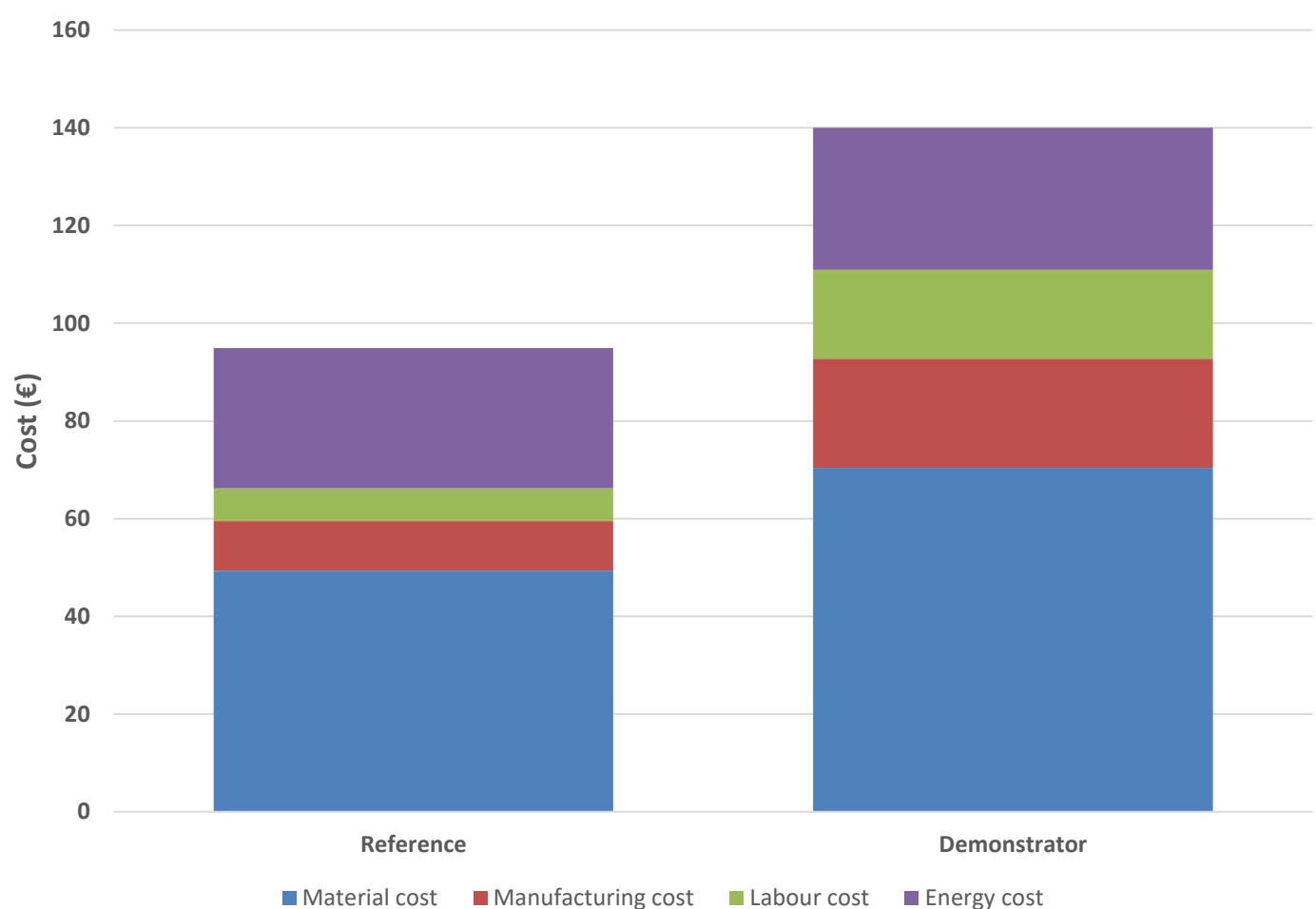
$\Delta_{mass} \sim -44\%$

# Results – Door structure (VW)

## Monomaterial part breakdown



## Comparative assessment



Reference design (35.2 kg)

- 100% Steel (deep drawing)

Lightweight design (24.6 kg)

- 63% Steel (deep drawing)
- 21% Epoxy resin GF42
- 16% Alu 6000s (deep drawing)

$\Delta_{mass} \sim -30\%$



# | Conclusions

# Conclusions

- most demonstrators comply or are slightly higher than OEM cost targets, meaning that **most of the technologies are ready or very close to commercialisation**
- cost of **materials is an important driver of module costs**, especially in the case of high-lightweighting-potential materials which have significantly higher costs, and typically higher labour costs
- cost of **manufacturing energy has a significant share over total costs** in most modules. This can change according to the production location (electricity **prices vary >300%** between lowest and highest end in Europe)

# Thank you



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