Hydrogen Naturally Inc.

Carbon Negative Bright Green™ Hydrogen from the Air

IEA Workshop - April 19, 2023

Our aim:
Help reach net zero fast enough to make a difference

Our plan: Natural Air Capture (NAC) with CCS

Large scale removal of CO_2 from the air – 0.75 Gigatonnes

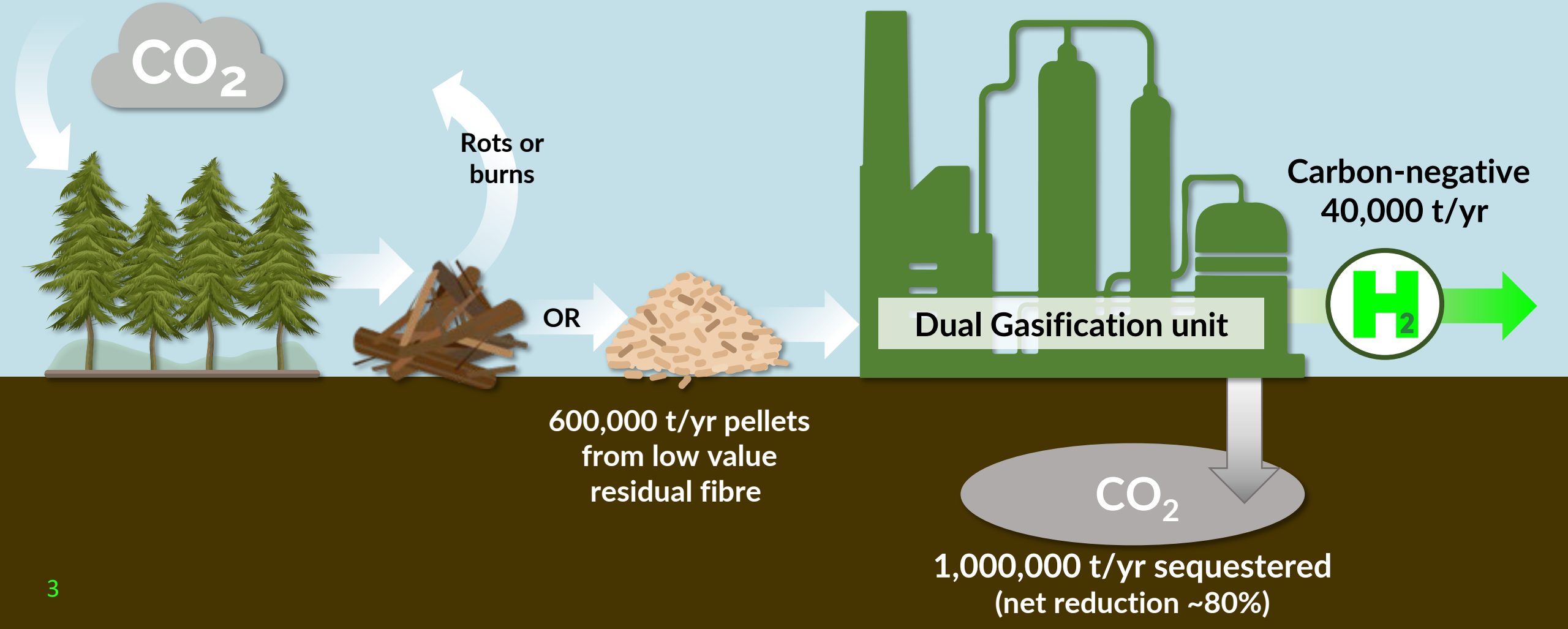
Negative emission fuel production

3 foundational principles:

1. Adapt known scalable technologies in a new way to address climate change
2. Complete solution: don't rely on others for critical pieces
3. Buildable, operable, financeable

H2N/NAC dual benefits

- Complete the **NAC** process: avoid CO_2 returning to atmosphere: capture & sequester it
- And supply **-150 gCO_2e/MJ** fuel for additional decarbonization



Proven track record of founders

PEAK RENEWABLES

Developer of renewable biomass projects, mills, pellets, etc.

NORTH WEST CAPITAL PARTNERS INC.

World leading developer and leading CCS credentials

North West Capital Partners: brought CCS to Alberta

Weyburn – *early CCS*

- Early partner in Weyburn sequestration project
- Injects 5,000 tonnes per day of CO_2

Sturgeon Refinery – *pioneering blue H_2 in heavy oil*

- Designed from conception with integrated CO_2 capture
- World's largest blue hydrogen plant
- Gasification unit optimized by current H2N team

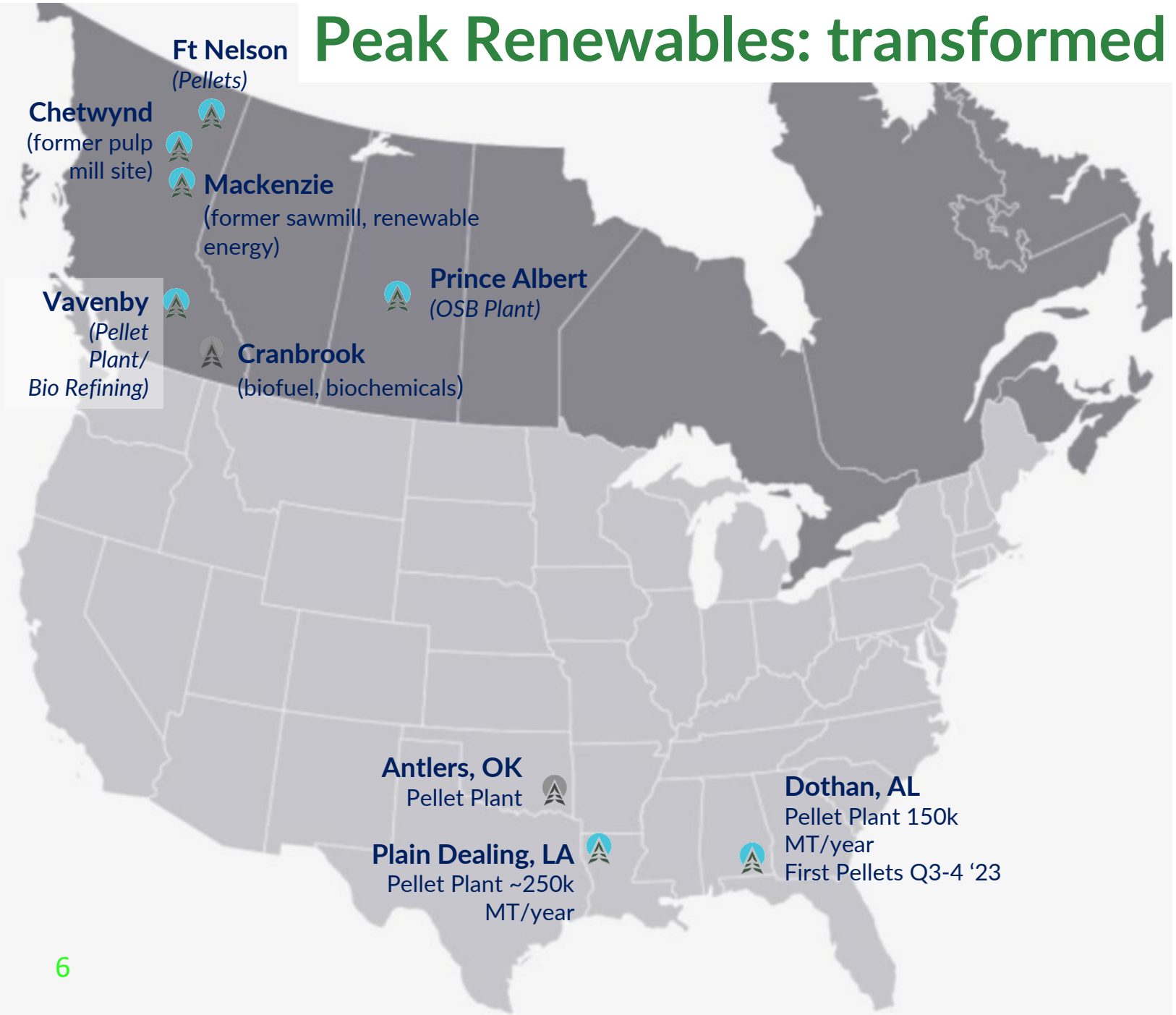
Alberta Carbon Trunk Line – *first to move CO_2 at scale*

- Conceived and incubated
- World's largest operational dedicated CCS pipeline, **15 million tonnes annual CO_2 capacity**

Qube – *first to scale AI based emission detection*

- Leading continuous methane emissions monitoring technology
- >250,000 tonnes CO_2e per year emissions abated

Peak Renewables: transformed forestry in N. America



- **Under BID Group, constructed 75% of the automated sawmills across N. America**
- **Converted the lumber processing industry from analog to digital**
- **Now building large scale mills to utilize low value fibre**
  - Combined 750 Kt/yr of pellet mill development underway – largest developer in N. America
  - 650 MMsf OSB plant in FID
  - Additional pellet plants in US South in development stages

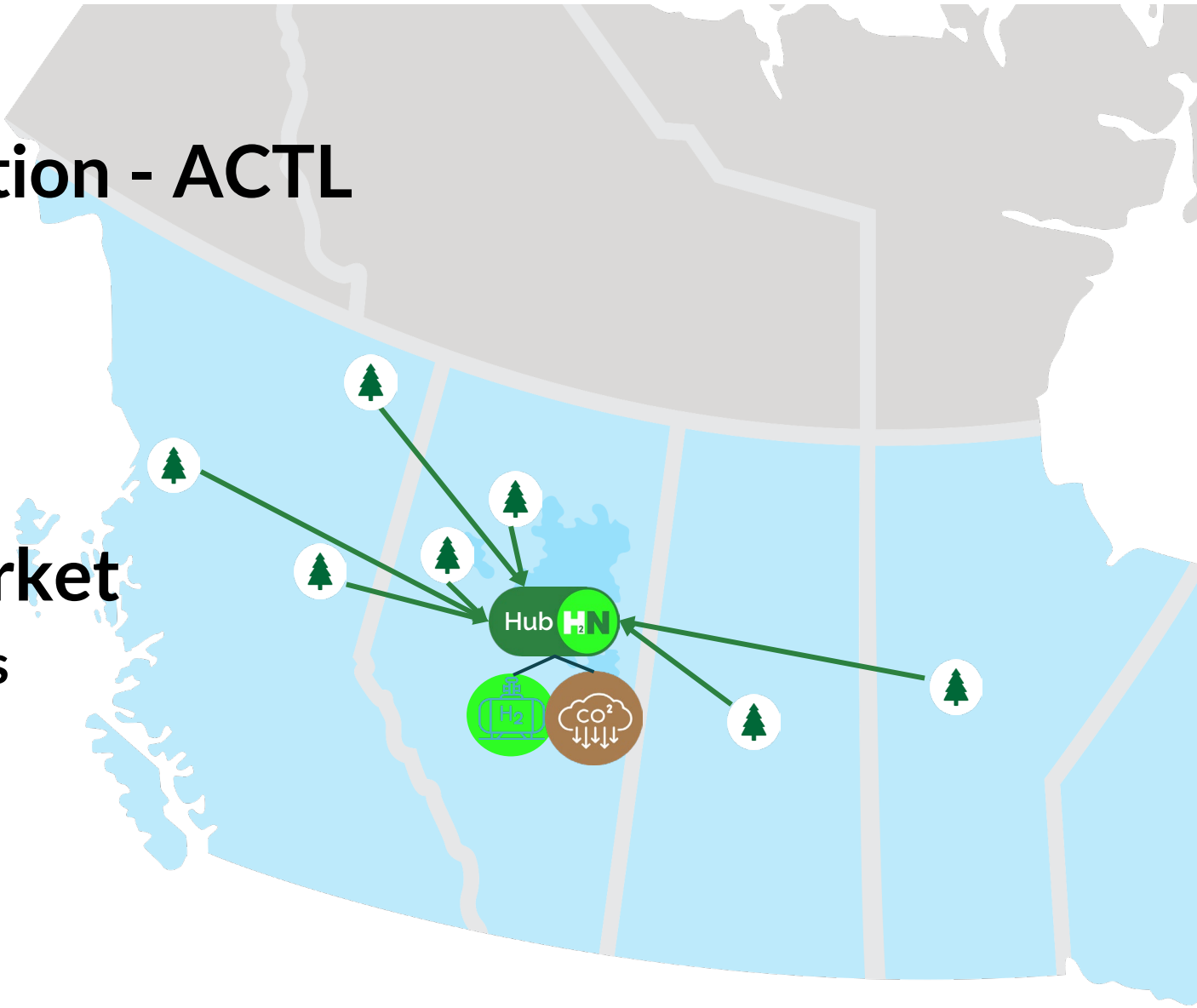
Legend:

Existing site/ active projects

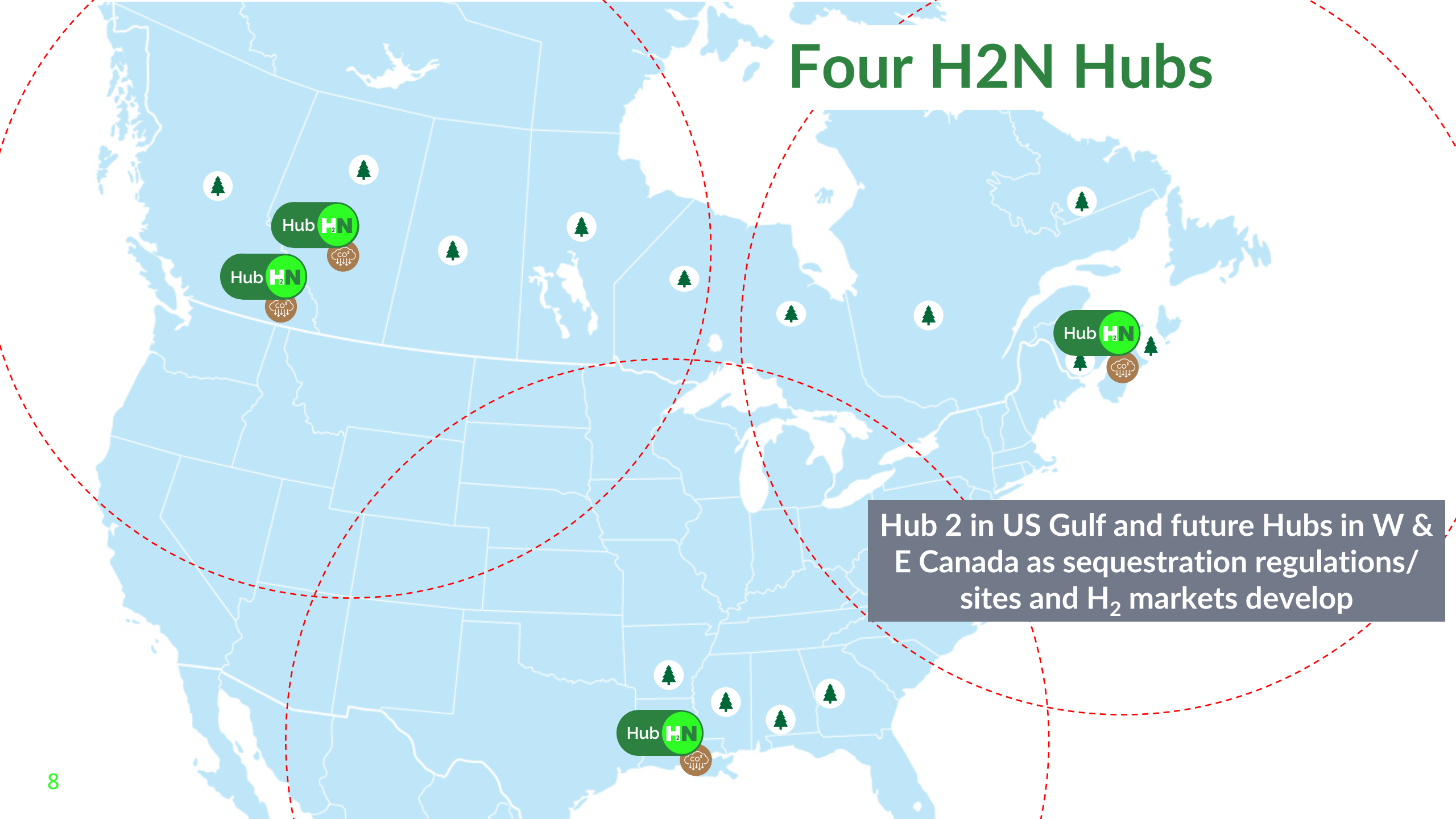
Potential future site/ project

Hub 1: Alberta's Industrial Heartland

- Operational CO_2 sequestration - ACTL
- Efficient rail fibre transport
- Large Bright Green™ H_2 market
  - Values carbon negative attributes



Four H2N Hubs



Hub 2 in US Gulf and future Hubs in W & E Canada as sequestration regulations/ sites and H_2 markets develop

H2N in Alberta's Industrial Heartland

World's first:

- Natural Air Capture 4-unit Hub with 4,000,000 tonnes of CO_2 stored/year
- 160,000 tonnes/year of carbon-negative Bright Green™ hydrogen
- Site selection underway Q2 2023

Project execution strategy

1. Complete detailed engineering before manufacturing

2. Manufacturing and installation

   not modularization and construction

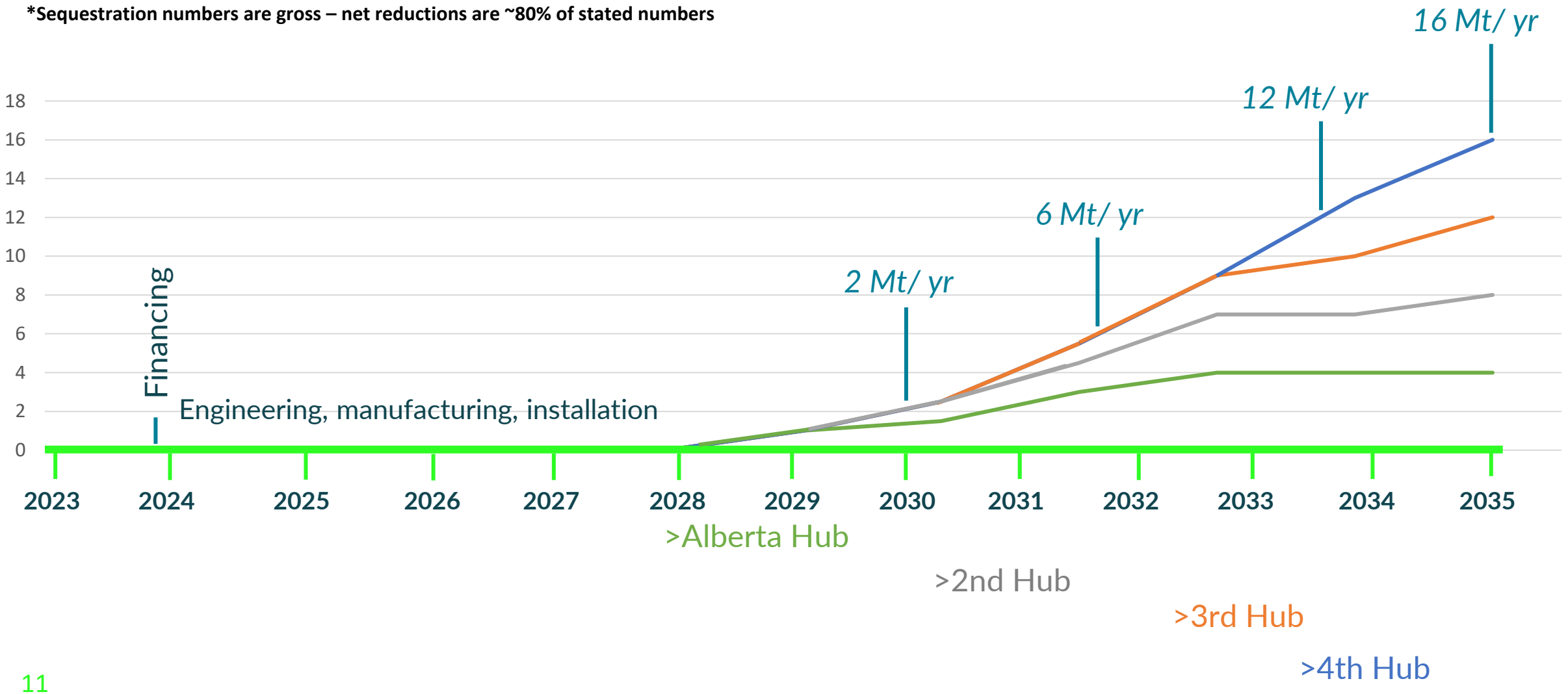
3. 2 x 1 configuration for economies of scale & reliability

4. Reduce costs through replication

5. Time expansion to match fibre supplies

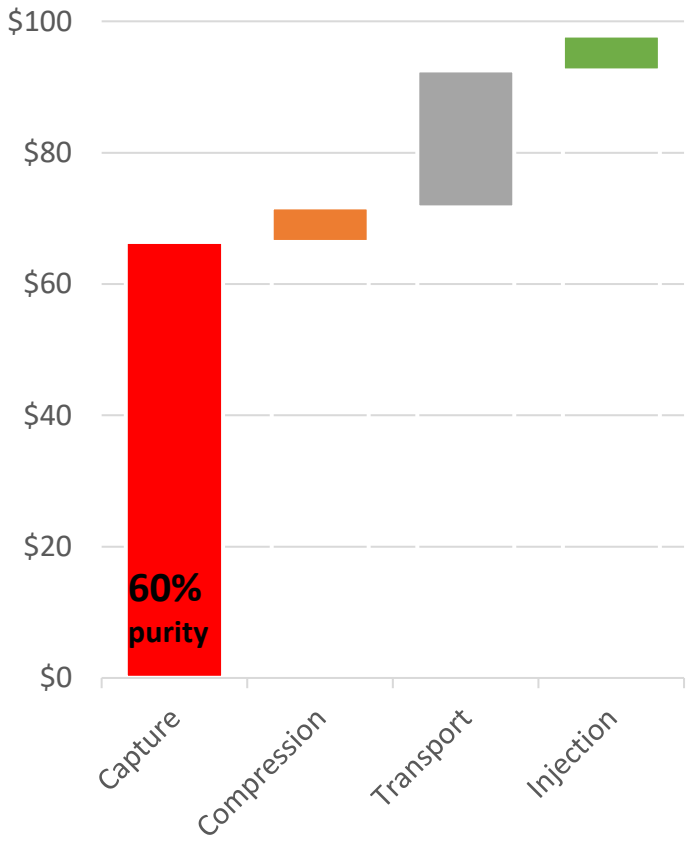
Sequestration CO_2 at scale

***Sequestration numbers are gross – net reductions are ~80% of stated numbers**

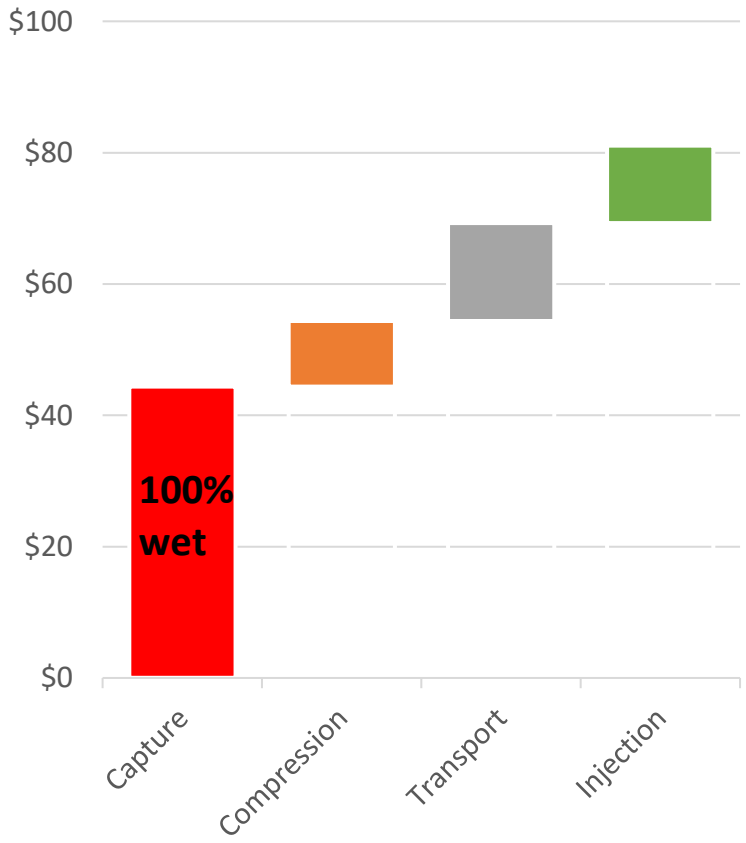


CCS: cost is all about CO_2 concentration

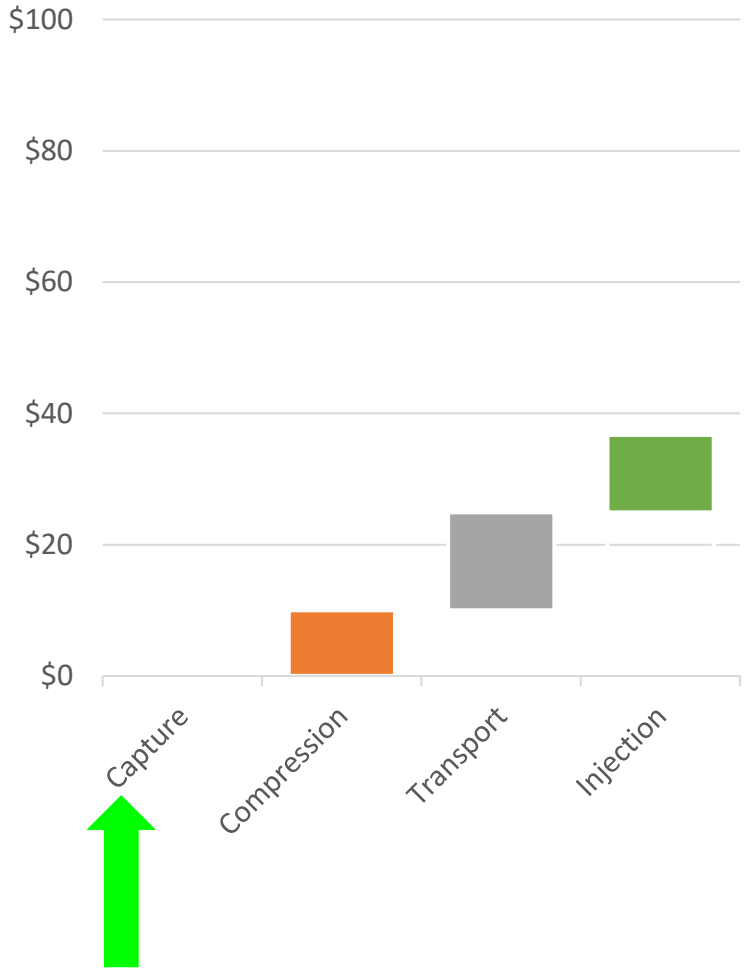
Shell Quest (2020) ($/tonne)



Nutrien ACTL (2020) ($/tonne)



H2N ($/tonne)

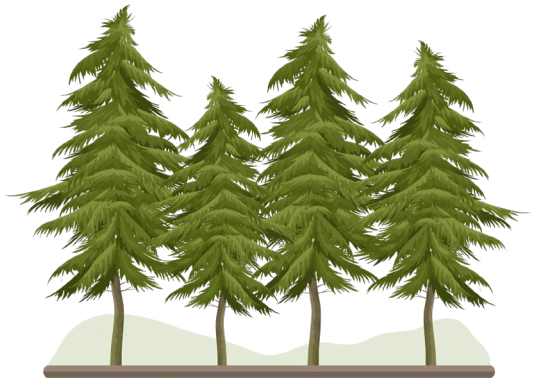


- Capture starts with concentrating CO_2
  - Most technologically difficult to solve, unproven at scale
  - Drives the real $/tonne cost of CCS using air capture

Biomass has solved this

Canada's vast carbon capture resource

60M tonnes/yr of CO_2 return to atmosphere



40M tonnes/yr of CO_2 return to atmosphere

CO_2

CO_2

Lumber

75M m^3/yr

Sawmill Residuals

75M m^3/yr

Low Value Residuals

50M m^3/yr

Pulp or combustion

Burnt or rots

A new market for residual fibre

New residual fibre market based on CO_2 sequestration with forestry, climate and energy benefits:

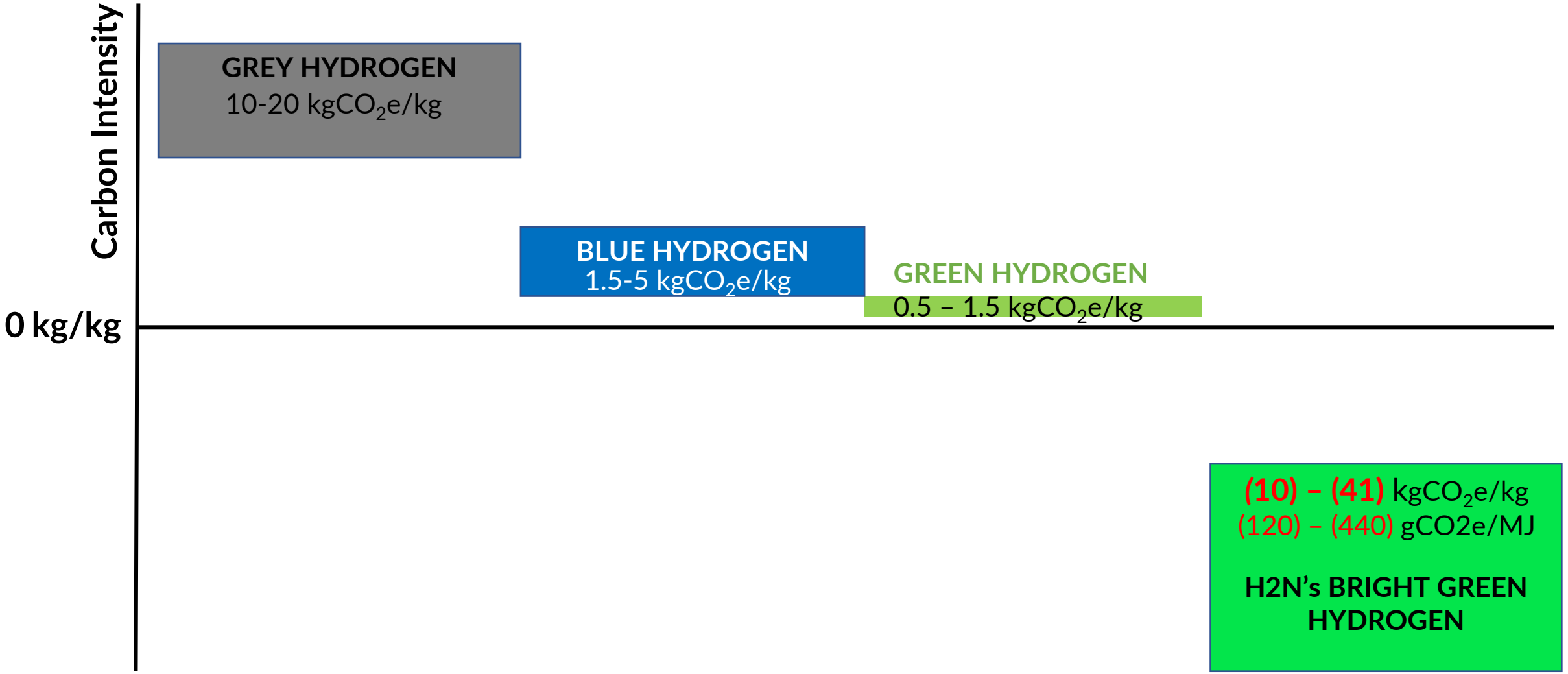
- **Supports primary forest economics and management**
  - Underpins lumber production
  - Utilize far greater percentage of the fibre than traditional industry model
  - Low value, waste and land-locked fibre becomes economic

- **Significantly increases the carbon benefits over pellet combustion, and keeps the climate benefits in Canada**
  - Pellets to Europe for power = +2tCO_2e/t vs pellets used in H2N process = -1.5tCO_2e/t
  - Avoids slash pile emissions AND displaces fossil fuel emissions

- **Durable forestry jobs across the country for Indigenous and rural communities**

Carbon negative is critical to actually reach net zero

Negative emission bright green™ hydrogen



Source: The Potential Role of Biohydrogen in Creating a Net-Zero World: The Production and Applications of Carbon-Negative Hydrogen and H2N 's own LCA analysis

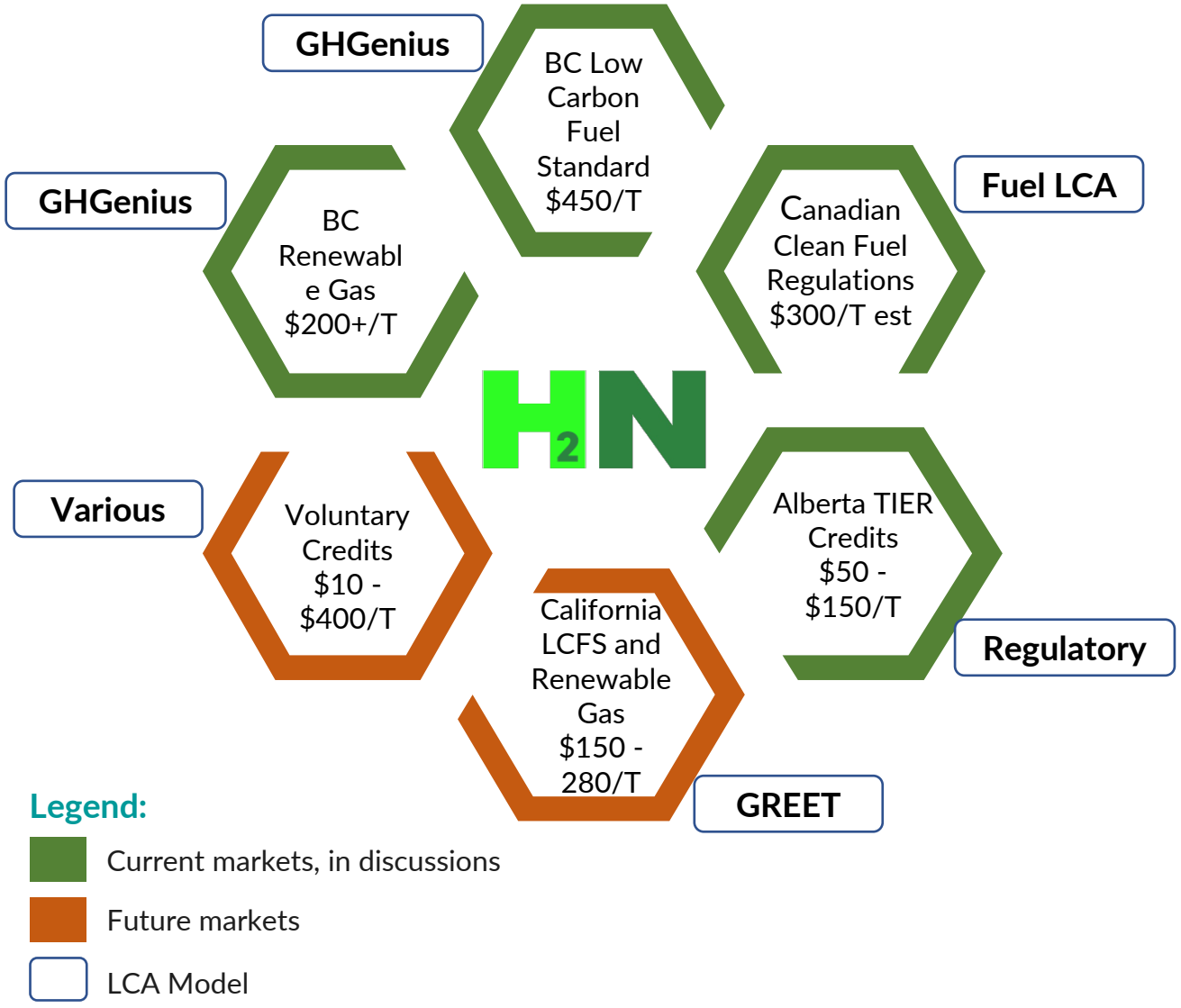
It isn’t easy being first

- Hydrogen from gasification isn’t new
- Biomass predates gasification
- The two have not been scaled together at the gigatonne level
- There will be solvable problems, the right team and resources are needed
- Reliability and optimization issues expected once operating at scale

H2N Scale Up Focus Areas

- **Feed Delivery Systems:**
  - Evaluating optimum delivery systems into the gasifier
- **Tar Destruction & Conversion**
- **Bed material & additive selection**
- **Shift Catalyst selection & protection**
  - Focus on testing syngas for impurities and breakthrough for different feedstocks
- **Heat Integration & Recovery**
- **Wastewater treatment and Recycling**
  - Testing of wastewater and design for maximum recycle and re-use

Embryonic carbon markets leads to uncertainty



- Carbon credits are based on the volume of carbon sequestered
- The exact amount of carbon considered to have been sequestered and number of credits generated varies in different systems
- Credits can be monetized via the CO_2 sequestration or attached to the hydrogen fuel
- Uncertainty on regulatory and voluntary carbon markets/ pricing creates risk

- *Exploring Contracts for Differences (carbon pricing and hydrogen demand/ pricing) through Canada Growth Fund*

Unit 2's stand on their own, Unit 1's need the right treatment for biomass

Sub $200/tonne CO_2 is achievable beyond unit 1 – opens access to multiple carbon markets using H_2 path

Unit 1 capital hurtle is managed by the right treatment by government for biomass projects with H_2 production

In Canada:

1. **Investment Tax Credit CCUS** - cannot have a marketable co-product (hydrogen)

   H2N Advocating for:
   - Confirming return to atmosphere of biogenic carbon qualifies
   - Requesting Natural Air Capture treated same as DAC
   - Eligibility for co-products if bio-based

2. **Clean Hydrogen Investment Tax Credit** - only electrolysis or natural gas + CCS qualifies

   Advocating for:
   - Inclusion of biomass-to-hydrogen pathway
   - 60% TIER (equivalent to DAC) for negative emissions hydrogen

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Thank you IEA for the opportunity to present

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