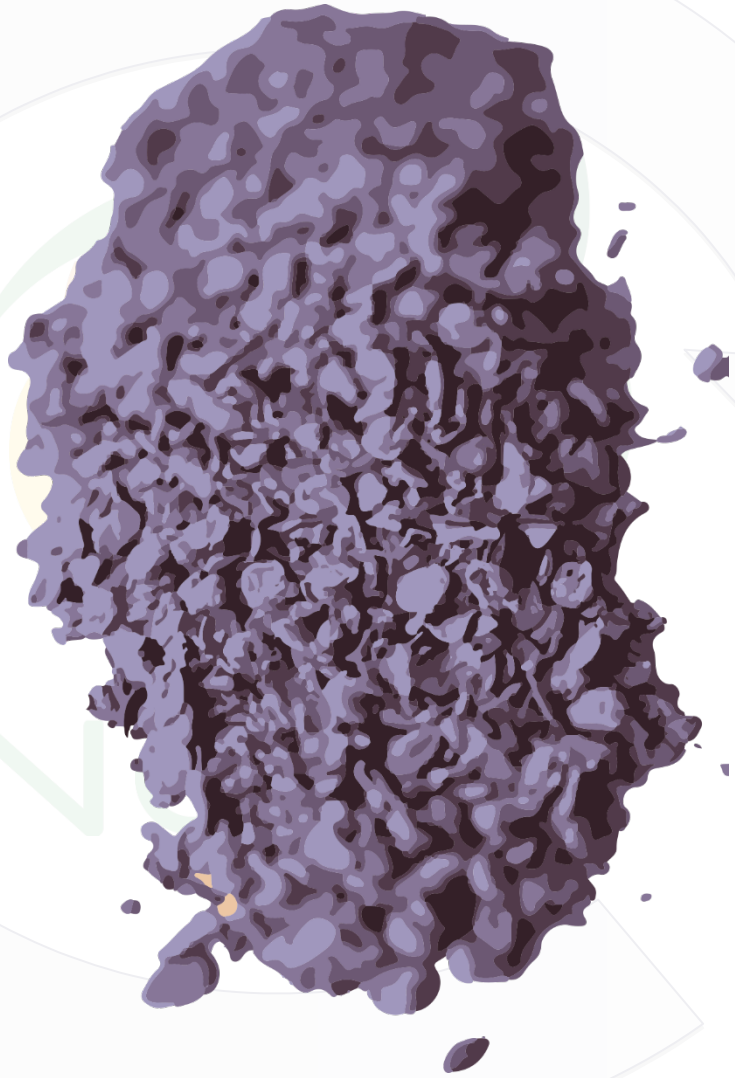
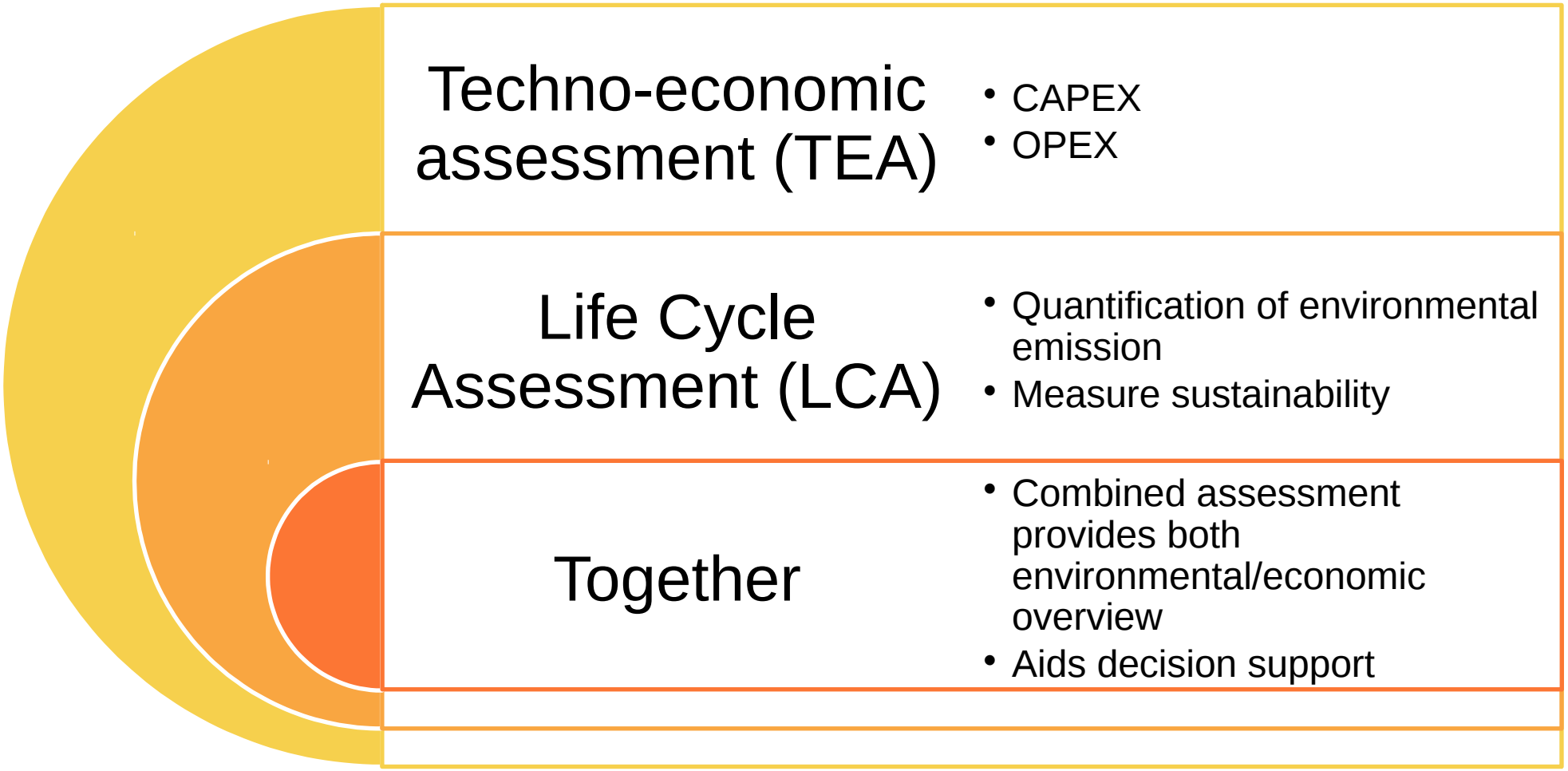
Sustainable
Bio-Products

Polyphenol extraction from grape pomace

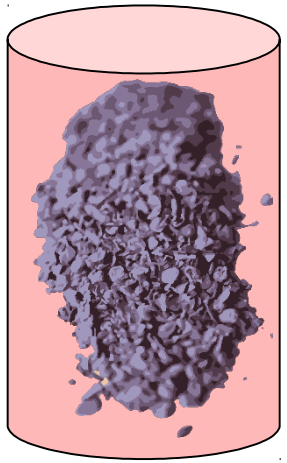


Bio-resources

TEA and LCA as tools for sustainability assessment

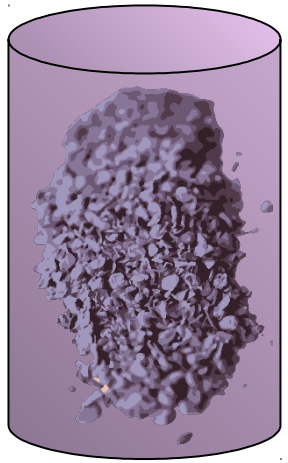


Systems assessed



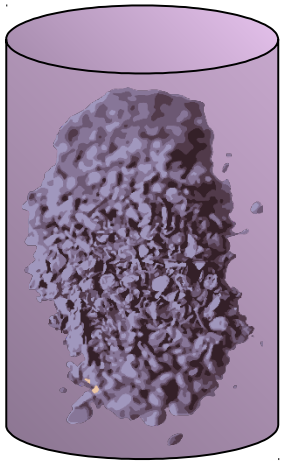
S-Acn

- 50°C
- 75% Acetone and water
- Solvent:DW = 11



PLE-EtOH

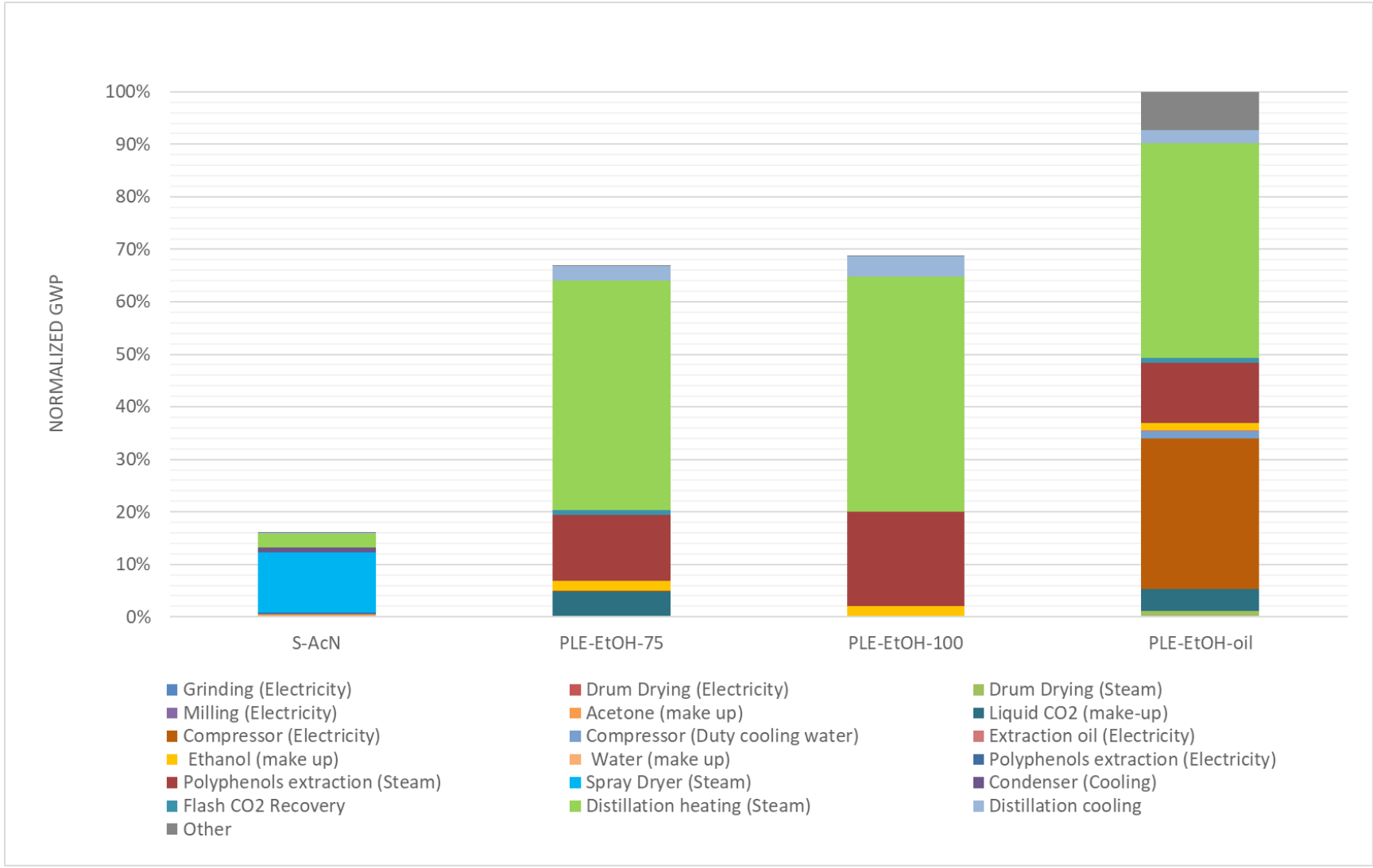
- 80°C
- 75% or 100% Ethanol and water
- Solvent:DW = 100



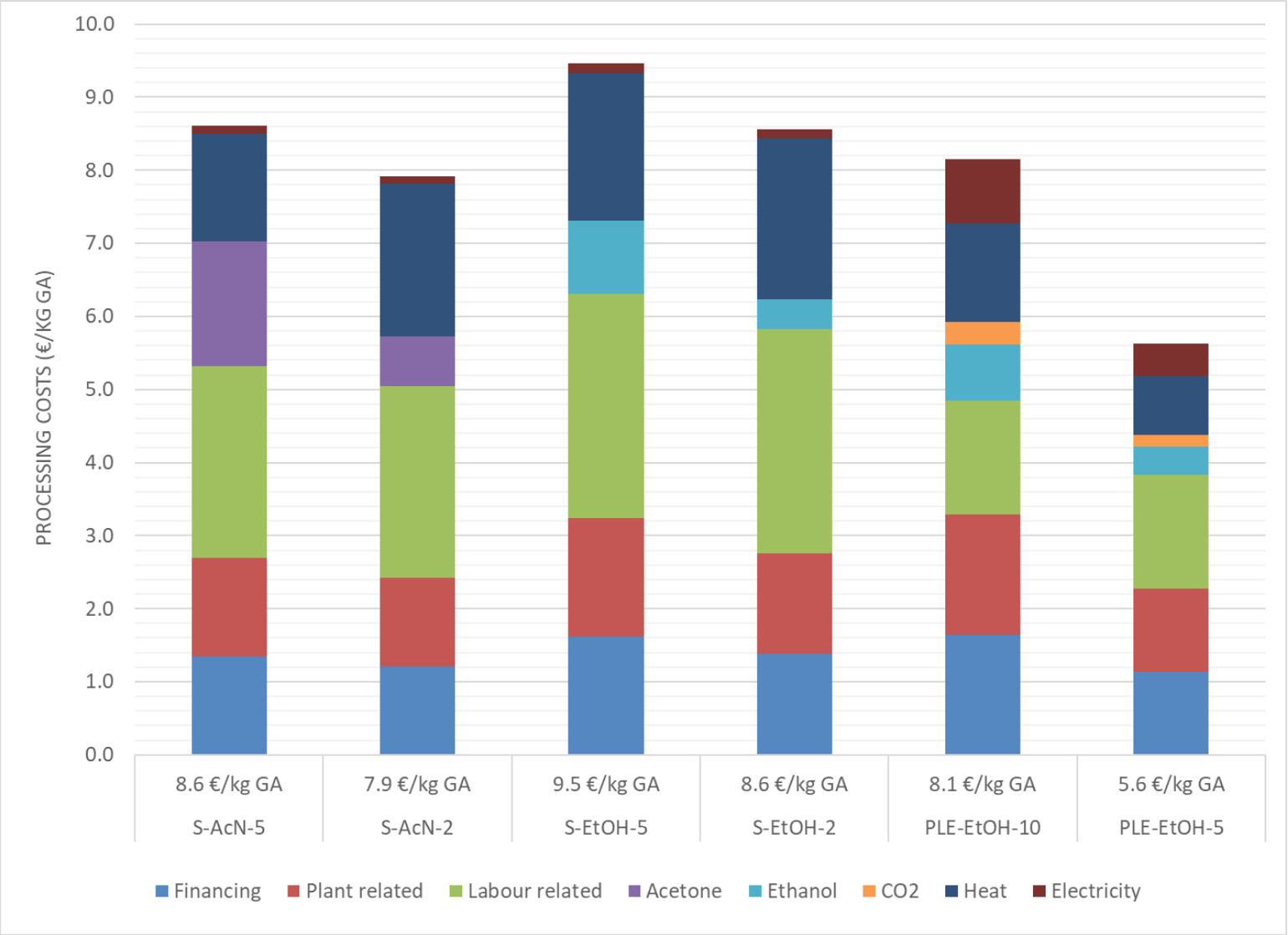
PLE-EtOH-oil

- 80°C
- 75% ethanol and water
- Solvent:DW = 500

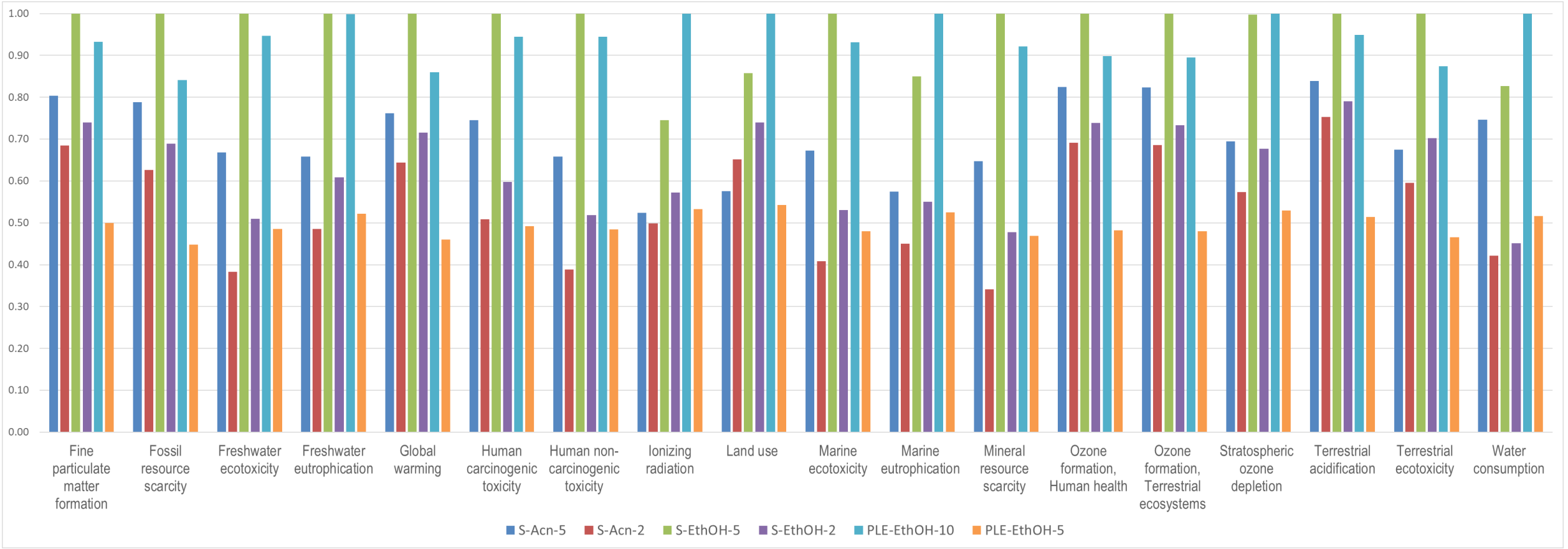
Early-Design LCA

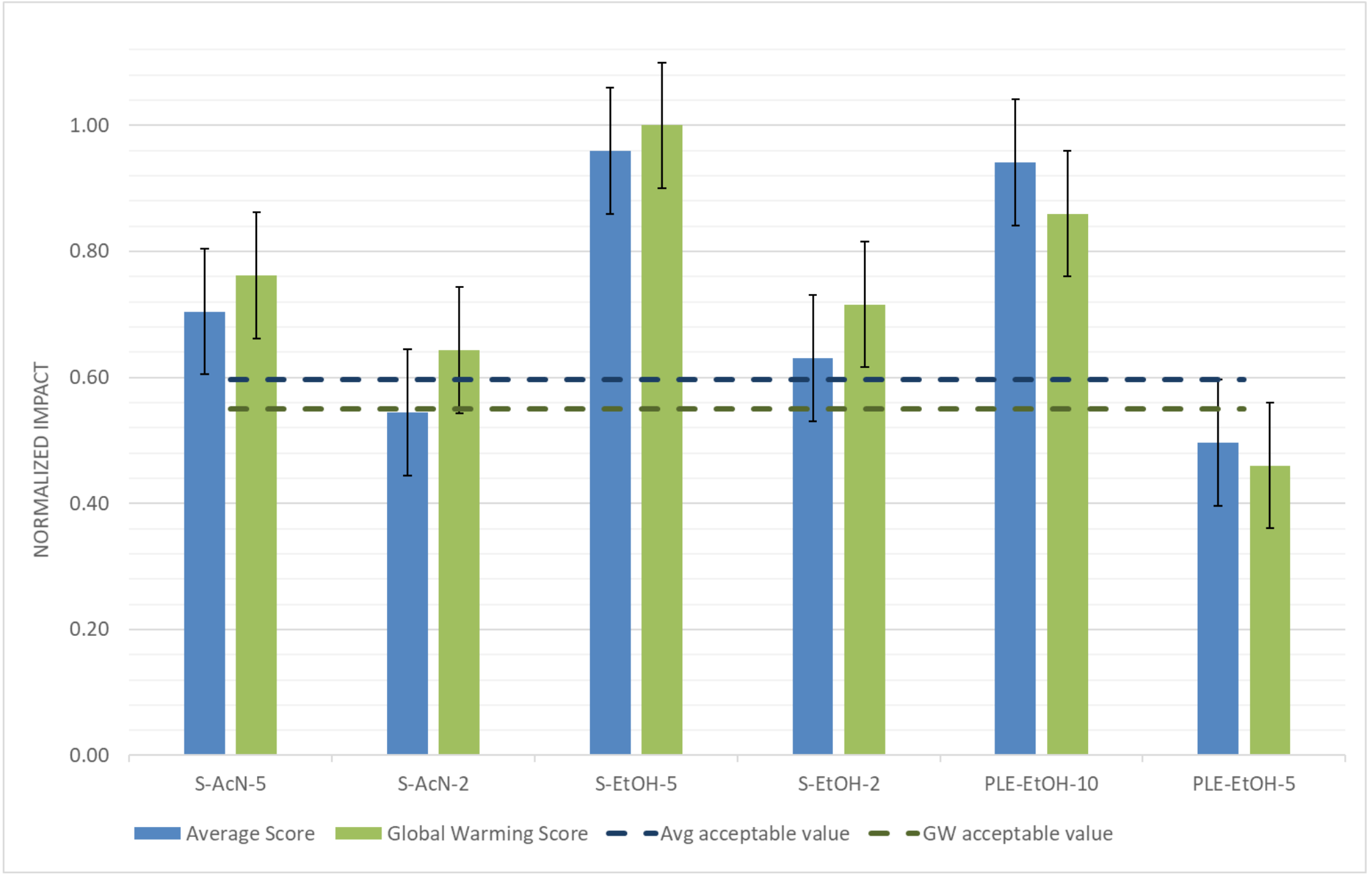


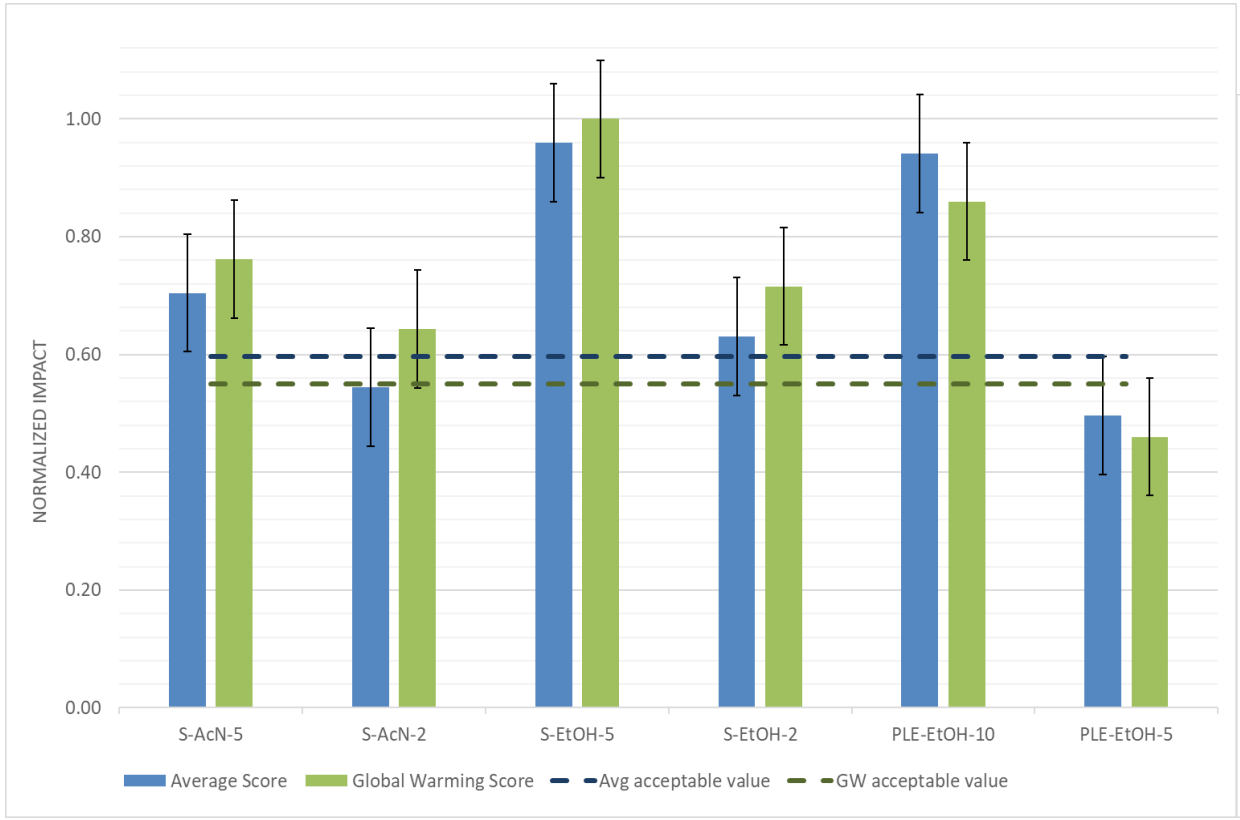
Optimized system through TEA

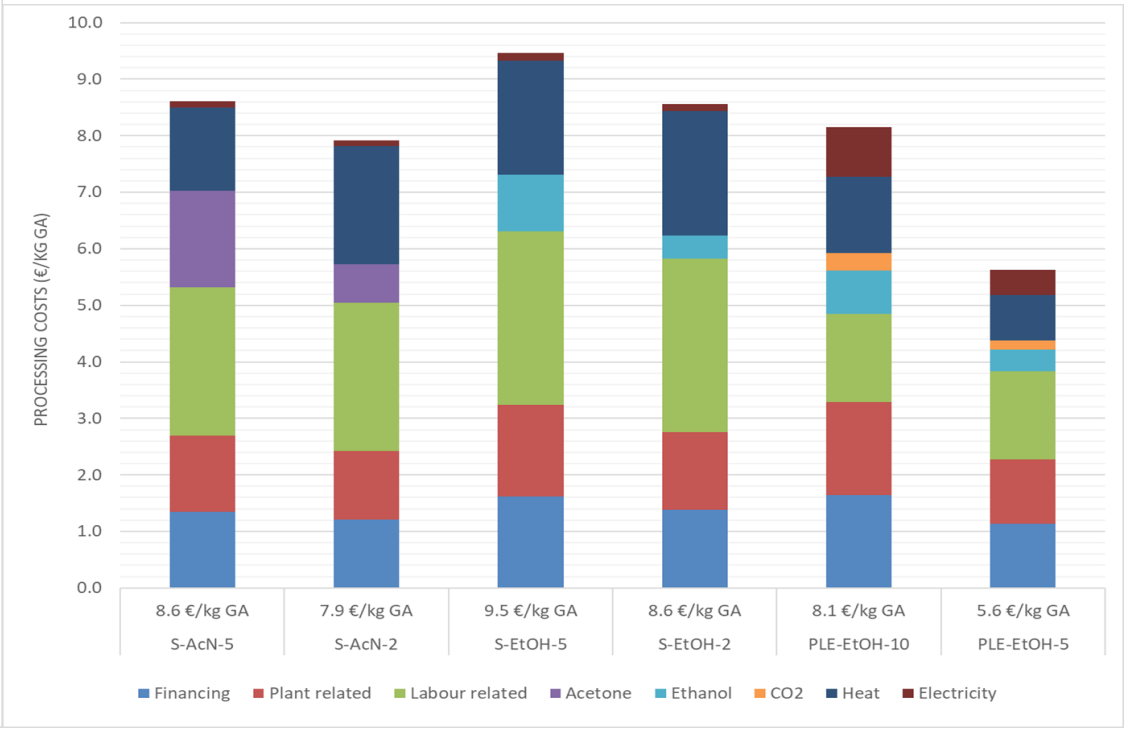


Mid-point impact category results from LCA



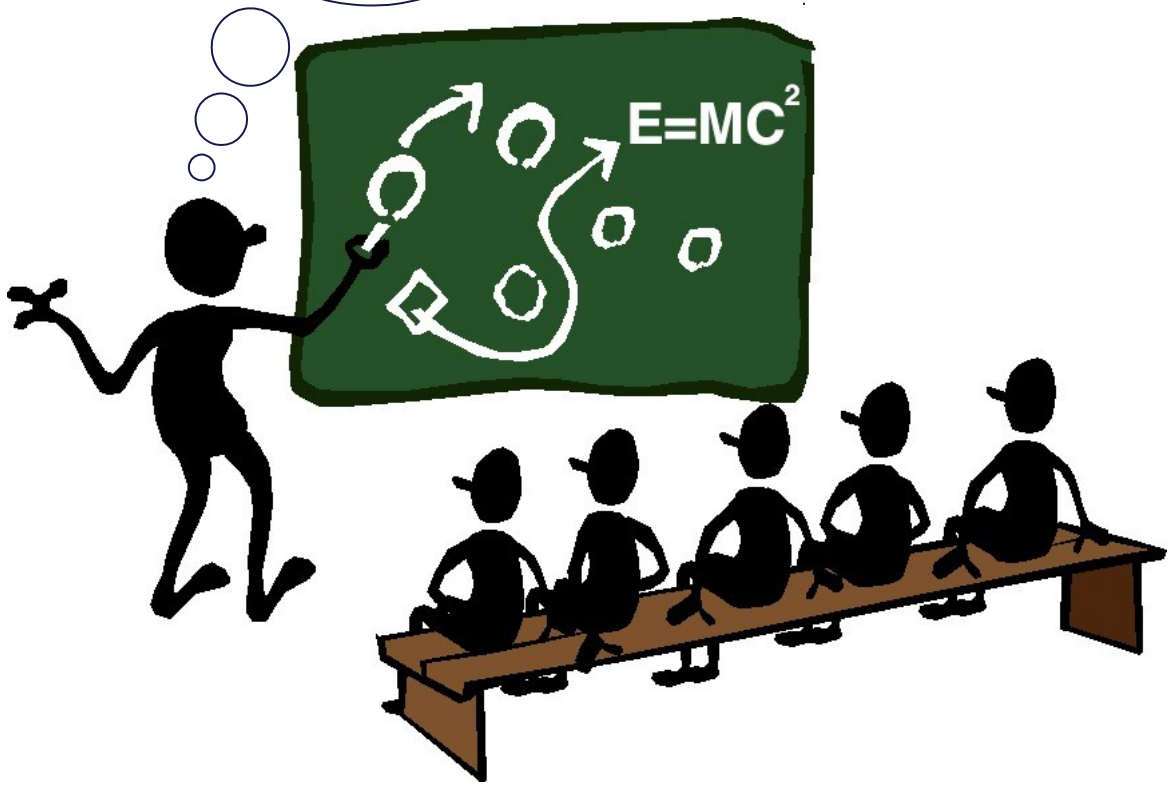

NORMALIZED IMPACT
1.00
0.80
0.60
0.40
0.20
0.00
S-AcN-5
S-AcN-2
S-EtOH-5
S-EtOH-2
PLE-EtOH-10
PLE-EtOH-5
Average Score
Global Warming Score
Avg acceptable value
GW acceptable value


NORMALIZED IMPACT
1.00
0.80
0.60
0.40
0.20
0.00
S-AcN-5
S-AcN-2
S-EtOH-5
S-EtOH-2
PLE-EtOH-10
PLE-EtOH-5
Average Score
Global Warming Score
Avg acceptable value
GW acceptable value


PROCESSING COSTS (€/KG GA)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
8.6 €/kg GA
S-AcN-5
7.9 €/kg GA
S-AcN-2
9.5 €/kg GA
S-EtOH-5
8.6 €/kg GA
S-EtOH-2
8.1 €/kg GA
PLE-EtOH-10
5.6 €/kg GA
PLE-EtOH-5
Financing
Plant related
Labour related
Acetone
Ethanol
CO2
Heat
Electricity

Conclusion

- TEA and LCA can be used to pinpoint hot spots in the production
  - These results can be used to proactively optimize the design of a technology
- Iterative process
- But what if the TEA and the LCA point towards different choices?
  - Need extra decision support or quantification of your values…more on that in 15 minutes….



Questions?

DTU Management Engineering
Quantitative Sustainability Assessment

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