

Future of Automobiles' Powertrain and Its Implications for Energy Market

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As noted in the 335th issue of this special bulletin titled A Japanese Perspective on the International Energy Landscape, moves have emerged in some countries to restrict or ban gasoline and diesel automobiles that now account for a dominant share of vehicle ownership in the world. In the United Kingdom and France, their governments have announced plans to ban sales of new gasoline and diesel vehicles by 2040. Among emerging countries that are expected to drive global growth in vehicle sales and ownership, China and India are reportedly considering similar plans. In response to such policy level moves, major automakers are enhancing their initiatives to promote advanced vehicles such as electric and fuel cell vehicles, symbolized by Volvo AB's announcement to switch all new vehicle sales to electric and hybrid vehicles.

Macro factors behind these moves include a trend of enhancing initiatives to address environmental problems including climate change and air pollution. Factors in the automobile market include the fact that remarkable technological developments and their effects, including the extension of driving ranges for electric vehicles, the relevant improvement of battery performance and lower electric vehicle prices, have attracted attentions. Efforts to diffuse recharging equipment for electric vehicles have also played a role in inducing the moves to restrict or ban gasoline and diesel vehicles sales. From the viewpoint of auto industry strategies, governments, industries and companies are racing to increase their influences while strategically considering what advanced technologies would lead to mainstay next-generation vehicles and how these technologies would change the competitive landscape for the global auto industry.

Choices on next-generation vehicles are one of the factors that would exert great influences on the energy sector. This is because oil as vehicle transportation fuel now plays a key role in the energy mix. It is also because new competitive energy sources have emerged in the transportation sector in which oil has remained a dominant fuel. This means that a possible "game changer" may come out in the area where no major change has been predicted. The so-called consensus view has been that global demand for oil including transportation fuel will sustain growth even in the long run. The recent auto technology development and major countries' moves to ban conventional vehicle sales could lead to a change in the consensus view. Such perception change is attracting attentions.

As indicated by the phrase "game changer," however, the change may not be usual. Any game changer triggers a change that had been viewed as impossible or unpredictable and would reverse traditional views. In other words, such enormous change may not happen easily.

For example, our Asia/World Energy Outlook 2016 analyzes the diffusion of advanced vehicles in the reference and advanced technologies scenarios. In the reference scenario in which the present trends will remain unchanged in the future, conventional automobiles including gasoline and diesel vehicles will see their share of global new vehicle sales falling slowly from 94% in 2014 to 59% in 2040. In the advanced technologies scenario in which advanced energy-related technologies will diffuse to the maximum extent on both the supply and demand sides under the fundamental enhancement of energy security and environmental policies, conventional vehicles' share of new auto sales will substantially decline to 23% in 2040. In the entire world, some 80% of new vehicles sales will be replaced by cleaner vehicles sales. When we prepared the outlook, we assumed the maximum, ambitious diffusion of advanced technologies as noted above. Even in this scenario in which oil consumption efficiency in general will also be improved, global oil demand will still increase from 88.75 million barrels per day in 2014 to 96.32 million bpd, though at a very slow pace.

Global oil demand growth will be so steady that oil demand would not peak easily even on the diffusion of advanced technologies (including the expansion of next-generation vehicles). If dramatic changes beyond assumptions for the abovementioned advanced technologies scenario occur, however, oil demand may peak. Such dramatic changes may have enormous impacts on crude oil prices, the international oil industry, oil producing economies and the global economy. In my talks with experts in Europe and the Middle East I visited September 13-21, this issue was controversial.

At present, the future picture of technological innovations and their diffusion are too unclear and uncertain. We must verify whether the diffusion of advanced vehicles at the dramatic speed and to the dramatic extent mentioned above would be feasible or not, from the viewpoint of the availability of policies, economic efficiency, technologies, raw materials and infrastructure development. As for impacts on the energy side, we will have to examine how oil demand would be affected and how international oil supply and demand, and crude oil prices would be influenced. We will also have to consider how a decline in demand for vehicle fuel would affect the structure of petroleum product demand, oil refining and petroleum product production, and the choice of crude oil by the refiners.

Energy-related impacts may not be limited to the oil sector. Depending on what will replace gasoline and diesel vehicles, various questions will emerge. If electric vehicles expand sharply, various implications for carbon dioxide emissions and other environmental loads may emerge depending on the power mix. If fuel cell vehicles expand, various implications for CO₂ emissions may emerge depending on how massive hydrogen supply would be realized and how hydrogen would be produced. In summary, the future picture of next-generation vehicles will have a wide range of implications for the future global landscape of energy and the environment.

The future is always uncertain. Depending on a single scenario is risky. It will grow even more important to address various uncertainties from various angles through strategic thinking.

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