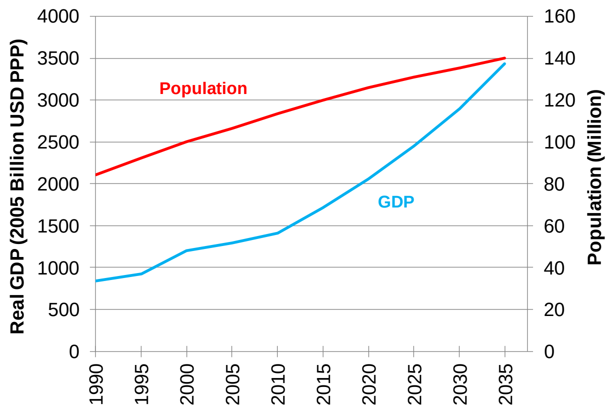
MEXICO

- *By sustaining its crude oil production, Mexico is likely to remain a large oil producer and exporter in the future.*
- *Even though Mexico is expected to be a net gas importer throughout the outlook period under business-as-usual assumptions, the full extent of Mexico's shale gas resources remains unknown. Better knowledge of these resources could change Mexico's gas outlook considerably.*
- *CO_2 emissions are projected to grow 56% in the outlook period with the economy's final use sectors accounting for 55% of those emissions by 2035. Mexico's CO_2 intensity is expected to decline much faster than its final energy intensity.*

ECONOMY

Mexico is legally constituted as a republic and politically divided into 31 states and one federal district. It is geographically located in North America and is one of APEC's three Latin American economies. Bordered by the United States (US) to the north and Belize and Guatemala to the south, the Mexican territory, of around 1.96 million square kilometres, is rich in resources. It encompasses a wide variety of climatic conditions, ranging from very dry with high temperatures in the north, to very humid with high temperatures in the south, to mild in the centre and warm on the coasts (SMN, 2011). Due to its abundant and complex ecosystems, Mexico is one of the 12 'megadiverse' economies in the world (UNEP, 2002).

Figure MEX1: GDP and Population



Sources: Global Insight (2012) and APERC Analysis (2012)

As depicted in Figure MEX1, the economy's total population of around 112 million in 2010 (Inegi, 2010) is projected to grow moderately, at an annual rate of 0.8%, to reach 140 million by 2035. Around 78% of Mexico's population live in urban areas and the remaining 22% live in rural areas (UN, 2009).

The largest urban areas are Mexico City, Guadalajara and Monterrey. While Greater Mexico City formed by the Capital City (Distrito Federal) and its surrounding metropolitan areas (Zona Metropolitana del Valle de México) represents only 0.1% of the Mexican territory, it accounts for as much as 25% of the economy's GDP. With a population close to 20 million, Mexico City is one of the top megacities in the world (UN, 2008).

Mexico's economic growth is expected to be moderate, with real GDP expanding at an average of 3.6% per year from 2010 to 2035 (see Figure MEX1). GDP per capita is expected to grow less dynamically, with a 2.8% average annual growth rate over the same period. In spite of being an OECD member since 1994, Mexico's GDP per capita was the lowest among the member economies in 2010 (IMF, 2011) and poverty reduction is one of the economy's major challenges—46% of Mexico's population are still considered poor and 10% live under extreme poverty conditions (Coneval, 2011). According to the United Nations Human Development Index (which measures progress in terms of human well-being rather than in pure economic terms) though, Mexico is considered a High Human Development economy, ranked 57th in the world and fifth in Latin America (UNDP, 2011).

Mexico is an export-driven economy, the second largest in Latin America and the 14th largest in the world (IMF, 2011). Roughly 80% of its total exports go to the US. Crude oil and manufactured goods (mostly machinery and vehicles) are Mexico's main exports. In 2010, crude oil, machinery and vehicle manufactures accounted respectively for 14%, 23.9% and 21.8% of Mexico's total exports (SE, 2011).

The energy sector, and particularly the oil industry, is critical to the economy. Revenues and taxes from the state-owned oil company provide nearly one-third of the total government revenue, from which Mexico's social development is mainly funded (Inegi, 2011; SHCP, 2011). In addition to exports, remittances from Mexicans working abroad are especially important. They not only constitute the second largest income source but, since 2009, have surpassed foreign direct investment inflows (Banxico, 2011).

The services sector is the main component of Mexico's GDP, accounting for 65% in 2010; industry and agriculture represent 31% and 4%, respectively. Along with the export-oriented industries described above, food products, chemicals, cement, beverages and tobacco are Mexico's most distinctive industries (Inegi, 2011). The most energy-intensive industries are iron and steel, cement, sugar, chemicals and mining; their joint energy demand amounts to half of the energy demand of Mexico's industry sector (Sener, 2011a).

Due to its location, Mexico is prone to natural disasters, with floods, hurricanes, droughts and even frosts being common. As the Mexican territory lies between several tectonic plates, the incidence of earthquakes is high, with most of the major ones stemming from the Pacific Coast (SSN, 2011). Moreover, Mexico has many volcanoes, several of them with little activity and close to major urban centres. An example is Popocatépetl, whose ash emissions have occasionally affected Mexico City's air quality, most recently during the second quarter of 2012 (Segob, 2012).

Road transport dominates passenger transport in Mexico, carrying more than 97% of all passenger trips. The remaining passenger transport is evenly split between air and (mostly short-distance) rail; marine transport has little significance. The economy has a comprehensive road infrastructure of almost 372 000 kilometres spread across the territory. Only 37% of the roads are paved (predominantly federal and state toll highways); the rest are gravel or unsurfaced (SCT, 2011).

As Mexico's vehicle ownership level of less than 300 units per 1000 people is well below saturation, it is expected that in the next few years vehicle growth will be robust due to increasing population and per capita income.

The recent expansion of bus-rapid-transit corridors, subway (metro) and local train systems in major urban centres such as León and Mexico City has helped to improve mass transport in the economy. However, most urban transport networks are still served by traditional systems where many small buses with drivers paid on a daily basis compete for customers. This has lead to an inefficient oversupply of obsolete vehicles that increase traffic congestion, commuting times, customer fares and greenhouse gas (GHG) emissions. Domestic freight transport is also dominated by road carriers, at around 85%; rail, marine and, marginally, air transport account for the remainder (SCT, 2012). The transport sector alone accounts for the majority of emissions in final energy demand—the sector is responsible for two-thirds of the emissions.

Mexico is one of the world's top 10 automobile manufacturers. Nonetheless, the majority of the vehicles produced are exported and only about 20% are sold domestically (BBVA, 2012), with most of Mexico's vehicle fleet being imported.

Although Mexico's weather conditions are diverse, most of its territory enjoys warm and consistent temperatures. The hottest areas in the territory are located in the humid south, along the coastlines and particularly in the dry north; and while they call for the intensive use of air conditioning and cooling equipment, their use is, still far from saturation. On the other hand, in spite of cold winters and occasional snowfalls in the north and high-altitude areas, the use of central heating in the economy's households is uncommon.

ENERGY RESOURCES AND INFRASTRUCTURE

Mexico's geographical position provides the economy with large energy resources including crude oil, natural gas, coal and uranium as well as hydro, wind and solar resources for power generation. In 2010, Mexico's proven primary energy reserves were 10.2 million barrels of crude oil (11.4 if gas liquids are included), 0.35 trillion cubic metres of natural gas, 1.21 billion tonnes of coal and 1.3 thousand tonnes of uranium (Pemex, 2011b; BP, 2011).

Mexico is among the top oil producer economies and is a net crude oil exporter. Around 53% of its total indigenous crude oil production of 2.56 million barrels per day is sent overseas, mainly to the US. In 2010, Mexico was the second largest oil exporter to that economy (USEIA, 2012; Pemex, 2011b).

By law, hydrocarbon resources are exclusively exploited by Petróleos Mexicanos (Pemex), the state-owned oil company, ranked as one of the largest in the world. The company is Mexico's sole upstream and downstream agent and is responsible for the final distribution of most oil products (liquefied petroleum gas, or LPG, is among the exceptions). At a broader level, Pemex is of the utmost importance as it represents Mexico's most significant taxpayer (Pemex, 2011a).

For its oil reserves Mexico is ranked 17th in the world. Its production, which comes primarily from its offshore southern regions, is characterised by a predominance of heavy (55%), light (32%) and extra-light (12%) oil types. One supergiant field, Cantarell, accounted for as much as 63% of Mexico's oil production at its peak production in 2004. However, due to its continuing natural decline, Pemex's efforts have been aimed at discovering and exploiting other fields to offset this output loss and the company's focus has shifted to production and investments in new areas in the oil-rich southern basins in an attempt to stabilise total crude oil output. Nonetheless, these new areas are more technically complex, such as the offshore Ku-Maloob-Zaap and onshore Chicontepec (Aceite Terciario del Golfo) fields. In addition, due to the permanent legal restriction on oil producers other than Pemex and to that company's severe budgetary constraints, the development of Mexico's oil resources has been hindered. This is the case with Mexico's considerable deepwater oil potential, whose production has been delayed and it is not expected to begin until 2015 (Pemex, 2012).

Even though Mexico is a big oil producer, the lack of sufficient domestic refining capacity forces the economy to be a major oil products importer, especially of gasoline. Nearly half of the total gasoline demand is met by imported stock.

Mexico is also an important natural gas producer of 0.20 billion cubic metres per day, of which roughly 65% is associated with crude oil and the remaining 35% is non-associated gas. For its natural gas reserves, Mexico was ranked 33rd in the world in 2010 (Pemex, 2011b). Historically, the Burgos Basin has been the main producer of non-associated natural gas; the offshore oil fields, including Cantarell, have been the most significant associated gas sources (Pemex, 2011b). In addition, with the recent release of a world assessment of shale gas resources by the US Department of Energy (USEIA, 2011), Mexico's shale gas potential has attracted domestic and international attention. Its shale gas resources were ranked fourth among the economies studied.

Despite being a significant gas producer, Mexico is not self-sufficient in natural gas. This is due to an increasing demand for natural gas in the oil industry, the electricity sector and the residential and commercial sectors for heating and cooking purposes. Expanding distribution grids for natural gas have helped it to replace other traditionally-used fuels like LPG. Nonetheless, some imports are necessary due to infrastructure and logistics reasons; Mexico's main natural gas pipeline connecting the production areas to the consuming centres does not extend to the north-west region. Natural gas imports from the US are required to meet that demand.

Unlike the oil industry, where all major activities are carried out by Pemex and its subsidiaries, the natural gas industry in Mexico allows private participation to some extent, namely in the import, export, transport, storage and distribution activities. This has helped to promote competition and infrastructure construction, including LNG (liquefied natural gas) terminals. Under the current regulations, the awarding of a distribution permit grants a single company exclusivity in a set area for a long-term period and is conditioned to the fulfilment of investment pledges. In an attempt to protect customers and to prevent vertical monopolies, companies cannot be awarded permits for both transport and distribution activities. So far, natural gas distribution grids are present in 20 areas of Mexico, including its major cities and many significant industrial clusters (Sener, 2010b).

To support and diversify its natural gas supply, Mexico has three LNG regasification facilities; one on the Gulf of Mexico and two on its Pacific Ocean coastline. In the northern Gulf of Mexico, the Altamira LNG Terminal, with a maximum regasification capacity of 21.5 million cubic metres per day (mcmd), supplies natural gas to combined-cycle public power plants. On the Pacific coastline of the Baja California State, close to the US, the Ensenada LNG Terminal (Energía Costa Azul) operates with a maximum regasification capacity of 36.8 mcmd. Mexico's third LNG terminal, Terminal KMS on the southern Pacific coastline at Manzanillo, Colima is under construction, with a maximum regasification capacity of 14.2 mcmd. It is expected to start operations during 2012, mainly to service public power plants. Once the three terminals are operating, Mexico's LNG storage capacity will amount to 72.5 million cubic metres per day (Sener, 2010b).

Coal consumption is relatively low in Mexico. Most of the economy's recoverable coal reserves of 1.21 billion tonnes are located in the north-eastern state of Coahuila, with some significant additional resources in Sonora (in the north-west) and Oaxaca (in the south). Around 70% of the recoverable reserves are of the anthracite and bituminous types, while 30% are sub-bituminous and lignite (BP, 2011). Coal production is around 11 million tonnes a year—more than 80% is thermal coal, the rest is coking coal. Mexico's main use for coal is as a fuel for thermal power plants (thermal coal). Coking coal is used for feeding the iron and steel industry's furnaces. Coal imports are required as production only meets about half the economy's demand (Sener, 2011a).

In the case of electricity, as in the oil sector, Mexico manages all its transmission, transformation, distribution and public service activities through the state-owned Power Federal Commission (CFE for its acronym in Spanish). On 11 October 2009, as part of the Mexican Government's action plan to improve energy efficiency in the power sector, the state-owned Luz y Fuerza del Centro electric power utility, which was responsible for servicing Mexico's central area including Mexico City and its metropolitan area, was abolished by presidential decree. Due to its poor efficiency and the considerable public financing required to support its operations, the utility had become a burden for Mexico's public budget and its energy sectors (DOF, 2009). As a result, the operation of its service territory was taken over by CFE, which now stands as the only public power utility in the economy.

CFE is in charge of the electricity sector's planning and manages all the electricity generated by itself and the independent power producers (IPPs) that operate in a segment of the industry open to the private sector. The Mexican Electricity System (SEN for its acronym in Spanish) is made up of three grids; the main one is comprehensive and spreads across most of the territory. The other two grids are located in the north and south of the Baja California State. Currently these three grids are isolated from each other although the northern Baja California grid is expected to be connected with the main grid by 2014 (CFE, 2011).

The northern Baja California grid is connected to the US at two points, allowing for electricity imports and exports depending on each economy's electricity needs. In addition to the US, Mexico exports electricity to the neighbouring economies of Belize and Guatemala. Exports and imports of electricity are modest and represent less than 1% of the economy's total electricity generation. Mexico's economy-wide reserve margins are over 40% due to planning decisions based on estimates that turned out to be above the actual demand (CFE, 2011), Thus, Mexico's electricity supply and SEN's reliability are considered strong.

Mexico's overall electrification rate is 97.7% of its total population, being 98.9% in the urban centres and 93.1% in rural areas (Sener, 2011b). As the legal framework mandates electricity supply to be universal except when economic or technical factors are present, in 2010 the government launched a project to bring electricity to Mexico's poorest communities through the installation of solar panels. The project, partially funded by the World Bank, looks forward to providing electricity over a 5-year span to 50 000 households in 2500 isolated communities located in Mexico's districts with the lowest Human Development Index values (Sener, 2010a).

The total installed electricity generation capacity for public service was 52 945 megawatts (MW) in 2010. Around 77.5% came from CFE, and the remaining 22.5% from IPPs, which sell their electricity to CFE to be supplied into the SEN. Roughly 74% of Mexico's power plant capacity is based on fossil fuels, with natural gas alone accounting for a little over half of that share. The remaining 26% is spread over nuclear, NRE (new renewable energy) and hydropower, the latter of which represents 22% of total capacity (Sener, 2011b).

SEN's concern with diversification of supply and sustainability issues has caused it to promote low-carbon technologies for power generation (especially more combined-cycle power plants and the replacement of fuel-oil based thermal power plants), the use of renewable energy, and some cogeneration opportunities. According to the SEN's expansion plan (CFE, 2011), Mexico's renewable-based electricity generation will increase in the next few years, building on the economy's promising potential for hydro, wind and geothermal electricity generation.

ENERGY POLICIES

Under the current legal framework, Mexico's Ministry of Energy (Secretaría de Energía, Sener for its acronym in Spanish) is responsible for the economy's energy policy. In 2007 and based on the National Development Plan 2007–2012, Sener launched the Energy Sector Program 2007–2012 to match the Presidential 6-year term. The main energy policy goals contained in the document aimed for the secure supply of the energy required for development at competitive prices, while minimising environmental impacts, operating at a high standard and promoting energy efficiency and diversification (Sener, 2007).

Considered the most significant recent development in Mexico's energy policy, the Energy Reform passed in 2008 included a set of laws and reform initiatives to strengthen the energy sector and to grant greater autonomy to Pemex.

With these reforms, a new document to guide energy sector policy in the long term was created. Mexico's National Energy Strategy (ENE for its acronym in Spanish) sets out the long-term vision for a 15-year span and is the reference point for all energy policies. The strategy focuses on three critical areas: energy security, economic efficiency and environmental sustainability. It also provides an insight into issues and topics that could shape the energy industry in the future. Although integrated and published annually by Sener, the ENE is developed through the collaboration of a number of governmental institutions, universities, research institutions, independent experts and representatives of Mexico's states and legislative powers, to ensure all relevant perspectives are reflected in the document.

The most recent edition of this document, issued in February 2012, explores several possible scenarios for Mexico's energy policy (business-as-usual, or BAU, and ENE-optimistic) and sets out several objectives covering the energy sector's major activities (hydrocarbons, electricity, renewable energy, energy efficiency, sustainability and technological research) to be achieved by 2026. By that year, its long-term policy aims for crude oil production of 3.4 million barrels per day, a replacement ratio of crude oil's proved reserves of more than 100%, natural gas production of 0.32 billion cubic metres per day, and a reduction in flaring and losses during gas extraction of 0.8% of the gas produced. In the downstream activities, the goals are to increase the natural gas transportation capacity and to boost petrochemicals production.

In comparison to previous documents, the latest edition of the ENE includes production from Mexico's shale gas resources by 2016. For this to happen, ENE assumes changes in the regulatory and business environment will be made to provide an incentive to develop this unconventional gas supply. While under the ENE's BAU scenario only one shale gas play will be developed with an output of 28 mcmd by 2026, its optimistic scenario considers developing another play providing an output of 92.9 mcmd by 2026 (Sener, 2012).

In compliance with these policies, Pemex defined the company's future priorities in its 2012–2016 Business Plan, including plans for several major projects it intends to carry out. Pemex looks forward to finding and developing new reserves, optimising its hydrocarbon and petrochemical production levels and ensuring their competitive and efficient supply in the economy (Sener, 2011b).

In the electricity sector, the economy's long-term energy policy calls for a reduction of total power losses from 11% in 2010 to 8% in 2026. For CFE to reduce its power losses, more aggressive measures against electric power theft will be needed. Power theft is not uncommon in Mexico, and represents one of the major causes of the economy's power losses. By 2026, Mexico's energy policy also aims to achieve a reduction in the reserve margin to 13%, and a 2.1% increase in the length of the power transmission network. This effort will include not only building new lines, but also replacing many of the existing ones that are reaching the end of their life cycle. Another objective is to improve energy efficiency enough to achieve a 15% or more energy savings over the government's BAU projection. This will be accomplished mainly through the allocation of more resources to strengthen the planned energy efficiency projects (Sener, 2012).

The long-term policy also demands an increase in the share of non-fossil-fuels electricity generation (NRE, large hydro and nuclear) from around 26% in 2010 to 35% by 2026. Natural gas based technologies have been favoured since the early 2000s for power generation, and this trend is expected to continue. However, other alternatives such as renewable energy and low-carbon technologies will play a significant role in Mexico's electricity generation in the future (Sener, 2012). Natural gas power plants have been preferred primarily due to relatively low prices and low emissions for natural gas, but also because of the increasing supply of natural gas in Mexico, the lower construction investment, and the higher thermal efficiency in comparison with other fuels (CFE, 2011).

Even though Mexico does not rule out nuclear energy for meeting its future electricity demands, the ENE only includes nuclear energy expansion in its alternative scenarios. Its BAU assumptions did not consider any additions to the economy's nuclear-generated power capacity, which consists of the Laguna Verde power plant.

To promote the use of renewable energy throughout the economy, Mexico developed a new regulatory framework as a result of the 2008 Energy Reform. This includes new legal and institutional provisions to promote renewable energy and biofuels, through several strategies. The passing of the Law for Renewable Energy Utilization and Energy Transition Funding lead to the creation of a National Strategy for Energy Transition and Sustainable Use. This strategy will promote policies, programs, actions and projects focusing on the increased use of low-carbon technologies, the promotion of energy sustainability and efficiency, and the reduction of Mexico's dependence on hydrocarbons. Created from a special tax levied on Pemex's revenue, the Law also provided for the creation of the Trust Fund for Energy's Transition and Sustainable Use. The fund's objective is to finance scientific and applied research projects dedicated to low-carbon technologies, the diversification of energy sources, renewable energy sources and energy efficiency.

The implementation of various other projects in collaboration with international organizations has helped to expand renewable energy in Mexico. In addition to the project for the electrification of poor communities mentioned above, with the aid of the German agency for International Cooperation, the program for solar water heating was launched in

2007. The objective of this program is to install 1.8 million square metres of solar collectors for water heating purposes in residential, commercial and agriculture sectors by providing the technical support, and by coordinating with the major stakeholders involved in the production and use of this technology.

Mexico has had energy efficiency programs since 1989 and has public institutions that encourage efforts in energy efficiency and conservation. The National Commission for the Efficient Use of Energy (Conuee) is responsible for promoting the programs and for providing technical advice in energy efficiency. Other institutions, such as the Trust Fund for Electricity Savings (FIDE), provide finance for energy audits and assessments, and facilitate the acquisition and installation of energy-efficient equipment.

Some of the energy efficiency policies currently being carried out by Mexico are: the Program for Energy-Saving Household Appliances Replacement, to replace freezer and air conditioning equipment at least 10 years old with energy-efficient new appliances through a preferential-rate loan from the Mexican Government repaid through the power utility bill; and the Program for Sustainable Light, to replace up to four traditional incandescent bulbs per household with four energy-efficient lamps free of charge. In addition, the Official Mexican Standards specify the minimum energy efficiency requirements for an electric product to be sold on the Mexican market.

To control the economy's inflation and to reduce the social impact of energy price increases, the Mexican Government subsidizes the fuels most used by families, such as electricity (restricted to low-consumption residential tariffs), LPG, gasoline and diesel. In the case of gasoline and diesel, the government applies a monthly slippage scheme. The scheme seeks to allow Mexico's prices to catch up with their US counterparts to avoid economic distortions, to reallocate subsidies to social projects, to promote lower imports through lower demand and to reduce emissions associated with fuels combustion. The slippage scheme works by increasing Mexico's gasoline and diesel prices by a few cents at a time, with the aim of gradually closing the gap between domestic and international prices (IISD, 2010). Since these fuel subsidies are general rather than targeted to the lowest-income population, they can promote inefficient or wasteful consumption, along with increased fuel demand and emissions without necessarily improving poor people's incomes. They also require the expending of considerable financial resources that could otherwise be directed to more urgent government priorities such as social programs.

Recognizing climate change as one of the major global and domestic challenges, the Mexican Government considers it to be a central policy concern. The economy introduced a National Climate Change Strategy (ENCC for its acronym in Spanish) in 2007 for mitigation and adaptation to climate change, and published the Special Climate Change Program 2009–2012 (PECC for its acronym in Spanish) in 2009.

As the energy sector is the main contributor of GHG emissions in Mexico, the PECC established actions to achieve the mitigation desired in two areas: oil and electricity production and final-demand efficiency and savings. In the short term, the PECC set a specific mitigation goal to be achieved by 2012—to avoid 50.6 million tonnes of carbon dioxide equivalent, with the energy sector accounting for 57% of those emissions. On the other hand, two ambitious aspirational long-term goals were also integrated in the document. These strive to reduce Mexico's total GHG emissions by 20% by 2020 and by 50% by 2050, compared with its emission levels in 2000 (Semarnat, 2009).

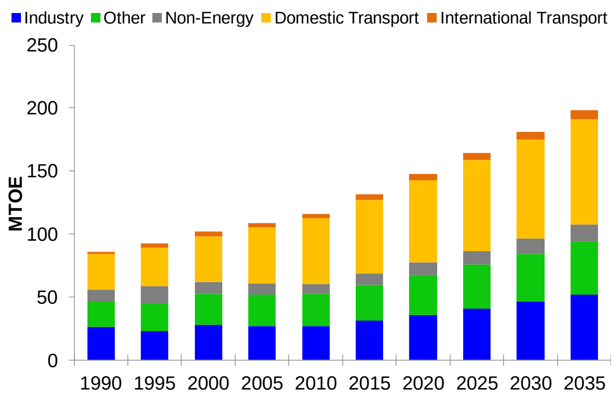
As an update to this document, it is worth mentioning that on 1 December 2012 Mexico had a new president, from a different political party than his last two predecessors and for the period up to 2018. While no formal plans had been announced at the time of closing this document, President Peña Nieto had announced the government's intentions of attaining a substantial reform in the energy sector, to turn it into an effective lever for Mexico's transformation (Presidencia de la República, 2012).

BUSINESS-AS-USUAL OUTLOOK

FINAL ENERGY DEMAND

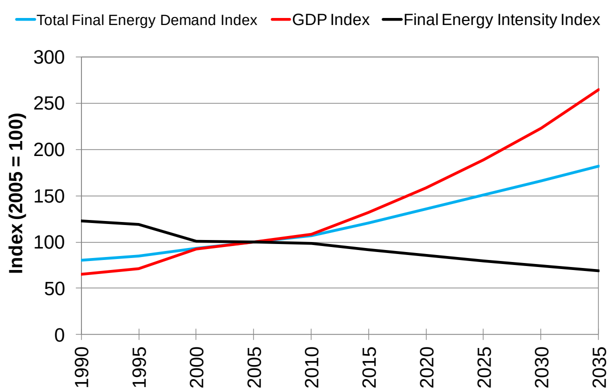
Under a BAU scenario, Mexico's final energy demand is expected to grow 70%, from 112 million tonnes of oil equivalent (Mtoe) in 2010 to 191 Mtoe by 2035. Sector shares are expected to remain fairly constant from 2010, with domestic transport accounting for the largest share of the demand (42%) followed by industry (26%), 'other' (residential, commercial and agriculture) (21%), non-energy (7%) and international transport (4%) in 2035. From 2005 to 2035, final energy intensity is expected to decline by 31%.

Figure MEX1: BAU Final Energy Demand



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Figure MEX3: BAU Final Energy Intensity



Source: APERC Analysis (2012)

Industry

The industry sector's energy demand is projected to grow 92% over the outlook period, increasing from 27.1 Mtoe in 2010 to 52.1 Mtoe by 2035. By energy source, shares in 2035 will remain fairly similar to those in 2010, with decreasing contributions from oil and NRE and increasing contributions from gas and electricity.

Reflecting the predominance of machinery in Mexico's industry composition, electricity is expected to continue as the main energy source with almost 39% of the industry sector's energy demand by 2035. Natural gas is expected to have the second largest share, at 37%. Apart from oil, with an expected share of 19%, the remainder will be made up by coal and NRE. These latter two energy sources are mainly used in the most energy-intensive industries: coal, in the cement and steel industries and NRE (as biomass) in the sugarcane industry. Industry energy intensity is projected to decrease 27% from 2005 to 2035.

Transport

Domestic transport is expected to remain the largest energy demand sector in Mexico with roughly 42% of the total energy demand in 2035. From 2010 to 2035 this sector is estimated to grow 61%. Given the lack of incentives for the use of alternative vehicles, by 2035 nearly all the sector's energy demand (95%) will be based on oil fuels (gasoline and diesel). The future chances for developing significant demand for energy alternatives other than compressed natural gas (CNG) and NRE (biofuels) are small.

Energy demand for CNG and NRE (in the form of bioethanol and biodiesel) is expected to grow significantly, expanding 48 and 5 times respectively, by 2035. The growth assumptions for CNG are based on favourable expectations for the relative price of CNG compared to gasoline and on tighter environmental standards calling for cleaner fuels, especially in mass transport vehicles. Nonetheless, in spite of this dramatic growth, CNG's share in the transport energy mix by 2035 will still be small, accounting for around 1%. In the case of NRE in the form of biofuels, the Mexican Government plans to replace gasoline's conventional oxygenates with bioethanol in the city of Guadalajara, to comply with the mandatory 2.7% oxygenation blending (Semarnat, 2006). Along with the ongoing early development of biodiesel-based transport solutions across the economy, this plan will push forward biofuels' demand in the long term.

On the other hand, although the strategies in the National Program for Sustainable Use of Energy (Pronase) issued in late 2009 called for an increase in fuel efficiency and an improvement in best practices for new vehicles added to the national fleet, Mexico lacks mandatory fuel efficiency standards. The issuing of such standards during the outlook period would be helpful not only in driving down energy demand, but also in reducing gasoline imports and decreasing CO_2 emissions.

Other

The 'other' sector's energy demand is projected to increase 65%, from 25.4 Mtoe in 2010 to 41.8 Mtoe by 2035. By the end of the outlook period, the combined energy demands of the residential, commercial and agriculture sectors are expected to represent around 21% of the total final energy demand. Natural gas will be the fastest-growing energy source, with its demand almost doubling by 2035. This will be followed by electricity demand increasing by 87%, oil (mostly as LPG) by 85% and NRE (in the form of firewood) showing very little growth.

Unlike other sectors whose energy composition is projected to remain stable from 2010 to 2035, in this sector the shares of the various fuels are expected to change. While the shares for oil (in the form of LPG), natural gas and electricity will increase, the share of NRE in the 'other' sector's total energy demand is expected to decrease. By 2035, this sector's energy demand is estimated to be made up by oil (47%), electricity (33%) and natural gas (4%). NRE's share (as non-commercial firewood) will be gradually replaced by commercial energy options, and will represent only 16% of the energy demand in 2035, down from a 25% share in 2010. Unlike other APEC economies, Mexico depends heavily on oil products, mostly LPG, to meet the energy demand in the residential and commercial sectors.

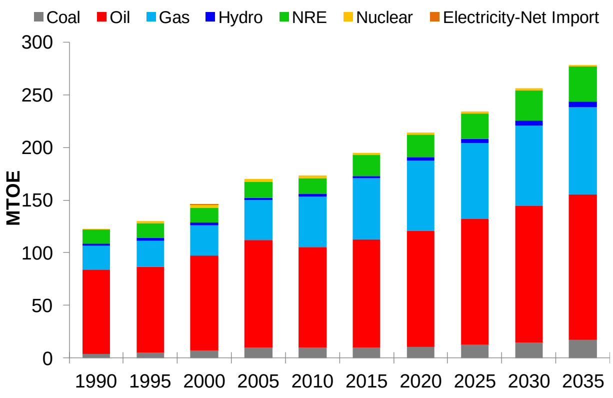
This situation is explained by a natural transition to more convenient energy sources. As new energy distribution infrastructure reaches more markets and more energy options are available for consumers, a shift away from non-commercial fuels is expected. In Mexico's case, these circumstances have historically favoured the wide distribution of LPG to replace firewood. Although the recent expansion of distribution grids has provided access to natural gas in more areas, their development is still limited and they have not significantly reduced the use of LPG.

It is worth noting that due to Mexico's energy efficiency programs and policies being especially focused on the residential sector in recent years, the 'other' sector's energy intensity reduction in the outlook period is expected to be slightly better than that in the industry and transport sectors, with a total improvement of 37% from 2005 to 2035.

PRIMARY ENERGY SUPPLY

Mexico's primary energy supply is expected to increase by 61% in the 2010–2035 outlook period. The predominance of fossil fuels is expected to continue, with coal, oil and gas jointly accounting for 86% of primary energy supply by 2035, with the rest provided by NRE (12%), hydro (2%) and nuclear (less than 1%). From 2005 to 2035, Mexico's primary energy intensity will decline 38%.

Figure MEX4: BAU Primary Energy Supply



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

As one of the world's major oil and gas producers and exporters, and given its potential resources for these products, Mexico's oil production is assumed to increase during the outlook period. Production is expected to reach its peak by 2025 with 200.4 Mtoe (3.3 million barrels per day) and to sustain this output until 2035. This represents an average annual growth of 1% from 2010 to 2035. It is expected the economy will remain a net oil exporter for the outlook period.

In contrast, Mexico will remain a net gas importer throughout the outlook period, with the import gap increasing from 2020 to 2035. This will occur in spite of an average annual growth of 1.4% in natural gas production from 2010 to 2035. However, additional shale gas production beyond the planned levels could affect these outcomes.

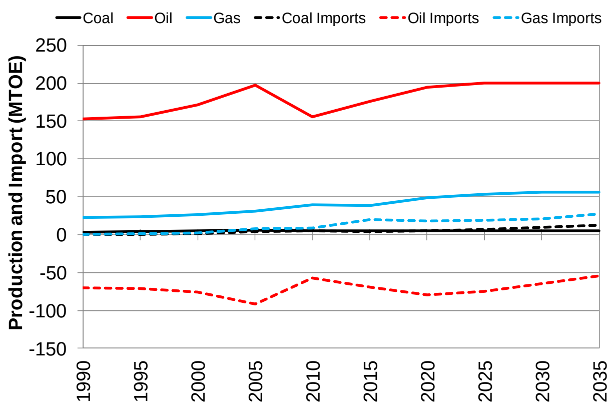
In this regard, the development of Mexico's shale gas resources poses several uncertainties. Although the economy is including one or two shale gas plays in its long-term energy policy, the available data on its resources is based on external information and Mexico still lacks its own studies to assess accurately the location and scale of its shale gas reserves. In addition, Pemex's budget is not only insufficient for addressing effectively all of its projects, but more than 90% of those financial resources are absorbed by its oil exploration and production activities. This leaves a very low share to be allocated for other operations and projects.

Aggravating this situation is the fact that hydrocarbons exploration in Mexico is exclusively reserved for the state. While private participants are currently undertaking some upstream activities under special contracting schemes, their operations are limited and the production planning and decisions are still carried out by Pemex. This limits flexibility, compared to standard practices in the global industry.

In contrast, a key factor for the booming shale gas production in the US is the existence of a plethora of predominantly small and mid-sized competing producers, site builders and service providers who can afford capital-intensive drilling and hydraulic fracturing in many wells dispersed across large areas (USDOE, 2009). This industry structure has allowed participants to bear higher capital costs compared with conventional gas production and to have greater organisational flexibility to come up with cost-effective technological solutions, to afford infrastructure construction, and to adapt to the market fluctuations.

The above conditions are totally the opposite to the ones prevailing in Mexico, where decisions tend to be centrally-made and politically-driven. As a result, budgets and project planning tend to favour conventional production, and to restrain investment in new technology and research and development. Unless policymakers are able to design a more competitive and attractive environment for shale gas production, it seems likely that Mexico's unconventional gas potential will not be fully developed. This in turn will hamper its aspirations to reverse its position as a gas importer in the future, restraining its energy security and the economic benefits that shale gas could bring.

Figure MEX5: BAU Energy Production and Net Imports



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

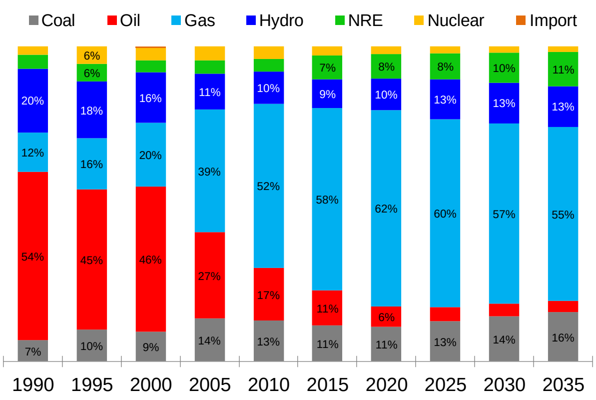
ELECTRICITY

Power generation in Mexico is projected to increase 72% in the outlook period. By 2035, it is expected that nearly three-quarters of the total electricity generation will remain based on fossil fuels, primarily natural gas. The rest will be supplied by hydro, NRE and nuclear energy power plants.

From 2010 to 2035, it is estimated that the largest growth by power generation source will be experienced by NRE at 356%. In contrast, oil-based generation is expected to drop by 63.5%. During the outlook period, NRE capacity will be based on wind, geothermal, mini-hydro and biomass. Based on SEN's expansion plan, solar energy growth is assumed to be limited, although particular projects carried out by private investors could be possible in the future.

Renewable energy and low-carbon technologies will play a growing role in Mexico's power generation over the coming years. Altogether, non-fossil sources (hydro, NRE and nuclear) are expected to expand their share in Mexico's power generation from 18% in 2010 to 25% by 2035. This is especially significant due to the projected growth in demand for the same period. However, this scenario suggests the Mexican Government's target of 35% of total electricity generation based on these technologies might not be accomplished. Technical issues as well as financial constraints (such as the higher costs of technology development and of the construction of needed transmission infrastructure) might limit NRE's output from growing to the targeted levels.

Figure MEX6: BAU Electricity Generation Mix



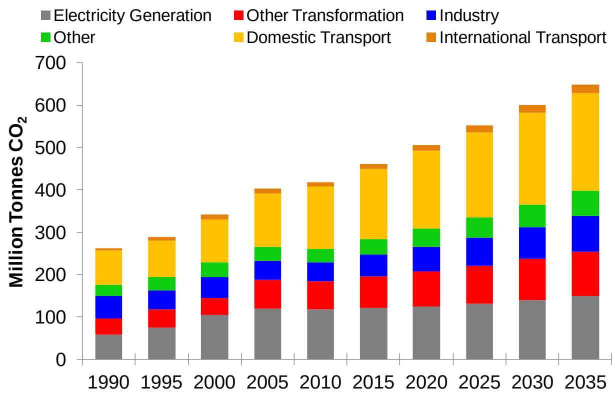
Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

CO_2 EMISSIONS

CO_2 emissions in Mexico's energy sector are projected to increase 55% from 2010, to reach around649 million tonnes of CO_2 by 2035. Final-use energy demand will contribute 58% of these emissions, and the economy's energy transformation sectors will account for the remaining 42%.

By fossil fuel, emissions from coal consumption are expected to have the largest increase in the outlook period (77%), followed by gas and oil (70% and 46%, respectively). The share of each of these sources in the total emissions is estimated to remain fairly constant over the outlook period. By 2035, emissions from oil consumption will make up the majority (nearly 60%) of the total emissions, followed by gas (30%) and coal (10%).

Figure MEX7: BAU CO_2 Emissions by Sector



Source: APERC Analysis (2012)

From the results of these projections, shown in Figure MEX7, it seems that Mexico's long-term strategy towards lower-carbon electricity generation will pay off. The electricity sector's CO_2 emissions will grow only 26% in the outlook period, with their share in the total energy sector emissions dropping from 28% in 2010 to 23% by 2035. This may be explained by Mexico's long-standing policy to decrease oil-based power generation and to promote combined-cycle gas technologies. In this case, it is expected that the emissions from oil-based (diesel and fuel oil) power plants will decrease roughly 66% during the outlook period.

In contrast, in the final demand sectors, emissions will grow more quickly. Industry will have the fastest growth in emissions, 91% from 2010 to 2035, although the transport sector will account for 61% of final demand emissions by the end of the period.

As shown in Table MEX1, emissions resulting from Mexico's GDP growth will be partly offset by energy intensity reductions and small reductions in the CO_2 intensity of energy.

Table MEX1: Analysis of Reasons for Change in BAU CO_2 Emissions from Fuel Combustion

(Average Annual Percent Change)

	1990-2005	2005-2010	2005-2030	2005-2035	2010-2035
Change in CO_2 Intensity of Energy	0.6%	0.4%	0.0%	-0.1%	-0.2%
Change in Energy Intensity of GDP	-0.6%	-1.3%	-1.6%	-1.6%	-1.6%
Change in GDP	2.9%	1.7%	3.3%	3.3%	3.6%
Total Change	2.9%	0.7%	1.6%	1.6%	1.8%

Source: APERC Analysis (2012)

CHALLENGES AND IMPLICATIONS OF BAU

Under the BAU scenario, Mexico's projected energy supply shows good potential. It is likely the economy will not only remain a large oil producer, but it will also sustain its crude oil exports into the future. Depending on the actual time and size of the development of its unconventional shale gas resources, the economy could also redefine its trade flows in the long term to become a net gas exporter.

In the electricity sector, the economy's target of 35% of its electricity generation to be based on carbon-free technologies by 2026 is not likely to be accomplished by that year, or even within the outlook period. Nonetheless, the projections suggest Mexico's efforts to fight climate change will achieve some success in the electricity sector as its CO_2 emissions are expected to increase at a slower pace than those of the final-demand sectors.

Although successful programs have been implemented in the residential and commercial sectors in recent years, Mexico will need more policies focused on energy efficiency, in particular ones focused on sectors such as transport and industry. In the light of the new government in Mexico and its priorities, the energy sector remains as one of the biggest challenges for improving economy-wide competitiveness and reducing CO_2 emissions.

ALTERNATIVE SCENARIOS

To address the energy security, economic development, and environmental sustainability challenges posed by the results from the business-as-usual (BAU) scenario, three sets of alternative scenarios were developed for most APEC economies.

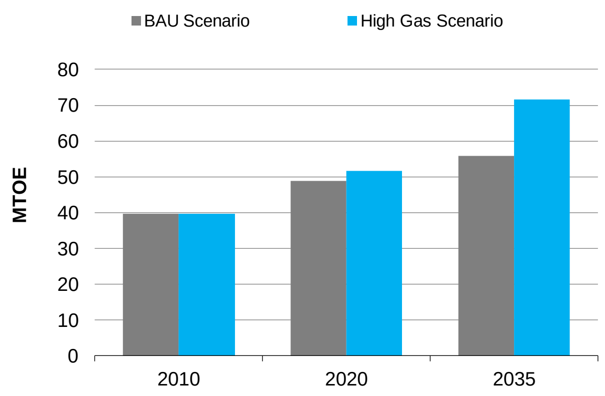
HIGH GAS SCENARIO

An alternative 'High Gas Scenario' was developed to consider the effects a higher gas output could have on Mexico's energy sector. The High Gas Scenario was built around estimates of gas production that could be available at BAU scenario prices or below if constraints on gas production and trade were reduced. The assumptions of the High Gas Scenario are further discussed in Volume 1, Chapter 12.

As shown in Figure MEX8, the High Gas Scenario for Mexico estimates an increase of 28% in gas production by 2035 in comparison with the BAU scenario. Assumptions of a larger output are based on the greater shale gas production that would result if an additional shale gas play were developed in the long term, as stated in the ENE's optimistic scenario.

Since ENE's outlook period only extends to 2026, it was assumed that the additional production achieved would be sustained afterwards, up to 2035.

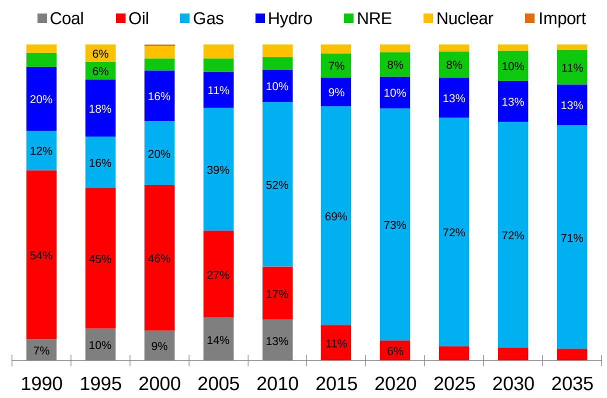
Figure MEX8: High Gas Scenario – Gas Production



Source: APERC Analysis (2012)

The High Gas Scenario assumes that the main use for the additional gas will be as a replacement for coal in the electricity generation sector. The effects of higher gas utilization on Mexico's electricity generation mix are presented in Figure MEX9 and may be contrasted with the BAU electricity generation mix shown in Figure MEX6. It can be seen that, by 2035, gas-based electricity generation will completely replace all coal-based generation and account for 71% of the total electricity generation mix in Mexico. This compares to a projected 55% share under BAU.

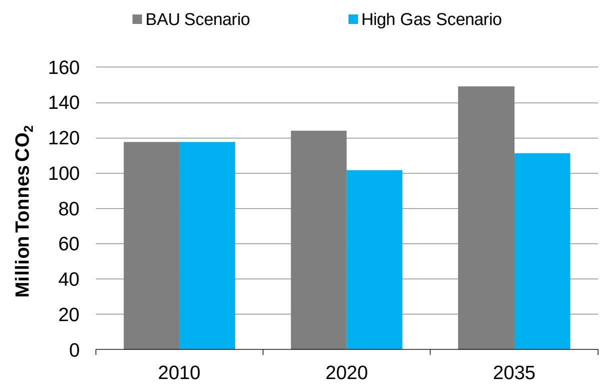
Figure MEX9: High Gas Scenario – Electricity Generation Mix



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Since gas produces roughly half of the CO_2 emissions of coal per unit of electricity generated, in Mexico this substitution would reduce CO_2 emissions in electricity generation by 25% in 2035, as depicted in Figure MEX10.

Figure MEX10: High Gas Scenario – CO_2 Emissions from Electricity Generation



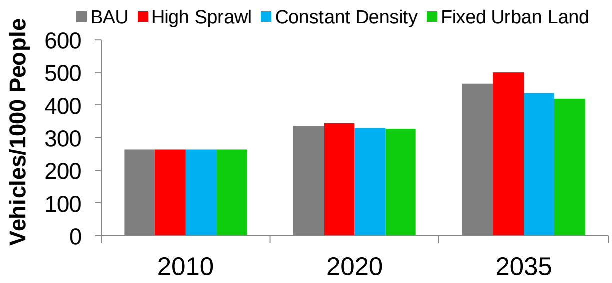
Source: APERC Analysis (2012)

ALTERNATIVE URBAN DEVELOPMENT SCENARIOS

To better appreciate the impact of future urban development on the energy sector, three alternative urban development scenarios were developed: 'High Sprawl', 'Constant Density', and 'Fixed Urban Land'. The assumptions behind these scenarios are discussed in more detail in Volume 1, Chapter 5.

Figure MEX11 shows the change in vehicle ownership under BAU and the three alternative urban development scenarios. In comparison to BAU, it is estimated that by 2035 the High Sprawl scenario would expand the number of vehicles per 1000 people by 7%, while in the Constant Density and Fixed Urban Land scenarios, decreases of 6% and 10% respectively are expected.

Figure MEX11: Urban Development Scenarios – Vehicle Ownership

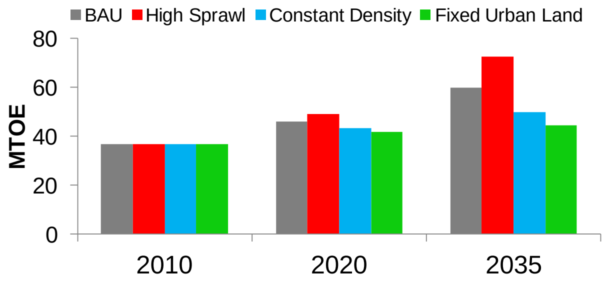


Source: APERC Analysis (2012)

Figure MEX12 shows the change in light vehicle oil consumption under BAU and the three alternative urban development scenarios. The impact of these scenarios on oil consumption is larger than it is on vehicle ownership. In comparison to BAU, it is estimated that by 2035 the High Sprawl scenario would expand the light vehicle oil consumption by 21%, while in the Constant Density and Fixed Urban

Land scenarios, decreases of 16% and 26% respectively, are expected.

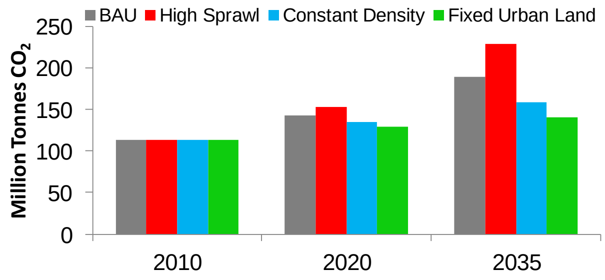
Figure MEX12: Urban Development Scenarios – Light Vehicle Oil Consumption



Source: APERC Analysis (2012)

Figure MEX13 shows the impact of these urban planning alternatives on CO_2 emissions, which is similar to the impact of the urban planning alternatives on oil consumption, as there is no significant change in the mix of fuels used in any of these scenarios.

Figure MEX13: Urban Development Scenarios – Light Vehicle Tank-to-Wheel CO_2 Emissions



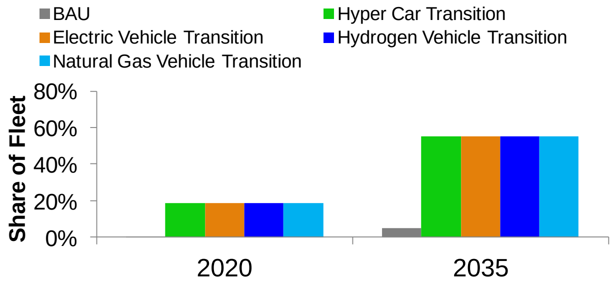
Source: APERC Analysis (2012)

VIRTUAL CLEAN CAR RACE

To assess the possible impact of vehicle technology on the energy sector, four alternative vehicle scenarios were developed: 'Hyper Car Transition' (ultra-light conventionally-powered vehicles), 'Electric Vehicle Transition', 'Hydrogen Vehicle Transition', and 'Natural Gas Vehicle Transition'. The main assumptions behind these scenarios are discussed in more detail in Volume 1, Chapter 5.

Figure MEX14 shows the evolution of the vehicle fleet under BAU and the four Virtual Clean Car Race scenarios. By 2035, the share of the alternative vehicles in the fleet would reach 55% compared to about 5% in the BAU scenario. Therefore, the share of conventional vehicles in the fleet under the alternative scenarios decreases to 45% in contrast to the 95% share projected for the BAU scenario.

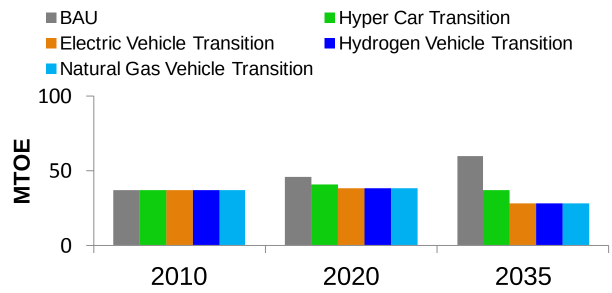
Figure MEX14: Virtual Clean Car Race – Share of Alternative Vehicles in the Light Vehicle Fleet



Source: APERC Analysis (2012)

In Figure MEX15, the change in light vehicle oil consumption under BAU and the four alternative vehicle scenarios is presented. Oil consumption drops by 53% in the Electric Vehicle Transition, Hydrogen Vehicle Transition, and Natural Gas Vehicle Transition scenarios compared to BAU by 2035. The drop is large as these alternative vehicles use no oil. Oil demand in the Hyper Car Transition scenario is also significantly reduced compared to BAU—down 38% by 2035—even though these highly-efficient vehicles still use oil.

Figure MEX15: Virtual Clean Car Race – Light Vehicle Oil Consumption



Source: APERC Analysis (2012)

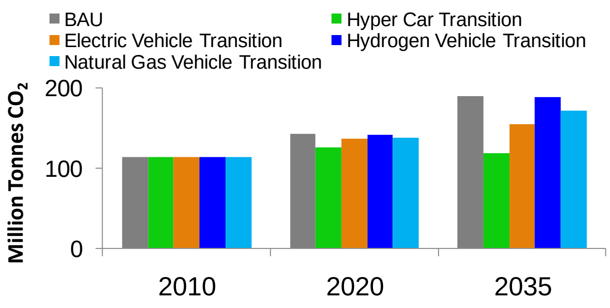
Finally, Figure MEX16 shows the change in light vehicle CO_2 emissions under BAU and the four alternative vehicle scenarios. To allow for consistent comparisons, the change in CO_2 emissions in the Electric Vehicle Transition and Hydrogen Vehicle Transition scenarios is defined as the variations in emissions from electricity and hydrogen generation. The emissions impacts of each scenario may differ significantly from their oil consumption impacts, since each alternative vehicle type uses a different fuel with a different emission factor per unit of energy.

In comparison to BAU, the results suggest the Hyper Car Transition scenario is the best option for Mexico in terms of reducing CO_2 emissions, with a 37% decrease by 2035. The Electric Vehicle Transition scenario would be second, offering a reduction of 18%, while the Natural Gas Vehicle

Transition scenario would offer a reduction of 10%. Although electric vehicles produce no CO_2 directly, the electricity consumed is assumed to be produced from fossil fuels, limiting their emissions reduction potential. Natural gas is, of course, a fossil fuel whose combustion emits CO_2, although in modestly lower quantities than oil.

The Hydrogen Vehicle Transition scenario offers little CO_2 emissions reduction benefits, emissions are unchanged compared to BAU in 2035. Like electric vehicles, hydrogen vehicles produce no CO_2 directly, however, the hydrogen consumed is assumed to be produced from fossil fuels, with a second transformation of hydrogen to electricity taking place in the vehicle. The conversion losses involved in these two transformation processes negate the emissions reduction potential of hydrogen vehicles.

Figure MEX16: Virtual Clean Car Race – Light Vehicle CO_2 Emissions



Source: APERC Analysis (2012)

REFERENCES

Banxico (Banco de México) (2011), *Balanza de Pagos*, www.banxico.gob.mx/politica-monetaria-e-inflacion/index.html

BBVA (Banco Bilbao Vizcaya Argentaria – Research) (2012), *Industria automotriz: Clave en el crecimiento económico de México*, www.bbvaresearch.com/KETD/fbin/mult/120125_PresentacionesMexico_81_tcm346-285045.pdf

BP (2011), *Statistical Review of World Energy 2011*, www.bp.com/statisticalreview

CFE (Comisión Federal de Electricidad) (2011), *Programa de Obras e Inversiones del Sector Eléctrico (POISE) 2011–2025*, http://aplicaciones.cfe.gob.mx/aplicaciones/otros/POISE2011_2025%20WEB.ZIP

Coneval (Consejo Nacional de Evaluación de la Política de Desarrollo Social) (2011), *Pobreza en México y en las Entidades Federativas 2008–2010*, http://web.coneval.gob.mx/Informes/Interactivo/Medicion_pobreza_2010.pdf

DOF (Diario Oficial de la Federación) (2009), *Decreto por el que se extingue el Organismo Descentralizado Luz y Fuerza del Centro*, 11 October 2009, www.energia.gob.mx/webSener/res/Acerca_de/DE_LFC_11102009.pdf

Global Insight (2012), *World Industry Services*, retrieved from IHS Global Insight Data Service.

IEA (International Energy Agency) (2011), *World Energy Statistics 2011*, retrieved from OECD/IEA CD-ROM Service.

IISD (International Institute for Sustainable Development) (2010), *Implementation of Subsidy Reform in Mexico*, www.iisd.org/gsi/sites/default/files/ffs_gsiunepconf_sess3_ovela.pdf

IMF (International Monetary Fund) (2011), *World Economic Outlook Database – GDP per capita, current prices in U.S. Dollars*, September 2011, www.imf.org/external/pubs/ft/weo/2011/02/weodata/index.aspx

Inegi (Instituto Nacional de Estadística y Geografía) (2010), *Censo de Población y Vivienda 2010. Cuadro Resumen*, www.inegi.org.mx/Sistemas/temasV2/Default.aspx?s=est&c=17484

— (2011), *Banco de Información Económica*, http://www.inegi.org.mx/sistemas/bie/

Pemex (Petróleos Mexicanos) (2011a), *Acerca de Pemex*, www.pemex.com/index.cfm?action=content&sectionid=1

— (2011b), *Memoria de Labores 2010*, www.pemex.com/files/content/Version_completa_memoria_de_labores_2010.pdf

— (2012), P*alabras del Director General de Petróleos Mexicanos, Dr. Juan José Suárez Coppel, durante la ceremonia conmemorativa del 74 aniversario de la expropiación de la industria petrolera*, www.pemex.com/index.cfm?action=news&sectionid=8&catid=42&contentid=26266

Presidencia de la República (2012), *Mensaje a la Nación del Presidente de los Estados Unidos Mexicanos*, www.presidencia.gob.mx/articulos-prensa/mensaje-a-la-nacion-del-presidente-de-los-estados-unidos-mexicanos/

SCT (Secretaría de Comunicaciones y Transportes) (2011), *Estadística de Bolsillo 2011*, www.sct.gob.mx/uploads/media/EB-2011.pdf

— (2012), North American Transportation Statistics Database, http://nats.sct.gob.mx/index_en.html

SE (Secretaría de Economía) (2011), *Diagnóstico de la Economía Mexicana*, www.economia.gob.mx/files/diagnostico_economia_mexicana.pdf

Segob (Secretaría de Gobernación) (2012), *Sistema Nacional de Protección Civil*, www.proteccioncivil.gob.mx/en/ProteccionCivil

Semarnat (Secretaría del Medio Ambiente y Recursos Naturales) (2006), *Norma Oficial Mexicana NOM-086-SEMARNAT-SENER-SCFI-2005, Especificaciones de los combustibles fósiles para protección ambiental*, www.ordenjuridico.gob.mx/Federal/PE/APF/APC/SEMARNAT/Normas/Oficiales/2006/30012006%281%29.pdf

— (2009), *Programa Especial de Cambio Climático 2009–2012*, www.semarnat.gob.mx/programas/semarnat/Paginas/PECC.aspx

Sener (Secretaría de Energía) (2007), *Programa Sectorial de Energía 2007–2012*, www.sener.gob.mx/res/0/Programa%20Sectorial%20de%20Energia%202007-2012.pdf

— (2010a), *Cuarto Informe de Labores 2010*, www.sener.gob.mx/res/0/CuartoInformeLaboresSENER2010.pdf

— (2010b), *Prospectiva del Mercado de Gas Natural 2010–2025*, www.sener.gob.mx/res/PE_y_DT/pub/perspectiva_gas_natural_2010_2025.pdf

— (2011a), *Balance Nacional de Energía 2010*, www.sener.gob.mx/res/PE_y_DT/pub/2011/Balance%20Nacional%20de%20Energ%C3%ADa%202010_2.pdf

— (2011b), *Quinto Informe de Labores 2011*, www.sener.gob.mx/res/0/SENER_5.pdf

— (2012), *Estrategia Nacional de Energía 2012–2026*, www.energia.gob.mx/res/PE_y_DT/pub/2012/ENE_2012_2026.pdf

SHCP (Secretaría de Hacienda y Crédito Público) (2011), *Criterios Generales de Política Económica 2011*, www.hacienda.gob.mx/POLITICAFINANCIERA/FINANZASPUBLICAS/Paginas/CriteriosGralesPolEco.aspx

SMN (Sistema Meteorológico Nacional) (2011), *Clima en México*, http://smn.cna.gob.mx/index.php?option=com_content&view=article&id=103&Itemid=68

SSN (Sistema Sismológico Nacional) (2011), *El SSN y la Sismicidad de México*, http://secre.ssn.unam.mx/SSN/Doc/Mx_sismo/mhist.htm

UN (United Nations) (2008), *State of the World's Cities 2010/2011. Bridging the Urban Divide*, United Nations Human Settlement Program, www.unhabitat.org/pmss/getElectronicVersion.aspx?nr=2917&alt=1

— (2009), *World Urbanization Prospects: The 2009 Revision Population Database*, Department of Economic and Social Affairs, Population Division, esa.un.org/unpd/wup/unup/

UNDP (United Nations Development Programme) (2011), *Human Development Report 2011*, hdr.undp.org/en/media/HDR_2011_EN_Complete.pdf

UNEP (United Nations Environment Programme) (2002), *Cancun Declaration of Like-Minded Megadiverse Countries*, www.pnuma.org/deramb_ing/CancunDeclaration.php

USDOE (United States Department of Energy) (2009), *Modern Shale Gas Development in the United States: A Primer*, www.netl.doe.gov/technologies/oil-gas/publications/epreports/shale_gas_primer_2009.pdf

USEIA (United States Energy Information Administration) (2011), *World Shale Gas Resources: An Initial Assessment of 14 Regions outside the United States*, www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf

— (2012), *U.S. Total Crude Oil and Products Imports*, www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbblpd_a.htm