LCA of Off-shore Floating PV

Binani, A. (Ashish), Jong, M.M (Minne) de

Start presentation

Rijksdienst voor Ondernemend Nederland

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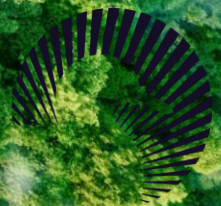
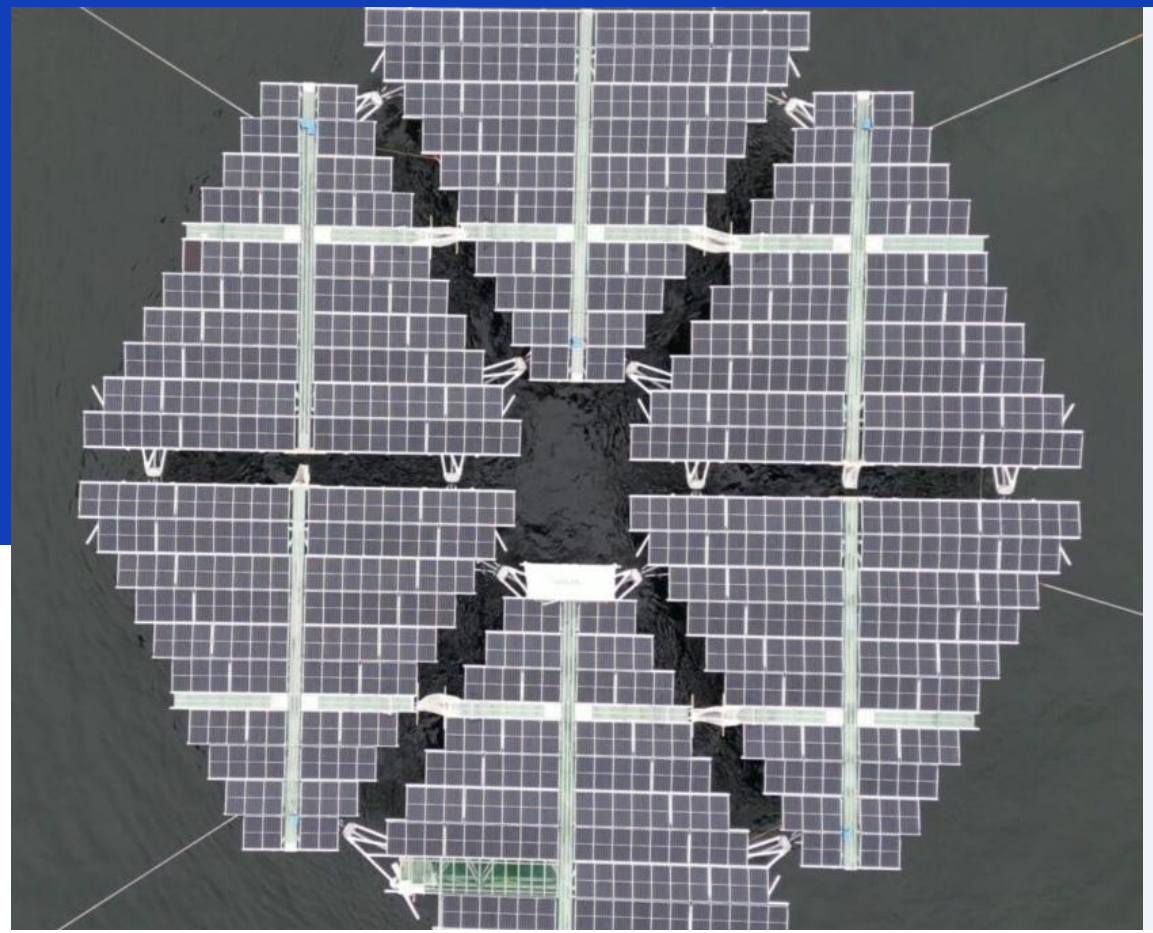


SOLARDUCK

Overview



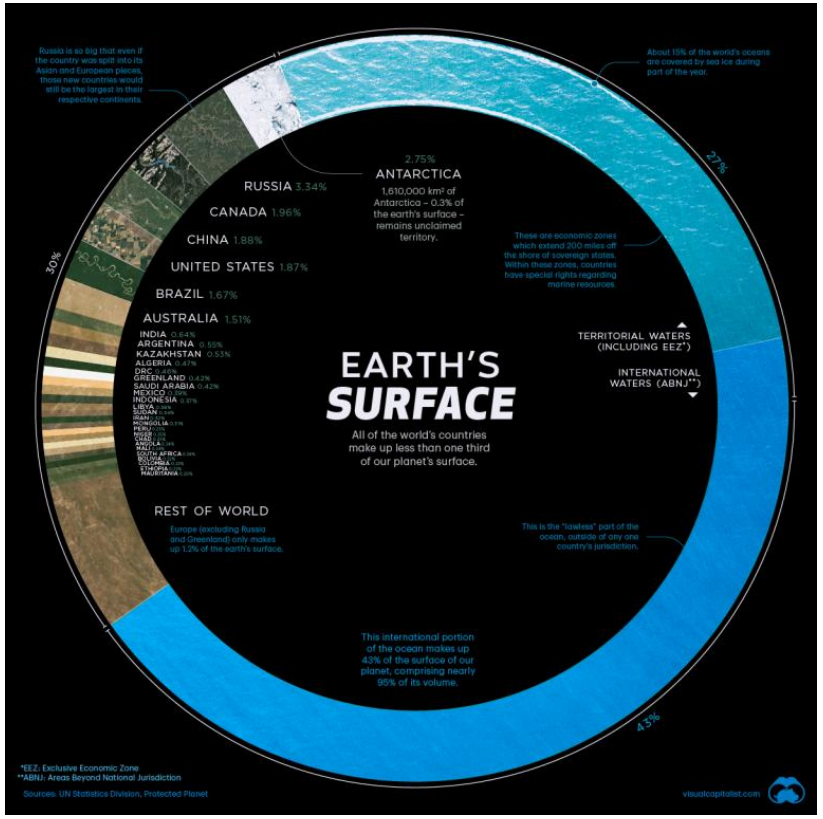
1. Why Off-shore?
2. Goal & Scope
3. System boundary and Assumptions
4. System description
5. Results analysis
6. Scenarios
7. Comparison with grid and other PV systems
8. Conclusion

Why Off-Shore Solar?

75% of Earth surface is water

Solar Energy Potential

Synergy with Offshore Wind

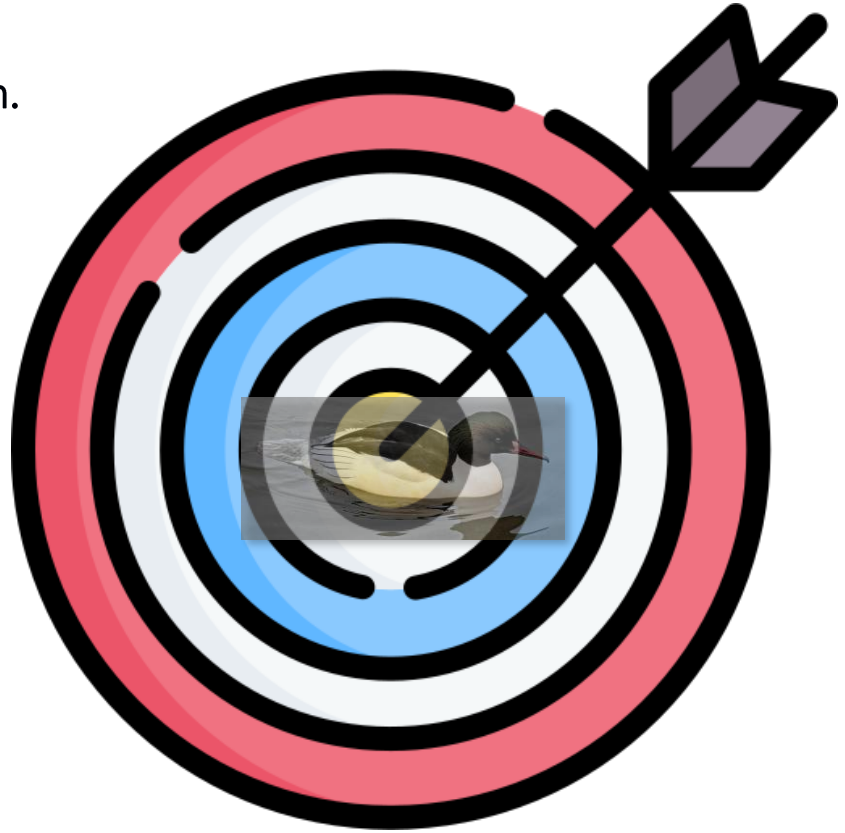


Goal & Scope

LCA of the pilot system Merganser : An Off-Shore Floating PV System by SolarDuck

- Collect latest LCI data on operational (pilot) offshore floating PV system.
- Functional unit is 1kWh of AC electricity generated.
- Mid-point Impact categories:
  - Climate Change – Global Warming Potential (kg CO_2 eq)
  - Energy demand – Cumulative Energy demand (kWh)
  - Water use – Water consumption (m^3)
  - Acidification potential (mol H^+ eq)

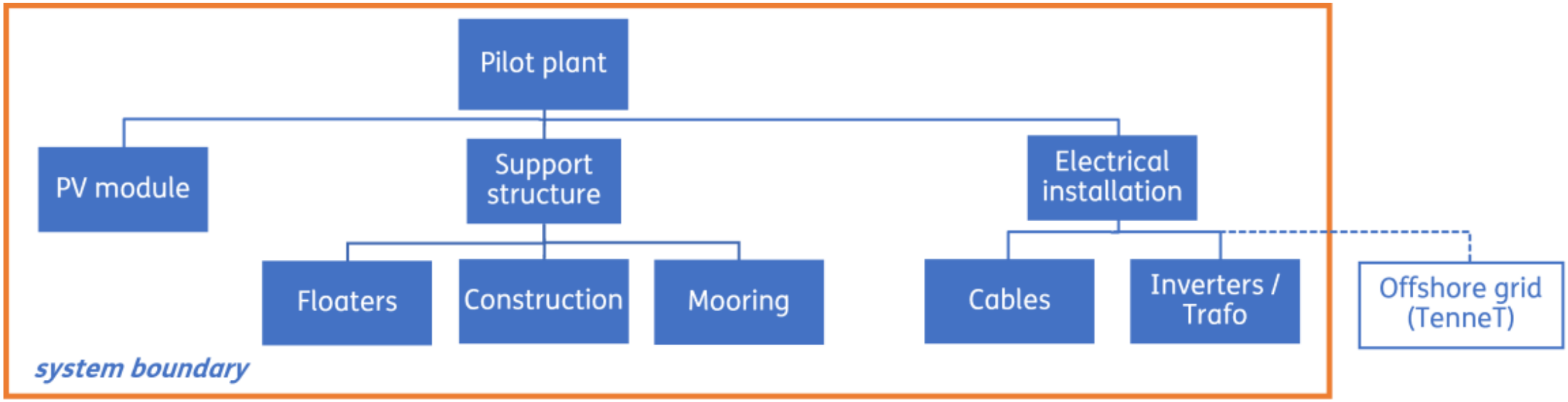
- Sensitivity analysis:
  - Circular design
  - Energy Yield



System Boundary

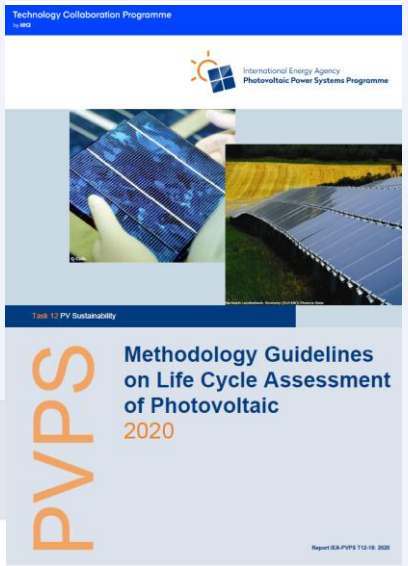
- PV modules
- Support structures
- Electrical components
- Installation phase
- Operations & Maintenance phase
- Spares (10%)

- Base case:
  - End of Life not taken into account.
- Background data
  - PV – Muller's paper 2021
  - Ecoinvent Library
  - Environmental Product Declaration



Assumptions

- As per IEA task 12 guidelines,
  - Life-time = 30 years
  - PR = 0.80



4CO.3.4 Explaining the Measured Performance of an Offshore Floating Solar Pilot System at the North Sea

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Speaker
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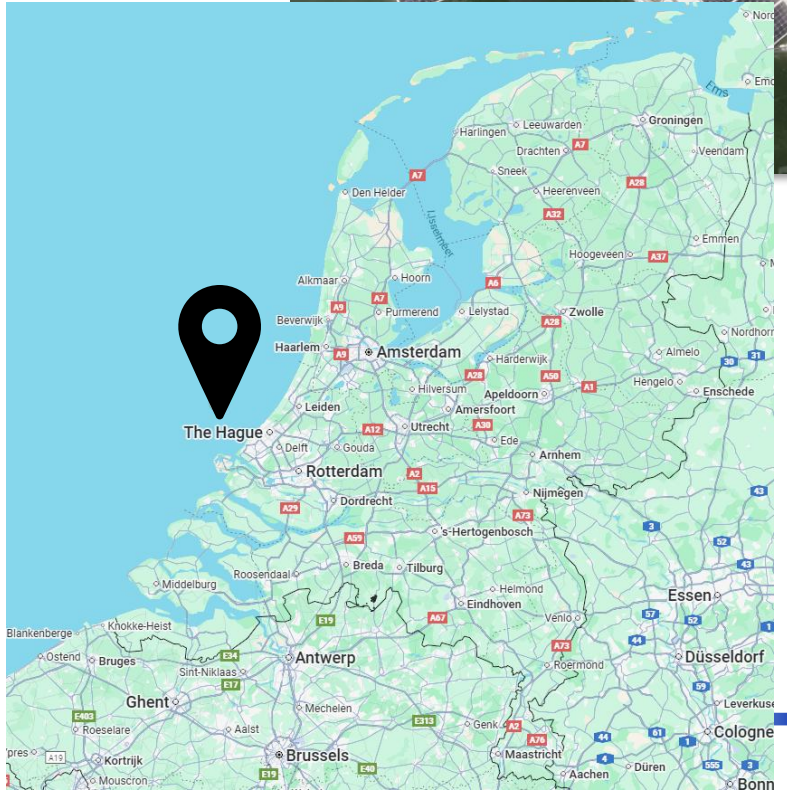
TNO, Eindhoven, The Netherlands

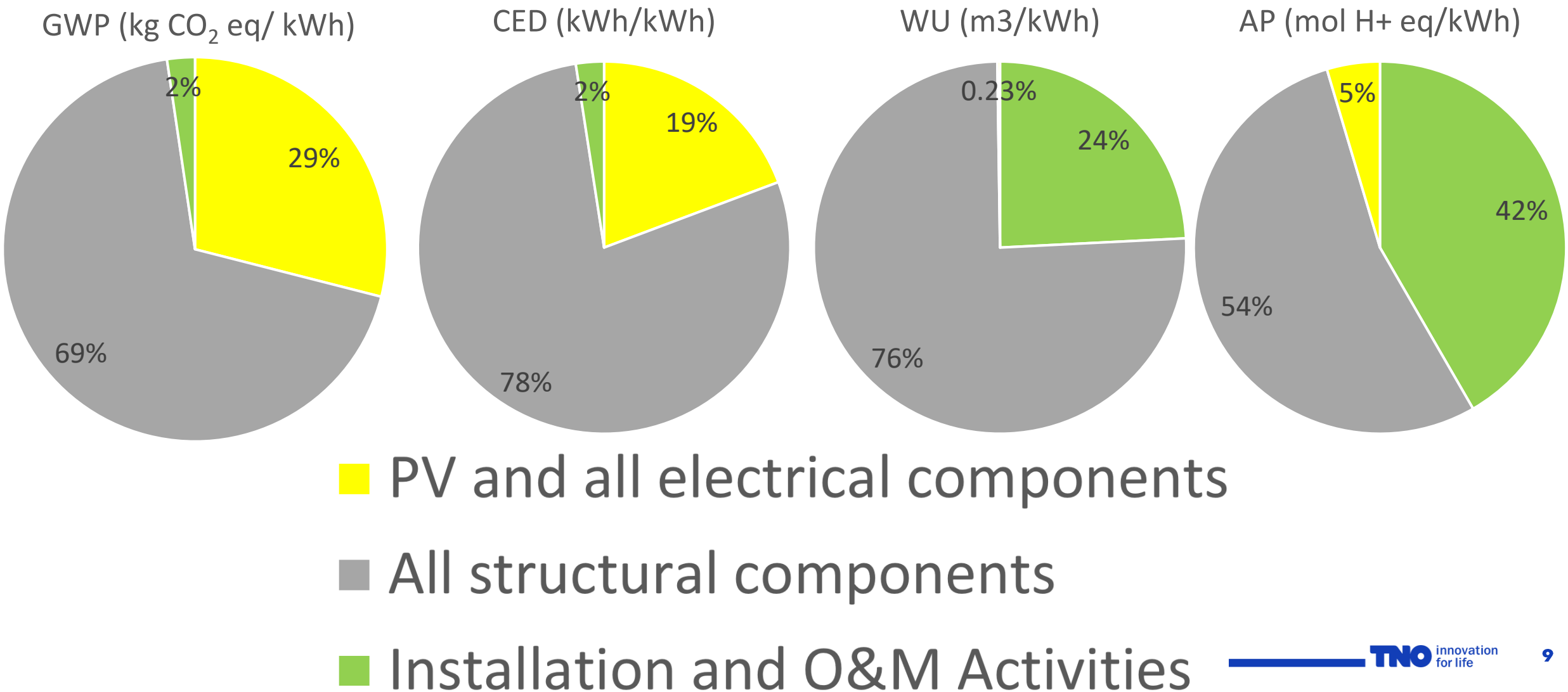
System description

- Pilot system from SolarDuck
  - Merganser
  - 0.5 MWp
  - Triangular platforms
  - 7 m above water surface
  - East-West oriented modules (PERC)
  - 10° tilt
  - Designed for high wave height regions.
  - Deployed 12 km off the west coast of The Netherlands.

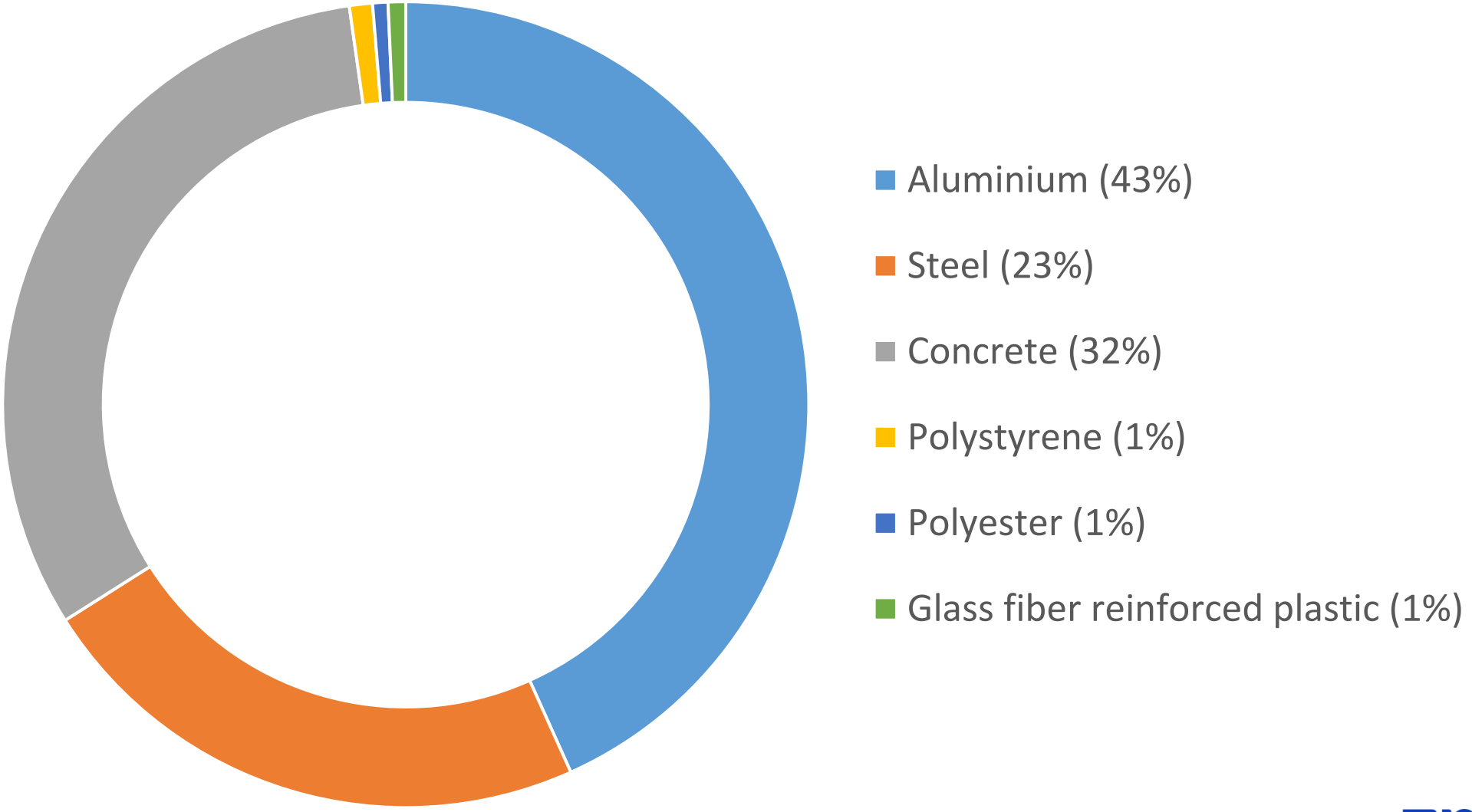


Base Case Result Analysis

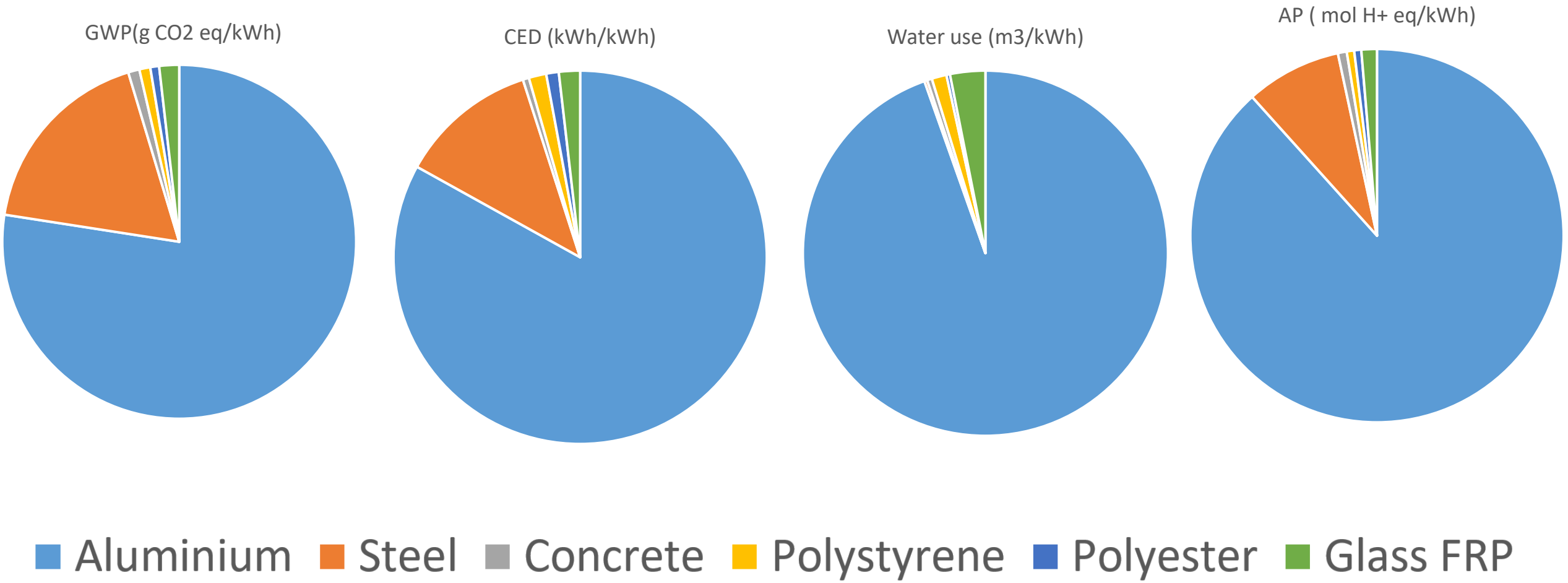
Environmental impacts of the system



Material Breakdown % mass (Support Structure)



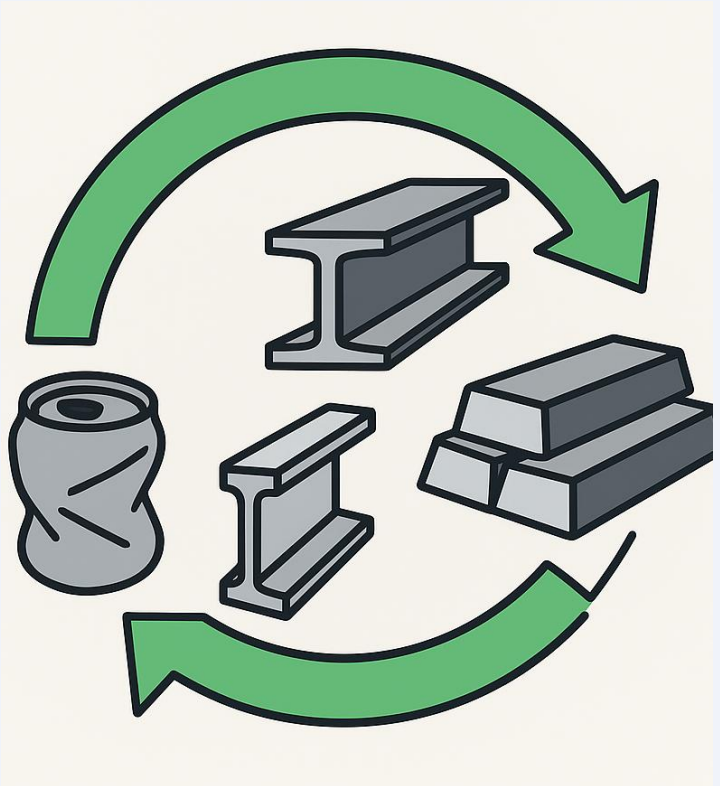
Environmental impacts of the support structure



Scenarios

Scenario 1 : Use of circular materials

- Recycling of support structures
  - Aluminium
  - Steel



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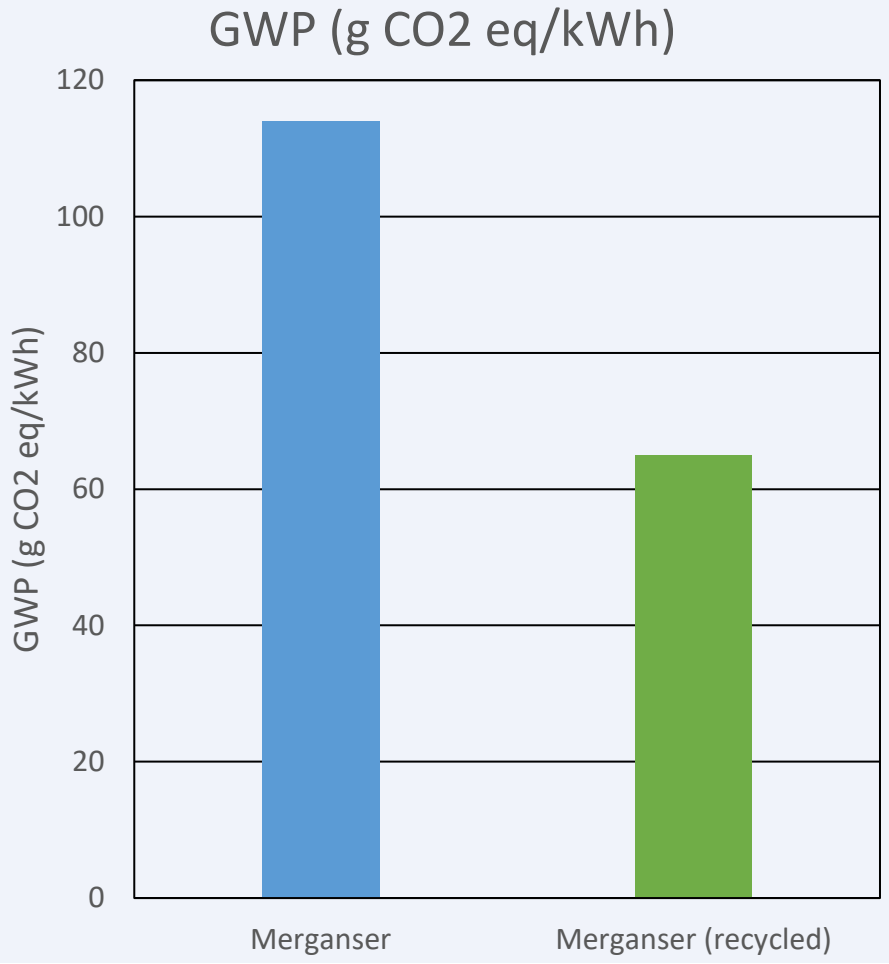

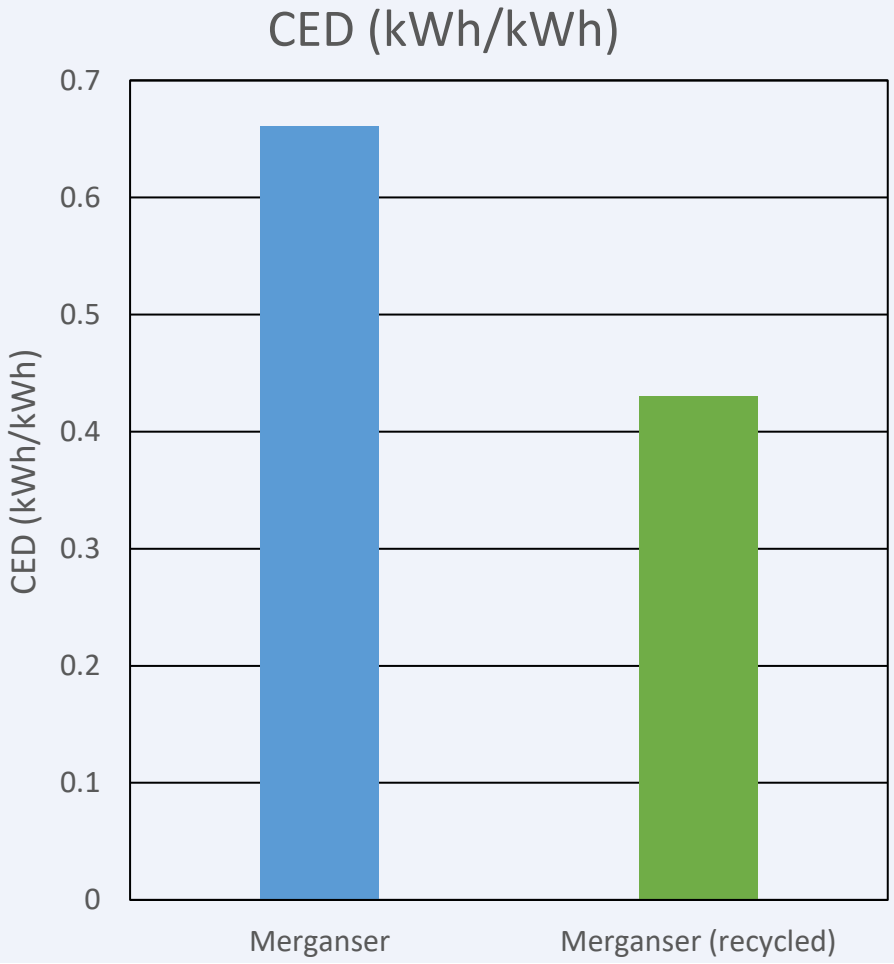

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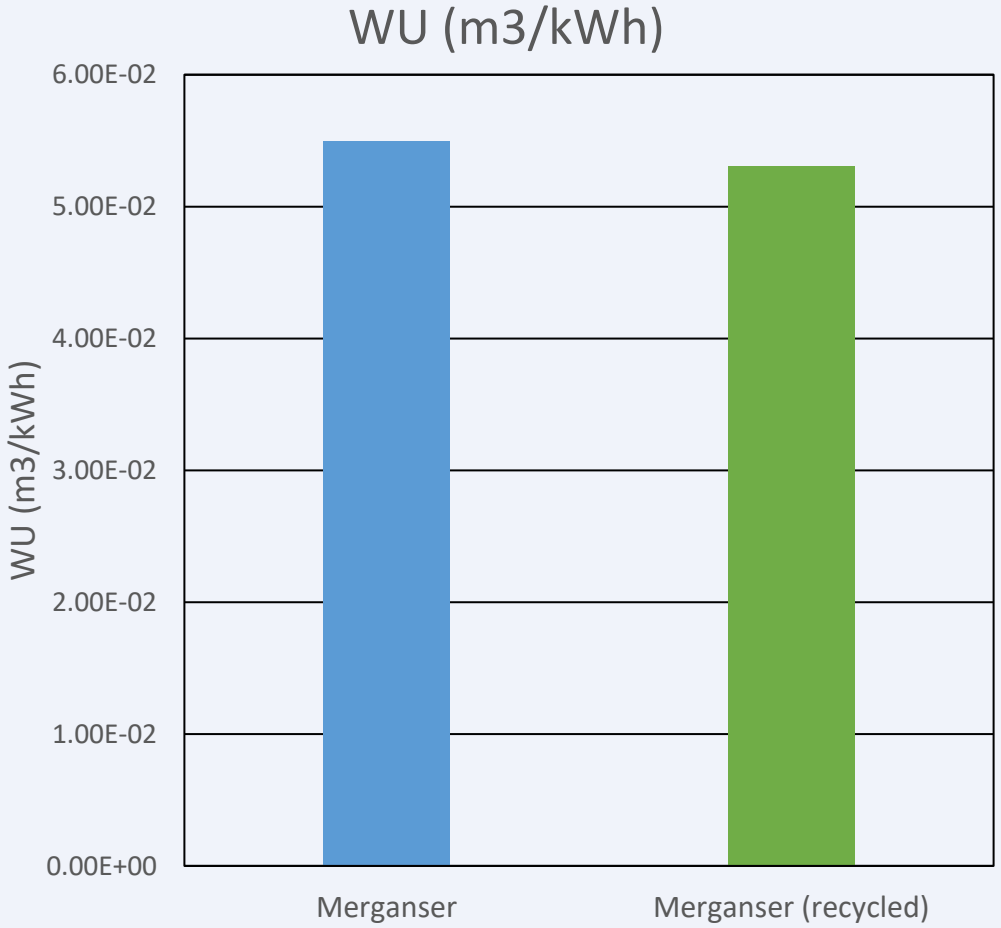
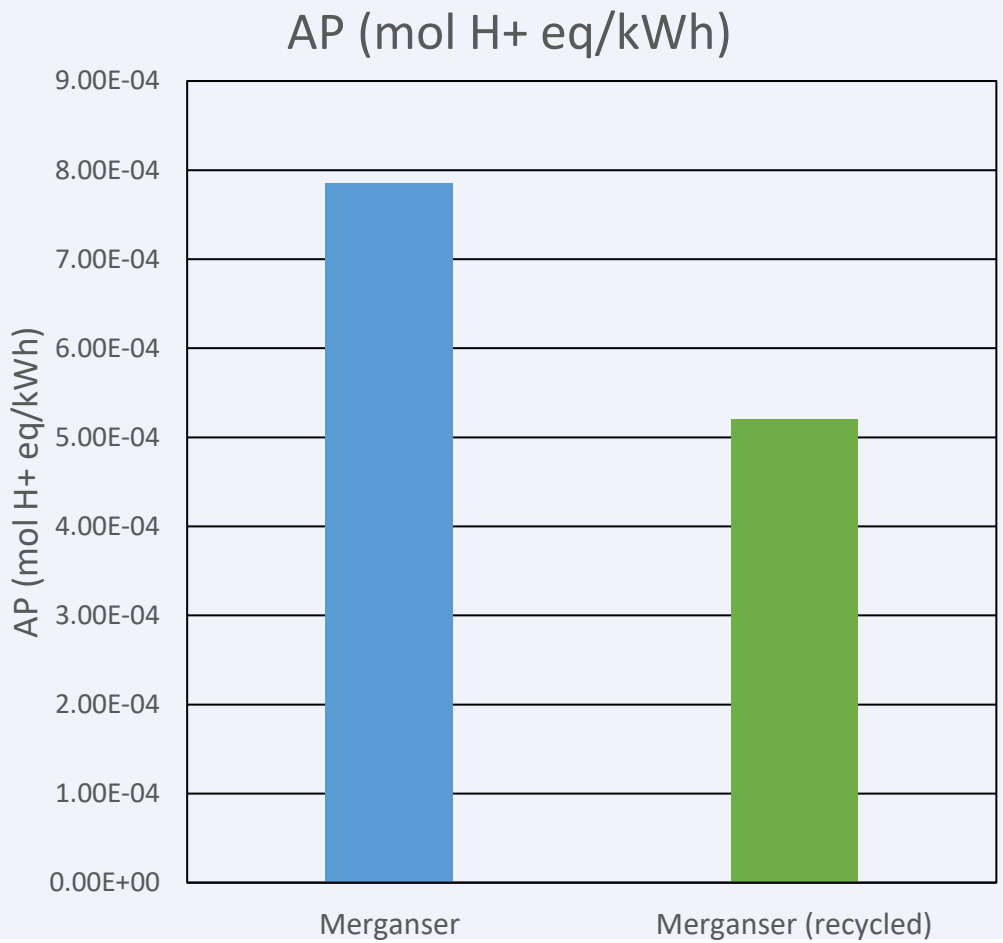
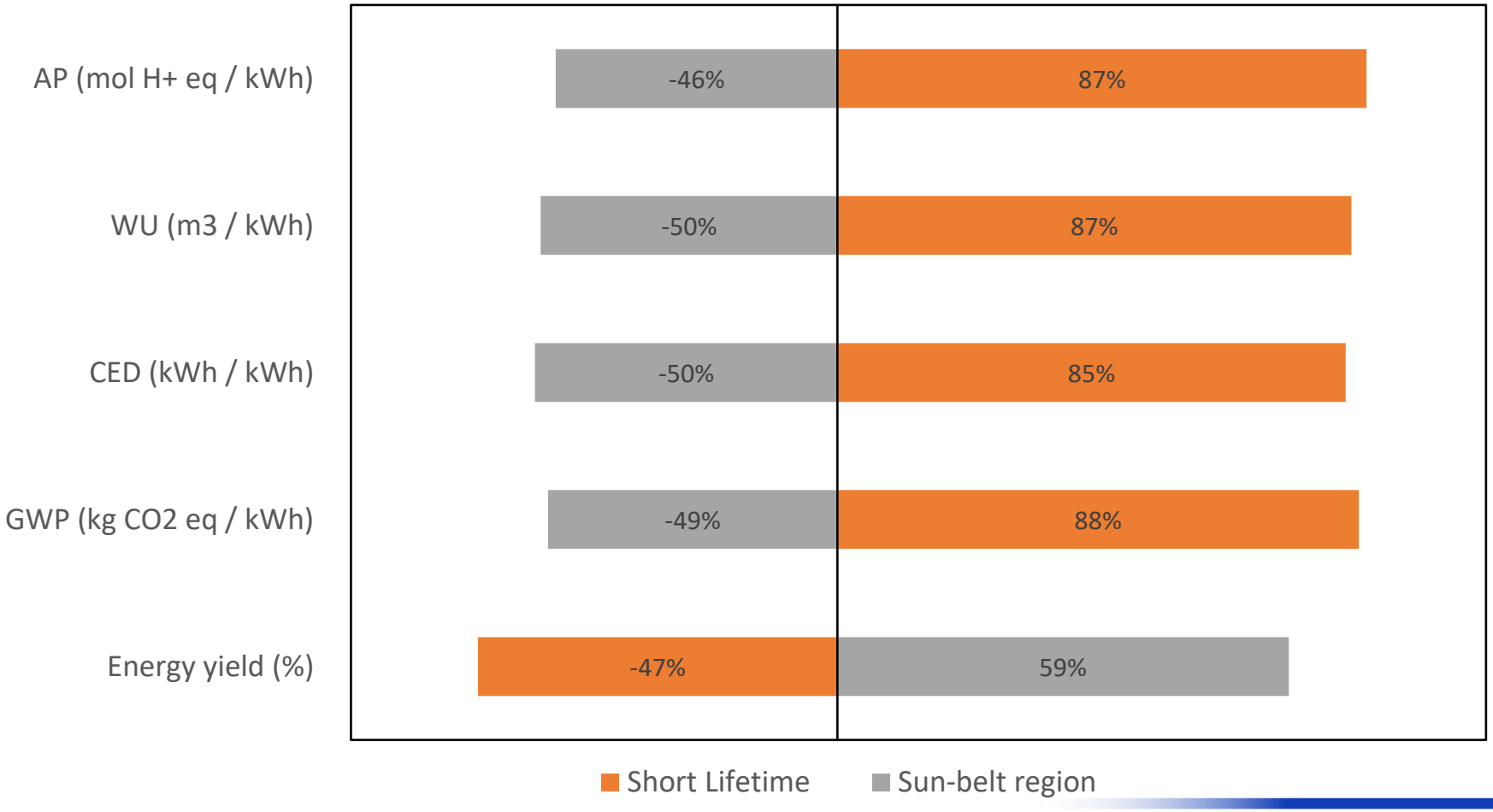




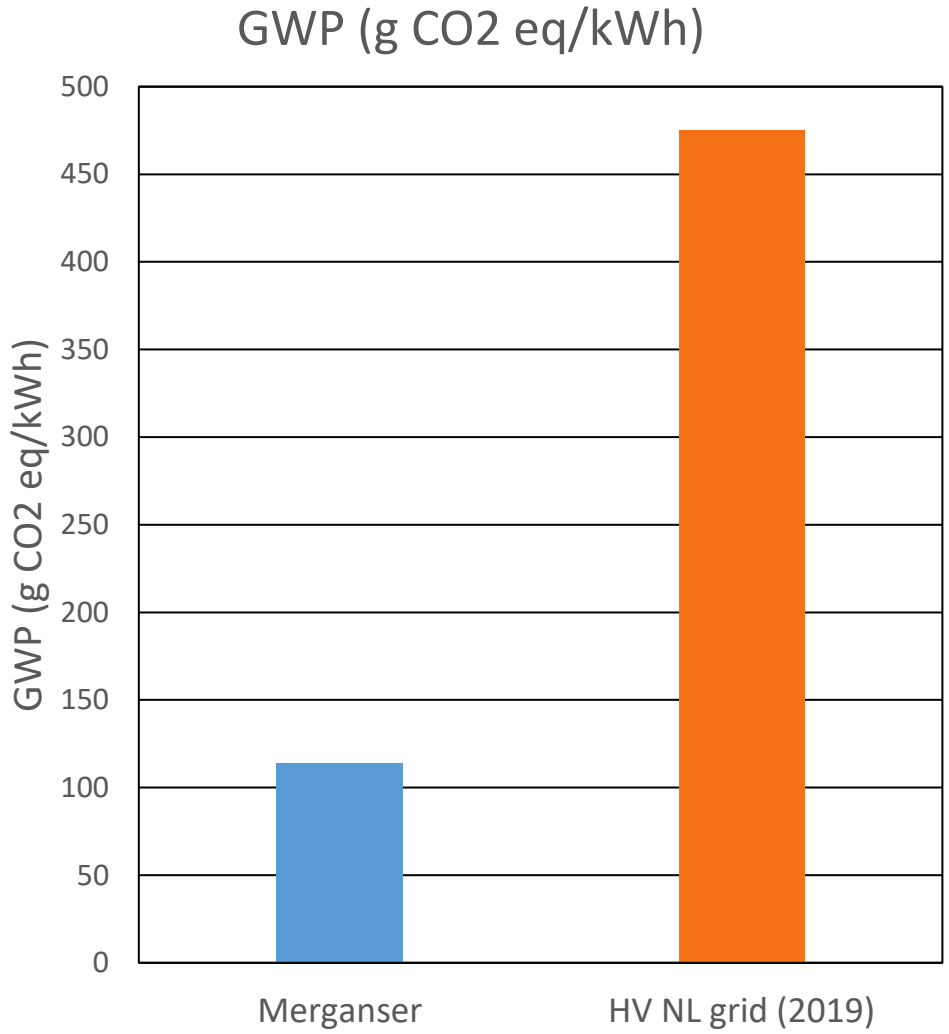
Scenario 2 : Sensitivity analysis on Energy Yield

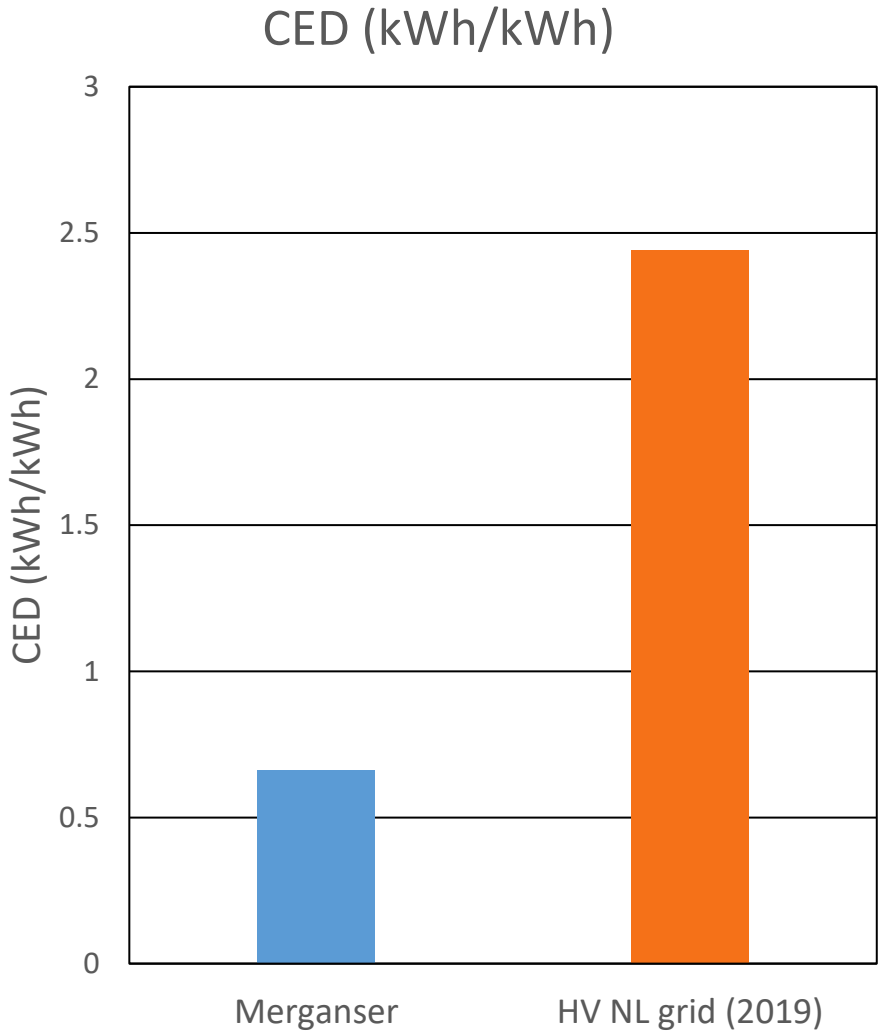
- Short lifetime (15 years)
- Optimized design for Sun-belt region



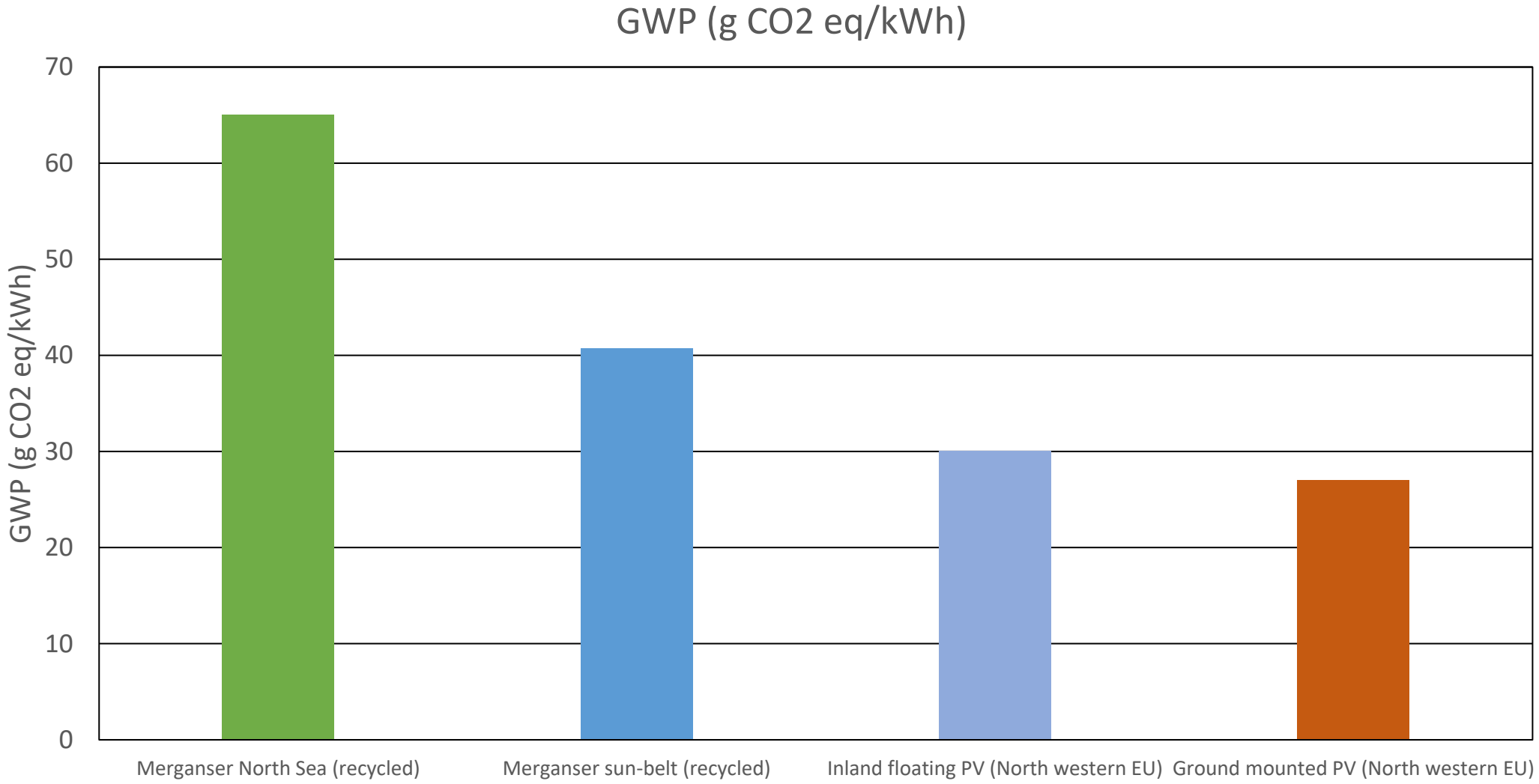
Comparison with grid and other PV systems

Merganser vs Grid

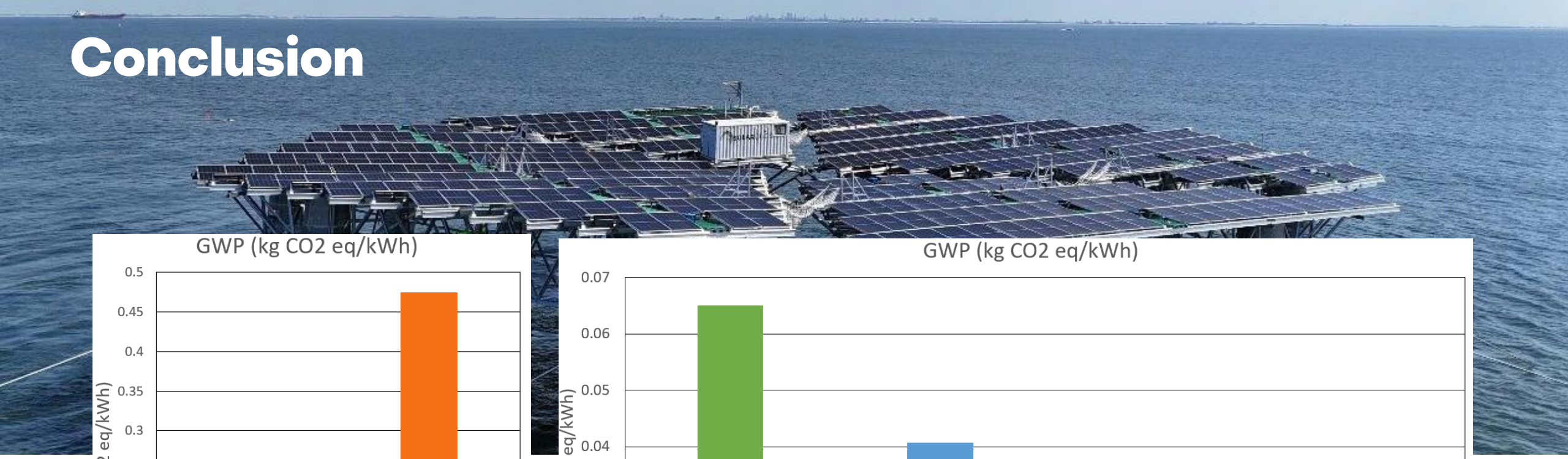


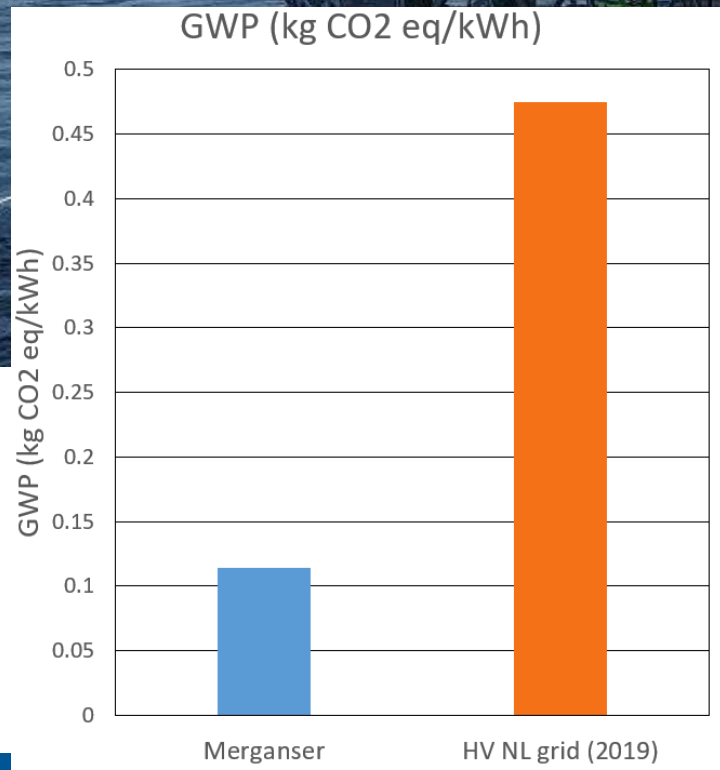


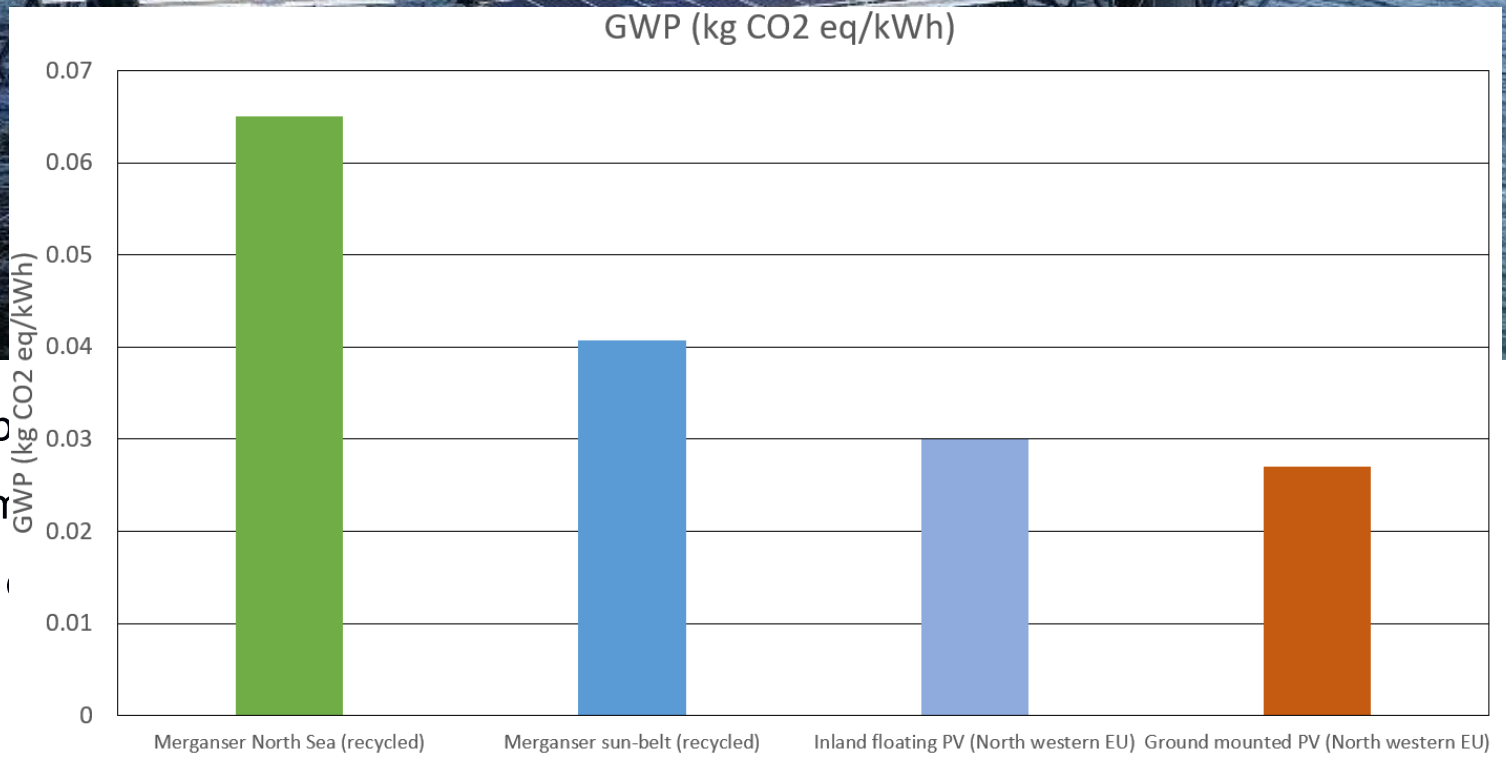
Comparison with other PV systems



Conclusion







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