

# **Impact of Alternative Powertrain Technologies on Energy Demand- A Scenario-based Approach**

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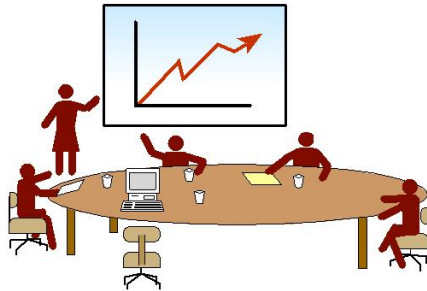
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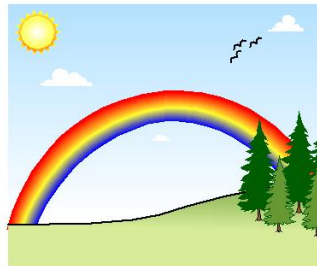
# In an Age of Uncertainty, Scenarios Help Make the Right Decisions



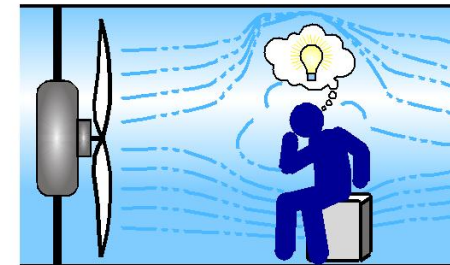
**Outlook for Corporate  
Planning and Budgeting**



**Refresh, Revise, and  
Harden Strategy**



**Identify New Growth  
Opportunities—and Threats**



**“Wind Tunnel” a Specific  
Decision or Investment**



Source: IHS CERA, IHS Global Insight, IHS Jane's.  
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# Challenging Conventional Wisdom

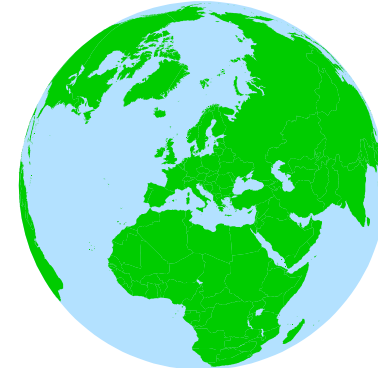
- **Scenarios = foresight, ≠ forecasts**
  - Forecasts mask uncertainty.
  - The key challenge for strategic planners is to uncover and evaluate uncertainties.
  - Scenarios put uncertainties on center stage, in a disciplined, creative and internally consistent way.
- **Visionary transformations, or fractured fairytales?**
  - Explore the validity of commonly held beliefs.
  - Develop the consequences in an internally consistent manner.
- **Identify opportunities and minimize risks**
  - Enable strategists and planners to think the unthinkable.
  - What is the best response to plausible future circumstance?
  - Will you prosper or merely survive?



# Structure of the IHS Global Scenarios: Two Components

## **Component 1:** Global Framework (geopolitics, economics, and security)

*Scenario-based economic, geopolitical, and security expertise applied to our industry knowledge—a unique differentiator in the marketplace*



## **Component 2:** Industry-focused Scenarios



**Energy**



**Automotive\***

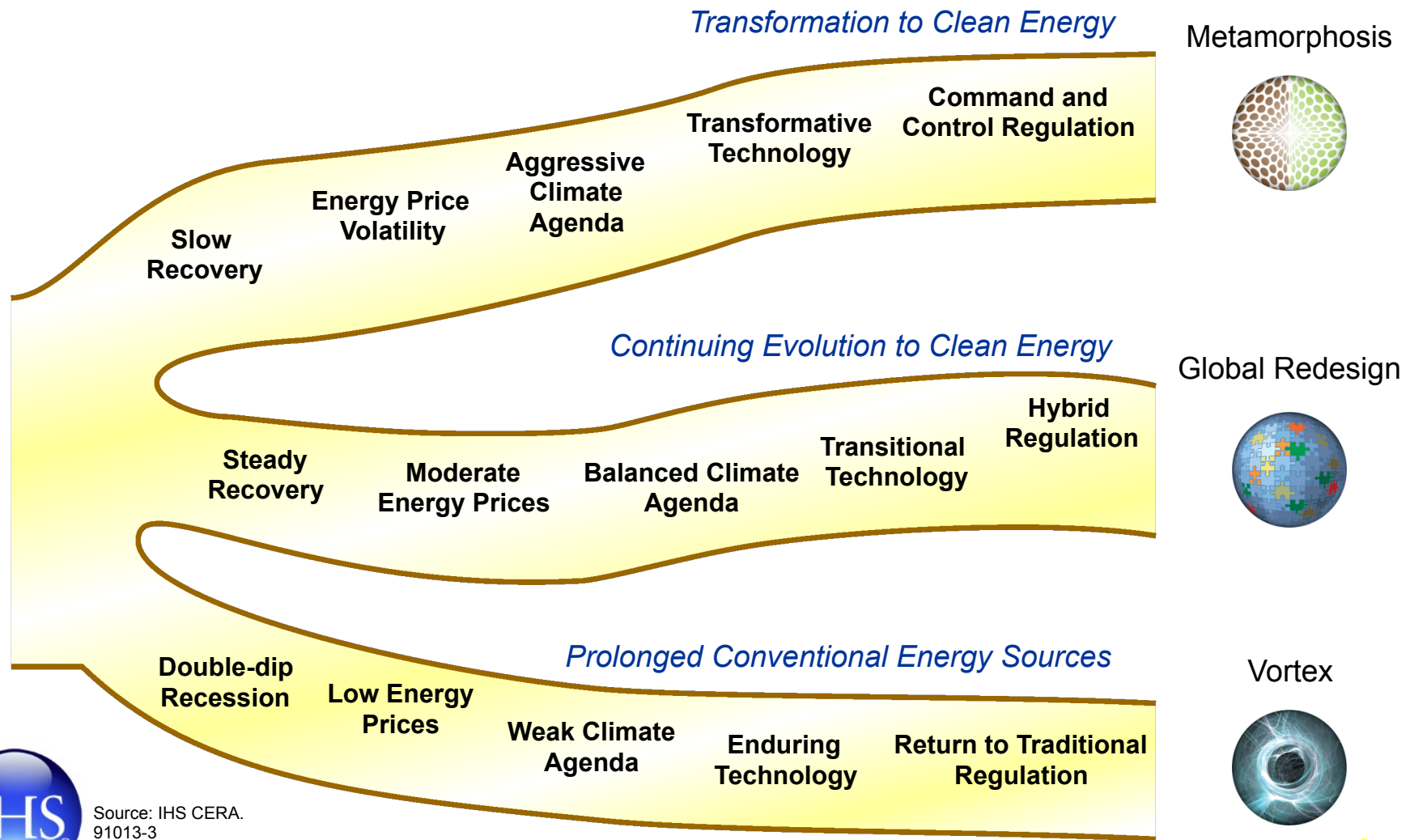


Source: IHS CERA.

\*Light-duty vehicles (cars and light trucks).

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# Three Paths Leading to the Future



Source: IHS CERA.  
91013-3

# Similarities Across the Scenarios



Aging Population



Urbanization



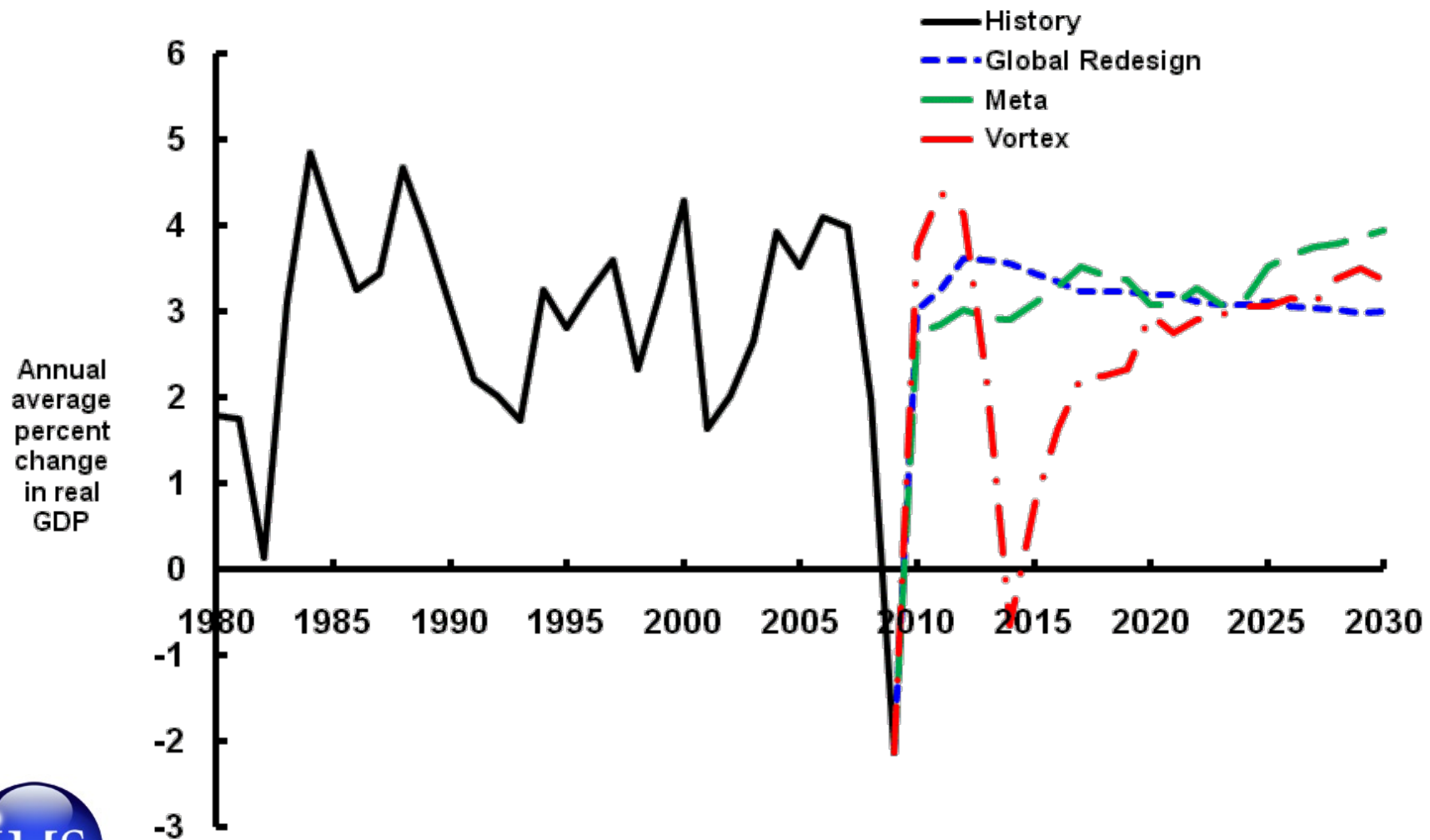
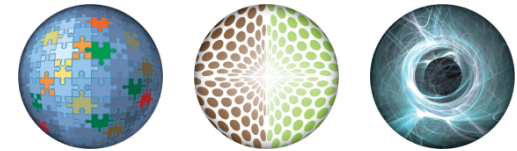
Congestion in Cities



- **An aging population will pose similar challenges across all scenarios**
  - Aging work force
  - Older population drives less
- **Continued urbanization will generate profound changes in vehicle ownership and use**
  - Reduced mileage requirement
  - Decreased relevance of the 2<sup>nd</sup> car
- **Increasing levels of congestion in urban areas will challenge personal motor vehicles**
  - Urban air quality levels
  - Inconvenience of owning a car or ownership “hassle factor”
- **New forms of mobility replace the personal car**
  - Connectivity and texting—“virtual mobility”
  - Telecommuting and video conferencing
  - Mass transit, cycling



# World Economic Growth



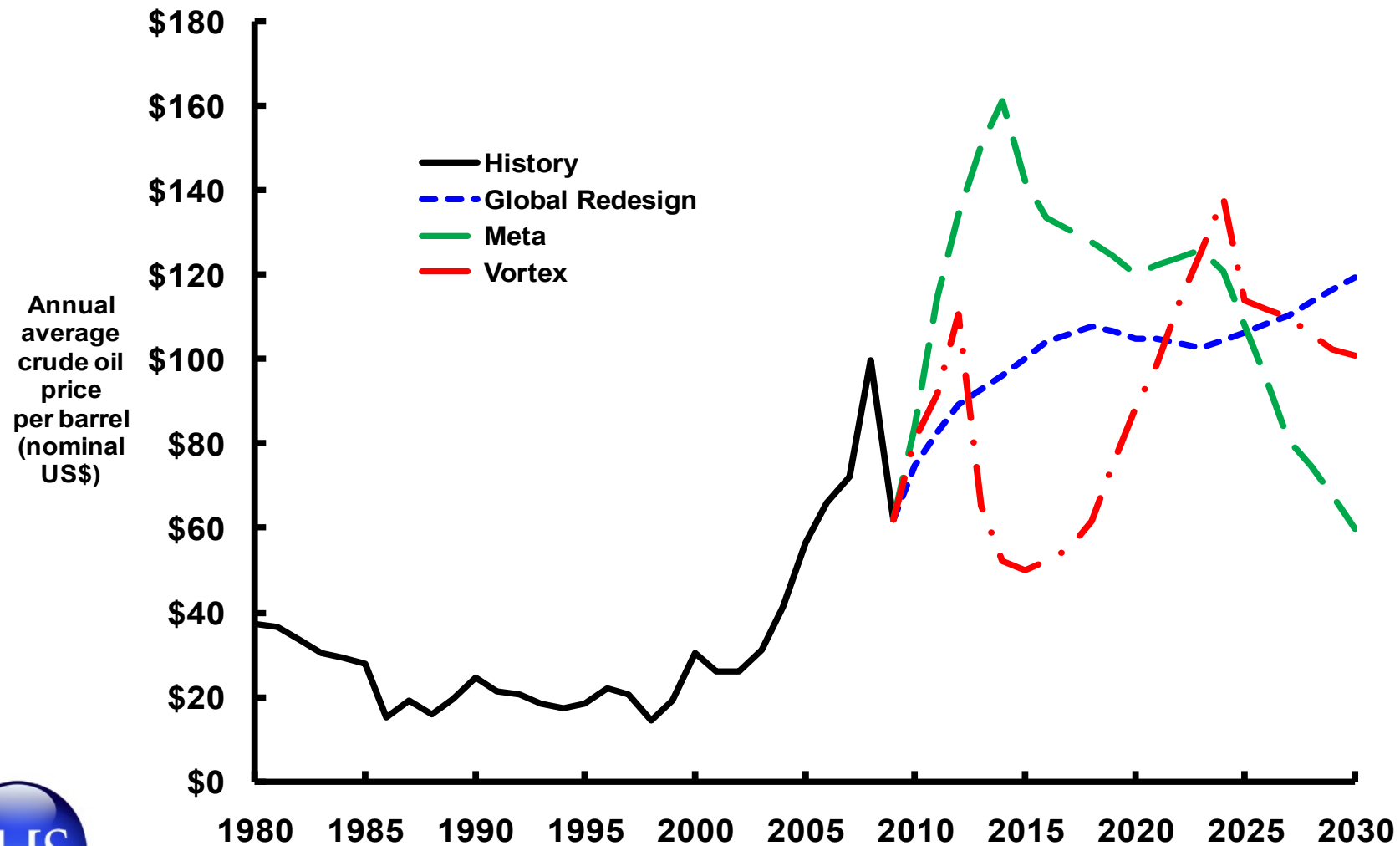
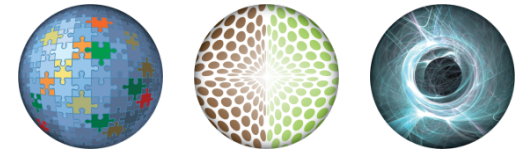
Source: IHS Global Insight.





# Crude Oil Prices

## Nominal US Dollar per Barrel

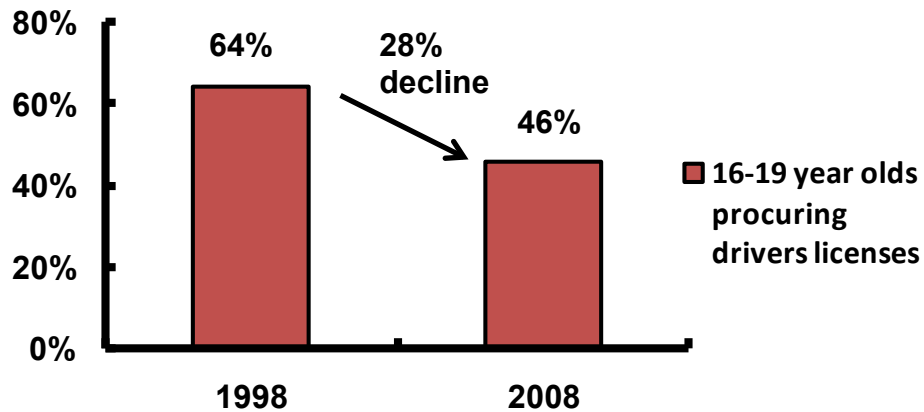


Source: IHS CERA. Price is for West Texas Intermediate crude oil at Cushing, Oklahoma USA.

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# Consumers Relationship with the Car is Changing

US: Young People Are Waiting Longer to Get Their Drivers Licenses



## Influencing Factors

- Increased environmental awareness
- Internet & mobile services offer alternative source of connection & freedom
- Loss of drivers education in high schools
- Higher cost of vehicle ownership
- Demographic changes

New NYC Bike Lane's



London Congestion Charge



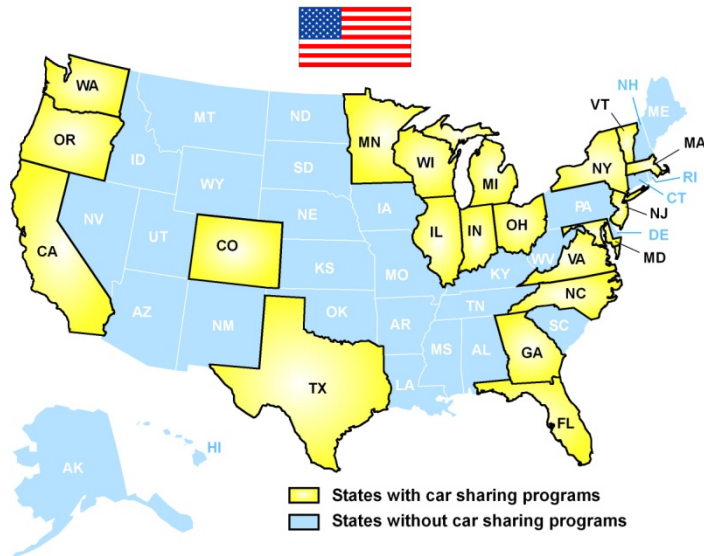
UK: Young People Are Waiting Longer to Get Their Drivers Licenses

## Young License Holders



Source: IHS staff photo.

# Alternative Transportation Options Are Emerging Globally: *Car Sharing Programs*



- eHi launched a car-sharing service in Beijing and Shanghai
- ShareIn Car operates in Shanghai, Lujiacui, Xujiacui.



- Interest from Hong Kong, Taiwan, Seoul



- Orix, Sumitomo, Mitsui programmes in Japan



- Sao Paulo was the 1000<sup>th</sup> city to have car sharing



BMW on Demand



## Daimler CAR2GO Experience



- Car-sharing project in Ulm, Germany
- Currently +18,000 members
- 60% of members are <36 years old
- 30% of all 18–35 year olds in Ulm are members
- Around 50% of members are regular users
- 1<sup>st</sup> year total usage: 3 million km
- Average distance per trip: 15 km



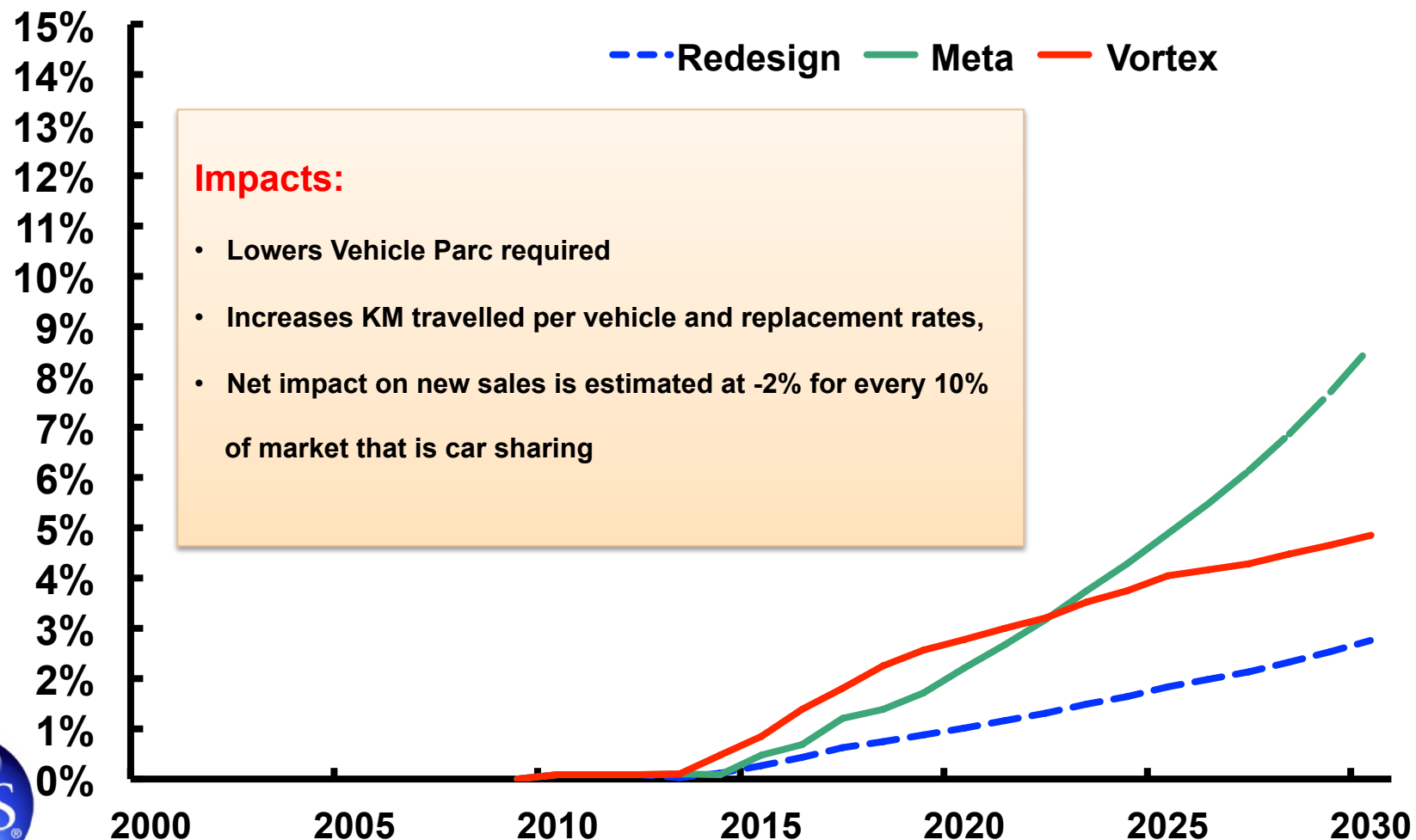
Courtesy Daimler

Source: Shaheen, *North American Car sharing: 10-year Retrospective*, Journal of Transportation Research. 00917-86

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# Car Sharing Begins to Make a Difference by 2030

## % of Drivers Using Car Sharing



# Major Market CO<sub>2</sub> Regulations Postulated Based Upon Scenario-specific Climate Change Objectives and Level of Global Cooperation

(tailpipe CO<sub>2</sub> grams per kilometer)



## GLOBAL REDESIGN

% change

	2015	2020	2025	2030	15-'30
US/Canada	160	140	125	110	31%
Europe	130	95	95	75	42%
Japan	138	120	110	100	28%
China	174	150	120	90	48%
China*	145	125	100	75	48%



## VORTEX

% change

	2015	2020	2025	2030	15-'30
US/Canada	160	150	135	120	25%
Europe	130	110	100	80	38%
Japan	138	125	115	105	24%
China	145	130	110	85	41%



## METAMORPHOSIS

% change

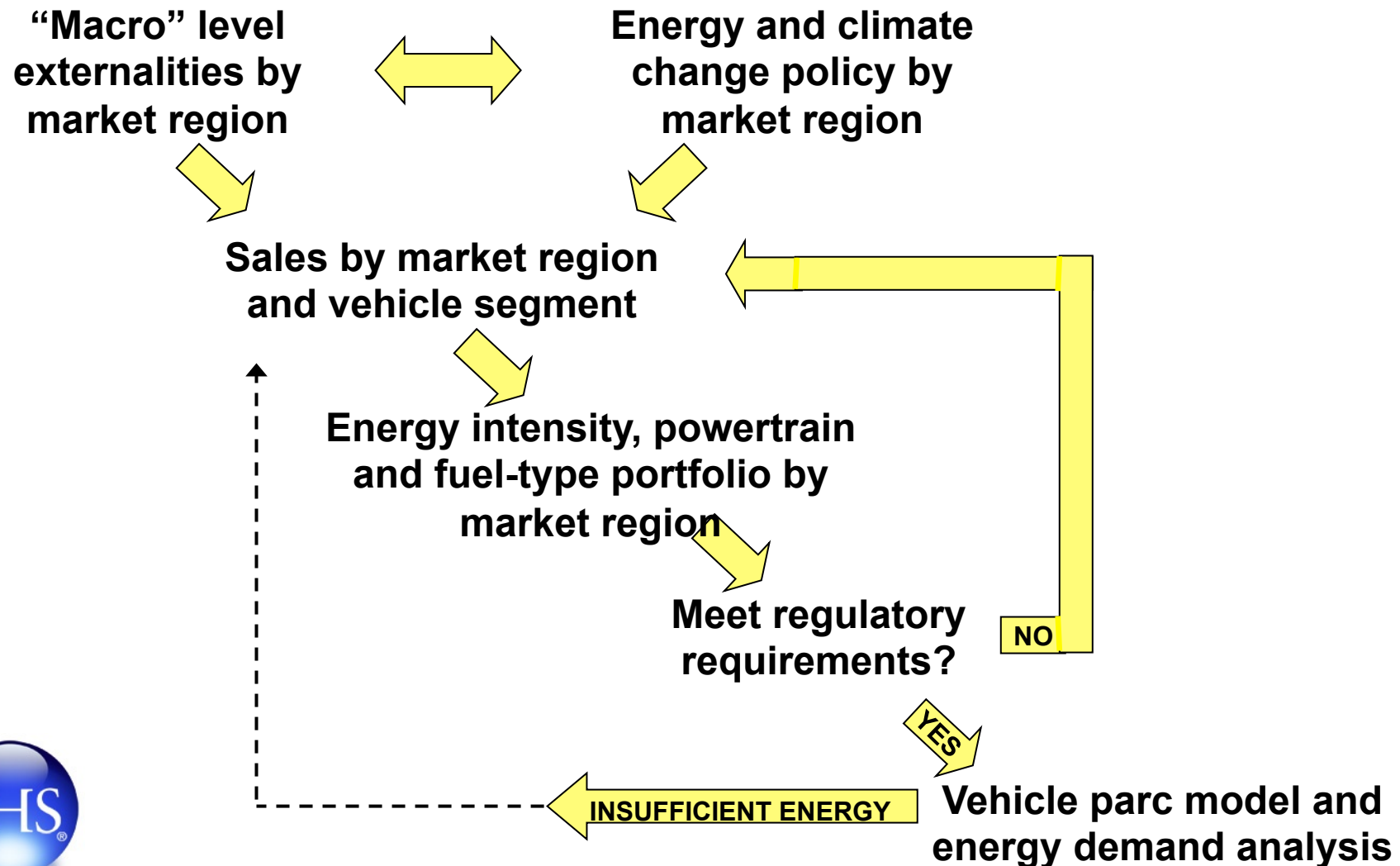
	2015	2020**	2025**	2030**	15-'30
US/Canada	160	130	110	95	41%
Europe	130	95	75	60	54%
Japan	138	110	95	75	46%
China*	145	115	90	65	55%



\* Normalized

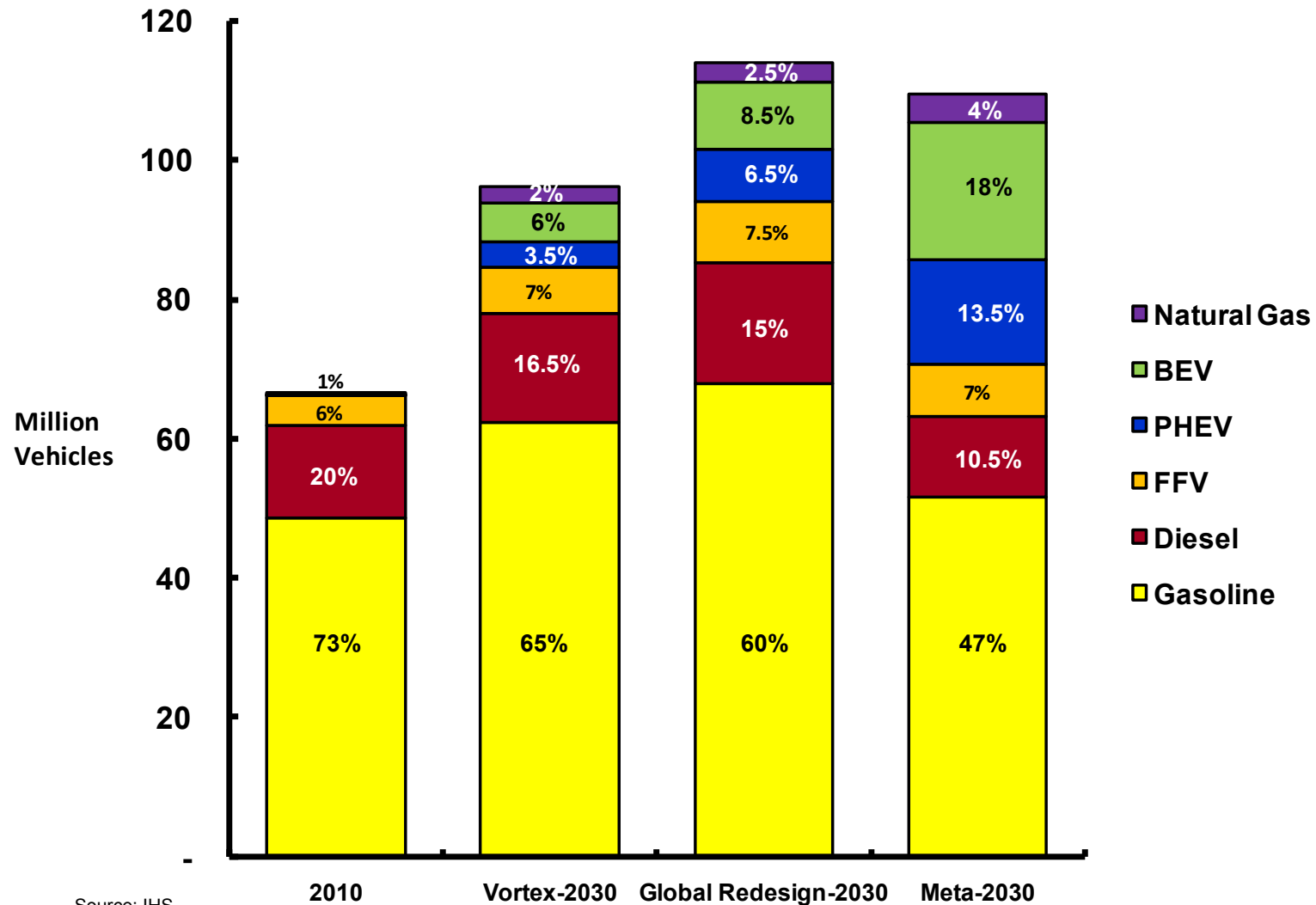
\*\* Well-to-Wheels

# The Methodology Leads to Vehicle and Powertrain Forecasts Consistent With the Regulatory Environment for Each Scenario



# Alternative Vehicle Sales Decrease Petroleum's Market Share of the Global New Vehicle Fleet

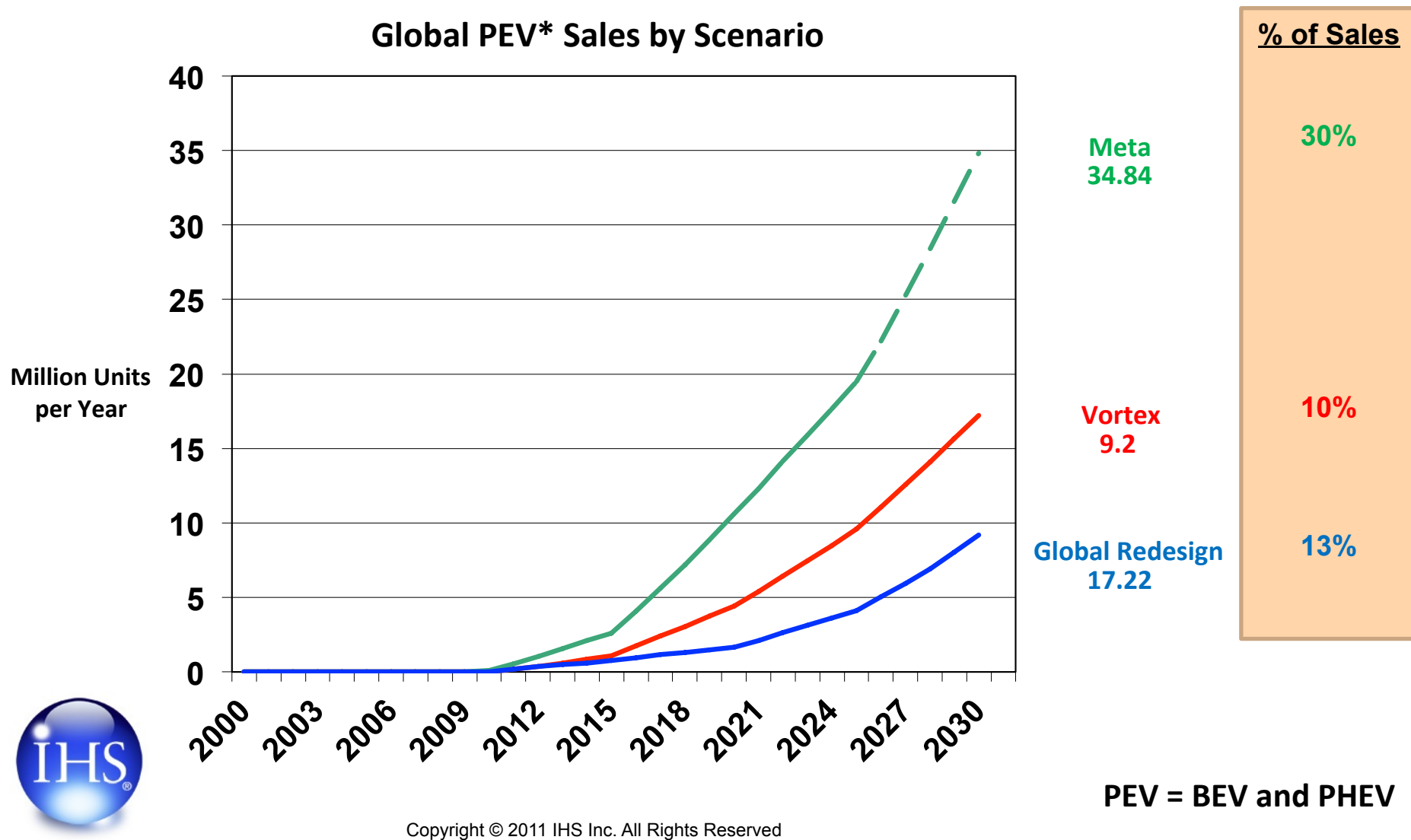
Light Duty Vehicle Sales by Powertrain



Source: IHS.

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# Global Sales of Electric Vehicles Highly Dependent Upon Regulatory Support

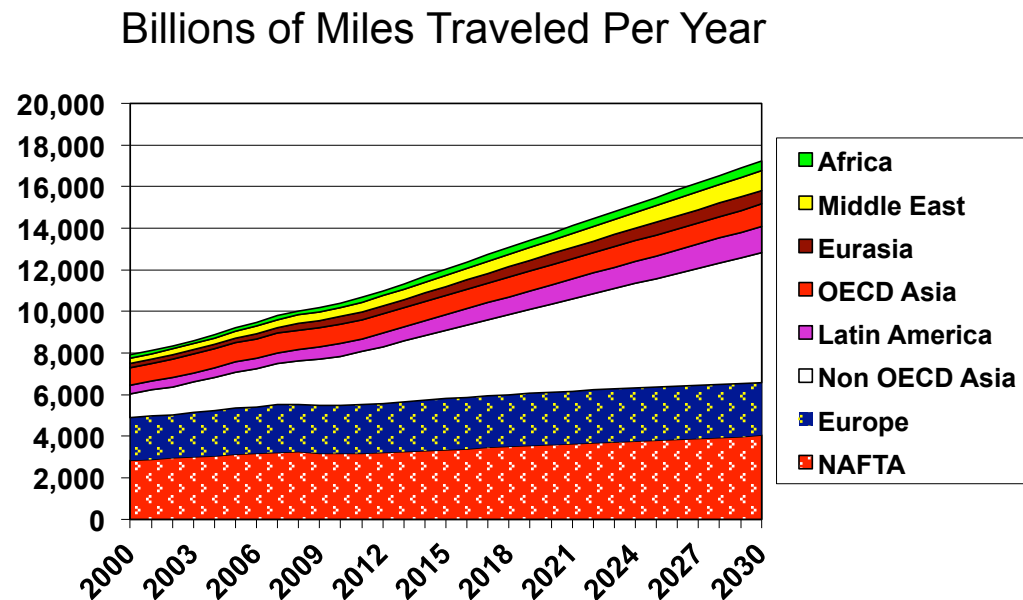




# Collision Course!

## Future Demand for Mobility vs. Societal and Environmental Objectives

- Global vehicle demand and **VMT WILL DOUBLE** overall



- On the other hand, there are global societal demands for reducing emissions of GHG and other toxins from the tail pipe by 50% or more

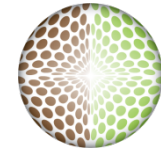


# IHS Light-duty Vehicle (LDV) Fleet Model

- Light-duty passenger fleet model calculates vehicle fleet size, composition, and fuel demand out to 2030 for the three IHS global energy scenarios
- Model inputs can be changed to analyze how different assumptions impact fleet size, technology penetration rates, and fuel consumption
- Model the world as 17 LDV markets
  - **Country Level Models:** *United States, Canada, Mexico, China, India, Brazil, Iran, Saudi Arabia, Russia, and Japan*
  - **Regional Models:** *Europe, Latin America (ex. Brazil), Eurasia (ex. Russia), OECD Asia (e.g., Japan), Non-OECD Asia (ex. China and India), Rest of the Middle East, and Africa*

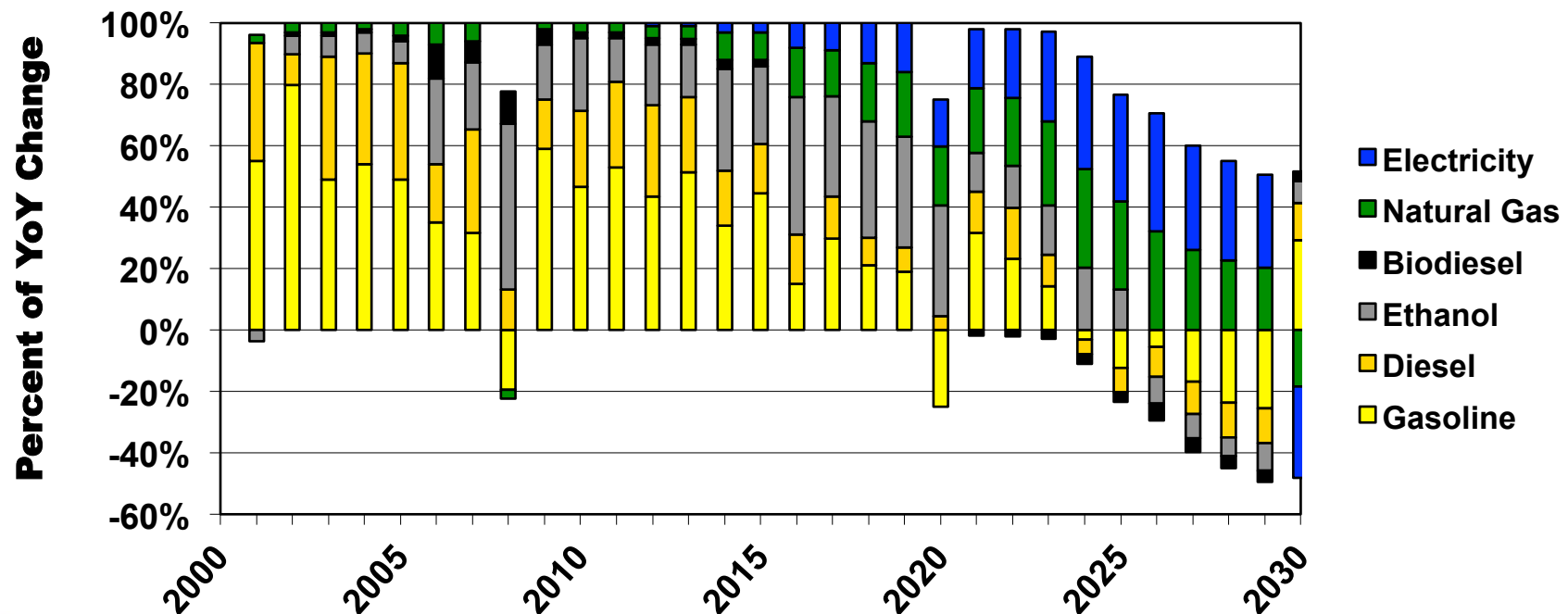


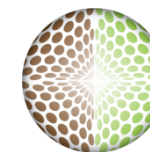
# Petroleum's Role of Meeting Incremental LDV Energy Demand Growth Is Dropping



***Natural Gas and Electricity are virtually the only fuels to significantly increase their Incremental Demand after 2026***

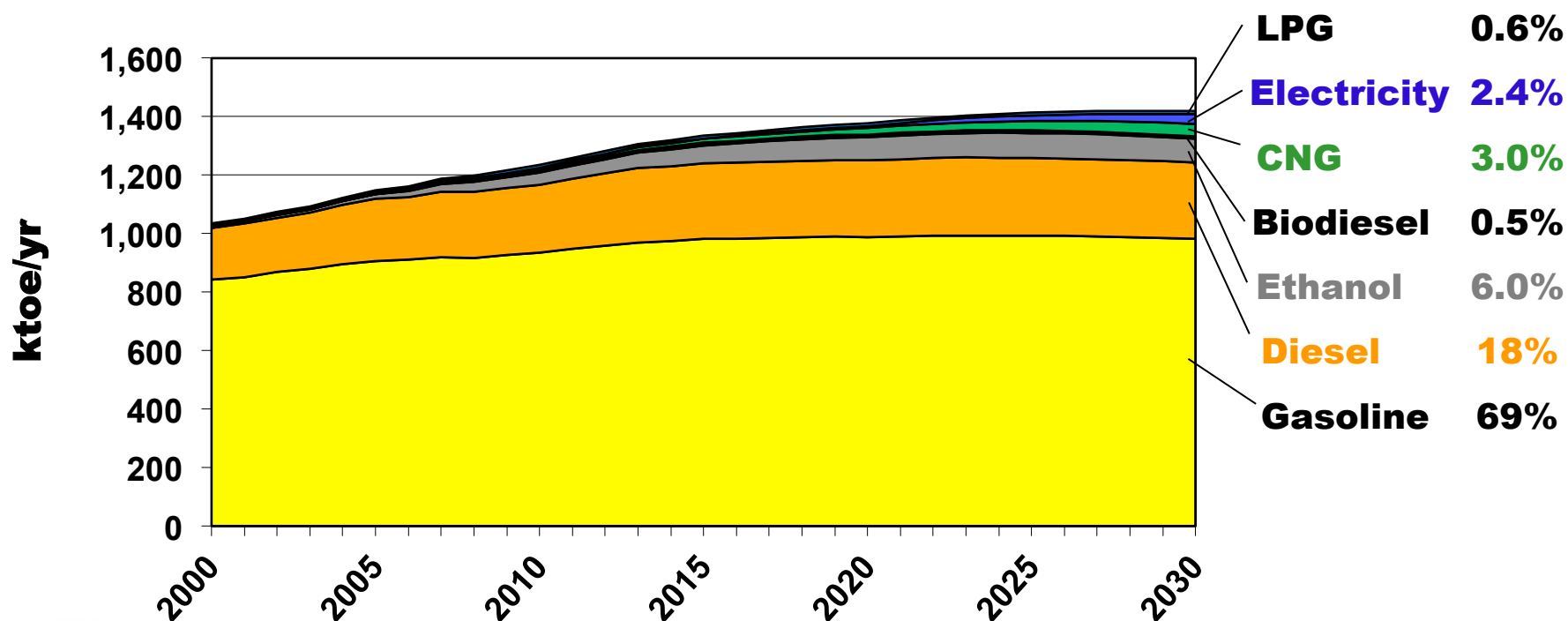
## Incremental Share of Demand Growth



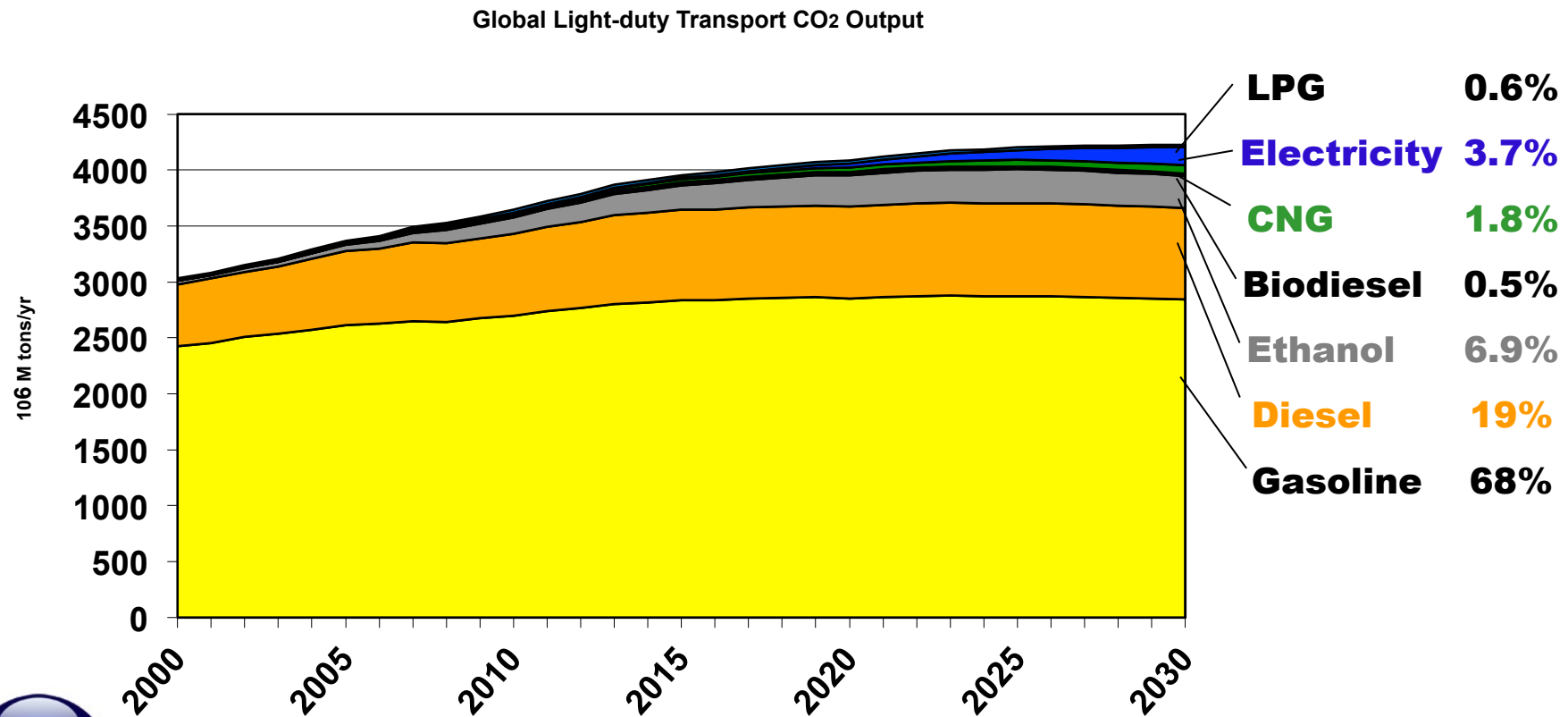
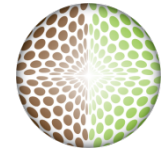


# EVs Will Barely Make a Difference by 2030!

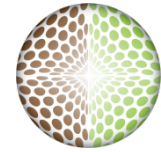
## Global Light-duty Transport Energy Demand



# Petroleum Still Responsible for 87% of Light-duty Transport CO<sub>2</sub> by 2030



# **Light-duty Energy Demand is Expected to Level off by 2030 in the Most Aggressive Climate Change Scenario**



- **To reach the objective of a 50% reduction in GHG by 2050 we need to accelerate the introduction of advanced technologies faster than we can imagine!**
- **Petroleum shows lowest incremental demand growth >2015**
  - Gasoline almost levels off
  - Diesel contribution has second-lowest incremental increases
  - Retains 87% of global transport energy supply by 2030
- **Biofuels (including blends) offer the greatest incremental improvements through 2020**
- **Electricity shows the greatest incremental gains after 2022**
  - But, grid-based vehicles still account for less than 3% of total vehicle energy demand by 2030



**Thank you!**



**Questions?**

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