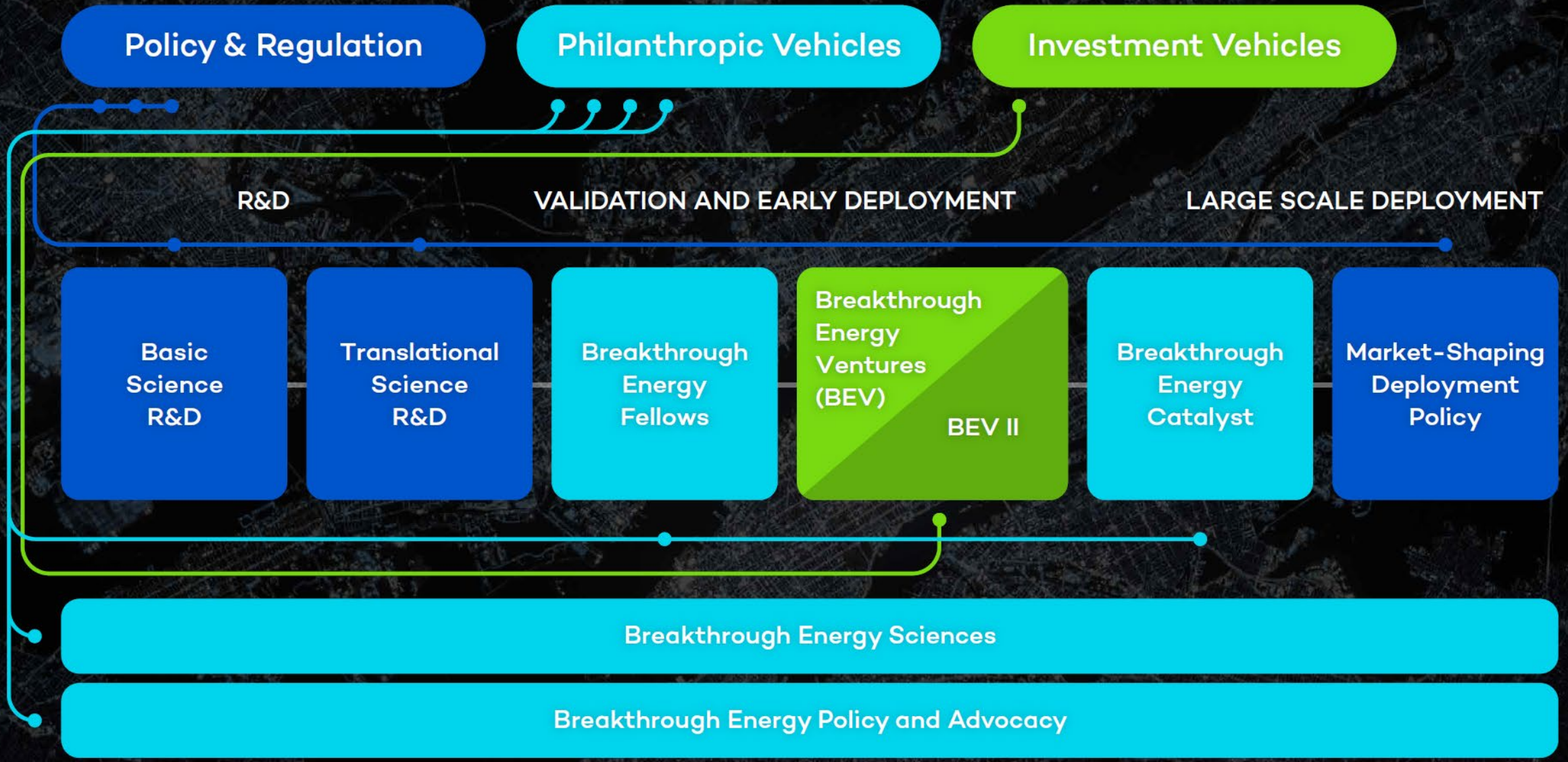
Breakthrough Energy
Catalyst

Breakthrough Energy Catalyst

Program Overview

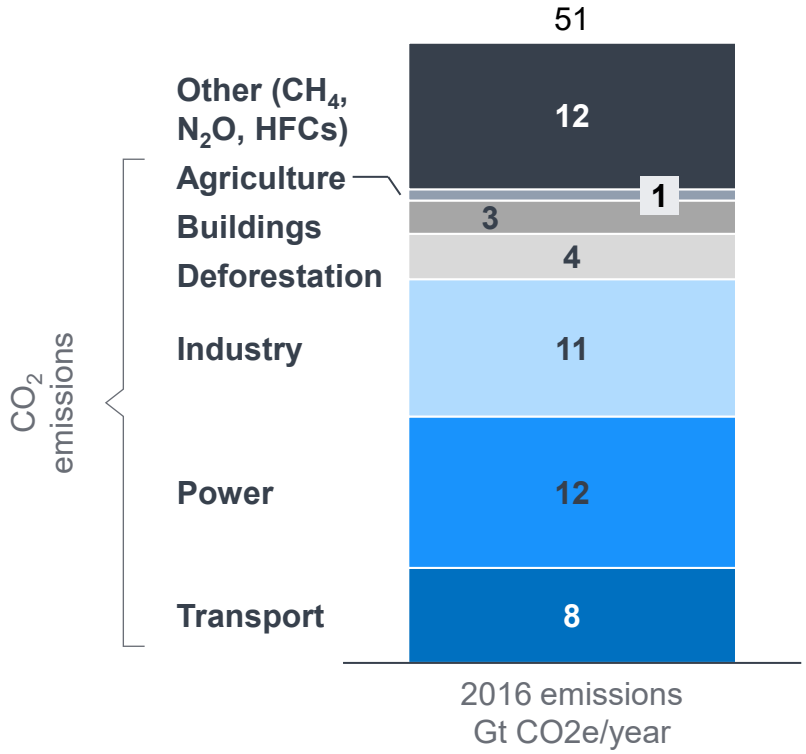
BREAKTHROUGH ENERGY OVERVIEW



Technologies to Reach Net-Zero Emissions

Getting to net zero requires a broad set of technologies and only some of those technologies are ready for cost-effective deployment.

Global emissions (100-year GWP)



Technologies that could make a difference

- Direct air capture
- Meat substitutes
- Cow methane reduction
- Green ammonia
- Heat pumps
- Building energy efficiency
- Low carbon steel
- Low carbon cement/alternative building materials
- Plastic recycling
- Renewable hydrogen
- Renewables
- Long duration energy storage
- Bioenergy with carbon capture and storage (BECCs)
- Perovskite solar cells
- Small modular nuclear reactors
- Electric vehicles
- Sustainable aviation fuels
- Batteries

These technologies typically fall into one of two challenge categories:

1. **Implementation challenge: Scaling cost effective solutions**, where the key challenge is coordinating and speeding deployment on the global scale.

2. **Innovation challenge: Decreasing cost of new climate technologies** by funding early deployment to drive technologies down their cost curves.

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Getting the Next Set of Climate Technologies to Scale

There is a gap in incentivizing actions to broadly commercialize the next set of climate technologies. We have systems in place to recognize companies and individuals for technologies that are ready to deploy, but no systems to bring the new technologies we'll need to that point.

Two types of actions needed to reach net zero

		1. Implementation challenge: Scaling cost effective climate technologies	2. Innovation challenge: Decreasing cost of new climate technologies
Status		There are **systems in place** that incentivize and recognize implementation of readily available, cost effective solutions.	There are **insufficient systems in place** to give recognition for reducing cost of techs that aren't yet ready for implementation.
Example systems and recognition	Impact quantification and reporting	TCFD Task Force on Climate-Related Financial Disclosures; CDP	Insufficient systems and recognition
	Recognition	RE 100; Science Based Targets – Driving Ambitious Corporate Climate Action	
	Supporting products	RECs; Offsets	
Example technologies		- Energy efficiency - Wind - Solar - Electric Vehicles	- Hydrogen - Sustainable aviation fuel - Long duration energy storage - Direct air capture

Insufficient incentives for supporting early commercial techs has led to slow scaling of critical emissions reducing technologies.

If we don't start recognizing companies for deceasing the cost of new technologies, we will run out of cost effective solutions and progress to net-zero will stall.

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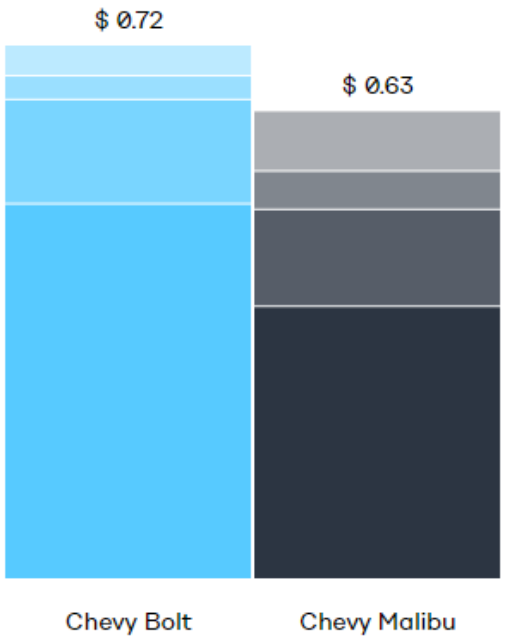
Addressing the Innovation Challenge: The Green Premium

The green premium is the difference in price between a fossil technology and its low carbon alternative. It is a metric that can help us measure the progress we've made toward addressing climate change and understand where we still have barriers to overcome.

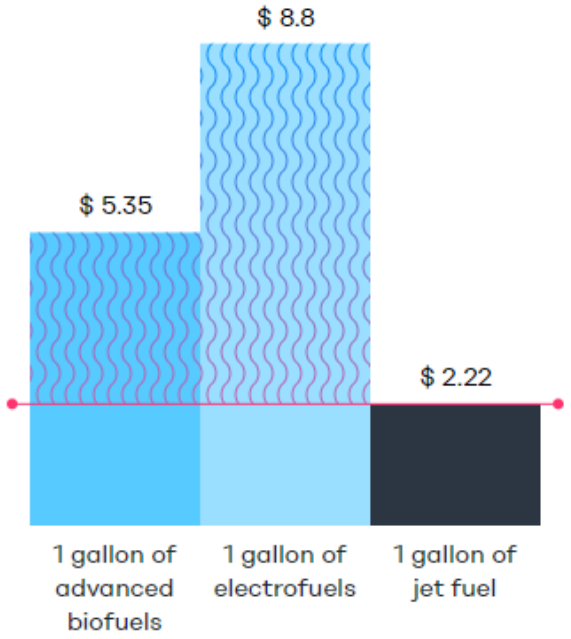
Low Green Premium Example
Electric Vehicles



Electric vehicles are reaching cost parity with internal combustion engines. We compared the total cost of ownership of the EV Chevy Bolt to a Chevy Malibu.

Price Breakdown: The average cost per mile in US cents assuming a 7% cost of capital, 8-year depreciation, 12,000 miles driven per year.

High Green Premium Example
Sustainable Aviation Fuel



Low carbon fuels, which will be required to decarbonize aviation, shipping, and heavy duty trucking, still have a very high green premium.

Price Breakdown: The cost per gallon of jet fuel relative to advanced biofuels (e.g. HEFA) and electrofuels (e.g. power to liquid).

Breakthrough Energy Catalyst

The goal of Breakthrough Energy Catalyst is to build projects that help the next set of critical climate technologies reach scale, eventually catalyzing the replacement of fossil-based technology with low carbon alternatives.

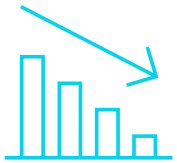
Key Program Components

Build coalition and partnerships

Assemble the necessary partnerships to make the project a success (e.g., with control point partners in the value chain)

Raise capital

Solicit contributions from philanthropy, government, corporates, and individuals



Deploy capital to buy down the green premium

Use capital to fund projects across a set of priority technologies and enable market penetration

Impact for Contributors

01

Increasing supply of technologies that enable transitions to low carbon business models

Increased production for cost competitive clean technologies will help financiers and large emitters transition to low carbon business models.

02

Creating demand for technologies needed to reach emissions commitments

Projects will provide opportunities for corporate buyers to procure products that allow them to reach their emissions commitments.

03

Recognizing climate leadership

A new methodology, the catalyzed emissions reduction framework, will recognize leadership on funding climate technology deployment based on a rigorous calculation methodology.

Technology Focus Areas

Green hydrogen, SAF, DAC, and LDS have been prioritized as initial focus areas for BE Catalyst.

Selected technologies

Sustainable aviation fuel (SAF)

Green Hydrogen

Direct Air Capture (DAC)

Long Duration Energy Storage (LDS)

Key selection criteria

We have prioritized these three technologies for the BE Catalyst program because:

- **The technology can play a critical role in a net zero future,** but cost is currently too high.
- **A modest amount of deployment funding can dramatically reduce cost** because the technology is at the appropriate stage in the deployment cycle: past R&D but before major investment has already matured project development.

Key Program Components

Contributors will aggregate capital into a pooled fund. Breakthrough Energy will allocate funding to projects with highest potential for impact.

Contributing Funds

Corporate Contributors

Companies will contribute dollars to the program fund, which will distribute capital to projects in priority technology areas.

Governments **Individuals** **Philanthropy**

Other contributors will aggregate funding to help buy down the green premium.

Aggregating Capital

Breakthrough Energy Catalyst Program Fund

Funding Projects

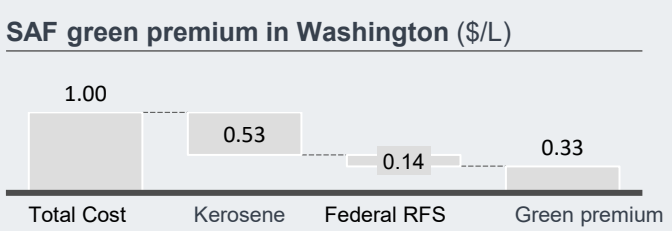
- **8** Green Hydrogen Projects
- **7** SAF Projects
- **4** Direct Air Capture Projects
- **15** LDS Projects

Measuring Impact

Breakthrough Energy Catalyst will measure impact in terms of long-term 'catalyzed emissions reductions.'

Contributors will be recognized based on the long-term climate impact of their contributions.

Example Project: Sustainable Aviation Fuel in the Pacific Northwest



$250 - $350M

for a SAF plant that produces ~100M liters per year