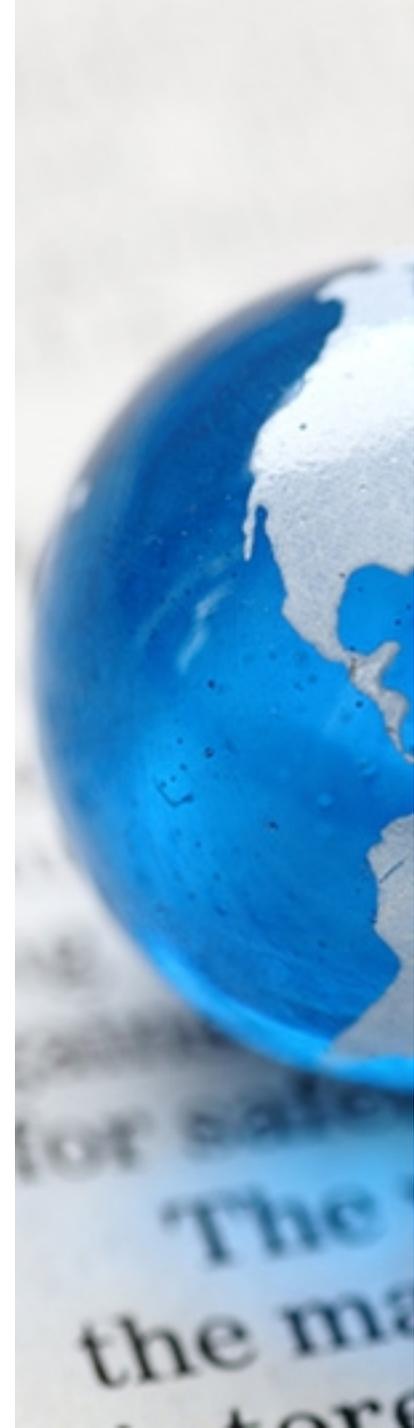


Automotive Market Forecasts to 2040

-Impact of Net-Zero CO2 on Powertrains-

Global Manufacturing Industry Consulting Department
Consulting Division
Nomura Research Institute, Ltd.

October 2021

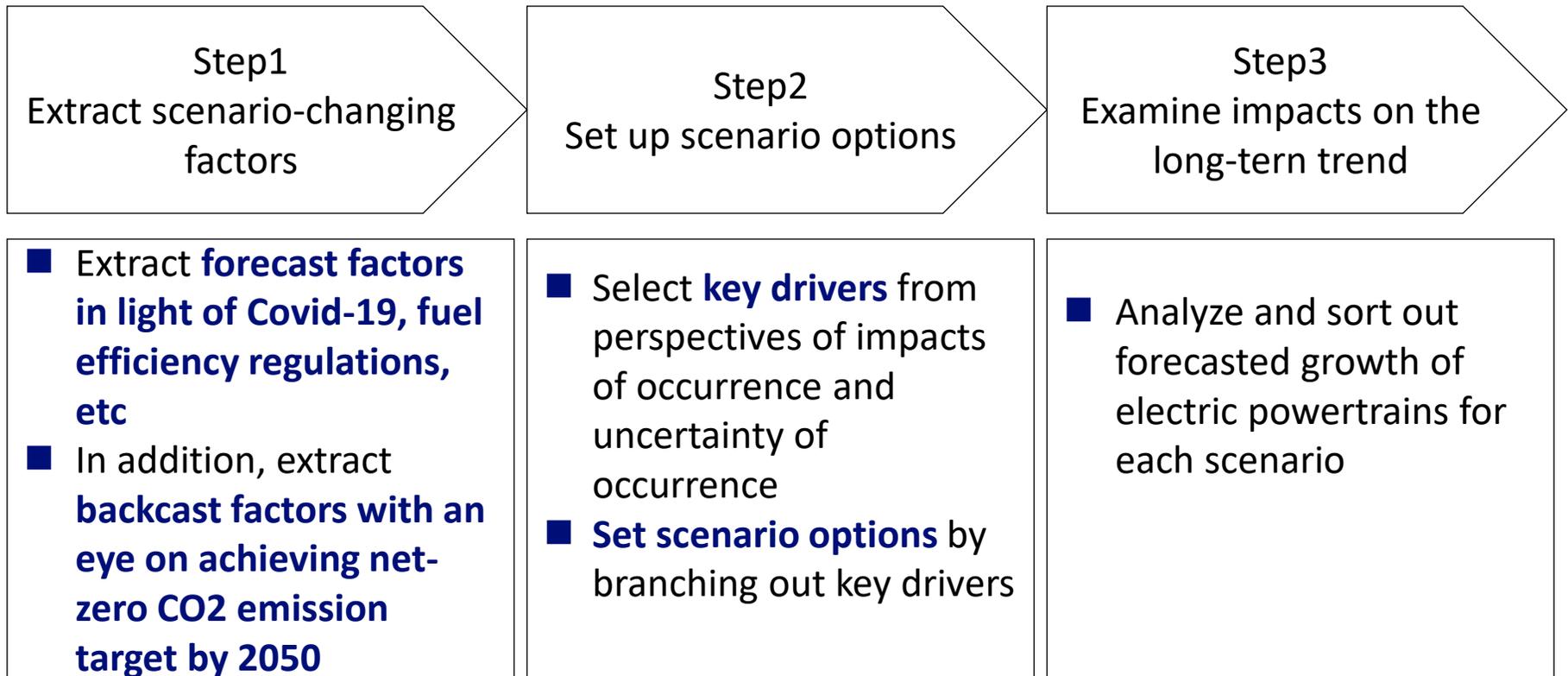


Summary

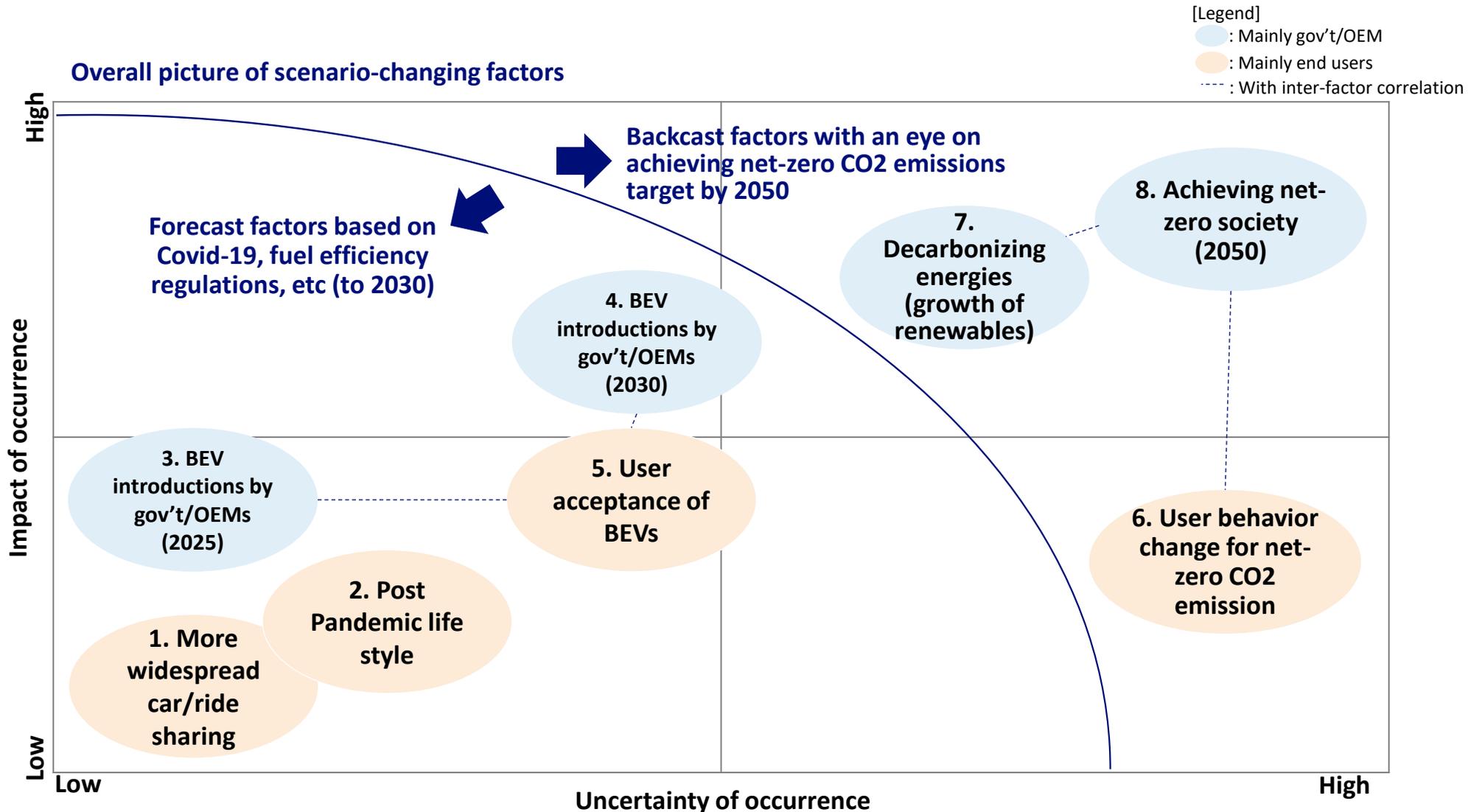
- NRI did a study on Automotive Market Forecasts to 2040, focused on impacts of Net-Zero CO2 on Powertrains.
- The study concluded that the sales volume of internal combustion engine vehicles may peak in 2030.
- Vehicle manufacturers and parts suppliers should develop detailed mid- to long-term roadmap with an eye on the widespread use of electric vehicles.

Using a technique called scenario planning, the long-term trend of the external conditions surrounding automotive business were identified.

Scenario Planning Implementation Steps:



Scenario-changing factors were extracted from both forecast and backcast.



Notes) BEV: Battery Electric Vehicle; vehicles that run without using fossil fuels.

OEM: Original Equipment Manufacturers.

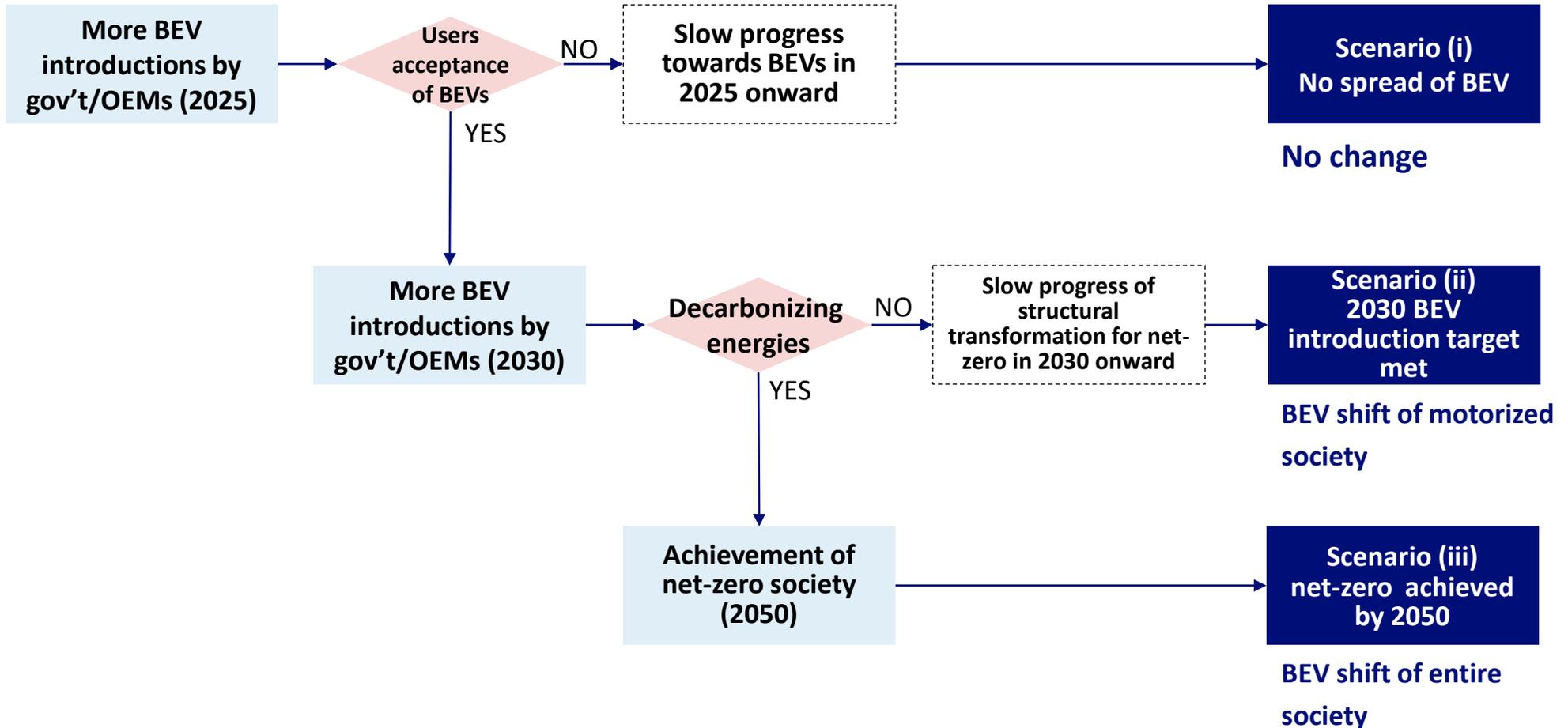
Overall picture of scenario-changing factors

Classification	No.	Changing factors	Overview	Impact	Uncertainty
Forecast factors	1	Widespread of car/ride sharing	• Shift in users' value from ownership to usage promotes more use of car/ride sharing mainly in central Tokyo.	Low	Low
	2	Post Pandemic life-style	• Activities with less physical contacts such as working from home continue or even expand after pandemic.	Low	Low
	3	More BEV introductions by gov't/OEMs (to 2025)	• Stringent fuel efficiency regulations of the government stretch BEV production plans of OEMs.	Medium * Impact gets bigger with Factor 5's realization	Low
	4	More BEV introductions by gov't/OEMs (to 2030)	• OEMs make full-scale investments for BEV-only production lines to meet the 2030 Fuel Efficiency Regulations.	Medium * Impact gets bigger with Factor 5's realization	Medium
	5	User acceptance of BEVs	• Environmentally-advanced nature and total cost of BEVs are accepted by users.	Impact is included in Factors 3 and 4	Medium
Backcast factors	6	User behavior change for net-zero CO2 emission	• Users spontaneously change their behavior to achieve net-zero CO2 emission. (Eco-friendly driving, more modal share to bicycles, walking, etc)	Low	High
	7	Decarbonizing energies (growth of renewables)	• In response to the government's energy decarbonization policies, renewables and carbon recoveries increase.	Impact included in Factor 8	High
	8	Achieving net-zero society (2050)	• Ban on sales of IC vehicles, adoption of carbon tax, etc. accelerate shift from IC vehicles to BEVs.	High	High

Setting scenario options: Setup logic

Set scenario options using “user acceptance of BEVs” and “decarbonizing energies” as key drivers.

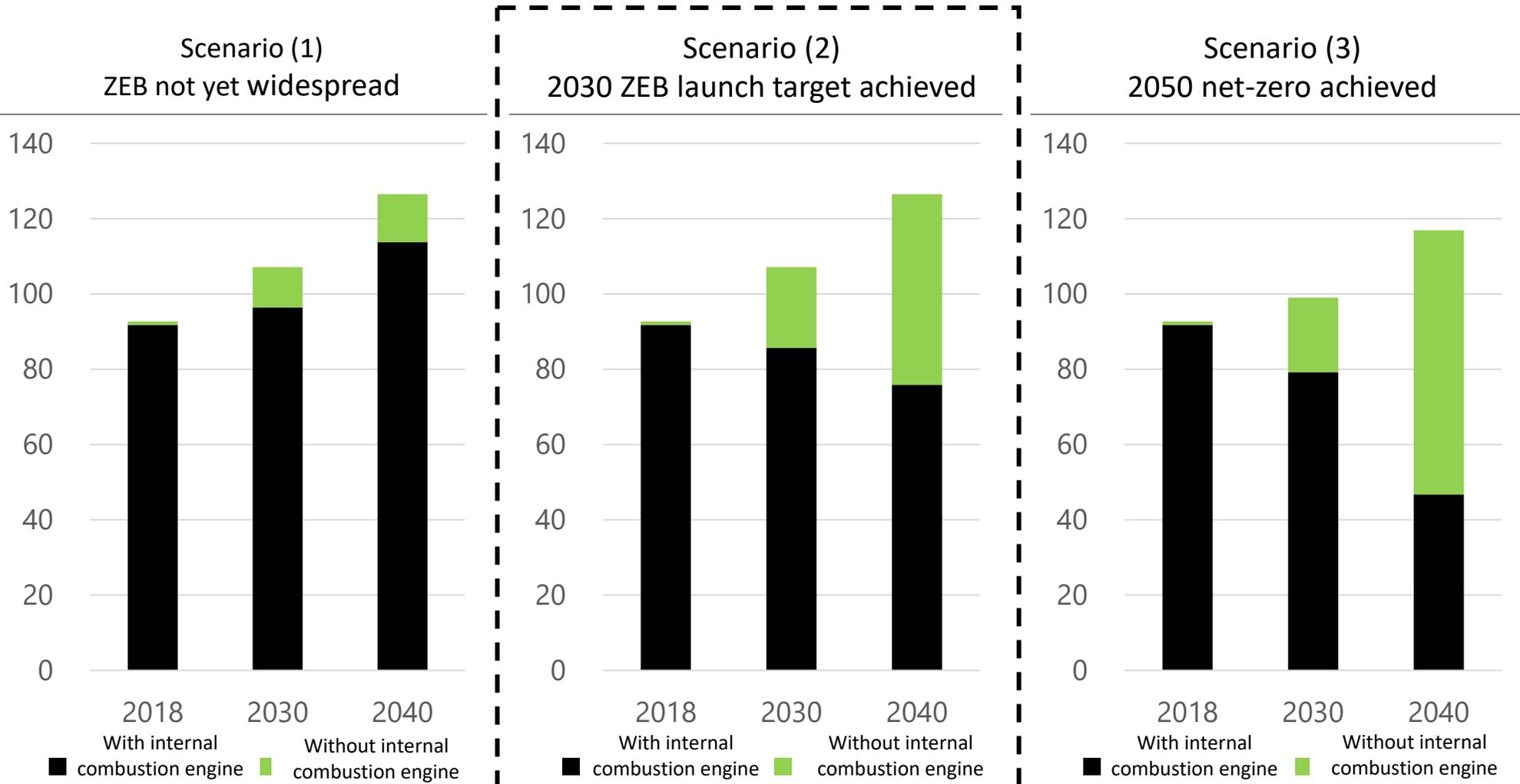
Scenario option setup logic



Number of vehicles with internal combustion engines may peak in 2030

*Vehicles with internal combustion engines: petrol-fuelled /diesel-powered vehicles, HEV, PHEV, etc.

Long-Term Outlook for Vehicle Sales Volume by Scenario (Global sales volume, Unit: 1 million vehicles)



Overview of scenario options

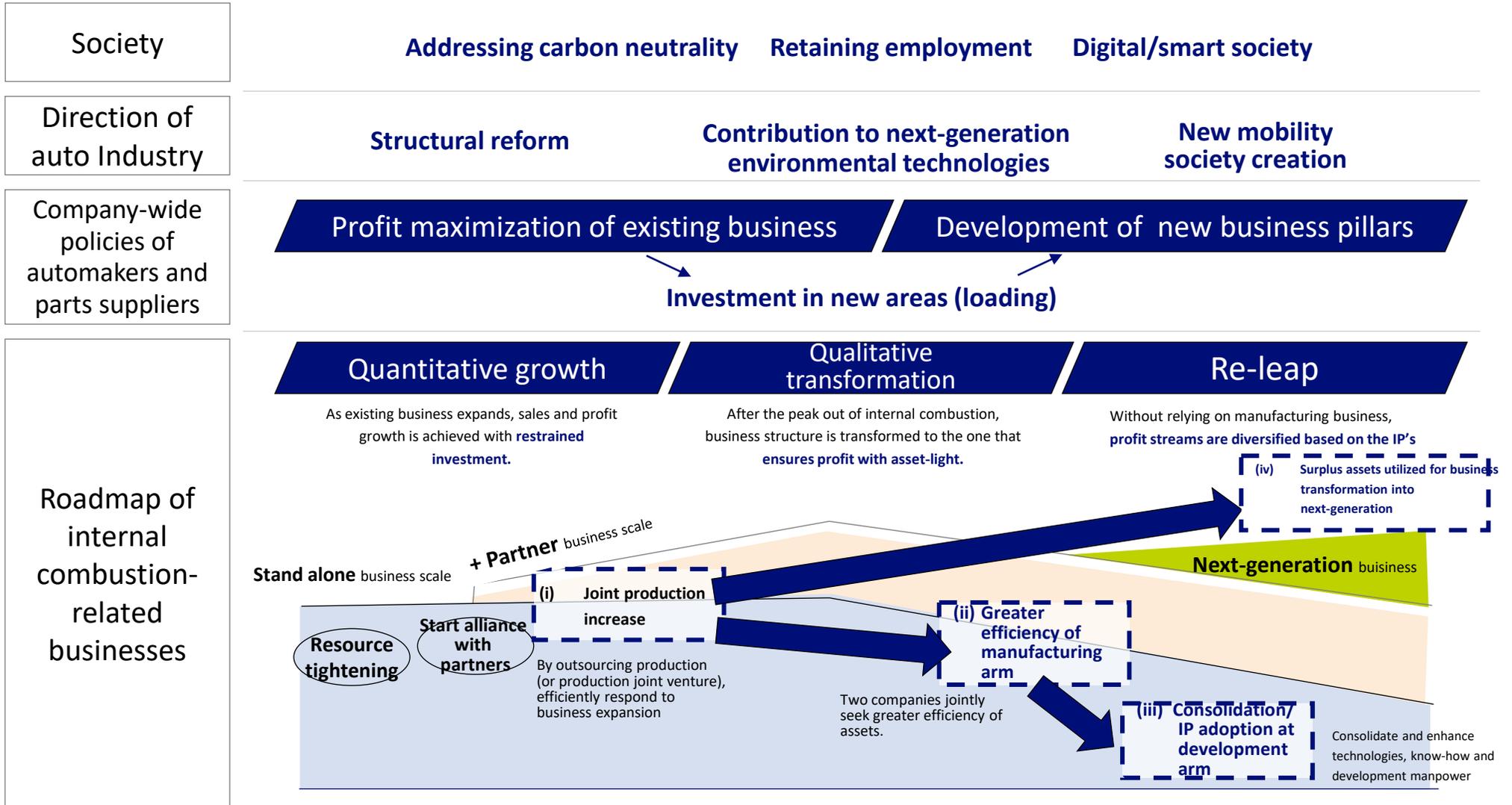
Option	Overview
<p>Scenario (1) ZEV not yet widespread</p>	<ul style="list-style-type: none"> • OEMs make capital investments in BEVs in accordance with their BEV launch targets each country/region to ensure supply capacity by 2025 • However, users are reluctant to use BEVs due to inconvenience of charging. As subsidies being cutback, OEMs shift their policies to meeting fuel efficiency regulations by introducing HEVs and PHEVs from 2025. Exhaust emission regulations are tightened, but internal combustion engine vehicles continue to be the mainstream.
<p>Scenario (2) 2030 ZEV launch target achieved</p>	<ul style="list-style-type: none"> • Users accept BEVs and sales volume increases. • OEMs make additional investments to switch from mixed-flow production lines to BEV-only lines, reaching the BEV launch targets of the government and of their own for 2030. • On the other hand, outside Europe, the shift to renewables in the energy mix does not progress, failing to promote the introduction of ZEVs toward net-zero CO2 target in 2050. • A gradual structural shift led by the private sector toward net-zero CO2 target by 2100 is underway. Carbon capture and storage (CCS) plays a lynchpin role for net-zero target. Internal combustion engine vehicles and ZEVs coexist in mobility.
<p>Scenario (3) 2050 CO2 net-zero target achieved</p>	<ul style="list-style-type: none"> • Users accept BEVs and the BEV targets announced by governments and OEMs are met by 2030. • At the same time, the ratio of renewables in the energy mix increase worldwide. With the shift to distributed power sources, ZEV mobility contributes more to CO2 reductions. • Governments promote ZEVs by introducing carbon taxes and banning the sale of internal combustion engine vehicles. • ZEVs account for almost 100% of vehicle sales volume in 2050.

Recommendation by NRI

Vehicle manufacturers and parts suppliers should develop detailed roadmap for mid- to long-term, with an eye on the widespread use of xEVs.

2020

2040



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