



ATKINS

Member of the SNC-Lavalin Group

Decarbonization of Bus Depots

Strategic Opportunities and Challenges

June 30, 2023

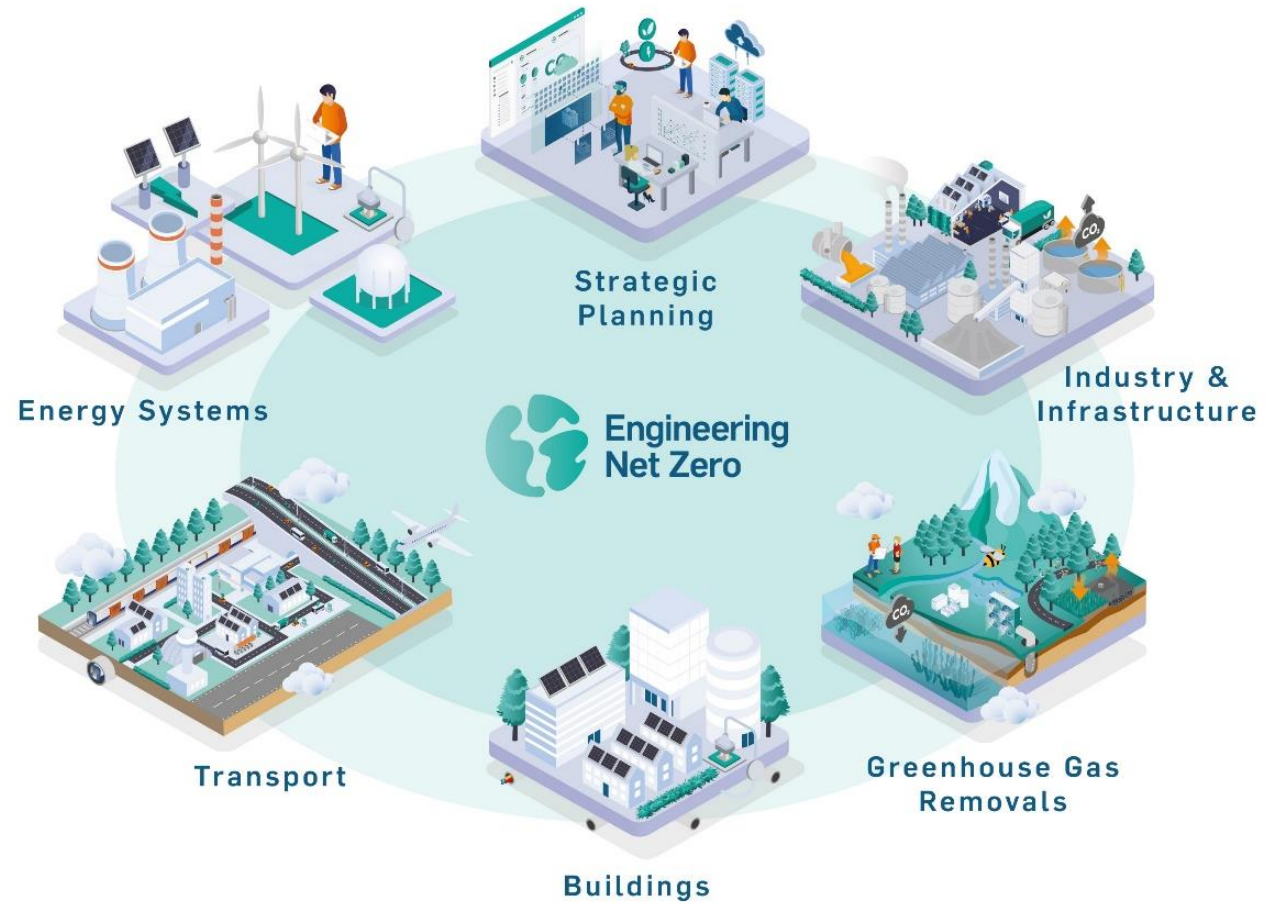


Agenda

- › Welcome
- › An Overview of US Long Term Net Zero Strategy
- › Transportation Industry Decarbonization Trends
- › Strategies for the Decarbonization of Bus Depots
 - › *Opportunities*
 - › *Challenges*
 - › *Considerations for Mixed Fleet Operations*

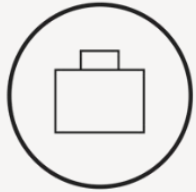
Introduction

Atkins is a leader in the **design and delivery** of the **built environment**, we play a unique role in **influencing** what gets built, and how **technologies** and **methods** can be used to **create and operate infrastructure** assets, while **minimizing** the **impacts** they have on **society**.



Enhanced value-chain

A more comprehensive end-to-end service offering



Capital

- › Arrange financing, invest equity, undertake complex financial modelling and manage our infrastructure investments for optimal returns



Consulting & Advisory

- › Expert consultancy covering the full lifecycle
- › Plan, design and enable major capital projects
- › Extensive engineering and master planning capabilities



Digital & AI

- › Digital products and tools to enhance delivery
- › IoT, mobility services and strategic digital asset management solutions



Design & Engineering

- › Concept, feasibility and design services
- › Human-centered innovative digital design tools and techniques
- › End-to-end offering, from initial regulatory approvals to final build
- › 20+ years of experience offering simulation consultancy and advice



Procurement

- › Procurement Management
- › Contract Administration
- › Purchasing
- › Expediting
- › Material Management
- › Logistics
- › Quality Surveillance
- › Inspection, Material Control



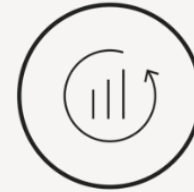
Construction & Project Management

- › Multi-disciplinary construction and technical field services
- › Construct, commission, maintain, and enhance assets
- › Self-performed construction using a qualified labour force
- › Consultancy services and entire program management
- › Business change programs



Operations & Maintenance

- › Around-the-clock support for mission-critical activities
- › Operate and maintain major public-private partnership (P3) projects

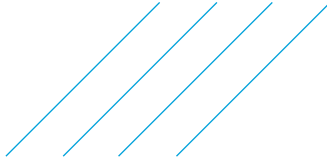
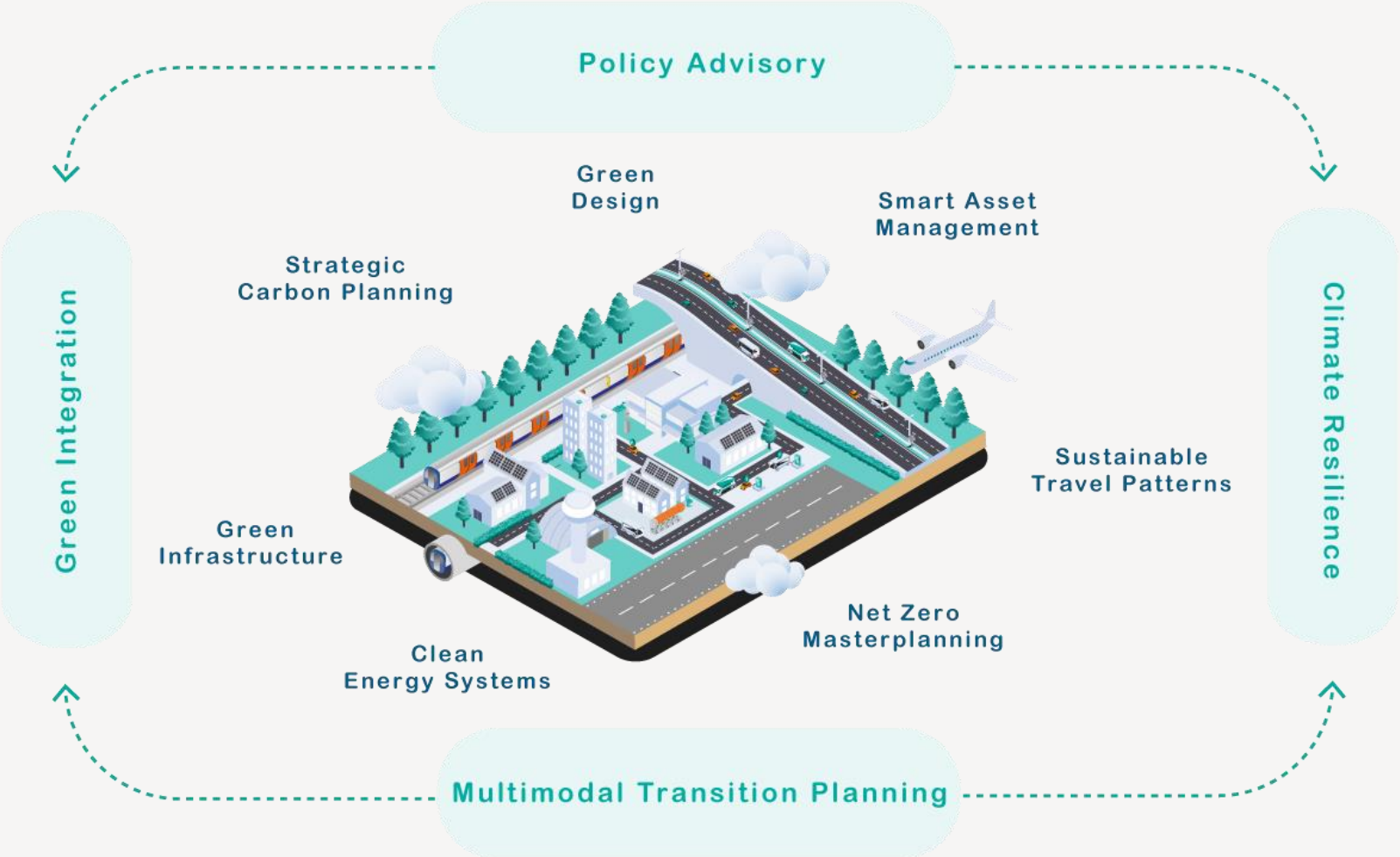


Sustaining Capital

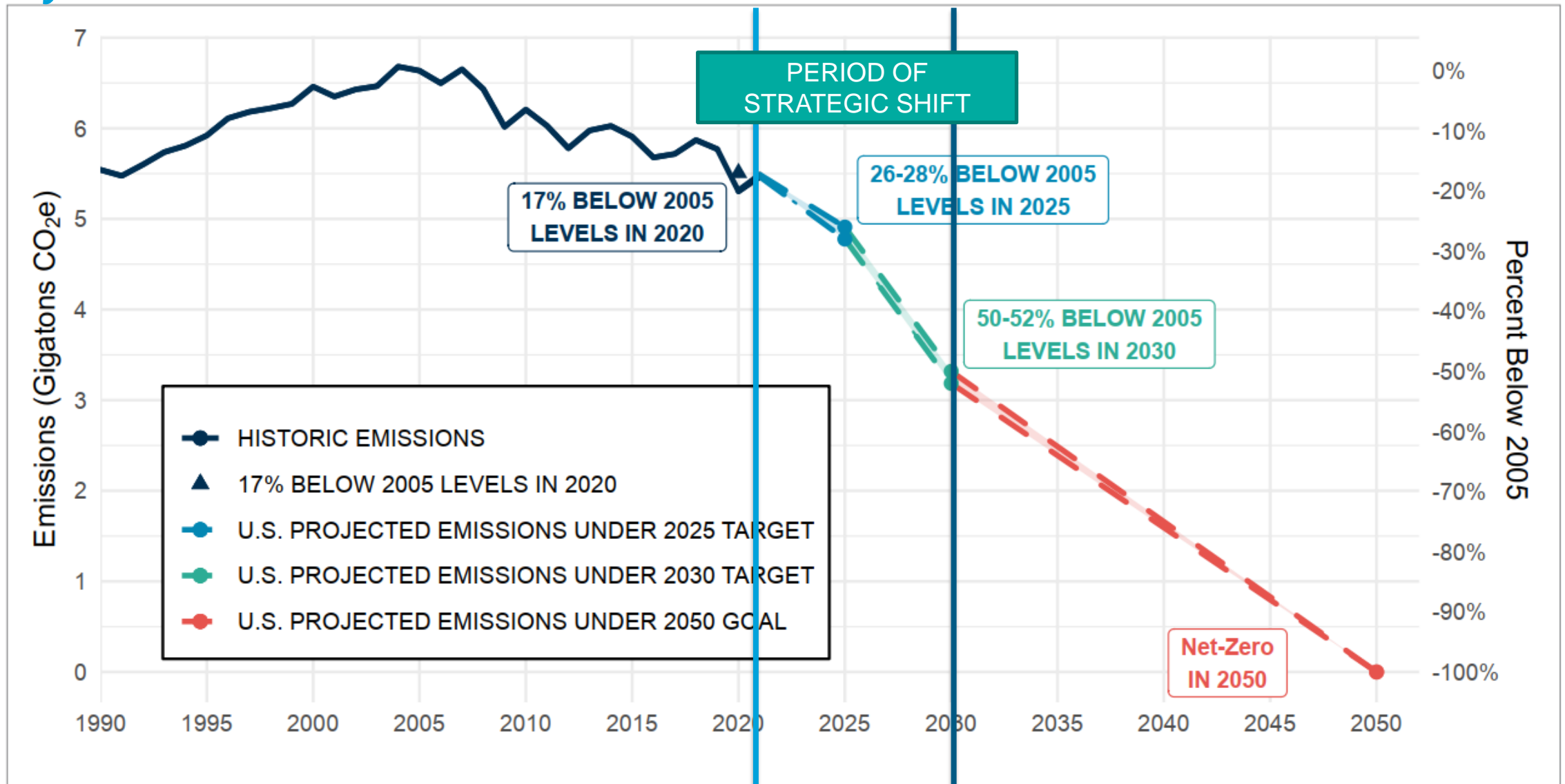
- › In-depth review of end-to-end operations, asset portfolios and value chain
- › Asset management and solutions to reduce costs and improve productivity



Transportation is our Core Business

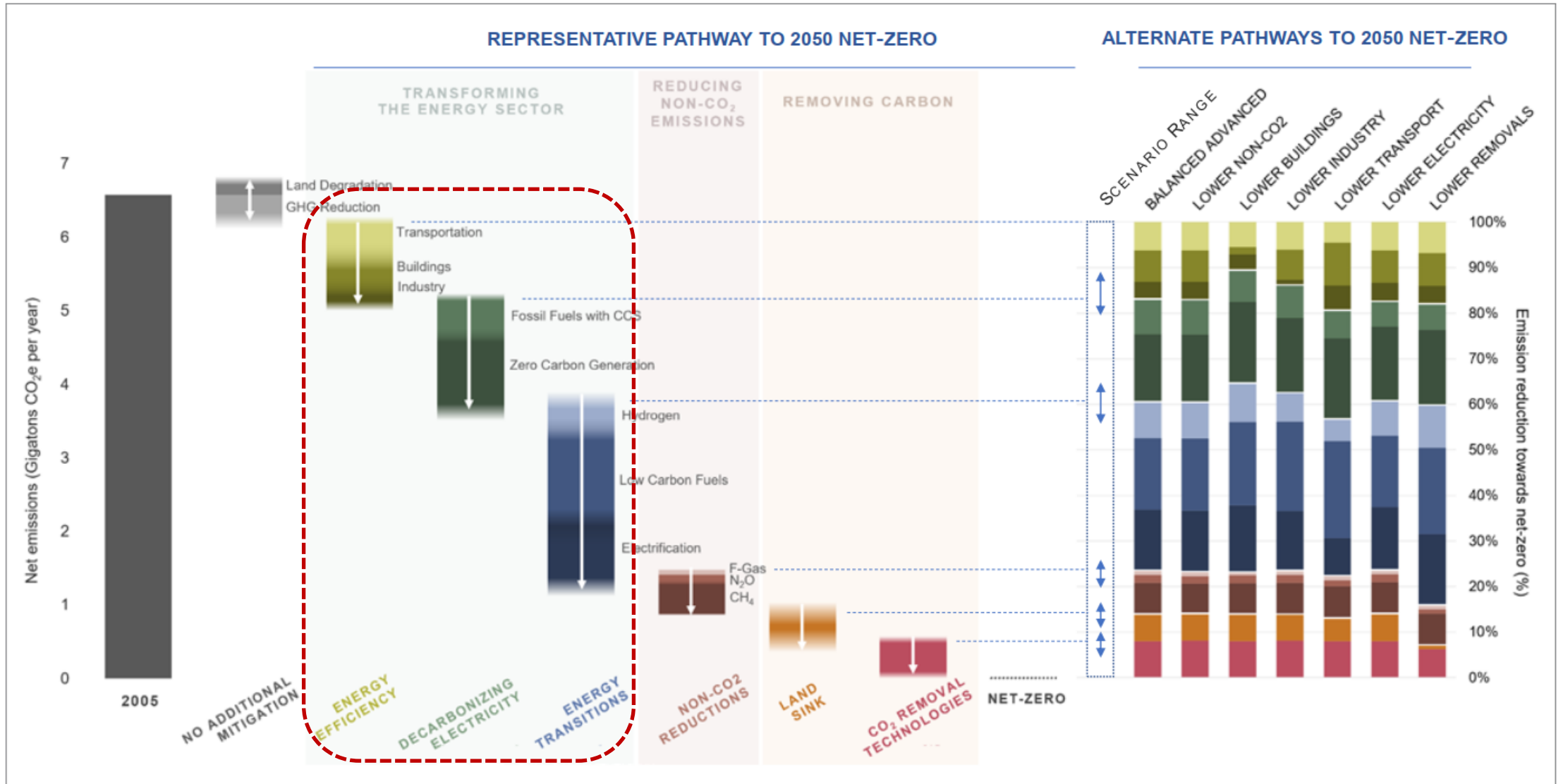


The Long-Term Strategy of the US to Reach Net-Zero Emissions by 2050



US Pathways to 2050 Net Zero

Courtesy: The Long-Term Strategy of the United States to Reach Net-Zero Emissions by 2050



US Key Goals by Economic Sectors

➤ Electricity

- › 100% carbon pollution free electricity by 2035

➤ Transportation

- › 50% of all new light-duty cars sold in 2030 to be zero-emission vehicles
- › Produce 3 billion gallons of sustainable aviation fuel by 2030

➤ Buildings

- › Rapidly improve energy efficiency
- › Increase the sales share of clean and efficient electric appliances

➤ Industry

- › Energy efficiency; electrification; low-carbon fuels, and industrial CCS

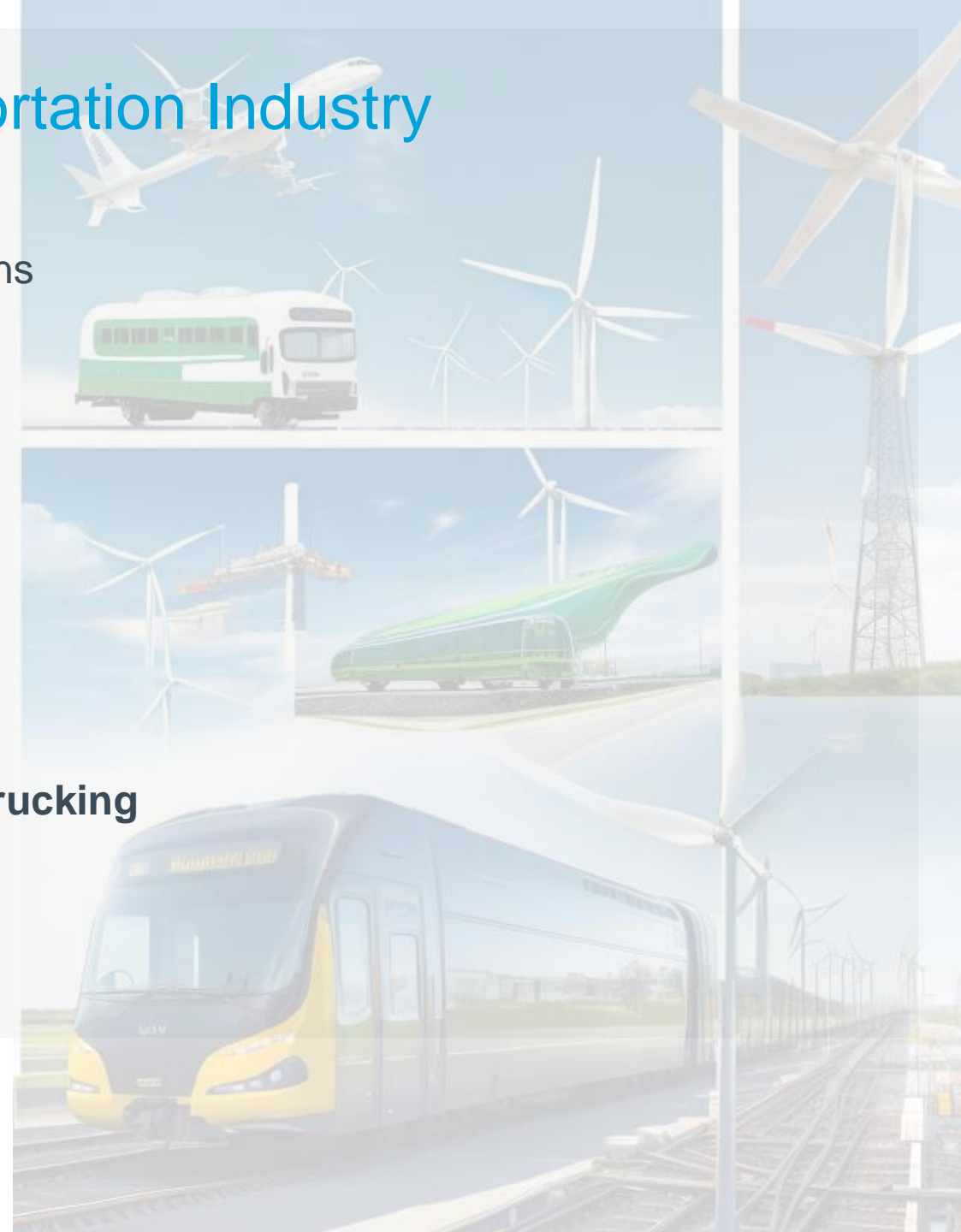
➤ Agriculture, Forestry, and Land Use

- › Expand and protect forests, integrate trees into urban areas, scaling up climate-smart agri-practices

Net Zero Strategy for the US Transportation Industry

Highest emitting sector, representing **29%** of all US emissions

- Transforming fleets to Zero Emission Vehicles (ZEVs)
- Infrastructure to support inter-modal public transit
 - › Electrifying segments of the **rail system**
 - › Enabling **electric grid** along railroad “right of way”
 - › “**Vehicle to grid**” innovations for grid services
- › Accelerated R&D to decarbonize **aviation, marine, and trucking** segments
 - › Biofuels
 - › Hydrogen



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Overview of the Mass Transit (Buses) Sector in the US

- Over 1,500 local, regional, and state level transit authorities in the US.
- In 2020 there were approx. 967,450 registered buses nationwide (Per Bureau of Transportation Statistics)
- Based on the # of passenger trips, some of the nations' largest transit authorities include:
 - Metropolitan Transportation Authority (MTA) - New York City ~5,700 buses
 - Los Angeles County Metropolitan Transportation Authority (LACMTA) ~2,200 buses
 - Chicago Transit Authority (CTA) ~ 1,800 buses
 - Washington Metropolitan Area Transit Authority (WMATA) ~1,500 buses
- On the private side companies like Greyhound operates, approx. 1,700 in the US, Coach USA operates approx. 2,250, and Student First operates approx. 44,000

Average Co2
per gallon of
fuel burned.

Diesel
22.4lbs

Gasoline
19.6lbs

CNG
15.7lbs



Key Strategies to Decarbonize Bus Depots

- **Zero Emission Fleet:** Transformation to Zero Emission Vehicles
- **Renewable Energy Integration:** Procurement and generation of renewable energy
- **Energy Efficiency Measures:** Optimizing building and equipment energy usage
- **Battery Energy Storage Systems:** Deploying BESS can store access energy
- **Green Infrastructure and Landscaping:** Green spaces, water management, bio-diversity etc.

Funding and supportive policies to enable and accelerate decarbonization efforts.



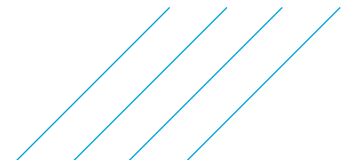
Decarbonization of Bus Depots: Opportunities

- **GHG Reduction:** Dependent on technology selection
- **Air Quality Improvements:** No Nitrogen Oxides (Nox) or Particulate Matter (PM)
- **Fuel Cost Savings:** Low fuel price fluctuations, and potential lower fuel costs
- **Operational Cost Savings:** Lower maintenance and operational cost predicted
- **Noise Reduction:** Low urban noise pollution, especially electric buses
- **Resilience and Energy Independence:** Low exposure to geopolitical risks etc.

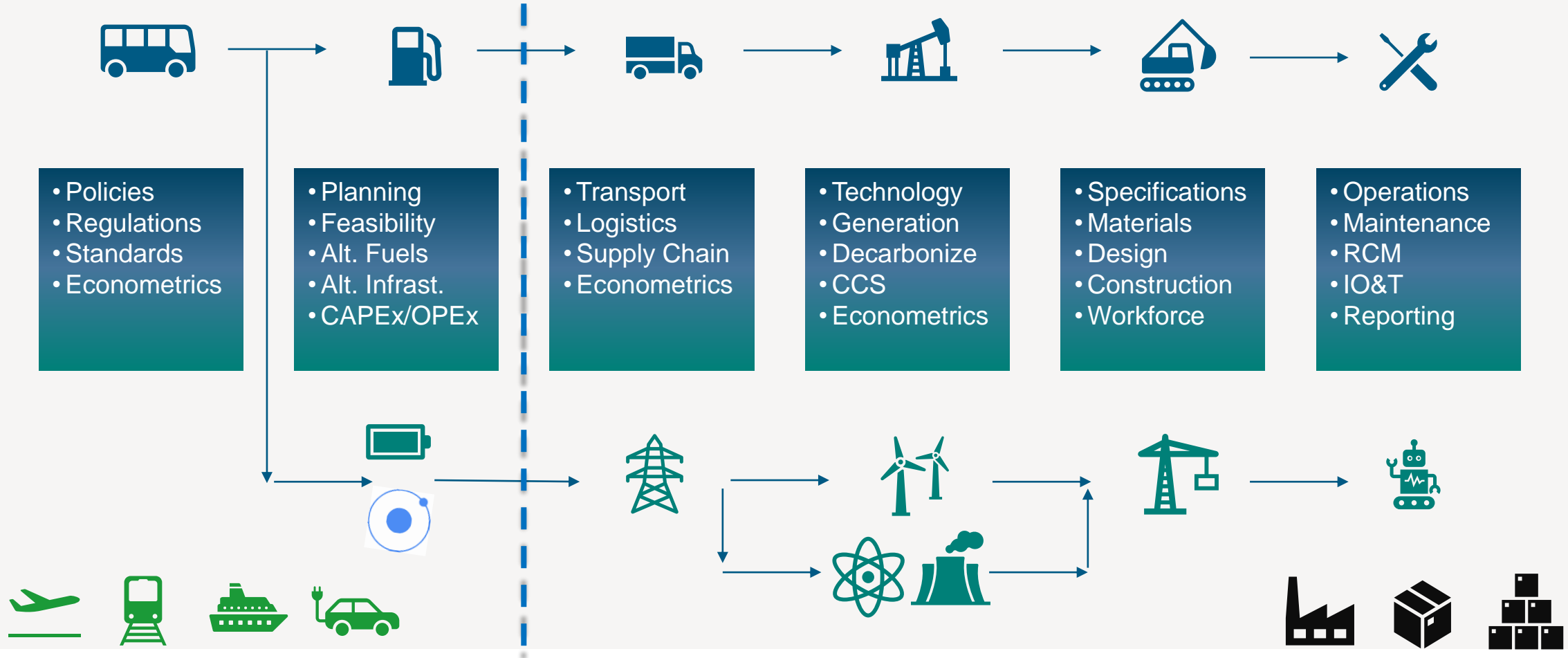


Decarbonization of Bus Depots: Challenges




- Higher Initial Costs: Higher capital costs for zero emission vehicles
- Limited Driving Range: Limited range could add to operational inefficiency
- Charging Infra: Building reliable charging infra can be complex and costly
- Longer Refueling Times: Longer refueling time may impact scheduling
- Limited H2 Infrastructure: H2 infra can be complex, time consuming, and costly
- Technology Constraints: Specialized maintenance and workforce training


















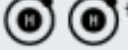




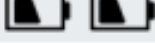


Fleet Transformation: Technological Uncertainties



Technology Solutions for Travel Modes to Reach Net Zero

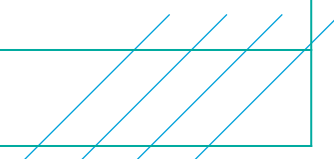
1 icon represents limited long-term opportunity 
 2 icons represents large long-term opportunity 
 3 icons represents greatest long-term opportunity 

	 BATTERY/ELECTRIC	 HYDROGEN	 SUSTAINABLE LIQUID FUELS
Light Duty Vehicles (49%)*		—	TBD
Medium, Short-Haul Heavy Trucks & Buses (~14%)			
Long-Haul Heavy Trucks (~7%)			
Off-road (10%)			
Rail (2%)			
Maritime (3%)			
Aviation (11%)			
Pipelines (4%)		TBD	TBD
Additional Opportunities	<ul style="list-style-type: none"> • Stationary battery use • Grid support (managed EV charging) 	<ul style="list-style-type: none"> • Heavy industries • Grid support • Feedstock for chemicals and fuels 	<ul style="list-style-type: none"> • Decarbonize plastics/chemicals • Bio-products
RD&D Priorities	<ul style="list-style-type: none"> • National battery strategy • Charging infrastructure • Grid integration • Battery recycling 	<ul style="list-style-type: none"> • Electrolyzer costs • Fuel cell durability and cost • Clean hydrogen infrastructure 	<ul style="list-style-type: none"> • Multiple cost-effective drop-in sustainable fuels • Reduce ethanol carbon intensity • Bioenergy scale-up

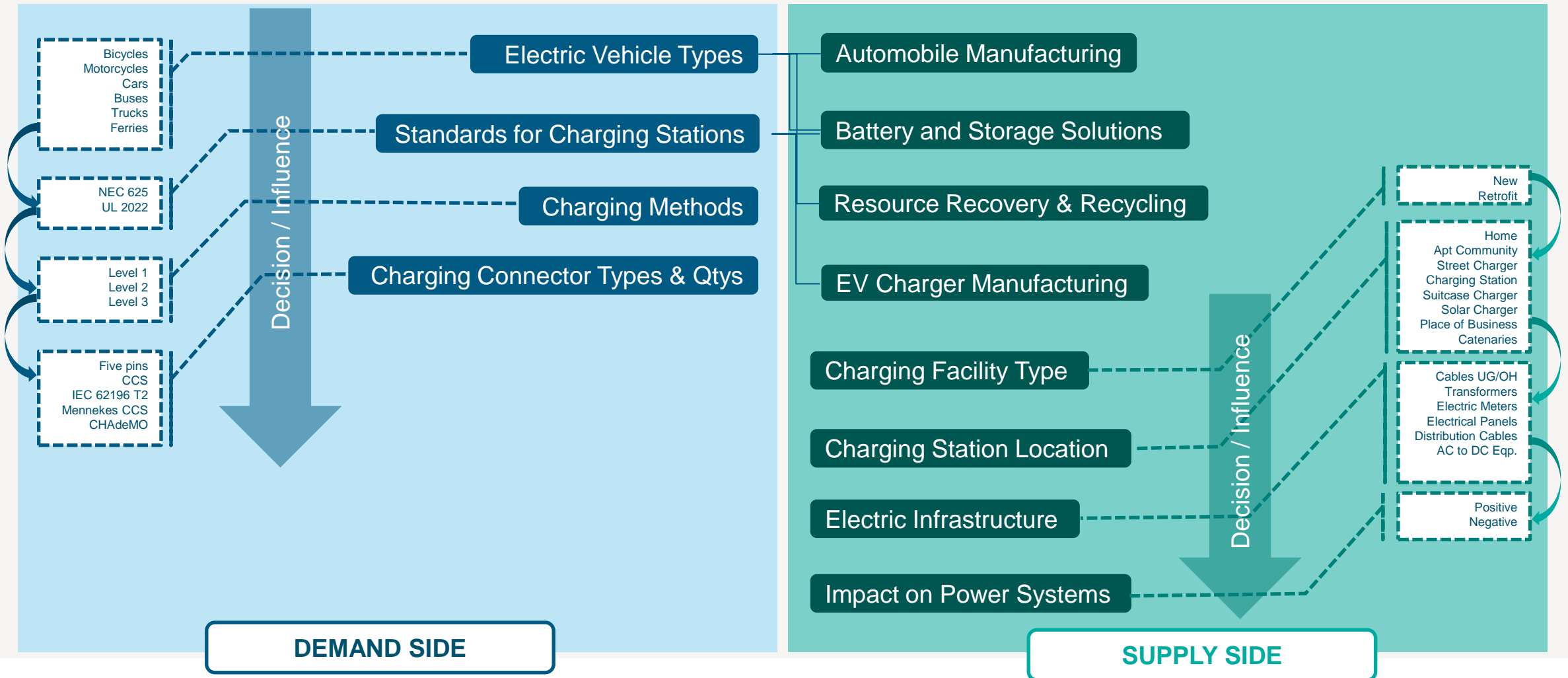
Courtesy: The US National Blueprint for Transportation Decarbonization (Fact Sheet) – January 2023

Fleet Transformation: Decision Considerations

Attributes	Key Consideration
Fueling Technology & Infrastructure	<ul style="list-style-type: none">• Availability & Accessibility• # of Fueling Stations• Fuel Suppliers• Government and Industry Plans & Partners
Vehicle Performance and Range	<ul style="list-style-type: none">• Driving Range• Refueling Times• Reliability
Safety and Training	<ul style="list-style-type: none">• Safety Protocols• Training Programs• Handling, Fueling, Maintaining, Emergency Response etc.
Fleet Size and Scalability	<ul style="list-style-type: none">• Fleet Size• Future Expansion• Funding Options• Hybrid Operations
Total Cost of Ownership	<ul style="list-style-type: none">• Procurement Costs• Infrastructure Costs• Maintenance Costs• Fueling Costs
Partnership and Support	<ul style="list-style-type: none">• Stakeholder Support• Fuel Suppliers• Manufacturers• Research Institutions
Environmental Impact	<ul style="list-style-type: none">• Life Cycle Emissions• Whole Life Carbon Modeling



Electric Bus Fleets: Charging Infra. Considerations



Key Considerations during Mixed Fleet Operations

- **Infrastructure requirements**
 - Dual/multiple refueling infrastructure may be needed for the selected technologies
- **Training and maintenance**
 - Specialized training for maintenance personnel for each fleet type
- **Inventory and sparing**
 - Inventory of different parts, tools, equipment specific to bus type
- **Operational planning and scheduling**
 - Driving ranges, refueling times, emergency response etc.
- **Training and transition of operators**
 - Operator training to handle specific technologies
- **Fleet transition and integration**
 - Coordination between internal and external stakeholders





Thank You



Masjood Jafri
Resiliency Market Director
P: +1 832 476 3326
E: Masjood.Jafri@atkinsglobal.com