Japanese Low Emission Vehicle (LEV) Policy
A Successful Strategy to Achieve Global Leadership in Next Generation Vehicles (NGV)

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ABSTRACT

Japan has long committed itself to a Low Emission Vehicle (LEV) policy to reduce greenhouse gas emissions as well as to maintain the viability of its automotive industry. For more than ten years, Japan has been implementing a series of programs supported by a multitude of well-designed policy measures. The rapid growth in next generation vehicle sales suggests these efforts are paying off and have led to significant declines in CO_2 emissions within the transport sector. Government implementation of two new action plans will encourage further advances in technologies for next generation vehicles that could obviate the need for fossil fuel engines.

1. Introduction

In early 2000s, Japan started to implement a series of low emission vehicle policies to promote the widespread use of fuel efficient, low emission vehicles (LEVs) in Japan. The government was committed to reduce greenhouse gas emissions and believed that one path toward that goal was to increase the number of high fuel efficient, low emission vehicles on the road. The policy initiatives began when there were relatively few LEVs and fuel supply facilities for serving LEVs were very limited.

- In 2000, the total number of LEVs in use in Japan was only about 600,000 vehicles, and the number of eco-stations was about 230.

2. Implementation of the First Two Low Emission Vehicle Action Plans in 2001 and 2004

Japan implemented "Prime Minister Koizumi's "Low Emission Vehicle Diffusion Action Plan" in 2001 and the "the World's Most Advanced Low Emission Vehicle Society Action Plan" in 2004. Both action plans called for 10 million "low emission vehicles" and 50,000 fuel cell vehicles on the road by the end of FY2010.

- LEVs included low emission gasoline vehicles, CNG vehicles, hybrid vehicles, hydrogen vehicles, methanol vehicles, and fuel cell vehicles.

To promote their plans, Japan deployed a multitude of creative policy measures. For example, Tokyo established a pool of $460 million in incentives to encourage the purchase of LEVs and devised an innovative classification system to determine the level of tax cuts for which a vehicle qualified. Vehicles received one to three stars depending on how much lower the vehicle emission was relative to the current standard, with "three star" vehicles receiving the greatest tax cut. Similarly, vehicles were provided with a certification sticker bearing a percentage number, such as 10, 25, or 50 percent, depending on how much higher the vehicle's fuel efficiency was relative to current and future standards.

This ingenious incentive system effectively shaped both current and future market demand. Tokyo did not need to enforce specific standards, but instead defined a road map that linked future market incentives to increasingly stringent standards. Responding to these incentives, many automakers pledged by 2005 to have 80 to 100 percent of their domestic vehicles qualify for three star emissions standards and bear the highest fuel efficiency ranking certificate. At the same time automakers invested in new technology to meet future standards. Tokyo thus was able to attain higher emission and fuel efficiency standards easily and faster.

Tokyo set vehicle emission and fuel economy goals that far exceeded any standard in the world. Tokyo also compiled a plan for new nitrogen oxide (NOx) and particulate matter (PM) standards for 2005 that were about equal to the Euro IV emission standards placed in force in 2005. Tokyo also has implemented a revised Vehicle NOx/PM Law that would encourage replacement of most trucks, buses, and diesel vehicles, thereby improving the chances for cleaning up NOx and PM pollution in 12 years.

- Incentives included subsidies at the time of vehicle purchase, reduction in the vehicle acquisition tax, and the annual vehicle tax, as well as the reduction in corporate tax and property tax. There were also reverse financial incentives. Owners of older vehicle models paid a greater annual vehicle tax, which created an additional incentive to replace them with new LEVs. Low interest loans were also available for corporate purchasers.

3. Assessment in 2007 Indicated Mixed Results

The two Action Plans triggered a marked increase in gasoline powered LEVs (but did not succeed in reducing CO_2 emissions). The goal of 10 million vehicles on the road was achieved in 2005, five years earlier than planned. Total number of LEVs in use was 16.5 million in 2007, a 26-fold increase since 2000. In 2000, LEVs were less than 1% of the total vehicle fleet but were 13% in 2004 and 22% in 2007.

Hybrid vehicles also increased about 8-fold. Growth

was initially slow but became robust starting in 2004. This outcome pointed to an important lesson, namely that technology advances in vehicles would radically alter buyer behavior. In the case of hybrid LEVs, the increase was triggered by the introduction in 2004 of the more technologically advanced, more fuel efficient 2nd generation Prius.

- The government assessed that the increase in hybrid vehicles was due to its inherent commercial appeal and that government subsidies for the vehicle were no longer necessary. It discontinued subsidies for hybrid vehicles in March 2007.

Sales of other LEVs, such as CNG vehicles, methanol vehicles, hydrogen combustion vehicles, and fuel cell vehicles, were unremarkable. CNG vehicles achieved a modest, 3.7-fold increase but methanol vehicles declined to the point of nearly fading away. Fuel cell vehicles and hydrogen vehicles did not perform well at all. Fuel cell vehicles were too costly and not viable for practical use.

- The government viewed methanol vehicles to be commercially uncompetitive and policy support was discontinued. It appears that the government might have dropped hydrogen combustion vehicles from its policy support as well.

4. Lessons Learned from the Outcome of 2007

The goal of 10 million LEVs was met, and the inventory of LEVs increased. But no significant reduction in CO_2 emissions was achieved.

Gasoline LEVs have a limited ability to cut greenhouse gas emissions because the vehicles still burn fossil fuel. Moreover, efficiency improvements in these vehicles encouraged owners to drive their cars more, undercutting reductions in CO_2 emissions. The government recognized that the key to building a fleet of LEVs that met CO_2 emission reduction goals would require a significant shift away from fossil fuels. It also recognized that R&D on next generation vehicle technology must be promoted because the future vehicle fleet would be based on technology advances derived from non-gasoline LEVs.

5. Implementation of Next Two Action Plans in 2008 and 2010

Japan implemented the "Low Carbon Society Construction Action Plan" in 2008. The Plan called for one out of two new vehicles sold by 2020 to be next generation vehicles (NGVs), which would include hybrid vehicles, electric vehicles, plug-in hybrid vehicles, fuel cell vehicles, clean diesel vehicles, and CNG vehicles. The government aimed to reduce greenhouse gas emissions by 60-80% by 2050. Japan subsequently launched the "Next Generation Automobile Strategy 2010." The Plan stipulated that 20 to 50% on the road should be NGVs by 2020 and 50-70% by 2030. It called for up to 1% of that number to be fuel cell vehicles by 2010 and up to 3% by 2019. Japan continued the same policy measures as before with minor modifications as needed.

6. Outcome as of 2011 Positive

The outcome, as of 2011, shows that the policies have achieved encouraging results. The rate of increase in sales of NGVs is greater than for gasoline LEVs. Sales of gasoline LEVs increased by 40% from 2007 and 2011, but NGVs increased five-fold during the same period.

Electric vehicles and hybrid vehicles both increased substantially. The increase was primarily due to technology advancements. Electric vehicles increased 11-fold due to introduction of two new vehicles, Mitsubishi i-MiEV and Nissan Leaf. Hybrid vehicles increased 5-fold, due to introduction of the 3rd generation Prius in 2009.

- As a result, NGVs comprised 3% of total vehicles in use.

The increase in NGVs in the vehicle inventory notably contributed to a decline in CO_2 emissions. After peaking in 2001, CO_2 emissions in Japan's transport sector steadily declined. It registered 267 million tons in 2001, 245 in 2007 and 230 million tons in 2011—well below the 2010 emissions target for the fourth consecutive year.

7. Challenges Ahead: Japan's Overall CO_2 Emissions Must Be Lowered

While CO_2 emissions in the transport sector have declined, total greenhouse gas emissions in the overall Japanese economy rose to 1,307 million tons in 2011, 3.6% above the 1990 level or 9.6% higher than the target. This is because, following the 2011 earthquake and tsunami, Japan's consumption of fossil fuels increased due to thermal power generation, which outweighed the reductions in emissions from the transport sector and a decline in greenhouse gas emissions from the manufacturing sector caused by decreased production due to the natural disaster. Faced with this challenge, Tokyo is now determined to achieve reductions in emissions that are 6 percent below the 1990 target.

8. Outlook - Japan will Likely Achieve its CO_2 Emission Target as well as Remain the Global Green Car Leader

The past record suggests that Japan's automakers will continue to aggressively reduce emissions and improve fuel efficiency and create breakthrough technology for NGVs, ultimately obviating the need for fossil fuel engines. Consequently, it seems likely that Japan will remain the global green vehicle leader and hold that position as long as it maintains its strong R&D focus on advancing NGV technologies.