Challenges and Options for Transportation

The fundamental characteristics of economic development, observed across regions and over decades, show a high degree of correlation observed between demand for mobility and the state of economic development. As the populous regions of the globe accelerate their pace of economic development, we may anticipate huge demands both for personal mobility and freight movement. Future transportation systems and solutions must therefore demonstrate sustainability while continuing to offer a variety of choices to suit the different needs of society.

This demand cannot be managed unless one addresses the entire chain of mobility, starting from the nature of the demand, viability of infrastructure, dependability and economies of energy sources, the environmental impact of different approaches, leading to transportation technologies and solutions. Therefore, the role of urban planning, proliferation of productivity tools and technological modifiers of demand must play an equal role together with vehicular technologies and solutions.

While transportation has a disproportionate dependence upon liquid fossil fuels, future evolution of alternative fuel sources must offer acceptable performance in terms of energy density, portability, safety and environmental friendliness. It is anticipated that as a result, automotive transportation will continue to have significant dependence upon liquid fossil fuels. However, in the near term, significant advances in energy efficiency and environmental responsibility can be achieved through new engine technologies, where clean diesels and a high performance, down-sized direct injection, gasoline engines have witnessed very health competition. Specific power output has grown significantly while at the same time, achieving significant gains in specific fuel consumption. When coupled with some degree of electric traction (as in the case of hybrid electric vehicles), these technologies promise even larger gains in fuel conservation. In parallel, increased use of renewable fuels has seen adoption of ethanol blends (with petrol) and bio-diesel in many parts of the world. The Auto Industry has also witnessed an acceleration in application of Compressed Natural Gas allowing economies to tap a fuel source which is more plentifully available now, while at the same time providing advantages in the quality of combustion. Equally non-powertrain technologies such as light weight structures that are aerodynamically more efficient have also played an important role in reducing energy demands. However, these gains have been somewhat moderated by society's increased emphasis on safety and comfort.

As one looks to the future towards a quantum change in the level of technology, one may anticipate a far greater penetration of pure electric vehicles as we continue to make progress with battery and storage technology. Auto-makers around the world have also invested heavily in hydrogen fuel vehicles and have

anticipated breakthroughs in hydrogen production efficiency (from non-carbon or fossil fuels). This too offers tremendous potential for the future. Finally, the explosion of electronics content in vehicles will also lead to more intelligence in the vehicles and roadway systems and this in turn will contribute significantly to energy efficient mobility.

In summary, one may anticipate automobiles in the next few decades, to offer a greater variety of technologies capable of dependence on a wider range of fuel types, while continuing to support society's hunger for further economic development and improved quality of life.
