OPEC production decisions are the most significant factor underlying differences among the price cases. The AEO2009 reference case assumes that OPEC will maintain a share of approximately 40 percent of total world liquids production through 2030, consistent with recent trends. In the high price case, OPEC reduces its market share to about 30 percent; in the low price case, OPEC’s share grows to nearly 50 percent (Figure 34). In all the cases, total liquids production by countries in the Organization for Economic Cooperation and Development (OECD) is between 22 and 26 million barrels per day in 2030, constrained mainly by resource availability rather than price or political concerns.

In the high price case, several non-OPEC countries with large resource holdings (including Russia, Brazil, and Kazakhstan) either maintain or further restrict opportunities for investment in resource development, limiting their contributions to total liquids supply. Political, fiscal, and resource conditions in each of those countries are unique; however, all will require domestic and foreign investment to develop new projects and maintain infrastructure, and all have either resisted encouraging such investment or indicated that they might enact restrictions on foreign investment.

In the low price case, several resource-rich nations, including Russia and Venezuela, adopt new legislation or fiscal regimes in order to encourage foreign investment in the development of their resources. As a result, the largest increases in liquids production among the non-OPEC countries are in Kazakhstan, Russia, and Brazil.

Growth in energy use is linked to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Since 1980, U.S. energy use per capita has remained relatively stable, between 310 and 360 million Btu per person. In periods of high energy prices (particularly, oil prices) energy consumption per capita has tended to be at the low end of the range, and in periods of low energy prices it has tended to move toward the high end. With the expectation that oil prices will remain high throughout the projection period, coupled with recent legislation enacted to increase energy efficiency, energy use per capita in the reference case drops below 310 million Btu in 2020 and continues a slow decline through 2030 (Figure 35).

Improvements in energy efficiency in response to higher CAFE standards and more stringent standards for lighting contribute to the decline in energy use per capita. Other contributing factors include moderate GDP growth and a decline in industrial energy use per dollar of output, as less energy-intensive industries provide a growing share of industrial production.

Energy intensity (energy use per 2000 dollar of GDP) also declines in all the end-use sectors in the reference case, as a result of both structural changes and efficiency improvements. The smallest decline from 2007 through 2030 is projected for the commercial sector, where recent energy legislation has only a small impact. In addition, growth in commercial floorspace outpaces housing growth.
Energy Demand

Buildings and Transportation Sectors Lead Increases in Primary Energy Use

Total primary energy consumption, including for electricity generation, grows by 0.5 percent per year from 2007 to 2030 in the reference case (Figure 36). The fastest growth is projected for the commercial sector (1.1 percent), which has the smallest share of end-use energy demand. Growth in commercial energy use is led by increases for office equipment, ventilation, and “other uses,” including service station equipment, automated teller machines, telecommunications equipment, and medical equipment—most of which are powered by electricity. Residential energy use grows by 0.4 percent per year, with increases resulting from population growth, more personal computer use, and shifts to larger formats for television sets being offset in large part by efficiency improvements in lighting and appliances, as required by EISA2007.

Energy use for transportation also grows by 0.5 percent per year in the reference case. All growth in transportation energy consumption results from increased fuel use for freight trucks and air transportation. For LDVs, which make up the largest segment of energy use in the transportation sector, rising energy prices and enhanced CAFE standards offset increases in the number of vehicles sold and miles traveled.

Energy consumption in the industrial sector increases by only 0.1 percent per year. EISA2007 requires more use of biofuels in the transportation sector. Conversion of biomass to ethanol or diesel fuel in the industrial sector produces liquids with lower Btu content than the biomass feedstock, creating heat that can be used to power on-site equipment or to generate electricity for sale to the grid.

Renewable Sources Lead Rise in Primary Energy Consumption

Primary energy consumption in the end-use sectors grows by 0.5 percent per year from 2007 to 2030, with annual demand for renewable fuels increasing the fastest—including E85 and biodiesel fuels for light-duty vehicles, biomass for co-firing at coal-fired electric power plants, and byproduct streams in the paper industry captured for energy production. Biomass consumption increases by 4.4 percent per year on average from 2007 to 2030 and makes up 22 percent of total marketed renewable energy consumption in 2030, compared with 10 percent in 2007.

The petroleum share of liquid fuel consumption in the transportation sector declines somewhat, as consumption of alternate fuels (such as biodiesel and E85) and blending components (such as ethanol) increases as a result of the RFS mandate in EISA2007. Overall, consumption of liquid fuels in the transportation sector—particularly for LDVs—continues to increase through 2030. After ethanol and biodiesel, the fastest growth in renewable energy consumption in the end-use sectors is projected for biomass use. In the mid-term (from 2014 to 2023), a decline in real output from the chemical industry leads to a reduction in demand for LPG and petrochemical feedstocks in the industrial sector.

Natural gas use increases by 0.2 percent per year over the projection period, including steady growth in the commercial sector, where it is used for on-site electricity generation. Coal consumption increases by 0.7 percent per year on average (Figure 37). Nearly all the increase results from the use of coal as a feedstock in the industrial sector, at new CTL plants.
Residential energy use per capita varies with technology assumptions

Figure 38. Residential delivered energy consumption per capita in three cases, 1990-2030 (index, 1990 = 1)

Over the past 10 years, the weather has generally been warmer than the 30-year average, causing residential energy use per person to remain mostly below its 1990 level. Increases in energy efficiency also have contributed to lower residential energy use, while consumer preference for larger homes and new energy-using technologies has worked in the opposite direction. Given the preponderance of warmer winters and summers, the AEO2009 projections define normal weather as the average of the most recent 10 years of historical data, which decreases the need for heating fuels, such as natural gas and fuel oil, and increases the need for electricity used for air conditioning, all else being equal.

In the AEO2009 projections, residential energy use per capita changes with assumptions about the rate at which more efficient technologies are adopted. The 2009 technology case assumes no increase in the efficiency of equipment or building shells beyond those available in 2009. The high technology case assumes no increase in the efficiency of equipment or building shells beyond those available in 2009. The high technology case assumes lower costs, higher efficiencies, and earlier availability of some advanced equipment. In the reference case, residential energy use per capita is projected to fall below the 2006 level (the lowest since 1990) after 2012. In the 2009 technology case, delivered energy use per capita in the residential sector remains near the 2006 level through 2030, when it is 6 percent higher than projected in the reference case (Figure 38). In the high technology case, delivered energy use per capita in the residential sector falls below the 2006 level after 2011, reaching a 2030 level that is 5 percent below the reference case projection.

Household use of electricity continues to grow

Figure 39. Residential delivered energy consumption by fuel and service, 2007, 2015, and 2030 (quadrillion Btu)

Residential electricity use has increased by 23 percent over the past decade, as efficiency improvements have been more than offset by increases in air conditioning use and the introduction of new applications. That trend continues in AEO2009 (Figure 39). In 2030, electricity use for home cooling in the reference case is 24 percent higher than the 2007 level, as the U.S. population continues to migrate to the South and West, and older homes are converted from room air conditioning to central air conditioning. A projected 24-percent increase in the number of households also increases the demand for appliances, and total electricity use in the residential sector increases by 20 percent from 2007 to 2030 in the reference case. The share of electricity used for “other appliances” grows from 51 percent in 2007 to 58 percent in 2030, as home electronics continue to proliferate, and efficiency gains in traditional end uses (such as lighting) foster reductions in energy use per household.

Natural gas and liquid fuels are used in the residential sector primarily for space and water heating. Few new uses have emerged over the past decade, and few are expected in the future. Thus, natural gas and liquids consumption per household falls as the energy efficiency of furnaces and building components continues to improve. Demand for space and water heating per household declines by 19 percent from 2007 to 2030, as the population shifts from colder to warmer climates. Technologies that can reduce demand for natural gas in the residential sector include condensing gas furnaces, which can attain 95 percent efficiency, and tankless (instantaneous) water heaters, which can attain 80-percent efficiency, representing an increase of 36 percent over the current standard.
Increases in Energy Efficiency Are Projected To Continue

**Figure 40. Efficiency gains for selected residential appliances in three cases, 2030 (percent change from 2007 installed stock efficiency)**

The energy efficiency of purchased equipment plays a key role in determining the types and amounts of energy used in residential buildings. Delivered energy use per household declines in the AEO2009 reference case at an average annual rate of 0.6 percent, even as the average square footage of households rises and the penetration of appliances, especially electronics, continues to grow. Stock turnover and the resulting purchase of more efficient equipment account for most of the decline in residential energy intensity, while rising energy prices and more rapid growth of households in the Sunbelt regions together account for about one-third of the decline.

In the 2009 technology case, which assumes no efficiency improvement in available appliances beyond 2009 levels, normal stock turnover still results in higher average energy efficiency for most end uses in 2030, as older, less efficient appliances in the existing stock are replaced (Figure 40). The best available technology case assumes that consumers will install only the most efficient products available, regardless of cost, at normal replacement intervals, and that new buildings will meet the most energy-efficient specifications available. Because purchases of new energy-efficient products (including compact fluorescent bulbs, solid-state lighting, and condensing gas furnaces) cut energy use without reducing service levels, residential delivered energy consumption in 2030 is 29 percent lower in the best available technology than in the 2009 technology case and 25 percent lower than in the reference case. In the best available technology case, residential delivered energy intensity declines by 1.8 percent per year, and residential electricity use declines by almost 1 percent per year.

EIEA2008 Tax Credit Increases Installations of Efficient Equipment

**Figure 41. Residential market penetration by renewable technologies in two cases, 2007, 2015, and 2030 (percent share of single-family homes)**

In the past, in a market dominated by such traditional energy resources as liquids, natural gas, and electricity, renewables have claimed only a tiny share of residential energy use. Wood-burning stoves and solar-powered water heaters are the most common renewable energy technologies used in households today; however, EIEA2008 provides sizable tax credits through 2016 for purchases of energy-efficient ground-source heat pumps and solar PV systems.

Ground-source heat pumps, which extract heat from the ground to provide energy for heating and cooling, are an efficient but relatively expensive alternative to traditional air-source heat pumps. Nationwide, roughly 35,000 ground-source heat pumps were installed in residential buildings in 2007. In the AEO2009 reference case, which includes the $2,000 EIEA2008 tax credit for ground-source heat pumps, installations average 90,264 per year. As a result, their market share increases more than fivefold over their 2007 share, to 1.5 percent in 2030.

The outlook for solar PV installations is similar. Although residential solar PV has received a 30-percent Federal tax credit in the past few years, that credit was capped at $2,000. EIEA2008 removes the cap, allowing the average tax credit to reach roughly $10,000 for a 3.5-kilowatt system, thus enhancing the economics of residential installations considerably. Over the period of the tax credit (2009-2016), more than 1.6 million residential solar PV units are projected to be installed in the reference case (Figure 41).
Assumptions about the availability and adoption of energy-efficient technologies help define the range for delivered commercial energy use per person in the AEO2009 projections. Energy consumption per capita, which increased steadily in the 1980s and 1990s, stabilizes in the AEO2009 reference case as efficiency improvements offset growth in demand for energy services (Figure 42). In the 2009 technology case, in which equipment and building shell efficiency improvements are limited to those available in 2009, commercial energy use per capita continues to increase through 2020 before leveling off. In the high technology case, which assumes earlier availability, lower costs, and higher efficiencies for more advanced equipment and building shells, future commercial energy use per capita remains below current levels, falling to 3.3 percent below the reference case level in 2030. Lower electricity use accounts for most of the difference from the reference case.

Growth in commercial floorspace averages 1.3 percent per year from 2007 to 2030 in the reference case, following trends in economic and population growth. The reference case assumes future improvements in efficiency for available equipment and building shells, as well as increased demand for services. The purchase of more efficient equipment in response to high energy prices offsets the increase in energy consumption that would have occurred with floorspace expansion, leading to a decline in commercial energy intensity in the AEO2009 projections across all cases. The projected average annual declines in delivered energy intensity from 2007 to 2030 range from 0.1 percent per year in the 2009 technology case to 0.4 percent per year in the high technology case.

In the AEO2009 reference case, growth in disposable income increases demand for services from hotels, restaurants, stores, theaters, and other commercial establishments, which increasingly depend on computers and other electronic office equipment for basic services and for business and customer transactions. The growing share of the population over age 65 also increases demand for health care and assisted-living facilities and for electricity to power medical and monitoring equipment at those facilities. In combination with “other” uses (such as telecommunications equipment), those increases offset improved efficiency in the major commercial end uses, so that total commercial electricity use increases by an average of 1.4 percent per year from 2007 to 2030.

Use of natural gas and liquids for heating shows limited growth (Figure 43), as commercial activity reflects the U.S. population shift to the South and West (where space heating requirements are relatively low) and the efficiency of building and equipment stocks improves. Commercial natural gas use grows by 0.6 percent per year on average from 2007 to 2030 in the reference case, including more use of CHP in the later years. Commercial natural gas use in 2030 varies slightly in response to changing economic assumptions, from 3.4 quadrillion Btu in the low growth case to 3.7 quadrillion Btu in the high growth case. Liquid fuels use shows little change over time in the reference case, as concerns about fuel costs and emissions make fuel oil less attractive for CHP. The high and low oil price cases show the widest range for liquid fuels use, from 8 percent below to 19 percent above the reference case projection of 0.6 quadrillion Btu in 2030, respectively.
The stock efficiency of energy-consuming equipment in the commercial sector increases in the AEO2009 reference case as equipment stocks age and are replaced by more energy-efficient technologies (Figure 44). As a result, commercial energy intensity falls by 0.3 percent per year. Stock turnover moderates the growth in energy use that otherwise would occur with a projected 1.3-percent average annual increase in commercial square footage. In addition, rising energy prices contribute about 0.1 percent per year to the decline in energy intensity.

The best available technology case assumes that only the most efficient technologies are chosen, regardless of cost, and that new building shells in 2030 are 29 percent more efficient than the 2007 stock. In the best available technology case, with the adoption of improved heat exchangers for space heating and cooling equipment, solid-state lighting, and more efficient compressors for commercial refrigeration, commercial delivered energy consumption in 2030 is 15 percent lower than in the reference case and 18 percent lower than in the 2009 technology case, and commercial delivered energy intensity declines by 1.0 percent per year from 2007 to 2030.

The 2009 technology case assumes that equipment and building shell efficiencies are limited to those available in 2009. In this case, energy efficiency in the commercial sector still improves from 2007 to 2030, but delivered energy intensity declines by only 0.1 percent per year, because the energy savings that otherwise would result from improving efficiency are offset primarily by increasing penetration of new electric appliances in the commercial sector.

The extension and expansion of ITCs for distributed generation technologies in EIEA2008 result in a 3.2-percent increase in commercial sector electricity generation capacity by 2016 in the AEO2009 reference case in comparison with the no 2008 tax legislation case. In the reference case, commercial solar PV installations show the largest increase, benefiting from a 30-percent business ITC with no cap on the allowable dollar amount. Conventional natural-gas-fired generating technologies, which are less capital-intensive than most renewable technologies, also receive a boost from the new 10-percent credit for CHP systems in the reference case (Figure 45).

In the high technology case, with more optimistic technology assumptions, electricity generation at commercial facilities in 2030 is 13 billion kilowatt-hours (37 percent) higher than in the reference case, and most of the increase offsets electricity purchases. In the best available technology case, 18 billion kilowatt-hours (55 percent) more commercial electricity generation (mostly from solar PV and wind systems) is projected for 2030 than in the reference case.

Some of the heat produced by fossil-fuel-fired generators in CHP applications can be used for water and space heating, increasing the efficiency and attractiveness of the technologies. On the other hand, the additional natural gas used for CHP systems in the commercial sector raises total natural gas consumption in the reference case and offsets some of the reductions in energy costs that result from efficiency gains in end-use equipment and building shells in the high technology and best technology cases.
Manufacturing Takes a Growing Share of Total Industrial Energy Use

About two-thirds of delivered energy consumption in the industrial sector is used for heat and power in manufacturing. Nonfuel uses of energy fuels, primarily as feedstocks in chemical manufacturing and asphalt for construction, make up one-fifth of the total, and nearly all the rest is used for heat and power in agriculture, mining, and construction. In the reference case, despite a 47-percent increase in industrial shipments, industrial delivered energy consumption grows by only 4 percent from 2007 to 2030, mainly as a result of slow growth or declines in output from most of the energy-intensive manufacturing industries. In the chemical industry, in particular, shipments decline by 10 percent from 2007 to 2030.

Manufacturing energy use for heat and power grows through 2030, with large increases in refining and biofuel production more than offsetting reductions in output for bulk chemicals, iron and steel, and aluminum. In contrast, despite projected recovery in the construction industry, with 23-percent output growth from 2007 to 2030, nonmanufacturing energy use in 2030 is approximately the same as in 2007. Efficiency improvements in diesel- and gasoline-powered construction equipment slow the growth of energy consumption in the nonmanufacturing industries.

Prospects for nonfuel uses of energy depend on output trends in the chemical, agriculture, and construction industries, as well as the potential for synthetic fuel production, including CTL and GTL. In the reference case, efficiency improvements, a shrinking chemical industry, and unfavorable prospects for CTL and GTL contribute to a 21-percent reduction in nonfuel uses of energy from 2007 to 2030 (Figure 46).

Industrial Fuel Choices Vary Over Time

Liquid fuels and natural gas account for 71 percent of industrial delivered energy consumption, with electricity, coal, and renewables accounting for the rest. Because fuel-switching opportunities in existing plants are limited, changes in fuel shares tend to reflect long-term transitions in the mix of industries, as well as impacts of capital investment. In the reference case, natural gas is the leading industrial fuel source in 2030, as opposed to liquid fuels in 2007 (Figure 47). Even so, natural gas use in 2030 remains below its 2000 level. Growth in natural gas use is moderated by a decline in consumption in the chemical industry, which accounted for about one third of total industrial natural gas use in 2007 (excluding natural gas lease and plant fuel). About three-fourths of liquid fuel consumption in the industrial sector is for nonfuel uses or is generated as a byproduct in refining.

Coal use for CTL production more than offsets a decline in such traditional applications as steam generation and coke production as a result of environmental concerns related to emissions from coal-fired boilers, along with manufacturing efficiency improvements that reduce the need for process steam. Metallurgical coal use also declines, reflecting modest growth in the steel industry and the spread of electric arc furnaces.

Modest growth in industrial electricity use reflects efficiency improvements across a wide spectrum of industries, attributable in part to the new motor efficiency standards included in EISA2007. Renewable energy consumption in the industrial sector expands with the projected growth in pulp and paper shipments, which allows more biomass to be recovered from those production processes.
Industrial activity varies across the AEO2009 economic growth cases, reflecting uncertainty about growth in the economy. Total industrial shipments grow by 47 percent from 2007 to 2030 in the reference case, as compared with 20 percent in the low economic growth case and 74 percent in the high economic growth case. In the near term, however, industrial activity is slowed by the current economic downturn. From 2007 to 2010, shipments decline for many industries (including construction, bulk chemicals, refining, steel, cement, and paper products), and industrial delivered energy use in the reference case falls by about 6 percent before recovering.

A few energy-intensive industries account for a large share of total industrial energy consumption. Ranked by 2007 energy consumption, the top five energy-consuming industries—bulk chemicals, refining, paper, steel, and food—accounted for about 60 percent of total industrial energy use but only 20 percent of total shipments. Those five and the other energy-intensive industries (glass, cement, and aluminum) grow more slowly than the non-energy-intensive industries (Figure 48).

The relatively slow growth of energy-intensive manufacturing industries in the reference case results from increased foreign competition, reduced demand for the raw materials and basic goods they produce, and movement of investment capital to more profitable areas. In general, a shift in manufacturing from basic goods toward less energy-intensive, higher-value products results from the comparative advantage of the technically advanced U.S. economy in international trade.

The projections for industrial energy consumption vary by industry and are subject to considerable uncertainty, as reflected in the three economic growth cases (Figure 49). Industrial delivered energy consumption grows by 4 percent from 2007 to 2030 in the reference case, declines by 9 percent in the low economic growth case, and increases by 19 percent in the high economic growth case. In absolute terms, the most significant changes in energy consumption from 2007 to 2030 are in the two largest energy-consuming industries, bulk chemicals and refining. The decline in energy use for bulk chemicals, a major exporting industry, reflects increased competition in foreign markets from countries with access to less expensive energy sources, combined with improvements in energy efficiency. Energy consumption in the refining industry increases—despite a relatively flat trend in overall petroleum demand—given the industry’s needs to process heavier crudes, comply with low-sulfur fuel standards, and produce biofuels as mandated in EISA2007.

For the cement and steel industries, delivered energy consumption declines from 2007 to 2030, primarily as a result of relatively slow output growth, expected long-term changes in production technology, and rising energy prices after 2020. Energy use increases in the paper and pulp industry, with rising shipments reversing recent declines, and in the food industry. The decline in aggregate industrial energy intensity, or consumption per real dollar of shipments, is more rapid when a higher rate of economic growth is assumed: 1.7 percent in the high economic growth case, as compared with 1.5 percent in the reference case and 1.2 percent per year in the low growth case.
Growth in Transportation Energy Use Is Expected To Be Slow

From 2007 to 2030, total delivered energy consumption in the transportation sector grows at an average annual rate of 0.4 percent, from 28.8 quadrillion Btu in 2007 to 31.9 quadrillion Btu in 2030, as compared with the 1.5-percent average rate from 1980 to 2007. Energy use by LDVs levels off in the reference case because of higher energy prices and more stringent CAFE standards, and because growth in demand for air travel also is expected to be slower than in the past.

Energy demand for LDVs (cars, pickup trucks, sport utility vehicles, and vans) increases by just 0.08 quadrillion Btu from 2007 to 2030 (Figure 50), with annual increases in vehicle-miles traveled offset by fuel economy gains resulting from rapidly increasing fuel economy requirements in the near term. Slower growth in income per capita and higher fuel costs also reduce the growth of personal travel, slowing the growth in demand for both highway and aviation fuels. Increases in the fuel efficiency of aircraft also reduce consumption of jet fuel.

More rapid increases in energy demand are projected for other transportation modes. Heavy-duty vehicles (including freight trucks and passenger buses) lead the growth in transportation energy demand over the projection, as a result of their smaller gains in fuel efficiency and expected increases in industrial output. For marine and rail transportation, increases in energy consumption result from the growth of industrial output and growing demand for coal transport. Pipeline energy consumption also increases with the projected growth in volumes of petroleum and natural gas transported.

New CAFE Standards Improve Light-Duty Vehicle Fuel Efficiency

Light trucks (pickups, sport utility vehicles, and vans) have made up a steadily growing share of U.S. LDV sales in recent years [95]. Thus, despite technology improvements, the average fuel economy of new LDVs declined from 26.2 mpg in 1987 to a range between 24 and 26 mpg from 1995 to 2006 (Figure 51).

NHTSA has proposed a new attribute-based CAFE standard under which LDV fuel economy would increase rapidly through 2015 and at a slower rate through 2020. Accordingly, in the AEO2009 reference case, the fuel economy of new LDVs increases by an average of 3.6 percent per year from 2011 to 2015, from 28 mpg to 33 mpg, and by 1.6 percent on average from 2016 to 2020, to 35.5 mpg, slightly exceeding the EISA2007 requirement of 35 mpg in 2020.

In all the AEO2009 cases, LDV sales in 2030 total about 20 million units; however, the mix of cars and light trucks sold varies across the cases. In the reference case, cars represent 64 percent of total sales in 2030, and LDV fuel economy averages 38.0 mpg. In the high oil price case, cars make up 69 percent of sales in 2030, and LDV fuel economy averages 39.7 mpg. In the low oil price case, cars make up 53 percent of total sales in 2030, and LDV fuel economy averages 36.1 mpg. The economics of fuel-saving technologies improve further in the high technology and high price cases, and consumers buy more fuel-efficient cars and trucks; however, average fuel economy improves only modestly, because the proposed new NHTSA CAFE standards already require significant penetration of advanced technologies, pushing fuel economy improvements to the limit of the technologies included in the model.
Concerns about oil supply, fuel prices, and emissions have driven the market penetration of unconventional vehicles (vehicles that can use alternative fuels, electric motors and advanced electricity storage, advanced engine controls, or other new technologies). Unconventional vehicle technologies are expected to play a greater role in meeting the new NHTSA CAFE standards for LDVs. Unconventional vehicles account for 63 percent of total new LDV sales in 2030 in the AEO2009 reference case.

Hybrid vehicles (including both standard hybrids and PHEVs) represent the largest share of the unconventional LDV market in 2030 (Figure 52), at 63 percent of all new unconventional LDV sales and 40 percent of all new LDV sales. Micro hybrids, which allow the vehicle’s gasoline engine to turn off by switching to battery power when the vehicle is idling, have the second-largest share, at 25 percent of unconventional LDV sales. Turbo diesel direct injection engines, which can improve fuel economy significantly, capture a 16-percent share of unconventional LDV sales. The availability of ultra-low-sulfur diesel and biodiesel fuels, along with advances in emission control technologies that reduce criteria pollutants, supports the increase in diesel LDV sales.

Currently, manufacturers receive incentives for selling FFVs, through fuel economy credits that count toward CAFE compliance. Although those credits are assumed to be phased out by 2020, FFVs make up 13 percent of all new LDV sales in 2030 in the reference case, in part because of the increased availability and lower cost of E85.

With more stringent CAFE standards and higher fuel prices, unconventional vehicles account for the majority of new LDV sales in 2030 in the reference case, and hybrid electric vehicles claim the largest share of unconventional vehicle sales. Four types of hybrid vehicle are expected to be available for sale in 2030: standard gasoline-electric hybrid (HEV), plug-in hybrid with an all-electric range of 10 miles (PHEV-10), plug-in hybrid with an all-electric range of 40 miles (PHEV-40), and micro hybrid (MHEV).

In the reference case, total hybrid sales increase from 2.3 percent of new LDV sales in 2007 to 20.6 percent in 2015 and 39.6 percent (7.9 million vehicles) in 2030. In the high oil price case, hybrids make up 45.3 percent of new LDV sales in 2030, with sales of 9.1 million; in the low oil price case, they make up 37.8 percent, with sales of 7.6 million.

In the high price case, the mix of hybrid vehicle types sold in 2030 shifts to more fuel-efficient PHEVs: PHEV-10 sales increase from 1.6 percent of LDV sales in the reference case to 2.0 percent in the high price case, and PHEV-40 sales increase from 0.6 percent to 1.0 percent of LDV sales. In the low price case, consumers have less incentive to buy the most efficient (and expensive) PHEVs. Accordingly, vehicle manufacturers increase production of less expensive MHEVs, which claim a larger share of hybrid vehicle sales than they do in the high price case (Figure 53).