ELECTRONIC TOLL COLLECTION SYSTEM OF JAPAN

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To encourage the use of the Electronic Toll Collection system along toll roads in Japan, considerable effort has been made, and these efforts are now showing results. ETC has taken root. We are now embarking on the next stage for further evolution. This document is intended to describe our efforts and the current status of ETC in three sub-themes:

- Current ETC prevalence status and standardization of Japan
- Features of Japanese ETC system
- Technological contribution to community

The following section outlines the above themes in more detail.

1. Current ETC prevalence status and standardization of Japan

1．1 Deployment of ETC On-Board Unit (OBU)

This section gives you a brief introduction of Japanese ETC system, which has been rapidly growing. The marketed ETC OBU throughout Japan now exceeds 12 million, and ETC is considered standard equipment for automobiles. As Figure 1.1 indicates, during the initial period of introduction in 2001, ETC experienced some glitches. However, cost reductions implemented for onboard units, as well as a subsidy system to boost the use of ETC along expressways has enticed motorists since 2003. Since then, ETC use at tollgates has shown steady increase. Moreover,

around 60% of the current transactions at tollgates are through ETC systems, resulting in a substantial reduction of congestion at tollgate sections.

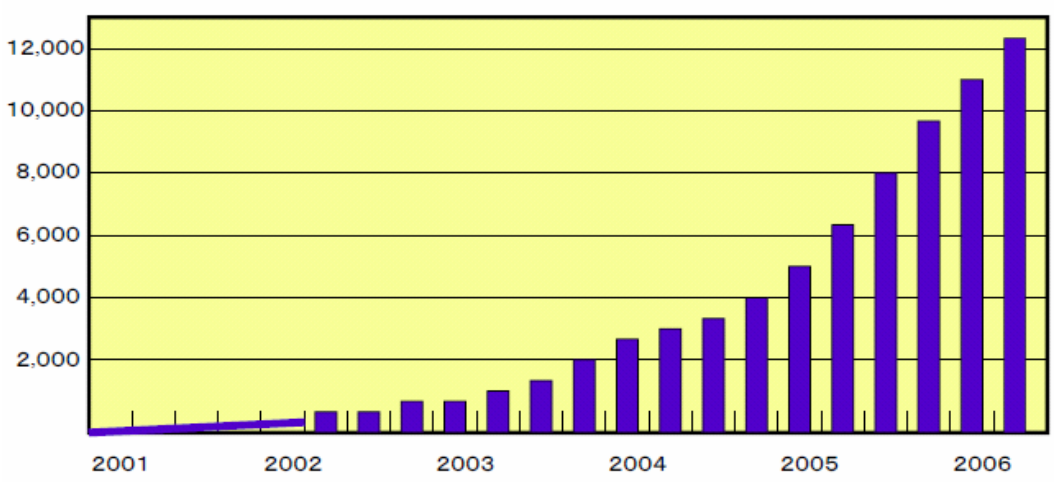

Figure 1.1 : shift to ETC OBU in market

1.2 Price Shift for OBU of ETC

Significant efforts have been made to reduce the price of the OBUs. In fact, the favorable price point served as one of the primary reasons for prevalence of OBU use in the following period for ETC transactions along expressways.

In 2001, at the outset of ETC operations, the original price of an OBU was more than $300 per unit, which proved to be a barrier to wider acceptance. However, through the cooperation and coordination of OBU manufacturers, solutions were found for the prohibitive price and these companies have successfully reduced the cost, in the past five years, to around $60.

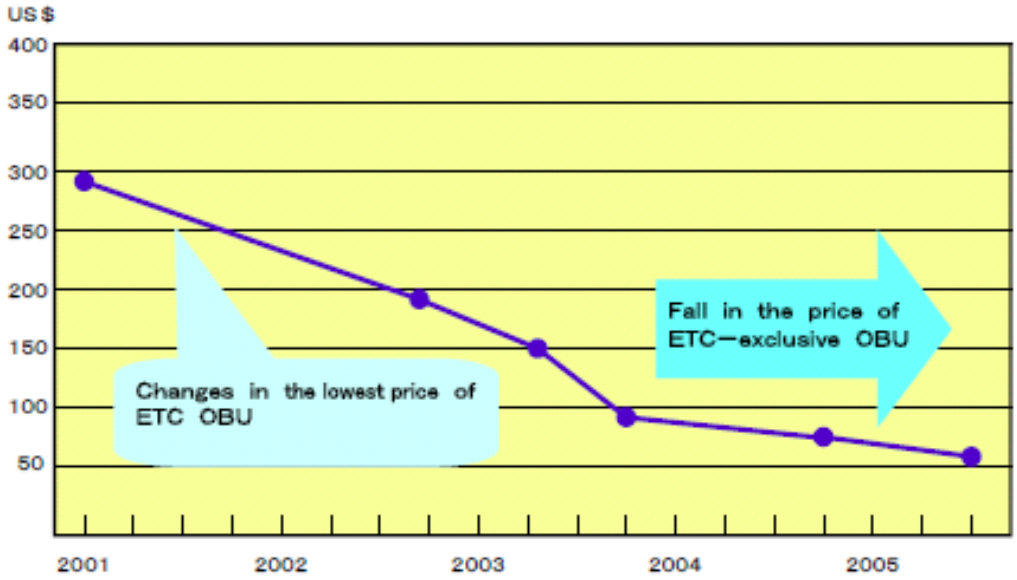

Figure 1.2 ETC OBU price shift

1.3 Impact of ETC operation

ETC service operations have provided an impact on expressway operations and the vicinity. Two primary effects are identified explicitly. First, vehicle operations not requiring a halt using ETC system have reduced tie-ups at tollgate sections. The economic impact when the ETC use ratio reaches 50% is estimated to be around ¥300 billion (US$2.5 billion). Second, ETC operations have improved the air quality. Calculations have been made which reveal that emissions of carbon dioxide have been reduced by 20 tons at tollgate sections when the ETC use ratio reached around 50% of transactions. Figure 1.3 shows carbon dioxide reductions of 30% which were measured at Yokohama-Machida interchange along Tomei Expressways.

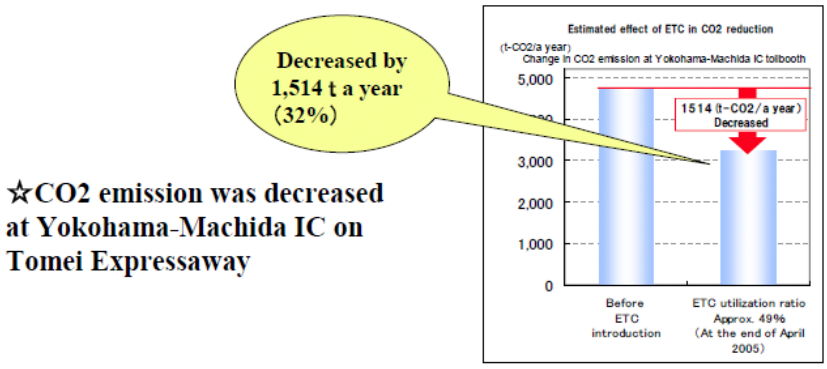

Figure 1.3 Impact in use

1.4 Feature of ETC of Japan

ETC service operations in Japan exhibit six prime aims. The first of these is universal use throughout the nation. A uniform OBU is available for all ETC operations provided by different road operators. The second aim is to broaden serviceability to all types of vehicles, ranging from large-sized vehicles to two-wheeled automobiles. The third is applicability to fare systems. Both distance-base variable fares and a flat rate fares can be accepted by a single OBU. Fourth, an extended flexibility is offered for charging both for prepayment and post-payment. Further, the fifth aim is to allow users to access and confirm historical usage data at anytime. Last but not least, system communication uses DSRC, which allows the system to transmit data at high-speed in a solid and robust manner.

1.5 Standardization of communication method

The effort for international standardization of ETC of Japan is underway. The Association of Radio Industries and Businesses (ARIB), a standardization organization consisting mainly of industries, has developed protocol for DSRC. In our case, we thrived on promotion of our standard internationally, approaching the International Telecommunication Union or ITU and International Standardization Organization. Eventually, communication through DSRC in active mode of Japan was officially approved as international standards of ITU and ISO.

1.6 The primacy in ETC deployment

The primacy in deploying ETC system is three-fold.

First, we placed ETC systems at almost all tollgates in a short period of time to enhance services of ETC operations. Approximately 1200 tollgates have been equipped with ETC systems in the three years of initial deployment. The second benefits users who prepare for ETC use. A discounted toll charge is offered only to ETC vehicles. The third point is a price reduction achieved by industrial effort and system integration with in-car navigation systems.

2. Future Extended Service 'Smartway'

To realize a society of smart mobility by improving the quality of mobility and transportation, it is necessary to position Smartway as national strategy, and to promote and further accelerate the development of Smartway. The ITS targeted in 2007 includes the following four basic services offering benefits of 'safety and safe driving', 'affluence and the environment', and 'comfort and convenience'.

These basic services are:

- Vehicle information transmission, where the individual driver or vehicle is identified, and services are provided for that vehicle or individual
- Fee payment, where cashless payment of various types of fees may be charged for services provided while riding in a car
- Information provision, where services provide various types of road traffic information or information on roadside facilities
- Information and warning, where services provide drivers with information and warnings to support their driving.

The excellence of DSRC proves the significant potential which can meet the needs of motorists, lifestyles, economies, and environments

3. ETC for Asian toll road

3.1 Basic concept

The ITS efforts by Highway Industry Development Organization include support for ITS efforts in Asian countries using our technology and knowledge cultivated through the domestic ETC deployment effort. In order to promote acceptance of DSRC active mode in the Asian toll roads, HIDO recognizes that ETC systems must promise effective and efficient modification which meet the specific needs of a chosen country. The basic concept for Asian use is a system that allows prepaid transactions with simplified, modified functions to achieve cost reduction.

3.2 Roadside system

The concept of a roadside system is a simple structure thats allows for both a variable fare system (distance dependent) and a flat charge system. The detailed study on the requirements is underway. The current works to achieve the system for Asian market are based on the existing ETC roadside systems deployed domestically. The reviews are:

1) wireless control segment: roadside antenna structure for prepaid method
2) monitoring segment: function of violation data storage, scoped by monitoring camera

3) vehicle type classification: eliminated
4) control bar: option
5) security: prepaid type IC chip card is acceptable
6) server: integrate tollgate server and lane monitoring device

3.3 ETC onboard unit

A cost reduction on onboard units is critically contingent on a mechanism for security and transactions. In particular, reviews are focused on a shift from 'SAM chip' on the existing ETC OBU to 'a soft module method' on a prepaid IC card. Further price reductions are anticipated.

	Japanese specification	Asian specification
Communication method	ARIB T−75	ITU−R M. 1453−2
Security	S A M(Hard module)	D E S(Soft module)
Type	2 piece	2 piece
Settlement method	Credit	Prepaid
Additional function	LED、buzzer、voice	LED、buzzer、voice
Price	US＄60	US＄40(Target price)

Figure 3.3 collaterally shows ETC system of domestic use and one for Asian market

1.8 Conclusion

Efforts have been made to promote ETC use along expressways in Japan, and positive results have been achieved: more than 60% of transactions by ETC systems at tollgates. Still further, we will embark on the 'Second Stage', aiming for extended service offerings to boost a higher use rate throughout the country. In parallel with the effort for Asian toll road transactions, we believe that the targeted product based on the philosophy of 'Asian specifications' will provide a valuable input for futuristic ETC developments. Again, we believe our effort will surely contribute to the elimination of tie-ups along Asian toll roads, promoting economic development, enhancing people's lifestyles, and preserving environments for communities.