

Clean Hydrogen Ladder Version 5.0

19 October 2023

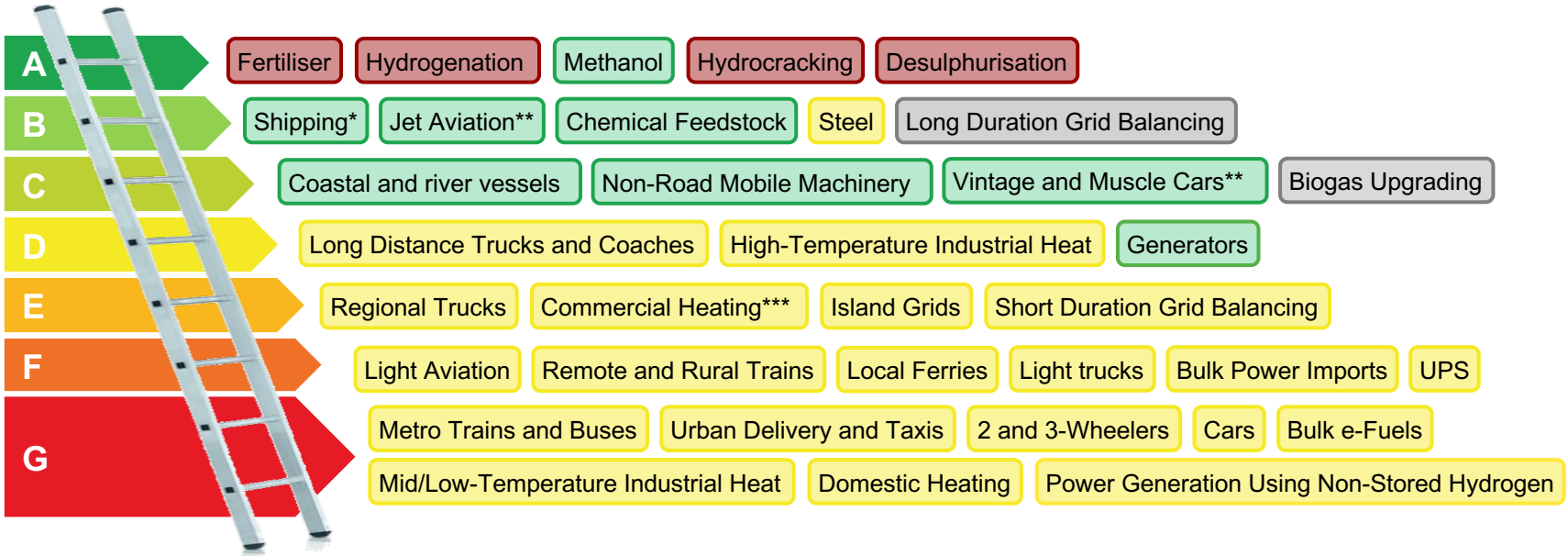
Michael Liebreich
Founder and CEO
Liebreich Associates

For more information
on the decisions
behind the Ladder,
please [read the launch
document](#)

Hydrogen Ladder 5.0

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

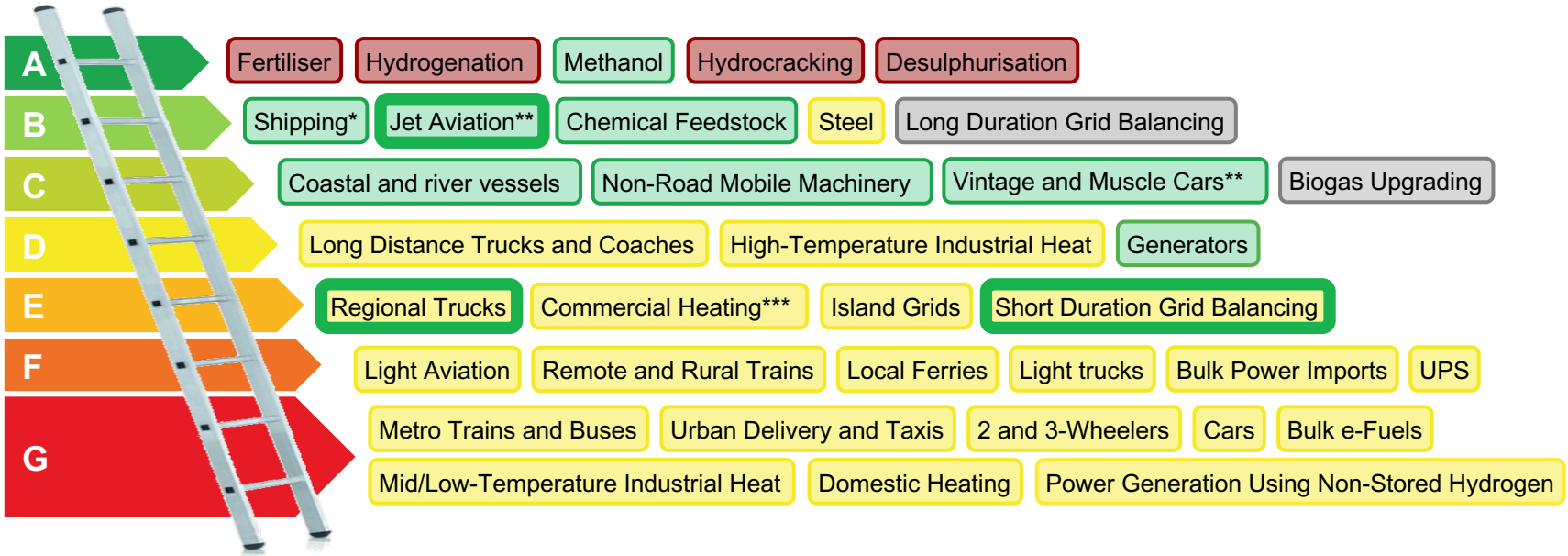
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. CC-BY 4.0

Hydrogen Ladder 5.0 – Promotions (3)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

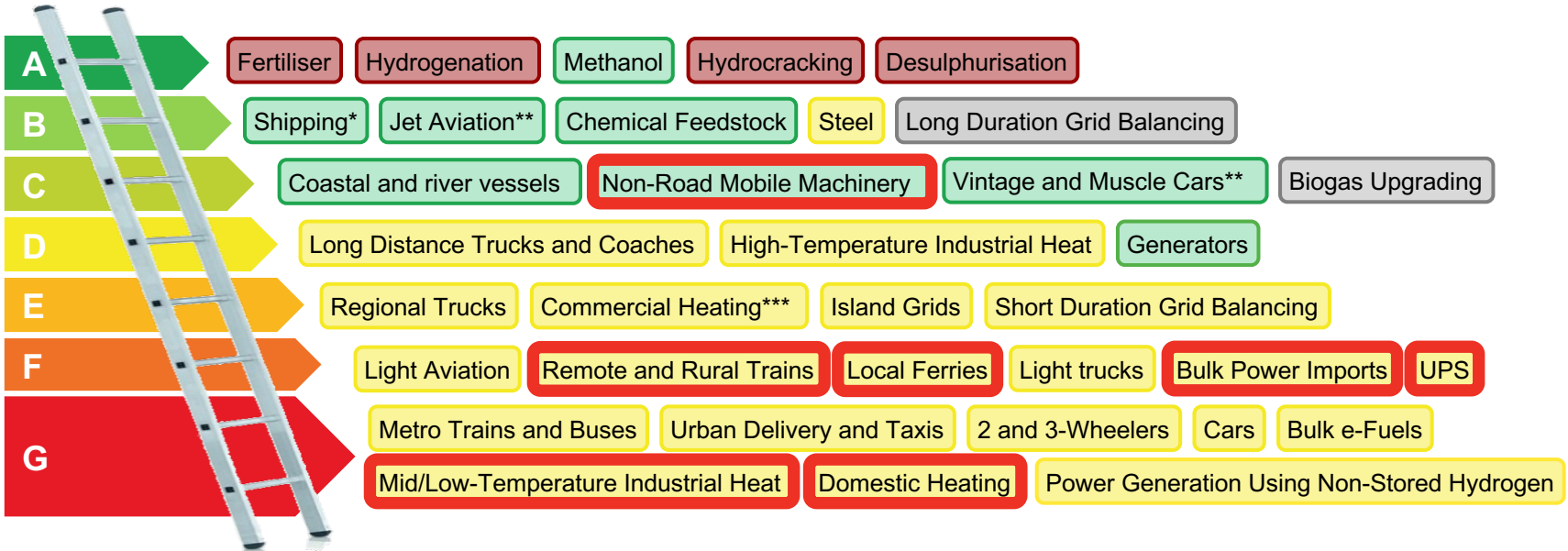
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. CC-BY 4.0

Hydrogen Ladder 5.0 – Demotions (7)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

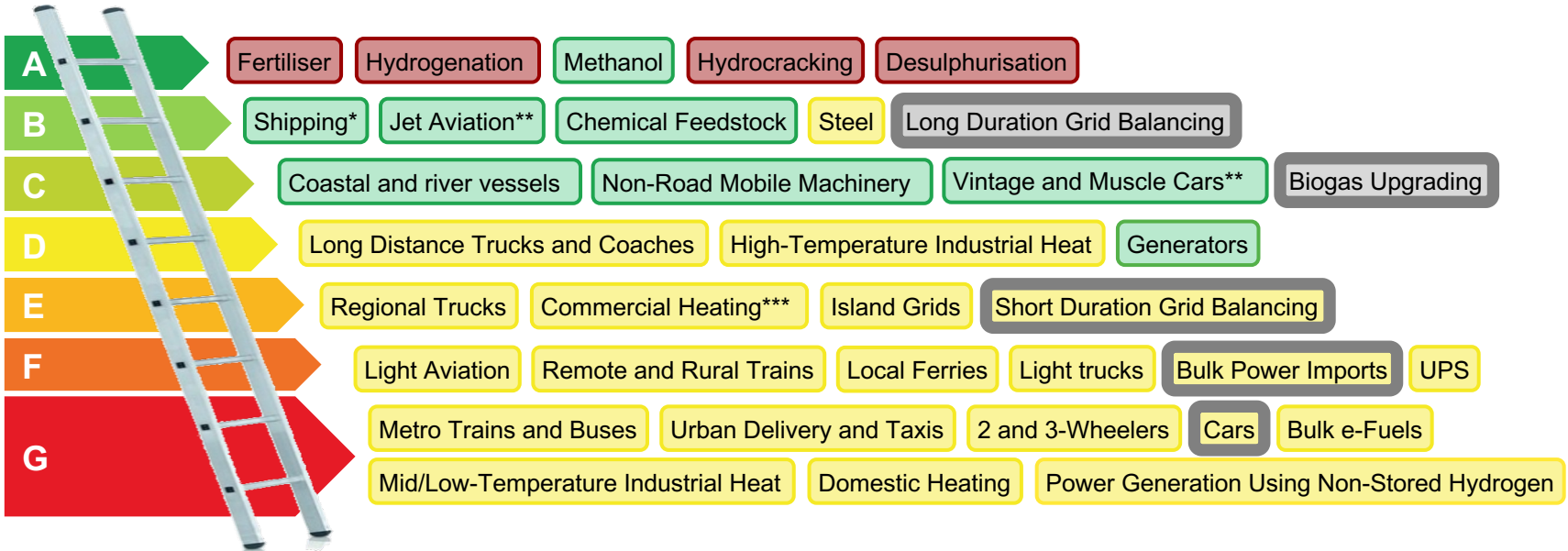
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. CC-BY 4.0

Hydrogen Ladder 5.0 – Wording changes (5)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

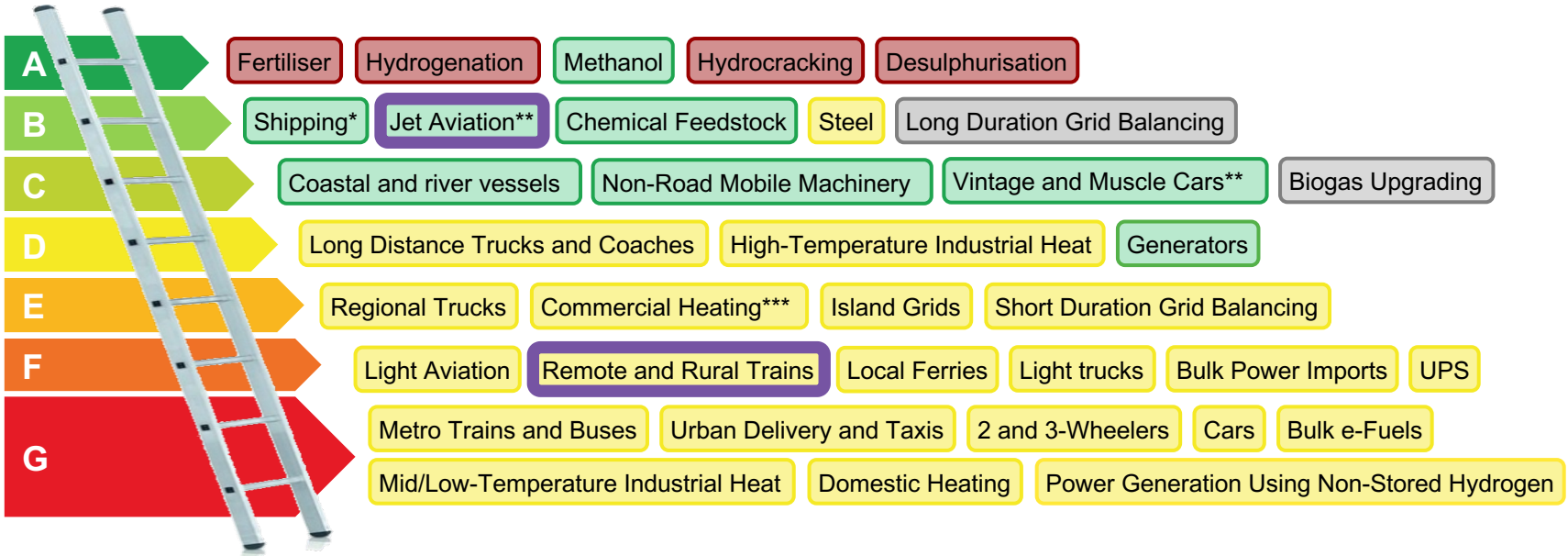
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, *Clean Hydrogen Ladder, Version 5.0, 2023*. Concept credit: Adrian Hiel, Energy Cities. [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/)

Hydrogen Ladder 5.0 – Use cases combined (5 to 2)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

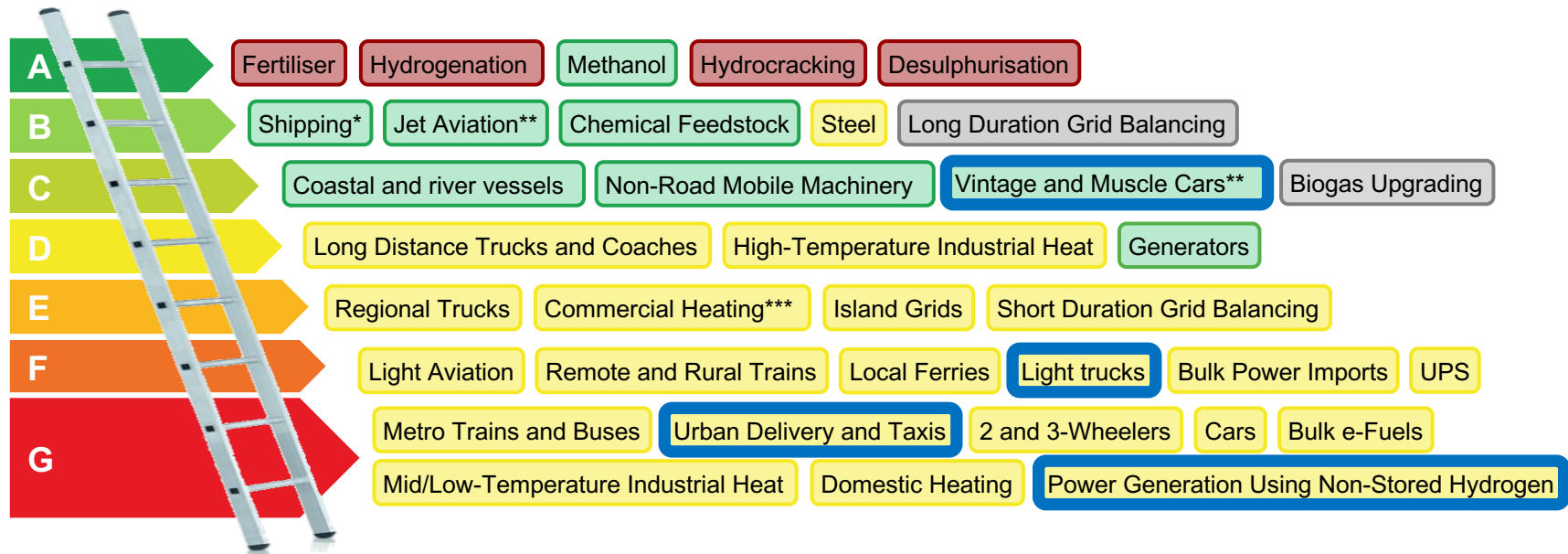
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. CC-BY 4.0

Hydrogen Ladder 5.0 – New or partially new uses (4)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

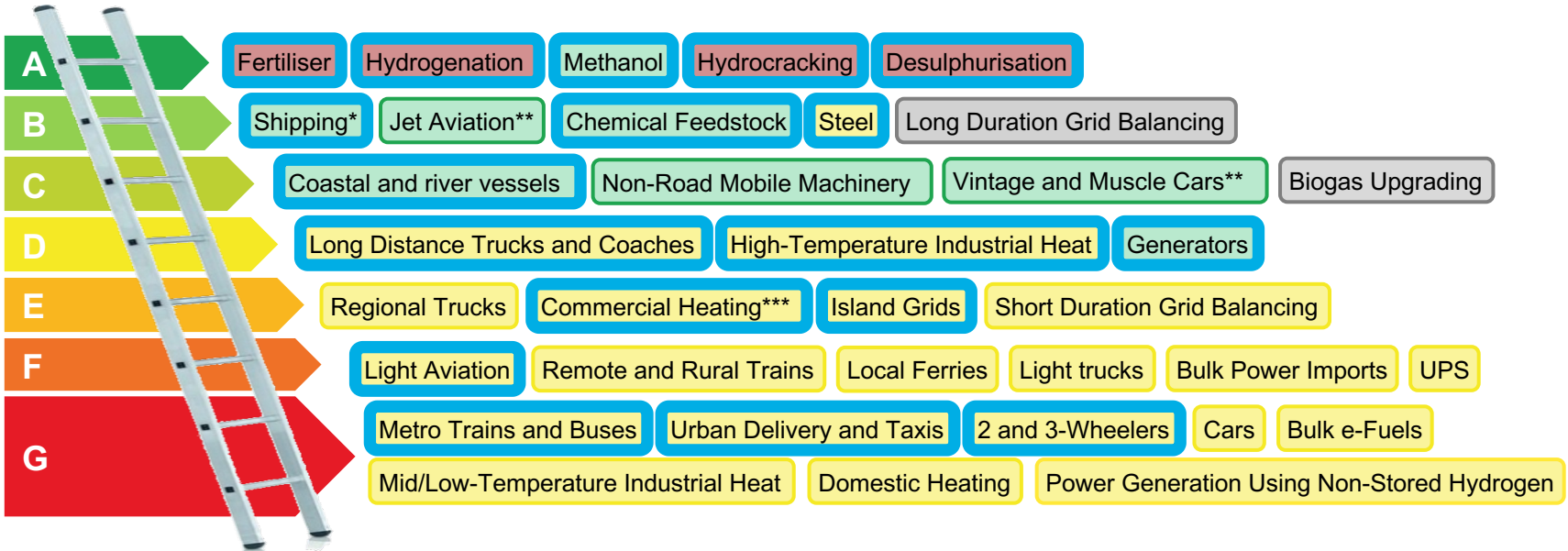
*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

Source: Michael Liebreich/Liebreich Associates, *Clean Hydrogen Ladder, Version 5.0, 2023*. Concept credit: Adrian Hiel, *Energy Cities*. [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/)

Hydrogen Ladder 5.0 – Unchanged (18)

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



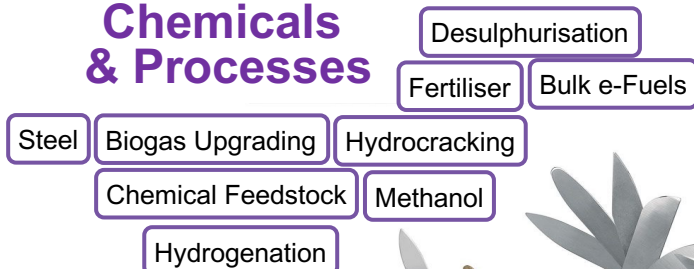
Uncompetitive

*As ammonia or methanol **As e-fuel or PBTL ***As hybrid system

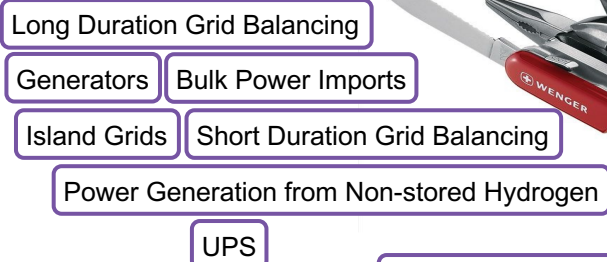
Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. CC-BY 4.0

Clean Hydrogen Swiss Army Knife

Chemicals & Processes

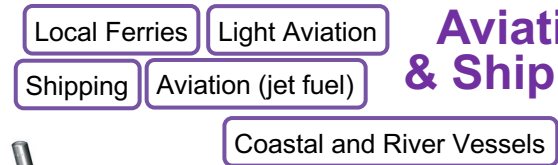


Power System

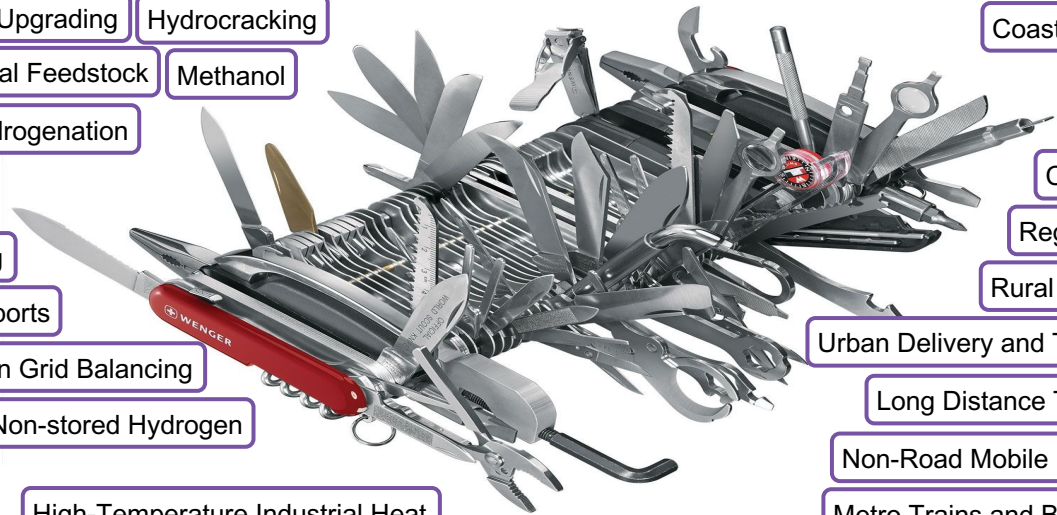
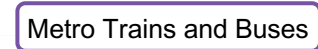


Heat

Aviation & Shipping



Land Transportation

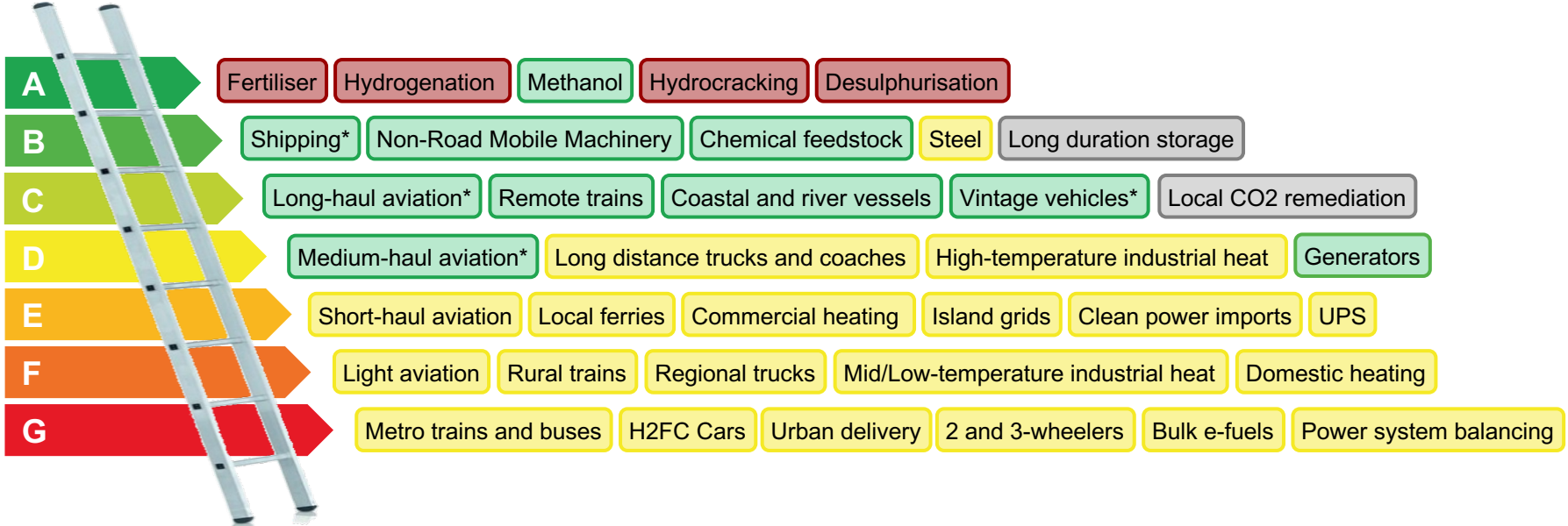


Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. Image: Wenger (concept credit: Paul Martin). CC-BY 4.0

Hydrogen Ladder 4.1 – For reference

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

* Most likely via ammonia or e-fuel rather than H2 gas or liquid

Source: Michael Liebreich/Liebreich Associates, *Clean Hydrogen Ladder, Version 4.1, 2021*. Concept credit: Adrian Hiel, *Energy Cities*. [CC-BY 3.0](https://creativecommons.org/licenses/by/3.0/)

Versions

- 4.1: Added Generators; renamed Off-Grid Vehicles as Non-Road Moving Machinery
- 4.1a: Standardised the Source line; Clarified Terms and Conditions of Use and add an approved-format credit
- 5.0: Significant update: promotions (3); demotions (7); wording changes (5); use cases combined (5 into 2); new or partially new use cases (4); entirely unchanged (18); changed wording or combined, but unchanged row (5). Read the [launch document](#) for details.

Source: Liebreich Associates

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