Workshop: Industrial Symbiosis and the Case Studies

FlexSNG

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A couple of discussion points…

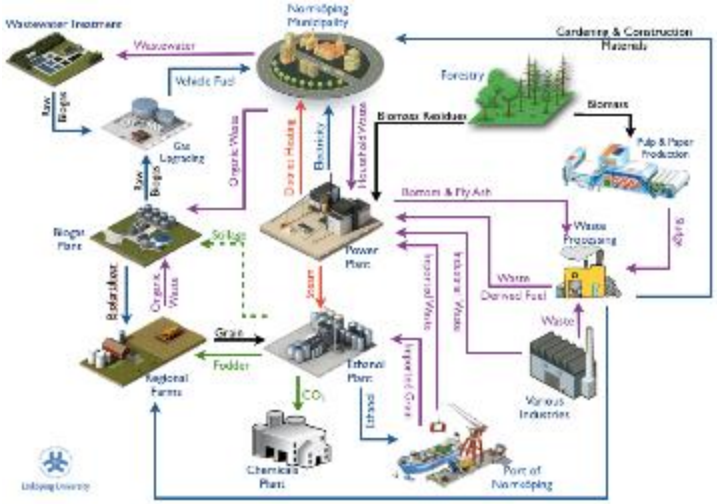
- ✓ **Industrial symbiosis** and its critical role in the economic viability of biofuel processes in general…
- ✓ Introduction to **Greenfield Global** and their business strategy – linkage to industrial symbiosis as a case study

Industrial symbiosis: Context

- ✓ The economic challenges of biofuel processes are well-known, and depend strongly on **feedstock price/quality** at the project scale, and **product price** (policy) - these are largely a function of site selection.

- ✓ **Biofuels is a commodity strategy:** The project developer can target a technology that has attractive economies-of-scale and minimum risk.
- ✓ **And address how the project "fits in" to its background – "industrial symbiosis" (IS).**

Industrial symbiosis: Definition – For our purposes

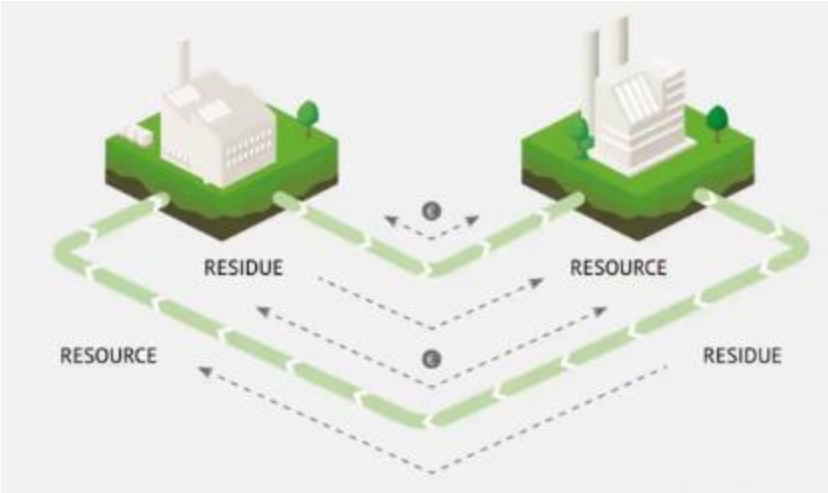


✓ *Industrial symbiosis identifies how a network of diverse organizations can foster eco-innovation and long-term culture change, create and share mutually profitable transactions—and improve business and technical processes.*

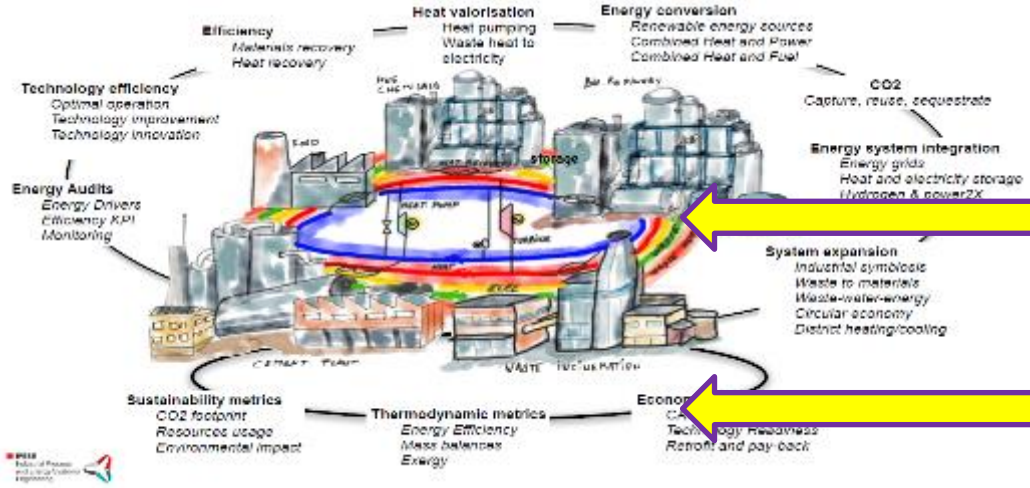
1. Industrial Symbiosis provides opportunities for facilities to **increase profitability and competitiveness** by reducing costs.
2. Industrial Symbiosis presents substantial **benefit to the environment** by reducing process energy, raw materials and waste.

Industrial symbiosis: Definition – 5 types (Chertow)

- ✓ **Type 1:** through waste exchanges
- ✓ **Type 2:** within a facility, firm, or organization
- ✓ **Type 3:** among firms co-located in an eco-industrial park
- ✓ **Type 4:** among local firms that are not colocated
- ✓ **Type 5:** among firms organized “virtually” across a broader region



Industrial symbiosis: Complexity



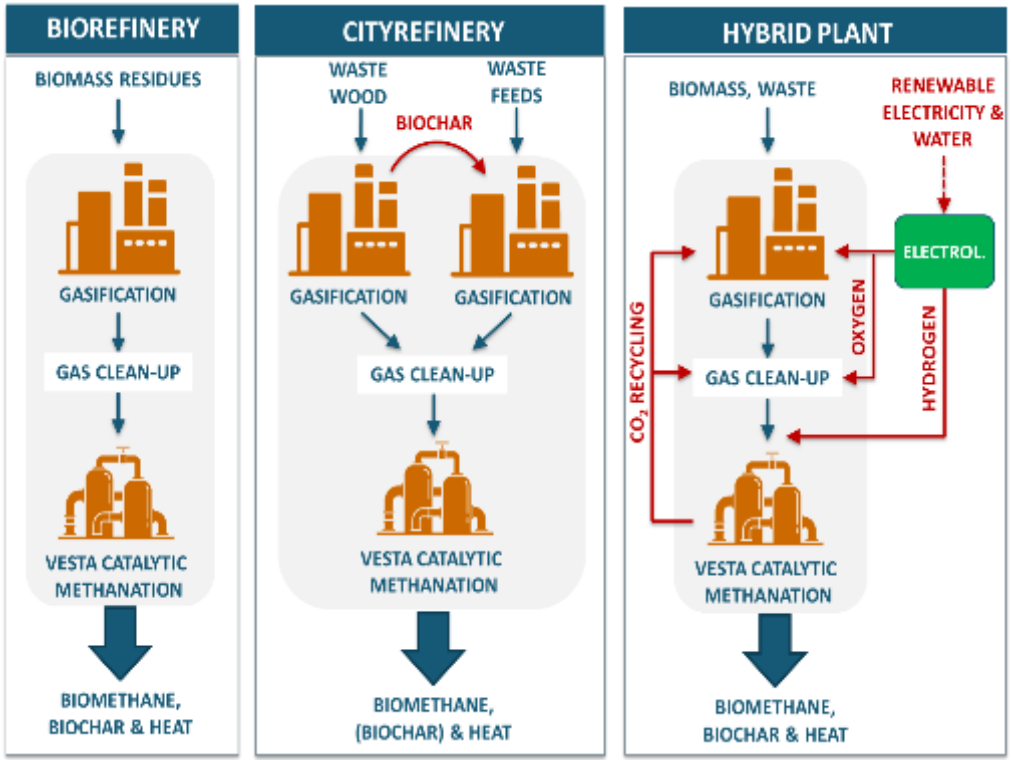
- ✓ Industrial parks are important, but IS goe… **t.**
- ✓ Nee… **per** con…

Industry facilities across sectors, including biorefinery

Analytics needed to identify and quantify potential for IS

- ✓ IS requires **systems analytics**, in which one seeks to optimize the total materials cycle, from virgin materials to finished material to component to product and to ultimate disposal.
- ✓ Factors to be optimized include **resources, energy, and capital**.

Biorefinery/cityrefinery/hybrid FlexSNG plant



The FlexSNG plant is being considered for a range of applications...

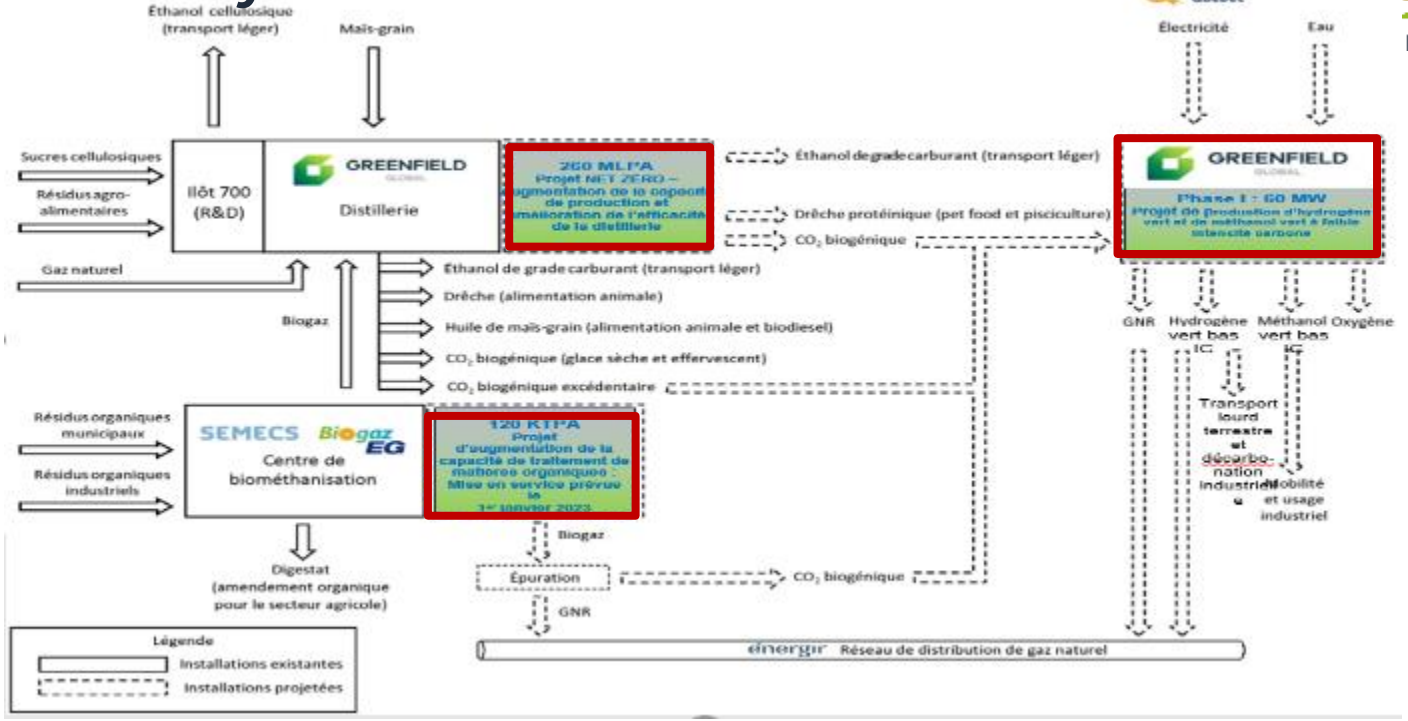
Each configuration will have its own potential for industrial symbiosis...

The Canadian Case Study: Greenfield Global – Varennes Site

FlexSNG

Greenfield Global is a leading producer and supplier of high-value, mission-critical raw materials, ingredients, and additives that are vital to businesses and integral to a lower-carbon economy.

The Canadian Case Study: Greenfield Global – Varennes Site



How might FlexSNG best fit into the existing Greenfield Global site?

How can we maximize industrial symbiosis opportunities, considering different future scenarios?

Thank you!

FlexSNG

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