

# Post-2015 Development Agenda

## Mexico Perspectives



Energy

## SPEAKER

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\*All work contributed by Amy Sopinka is not on behalf of the provincial government.

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## Summary: White Paper Report by Amy Sopinka

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Mexico has over 122 million people, making it the 12<sup>th</sup> most populous country in the world. Over 97% of the population has access to electricity, but 30 million people – a quarter of the total – still use firewood and other biomass for cooking. Growth is recovering after being hit by the global recession and oil price shock. The government is beginning to make changes to the energy sector, but nearly all energy prices are currently state controlled.

The major energy sources in the country are oil (55%) and natural gas (29%). Although production has declined significantly over the past five years, Mexico remains the world's seventh largest oil producer. The industry produces about 2.6 million barrels of oil a day and exports nearly half of that, mainly to the United States. The oil industry provided nearly one-third (32%) of total government revenue in 2013, and declining production and global prices have negatively affected the country's finances.

The country also produces 6.8 million cubic feet of natural gas a day. This is increasing rapidly, but demand is outstripping supply and liquefied natural gas (LNG) is also imported from Qatar, Nigeria and Peru.

Among the proposed post-2015 development goals, there are three particular energy-related targets which we can consider in a Mexican context: increasing the use of renewable energy (to reduce dependency on fossil fuels and cut greenhouse gas emissions), improving energy efficiency and reforming the current energy subsidies.

The government is already working to reduce household energy consumption by increasing the efficiency of lighting and electrical appliances, funded by \$307 billion in loans and grants from the World Bank. The planned efficiency increases would produce cuts in energy use and carbon dioxide emissions worth nearly a billion dollars. This makes the target quite a smart one: every peso spent would give benefits (reductions in energy use and greenhouse gas emissions) valued at about three pesos.

Another good target would be a reduction in energy subsidies. Nearly all energy sources – including electricity, gasoline, diesel and liquefied petroleum gas (LPG) – are subsidised, at a total cost of nearly \$13 billion a year (1.7% of GDP).

On average over the past decade, gasoline subsidy has been about 1.2 pesos per litre. Although intended to make fuel more affordable, more than half this subsidy goes to the wealthiest 20% of the population, while the poorest 20% get only 3%. Eliminating this subsidy would boost the economy and cut demand for fuel by a few percent.

The country's poorest could be compensated for higher fuel costs by a social protection program costing \$3.35 billion a year, and spending on this would decline as the economy grows. The annual benefit to the economy would be about \$12.4 billion. Each peso spent on the social protection programme would give economic benefits worth nearly four pesos.

The third possible energy target would be to increase the use of renewable energy. The government has a target of 35% of electricity to be generated from non-fossil sources by 2024. Most of this would come from hydroelectric power stations and the single existing nuclear power plant, but the target for non-hydro renewables (mainly wind energy) is set at 5%. This was originally 8.2%, but reduced for cost reasons.

Expanding wind generation to 5% of the total would cost \$14 billion. There would be a number of benefits: reduced carbon dioxide emissions, reduced ill health from air pollution and avoided costs of generation from

other sources. However, these benefits are worth at best \$5 billion, so investing in more renewable energy is not a good target to set.

# White Paper Report by Amy Sopinka

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Mexico is the world's 14th largest country comprising 1,964,375 km<sup>2</sup> of land and is currently home to 122.3 million people, making it the globe's 12th most populous country (World Bank, 2015). The per capita income in Mexico is \$10,307 placing it 88th in the world. The Mexican economy was affected by the global recession, and by the oil price shock, but has shown signs of recovery in the last two years, exhibiting growth rates of 1.4% and 2.1% in 2013 and 2014. Economic activity in the country is expected to improve, with growth rates estimated to be 2.9% in 2015 and 3.5% in 2017. Over 97% of Mexico's population has access to electricity while 30 million people continue to use biomass for cooking (IIASA, 2012).

Perhaps as a response to its susceptibility to global economic conditions, the Mexican government is enacting economic reforms in education, finance, government spending and telecommunications. In addition, the government is beginning to make changes to Mexico's energy sector, and is now encouraging private sector participation. For example, the Mexican government ended the monopoly of PEMEX, the state-owned oil company, and is allowing private industry to participate in the electricity sector.

Despite some reforms in the energy sector, Mexico continues to control nearly all energy prices including gasoline, diesel, liquefied petroleum gas and electricity. All electricity tariffs are approved by the Ministry of Finance and average electricity rates in Mexico for agriculture and households are held below cost which impedes the ability for Comision Federal de Electricidad (CFE) to invest in electricity infrastructure.

## Overview of Mexican Energy Situation

Mexico has substantial energy resources including oil, natural gas and renewable energy sources such as wind, solar and geothermal. Mexico is the seventh-leading producer of oil globally however, due to an aging oil field, production has declined significantly over the past half decade.

Mexico produces approximately 2.6 million barrels of oil per day and exports just under half of that, mostly to the US, with some exported to Europe, other American countries and a small amount to Asia. The oil industry provided 32% of total government revenues in 2013; declining production and lower global prices have negatively impacted the country's fiscal health.

Mexico produces 6.8 million cubic feet per day of natural gas, and although Mexican oil production is declining, natural gas output is increasing rapidly. However with a growing population, and even with increased production, the demand for natural gas is outstripping domestic supply. The supply gap is being met with annual imports of 224 billion cubic feet of liquefied natural gas from Qatar, Nigeria and Peru.

Mexico's energy supply is predominantly derived from fossil fuels; 55% from oil and 29% from natural gas. The remainder of primary supply is from coal (domestically produced and imported), and renewables. In addition to hydroelectric sources, the remainder of Mexico's non-hydro renewables consumption is attributable to traditional biomass, the use of which is important in rural areas. The country also has growing geothermal and wind energy sectors. There is one nuclear electricity plant in Mexico.

CFE is the dominant entity in the electricity sector as it manages over 75% of domestic installed generating capacity and is the sole provider of electricity transmission and distribution services. The generation side of the market changed through legislative amendments that allow the private sector to participate in electricity generation for purposes such as self-supply, cogeneration, small power plants less than 30 MW and for import/export. As of 2012, independent power producers — Productores Independientes de Energía (PIE)— owned 12.2 GW of predominantly natural gas fired generation capacity.

# Post-2015 Energy Goals

Although Mexico is undertaking significant reforms in the energy sector, there are some targets that are particularly prominent and should be analyzed to determine whether they should be prioritized in a post-2015 Millennium Development Goal context. The three goals we have examined here are: increasing the use of renewable energy, improving energy efficiency and energy subsidy reform.

## Renewable Energy Targets

Mexico has a diverse portfolio of installed capacity. In 2012, the Mexican public electric grid had 53,200 MW of installed capacity, with 38,550 MW from fossil fuels, 11,500 MW from hydroelectric, 1,610 MW of nuclear and 598 MW of wind. Approximately 8,000 MW of additional capacity is used for self-supply and cogeneration.

Fossil fuel, nuclear and storage hydroelectric facilities are able to provide consistent energy output and therefore they produce proportionally more electricity. Mexican electricity generation is mainly from fossil fuel-fired stations (both oil and gas) and although the country has a single nuclear plant, that one facility produces around 9% of total generation. Storage hydroelectric facilities are integral to producing electricity, however, the country has a growing renewable portfolio comprised of biomass, wind, solar and geothermal energy.

It is expected that an additional 55,000 MW of new capacity will be required over the next 15 years to meet new demand and compensate for an estimated 11,800 MW of retirements. The Mexican government has created a target of 35% of electric power generation through non-fossil sources for 2024, with 8.2% of generation to come from non-hydro renewable resources. In March 2015, Mexico downgraded the non-hydro renewable target to 5% citing the high cost of meeting the original target as the reason for the revision.

In order to meet this 5% target, the Mexican wind industry will receive \$14 billion between now and 2018 in order to triple the country's installed capacity (Reuters, 2015). By 2014, Mexico's wind capacity had grown to 2,551 MW and the goal by 2018 is to have 9,500 MW.

The benefits of using non-hydro renewable in Mexico include: avoided emissions, avoided illness and death from outdoor air pollution as well as avoided energy and capacity costs. Reducing electricity demand means that less electricity production is required. As a result of the lower electricity supply requirements, the electric system will need fewer to build fewer electrical generating stations. The size of generating stations is given by their capacity.

The estimates for the benefits of renewable energy are from the Brookings Institution and include, on a per megawatt of installed wind capacity basis: avoided emissions (\$105,697), avoided energy costs (\$74,412) and avoided capacity costs (\$69,570).

The World Health Organization (WHO) states that pollution, including outdoor air pollution caused by the combustion of fossil fuels in electricity generating stations, is a significant health risk. WHO (2014) estimated that rural and urban outdoor air pollution was the cause of 3.7 million premature deaths globally in 2012. Reducing outdoor air pollution reduces mortality and decreases the incidence of: stroke, heart disease, lung cancer, and other respiratory diseases, including asthma.

The estimated health benefits associated with reducing outdoor air pollution in Mexico is \$1.8 billion. This value is based on an assumption that the mid-range value of a disability adjusted life-year is \$3,000 and that on average, half a person's life, is saved.

Estimated Cost: \$14 billion

Estimated benefits: \$3.5- \$5 billion

BCR: <1

## Improve Residential Energy Efficiency

Mexico consumes approximately 1.5 % of the world's primary energy. Mexico first adopted energy efficiency standards in 1995 and the subsequent organization, National Commission for Energy Efficiency (CONUEE), created energy efficiency standards and regulates energy labels for domestic appliance products. As part of this program, Mexico has developed an energy efficiency strategy that is targeted at reducing residential power consumption through increasing energy efficiency of household lighting and appliances.

The program is funded through the World Bank via \$50 million loan from the Clean Technology Fund a \$250 million IBRD loan and a \$7 million Global Environmental Facility grant.

The benefits of this program include 5.14 million tCO<sub>2</sub>e of emissions reductions and electricity savings of 10 terawatt hours. To estimate the economic value of those benefits, the carbon emission reductions were valued between \$50 and \$100/tCO<sub>2</sub>. The avoided energy costs are based on the current residential electricity rate of \$54.60/MWh.

Estimated Benefits: \$803-\$1,060 million

Estimated Costs: \$307 million

BCR: 2.6 - 3.5

## Gasoline subsidy reform

Mexico subsidizes nearly all its energy, including subsidies to electricity, gasoline, diesel, and liquefied petroleum gas. It is estimated that on an annual basis, subsidies were approximately US\$12.9 billion per year. In aggregate, energy subsidies comprise 1.7% of GDP.

Fossil fuel subsidies are determined by the government; retail gasoline and diesel prices are set monthly. A formula provides an estimate of production, distribution and retailing costs, but the government also has the ability to set a different price at its discretion. Retail prices can be set above or below cost with consumers paying a tax in the case of the former, or a subsidy in the latter case. Over the past decade, the average gasoline and diesel subsidies have been set at about 1.2 pesos and 1.8 pesos per litre per year respectively, the equivalent of 40 U.S. cents and 59 cents per gallon.

Subsidies both distort price signals and at the same time can be highly regressive. It is estimated that more than 50 per cent of the Mexican gasoline subsidy goes to the wealthiest 20% of the population while only 3% is provided to the lowest 20%. The benefit of removing the subsidy is estimated as the elimination of the deadweight loss of the subsidy over a five-year period, which is estimated by Montes de Oca-Leon et al. (2013) to be between \$0.438 and \$24.2 billion, with a mid-range value of \$12.4 billion.

Costs are based on the impacts of the fuel subsidy on the poorest segments of Mexican society. As most of the benefits of the subsidy currently accrue to the highest income earners, the costs of removing the subsidy to the poor are likely to be low. Moreover, the long-term demand impacts of price changes are also small.

Although on average the subsidy on gasoline is around 14% of its price (World Bank, 2013a), it is estimated that the removal of gasoline subsidies would reduce demand by approximately 4%. The World Bank data

indicate that the Gross National Income (GNI) of Mexico's 10% poorest is 1.9% of national GDP, or \$37 billion. Doubling the impact of the subsidy removal to account for difficulties in program administration, poor targeting, transaction costs and other inefficiencies, would require a social protection program transferring \$3.35 billion to the country's poorest. The fiscal burden of this program would decline over time as Mexico's economy grows, whereas the benefits would be permanent.

Estimated Benefits: \$0.44-\$12.4 billion

Estimated Costs: \$3.35 billion

Extra government revenue, net: \$9.6 billion

BCR: 0.13-7.23

## BCR Summary

Target	Benefit	Cost	BCR
Renewable Energy	Midrange: \$4.25 \$3.5 - \$5 billion	\$14 billion	<1
Energy Efficiency	\$803- \$1,060 million	\$307 million	2.6 - 3.5
Remove Fuel Subsidies	MidRange: \$12.32 \$0.44-\$24.2 billion	\$3.35 billion	MidRange: 3.68 0.13-7.23

## Conclusion

Mexico is a country with vast energy resources and can utilize its natural abundance to promote economic growth. However, energy subsidies on gasoline are expensive and create inefficiency. Removing these subsidies while providing a social protection program to benefit the poorest 10% of the population will remove the deadweight loss associated with subsidization while providing the government with additional means of supporting other fiscal priorities.

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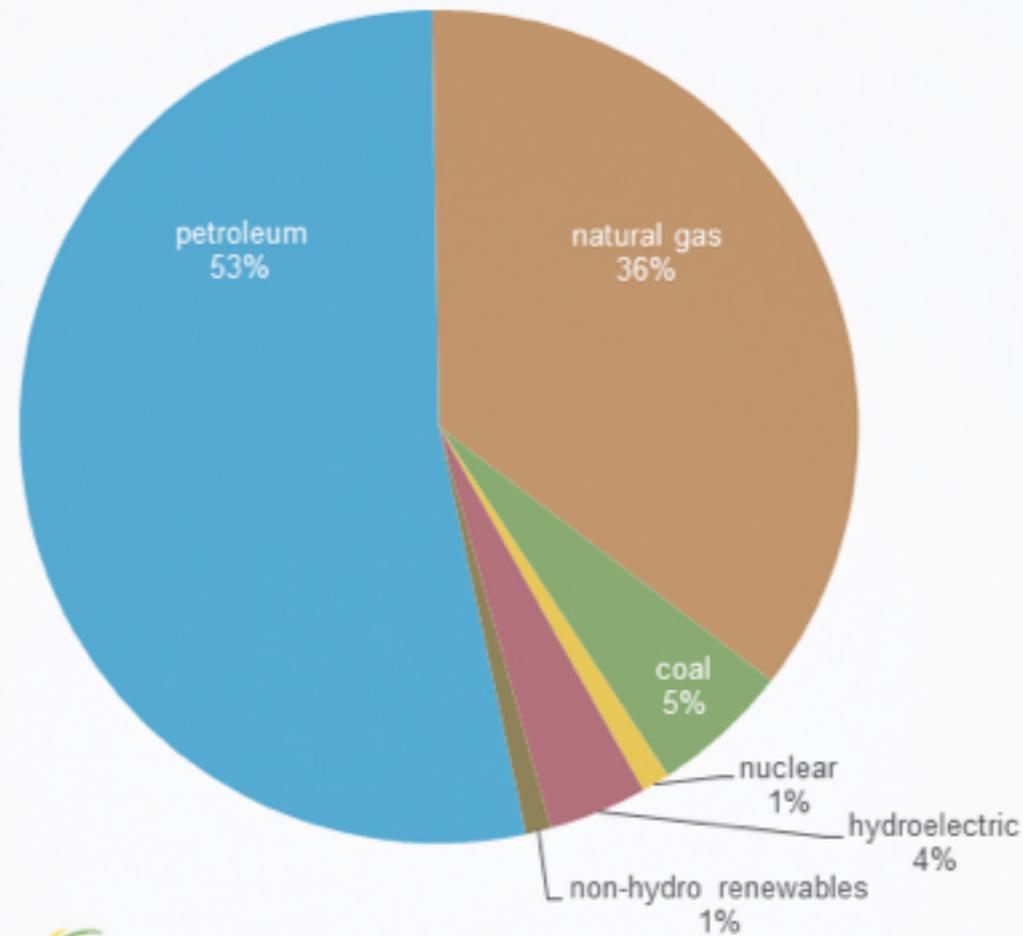
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# MEXICO - POST 2015 MILLENNIUM DEVELOPMENT GOALS

May 11, 2015

# WHAT IS THE CURRENT POSITION IN MEXICO REGARDING ENERGY?

Total energy consumption in Mexico by type, 2012



Source: U.S. Energy Information Administration

# WHAT DOES THIS MEAN FOR PEOPLE? WHAT IS THE IMPACT ON PEOPLE'S LIVES AND ON THE COUNTRY MORE BROADLY?

- 94% of primary energy comes from fossil fuels
- 88th in the world in terms of GDP per capita.
- 30 million people continue to depend on biomass for cooking.

# WHAT ARE THE PROPOSED INITIATIVES AND WHAT DIFFERENCES WILL THESE MAKE? OR ARE THEY MAKING?

The proposed targets for Mexico are:

1. Increasing Renewable Energy
2. Improving Energy Efficiency
3. Removing gasoline subsidies

# WHAT POLICIES MIGHT HELP OR SUPPORT THESE INITIATIVES?

- Continued support of energy sector reform
- Improved pipeline capacity to transport natural gas throughout the country and decreasing reliance on LNG imports
- Social protection programs to reduce impacts of subsidy reform.

# WHAT ARE THE CHALLENGES TO ACHIEVING POSITIVE CHANGE?

- Volatility of fossil fuel prices
- Resistance to continued subsidy reform
- Slow stock turnover in improving energy efficiency
- Renewable energy requires additional firm energy for reliability

# HOW MUCH REAL DIFFERENCE CAN WE MAKE TO THE LIVES OF MEXICAN PEOPLE OVER THE NEXT 15 YEARS?

- Reducing coal and fossil-fuel electricity production will decrease outdoor air pollution and the associated mortality and morbidity.
- Subsidy reform will eliminate deadweight loss.
- Demand-side management through energy efficiency targets reduces energy procurement needs

# FINAL MESSAGE

- Continued reforms around energy production (oil and electricity) have the potential to increase economic growth.
- Subsidy reform will ensure the fidelity of price signals and reduce inefficiencies resulting from regressive policies.