Low Carbon Utility

Jason Lankford, Dow Energy Technology Center Director

September-2020

DOW CONFIDENTIAL - Do not share without permission

MATERIALS SCIENCE SOLUTIONS TO SUSTAINABLY ADDRESS GLOBAL NEEDS

SUSTAINABILITY

1/3 of all food produced is wasted before consumed

50% of the growth in consumer packaged goods between 2013-2018 came from sustainability-marketed products

MIDDLE CLASS GROWTH

Global middle class is expected to reach

5.5 BILLION

by 2030

DIGITAL TRANSFORMATION

Worldwide spending on digital transformation will reach

$2.3 TRILLION

by 2023

URBANIZATION

2/3 of the world's population is expected to live in urban areas by 2050

Channeling Dow's materials science expertise as we collaborate and innovate with customers and partners to create solutions that positively impact the world

Packaging | **Infrastructure** | **Consumer**

2019 NET SALES	EMPLOYEES	MANUFACTURING SITES	GLOBAL REACH
$43B	**~36,500**	**109 sites**	**31 countries** in which Dow manufactures products

DOW CONFIDENTIAL - Do not share without permission

FROM BIG TO BREAKTHROUGH

DOW'S NEW SUSTAINABILITY TARGETS

PROTECT THE CLIMATE: By 2030, Dow will reduce its net annual carbon emissions by 5 million metric tons versus its 2020 baseline (15% reduction). By 2050, Dow intends to be carbon neutral (Scopes 1+2+3 plus product benefits).

Dow's Action Plan to Achieve Carbon Neutrality by 2050

Dow's "protect the climate" targets reflect our commitment to accelerate our work with our suppliers, customers and value chain partners to ensure Dow's ecosystem is carbon neutral by 2050.

Ensuring our products are more sustainable than alternatives

- Dow products have an estimated 4:1 greenhouse gas emission benefit – continue to **build this advantage**
- Ensure we are the **top choice** for brand owners and customers to advance the sustainability of their products

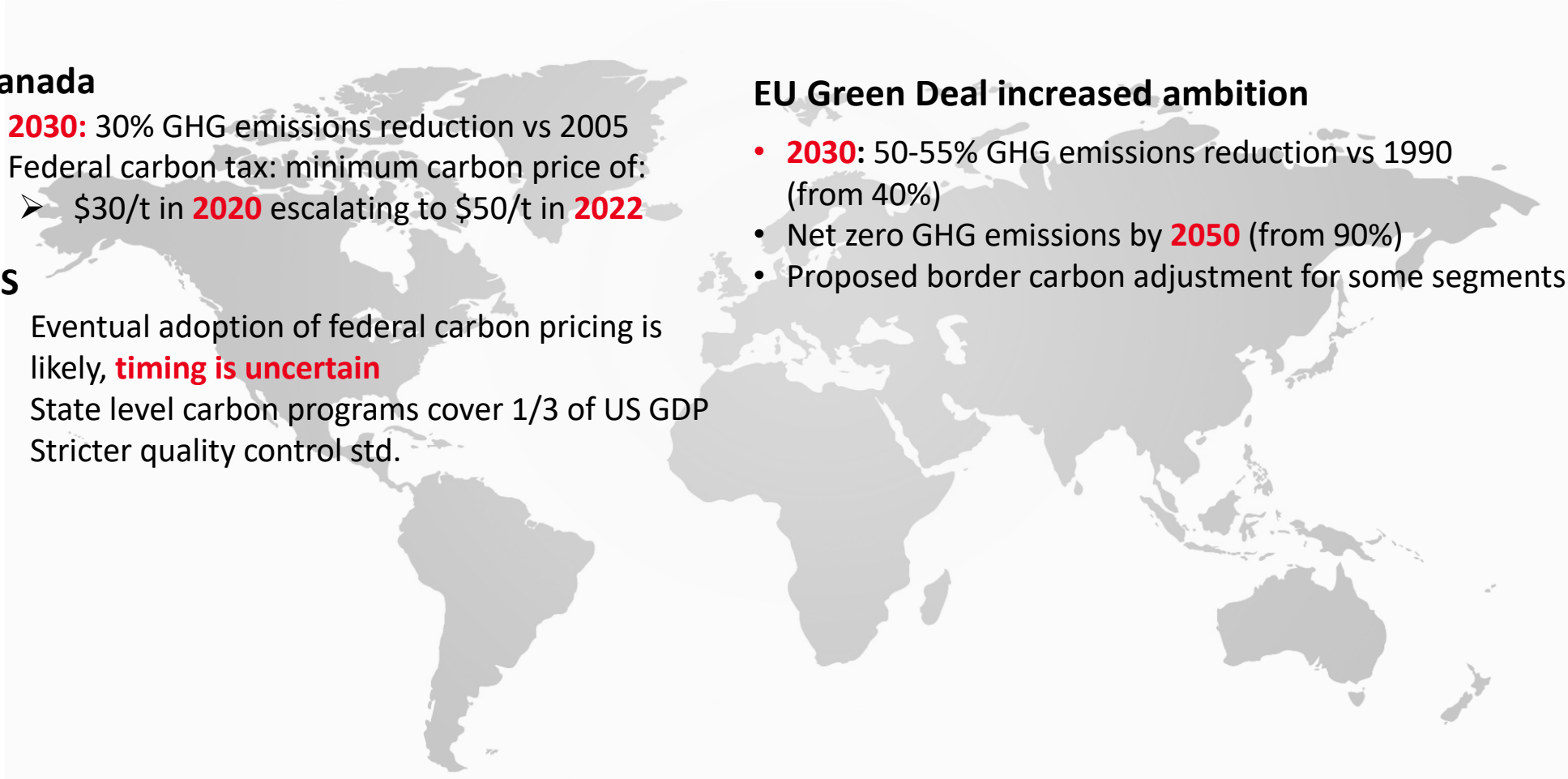
Advancing the efficiency of our manufacturing operations

- **Optimizing current manufacturing assets** – to make meaningful progress.
- **Implementing transitional technologies** – to meet increasing regulations and customer needs
- **Innovating next-generation technologies** – for emission-free manufacturing

Collaborating with external stakeholders to incentivize low carbon innovation

- **Convene stakeholders** to develop a carbon accounting system that acknowledges the role of products that contribute to a low-carbon economy
- **Engage** with customers, brand owners, policy makers and the investment community to advance policies and technology that address climate change

EMISSIONS REGULATIONS TIGHTENING



Canada

- **2030:** 30% GHG emissions reduction vs 2005
- Federal carbon tax: minimum carbon price of:
  - $30/t in **2020** escalating to $50/t in **2022**

US

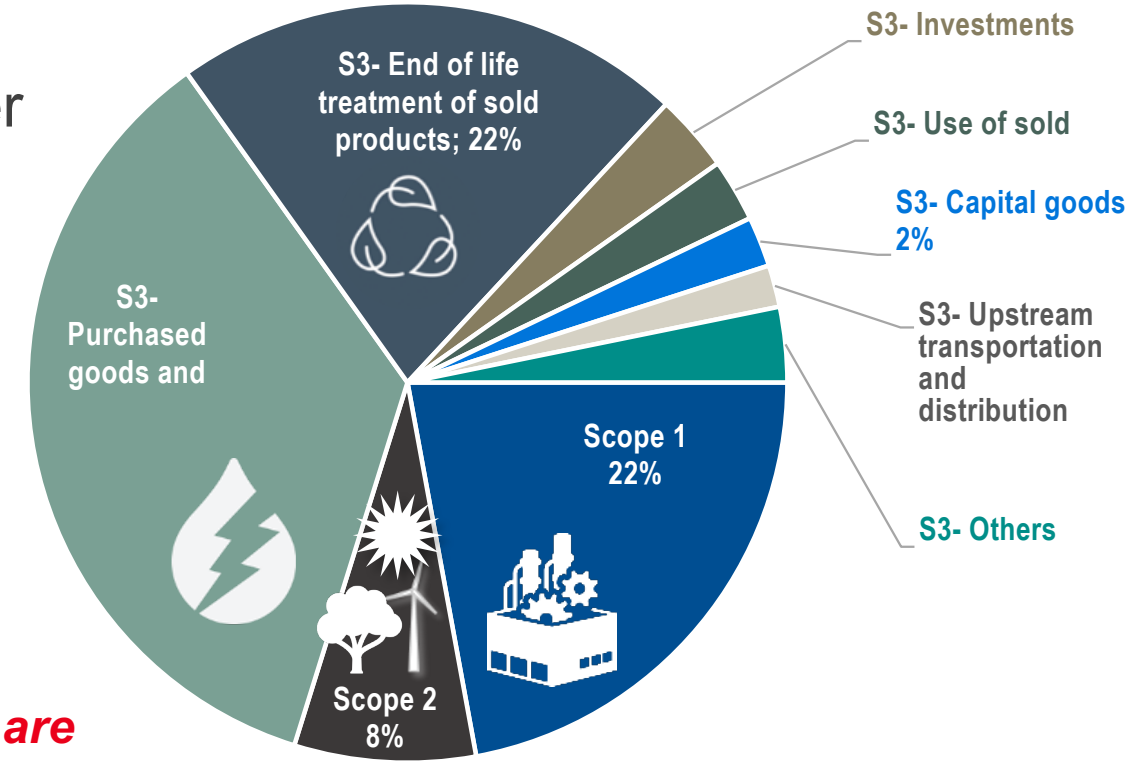
- Eventual adoption of federal carbon pricing is likely, **timing is uncertain**
- State level carbon programs cover 1/3 of US GDP
- Stricter quality control std.

EU Green Deal increased ambition

- **2030:** 50-55% GHG emissions reduction vs 1990 (from 40%)
- Net zero GHG emissions by **2050** (from 90%)
- Proposed border carbon adjustment for some segments

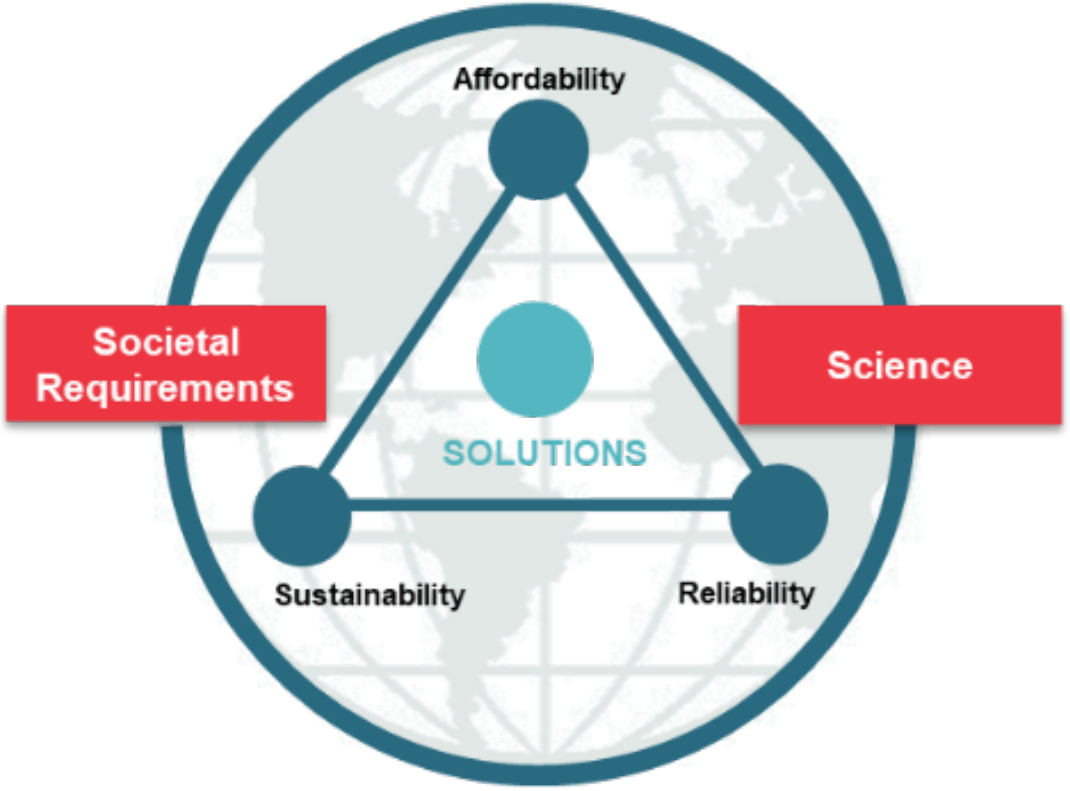
DOW EMISSIONS BY TYPE : ~115 MILLION METRIC TONNES OF CO2 EQ.

- **Scope 1** – Direct (22%)
- **Scope 2** – Purchased power & steam (8%)
- **Scope 3** – Full impact (incl. upstream, JVs, downstream and end of life)



Half of Dow's Scope 1&2 emissions are from steam and power

ENERGY CONSIDERATIONS

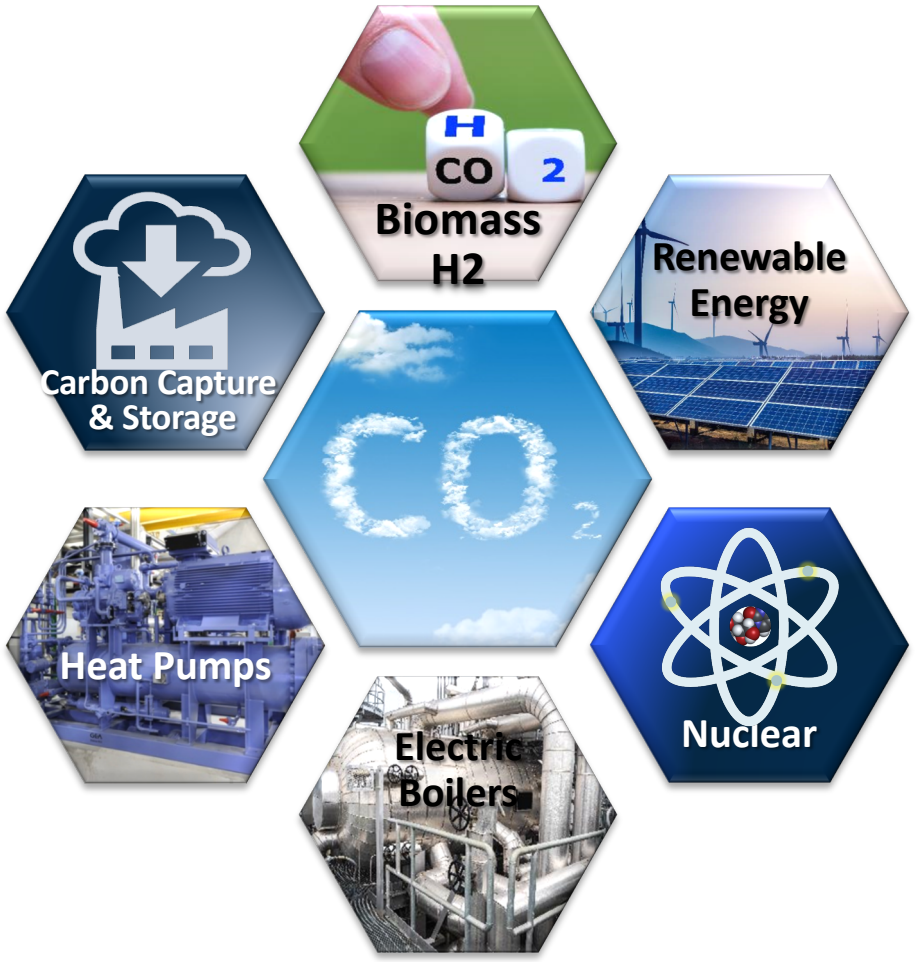


STEAM AND POWER LOW-CARBON OPTIONS CONSIDERED

	Technology			Sustainability						Competitiveness			Other		
Option	Power	Heat	Tech. Readiness Level	Energy efficiency	CO2 emission	NOx emission	Water use	Waste	Public acceptance	Opex	Capex 1	CF / AU	Plot space	Internal infra	External infra
Biomass	(✓)	✓													
Hydrogen (byprod. or purch.)	✓	✓													
Wind PPA	✓														
Solar PPA	✓														
Advanced nuclear	✓	✓													
Electric boiler		✓													
Heat pumps		✓													
Steam recompressor		✓													
CCS	✓	✓													
CCU	✓	✓													

No Impact
Advantaged, Commercial (TRL)
Neutral/Intermediate Impact, Demo (TRL)
Disadvantaged, R&D/Pilot (TRL)

Options Analysis



- No single solution / silver bullets
- Progress is needed in all areas
- Technology, infrastructure and policy solutions are needed to support commercial scale and societal needs

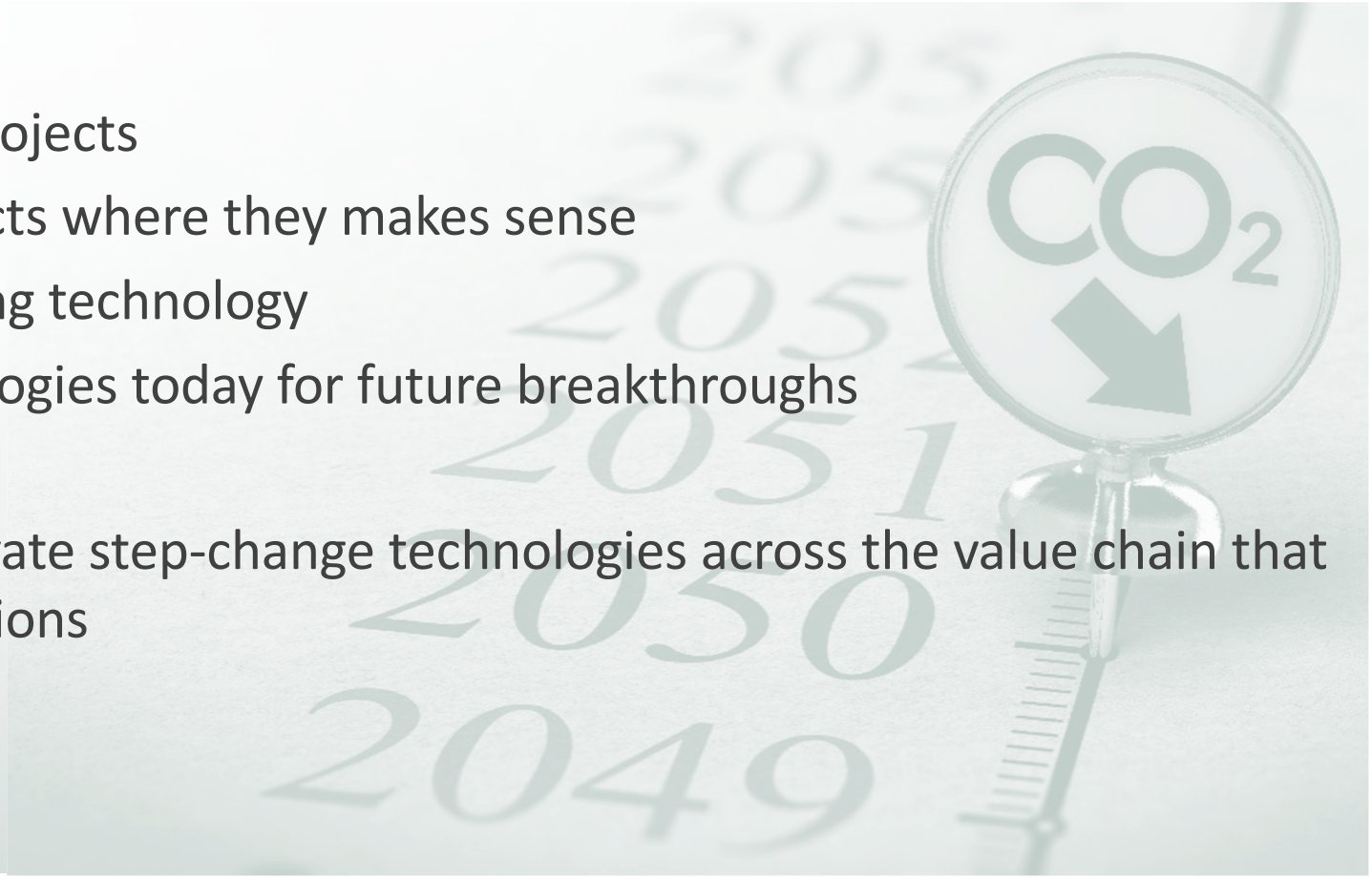
CONCLUSIONS

2020-2030

- Energy-efficiency projects
- Renewables contracts where they makes sense
- Use CCS as a bridging technology
- Working on technologies today for future breakthroughs

2030-2050

- Collaborate & innovate step-change technologies across the value chain that lower carbon emissions



Seek

Together™