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INTRODUCTION

The Office of Transportation and Machinery prepares annual reports on both the U.S. motor vehicle and automotive parts industries.

The Road Ahead, released in March 2010, focuses on the state-of-play of the vehicle market in the United States and the changing face of the domestic industry. It covers topics including the state of the major auto companies' affairs in the U.S. market, an in-depth look at sales and production, and a review of employment trends. The paper concludes with a look at market forecasts for the coming year.

The paper "On the Road: U.S. Automotive Parts Industry Annual Assessment" was released in April 2010. It mirrors the Road Ahead, but focuses on the automotive parts industry. This paper examines the activities of the major companies, examines the domestic market and employment trends, and includes an analysis of key international activity for the sector.

This report, the Road Ahead II, serves as a follow up piece to the Road Ahead. It focuses on trade and the major international markets for the U.S. motor vehicle industry, as well as the current state-of-play of developing automotive technologies and innovations and evolving U.S. regulatory and dealership issues which affect how the domestic industry must compete internationally.

TRADE OVERVIEW

The 2009 global recession reduced total U.S. motor vehicle exports by nearly 40 percent in dollar terms, compared to 2008 levels. This reversed a long term trend of increasing U. S. vehicle exports. In 2009, U.S. vehicle imports continued to decrease for the third year in a row. This trade combination resulted in a 30 percent decrease in the U.S vehicle trade deficit to \$55.9 billion, down from a peak \$109 billion in 2006. Despite the drastic change in vehicle exports during 2009, coupled with a decline in vehicle imports, the United States maintains the world's largest vehicle deficit.

Besides a reduction in U.S. vehicle demand resulting from the recession, imports continue to drop because foreign brands are increasing their U.S. manufacturing capacity. All the major foreign brands have opened, plan to open, or have enlarged existing facilities. U.S. consumers are increasing their purchases of "import brands" that are made in the United States.

Exports

U.S. vehicle exports dropped dramatically in 2009. In 2008, the United States exported approximately 2.7 million units to the world compared to 1.7 million in 2009. This represents a decrease of nearly 35 percent and the lowest export level since 2004. U.S. light vehicle exports reached over 200 countries in 2009, valued at \$32.5 billion, a 40 percent decrease over 2008. The top five export markets continue to be: Canada, Germany, Mexico, Saudi Arabia, and the United Kingdom.

Canada remains the largest market for U.S. light vehicle exports. Exports to Canada decreased by 31 percent last year to \$13 billion (621,000 vehicles). Germany was in second position with exports decreasing over 4 percent to \$4.6 billion (132,000 vehicles). Mexico was the third largest export market, with U.S. exports decreasing over 51 percent to almost \$2.2 billion (164,000 vehicles) in 2009. Mexico remains a key auto-trading partner compared to pre-NAFTA when it was not even in the top 15 export destinations.

The only bright spot for the U.S. vehicle export market was in exports to China. U.S. vehicle exports increased over five percent, accounting for 37,591 of U.S. vehicle sales in China. Exports to other key U.S. markets decreased significantly. Exports to Saudi Arabia decreased substantially by 39 percent to 106,317 units, and exports to the United Kingdom decreased by 44 percent to 15,429 units. Light vehicle exports to Korea reversed a recent growth trend by decreasing 43 percent to 7,663 units exported in 2009.

Imports

The passenger vehicles and light truck imports continued to decrease to \$86 billion in 2009. This represents a decrease of 35 percent compared to 2008. Although this represents a large decrease, the United States still imports more vehicles by volume and value than any other country. This is largely explained by shipments from plants in Mexico and Canada. Our NAFTA partners accounted for 44 percent of U.S. light vehicle imports. This percentage has remained relatively consistent for the past few years. Canada and Mexico, along with Germany, Japan, and Korea, account for over 94 percent of all U.S. light vehicle imports.

Germany was the primary source of U.S. light vehicle imports in 1965, while Canada was a distant third behind the United Kingdom. Canada rose to the top in 1970 because of the Big Three investment in production facilities in Canada. In 1976, Japan, aided by the first oil shock in 1974, quickly rose to the top source for U.S. imports. Canada has since regained its top U.S. vehicle supplier status aided by Japanese investment in new U.S. production facilities.

The import statistics of all our primary import vehicle suppliers were sharply down in 2009. Imports from Canada were down 30 percent to \$23.3 billion while imports from Mexico decreased by 13 percent to almost \$15 billion. Imports from Japan decreased by 41 percent to \$24 billion (compared to \$41 billion in 2008) and imports from Korea decreased by 24 percent to \$5 billion. Imports from Germany decreased 39 percent, to \$11 billion in 2008, from \$18 billion in 2008.

MAJOR MARKETS: REGIONAL AND INDIVIDUAL COUNTRIES

Regional trade agreements continue to play a significant role in the automotive industry and how corporations choose to invest and trade. With the global recession and concurrent global shakeout of the industry, trade agreements can determine how the industry consolidates its operations and aligns its corporate strategies.

With the global nature of the automotive industry, it is vital to keep track of key developed, developing, and regional economies. While this report cannot address all of these areas, many examples are provided and discussed below. Key regions for the automotive industry include: the North American Free Trade Agreement (NAFTA), the Association of South East Asian Nations (ASEAN), and Central and Eastern Europe (CEE) markets. Key trading partners include Japan and Korea, and key developing economies include the “BRIC” nations: Brazil, Russia, India, and China.

Regional Groups (NAFTA, ASEAN, CEE)

NAFTA

The North American Free Trade Agreement (NAFTA) includes the United States, Canada, and Mexico. Like the United States, the auto industry in Canada and Mexico faced a difficult 2009. Their problems, especially in terms of production, were directly tied to their reliance on the United States as an export market. As they did in the United States, General Motors (GM) and Chrysler sought financial support from the Canadian government in 2008/2009 in order to remain solvent. The national Canadian government, partnered with the Province of Ontario to loan GM \$9.5 billion, resulting in a 12 percent (approximately) ownership stake in the company. The national and provincial governments loaned Chrysler \$2.4 billion and, as a result, now own two percent of Chrysler. The Canadian process for granting the loans and the final terms of the loans are very similar to those found in the U.S. process.

In 2009, Canadian light vehicle sales declined 6.25 percent compared to 2008, with sales falling from 1.6 million to 1.5 million vehicles. Car sales fell by 16 percent and light truck sales fell by only four percent. Production declines in Canada were sharper, with total light vehicle (cars and light trucks) production declining 28 percent, falling from 2 million to 1.5 million. Car production was down 31 percent, slightly more than light truck production, which fell 23 percent.

Mexico’s overall passenger vehicle market fell by 26 percent in 2009 compared to 2008, falling from 1.0 million to 752,000 vehicles. Passenger vehicle production in Mexico fell in proportional amounts to the sales decline, dropping 28 percent for the year. Car production fell by 23 percent while light truck production declined 36 percent.

Trade between the United States and its North American neighbors suffered as a result of the downturns in the three markets. U.S. passenger vehicle exports to Canada declined 29 percent in 2009 compared to 2008, falling from \$17.7 billion to \$12.6 billion. Passenger vehicle exports to Mexico declined even further, falling 51 percent from \$4.1 billion to \$2 billion. However, market recovery in the beginning of 2010 has sparked a rise in exports. For the first two months of the year, U.S. passenger vehicle exports to Canada were up 136 percent and exports to Mexico were up 83 percent.

U.S. imports of passenger vehicles from the NAFTA region followed a similar pattern. Imports from Canada declined 31 percent from 2009 to 2008, dropping from \$33.6 billion to \$23.3

billion. Imports from Mexico fell 22 percent, from \$19.7 billion to \$15.3 billion during the period. For the first two months of the year, imports from Canada are up 110 percent and imports from Mexico are up 121 percent.

ASEAN

Despite the global economic downturn, Asia's emerging economies are recovering more quickly than other parts of the world. The Association of Southeast Asian Nations (ASEAN)¹ is our fifth largest export market, behind Canada, Mexico, China and Japan. ASEAN has a combined GDP of over \$150 billion and a population of close to 600 million people, making it a key market for U.S. exports and investments. In 2009, total ASEAN merchandise trade was \$1.5 trillion, a slight decrease from \$1.71 trillion in 2008, and U.S.-ASEAN trade was nearly \$146 billion (an 18 percent decrease from 2008). According to *Just-Auto*, combined automotive sales in the ASEAN's six main markets, Thailand, Indonesia, Vietnam, Philippines, Singapore, and Malaysia, declined by 10.2 percent in 2009 to nearly 1.9 million units, down from 2.1 million in 2008. However, Vietnam and the Philippines increased from 2008 to 2009.

Forecasts suggest combined vehicle sales in ASEAN's top six markets are expected to exceed 2 million units in 2010, a slight increase over 2009, and slightly below 2008 figures. Some economies, however, will continue to fare better than others. Government policies such as scrappage schemes and fiscal stimulus policies are positively stimulating the market and affording some markets an advantage over others. The Thai auto market, for example, has responded favorably to tax incentives provided by the government for producers of "eco-cars."

According to *Business Monitor*, "the ASEAN region and the ASEAN Free Trade Agreement (AFTA) have been instrumental in providing a basis for trade and cooperation between not only the member states, but between divisions of the same company in different countries." AFTA provides for regional tariff reductions, elimination of NTBs, harmonized customs nomenclature, intra-regional liberalization of trade in services, and regional IPR cooperation. ASEAN is seeking to build a European Union (EU)-like community by 2015 for all its members. Under the AFTA, all internal tariffs on manufactured products have been lowered to 0-5 percent. Thailand has been particularly successful in taking advantage of low tariff rates throughout the region. In fact, Thailand has become the world's second largest market for the one-ton pickup truck behind the United States, making Thailand both a regional production and export hub.

The ASEAN Industrial Cooperation Scheme (AICO) has also had a major impact on automotive trade within the region. Under the AICO program, approved companies are eligible to benefit immediately from the AFTA 0-5 percent preferential tariff rate, for trade in approved items. In the automotive sector this applies to completed vehicles, parts, half-finished goods, and materials. In order to qualify, products must have 40 percent ASEAN content and demonstrate resource sharing between participating companies. In addition, ASEAN members are required to

¹ Ten countries currently form the membership of the Association of Southeast Asian Nations (ASEAN). These countries include Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Burma, the Philippines, Singapore, Thailand and Vietnam.

abolish the localization arrangements in each country as well as the import tariff exemptions and local capital requirements.

The three largest automotive markets in ASEAN are Thailand, Malaysia, and Indonesia. The automotive industry in Thailand is one of the key sectors in the Thai economy, accounting for around 8.1 percent of GDP, strengthened by strong domestic demand. In 2009, Thailand produced 999,378 vehicles, and over half of these were exported (536,000). Over the past few years, Thailand has joined China and India as primary production bases for exports to the rest of the world. Moreover, high import duties keep imports low (especially from regions outside of ASEAN), while approximately 40 percent of locally produced vehicles and trucks are typically exported (2009 began a trend of over 50 percent, which will likely grow in the coming years). Thailand also exports vehicle parts, primarily to the rest of Southeast Asia, and with the consolidation of the AICO scheme, this is only expected to grow.

Malaysia has retained the highest level of ASEAN passenger car sales for 2009 with 486,342 vehicles sold, mainly due to its domestic national car programs which focus on indigenous car sales and production. For example, Malaysia's closest rival in the region in terms of passenger car vehicles in operation is Indonesia, which only totaled 4.8 million in 2008, compared with 7.2 million for Malaysia. Malaysia has an indigenous vehicle industry, and, over the past three decades, has been dependent on strong protection provided by the government. Consequently, liberalization in the vehicle industry has been slow. In October 2009, the government released its new National Automotive Policy (NAP), which focuses on sustainability of the domestic industry, with more market opening for foreign brands. It is especially interested in streamlining its domestic industry to two national high volume car producers, Proton and Perodua. Malaysia has made progress in reducing import tariffs, admittedly after having secured a two-year deferral from ASEAN. Import tariffs on completely built-up (CBU) units were reduced from a band of 70–90 percent to 20 percent at the start of 2005. For completely knocked-down (CKD) kits, the import tariff was cut from 25 percent to zero. Import duties on CBUs were cut further, to just 5 percent, in March 2006.

Indonesia is also a major market in this region. Demand for motor vehicles in Indonesia has recovered from the 1997 Asian Financial Crisis, with a 45.9 percent increase in production and an increase of 39 percent in sales in 2008. In 2009, vehicle sales dropped by 20 percent to 486,061 units from a record high of 607,805 units in 2008. The *Economist Intelligence Unit* forecasts an average growth rate of 14 percent in consumer demand during 2008-12. The passenger vehicle segment dominates the automotive market in Indonesia, with mini-vans and multi-purpose vehicles (MPVs) in extensive use for both personal and commercial operations.

The large size of the Indonesian population and the low level of car ownership in the country suggest there is a lot of potential for expansion in the automotive industry. In 2007, only one in every 35 people in Indonesia owned a car, compared with one in 14 in Thailand and one in seven in Malaysia. The sector was deregulated and liberalized in 1999, and is one of the most competitive sectors in the Indonesian economy. When the current government came to power in 2004 infrastructure improvements, especially in roads, was a primary focus. In August 2009, Indonesia's parliament approved a tax bill that allows local governments to increase tariffs on car and motorcycle owners who have more than one vehicle. The new law annually taxes owners

for their second and successive vehicles at a levy of two to 10 percent of a sum based on the region's road conditions and the value of the car sales. Local governments are asked to allocate at least 10 percent of this tax source for transport infrastructure projects in their regions.

Indonesia plans to follow in the footsteps of Thailand by offering incentives for the production of fuel-efficient cars. The incentives are not expected to be available before 2012, but automotive manufacturers are pleased that producing "greener" vehicles will become more competitive. Indonesia is expected to be one of the better performing economies in the ASEAN region and this should be reflected in future vehicle purchases and annual sales data.

Central and Eastern Europe

The Central and Eastern European (CEE) automotive market represents an evolving region of diverse economies; some with indigenous automotive operations, and most with aspirations for attracting new, or more, automotive foreign direct investment. As many have recently joined the EU, they have also adopted EU economic policies affecting the auto industry, such as the Common External Tariffs and regulatory type approval. This region is geographically nestled between the EU and the Commonwealth of Independent States (CIS: Russia and the Ukraine), which make it a strategic location for global automotive companies to supply and export products both west and east. The combination of lower costs and cheaper land and labor in the new EU member states appeals to many global automakers, and provides impetus to realign and better integrate their respective European operations. Entry into the EU has also reduced not only tariffs, but value-added tax (VAT) levels on vehicles as well, making them more popular and affordable for all.

The top five CEE automotive markets in terms of sales and production are: the Czech Republic, Hungary, Poland, Romania, and Slovakia. Over the past few years, as the Western European auto market has stagnated, the new EU members from the CEE have contributed what little growth there is in the overall European automotive market. However, with the arrival of the world recession, *ACEA* (the European Automobile Trade Association), reported that overall European new passenger car registrations in 2008 recorded the sharpest decline since 1993, by 7.8% to 14.7 million units. Specifically, Western European demand contracted by 8.4%, while new EU Member states were down 10.7%; the sharpest decline since *ACEA* started reporting figures for this region in 2004. Incentive programs were implemented across many of the Western European countries during 2009 and *ACEA* reports that overall EU registrations improved to 15.8 million units. However, it was Western European sales that fared better overall than CEE sales given the extensive national fleet renewal and scrappage schemes introduced to counter these downward trends.

In fact, *JATO Dynamics*, a London-based industry consultancy, reports that vehicle sales in the CEE fell by nearly 30 percent in 2009. Less than one million cars were sold as the effects of recession were felt across the region. Only Poland ended the year with flat sales (+0.1 percent). Many markets suffered double digit sales falls, with Latvia (-72.9 percent), Lithuania (-66.2 percent), Estonia (-59.6 percent) and Hungary (-60.0 percent) amongst the worst affected. *JATO* said the picture was very different from two years ago, when the CEE region was considered the engine of growth in European new car sales.

Moreover, according to ACEA data, 2009 production was at its lowest since 1996. Specifically, total vehicle production in Europe (cars, trucks, buses) decreased by 17.3 percent compared to 2008 and by 23 percent compared to the pre-crisis level of 2007. Passenger car production dropped by 13 percent to 13.4 million units, or the lowest level in fourteen years. Truck production dropped to a historic low (-64.0 percent). However, passenger car sales fell by only 1.3 percent in 2009, with demand supported by fleet renewal schemes in 13 EU countries. Critics argue that the scrappage programs will inevitably result in severe market downturns in Western Europe. (Ironically, many of the cars that fit the parameters for these schemes are produced in and exported from the CEE states into Western Europe.) Therefore, despite recent years of significant growth, recovery due to the global recession will likely be slow, with 2008 marking a peak in production, and anticipated recovery to pre-recession levels only being achieved by 2015, according to *Just-Auto*. *Just-Auto* further projects that the Czech Republic and Slovakia are poised to overthrow Poland's historic powerhouse status in the region, given significant automotive investment choices recently made in these countries by the likes of PSA Peugeot, Toyota, Hyundai and Kia, based on their geographically more centralized location.

CEE governments were among the first to react to the recession by clamping down on credit in 2008, which had a huge affect on sales in the region. Car sales for 2009 had the Skoda brand (owned by VW) dominating the region, with the other VW brands following closely behind. Ford, Fiat, and Renault ranked third, fourth and fifth in the region. Opel, Toyota, Dacia, Hyundai, and Kia ranked behind them, respectively.

Business Monitor has indicated that CEE has a low rate of car ownership compared to Western Europe, and while this implies increased demand in the region, with weak economic conditions and tight credit access in most CEE countries, consumers are likely to favor used cars for the foreseeable future. Moreover, David Di Girolamo, head of *JATO Consult*, states: "Central and Eastern Europe is not the new car market it once was. The lack of any formal incentive schemes, coupled with rising taxes and more stringent banking requirements, has reduced consumer demand across the region."

The automotive industry in the Czech Republic is one of the key sectors in the economy, accounting for approximately 7.7 percent of GDP and direct employment of 121,000 people in the workforce. The Czech Republic is emerging as one of the major markets in the region in terms of both sales and production. *Business Monitor* reported that 2008 sales were 219,012 units, up from 2007's 207,038 and 2006's 183,631. However, car sales dropped by 11 percent during 2009. Nonetheless, of significance are the growing production levels and the level of exports from that production. For example, nearly all of 2008's completely-built-up (CBU) vehicle production of 1.3 million units was exported (1.2 million).

The Czech Republic has drawn significant investment over the years. For example, Hyundai's Nosovice plant opened in November 2008, building the i30 hatchback. Considered as the mirror plant to Kia's Zilna plant in Slovakia (which opened in 2007, and is only 90 kilometers away) there will likely be product integration and model sharing, with Nosovice building some Kias and Zilna building some Hyundai's. A strong recovery in 2011 is expected, with passenger car sales at 282,000 units by 2013. Output is also expected to reach 1.5 million units by 2013,

boosted by production at the Hyundai plant, which should be operating at full capacity of 300,000 units by then.

Hungary's automotive industry is also one of the key sectors in the economy, accounting for approximately 8.5 percent of GDP, and employing 57,336 people in the workforce. In fact, Hungary's production from 2007 to 2008 more than doubled based on new investments. In 2007, Hungary produced 292,027 vehicles, and in 2008 this grew to 696,182 units. It is forecast to produce over 1 million units by 2012 and over 1.5 million by 2013. On the other hand, sales have dropped over the past few years, from 215,653 in 2007 to 181,209 in 2008, and are forecasted to be fewer than 200,000 units by 2013. Like the Czech Republic, the focus is on production and export. Imports, however, are on the rise. In 2007, imports were 244,856 units, and these grew to 557,778 units in 2008. They are, forecasted to be nearly 1.5 million in 2013.

Poland has traditionally been the largest market in the region in terms of both automotive sales and production. Nearly four percent of Poland's GDP can be accounted for by the automotive industry, which directly employs 125,000 people in the workforce. The automotive industry's strength is in its export-driven strategy. For example, in 2008, Poland produced 1.16 million vehicles, yet it exported 1.46 million, including kits. During previous years it had produced primarily for the indigenous market. Most sales in the Polish market are from imported models (mostly used), not domestic production, as these vehicles are typically exported to more lucrative markets. Therefore, it is not surprising that the Government of Poland is juggling policies regarding used car imports to ensure environmentally-sound, but also to encourage the absorption of indigenous production and to insulate from such reliance on exports.

The Polish automotive association also reported that new and used vehicle registrations were up by 11 percent during 2008. According to *Just-Auto*, Poland was the only market in CEE to post gains at 0.1 percent. Since vehicle ownership level remains low (383 units per 1,000 people), a raise in wages should also boost demand. But with a tight economy, demand for older, used cars is also on the rise. The CEE markets are vulnerable to the flood of used cars challenging new market sales. In addition, output growth could slow with a forecasted stagnant EU market. With over 90 percent of its car production exported, Poland is overexposed to fluctuations in overseas markets.

Export volume has risen steadily over the past few years; however, with the global recession, exports are expected to decrease, despite increases in local production capacity. For example, exports in 2008 were estimated at 1.46 million units. Despite low numbers in 2009, exports are still expected to gradually recover, reaching 1.37 million by 2013. Production in 2008 was estimated at 1.16 units, and is forecast to increase steadily to 1.86 units by 2013. Therefore, the indigenous market will need to absorb this disparity and the GOP appears to be ready to handle this situation with various taxes and schemes.

Some manufacturers, including auto parts manufacturers, are relocating within CEE, increasing competition for investments in the region. For example, in October 2009, Takata Petri, an auto parts manufacturer, announced that it is relocating its plant to Romania from Poland, based on closer proximity to demand. Nonetheless, substantial production will remain in Poland. For example, according to *Just-Auto*, Fiat Auto Poland broke its production record of 500,000

vehicles (by third quarter 2009) and it hit its target of 600,000 vehicles by year end, at its Tychy plant. Fiat is fully-committed to remaining in this market.

Romania's automotive industry accounts for approximately five percent of its GDP and directly employs 120,000 people. Many investments are underway, such as Renault's investment of one billion dollars to modernize Dacia's huge Pitesti plant. The low-cost Logan model, originally targeted as a low-cost car for emerging markets, is also a hit in France and Germany during these difficult economic times. In less than four years, 1 million Logans have been built. During 2007, Ford acquired the Romanian automaker Automobile Craiova, which operates the former Daewoo plant in the southwest of the country. (Ford had been absent as a producer in the CEE since it closed its CKD plant in Poland in the late 1990s, with most of its focus on a successful plant near St. Petersburg, Russia). Ford will start with a small car built solely in Craiova and expects up to 90% of vehicle production to be exported. This could be a version of the next generation Ka, which is being developed jointly with Fiat on the new 500 platform.

Slovakia is also emerging as one of the CEE's most significant automotive economies, with the sector accounting for approximately 16 percent of GDP and directly employing 76,000 people. According to Business Monitor, in 2008, Slovakia produced 846,012 vehicles, up from 572,000 in 2007. Sales were also up to 104,277 units, from 89,094 in 2007. Kia's Zilna plant opened in 2007 and currently makes three versions of the Kia Cee'd compact. Even with labor costs low, both Nosovice and Zilna plants are highly automated, including 100 percent automation in body shops, which run constantly. Volkswagen's plant in Bratislava currently builds the Audi Q7, the Volkswagen Touareg and the Porsche Cayenne, but will be the site for VW's new small family car: "Up" doubling capacity to 400,000 units, and increasing employment by 1,500 people. PSA Peugeot Citroen's small car plant in Trnava, Western Slovakia, opened toward the end of 2006, is another beneficiary of the West European scrappage schemes in operation in markets such as Germany and the United Kingdom. In fact, PSA had to increase daily output at its Slovak plant in response to rising demand for small cars.

Without a doubt, the CEE region will remain important for years to come, as the dynamics between the regions of Western Europe and the CIS places these countries in a strategic zone for automotive manufacturers. With the latest investments, it will be a region to watch.

Key Trading Partners (Japan, Korea)

Japan

The United States has sustained automotive trade imbalances with Japan for over three decades. This imbalance has had significant economic and political impacts, and has dominated our trade relationship with Japan over much of this period. U.S. automotive companies' sales in Japan have not improved significantly, while Japanese companies have continued to gain market share in the United States. A variety of non-tariff barriers have traditionally impeded access to Japan's automobile and automotive parts market, and overall sales of North American made vehicles and parts in Japan remain low.

In fact, the automotive trade deficit with Japan is the largest U.S. sectoral bilateral imbalance. It has grown from the \$30 billion dollar level in the early 1980's to a peak of \$56.8 in 2006. Due to the worldwide recession, the trade imbalance shrank dramatically in 2009. The overall automotive deficit fell to \$31.8 billion, down from \$52.6 billion in 2008 (\$23.8 billion deficit in autos and \$7.9 billion deficit in auto parts). Meanwhile, overall sales of North American-made vehicles and parts in Japan remain low despite an upturn in U.S. vehicle exports in 2007. Sales of U.S. produced motor vehicles in Japan decreased by 54 percent in 2009 to 12,364.

In June 2009, Japan instituted an Environmentally-Friendly Vehicle Purchase Program that provides subsidies to consumers for the purchase of a new vehicle, with differing subsidy amounts available depending upon the class of the vehicle and whether a qualifying used vehicle is traded-in. The U.S. Government raised strong concern with the Program because, as originally structured, U.S. automobiles imported into Japan using the Preferential Handling Procedure (PHP) certification process were unable to qualify. On January 19, 2010, Japan announced it would open its program to qualifying automobiles imported using the PHP process. While a welcome step, the actual number of U.S. models that qualified was greatly limited by Japan's decision to use the U.S. Environmental Protection Agency (EPA) "city" mileage fuel economy rating, instead of the EPA "combined" mileage fuel economy rating, as a criterion for qualification. The U.S. Government continues to urge the Japanese government to re-consider this decision and instead apply the EPA "combined" rating.

The U.S. Government also has expressed concern with the overall lack of market access to Japan's automotive market, as well as with specific aspects of Japan's regulatory system that limit the ability of U.S. automobile and related companies to expand their business in the market. For example, U.S. automakers seeking to introduce, for testing and demonstration purposes, automobiles using new technology (i.e. fuel cell vehicles) face a lack of transparency and other barriers to certifying these new products in a timely and efficient manner. The U.S. Government is urging Japan to address other regulatory barriers and to take into full consideration global harmonization efforts as it develops and implements standards and regulations.

According to *Ward's Automotive Reports*, over the last thirteen years, the Detroit 3 have lost 29 points of U.S. market share, declining from 73.1 percent of the market in 1995 to only 44.1 percent of the U.S. market in 2008. Japanese brands have made strong headway during this period, climbing from 22.9 percent to 40.5 percent, a gain of 17.6 points of market share.

The Japanese auto companies have supplied their increased U.S. market share through both export and investment in U.S. manufacturing facilities. Imports from Japan were down significantly by 42 percent in 2009 to 1,225,941 units from 2,110,830 units in 2008. The value of Japanese imports also decreased by 41 percent to \$24.026 billion. In 2008, 65.6 percent of the Japanese brand vehicle sales in the United States were produced in the United States.

The cumulative Japanese investment in the U.S stands at \$33.6 billion. Japanese manufacturers produced over 2.94 million cars in the United States in 2008, decreasing from 3.4 million units in

2007. In 2008, Japanese brand manufacturers accounted for 18 percent of the total U.S. car and truck exports.

The largest Japanese investor, Toyota, has invested over \$14 billion in eleven U.S. manufacturing facilities that produced 1,026,711 vehicles in 2008. Toyota employed 21,722 in the United States in 2008 at its manufacturing facilities. Other Japanese manufacturers are similarly increasing their presence in the United States. Honda of America has invested over 9 billion in five U.S. manufacturing facilities that produced 987,169 vehicles in 2008. Nissan has invested over \$5 billion in three U.S. manufacturing facilities that produced 545,057 vehicles in 2008. Mazda, in a joint venture with Ford, has invested over \$1,900 million in one manufacturing facility that produced 167,258 vehicles in 2008.

Korea

The South Korean automotive industry is world class, and exports from South Korea's automakers go to all of the key world markets, including the United States. According to *Automotive News*, for the first half of 2009, Hyundai (including Hyundai controlled Kia) jumped one spot in the global rankings to become the 4th largest vehicle manufacturer in the world. Korea's automakers are heavily reliant on exports. In 2009 Korean manufacturers produced 3.5 million vehicles in Korea, but exported 61 percent to foreign markets.

The United States and South Korea have a long history of negotiations on automotive trade, having reached agreement on two Memoranda of Understanding to improve access to the Korean market – one in 1995 and one in 1998. These MOUs were negotiated because U.S. vehicle manufacturers were prevented from selling into the Korean market by a variety of measures.

Throughout 2006 the United States and Korea engaged in Free Trade Agreement (FTA) negotiations. The resulting agreement, which was signed in mid-2007, has not yet been ratified by either country's legislatures. The Obama Administration has indicated a desire to re-examine the automotive provisions of the Agreement before seeking ratification. The full text of the Agreement can be found on-line.²

In 1994, before the first MOU was signed, import sales in the Korean auto market totaled 3,810 vehicles (0.3 percent of the market), with Ford, Chrysler and General Motors accounting for slightly over half that total. By 1997, total import share had only climbed to 0.7 percent, with U.S. manufacturers accounting for approximately half (or 0.35 percent of the Korean market). Also during that time, the U.S. automotive trade deficit with Korea rose dramatically, up 30 percent to reach \$1.8 billion. As a result of unsatisfactory progress under the 1995 MOU, a second, more comprehensive agreement was negotiated and put into place in 1998.³ While import sales in Korea have improved slowly, they are still low, representing only slightly under five percent of the total market in 2009 (down from their peak of just over six percent in 2008).

² http://www.ustr.gov/Trade_Agreements/Bilateral/Republic_of_Korea_FTA/Final_Text/Section_Index.html

³ For more detailed information on the 1998 MOU see the report "World Motor Vehicle Import Requirements," also on the Office of Transportation and Machinery's Automotive Industry Team's web page: www.ita.doc.gov/auto

The opening of Hyundai's first U.S. plant has had a strong impact on trade flows. This impact will likely be augmented by the opening of Kia's new U.S. plant in late 2009. The U.S. vehicle trade deficit with Korea increased every year until peaking in 2004 at \$10 billion (Hyundai began U.S. production in 2005). Since then, it has declined - -reaching only \$5.6 billion in 2009. The U.S. automotive parts deficit with Korea continued to climb, reaching \$3.5 billion in 2008. However, in 2009 auto parts imports from Korea fell 33 percent as a result of the large-scale production decreases among U.S. manufacturers. The overall automotive trade deficit was down to \$7.9 billion in 2009, off \$3.5 billion from its peak of \$11.4 billion in 2004.

The Korean manufacturers have enjoyed a sustained string of success in the U.S. passenger vehicle market. Every year since 1993 they have either maintained or increased their share of the U.S. market, rising from 0.8 percent, with sales of 109,000 vehicles in 1993, to 5.1 percent of the market with sales of 675,000 vehicles in 2008 (down from 750,000 vehicles in 2006 for a share of 4.6 percent). In 2009, Hyundai and Kia increase their U.S. sales by 8.3 percent and 9.8 percent respectively, in a market that saw an overall decline of 21 percent. Their combined market share rose two full points to 7.1 percent.

Korean automakers have a long history in the United States – one that, contrary to current trends, has not always been successful. The first Korean automaker to enter the United States was Hyundai in 1986. Kia followed much later in 1994 and Daewoo started sales in 1998 (only to leave the U.S. market in 2003 after declaring bankruptcy and to re-enter the U.S. market badged as Chevrolet and Suzuki products after GM purchased Daewoo assets and created a new company).

In 1986, Hyundai introduced the Excel, a small sedan, priced well below competitors' brands. Sales of the Excel reached 264,000 units by 1988. To build on the brand's growing popularity; in late 1988 Hyundai opened a plant in Canada, producing the Sonata (primarily for the Canadian market, with some exports to the United States). However, after only a few years, the Excel developed a reputation for poor quality, and sales plummeted. By 1992, Excel sales were down to only 42,000 and total Hyundai sales reached only 109,000 units. After only three years of production, the Hyundai Canada plant closed. It wasn't until the year 2000 that Hyundai sales began to approach the peak year of 1988, with sales reaching past that peak in 2001.

After a long period of supplying the U.S. market entirely through exports, Hyundai invested over \$1 billion in its first U.S. manufacturing plant in Montgomery, Alabama. The plant started producing vehicles in 2005 and last year Hyundai sourced 46 percent (down from 47 percent in 2008) of its U.S. sales with U.S. produced vehicles. Hyundai produces the Sonata and the Santa Fe SUV at the Montgomery plant.

While the Hyundai plant operated near capacity in 2008 with production of 237,000 vehicles, production at the plant fell to only 196,000 in 2009. The plant employs more than 2,000 people. Kia began mass production at its West Point, Georgia plant in December 2009 (for more information on the Kia plant, see the Hyundai/Kia section of the Road Ahead I).

“BRIC” Economies (Brazil, Russia, India and China)

Brazil, Russia, India, and China were picked by leading economic forecasters in the early 2000's as countries likely to benefit from significant sustainable future economic growth. Collectively, this group is known as the “BRIC” nations, an acronym based on the first letters of all four countries. These four countries make up over 40 percent of the world's population and are poised to play a major role in the future global economy.

Brazil

Responding to the international global financial crisis, the Government of Brazil slashed taxes during 2009 to spur consumer demand on multiple products, including autos. Auto sales for 2009 reached a record 3.14 million units. Vehicle production only fell 1 percent as high home market demand offset exports, which were down 40 percent from 2008. According to *Just-Auto*, Fiat remained the market leader in 2009, selling nearly 737,000 units; VW at 686,000; GM at 595,000; and Ford at 304,000. *ANFAVEA*, the Brazilian Automotive Trade Association, is very optimistic about 2010, anticipating sales and production to reach 3.4 million units, and exports to rise 13 percent to 530,000 units.

Indeed, in just 10 years, Brazil has climbed from number 10 in the global new vehicle market to an expected number 4 this year. According to Roland Berger, founder of a leading industry consulting firm, Brazil will overtake Germany this year and its market is forecast to grow to 6 million units by 2015.

With these optimistic forecasts, it is not surprising many manufacturers are announcing new investments. For example, in March 2010, Ford increased its original investment of \$2.2 billion to \$2.4 billion. According to Ford CEO Mulally, this is the most Ford has committed in terms of a five-year investment since it started operations in Brazil 91 years ago. Ford is also investing further in its engine facility at Taubate, producing advanced Sigma series flexfuel engines at a capacity of 500,000 units a year.

GM announced its intention to invest \$778 million in 2 plants in the Sao Paulo region. Given that Brazil is GM's second largest market for the Chevrolet brand, and third largest market for the company, after the United States and China, this move accentuates the importance of this market to GM.

VW made an announcement late last year that it would be investing another \$3.5 billion in its plants through 2014, with a focus on product development, as well as an increase in output. It hopes to achieve one million sales in Brazil annually by 2014. Brazil is VW's third largest market after Germany and China.

Mercedes is reportedly considering A-class production in Brazil as well. Peugeot is planning an expansion of its current facility to accommodate new vehicles and Fiat is considering Chrysler Jeep production. Hyundai is investing \$750 million for a 150,000 unit facility and began construction in April 2010. Nissan is aggressively pursuing its “Shift Mercosur” plan, which provides consumers with three local models and three imported models in an increasingly competitive market.

Manufacturers are also taking advantage of trade agreements. For example, Ford plans to import Mexican-made Fiestas into Brazil under the Mexico-Brazil Free Trade Agreement (FTA). The EU and Mercosur are also reportedly close to sealing an FTA, which will greatly enhance vehicle flow across the Atlantic Ocean, similar to the EU-Mexico FTA. Volkswagen and Fiat will especially be able to take advantage of this.

Russia

The downturn of the global economy hit Russia hard. Consumer confidence was down because job losses, unemployment fears, while tightened credit made it difficult for consumers to purchase new vehicles. The ruble was weakened and Russia lost revenue from lower worldwide oil-prices. According to *PriceWaterhouseCoopers (PWC)*, sales of vehicles in 2009 fell to 1.5 million units, down 49 percent from 2008 levels of 2.9 million units. Of the 1.5 million light vehicles sold in 2009, one million were foreign-brand vehicles. PWC also noted that the level of monthly sales was relatively stable at about 120,000 units, indicating a stable demand on which recovery could build.

Russia was on track to become Europe's largest auto market in 2008. Contributing factors to Russia's automotive growth were increased crude oil revenue (when the price of crude oil spiked in 2008) along with increased access to consumer credit. However, access to credit dried up in the second half of 2008 as Russia felt the impact of the worldwide credit crunch. According to *PWC*, Russia's new-car sales jumped 41 percent through June 2008, to 1.65 million units, surpassing Germany as Europe's biggest auto market. If the market growth rate had remained at the same level in the second half of 2008, sales in Russia would have exceeded sales in Germany and might have reached 3.6–3.8 million cars. The Russian economy had an injection of money from oil and gas industries trickling down to Russian consumers. But crude oil prices receded, the global recession slammed Russia's auto market, and credit dried up for Russian consumers. In the second half of 2008, sales of autos in Russia slowed dramatically, resulting in 2.9 million light vehicles sold for the year, and Russia ended up as Europe's second largest auto market. Of the 2.9 million sold, 2 million were foreign brand vehicles. Russia has 142 million people and 27 million cars on the road. That is 188 cars per 1,000 people, compared with 565 cars in Germany, 369 cars in Poland and 800 cars in the United States. Roland Berger consultants projected an increase to 432 cars per 1,000 Russians by 2020.

Based on *PWC* data, in 2009 foreign-brand automakers produced 297,000 units, while Russian brand automakers produced 365,000 units, for a total of 662,000 vehicles produced in Russia. This was down 59 percent from the 1.6 million vehicles (one million Russian-brand and 595,000 foreign-brand) produced in 2008. In 2007, 1.5 million cars were produced in Russia and it was expected to increase to more than 2 million within a few years. Although the downturn in the global and Russian economy delayed that projection and projections for 2010 are fairly flat, Russia hopes to get back to this level by 2014 or 2015.

The Russian government has supported the domestic automotive industry by raising import tariffs on used cars, expanding credit, and making loans to automakers. Russia will invest about \$6 billion (180 billion rubles) in its domestic auto making industry over the next decade. Russia

has a 15-25 percent tariff to support domestic auto makers. The devaluation of the ruble and duties has made imports less attractive to manufacturers and consumers in Russia.

The Russian government provided 2 billion rubles (\$56 million) toward subsidizing consumer car loans for buyers to purchase one of 30 foreign or domestic models made in Russia. The government also planned to spend another 12.5 billion rubles (\$347 million) through 2011 to buy up excess vehicle components and unsold commercial vehicles from domestic auto makers.

A new scrappage program started in March 2010, was modeled on other European programs. The program would give participants who turn in vehicles older than 10 years that they've owned for at least 12 months vouchers worth 50,000 rubles (\$1,670) to apply toward the purchase of a new Russian-built vehicle. Foreign brand automakers, including Ford, GM, and Renault, geared up for the Russian scrappage program by increasing production in Russia.

According to the *Association of European Businesses (AEB)*, the Russian-brand Lada sold 349,490 vehicles in 2009 compared with 622,182 sold in 2008. Chevrolet, the leading foreign brand in Russia, sold 104,398 vehicles in 2009 compared with 235,466 sold in 2008. In terms of individual models, the four top selling models were Russian Ladas followed by the Renault Logan which sold 53,869 units and passed the Ford Focus in sales by 1,761 units. The Ford Focus sold 52,108 units and Chevrolet Lacetti sold 29,362 units in 2009. The Ford Focus was the best selling model in 2008 with 93,496 units sold, followed by the Chevrolet Lacetti (81,656 units) and the Renault Logan (74,300 units).

As GM went through bankruptcy in the United States there was a play for GM's stake in Adam Opel GmbH. Russian Sberbank and Canadian-based Magna International attempted to gain control of Opel and Opel's access to GM intellectual property. The plan was to give Magna and its Russian partners – state-controlled Sberbank and automaker GAZ group- an equal share of a 55 percent stake in Opel, while GM would retain 35 percent and Opel workers retain 10 percent. Most German state and federal officials and Opel's labor representatives in Germany favored the deal. However, in the end, GM cancelled the deal.

Ford launched its manufacturing operations in St. Petersburg in July 2002, and laid claim to being the first foreign auto maker to open a wholly-owned assembly plant in Russia. Ford began production of its Mondeo mid-sized sedan in Russia in March 2009, after it delayed the launch from September 2008 because of the global economic crisis. The production plant in Vsevolzhsk, near St. Petersburg, also produces the Ford Focus. Initial plans called for 25,000 Mondeos to be produced annually at the plant, but this figure was reduced because of the market. Ford imported more than 50 percent of its vehicles in 2008, but with Russian production of the Mondeo and Focus, Ford planned to produce about 80 percent of its vehicles for the Russia market in 2009. Because of the slump in demand for cars in Russia, Ford implemented a four-day work week in 2009 intended to last through October to cut salaries. With a capacity of 125,000 units annually, the St. Petersburg plant was running at 50 percent capacity in late 2009.

Russia is undertaking an effort to restructure AvtoVAZ, its largest automaker. With help from Renault, Russia will inject \$1.65 billion into AvtoVAZ, while the Samara region will help with

payroll and benefits. Renault, which owns 25 percent of AvtoVAZ, will contribute technology and equipment valued at \$360 million to update AvtoVAZ vehicles. The aim was to increase AvtoVAZ production to 900,000 cars a year by 2015. AvtoVAZ had 100,000 workers producing 400,000 vehicles at the end of 2009, compared to Renault in Europe which had 80,000 workers, producing over 1.5 million cars. AvtoVAZ announced plans to cut its workforce by almost 50 percent (47,000 employees) and to break off some of its parts-making operations employing 30,000 people into separate subsidiaries.

Delphi, a leading U.S. automotive parts supplier, marked its 20th year in Russia, having established a presence there in 1990. It has two manufacturing sites in the Samara region and a customer service and sales office in Moscow and employs about 900 people in Russia. Delphi has grown its customer base to provide parts for AvtoVAZ, GM-AvtoVAZ, GM Russia, Sollers group, GAZ Group, and others. Stefaan Vandevelde, vice president of Delphi Packard Electrical/Electronic Architecture for Europe, was quoted in *Aftermarket News* as saying: “with high custom duties on imported cars and components, finding strong suppliers locally is one of the biggest hurdles in growing local car production in Russia.”

India

Automakers realize the long-term potential of investing in the Indian market. Given the large population, relative low ownership rates of vehicles, and a growing middle class, there is a tremendous opportunity for growth in the Indian automotive marketplace. With a large inexpensive yet skilled labor force, automakers also view India as an export center. According to data provided by the *Society of Indian Automobile Manufacturers (SIAM)*, both of these points are demonstrated by the fact that Indian exports tripled from 72,005 to 218,401 between FY03 (April 2002 – March 2003) and FY08 (April 2007 – March 2008). Since FY08, exports have doubled again to 446,146 passenger vehicles in FY10. Domestic passenger vehicle sales have shown similar levels of growth in recent years. Passenger cars reached almost 2 million units in 2009-10, more than double the level of sales in FY04 (902,096).

In 2006, India released the *Automotive Mission Plan (AMP)* which details development goals for the years 2006-2016, recognizes the importance of the automotive industry for all levels of society, and describes the government’s role in supporting the automotive industry. The stated goal of the *AMP* is to double the automotive sector’s contributions to India’s gross domestic product (GDP) from 5 percent to 10 percent by 2016. However, today there are still a number of barriers that limit the development of the Indian automotive industry, both domestic and foreign. Some of these limitations include high tariffs on automobiles, customs procedures that impede importation of automotive products, the high demand for two wheel vehicles, and lack of adequate infrastructure that causes overcrowded roads and heavy congestion, and inflexible labor regulations.

In 2008, the United States imported only five vehicles from India, and this number declined to three in 2009. The United States exported only 224 vehicles to India in 2008 and 177 in 2009. U.S. manufacturers have instead invested directly in India as not only a potential market, but also as an export hub for the Asia and African region. Indian auto manufacturers are beginning to view the U.S. market in a similar way. India’s Mahindra & Mahindra is hoping to eventually

offer diesel pickups in the United States. Over 300 dealers have signed on to sell the Mahindra vehicles in the United States according to Global Vehicles, which has exclusive U.S. distribution rights. The original goal was to introduce the truck in the United States in 2009. However, the target date has been delayed several times, and it is currently unknown when the Mahindra truck will hit the U.S. market. The Chairman for Tata has also stated that they plan to introduce a U.S.-engineered version of the Tata Nano within the next several years.

Given the recent growth in exports and sales in India, U.S. manufacturers continue with plans to invest billions of dollars in the Indian market over the next several years. Ford is investing \$500 million to expand its Indian subsidiary. Ford began production at a new plant that has the capacity to produce 250,000 engines per year. While these engines will be used primarily for Indian vehicles, it is expected the engines will be shipped throughout the Asia-Pacific and Africa regions once output expands around 2011. GM's facility in Halol had its capacity raised from 60,000 units to 85,000 units in 2007. GM opened a second plant in India that began manufacturing in 2008, which has a capacity of 140,000 vehicles. According to *Automotive News*, this raises GM's capacity in India to 225,000 vehicles. Further, GM plans to invest \$200 million in an engine facility that will be able to produce up to 160,000 units initially when it opens in 2010. According to Business Monitor International, these investments will raise GM's investment in India to almost \$1 billion.

However, while foreign investment in India has increased, Indian automakers control the market. According to Ward's, in 2008 Maruti Suzuki controlled about half of the Indian passenger car market, followed by Hyundai, Tata, Honda, GM and Ford. The global financial crisis also impacted Indian auto sales in 2008 and 2009. However, tax breaks and other measures like better access to financing stimulated the Indian auto industry with strong sales through the last half of 2009 and into 2010. Based on *SIAM* data, this is demonstrated by the almost 21 percent growth in sales of passenger vehicles in FY10 over the previous year.

The Indian market is dominated by small, low-cost vehicles (two wheelers such as scooters and motorcycles make up about 75 percent of the market share). The Tata Nano, also known as the "People's Car" due to its low price (\$2,500), was released in 2009. There will be competition in the low-cost car segment from the alliance between Indian motorcycle-maker Bajaj Auto and Renault-Nissan. According to *Just-Auto*, they plan to build a plant in India with a capacity of 400,000 units a year to produce a car that they hope to sell between \$2,500-3,000. In addition, Volkswagen launched its first small car in India in early 2010, the Polo.

For the 2008 calendar year, GM saw its sales in India rise 9.5 percent despite an overall decline in the Indian market, and they expect to sell 100,000 vehicles in 2010 according to Karl Slym, president of GM India. These competitive sales figures are due in part to the success GM has achieved from sales of the compact Spark. GM is also developing a mini-car to help it compete with the Tata Nano. They hope to price this new model between the \$2,500 price tag of the Nano and the \$5,000 price tag of the Chevrolet Spark. In March 2010, Ford released the all new Ford Figo, which helped Ford triple its March sales from the previous year. Currently, other Ford India models include the Fusion, Endeavour, and Fiesta. According to *Ward's*, Ford sold 26,564 cars and light trucks in 2008.

China

In 2009, China became the world's largest auto market for the first time with sales of 13.64 million vehicles, an increase of 46 percent from 2008. China's government policy incentives, which included sales tax cuts, subsidies for rural residents, and incentives for trading in vehicles, along with rising demand from small and mid-size cities, all contributed to the sales increase. According to the China Association of Automobile Manufacturers, the biggest selling domestic Chinese automakers in 2009 were: Shanghai Automotive Industry Corporation (SAIC), the First Automobile Works (FAW), Dongfeng Motor Corporation, Chongqing Chang'an Auto, the Beijing Automotive Industry Holding Co., Ltd. (BAIC), the Guangzhou Automobile Industry Group (GAIG), Chery Automobile, BYD Auto, Brilliance Auto and Geely Auto. The leading international automakers in China are: General Motors, Volkswagen, Nissan, Hyundai-Kia, Toyota, Honda, Ford, and PSA. Overall production in China grew in 2009 to 13.79 million units, an increase of 48 percent.

GM was the leading global automaker in China in 2009 with sales of GM brands reaching 1.83 million, up 67 percent from 2008. GM China's market share increased to an estimated 13.4 percent, up from 12.1 percent in 2008. Shanghai GM, GM's joint venture with SAIC, sold 727,620 vehicles in 2009, an increase of 63.3 percent. The joint venture makes Cadillac, Buick and Chevrolet models. In December 2009, SAIC bought an additional 1 percent of its 50-50 joint venture with GM for \$85 million. With majority ownership, SAIC can now list Shanghai GM's revenue in its financial reports, increasing both its size and status in China. In August 2009, GM launched a 50-50 joint venture with FAW, FAW-GM Light Duty Commercial Vehicle Co., which sold 34,510 light duty trucks and vans in the four months after it was established. In addition, GM has a 34 percent stake in SAIC-GM-Wuling, which had domestic sales of 1,061,213 in 2009 (becoming the first automaker in China to sell more than 1 million vehicles a year).

Throughout 2009, GM launched a wholly owned science lab in Shanghai, and opened a vehicle safety lab at the Pan Asian Technical Automotive Center, which is a GM joint venture with SAIC. In addition, Shanghai GM broke ground on China's largest proving ground, and SAIC-GM-Wuling opened a new engine plant. In September 2009, GM and Shanghai GM agreed to purchase \$607 million worth of vehicles, vehicle kits, machinery and equipment exported from the United States. Following GM's emergence from bankruptcy in July 2010, it was decided that GM's international operations would be managed from Shanghai. GM expects to sell approximately two million vehicles in China in 2010. The automaker also plans to introduce 30 new or revamped models in China from 2009 to 2014.

Ford is in the process of increasing its capacity and product lineup in China in order to catch up to its competition. Sales in China by Ford and its local partners increased 44 percent to reach 440,619 units in 2009. Ford's three-way joint venture in China, Chang'an Ford Mazda Automobile Co., sold 315,791 units, an increase of 55 percent from 2008. Ford owns a 35 percent stake in the joint venture, which makes Ford's Focus, Fiesta, Mondeo and S-MAX, in

addition to the Mazda2 and Mazda3. Ford announced plans in September 2009 to spend \$490 million to build its third assembly plant in China jointly operated with Mazda and Chongqing Chang'an. The plant, which will open in 2012, will initially produce the next-generation Focus. In 2010, Ford plans to expand its dealer network in China and begin a new warranty program for its entire product lineup covering three years/100,000km. Ford also owns a 30 percent stake of Chinese light truck and van maker, Jiangling Motors Corporation, which sold a total of 114,688 units in 2009. In March 2010, Ford announced it entered into a definitive agreement to sell Volvo to Zhejiang Geely Holding Group Co. The sale is expected to close during the third quarter of the year.

Chrysler imports sport-utility vehicles, multi-purpose vehicles and passenger cars under its Jeep, Dodge and Chrysler brands in China. The automaker would like to increase its presence in China. In 2009, Chrysler sold 19,233 vehicles in China, which was its biggest market outside of North America.

There have been some recent automotive-related trade issues with China. In Spring 2006, the United States, along with the EU and Canada, requested World Trade Organization (WTO) dispute settlement consultations with China regarding regulations on imported auto parts. They argued that China's auto parts tariff classification regulations result in increased tariffs that are higher than China agreed to in its WTO accession agreement, and it discourages auto manufacturers in China from using imported auto parts. China's regulations impose the same tariff rates for a vehicle on imported auto parts if the imported parts exceed a fixed percentage of the final vehicle content or vehicle price, or when specific combinations of imported auto parts are used in the final vehicle. The tariff on automobiles is typically 25 percent, and the tariff on imported parts is typically 10 percent. In mid-September 2008, China appealed the WTO's July 2008 ruling that China must bring its import tariffs for foreign auto parts into compliance with international trade rules. However, in December 2008, China's appeal was rejected. In September 2009, in response to the WTO ruling, China eliminated the additional charges on imported auto parts.

In September 2009, the United States decided to impose three years of additional ad valorem tariffs on imported tires from China. The International Trade Commission had previously determined that there had been a disruption in the U.S. tire market from a surge of imported passenger vehicle and light truck tires from China. The surge resulted in a decrease in the U.S. production of similar products, closings of domestic tire plants, and a decrease in related U.S. employment.

In November 2009, China initiated an antidumping and countervailing duty case on imports of U.S.-made sedans and SUVs. If GM, Ford and Chrysler are found to be receiving government subsidies or selling products in China below market price, imported vehicles from the United States into China could face higher tariffs.

In recent years, many Chinese automakers have announced plans to sell in the U.S. market and/or have at least exhibited at the North American International Auto Show. However, many plans to sell in the United States have been derailed for one reason or another. Complying with

U.S. safety and emissions standards, meeting U.S. consumers' quality expectations, and overcoming financial- and distribution-related issues, have all been impediments to Chinese automakers' U.S. arrival. In addition, many have been focusing on China's high-growth auto market. BYD Auto, which has Warren Buffet's Berkshire Hathaway as an investor, could become the first company to sell Chinese-made vehicles in the United States. BYD is planning to sell its e6 battery-powered electric crossover in the United States beginning in late 2010. BYD sold 450,000 vehicles in 2009, and aims to become China's top automaker by 2015, and the world's largest by 2025.

The Chinese government aims to have production of 500,000 hybrid or all-electric cars and buses in China by 2011. As of April 2010, the government was still deciding on a national policy related to consumer subsidies for new energy vehicles. In November 2009, President Obama and President Jintao announced the launch of a U.S.-China Electric Vehicles Initiative. The initiatives activities will include joint standards development, joint demonstrations, a joint technical roadmap, and public awareness and engagement.

The *China Association of Automobile Manufacturers* estimates new car sales in China will reach between 15 million and 16.5 million units in 2010. J.D. Power forecasts China's sales in 2010 will rise to 14 million vehicles, and the China Passenger Car Association predicts sales will surpass 17 million units. First quarter production of vehicles in China totaled 3.5 million units, an increase of 84 percent compared to a year earlier. Sales for GM and its joint ventures in China were 623,546 for the first quarter of 2010, an increase of 71 percent. Ford's sales, primarily through its joint venture, were up 84 percent during the first quarter of 2010, reaching 153,362 vehicles.

INNOVATION

Changes in Corporate Strategy

The global recession has caused manufacturers to reconsider traditional strategies. For example, a switch from developing niche market models to developing the same model for global markets is underway. Ford's global vice president of marketing Jim Foley believes that automakers are reacting to several factors: expensive fuel in the United States means Americans are looking for more fuel efficient vehicles like those found in other countries; consumers in countries like China are buying more U.S.-sized cars; and automakers feel the need to maximize their investment in this economy by selling new models in as many markets as possible.

In turn, the transition to global platforms will shake up suppliers. Global platforms reduce engineering costs and give automakers flexibility to react to the market, and they also simplify manufacturing processes and improve quality by reducing variability. This will likely force further consolidation in the supplier industry. Moreover, suppliers must move quickly as manufacturers are already sourcing products for 2013-14, with GM reportedly being the most aggressive targeting its vehicle platforms to be reduced from 18 today to 11 in 2014. In fact, according to Fred Thomas, Industry Director at *Apriso*, the tech and data revolution may assist the Detroit-3 by aligning corporate strategies with a more "pull" than "push" approach, applied by Henry Ford in the early days of the industry.

Automotive News' reporter James Treece considers the three major challenges for auto engineers to be "how to limit a vehicle's impact on the environment, how to keep occupants connected and informed, and how to reduce the chance of driver error in such mundane tasks as parking." Diesel, electricity, compressed natural gas, biofuels and hydrogen cars are all being considered, with a view toward boosting fuel efficiency as well as limiting environmental impact. As new innovations flood the patent offices and markets, yesterday's concepts are rapidly becoming today's standard features.

Competition and Collaboration

Although automakers rank at the top of lists on industry R&D investments, the process to achieve automotive innovation remains secretive, given fierce marketplace competition. Since company R&D is highly valuable intellectual property, engineers often work under top-secret security because the first company to market a technology can gain market share. For example, *Automotive News* reported that last year there were 15,077 global patents and patent applications for alternative power innovations, while there were only 6,847 patents and patent applications five years ago. Many of these patents are for vehicle security systems and vehicle navigation. Japanese and Korean automakers and their suppliers definitely lead the pack with patent applications. The leader in patent applications and awards is Toyota with over 2,379 patents in 2008, and trailing far behind are Nissan, Hyundai, Honda and Matsushita/Panasonic. GM, at number seven, has also increased its number of applications by 253 percent with 261 patents in 2008.

Despite intense competition in innovative technologies, collaboration is occurring in developing electric vehicle batteries which will accelerate products to market and reduce costs by burden-sharing, so mass production can become a reality more quickly. International efforts by governments are also underway to streamline safety regulations for electric vehicles.⁴ Collaboration is also occurring as manufacturers seek light-weighting solutions (e.g., switching from steel to aluminum) in order to achieve fuel economy requirements, and integrating more composite and recyclable plastic materials into their vehicles.

In terms of energy and autos, the smart grid and electric vehicles must develop in harmony. Collaboration means not only burden-sharing in terms of development, but also in advancing safety. According to Jason Forcier, President of North America for Robert Bosch LLC, "the industry – automakers and suppliers – legislators, regulators and consumer advocacy groups must work in unison to achieve technology neutral legislation and a common understanding among consumers of the benefits of these safety technologies." Another example of collaboration can be seen in the recent release of guidelines by the *Alliance of Automobile Manufacturers (AAM)* addressing the development of telematics and in-vehicle technology, called Driver-Focused-Telematics (DF-T). (Nearly all auto manufacturers in the United States are represented by the *AAM*.)

Emerging Technologies and Top Gadgets of 2010

⁴ http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29glob_candidate.html

Some of the new technologies being added to or becoming standard on vehicles are safety features like blind-spot detection, and side/head airbags. Other innovations showing up more frequently are navigation systems, MP3 player connections, Bluetooth wireless connections, and mobile video. In addition, the Global Positioning System (GPS) and telematics packages that connect cars to home computers will become standard within the next few years. Even more opportunities are evolving in telematics as more manufacturers are developing electric vehicles. Energy management and navigation will become critical in terms of range and locations for recharging/battery swap stations, as well as topography for elevation, given how batteries use more power going uphill and recharge going down. Ford's SYNC infotainment system may have more competition once Blackberry commits to the auto market. RIM, the company that makes Blackberry smartphone, has just purchased QNX, a software company. In November 2009, Mercedes-Benz USA and Hughes Telematics Inc. launched "mbrace" a new telematics offering that they say brings an unprecedented level of connectivity to customers. This will replace Tele Aid, the previous system of the last ten years.

Within the emerging technologies, there are both safety and fuel-efficient features. However, there are also some "cool" items that more and more people want to incorporate in their vehicles since the time spent getting back and forth to work, or travelling for work and/or pleasure typically requires more time in a vehicle. According to GK Men, a leading on-line men's magazine, the top car gadgets for 2010 are: lane departure warning systems; real time traffic information; in-car media storage devices; Bluetooth; self-parking; heated and/or cooled cup-holders; remote start; and, rear parking cameras.

For example, the lane departure warning system consists of speed sensors and cameras that judge an approaching vehicle's speed and distance to warn of potential danger if the driver is changing lanes. It also warns the driver when the car wanders out of its lane. The systems consist of a seat vibrator or buzzer that will alert the driver and the turn signal shuts the system down. The Europeans have had real time traffic information for a few years. Acuras and some BMWs now come equipped to provide information directly to navigation screens on traffic jams, constructions and accidents. However, this is only available in certain select cities. In-car media storage devices allow the driver to store music and pictures directly to the hard drive with a USB stored in a car's dash. This is currently available on Jeep Wranglers and Mercedes S-Class vehicles. Bluetooth enables the driver to make phone calls without ever touching a phone. The technology includes a phone book voice recognizer that allows numbers and information to be added without having to take eyes off the road. Newer Chryslers are available with the UConnect system and BMW, Toyota, and Nissan are working on a similar system. Self-parking allows the driver to put in parking parameters on a touch screen, and then the car maneuvers itself into the parking spot. The Lexus LS460 currently has this technology. Heated and/or cooled cup holders are available in the Cadillac Escalade ESV Platinum edition or the much less pricey Dodge Caliber. Small coolers that plug into cigarette lighters or a power outlet are also available. Remote start has a button on a key that allows a driver to start the vehicle and let it warm up or cool down. It simultaneously locks the doors and steering wheel as an anti-theft measure. The Malibu and Dodge minivans have this feature. Lastly, rearview cameras send a live video image to the navigation screen and eliminate blind spots. They not only protect the car, but also protect children and animals from accidental back-overs. These are available on the Honda Odyssey, Toyota Sienna, Chevrolet Tahoe and others.

Leading Safety Technologies and Top Next Generation

New technology geared to improve automotive safety can save lives. According to the Department of Transportation's National Highway Traffic Safety Administration (NHTSA), there were 33,963 traffic-related deaths in 2009, down 8.9 percent from 37,261 in 2008. The count for 2009 represents the 15th consecutive year fatalities have declined and the fewest number of deaths in a year since 1954. According to *Ward's Automotive Reports*, the key factors in lowering the fatality rate are electronic stability control and new crash avoidance technologies being added to cars and trucks.

Edmunds' identifies technologies currently under development that can help keep the roads safer for drivers and pedestrians. In addition to the lane departure warning system and rearview camera, other top safety technologies include: tire-pressure monitoring; adaptive cruise control/collision mitigation; blind-spot detection/side assist/collision warning; rollover prevention/mitigation; occupant-sensitive/dual-stage air bags; emergency brake assist/collision mitigation; adaptive headlights and/or night-vision assist; and, emergency response.

NHTSA has required that all U.S. passenger vehicles weighing 10,000 pounds or less be equipped with tire monitoring systems in their 2008 models. Sensors at the wheel alert the driver if the pressure is too low by sounding an audible warning, a light on the instrument panel or both. BMW now offers this as standard on all of its models. Corvettes use run-flat tires, which allow the vehicle to continue to run at a relatively high rate of speed for 50 or more miles per hour. Adaptive cruise control/collision mitigation is a new technology that allows the cruise control to adjust the throttle and brakes to keep a safe distance from the vehicle in front if there are changes in traffic speed. If the system senses a potential collision it will typically brake hard and tighten the seat belts. This is available in Mercedes Benz models.

Blind spot detection/side assist/collision warning is designed to alert the driver to cars and objects in blind spots during driving or parking. It usually responds when the turn signal is turned on and if it detects something in the way, it sends a signal (flashing light in mirror, vibration in seat or steering wheel, or an alarm will go off). Rollover prevention/mitigation is a system that senses and reacts to a potential rollover by applying the brakes and modulating the throttle to maintain control. They all have the same goal. Occupant-sensitive/dual stage airbags can sense different sizes and weights of occupants as well as seatbelt usage, abnormal seating position, rear facing child seats and vehicle speed. This is standard equipment on every Porsche. Emergency brake assist/collision mitigation technology recognizes when a driver makes a panic stop (changing quickly from gas to brake pad) and applies additional brake pressure to help shorten the stopping distance. This is different from an antilock braking system or electronic brake force distribution. Adaptive headlights and/or night-vision assist help the driver see farther down the road and to spot people, animals or trees in its path. The assist works in different forms such as infrared headlamps or thermal imaging cameras, and can provide coverage up to 1,000 feet away. The BMW night-vision system uses a high contrast image (far infra-red technology, or FIR), giving the driver up to five seconds of warning at a speed of 62 mph. Cadillac has also developed night vision technology that creates a black and white image of objects highlighted ahead, and displays them on a head-up display. It can be viewed by the driver's peripheral vision without obstructing the view of the road. Lastly, emergency response

gives vehicles various ways to handle emergency situations. Daimler's enhanced Accident Response System (EARS) turns on interior lighting, unlocks doors and shuts off fuel when airbags deploy. Volkswagen also switches on the hazards and disconnects the battery terminal from the alternator. GM's OnStar and BMW's Assist both alert their response centers and make crash details available to emergency personnel.

Technologies such as stability-control systems, antilock brakes and better airbags are the primary reason U.S. highway fatalities have steadily declined for decades. Still, engineers around the world are working on ever better ideas for safety tech. According to Dan Carney of *Popular Mechanics* magazine, here are five of the most promising: skidding airbags; expandable door beams; inflating seatbelts; autonomous brakes; and, auto steering correction.

GOVERNMENT INVOLVEMENT - INCENTIVES AND MANDATES FOR ADVANCED VEHICLE TECHNOLOGIES

Government-Industry Partnerships (USCAR, PNGV, FreedomCar, USABC)

The U.S. Government has provided ongoing research and development assistance to the U.S. automotive industry. It has provided most of this assistance through its partnership with the Detroit 3 via the United States Council for Automotive Research (USCAR). USCAR was formalized in 1992 as part of the Federal government's Partnership for New Generation Vehicles (PNGV) program. The PNGV program later became the FreedomCar program. Under these programs the U.S. Government provided research assistance for hybrid drive, fuel cell and battery electric technologies among others. Looking specifically at the PNGV program, according to the Government Accounting Office, the Federal government spent approximately \$250 million per year for PNGV related research. Industry estimates put their tab at \$800 million per year for PNGV related activities.

USCAR continues to oversee research in advanced combustion and emissions control, electrical and electronics, electrochemical energy storage, fuel cells, materials, and vehicle systems analysis. The U.S. Advanced Battery Consortium (USABC) is part of USCAR. USABC is supported by a cooperative agreement with the U.S. Department of Energy that provides up to 50 percent of the USABC budget. The Consortium's mission is to develop electrical energy storage for fuel cell, hybrid and electric vehicles.

Federal Incentives (2005-2008)

The Federal government also provides incentives and requirements to produce advanced technology vehicles and inducements for their sale. The Energy Policy Act of 2005 provides a credit for taxpayers who purchase certain energy efficient vehicles, including qualified hybrid vehicles. The credit is applied by manufacturer and begins to phase out after 60,000 of the manufacturer's qualifying passenger automobiles and light trucks have been sold.

The Energy Independence and Security Act (EISA) of 2007 increased fuel economy standards, provided tax credits for increased production of biofuels for transportation, and provided incentives for electric vehicles. EISA included loan guarantees and grants for production

facilities aimed at the manufacture of fuel efficient and electric drive vehicles or parts. It also contained loan guarantees for the construction of manufacturing facilities in the U.S. for advanced vehicle batteries, battery systems, components and related software. It further included \$25 billion in loan for re-equipping, expanding, or establishing a manufacturing facility in the United States to produce advanced technology vehicles or parts. And, there is a Federal fleet requirement to purchase vehicles with higher fuel economy, including hybrid vehicles, neighborhood electric vehicles, electric vehicles, and plug-in hybrid vehicles if the vehicles are commercially available.

The America Competes Act of 2007 created the “Advanced Research Projects Agency—Energy” (ARPA-E) at the Department of Energy. The new agency is aimed at providing cost share funding for long-term and high-risk energy technologies including advanced batteries, engine waste heat recovery and other technologies applicable to the automotive industry. No funds were set aside for it at the time of its creation.

The Energy Improvement and Extension Act of 2008 was part of the Emergency Economic Stabilization Act of 2008. (H.R.1424) signed into law in October 2008. Among other important changes, the Act provided a tax credit for the purchase plug-in vehicles until 2014. The base credit is \$2,500, plus \$417 for each kilowatt hour of traction battery capacity (battery capacity used to propel the vehicle) in excess of 4 kilowatt hours. It limited payments to \$7,500 for vehicles 10,000 pounds and under but payments were to rise to \$10,000 for vehicles weighing between 10,000 and 14,000 pounds. For vehicles weighing between 14,000 pounds and 26,000 pounds the credit was to be \$15,000. The credits were set to phase out after the first 250,000 total vehicles were produced.

The American Recovery and Reinvestment Act (ARRA) enacted in February of 2009, added further incentives including extending the tax credit for plug-in vehicles, more loan guarantees for advanced vehicle technology production capabilities, federal fleet purchasing requirements and \$2 billion in grants for U.S. manufacturers of advanced vehicle batteries, battery systems, components and related software. ARRA also capped the plug-in credit at \$7,500 and excluded vehicles over 14,000 pounds from receiving credits. And, it changed the plug-in vehicle tax credit program by raising the limit from a program total of 250,000 vehicles to a maximum of 200,000 plug-in vehicles per manufacturer. The act also provided \$400 million in funding for ARPA-E.

State Incentives

Many U.S. states have similar incentives and mandates. Oklahoma provides a 50 percent subsidy for EVs while California offers \$5,000 for qualified vehicles. Minnesota passed a law in May 2005 that requires its gasoline contains 20 percent ethanol by volume (E-20). Minnesota needs Federal approval by the end of 2010 for the E-20 mandate to take effect in 2013. EPA is studying the effects of higher ethanol fuels and may allow amounts higher than the E-10 now specified. Its decision is expected at some point during the Summer of 2010.

When it comes to mandates, California is the most extensive by far because its air quality problems led to an exception in the language establishing the U.S. Environmental Protection Agency (EPA). California's Air Resources Board (CARB) has the authority to set separate environmental regulations. Other states may choose to adopt these stricter standards or abide by those mandated by EPA. In September 2004, California requested a waiver from the Environmental Protection Agency (EPA) to allow the state to set its own regulations to reduce greenhouse gases (GHG) by 30 percent by the 2016 model year. Those rules could only be accomplished by meeting fuel economy levels more stringent than the CAFE standard mandated by EISA though for biofuels or other advanced vehicle technologies the correlations with vehicle efficiency would be less direct. In a landmark action, California agreed to allow harmonized rules from EPA and the National Highway and Traffic Safety Administration (NHTSA) to substitute for its carbon emissions standard for automobiles.

Corporate Average Fuel Economy (CAFE)

Congress sets out fuel economy rules for NHTSA to implement while EPA has determined that vehicle emissions lead to climate change which harms the U.S. environment. Thus, like California, EPA is regulating the carbon emissions of vehicles while NHTSA is looking strictly at vehicle miles per gallon. NHTSA established fuel economy standards that will reach 34.1 mpg for model year 2016 (the total fleet average for 2009 was 28.5), and the EPA standards require manufacturers to achieve a combined average vehicle emission level of 250 grams of carbon dioxide per mile. EPA states these reductions will be the equivalent of taking 50 million cars and light trucks off the road by 2030. The rules have been applied according to vehicle architecture so that the smallest vehicles must attain much higher mileage than the largest, though the mandates ensure that manufacturers will apply advanced technologies across their product lines. NHTSA's mandate to increase fuel mileage comes from EISA as mentioned above. EISA requires that each manufacturer come within 92 percent of the standard for a given year or risk civil penalties being assessed for non-compliance. Under EISA manufacturers are also expected to have the ability to earn credits for exceeding standards in one vehicle class that can be applied to increase the CAFE attainment of a different vehicle class where it is failing to comply with the standards.

There are a few other important distinctions. NHTSA runs a program aimed at increasing the number of vehicles that can use ethanol as a base vehicle fuel. NHTSA credits the manufacturers of these Flex Fuel Vehicles (FFVs) with higher mileage under its fuel economy rules in line with limits established under the Energy Independence and Security Act of 2007. EPA is following NHTSA's implementation during model years 2012 to 2015. After model year 2015, EPA will determine alternative fuel vehicle emission values based on a vehicle's actual emissions while operating on gasoline as well as on the alternative fuel and a demonstration of actual alternative fuel use. NHTSA's tests occur without the air conditioning running. EPA is allowing firms to include emissions reductions from air conditioners including those caused by refrigerant leaks.

EPA is also allowing the producers of greenhouse gas/fuel economy control technologies, such as electric vehicles, plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles to assign a zero gram per mile CO₂ emissions value to the first 200,000 vehicles sold in model years 2012-

2016 (for PHEVs, the zero gram per mile value applies only to the percentage of miles driven on grid electricity), or 300,000 vehicles for manufacturers that sell 25,000 vehicles or more in model year 2012. The CO₂ emissions compliance levels for advanced technology vehicles sold beyond these cumulative vehicle production caps will account for the net increase in upstream CO₂ emissions relative to a comparable gasoline vehicle. EPA says it will reassess advanced technology vehicle emissions in future rulemakings for MY2017 and beyond, based on the status of their commercialization, upstream GHG control programs, and other factors.⁵

International Factors

There are international drivers pushing advanced technologies as well. During the UN Climate Change talks in Copenhagen in December 2009, representatives of 14 of the world's largest cities pledged to make their cities more electric-vehicle-accessible. The "C40 Electric Vehicle Network" includes: Bogota, Buenos Aires, Chicago, Copenhagen, Delhi, Hong Kong, Houston, London, Los Angeles, Mexico City, Toronto, Sao Paulo, Seoul and Sydney. These cities plan to make it easier to obtain permits for charging stations, install public charging infrastructure, coordinate incentives, and purchase the vehicles for municipal fleets in the 2010 through 2013 time period.

Likewise, Germany adopted a National Development Plan for Electric Mobility (NEPE). The plan aims to prepare the market for the introduction of plug-in vehicles as well as support research and development for these vehicles. The plan aims for 1 million plug-in vehicle on German roads by 2020 and 5 million by 2030. Governments in France, Denmark, the United Kingdom, Ireland and Spain have similar plans. Unlike these other countries, Germany is not offering vehicle purchase incentives.

According to the *China Daily*, the Chinese government is working on a plan that encourages advanced vehicle production. The proposed plan has purchase incentives for plug-in electric vehicles of 50,000 Yuan or nearly \$9,000 per vehicle. Though incentives will exist for hybrids and fuel cell electric vehicles, the initial focus is apparently plug-in electric vehicles. The Chinese government had given priority to fuel cell vehicles in its last planning cycle, but it is now "giving priority to pure electric cars, and taking hybrid cars as complement" according to Zhang Jinhua, Vice-Secretary General of China's Society of Automotive Engineers. The Chinese also expect hybrid and fuel cell technology to be applied mainly to commercial vehicles.

Energy and Environment

The White House has stated it would like to implement an economy-wide cap-and-trade program to reduce GHG emissions 80 percent by 2050 and make the United States a leader on climate change. Congress is also working on climate change legislation. According to the Alliance of Automobile Manufacturers, about 17 percent of man-made carbon dioxide emissions in the United States are accounted for by automobiles. Given this, the auto industry could be both greatly impacted by new policies and also play a leading role in reducing overall emissions across all sectors of the economy through new technologies. The Alliance, whose members

⁵ Read more at: <http://www.epa.gov/oms/climate/regulations/420f10014.pdf>

include Chrysler, Ford, GM, Toyota and others, has stated in the past they support climate change legislation that will require equitable carbon dioxide reductions across all sectors of the economy that is economically feasible, is primarily market-based, and provides incentives for advanced technologies.

The Car Allowance Rebate System (CARS), often referred to as Cash for Clunkers, was a temporary federal program established in 2009 to both help stimulate the economy and to aid the environment by replacing older cars with fuel-efficient vehicles. The CARS program gave buyers up to \$4,500 towards a new vehicle when they traded-in an older vehicle that was: manufactured less than 25 years before the date it was traded in; have a combined city/highway fuel economy of 18 miles per gallon or less; and continuously insured and registered to the same owner for a full year before being traded-in. Congress initially appropriated \$1 billion for the program but subsequently appropriated an additional \$2 billion to ensure enough funds to meet consumer demand. According to data provided by cars.gov and the official CARS Report to Congress and NHTSA, new vehicles purchased under the CARS program had an EPA fuel economy rating of 9.2 mpg more than the traded-in vehicle, and the replacement of the old vehicles with the new ones will reduce fuel consumption by 20 million barrels and oil imports by 11 million barrels over 25 years.

FUEL RELATED TECHNOLOGIES

Hybrids

Hybrid vehicle sales continue to gain market share despite the fact that the number of hybrid models remain limited. Based on data provided by GreenCarCongress.com, hybrid vehicle sales were roughly 2.8 percent of total U.S. vehicle sales in 2009. With many manufacturers working on adding hybrids or increasing their range of offerings, this number will continue to grow. Toyota, with the largest number of hybrid models, received roughly 9.6 percent of total sales from hybrids in December 2009. This is up from 8.5 percent in December of 2008. Ford's Fusion and Milan hybrids similarly account for 8 percent of those model's sales. Toyota dominates the production and sale of hybrid vehicles with roughly 50 percent of the market followed by Ford, Honda, and GM. The increased offerings should lead to increased price competition pushing down sales prices and further increasing market penetration.

Plug-ins and Electric Vehicles

Virtually every major manufacturer worldwide is also working to market a plug-in vehicle over the next 4 years. GM is focusing on its Volt plug-in hybrid technology. It will offer a 40 mile range under electric power after which it will operate like a regular hybrid. Ford and Toyota are working on similar plug-in versions of their current hybrid vehicles and both are also looking at bringing fully electric vehicles to market. The Nissan/Renault alliance is making major commitments toward the manufacture of highway capable electric vehicles. According to Bloomberg, Nissan alone is making investments to enable it to produce 500,000 vehicles globally per year by 2012. This is much higher than the 50,000 to 60,000 units GM has plans to produce by that point. Ford plans to begin marketing an electric version of the "Transit" van

later this year, followed by an electric Focus beginning next year. Ford too is planning to sell limited quantities when compared to those Nissan/Renault is targeting. Targeted electric Transit production will be roughly 10,000 per year while the Focus EV production is closer to GM's initial plans for the Volt.

Developing country firms are also working to introduce plug-in vehicles. The Chinese firm BYD began Chinese market sales of its plug-in hybrid in December of 2008, and Chery unveiled the "S18" a fully electric vehicle in February of 2009. Likewise, Indian firm Tata Motors has discussed sales of a fully electric vehicle in Denmark in 2010. Initial production volumes will be low for most of these early vehicles and many early products will be targeted toward fleet users. Despite the modest initial production plans, compared to the roll-out of hybrid vehicles, the roll-out of plug-in vehicles is occurring at a much, much faster rate. It has been more than 13 years since the first hybrid was mass marketed and yet only a handful of companies produce hybrid models today. The number of plug-in models will reach a similar number in at least half the time span and as mentioned earlier virtually every major manufacturer worldwide will have at least one in production. It took Toyota over 12 years to sell 2 million hybrids. The Nissan Renault alliance plans to be able to achieve that in less than half the time. The much higher level of competition suggests much faster price declines than hybrids have achieved.

Still, early plug-in vehicles will be expensive to purchase. Most of the added cost will be in the batteries. Researchers from Nissan claim that batteries will reach price parity with internal combustion engines by 2015, and that they will offer a vehicle range of roughly 250 miles. This claim is supported to an extent by a statement made by Andy Karsner, Former Assistant Secretary for Energy Efficiency at the U.S. Department of Energy. Speaking at the "Plug-in Electric Vehicles 2008: What Role for Washington?" conference, Mr. Karsner noted that by 2014 advanced batteries would decline to \$300 per kilowatt hour (kw/h). He said that he based his comments on his access to the financial data of several major advanced battery suppliers. To put this into perspective, GM's "Volt" will use a 16kw/h battery enabling 40 miles of all electric travel. At \$300 kw/h the Volt battery would cost \$4,800. Even at 7 percent interest, it could take an average driver less than three years to pay back the cost of a Volt size battery at \$300 kw/h, leaving room for manufacturer markup, packaging and consumer return on purchase.

In addition to declines in battery prices, there are other opportunities for the manufacturers to achieve price declines in plug-in vehicles. GM may determine that it does not need a 16kw/h battery to achieve the 8kw/h usage over its 10 year 150,000 mile warrantee period. If GM can use a smaller battery of say 14kw/h versus the 16kw/h battery it is using initially, the vehicle cost would decline accordingly. There are also advancements to be made in packaging the batteries and in their control electronics. Researchers from Oak Ridge National Lab have already developed a way to eliminate one of the charging systems on plug-in vehicles. Doing this can cut both the costs of the vehicle's electronics but it can also reduce the unit size, complexity, and cooling needs.

VEHICLE EFFICIENCY TECHNOLOGIES

Vehicle manufacturers also continue to develop current vehicle technologies to increase the efficiency of their products. Some of the new innovations to help reduce fuel cost include: Stop-start, cylinder deactivation (variable displacement), direct injection for gasoline, efficient air conditioners, and low-rolling resistance tires. Reducing weight is the major avenue all firms are pursuing. Many are also working to increase their small vehicle offerings, particularly the Detroit 3. According to the Society of Automotive Engineers (SAE), Chrysler's tie-up with Fiat will allow it to market several of Fiat's small cars in the United States. It will also enable it to use Fiat's fuel efficiency inducing technologies such as its "Multiair" engine technology. Multiair is Fiat's proprietary variable valve technology which enables higher gas mileage and lower emissions.

Ford is working to market similar "EcoBoost Engine Technology." EcoBoost is actually a combination of variable valve, turbo boost and direct fuel injection technologies that allow smaller engines to deliver the power of larger displacement engines while also delivering increased fuel efficiency. This technology involves highly pressurized fuel that is injected from a fuel line directly into the combustion chamber of each cylinder of the engine. Direct fuel injection is expected to grow substantially in North America. Ford plans to produce 1.5 million EcoBoost engines globally by 2013.

Vehicle manufacturers are also offering other technologies such as the dual clutch, CVT, and additional gear transmissions that allow engines to operate closer to their peak efficiency, thereby offering increased fuel economy. Similarly the companies adopting "Stop/Start" systems which turn off the engine when the vehicle comes to a stop save fuel. The vehicle restarts once the driver's foot leaves the brake pedal. This is an affordable system for standard transmissions. It is more expensive for automatic transmissions, adding \$2,000-3,000 to the cost of the car. Some of the 2010 vehicles with Stop-start are the Ford Escape Hybrid, Porsche Panamera, Toyota Prius and various European vehicles with standard transmissions. Ford says that 98 percent of their vehicles will have six speed transmissions by 2012 and 20 percent will have Stop/Start by 2014.

Cylinder deactivation or variable displacement is a process of turning off the combustion in several cylinders of an engine under low-revving situations. This is another cost-effective innovation, allowing the driver to squeeze more fuel out of the engine. Several automakers have developed their own versions of the system: Chrysler calls it "Multi-Displacement," GM calls it "Active Fuel Management," and Honda calls it "Variable Cylinder Management." According to Paul Lacy at IHS Global Insight, "cylinder deactivation will be used more widely in the future, particularly on V-6 and V-8 engines, while direct injection and turbocharging will be more common on four-cylinder engines."

Low-rolling resistance tires can boost fuel efficiency by one to 2.5 mpg. Most of the gains in fuel efficiency are due to new tread compounds and tread designs. Some tests have shown these tires to provide a five percent increase in fuel efficiency plus a shorter stopping time per vehicle (around 25 feet sooner than a baseline tire). Unfortunately, tires with low rolling resistance are expensive, though they provide enough of a return at the gas pump to compensate for the extra expense.

Diesel

Diesel is a dominant drive train technology in Europe. Given the stringency of U.S. emission regulations, manufacturers are still exploring the most cost effective means of bringing diesel technology to market here. Technologies that meet emissions requirements add cost and generally lower the efficiency of diesels. Diesel engines have done well in Europe due in part to both looser environmental regulations and significantly higher tax rates on gasoline. The United States introduced regulations in 2006 that reduce sulfur content in diesel motor fuels, which makes meeting emission regulations easier for diesel-fuelled engines. However, without the comparative fuel price advantage it will be difficult for diesels to reach similar market shares as in Europe. The fact that only about 34 percent of filling stations in the United States sell diesel fuel also limits their attractiveness to consumers. European-based firms such as Volkswagen and Mercedes are introducing advanced diesels to their U.S. line-ups. Likewise, Indian-based Tata is trying to certify a small diesel-powered pick-up for import into the U.S. market.

Biofuels

Infrastructure availability remains a very large impediment to the use of E85 (85 percent ethanol) fuel. E85 distribution infrastructure is increasing though it remains very limited with roughly 2,000 E85 filling stations nationwide (compared to approximately 115,000 gas stations in the United States). The Detroit 3 remain committed to biofuels and are still aiming to make 50 percent of their respective lineups capable of burning E85 by 2012. While other firms offer vehicles E85 capable vehicles, the vast majority of flex-fuel vehicles currently offered for sale in the U.S. are produced by the Detroit 3. The Detroit 3 have also been working to increase the amount of bio-diesel their diesel engine vehicles can handle. Biofuel makers continue to make efficiency improvements and vehicle makers are enabling consumers to use the fuel as it becomes available by marketing E85 capable vehicles.

The primary way biofuels have been gaining market share in the U.S. motor fuel supply is as a fuel additive. EPA regulates gasoline blending rules to help reduce vehicle emissions. Current requirements for fuel grade gasoline allow ethanol to be blended to 10 percent by volume (E10). However EPA has a mandate to increase the use of ethanol in the fuel supply and is considering a petition by ethanol manufacturers to increase the blending limit. Testing is underway to determine the impacts of E15 and E20 on the current fleet. EPA will not make a decision until the Summer of 2010 but has indicated that it is leaning toward increasing the limit to E15.

Hydrogen Fuel Cells

Many of the largest automakers also continue to make progress toward mass marketing hydrogen fuel cell vehicles. GM continues to pursue its Project Driveway program having passed over a million miles on its fuel cell powered Equinox SUVs in September of 2009. Honda's U.S. lease program for their fuel cell powered "Clarity" which began in 2008 also continues. Toyota, Ford, Mercedes and Hyundai are some of the other firms continuing to pursue early adoption of hydrogen fuel cells for the automotive market. Many of these automakers are currently

expecting plug-in vehicles to be targeted toward the smaller vehicle spectrum while fuel cells would be aimed at larger models. Fuel cell costs remain high but they are declining and targets for mass market cost competitiveness continue to be met. Several firms are targeting 2015 market introductions, though limited fuelling infrastructure will likely hold back early sales. At roughly 60 stations total in the U.S., fuelling infrastructure is the largest barrier to mass marketing hydrogen fuel cell vehicles in the United States. Germany has a commitment to invest roughly \$2 billion in building out a hydrogen infrastructure making it potentially the best early market for these vehicles.

DOMESTIC ISSUES IMPACTING COMPETITIVENESS

Dealerships

There are two major associations that represent new vehicle dealerships. They are the National Automobile Dealers Association (NADA) and the American International Automobile Dealers Association (AIADA). Although NADA primarily represents Ford, GM, and Chrysler; and AIADA represents imported brands, many dealers belong to both since many multiple dealership owners have both a Detroit 3 brand and an imported brand. Both associations work together on most dealer issues (especially fuel mileage, emissions, and tax laws), although NADA at times has a different agenda on trade issues than AIADA.

Five of the top six dealership groups in 2009 were publically held, with Autonation and Penske Automotive the two largest dealership groups. The total average dealership revenues decreased from \$33.4 million in 2007 to \$28.6 million in 2008 and preliminary data show it declined further in 2009 to \$26.4 million. The loss is even greater than the average indicates since there were almost 2,500 fewer dealers in 2009 than 2007.

According to NADA data, the number of U.S. dealerships declined from 20,010 at the end of 2008 to 18,458 at the end of 2009. This represents a decline of almost 7,000 dealerships since 1990. The number of U.S. dealers has decreased every year since 1988. During the first 3 months of 2010, almost 100 additional dealerships have ceased operations. Furthermore, a survey conducted by Urban Science indicates that the total drop in dealerships was the highest, in percentage terms, since the early 1950's. States with the highest percentage of closings were Alaska, Mississippi, South Carolina, Arkansas, and Missouri.

The dramatic drop in dealerships was caused by two principal factors: 1) U.S. vehicles sales declined from 13.2 million in 2008 to 10.4 million in 2009 and 2) GM discontinued four brand names: Pontiac, Hummer, Saturn, and Saab, which was sold. The dramatic drop in U.S. sales caused a number of dealers to close, and those carrying the four discontinued GM brands either closed or will close during 2010, unless they are also selling other GM or non GM vehicles in their showrooms. In addition, the bankruptcy court allowed GM to close about 2,000 dealers (almost half were Cadillac dealers) and Chrysler to close 789 dealers and void all of these dealers' franchises. Since the Detroit 3 have been losing U.S. market share for years, they have been encouraging dealers to close or merge with other dealers due to inadequate sales.

Dealers make very little profit on the new vehicles they sell, with many selling at a loss after all new-car-related expenses are included. Even the profit from selling used vehicles was negative for the first time in many years in 2008; however, it was again marginally profitable in 2009. Most of a dealer's profits are generated from service and repairs. However, due to reduced costs and increases in used vehicle profits, dealer's net pretax profits as a percentage of total sales rose from 1 percent in 2008 to 1.5 percent in 2009.

The major trend facing dealerships in the United States is the elimination of smaller dealers and the growing number of larger dealers. In 1989, there were 15,000 dealers selling fewer than 400 vehicles a year, and the larger dealers selling more than 400 vehicles totaled 10,000. By 2009 there were only 8,287 dealers selling fewer than 400 vehicles, but 11,723 selling more than 400 per year.

Since GM and Chrysler notified the dealers who were to close during the summer, these dealers have taken actions to stop the two vehicle companies from terminating their franchises. President Obama signed a bill passed by Congress in December to allow all terminated dealers to file for arbitration if they thought their franchise was unjustly closed. Many GM and Chrysler dealers initiated arbitration procedures with the two companies.

In January, 2010 GM announced it wanted to restore some of the terminated dealers. In early March, GM said it planned to reinstate 661 dealers that lost their franchises without any arbitration. Early in 2010, 1,160 dealers had filed for arbitration under the federal law. However, they had only ten days to respond and 60 more days to comply with GM's requirements for facilities, capitalization, location, licensing, and floorplaning. Later GM stated it would reinstate more of the rejected dealers if they presented evidence that they could meet GM's new standards for each dealership.

According to *Automotive News*, Chrysler planned to be less flexible in taking back its terminated dealers than GM. Chrysler announced it would reinstate 36 of the 789 terminated dealers early in 2010, and on March 26 it reinstated an additional 50. Over 400 had already stated they would enter into the arbitration process. In order to be reinstated, Chrysler asked the terminated dealer to spend as much as \$3 million to upgrade their facilities within eight months, have \$500,000 in working capital, and waive the right to block the company from placing another new dealer near the reinstated dealer for five years.

CONCLUSION

The automotive trade balance is moving in a positive direction for the United States. We expect this trend to continue as the United States becomes more aggressive in its export strategies (i.e., National Export Initiative), and more manufacturers choose to locate operations or expand current operations by developing exclusive models in the United States for global export.

It is also clear that the shakeout in leading global auto markets is underway. With Brazil expected to overtake Germany, countries with existing auto industries are fighting to keep plants open as other, more affordable locations (such as the BRIC countries and also the United States with its weak dollar), increasingly become hubs of auto manufacturing. In fact, many manufacturers have chosen to locate even more production in the United States for this reason.

Furthermore, the importance of trade agreements cannot be underestimated, as manufacturers attempt to take advantage and maximize these opportunities, whether regional (i.e., further consolidation in ASEAN and relocations by manufacturers throughout NAFTA) or international (i.e., EU-Korea, etc). Therefore it is vital to closely monitor trends in all economies, both developed and developing, in the global marketplace.

In addition to focusing on regional markets, automakers must stay ahead of the competition through continuous innovation. As global economies change, automakers must adapt. Emerging challenges for automakers include limiting the impact on the environment, keeping customers connected, and keeping customers safe. Increases in fuel costs are causing manufacturers to consider and develop propulsion systems for alternative fuel sources such as diesel, bio-fuels, electricity, compressed natural gas, and hydrogen. The ultimate goal is to boost fuel efficiency and limit the environmental impact. With all of the changes in technology, governments are playing a key role through ongoing research and development assistance, federal and state incentives, and new regulations. Through consistent and effective industry and government collaboration and coordination, the changing auto landscape will be better than ever as we navigate the Road Ahead.