

Greening Industry: The Forgotten Climate Wedge

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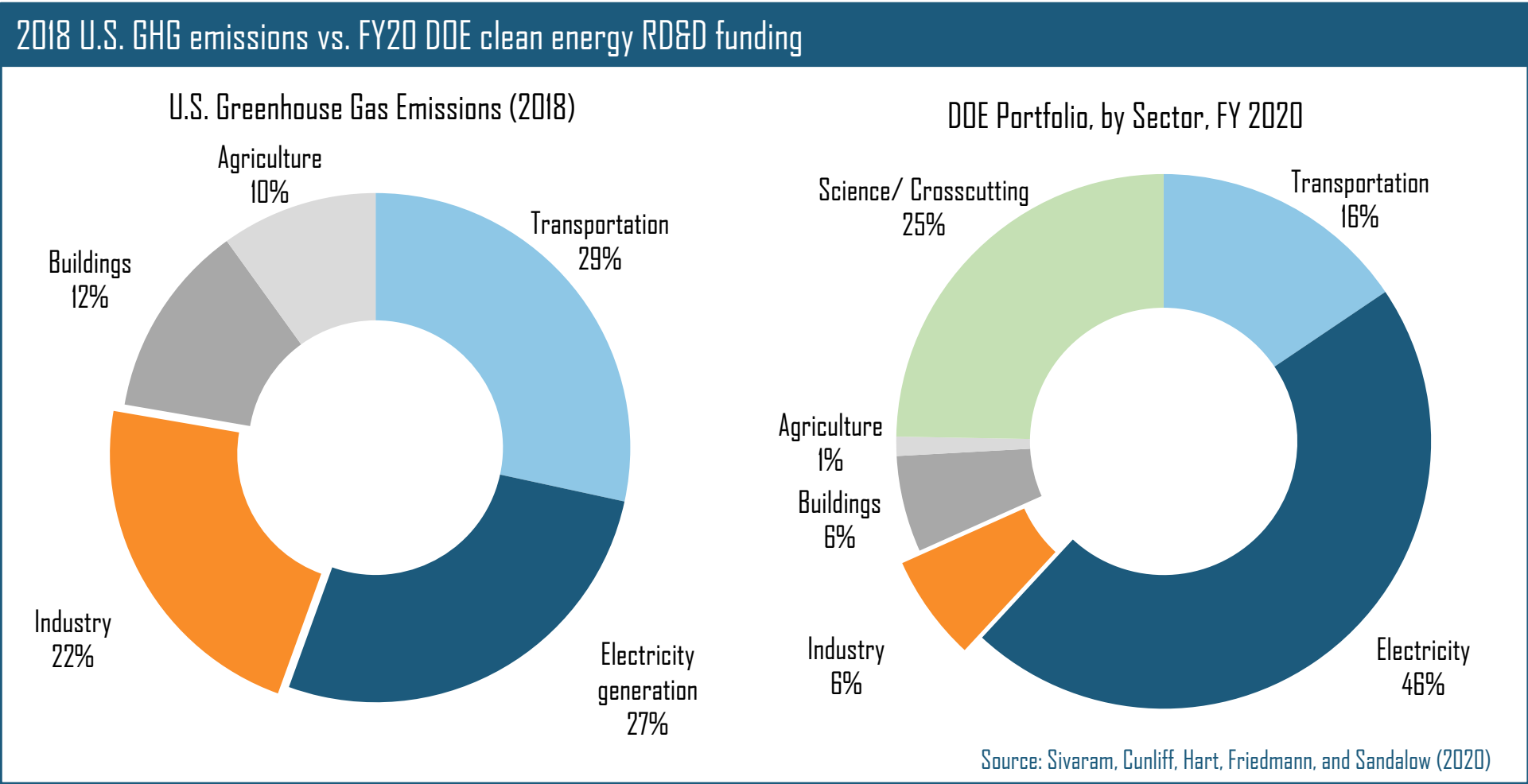
Join the Conversation: Submit your questions in the Q&A

@colin_cunliff

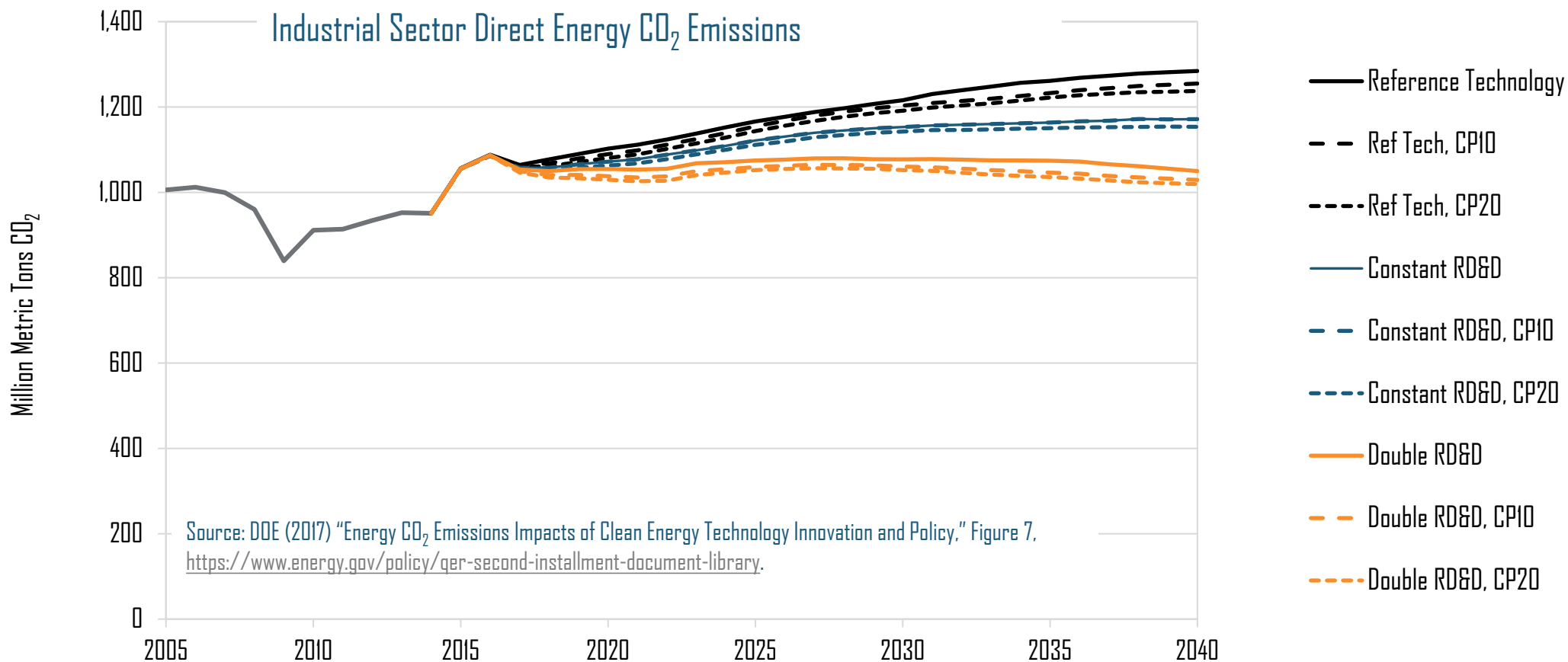
About ITIF

- Independent, nonpartisan research and education institute focusing on intersection of technological innovation and public policy, including:
 - Innovation and competitiveness
 - IT and data
 - Telecommunications
 - Trade and globalization
 - Life sciences & agricultural biotech
 - Clean energy innovation
- Formulates and promotes policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress
- World's top think tank for science and technology policy, according to the University of Pennsylvania's authoritative *Global Go To Think Tank Index*

Industrial emissions: the forgotten climate wedge

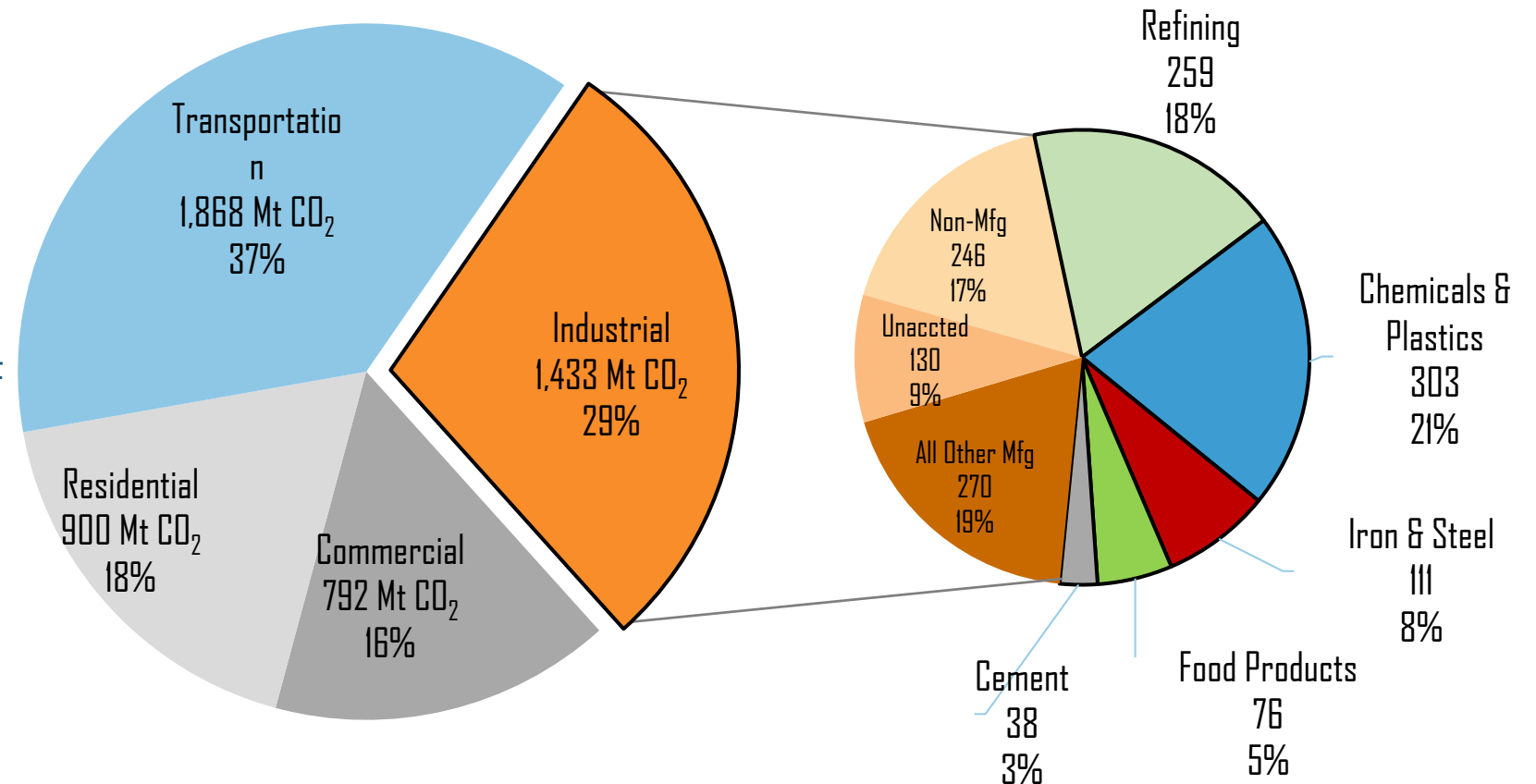


Industrial emissions are remarkably inelastic to climate policy



U.S. energy-related CO₂ emissions in 2020

- Five energy-intensive sectors account for 70% of manufacturing energy CO₂ emissions
- These sectors will be the focus of forthcoming AMD industrial decarbonization roadmaps



Source: AEO (2020)

Why are emissions from heavy industry hard to abate?

Challenge #1: High-temperature heat for industrial processes cannot be easily electrified

Challenge #2: "Process" emissions from chemical transformations cannot be eliminated by switching to zero-carbon energy

Calcination: $\text{CaCO}_3 + \text{heat} \rightarrow \text{CaO} + \text{CO}_2$

Challenge #3: Long lifetimes of industrial plants, ~30-40 years, which leads to slow stock turnover and long investment horizons

Cement



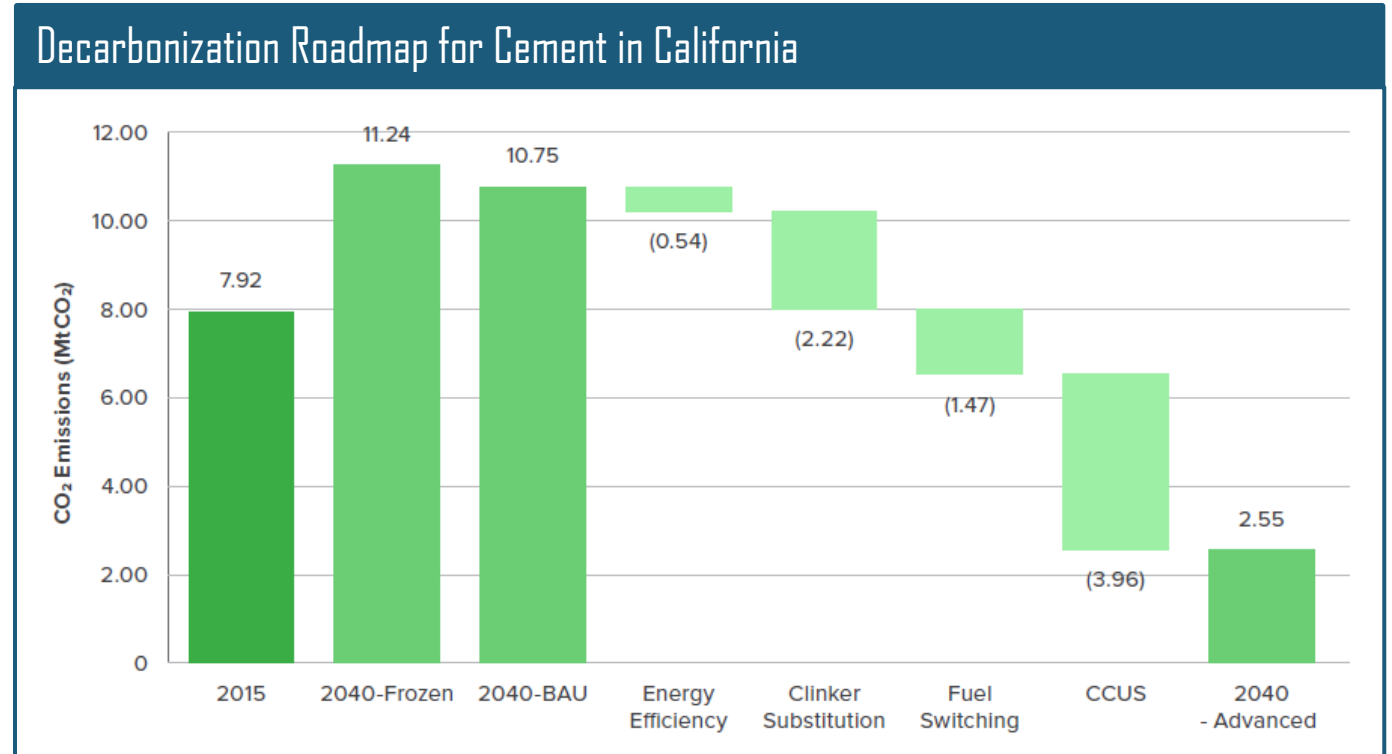
Iron and Steel

Chemicals



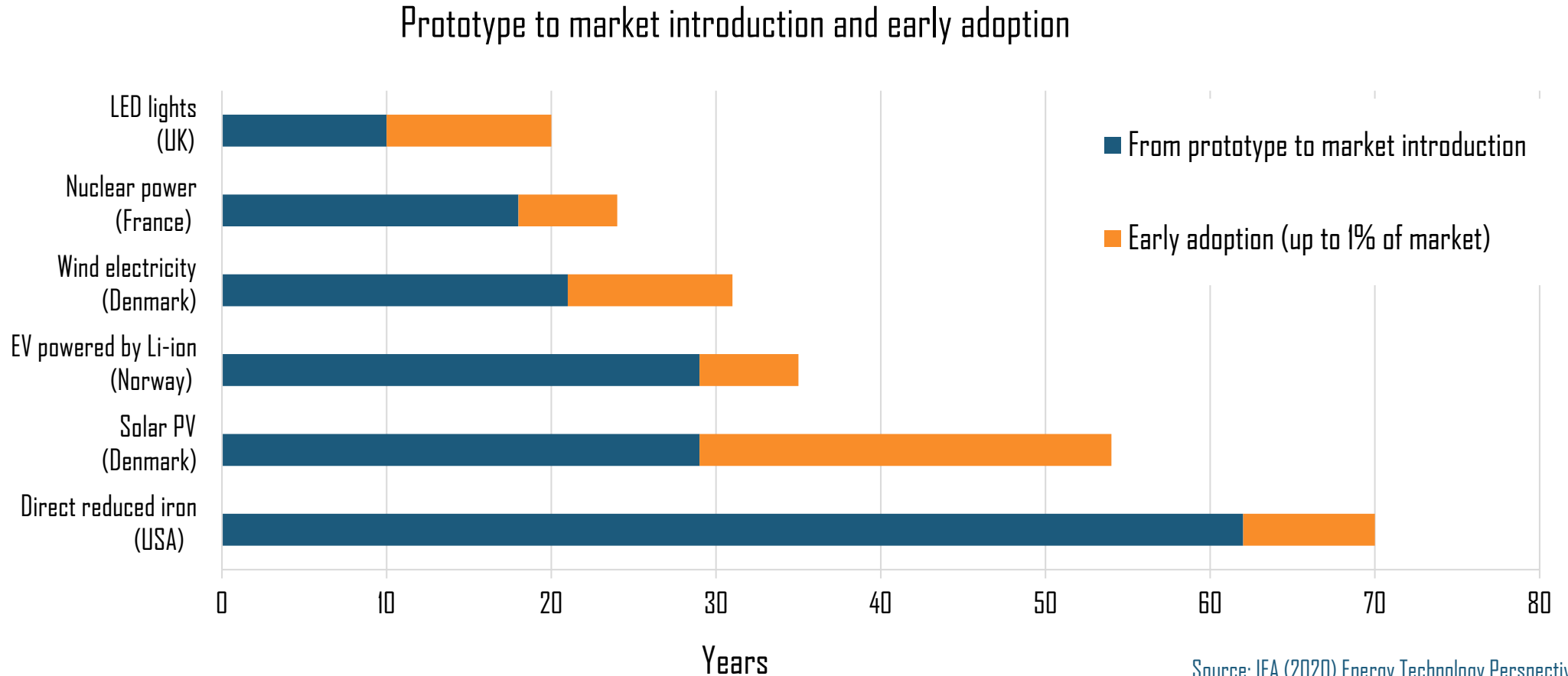
Decarbonization levers for heavy industry

Near-term	Demand management
	Energy Efficiency
	Materials Substitution
Deep Decarbonization	Hydrogen
	Electrification
	CCUS
	Transformational processes

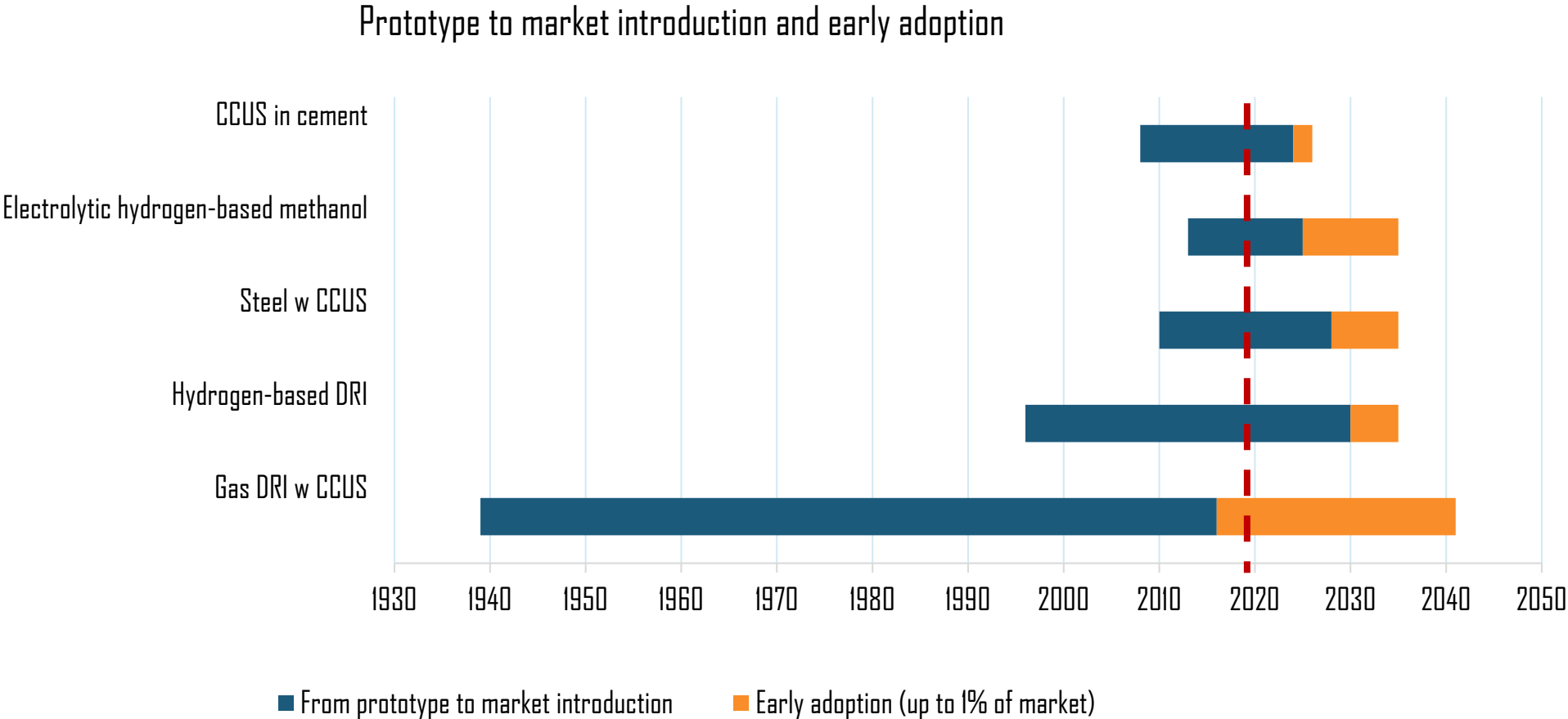


Source: Hasanbeigi and Springer (2019)

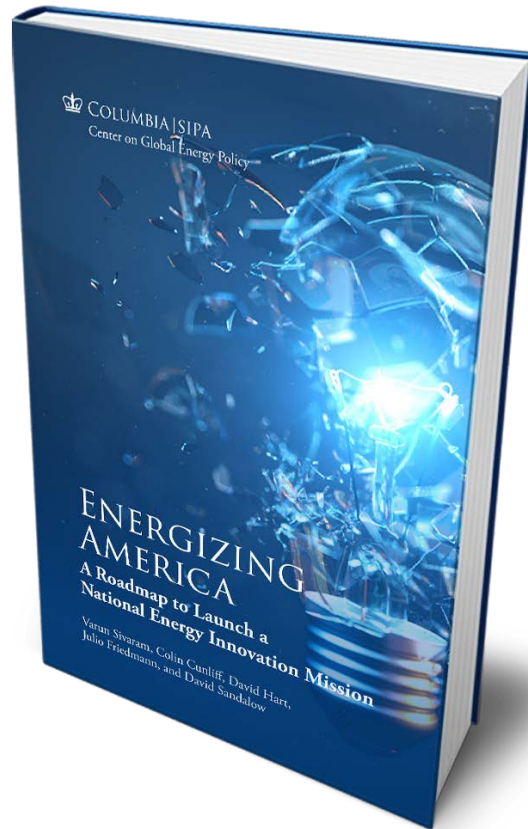
Bringing new technologies to market on a large scale can take 20-70 years



Times to early adoption for select technologies in IEA's Sustainable Development Scenario



Toward a clean manufacturing RD&D strategy



<http://bit.ly/energizingamerica>



More funding for industrial decarbonization (AMD appropriations and CITA)



Refocus AMD on decarbonization (not just efficiency). Industrial decarbonization roadmaps are a good start.



Explore H2 applications in industrial sectors (not just transportation)



Explore CCUS applications in industrial sectors (not just coal power generation)

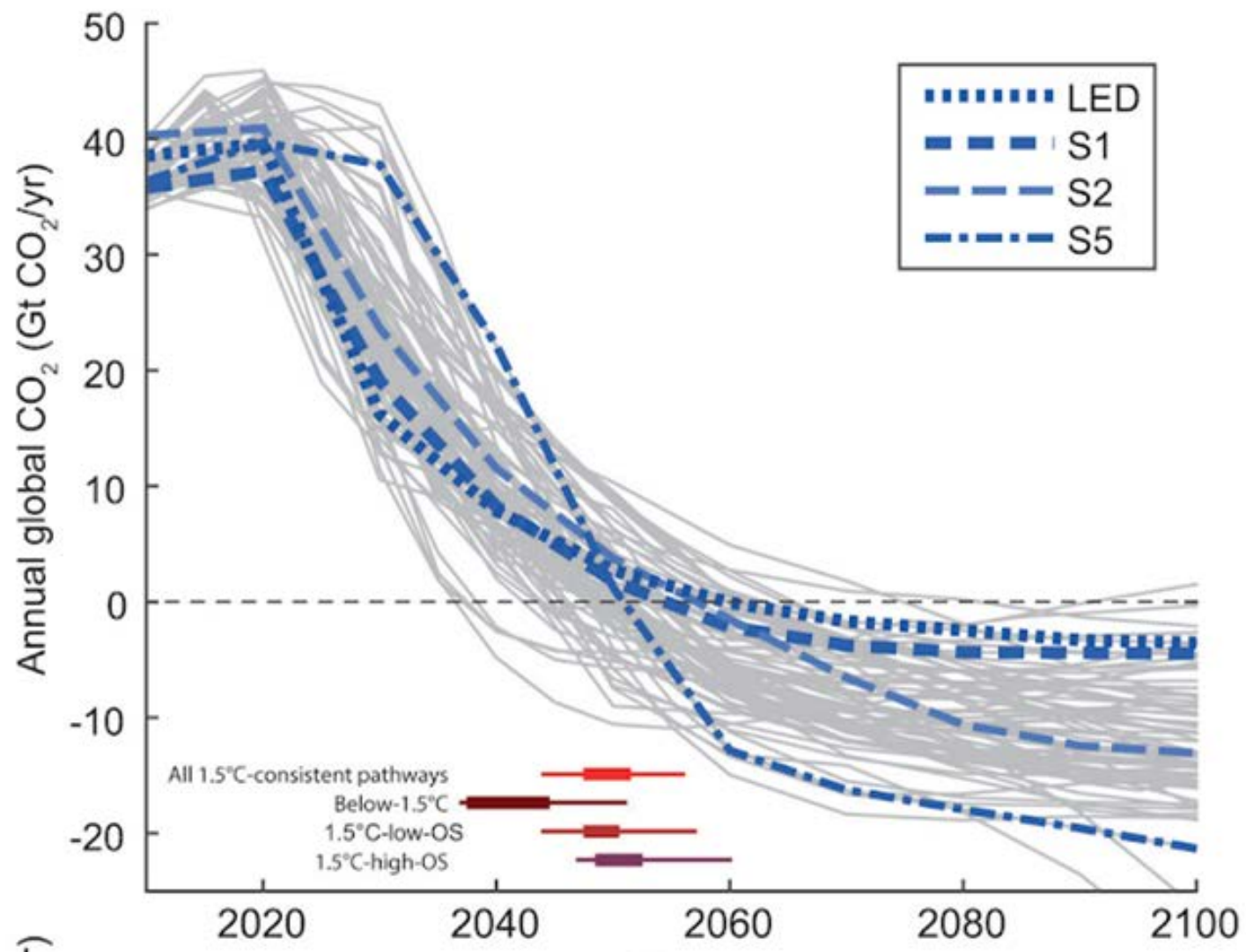
Thank You!

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Climate Goals and Manufacturing Opportunities

Henry Kelly
11/20/2020

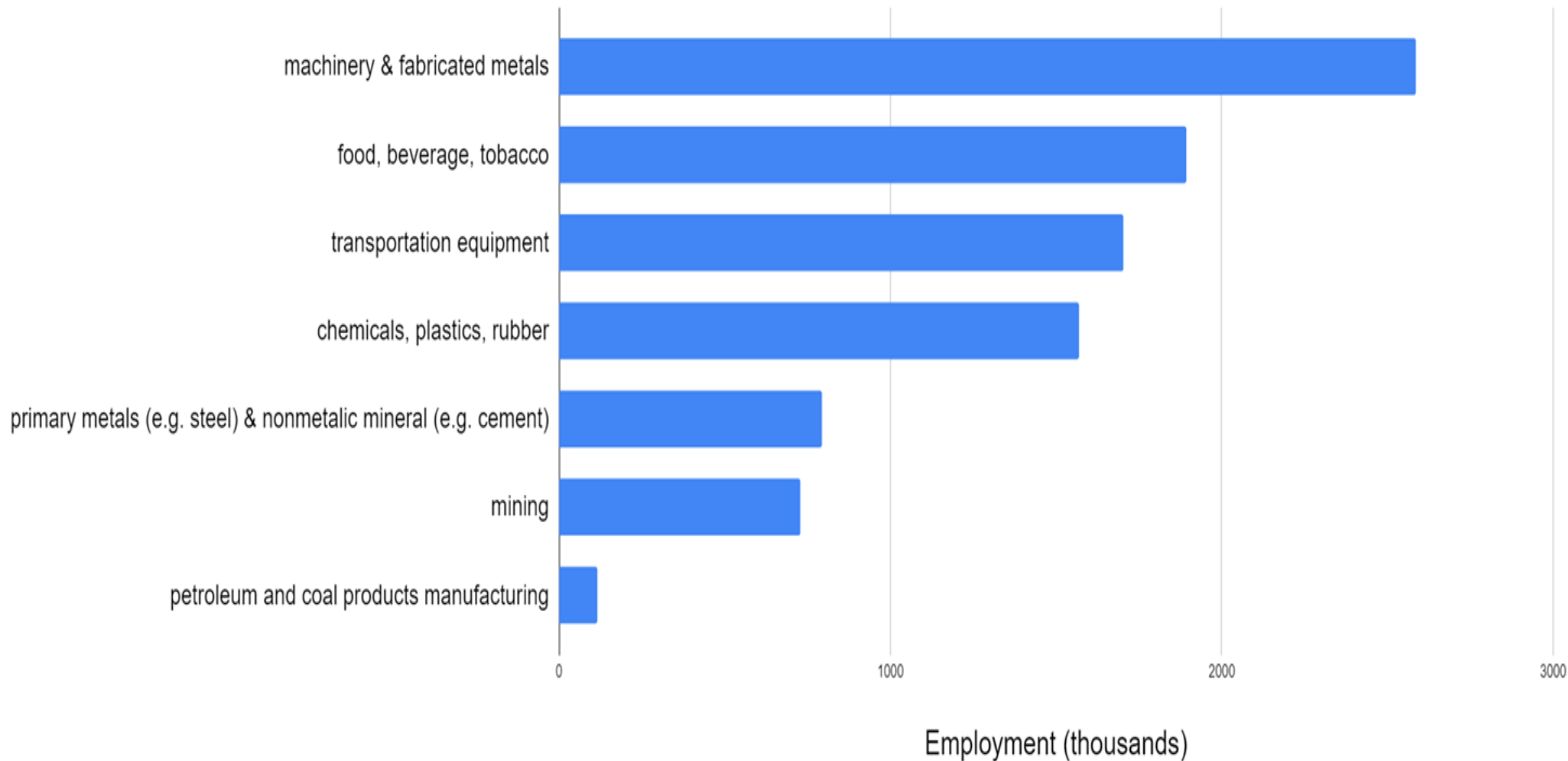
IPCC scenarios for limiting warming to 1.5 degree C



Manufacturing and Emissions

- Improving the efficiency of industrial processes and substituting clean fuels
- Manufacturing the equipment needed to achieve these goals

Major Manufacturing Employers 2018

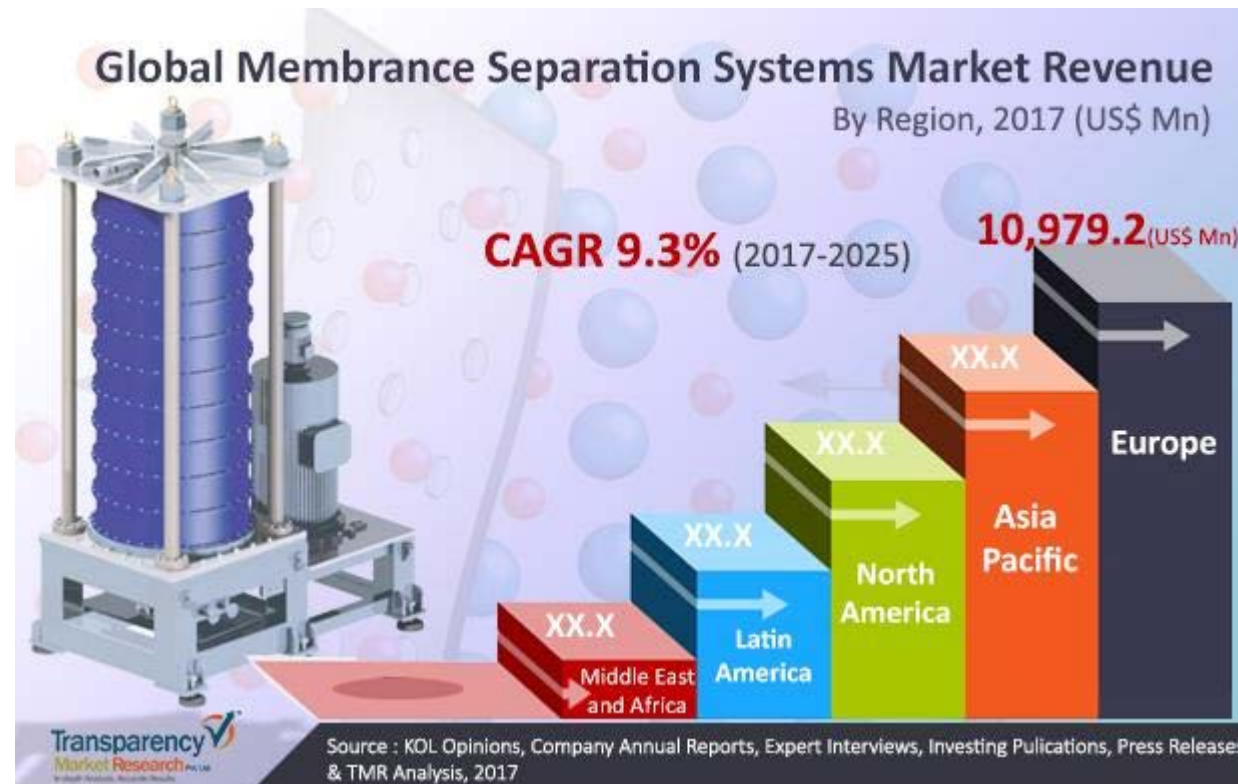


Four Targets for Innovation in Next-generation Manufacturing

1. Low Temperature Processes (heating, removing water)
2. High Temperature Processes (steel, cement, glass)
3. Bio-based manufacturing (chemicals, food products)
4. Materials (computational design, bio-inspired, efficient use of materials, recycling)

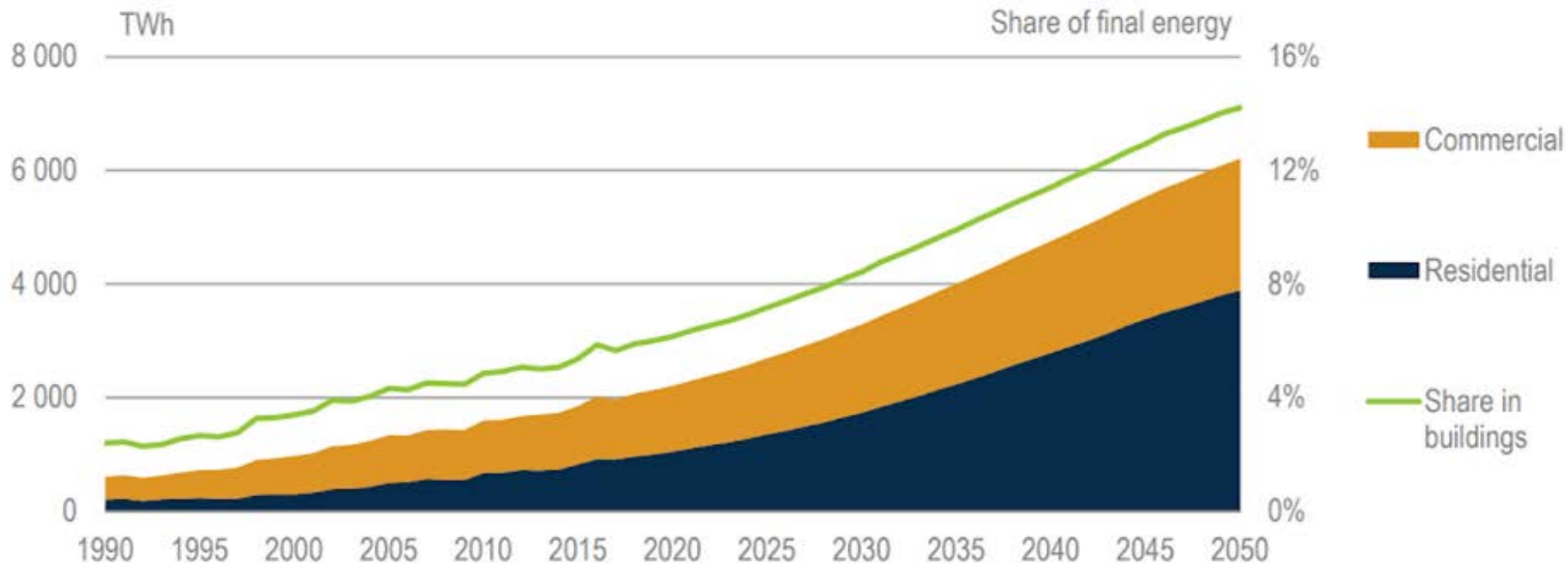
Process Revolutions: Heating, Drying, Separations

- *High efficiency Heat Pumps*
- *Membranes, mechanical water removal*



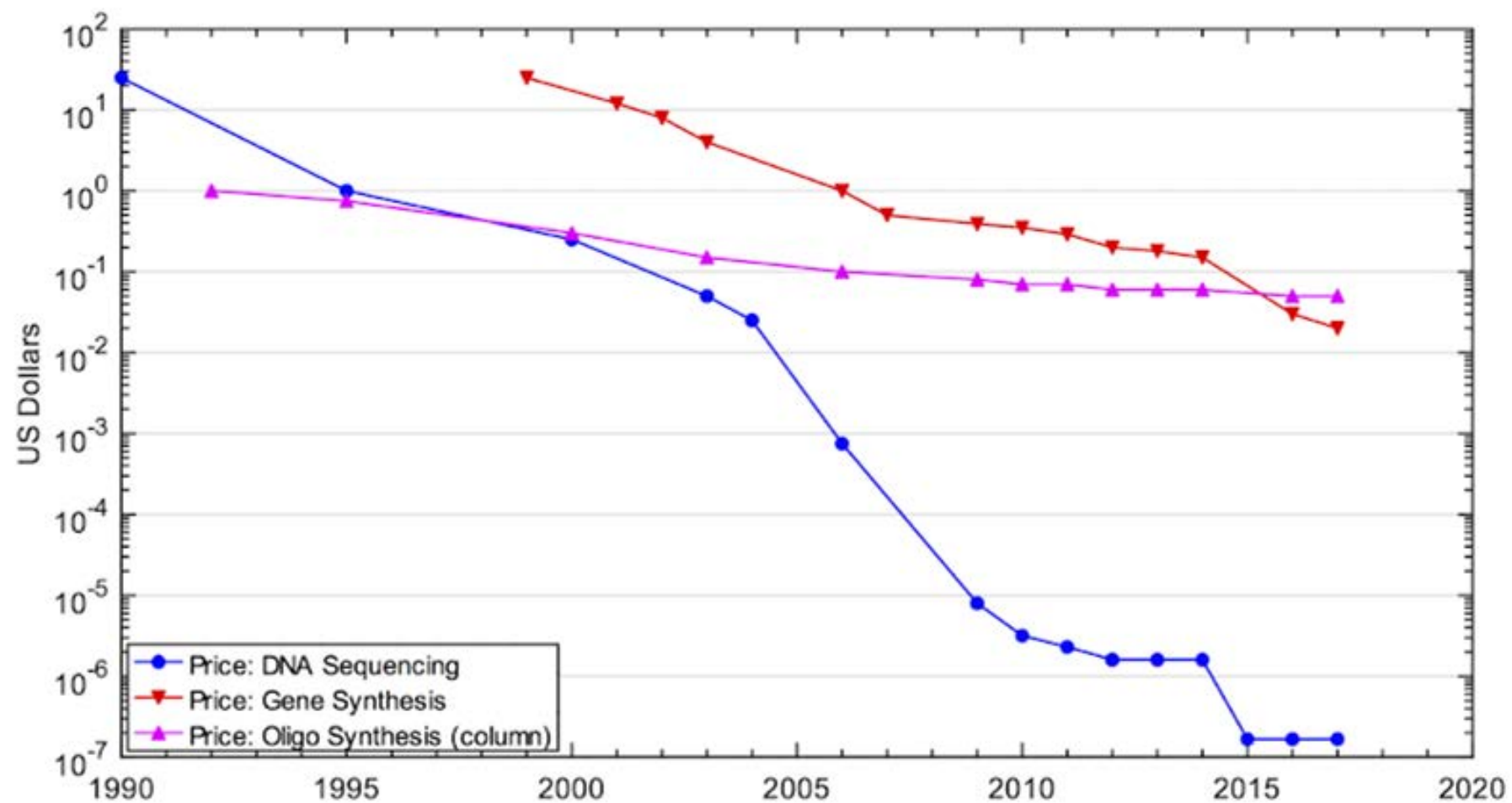
Source: Transparency Market Research

World energy use for space cooling by subsector in the Baseline Scenario

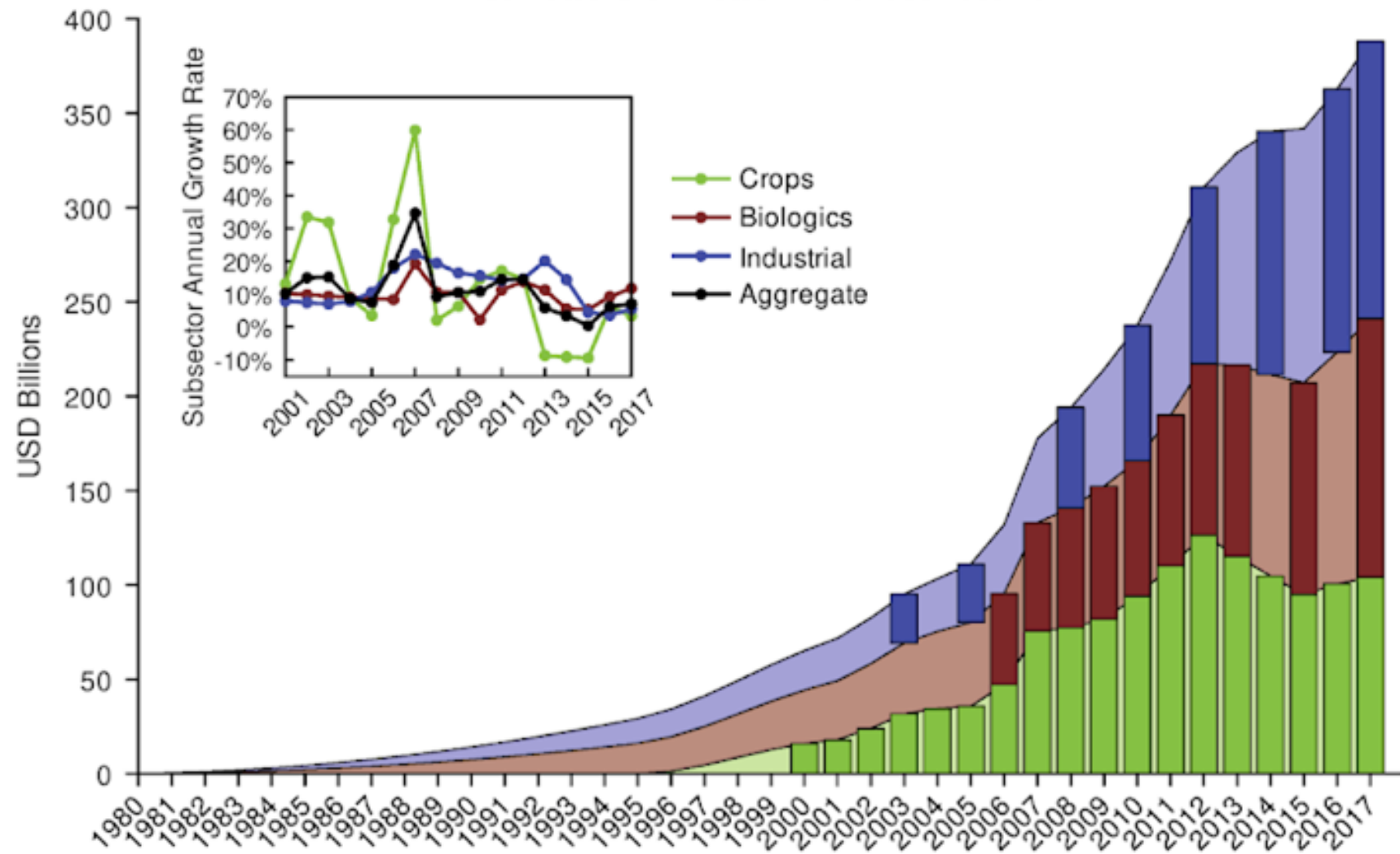


~2.4 billion units sold from 2020-2050

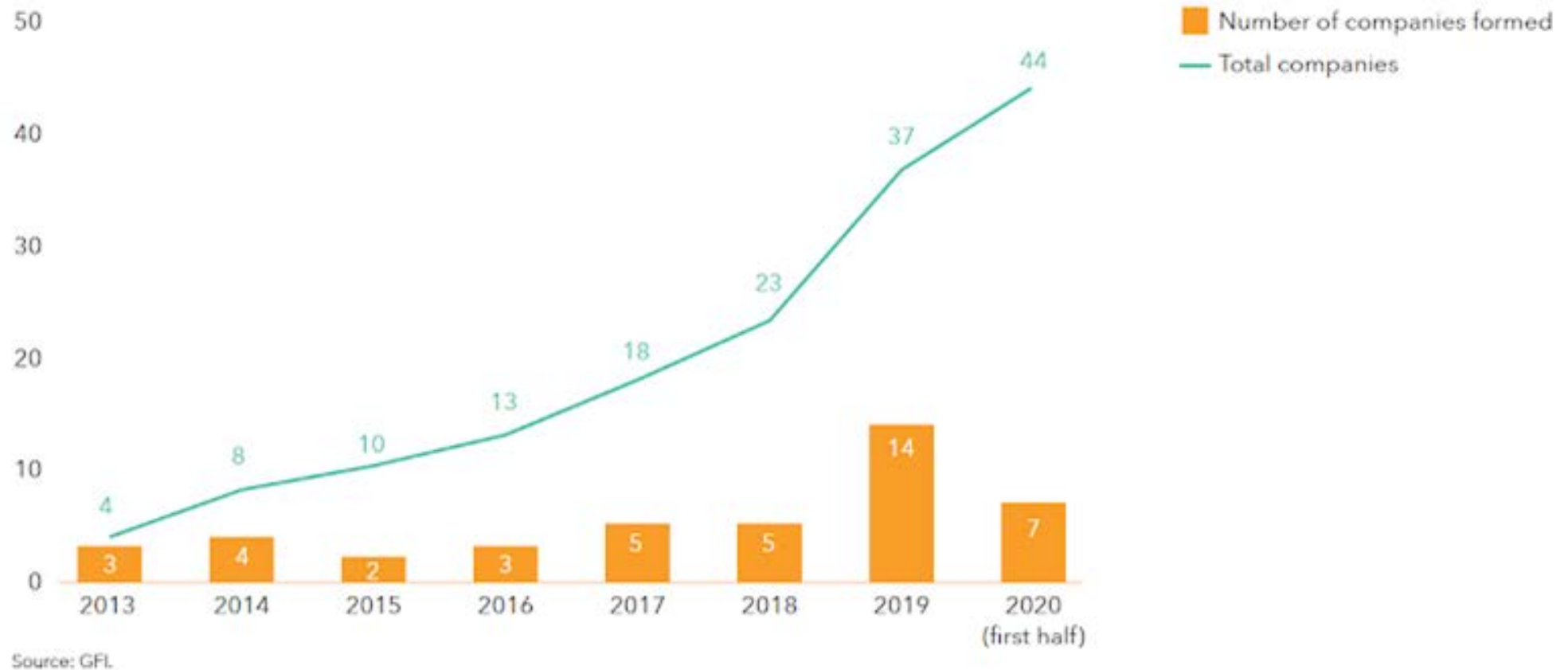
Price Per Base of DNA Sequencing and Synthesis (circa 2017)



Estimated U.S. Biotech Revenues 1980-2017

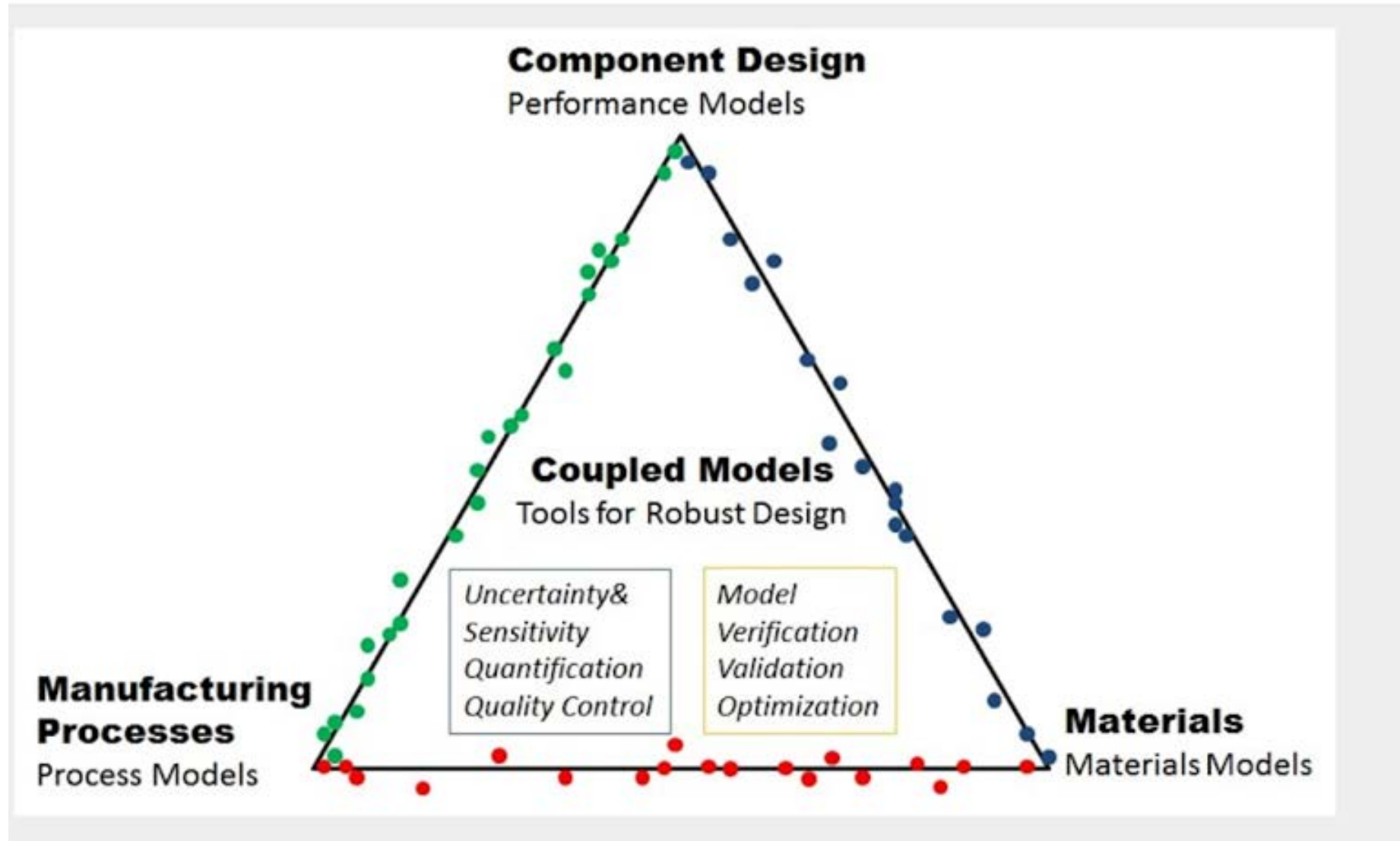


Number of Dedicated Alternative Protein Companies



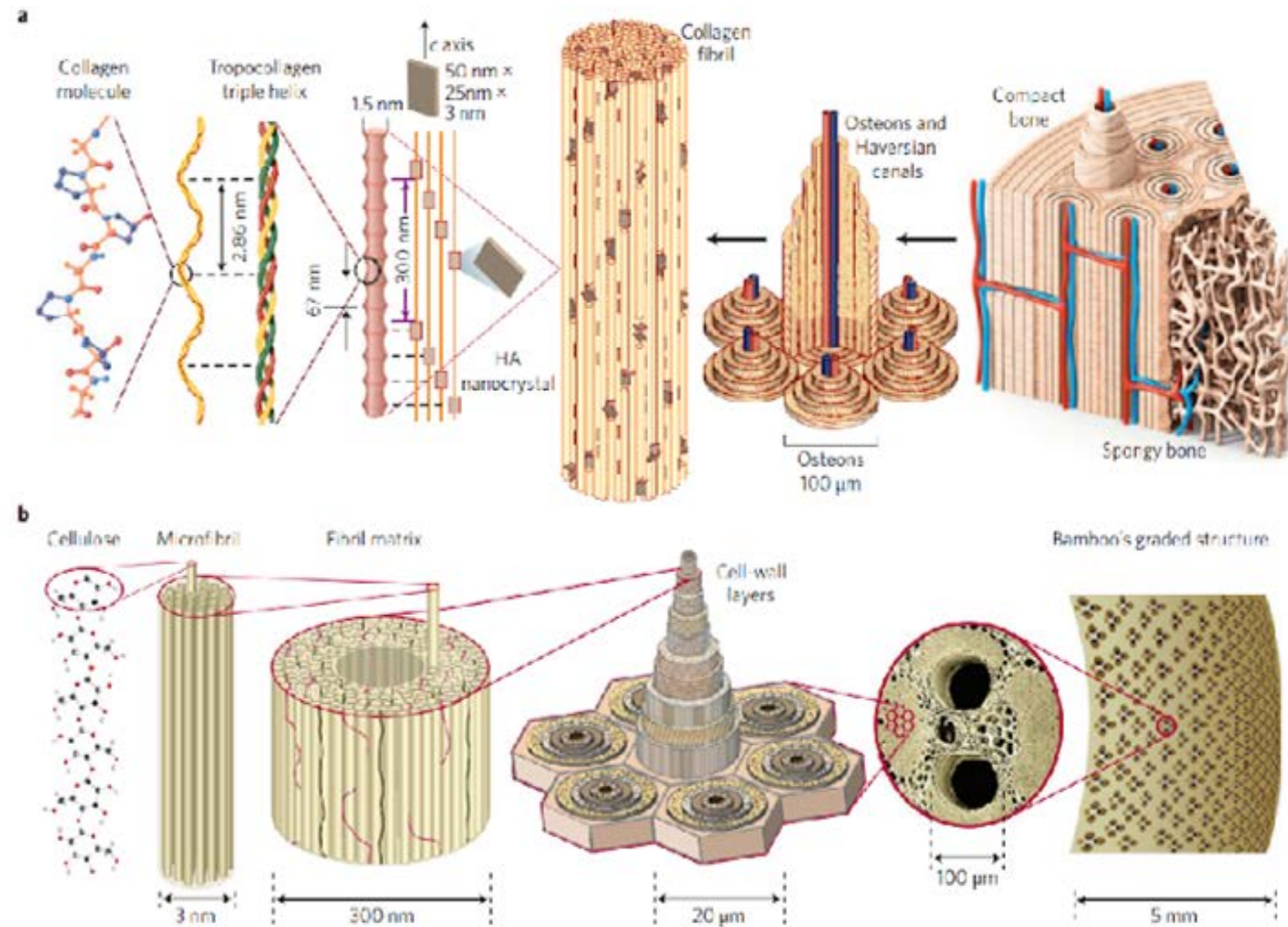
The Good Food Institute: State of the Industry Report, Fermentation

Computational Materials Design



Hierarchical structure of (a) bone, (b) bamboo

source: Wegst 2015



Recycling		
	Energy efficiency gain (% savings from production from raw materials)	Recycling rate
Iron and steel	60-70%	33%
Aluminum	90%	18.5%
Plastics		9% (US), 30% (EU)

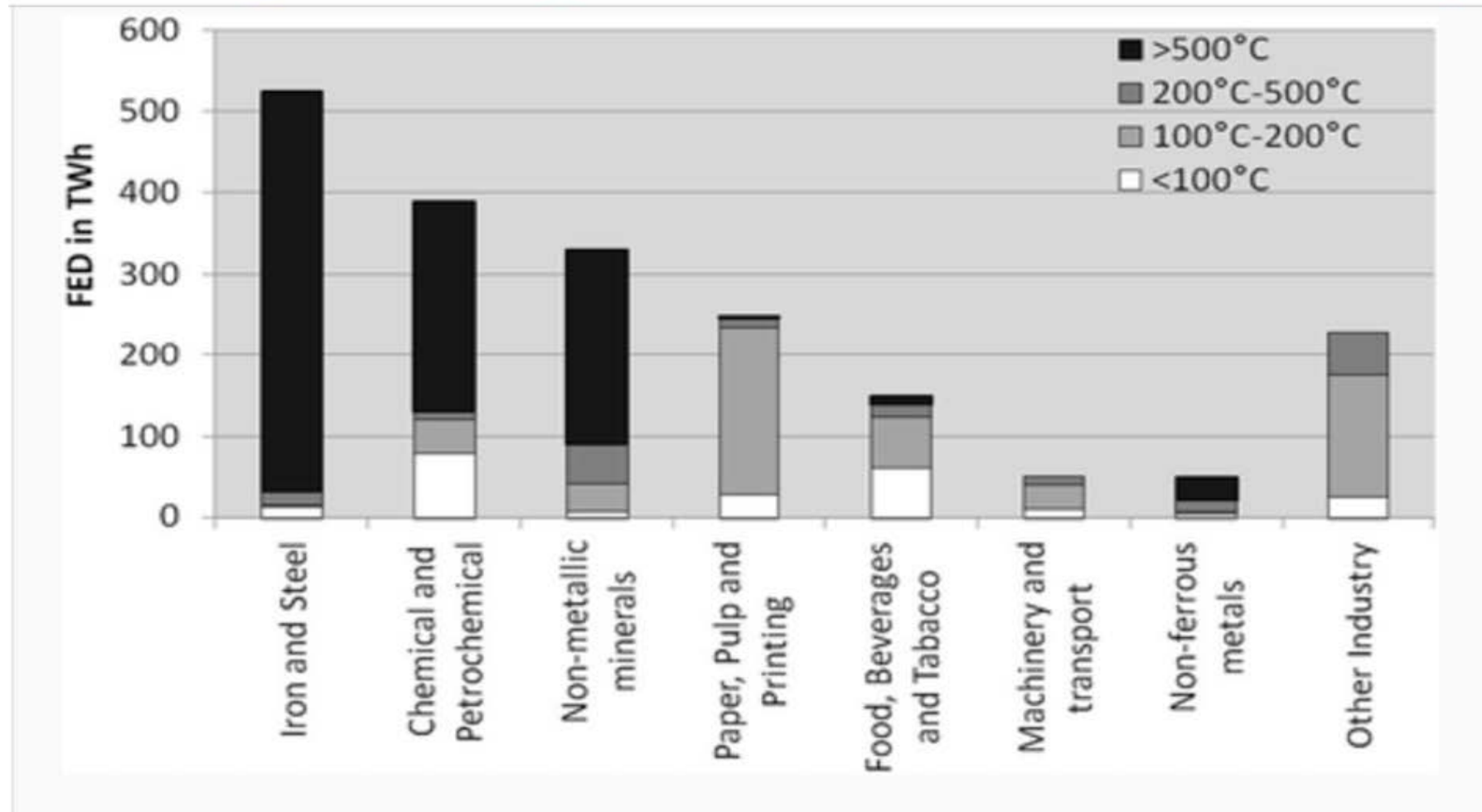




Muta pagoda, built in 1056, 67m tall

Industrial Process Heat Demand EU28+3

source: Rechfeld et. al. 2018



Manufacturing and Industrial Transformation: Securing Good Jobs in a Cleaner Economy

Zoe Lipman
BlueGreen Alliance
November 20, 2020

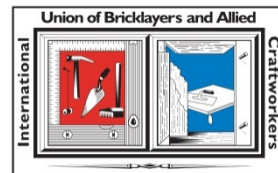


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A pro-worker pro-climate agenda



Solidarity for
Climate Action

Manufacturing
Agenda

Relief & Recovery

“We can’t rebuild prosperity if we fall behind the rest of the world in building the technologies of the future, or if working people don’t see gains from innovation or a clean economy..”

Now more critical than ever

Manufacturing matters



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Critical to economy

NATIONALLY:

- Employs 1 in 11 U.S. workers
- \$2 Trillion/ year to GDP but +/- one third of US economic output
- > 2/3 of private sector R&D
- Proven pathway into middle class – no longer available to too many workers



.....and an essential part of an effective and sustained recovery



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Manufacturing is essential to addressing climate crisis



- Manufactured goods are critical to meeting climate challenge
- Critical energy-intensive industries are a major and growing source of emissions
- Offshoring jobs and pollution is not the solution



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Now more than ever: Crisis has underscored the challenges facing workers and communities

- Offshoring, outsourcing
- Worse jobs, worse conditions
- Declines in union density = less for working families
- Hollowing out of communities, middle-class

TODAY

Crisis for essential workers
Disproportionate impacts

Climate, economic and racial equity crises must be solved together

- Clean tech example is mixed

We have the opportunity to head down a stronger path

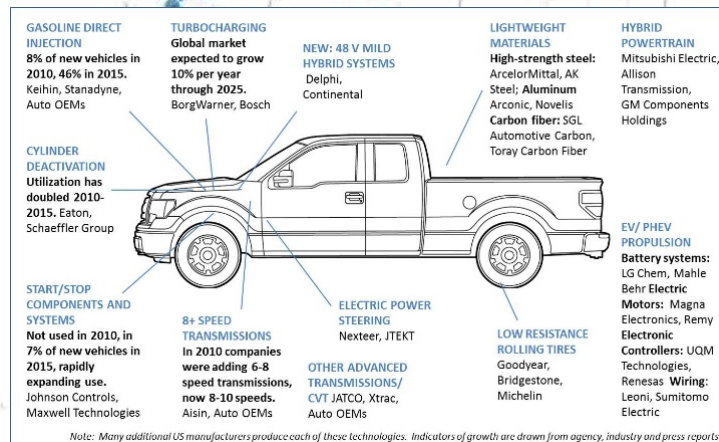


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At a crossroads. Choices we make matter

- **Climate, economy changing rapidly**
- **Leadership on climate and clean tech is critical to growing manufacturing and good jobs, but not sufficient to guarantee it**
- **Failure to act is worse case, but...**



...Choices we make now are critical to whether we see jobs and economic gains

An interactive map of the advanced vehicle supply chain is available at: <https://www.bgafoundation.org/>

Jobs outcomes depend on the choices we make now



- Energy-intensive basic materials at heart of economy – today and tomorrow
- Offshoring isn't cheap
- Utilizing policies that support labor standards, increased domestic content, strong supply chains are critical to short and long term economic benefit



We need a proactive strategy...



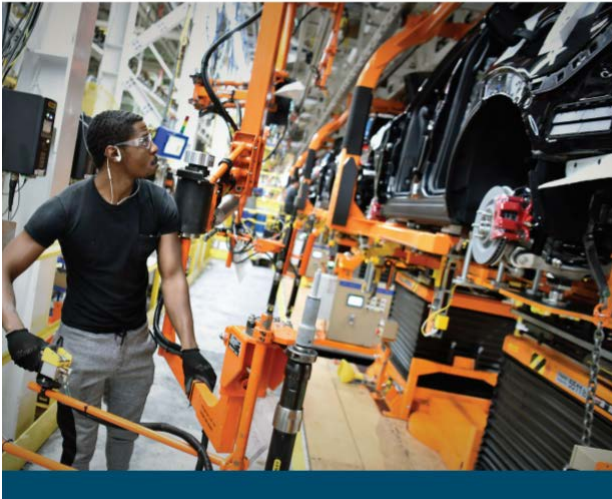
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A National Manufacturing Agenda



MANUFACTURING AGENDA

A National Blueprint for Clean Technology Manufacturing
Leadership and Industrial Transformation



Available at:
<https://www.bluegreenalliance.org/manufacturing>



Invest at scale in a new
generation of American
manufacturing

- Reinvest in critical clean technology, supply chains
- Transform basic industry
- **Use all the tools**
- **Rebuild manufacturing and do it right**



What: Key policy actions

- INVEST at scale in a new generation of American manufacturing
- INNOVATE to transform industry
- RESPONSIBLY PRODUCE mine, recycle, and reclaim the CRITICAL MATERIALS necessary for a secure, clean economy
- USE PUBLIC INVESTMENT WISELY to support a strong, clean, fair manufacturing economy across America
- CHANGE THE RULES to build a clean economy that works for all ards – Americans - Fair trade, tax and labor standards.



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How: Build-in manufacturing, good jobs, equity at every point



- Create family-sustaining jobs across the clean economy and across the manufacturing supply chain;
- Maximize benefits to workers and communities that need it most;
- Systematically strengthen domestic clean technology and materials manufacturing and supply chains;
- Reduce pollution and make our communities and workplaces safer and more resilient; and
- Invest in training and jobs together; increase and improve pathways into family-supporting manufacturing and technical careers.



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Priorities now

- Recovery!
- Invest at scale, particularly in energy-intensive industry
 - Opportunities from E2 to first-in-class
- Reinvest to build key emerging tech, critical supply chains here
 - Manufacturing conversion
- Target investments in the workers, communities and sectors that need it most.
- Ensure the production of clean and advanced products in ways that are clean and just for workers and communities alike.



In closing...

wind

Ørsted, U.S. Trade Unions Enter Pact to Grow Offshore Wind Workforce

Thursday, 19 November 2020



Discussion, Questions?



Photos in this presentation
courtesy of : Ford Motor
Co, General Motors Co,
ArcelorMittal, Proterra,
BGA. Contact BGA for
more detail.



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