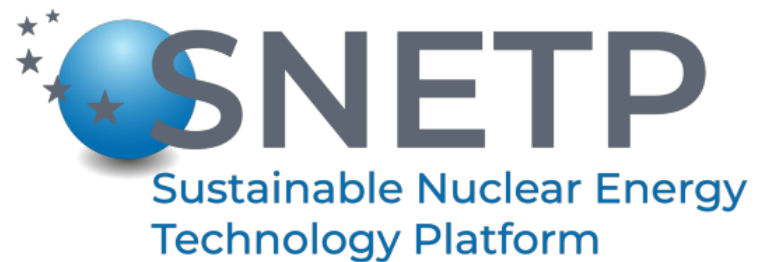




Canadian Nuclear Laboratories (CNL)

Nuclear Powered Carbon Capture for Industry

Ted Moryto – Director Business Development
Canadian Nuclear Laboratories 2021 January



Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

UNRESTRICTED / ILLIMITÉ

-1-

CLIMATE URGENCY

‘Lepsi vrabec v hrsti nez holub na strese’ – Czech

(A sparrow in the fist is better than a pigeon on the roof).

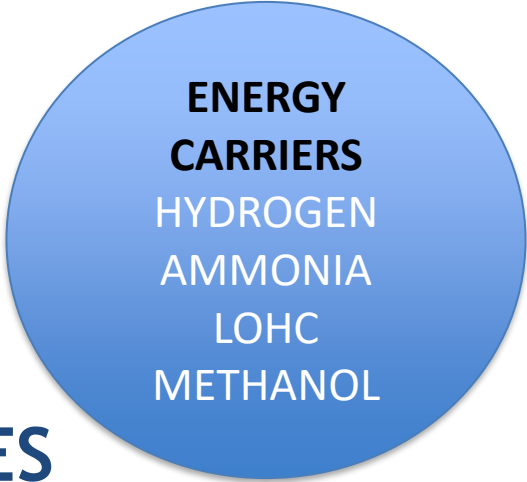
A bird in the hand is worth two in the bush

Carbon Capture and Utilization can reduce CO2 emissions by 50%



SOURCE OF LOW CARBON ENERGY

- PV Solar
- Wind
- Concentrated Solar
- GeoThermal
- Nuclear
- HydroKinetics
- BioMass



**ENERGY
CARRIERS**
HYDROGEN
AMMONIA
LOHC
METHANOL

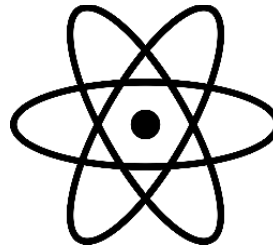
CARBON REDUCTION ALTERNATIVES

- Source Capture
- DAC Direct Air Capture
- Sequestration
- Utilization



REDUCING CO2 EMISSIONS IN INDUSTRY

- REPLACE FOSSIL FUELS WITH LOW CARBON ENERGY (DUH!)
- Hydrogen is not an energy source but it does burn hot!



- **WHAT'S LEFT – A LOT!**
- **CEMENT, STEEL AND STEAM METHANE REFORMING (AGRI, O&G)**
- **- 50% CO2 EMISSIONS REMAIN AFTER REPLACING FOSSIL FUEL DERIVED ENERGY**



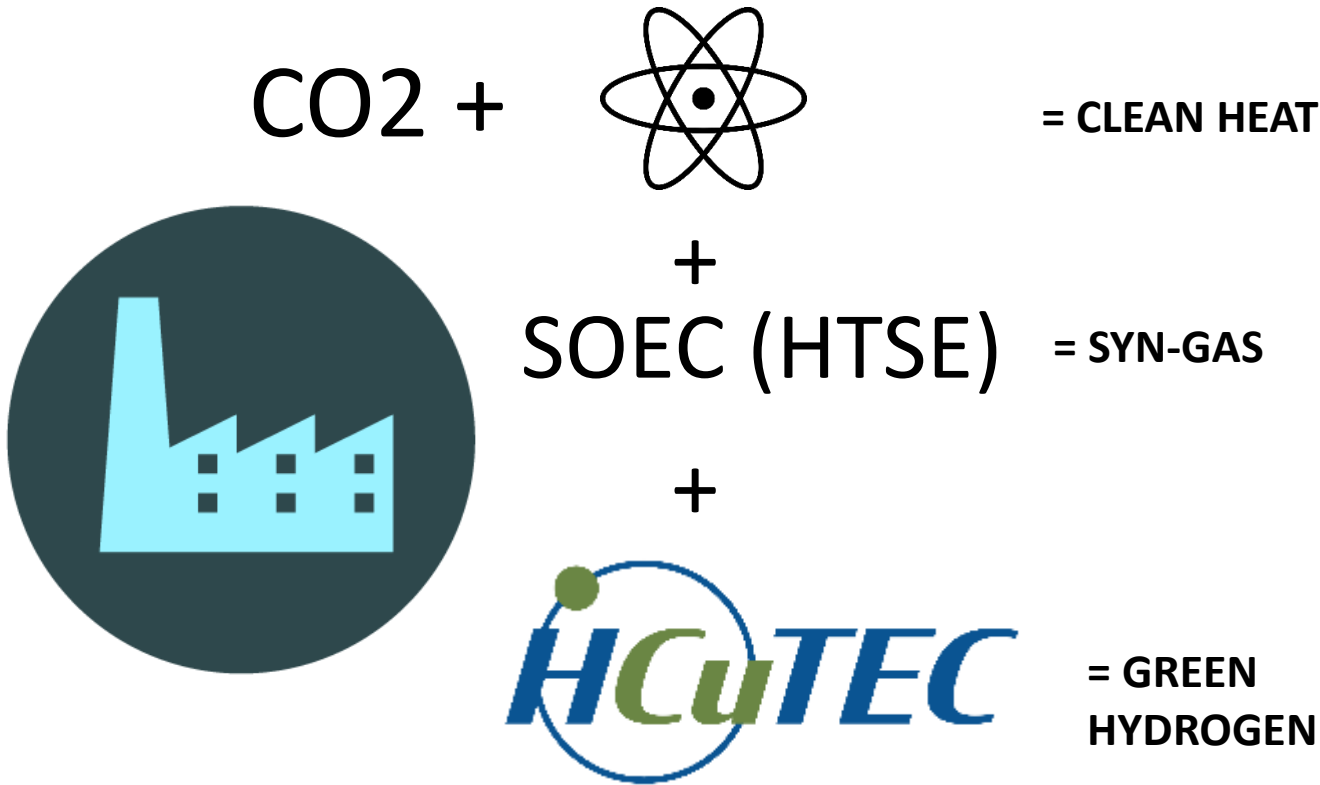
NEW PROCESSES VS EXISTING INFRASTRUCTURE

- **\$TRILLIONS IN EXISTING ASSETS WITH LONG LIFESPANS (40+ YEARS)**
- **DECADES OF EVOLUTION**
 - **COST REDUCTION AND ENERGY EFFICIENCY**
- **HIGHLY INTEGRATED SYSTEMS**

A sparrow in the fist is better than a pigeon on the roof



NEW PROCESSES VS EXISTING INFRASTRUCTURE



SYN-FUELS

Fischer-Tropsche

Kerosene (Jet Fuel)

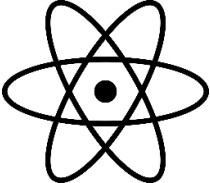
Methanol

Synthetic diesel

Stable materials



ASSET UTILIZATION

CO₂ +  = CLEAN HEAT



+
SOEC (HTSE) = GREEN
= SYN-GAS
HYDROGEN

+



= GREEN
HYDROGEN

SYN-FUELS

Fischer-Tropsche

Kerosene (Jet Fuel)

Methanol

Synthetic diesel

Stable materials



TIME IS OF THE ESSENCE

- Transition Fuels
- High Temp Reactors – 10 to 20 years out
- Bio Mass? And Grid based renewables
- Carbon Capture – available now!
- Green Hydrogen, SOEC technology 1-5 years
- Ready for Nuclear



Thank You!

QUESTIONS?

