# 3 distinct net zero energy systems are possible in Canada.

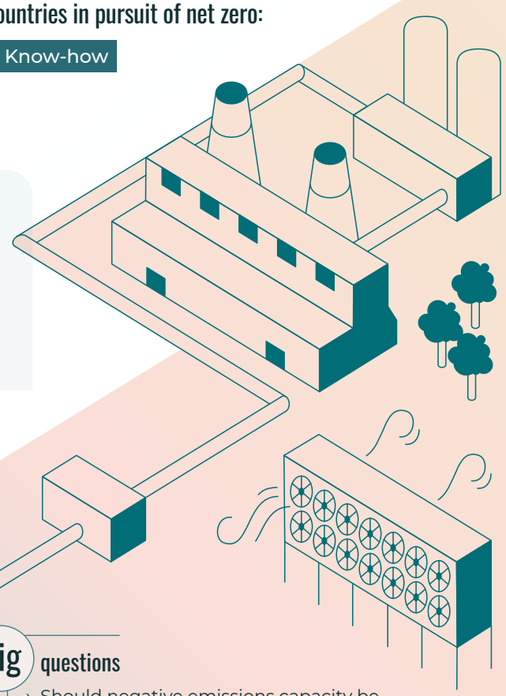
## One could eventually dominate, or a mix of systems could emerge.

### FACTORS affecting how our energy systems will evolve:

| Within Canada's control | Outside Canada's control |
|---|---|
| Domestic policy | Technology adoption abroad |
| Infrastructure | Global market trends |
| Land-use priorities | Global climate policy |
| Research, development and demonstration | Technological innovation |

### Canada has more ADVANTAGES than other countries in pursuit of net zero:

Resources | Land mass | Infrastructure | Know-how



SYSTEM 1

## Fossil fuels + negative emissions

**Fossil fuels continue to provide much of our energy**

**Emissions are offset by negative emissions solutions, requiring both engineered and nature-based solutions**

**Upsides**

- **Avoids need to replace** existing fossil fuel infrastructure
- **Less structural change** in the economy

**Downsides**

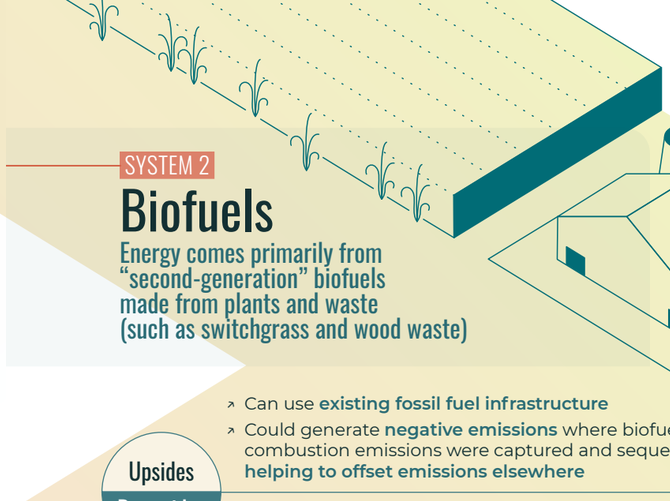
- Burning fossil fuels has **negative health and environmental consequences**
- May only **delay the transition** to another system (may need the negative emissions for other uses later)
- Avoiding structural change may mean **lost opportunities**

### Barriers

- Technology is only at **demonstration stage**, would need to prove cost-effective and scalable; other countries' investment in it is still uncertain
- Would require **a massive build out** of negative emissions facilities and infrastructure
- Would require development of **a large and complex** offset trading system
- Public sees solution as **risky**

### Big questions

- Should negative emissions capacity be reserved for the net negative emissions many global assessments say is necessary in the latter part of this century **to avoid severe climate change?**
- How should health impacts from air pollution in this system **affect Canada's choices?**



SYSTEM 2

## Biofuels

**Energy comes primarily from "second-generation" biofuels made from plants and waste (such as switchgrass and wood waste)**

**Upsides**

- Can use **existing fossil fuel infrastructure**
- Could generate **negative emissions** where biofuel combustion emissions were captured and sequestered, **helping to offset emissions elsewhere**

**Downsides**

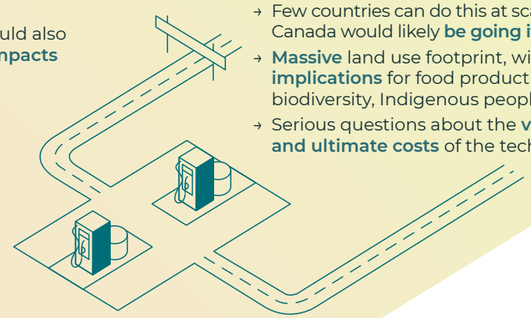
- **Social equity and justice challenges** associated with the large land-use footprint
- Land conversion requirements would also have **significant environmental impacts**

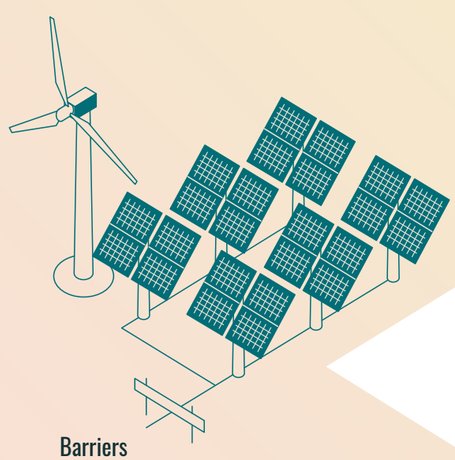
### Big questions

- What are the implications of Canada going it **more alone** with this system?
- How should this system's **land-use footprint** affect Canada's choices?

### Barriers

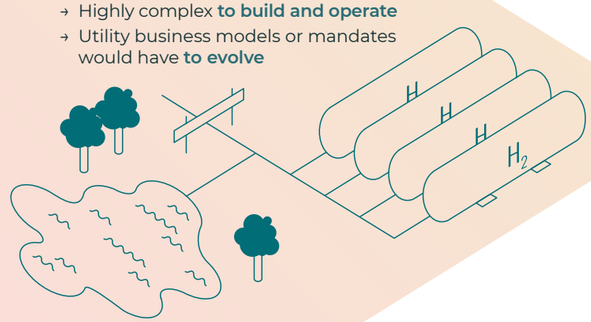
- Few countries can do this at scale, so Canada would likely **be going it alone**
- **Massive** land use footprint, with **implications** for food production, biodiversity, Indigenous peoples
- Serious questions about the **viability and ultimate costs** of the technologies





### Barriers

- Highly complex **to build and operate**
- Utility business models or mandates would have **to evolve**




SYSTEM 3

## Electrification + hydrogen

**Emissions-free electricity is the dominant form of energy, with hydrogen used in areas that are difficult to run on electricity**

**Upsides**

- **Lower air pollution** than in other systems
- **Potential export opportunities**, as this will be the type of net zero energy system most commonly adopted abroad

**Downsides**

- **Big departure** from the status quo
- Some types of electricity generation and transmission infrastructure may be **more vulnerable** to effects of climate change

### Big questions

- What implications does **the logistical complexity** of realizing this system have?
- What could **affect Canada's ability** to compete globally for export opportunities?