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Waste-to-energy-flexibility: HZI R&D perspective
What can waste bring to TMCES?

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Need for energy flexibility/storage
(evolution and qualitative understanding)

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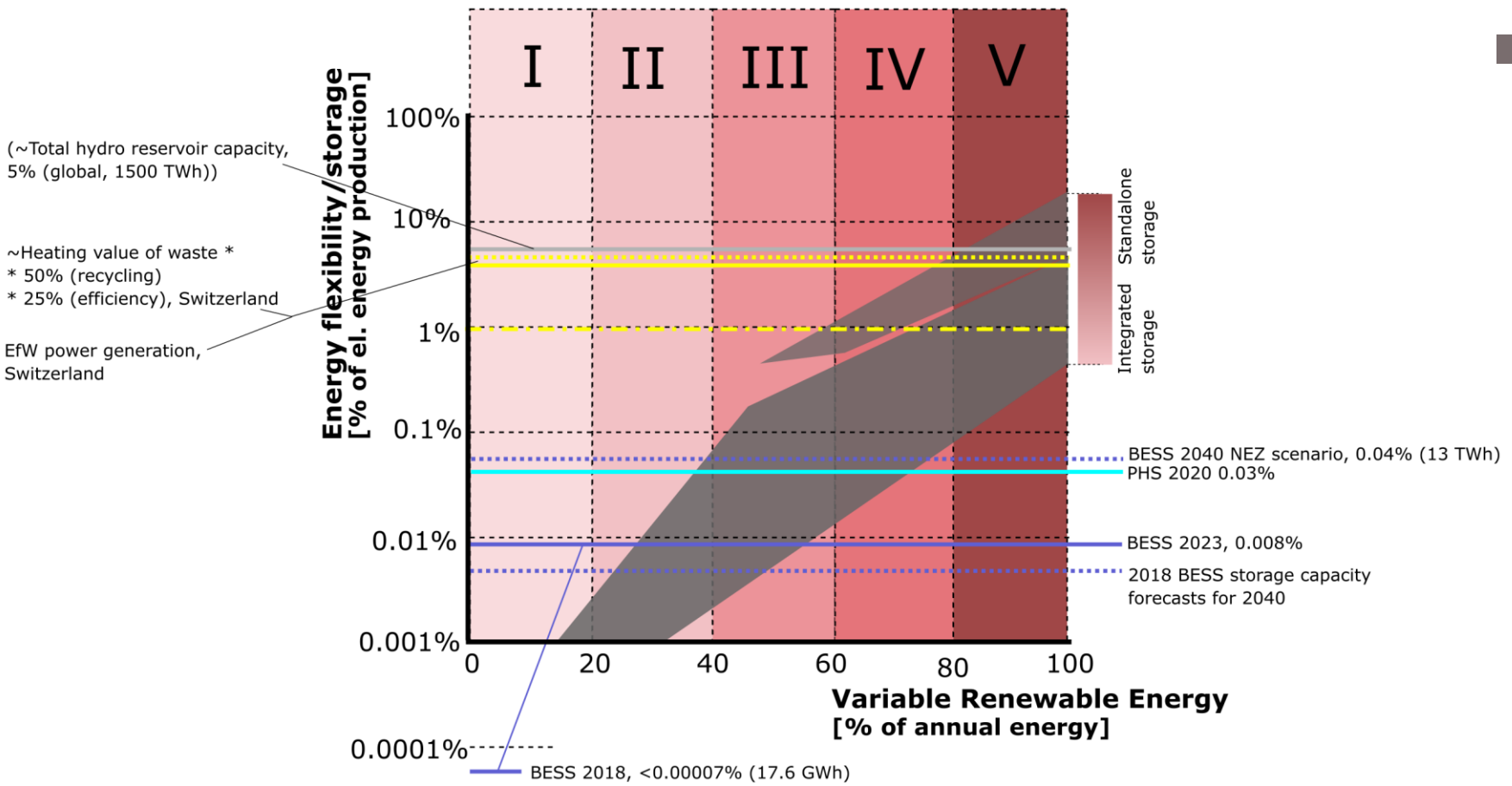

References:

- Entries processed from wide range of energy storage studies + own
- Inosuisse Greenhub consortium project
- IEA Bioenergy, Implementation of bioenergy in Switzerland – 2021 update

Waste-Energy Network
Observations

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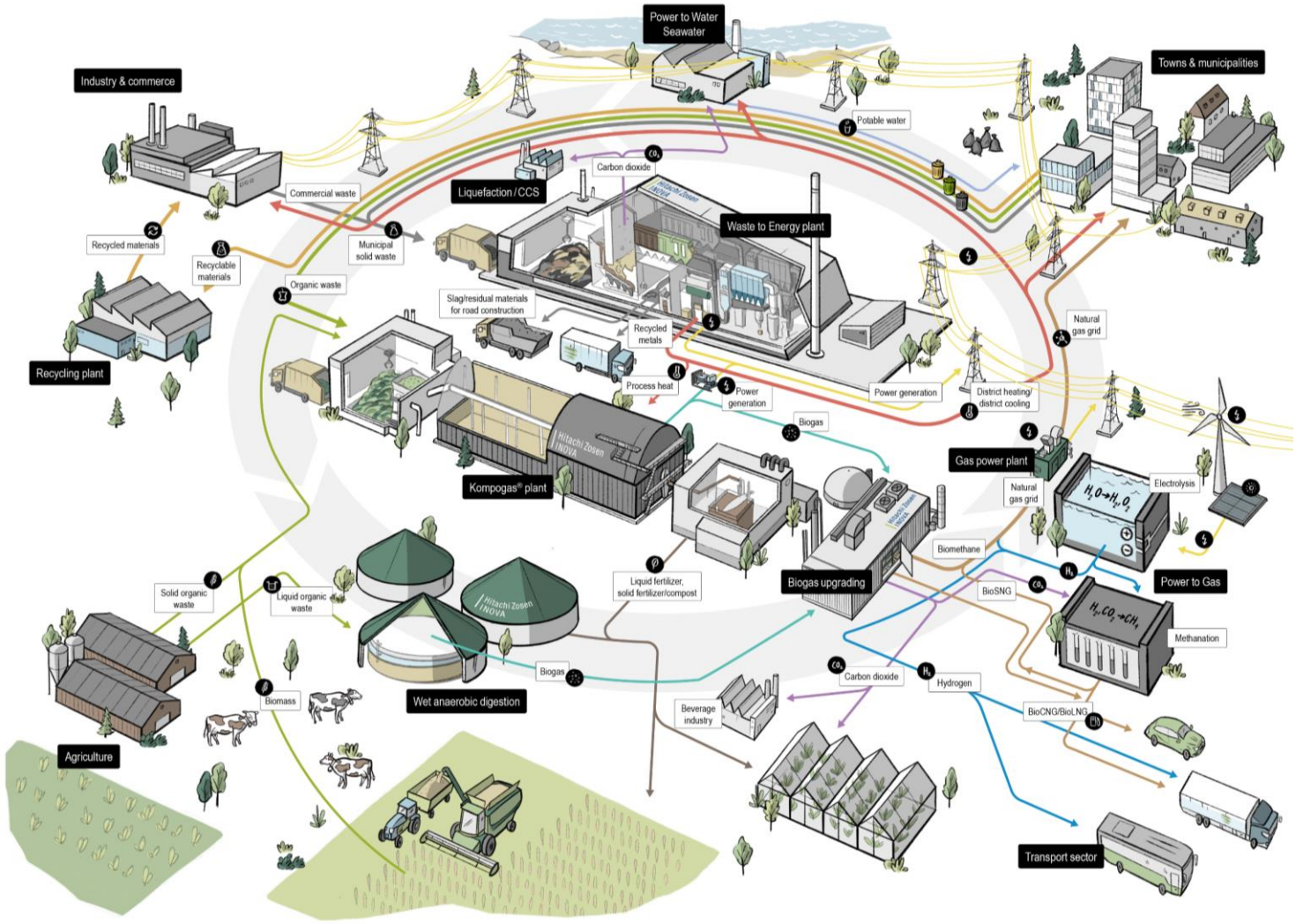

- **Waste treatment = primary function**
  - Large masses of extremely low specific value
  - 20% thermal, 65-75% energy efficiency
- **Carbon capture from energy from waste plants as C source**
  - EU: towards ETS; Switzerland: agreement 2030
  - CO_2 utilization vs storage
  - Heat integration and competition in winter
  - Solvents and permits
- **Waste-to-Energy Carriers**
  - CO_2 >> Power (H_2)
  - H_2 vs CH_4 vs (increasingly) MeOH, NH_4 vs high value

Examples of HZI activities
(besides conventional biogas, upgrading and similar)

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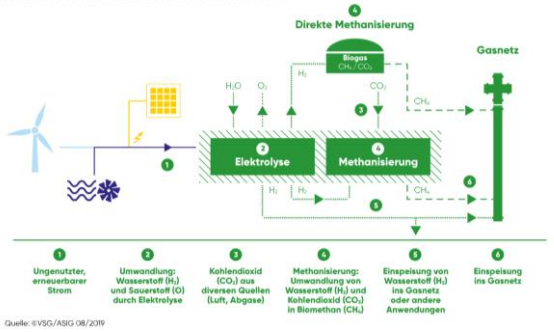
H_2 production integrated to energy from waste plant

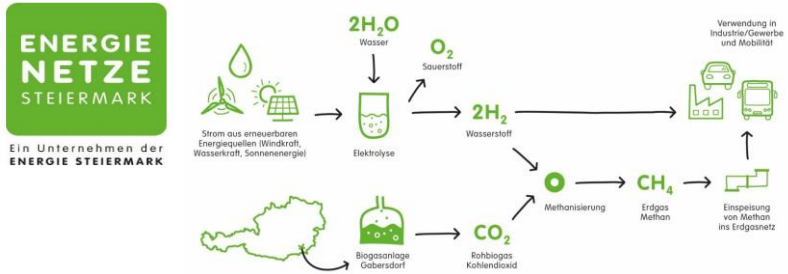
- Buchs, Switzerland
  - 550 Nm^3/h, 350 bar
  - Power directly coupled to energy from waste plant

Methanation

- Industrial Power-to-gas, Limeco, Dietikon, Switzerland
  - Direct biological methanation
  - EfW power to H_2 + CO_2 from sewage gas or similar sources



- CH_4, Energienetze Steinmark, Gabersdorf, Austria
  - Utilization of CO_2 from biogas upgrading



Carbon capture from energy from waste plants

- Projects, e.g.:
  - Switzerland: industry agreement by 2030
  - UK: links to HyNet and EastCoastCluster for Carbon capture
    - enfinium EfW plant (pilot+full scale)

- Variety of technology and CCU assessments

References: Public announcements HZI, KVA Buchs, Limeco, Energeienetze Steinmark, enfinium

Challenges in simulation of «Waste-to-Energy Flexibility»

HZI DSP4ROSE (Decision Support Platform for Resource Optimization and Sustainable Energy)

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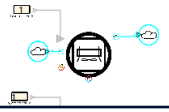
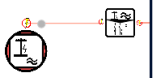
Heat/cold Utilities/uses



- **Very complex streams** (up to 80 components)

Logistics/so

Power grid i



ISO 14040 (vs. ostprocess)

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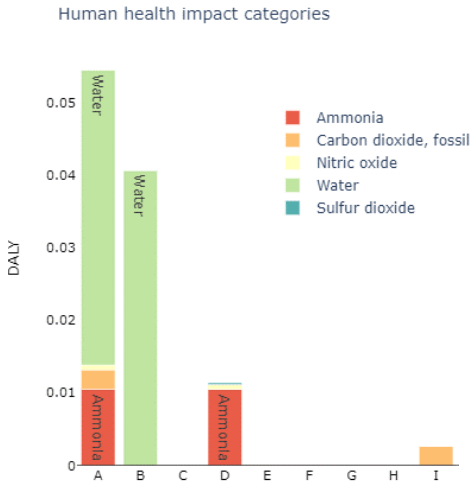
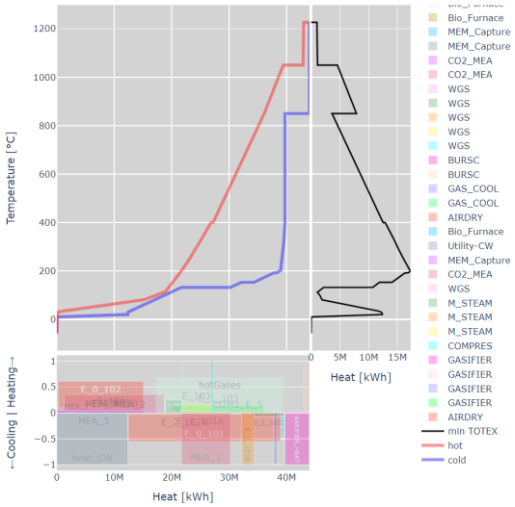
ion simulation

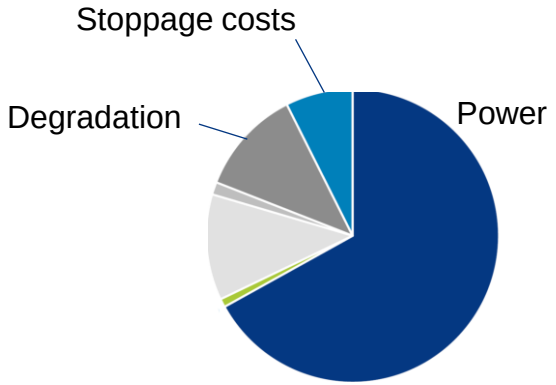
Life cycle impact analysis



Thermal integration



Operating costs



Credits HZI:
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