

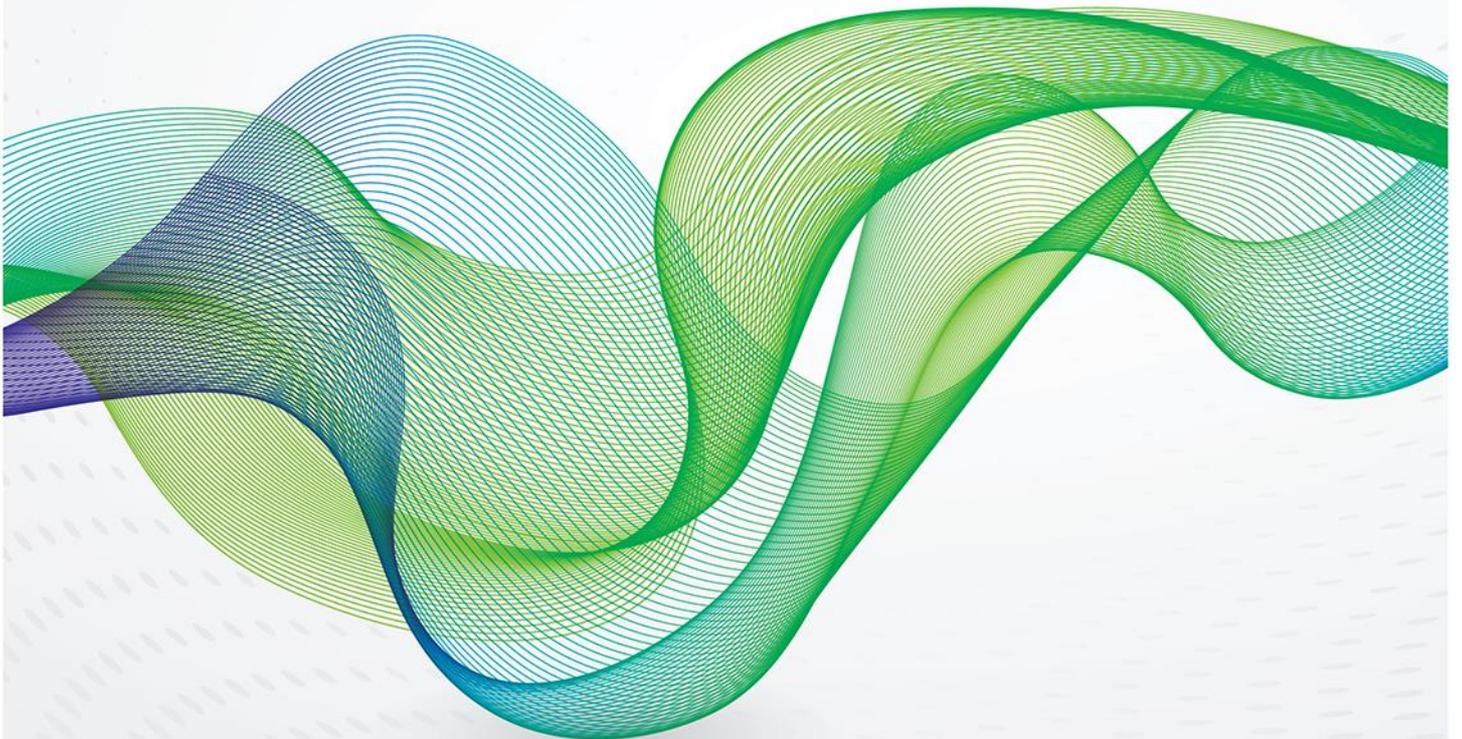


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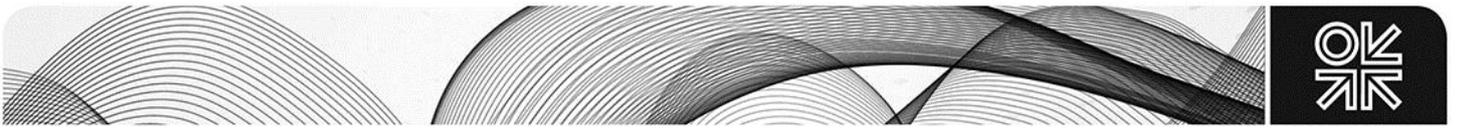
In Search of the Mexican Way:

How to kick start competition in the electricity sector and
achieve lower tariffs



OXFORD ENERGY COMMENT

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Abstract

This comment analyses the political economy aspects of the electricity market reform that has been proposed by recent changes to the Constitution in Mexico. It identifies the main political and economic barriers that could potentially prevent the reform from progressing. Although privatization is not being considered, Mexico is following closely the same deregulation-commercialization path to electricity market reform as has been implemented since the early 1990 in many developed countries. The danger is that the potential gains for the Mexican economy from electricity market deregulation will be delayed for many years if the reforms become trapped in a political impasse over electricity subsidies and commercializing Comision Federal de Electricidad (CFE). We propose an alternative route that takes into account the economic, political and social realities of Mexico, recognizing that our proposal is a 'second best' alternative, but one that increases the chances of success as compared to trying and ultimately failing to implement the 'first best' standard solution.



1. Background to Mexican electricity reform

Mexico's sweeping and historic energy reform bill was promulgated in December 2013 by the executive branch after being approved by the upper and lower houses of the Federal Congress by more than two-thirds of votes and confirmed by 51 per cent of Mexico's 32 state legislatures. This reform entails changes to articles 25, 27 and 28 of the Mexican Constitution that affect the entire energy sector. For the electricity sector, the reform creates a competitive electricity market together with open transmission access. It opens the market for sale of electricity by independent generators direct to customers and abolishes the existing requirement for all electricity to be sold via Comision Federal de Electricidad (CFE), the Mexican public utility company.

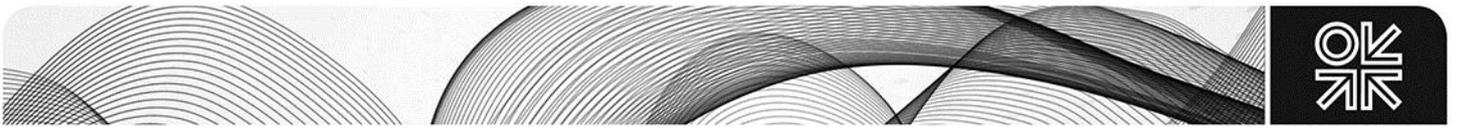
The energy reform transforms CFE - and Petr6leos Mexicanos (Pemex) - into Productive State Enterprises¹ with technical, management and budgetary autonomy. As such, CFE would compete in the electricity market with private entities but will not be privatized. These changes should be accomplished within two years of the approval of the reform.

The energy reform also proposes the establishment of new agencies and new roles for existing governmental bodies in the electricity sector:

- i. The *Centro Nacional de Control de la Energía* (CENACE) would be separate from CFE and should be established within 12 months of the effective date. Once established, the CENACE will act as independent system operator (ISO) responsible for the impartial dispatch of energy according to economic and technical considerations. It will also be in charge of planning and operational control of the national electric grid, Sistema Eléctrico Nacional (SEN), activities that remain exclusively reserved to the State.
- ii. The *Comisión Reguladora de Energía* (CRE) will regulate activities of the electricity industry, as well as storage, transport, and distribution by pipeline of natural gas and oil products. The CRE shall be responsible for regulating and granting permits for power generation, as well as regulating dispatch fees for transmission and distribution. In practice, CRE as Government appointed regulator and CFE as the dominant state-owned supplier will remain in a close tripartite relationship with the Mexican government during the transition process of deregulation and for the foreseeable future.
- iii. The *Secretaría de Energía* (SENER) shall be responsible for the terms and conditions that would allow and foster open access and efficient operation of the electricity sector.

The remainder of the reform package concerns the oil sector and will not be discussed further – though oil sector reforms may eventually impact the electricity sector indirectly by leading to increased natural gas production in Mexico. As natural gas is likely to be the major generating fuel for new-entrant Independent Power Producers (IPPs), any increase in indigenous production will increase

¹ Its purpose shall be to increase the economic value and revenue of the State; (2) it shall enjoy budgetary autonomy; (3) its organization, administration and corporate governance shall be arranged in keeping with best international practices; (4) its CEO shall be appointed by the President and removed by the President or the board of directors; and (5) a particular regime shall be established regarding public procurement, budgeting and public debt to allow it to efficiently compete in the market place. Source: 'Landmark Mexican Energy Reform Is Approved', White & Case Client Alert, December 2013.



competition with imported natural gas supplies and eventually feed through into lower electricity prices.

The next step is for the Federal Congress to enact secondary legislation to establish the contractual arrangements for private companies to participate, on behalf of the State, in the financing, installation, operation, maintenance and expansion of the necessary infrastructure for distributing public-use electricity. It is expected that the secondary legislation will also seek to eliminate legal and financial barriers that deter the use of renewables, thus promoting their use and that of cleaner fuels, and establish a means to reduce polluting emissions from the electricity industry.

2. Barriers to reform

2.1 Commercializing CFE

Implementation of the electricity reforms is planned as a series of sequential steps. The first step has been completed by changing the terms of the Constitution that mandated electricity service provision as a public monopoly. The second step will be to incentivize competition within the electricity market and prevent firms from exercising market power. The third will be to decarbonize the electricity sector.

However, the planned reforms do not provide the necessary elements to incentivize competition, in part because they leave the CFE as the unchallenged and dominant state-owned generator and electricity supplier. The proposed reforms establish a legal framework that allows an electricity market to exist but do not ensure such a market's creation, or that any such market could produce competitive tariffs.

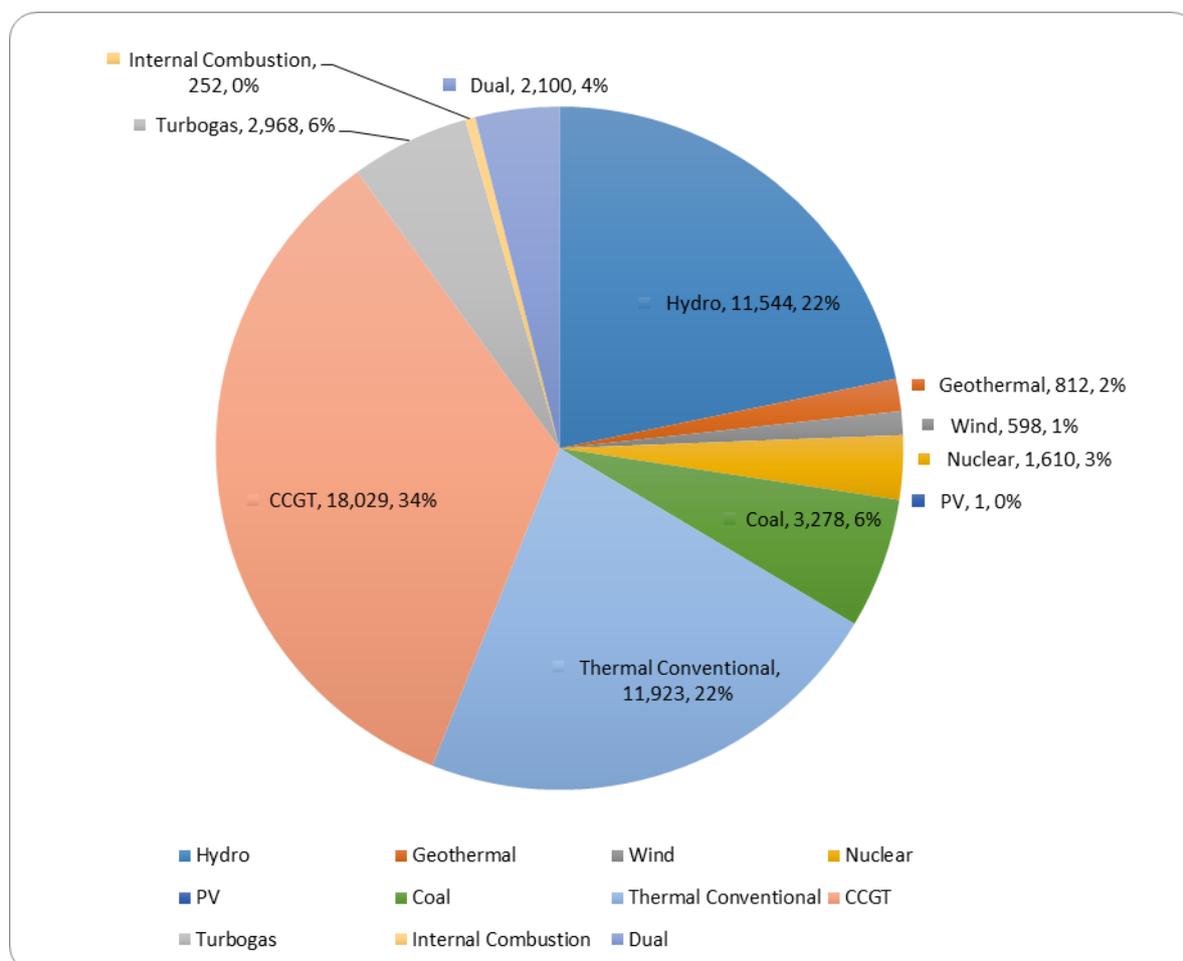
If Mexico could guarantee a sufficiently high level of entry by IPPs building new capacity and thus reducing CFE market share, then ultimately, the process of commercialization would deliver on its stated objectives. However, this would be a process rather than an instantaneous change. In 2012, CFE had an installed capacity of approximately 53 Gigawatts (GW) with a broad spread of generating technologies as shown in Figure 1. In contrast, IPPs had an installed capacity of 9.3 GW which is almost wholly made up of Combined Cycle Gas Turbine (CCGT) technology.

The short-term elasticity of electricity demand is extremely low, especially from household, service sector and agricultural consumers. Therefore, with an overall market share of nearly 70 per cent and 100 per cent control of marginal generating capacity, which by definition sets the market price, it is inevitable that CFE would use that dominant position to drive up prices. Therefore, as it stands, the industry structure of the generation sector would not deliver competitive prices.

CFE controls all of the marginal capacity that would set the market price if the industry were liberalized without price controls in place. With CFE retaining monopoly control of marginal price setting capacity, household, service sector and agricultural consumers would endure years of very high electricity prices. Rising prices would no doubt incentivize and strengthen the existing trend of large industrial consumers and new-entrant IPPs building CCGT capacity. However, industrial consumers building capacity to meet their own needs and new entry by IPPs would have little or no impact on overall market prices because they would likely run their power stations in baseload mode

and therefore not play any significant role in competing with the CFE-controlled marginal price setting capacity.

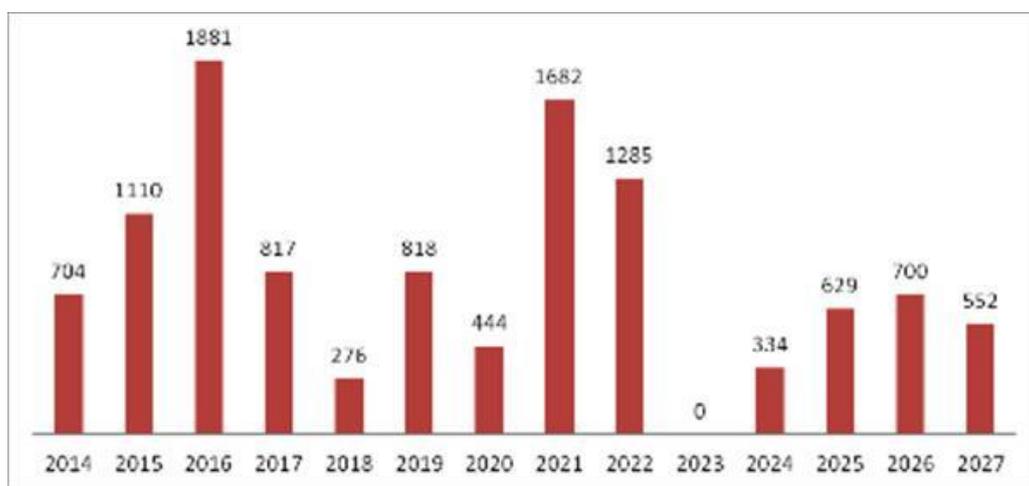
Figure 1: CFE's Installed Capacity in 2012



Source: SENER

Thanks to an 80-year legacy of dominance, the CFE would bequeath to any new commercial entity several important advantages. Such a new entity would rationally set very high tariffs and allow its market share to be eroded by new entry, thus maximizing its profits to rapidly invest in its own new generating capacity. The most likely option would be to close some of its existing oil-fired power stations - that are high-cost and low-efficiency - and build new CCGT plants. The new entity would also inherit CFE sites close to major demand centers, gas pipelines and existing transmission grid connections, while new entrants would need to buy land and build pipelines and transmission infrastructure. New entrants would gradually erode the CFE overall market share, however, as Figure 2 shows, CFE already has already put in place a program of planned capacity closure totalling 4.8 GW by 2018. In essence, if the entire Mexican electricity market was instantly deregulated and opened fully to competition across all consumer sectors, CFE would rationally continue with this planned program of closures to accommodate new entrant IPPs, reduce its own costs of generation by closing its highest cost capacity and retain its monopoly position in price setting capacity.

Figure 2: Planned Retirements of CFE Capacity (MW)



Source: SENER

In the long run, CFE would eventually reduce prices to just below the long run marginal cost of entry, but only after it had cemented its dominant market position in the reformed electricity market. In the short run, if CFE were allowed to set very high unregulated tariffs the economic shock would be equivalent to the Mexican government imposing a large and instantaneous tax increase across the economy.

Mexico can perhaps glean insight from the British and American experiences of managing generation capacity. In the 1990s the England & Wales electricity market - run with a duopoly of generators - required constant regulatory interventions, including price controls and a series of mandatory divestments of marginal generating capacity. In California, meanwhile, extremely hot summer weather from 2001 to 2003 drove up electricity prices to above USD 10,000 per megawatt hour. This was due to increased electricity demand – particularly air conditioning load - combined with concentrated ownership of the limited amount of marginal generating capacity.

Under normal circumstances, the Mexican electricity market would eventually self-correct if prices and profits on offer to generators were very high. The response of investors to very high prices and profits on offer in the England & Wales market during the 1990s resulted in the so called ‘dash for gas’ in which a significant amount of CCGT capacity was built by incumbents and new entrants. Prices did ultimately fall through a combination of the regulator mandating significant disposals of coal-fired capacity by the duopoly generators and new entrant CCGT capacity contributing to oversupply and a slump in prices.

The difficulty with relying on economic incentives to deliver desired policy outcomes is that the timescale over which that occurs is often longer than the political cycle. For example it took a decade before wholesale electricity prices in England & Wales fell to a more competitive level. In fact, as wholesale prices declined, prices for retail customers continued to rise and have carried on rising to the point that in 2013 household electricity prices became the source of major political division and sparked an ongoing series of regulatory inquiries. Electricity prices remain highly political in every country where deregulation and privatization have occurred.



If the Mexican government wishes to create a sufficiently competitive market quicker than could be delivered by relying solely on new-entrant competition, it could seek to break the CFE's monopoly position in marginal generating capacity. Typically, a competitive market would require at least five independent and competing firms to be created, each owning an equal share of the marginal price setting capacity. In our view, the process of creating a competitive industry structure by fragmenting CFE into five or more independent firms would inevitably be seen as a precursor to privatization and would be politically infeasible in the short to medium term. Any attempt to force that degree of restructuring of CFE through the Mexican legislative process would take years and the overall reform process would likely become stalled in a political impasse.

The alternative of allowing a rise in tariffs, especially for household, service sector and agricultural consumers, would likely be political suicide for any government. If CFE were permitted to use its dominant market position to increase prices, then the pressure for political intervention from voters would almost inevitably end in the election of a political party or parties committed to reversing the reforms. In this scenario the likely outcome would be even higher subsidies for household consumers to offset the higher tariffs set by CFE, perhaps an even more extreme version of the current situation, with industrial consumers paying ever higher tariffs and households and other politically sensitive sectors using even more heavily subsidized electricity. Significant price rises always cause political tension between the supporters of the free market and those who wish to return to actual or quasi state control under a mandatory price-cap regime. Unless household electricity prices can be guaranteed to fall, political opposition to reform will continue to grow in Mexico and inevitably cause it to be delayed or even reversed. In the alternative, constant regulatory intervention to control prices would result in increased risk for investors, raise the cost of capital and slow the rate of new entry and investment.

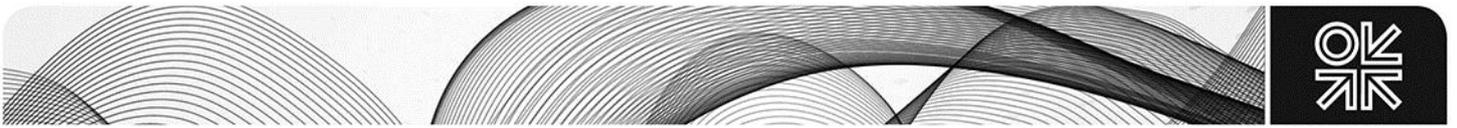
The political imperative of ensuring lower electricity prices for all Mexican consumers runs counter to the political opposition to any attempt to create a competitive industry structure by fragmenting CFE. That leaves the Mexican government with little option but to retain price controls at the same time as attempting to deregulate and open the Mexico electricity market to competition. This of course is a contradictory position, as imposing regulated tariffs negates much of the purpose of introducing the reform since regulated tariffs already exist. Price controls would run against the objective of opening the electricity market. The energy reform therefore has set an objective that is economically desirable in the long term but politically impossible to deliver within one electoral cycle.

2.2 Subsidies

The Mexican government must shoulder some of the blame for making the process of implementing deregulation and commercialization more difficult than it otherwise would have been. In order to gain broad public support, the government has pitched the reform process as a tool to lower electricity prices. However, it is hard to envisage the proposed reforms causing prices to fall below their current level, which is already artificially low thanks to subsidies that are among the highest in the world (85.8 billion pesos in 2010, approximately USD 6.6 billion)². Indeed, subsidies in 2006 alone were equivalent to about 1 per cent of gross domestic product and were more than one-third of total electricity sector revenues.

Mexico has a complex tariff system with over 112 different billing possibilities for residential consumers. In 2002 a new a new tariff schedule, Tarifa Doméstica de Alto Consumo (DAC), was

² CIDAC, ¡No más subsidios injustos!, 2012, Centro de Investigación para el Desarrollo A.C.,: México. p. 35.



introduced for households consuming large volumes of electricity. DAC, however, only raised tariffs slightly above long-run marginal costs for roughly the top 5 per cent of customers in each category. Box 1 summarizes the legal framework for setting electricity tariffs. Although tariff subsidies were intended to be temporary, the supply of cheaper electricity to low income groups has become expected, making it virtually impossible for politicians to reduce or remove no matter how economically desirable that may be. Figure 3 shows that in 2012 residential customer tariffs in Mexico were the lowest of all OECD countries, and some 57 per cent below the OECD average. Figure 4 shows industrial tariffs in Mexico were still some 12 per cent below the OECD average but 68 per cent above the USA, Mexico's main trade partner.

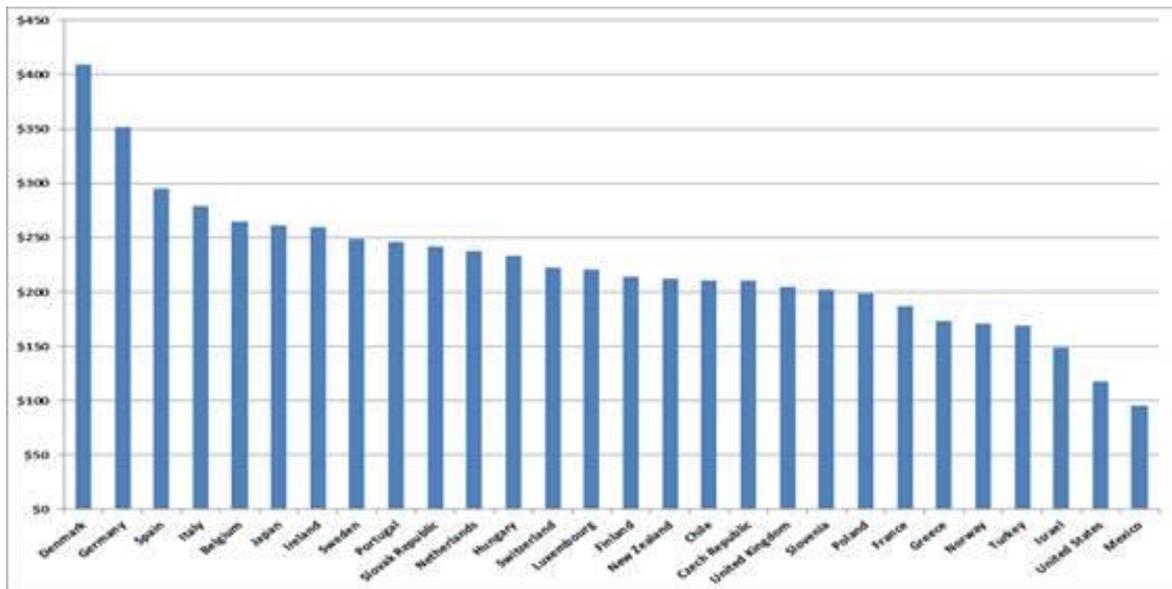
Box 1: Legal Framework Governing the Establishment of Mexican Electricity Tariffs

Regulatory Law for Parastatal Enterprises. Article 2 states that tariffs of state-owned enterprises are to be set “in accordance with economic efficiency and financial health criteria”.

General Law of the Public Service of Electricity. Article 31 establishes that tariffs are to be ‘fixed, adjusted, and restructured in a way that covers financial and public service expansion requirements, and rational energy consumption’. The legal framework establishes that subsidies ‘shall be temporary’ and subject to the criteria of ‘objectivity, equity, transparency, publicity, and selectivity.’

Federal Law for Budget and Fiscal Responsibility. Article 75 states that ‘in programs of direct benefit to individuals or social groups, amounts [of the subsidy] and percentages shall be determined on the basis of redistributive criteria that must privilege the lower income population and aim at equity amongst regions and states’.

Figure 3: Average Residential Electricity Prices 2012 (OECD)



Source: IEA Key World Energy Statistics, 2012

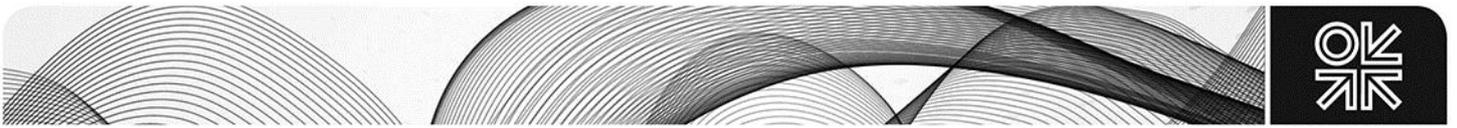
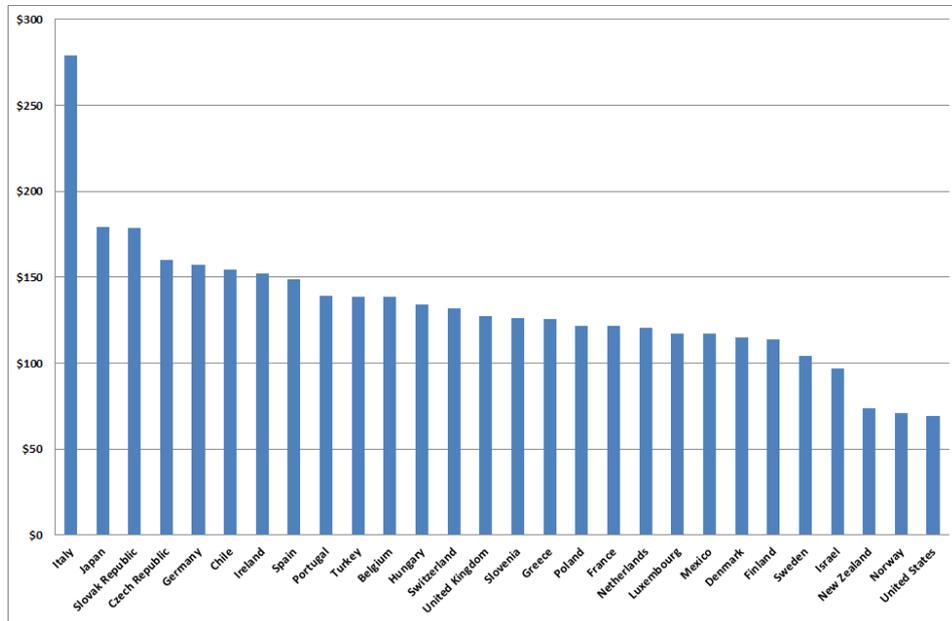


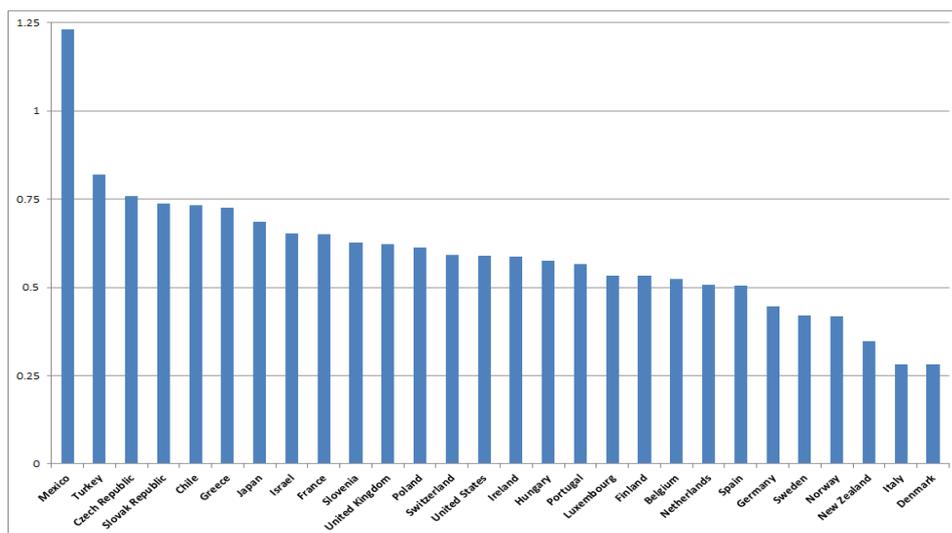
Figure 4: Average OECD Industrial Electricity Prices 2012 (\$/MWh)



Source: IEA Key World Energy Statistics, 2012

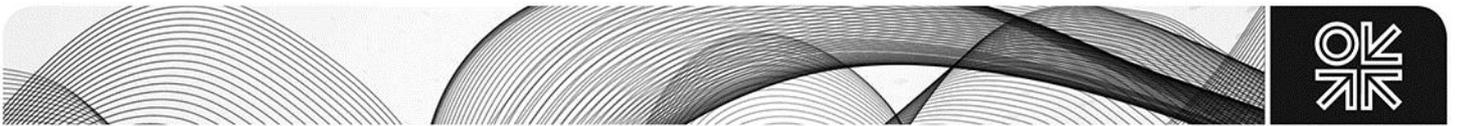
Figure 5 shows that in 2012 Mexico had the highest ratio of industrial tariffs to residential tariffs of any OECD nation and that Mexico was the only such nation to have an industrial-residential ratio above 1, which at 1.23 was twice the OECD average. The ratio, which should be below 1 as industrial buyers typically have a significantly larger buying power than residential customers, is so high in Mexico due to heavily subsidized residential tariffs.

Figure 5: Ratio of OECD Country Industrial to Residential Electricity Prices 2012



Source: Authors' calculation from data in Figure 1 and Figure 2.

Figure 6 shows the ratio of total tariff income to total production costs for electricity in Mexico. Residential tariffs only cover four-fifths of production costs and certain politically sensitive sectors,

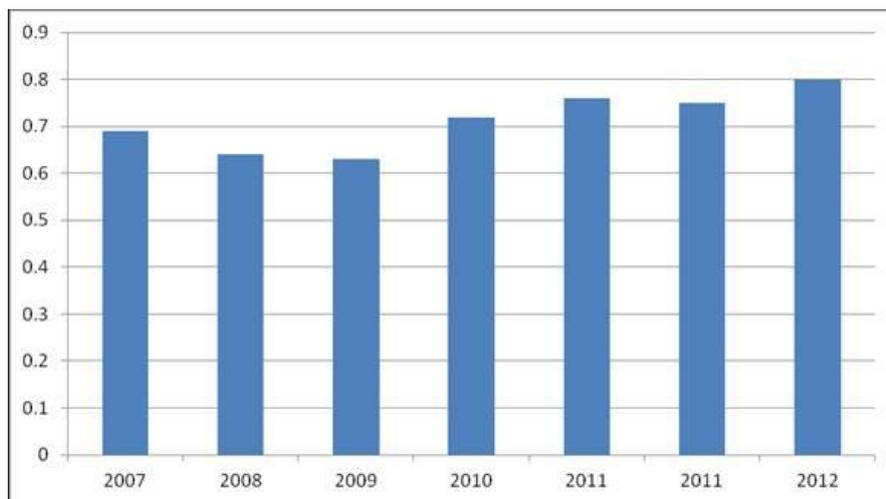


such as agriculture and service industries, are also heavily subsidized. Although some tariff reform has been carried out, the ratio of total income to total production costs across the whole electricity sector was 80 per cent in 2012. This confirms how much of the subsidy to residential customers is being made up by raising tariffs charged to industrial customers.

The many problems caused by subsidies are well-known: they distort price signals; elevate demand above what it would be if electricity was priced at marginal or average cost; and the bulk of subsidies usually go to the non-poor. For our case though, the main problem is that subsidies needs to be covered in some way—if not by consumers, then by government, and if not by the government directly, then by CFE.

Electricity subsidies in Mexico are financial subsidies that result from below-cost pricing, with cost measured as accounting costs. Subsidies are measured as the difference between the price of electricity paid by consumers and the average cost of supply. However, this measurement approach does not capture the economic cost of electricity provision (allocating these resources to other more productive activities, or other activities with higher impact on poverty alleviation, for example), which could differ significantly from the accounting costs.

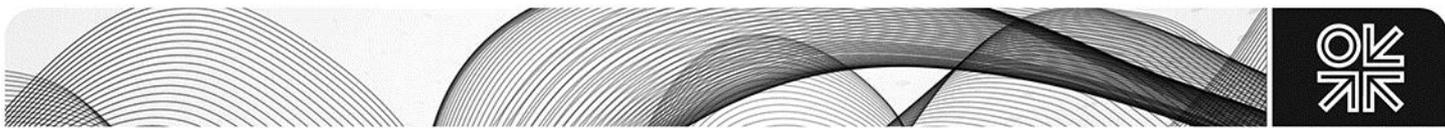
Figure 6: Ratio of Total Electricity Tariffs to Total Production Costs in Mexico



Source: SENER

CFE's subsidies have been financed by internal governmental transfers. The federal government reimburses CFE for providing subsidies to its customers by discounting the taxes and dividends – known as *aprovechamiento* - that CFE would otherwise have to pay the government. Since 2002, the volume of subsidies has exceeded this amount though. In 2012, *aprovechamiento* was 44.6 billion pesos, while the reimbursement needed was 77 billion pesos, but only 44 billion pesos were transferred. The remaining was cancelled against assets. CFE ended the 2012 fiscal year with a loss of 19.2 billion pesos³. The result is an erosion of CFE's capital base.

³ CFE (2012). Informe Anual, p 43
http://www.cfe.gob.mx/ConoceCFE/1_AcercadeCFE/Lists/Publicaciones%20Informes%20Anuales/Attachments/10/Informe2012CFE.pdf?Mobile=1
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Given the way that subsidies are measured – tariff minus accounting cost—the magnitude of subsidies is directly related to the cost of supplying electricity. Reducing costs can offset, at least partly, the need for raising tariffs and thus also reduce the need for subsidies. However, since 2002, CFE's average cost per Megawatt hour (MWh) delivered has increased by about 20 per cent because fuel costs (mainly natural gas and fuel oil) rose by nearly 70 per cent during this period⁴. While transmission losses have declined in percentage terms, distribution losses have been rising from 11 per cent to 11.6 per cent between 2000 and 2005⁵. These losses in the main arise because of electricity theft rather than technical losses.

Creating an electricity market competitive enough to deliver a price reduction for household, service sector and agricultural consumers could not be achieved even if CFE were fragmented into many smaller competitors and price competition was intense. This is because current subsidized prices are below production costs. Even if operational efficiency in the Mexico electricity industry could be improved to match the best levels in other deregulated electricity markets around the world, prices could not fall below the long run marginal cost of production for more than a few years otherwise new investment would cease. It is therefore economically very difficult for competition and improved efficiency to deliver lower prices to household, service sector and agricultural consumers without maintaining subsidies.

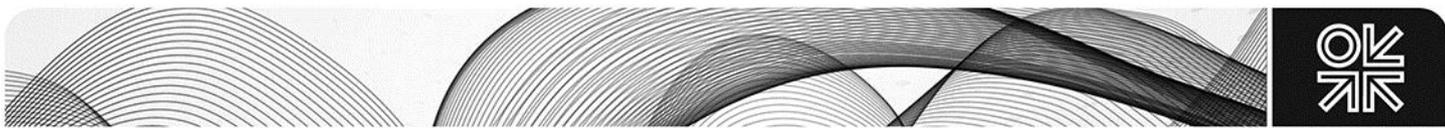
One solution to this subsidy problem would be to continue with a modified subsidy regime. New entrants would be allowed to compete for all types of household, service sector and agricultural consumer, who would then receive a subsidy regardless of who their supplier was, whether that be CFE or a new entrant IPP. However, this would still not deliver an efficient outcome because CFE would remain as the dominant supplier and price setter. As discussed in the previous section, prices would rise dramatically because of the concentrated nature of the generating sector and the very low elasticity of demand for electricity. Indeed, if the subsidized sectors continued to be shielded from price rises they would never receive a price signal to reduce their consumption. Elasticity of demand would remain close to zero in the short, medium, and long term, thus reducing the efficiency gains that could be achieved on the demand side by the proposed reforms.

A continued subsidy regime, combined with a highly concentrated generating sector that drive up prices, would also mean that subsidies would have to rise by a similar amount in response. The Mexican government would be forced to foot the bill for a significant portion of these rises while CFE and new entrants enjoy very high prices. This would not be an affordable solution. The experience of privatizing Telmex and transferring what amounted to almost a state monopoly into the hands of the private sector is an example of failed deregulation⁶. This privatization experiment in Mexico has inevitably led to intense political opposition to any move to commercialize CFE. Any proposal to increase subsidies to CFE and then additionally begin paying subsidies to new entrant IPPs funded by private capital would raise justifiable concern that deregulation will deliver no benefit to consumer or taxpayer. At worst, it could cause a rapid rise in household electricity prices if subsidies do not

⁴ World Bank (2006). Residential Electricity Subsidies in Mexico: Exploring Options of Reform and for Enhancing the Impact on the Poor. World Bank Working Paper No. 160 <https://openknowledge.worldbank.org/handle/10986/5959>

⁵ For the now extinct Luz y Fuerza de Mexico, covering the metropolitan area of the Valley of Mexico until 2009, distribution losses exceeded 30 per cent.

⁶ In the case of the Mexican privatization during the late 1980s and early 1990s, we find evidence that in general it has been successful (La Porta and Lopez-De-Silanes 1999; Chong and López-de-Silanes 2003). But Castañeda-Sabido (2004) finds that although there is evidence that privatization has been successful for firms involved in competitive environments, the results for key industries are not that optimistic. Privatization of telecommunications, banking and airlines were highly unsuccessful. In the case of telecommunications, the prospect of future monopoly rents allowed the newly privatized company to earn excessive benefits, while infrastructure had not expanded at a desirable rate. For banks, bad market architecture, poor regulation, and weak legal framework triggered the economic crisis of 1995. For airlines, there is considerable evidence of market power.



increase in line with prices. However, the alternative of an unaffordable subsidy program to offset rapid price rises does not offer a better solution. Meanwhile, private capital invested by large industrial groups and IPPs building generating capacity will benefit from rising prices. The dominant and heavily subsidized position of CFE in supplying the existing base of household, service sector and agricultural consumers would remain largely unchallenged.

The industrial and commercial sectors face largely unsubsidized electricity tariffs, while CFE uses higher tariffs to offset subsidies in other sectors of the economy. Since a factory in Mexico pays approximately 70 per cent⁷ more for its electricity than its USA counterpart, the potential benefits of electricity market reform to industrial competitiveness are significant. Lower unit labor costs in Mexico offset higher electricity prices, but a lowering of commercial and industrial electricity tariffs would have an immediate impact on industrial competitiveness and feed through into faster economic growth and reducing Mexico's chronic unemployment problems. However, there is a real danger that Mexico could miss out on the potential long-term benefits of electricity market reform if the required secondary legislation becomes bogged down in short-term political bargaining and ideological debates over state ownership. For example, two important constitutional reforms, the telecoms reform and political reform, are currently entrapped in the Congress with parties debating the secondary legislation.

2.3 Pemex and Natural Gas

Even if the problems surrounding subsidies and CFE dominance could be overcome, perhaps by instituting a time-limited period of electricity price controls, the entry of new IPP capacity investors could only occur if they could be guaranteed access to generating fuels at competitive prices. IPPs are likely to prefer natural gas as CCGT power stations have superior thermal efficiencies, lower emissions and lower capital costs than coal-fired plants. Therefore the fate of the electricity reform depends to a great extent to what happens in the natural gas market.

The rapid growth of household and industrial demand and the increase in electricity generation has led to a shortage of natural gas in Mexico and increasing amounts are imported. Because Pemex directs its efforts to finding oil for export and regards gas as a secondary fuel, indigenous natural gas resources are underdeveloped.

Figure 7 shows the change in electricity generation mix has been largely driven by the dramatic rise in CCGT capacity and Figure 8 shows how growth in demand for electricity has tracked the growth in demand for natural gas. Most new natural gas supply is imported via pipeline from the USA. The 'Los Ramones' gas pipeline project currently under construction runs from Texas and crosses almost half of Mexico. It represents the only means by which Mexico can meet its natural gas demand in the near term at prices which are economic for electricity generation. Currently, the National Pipeline System⁸ has capacity to transport 5.1 billion cubic feet per day [Bcf/d] across 18 of Mexico's 32 states. Mexico's pipeline capacity to import gas from the USA is nearly 4.4 Bcf/d. Los Ramones could expand this capacity by a further 3.7 Bcf/d.

⁷ Authors' calculations using OECD data in Figure 4.

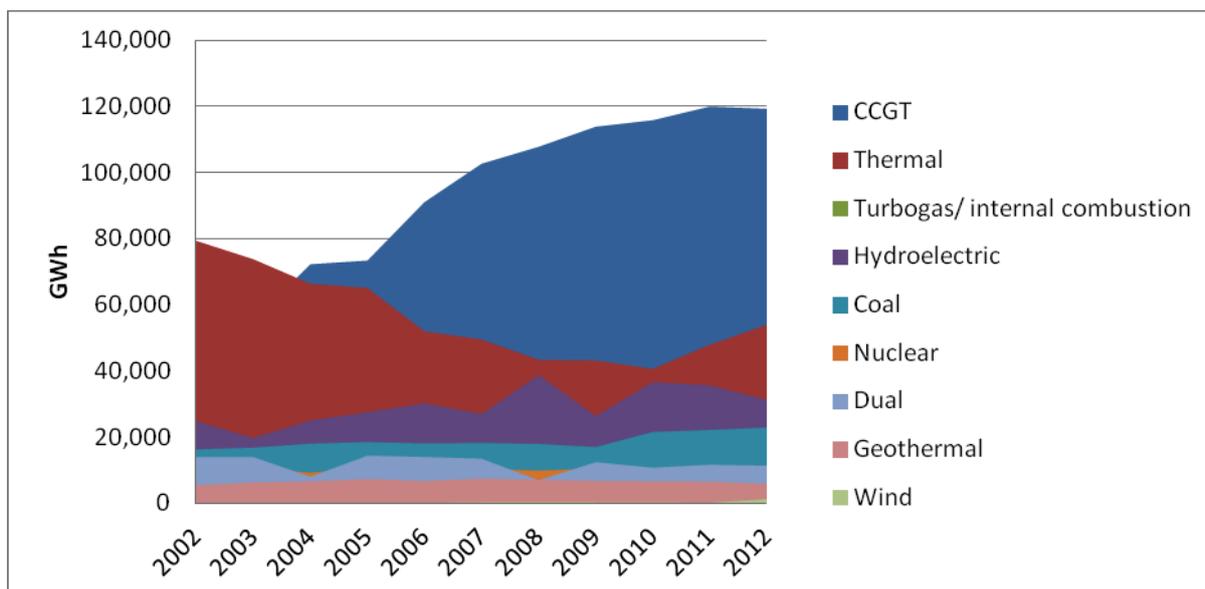
⁸ There are other 17 private pipelines operating now in Mexico. Weblink: http://www.sener.gob.mx/portal/Default_Intermedia.aspx?id=2615 Gas Natural y Gas L.P. Cuadro 3.34



According to SENER, natural gas requirements for power generation will increase from 2.7 billion cubic feet per day [Bcf/d] in 2012 to 6.1 Bcf/d in 2027⁹. The National Energy Strategy estimates a surge of imports during the present administration - 2012-2018. LNG terminals on the Pacific coast allow imports at a price that is three to five times higher than prices at Henry Hub across the border in the USA. SENER estimates LNG imports will double over the period 2011-2027, reaching 1.14 Bcf/d (32.5 MMm3/d). LNG makes sense in meeting peaks in demand but not for baseload generation. In addition, industrial users were cut off from gas supply 42 days last year, so increasing electricity generation from gas will only create greater shortages to industry as well as to the gas-fired power stations.

This creates an artificial shortage of gas which the SENER combats by mandating CFE to stop generation using natural gas to allow industry to use it. However, this comes at a cost because CFE replaces the lost generation capacity with higher-cost fuel oil, operates older power stations at lower levels of thermal efficiency, or operates CCGT plants with expensive LNG. The current natural gas transport pricing system is a formula that includes a postage stamp rate and a mileage rate which is a variable charge to take account of distances between entry-exit points. Mexico's inflation and exchange rates, local and federal taxes and a five-year price cap are also factors that influence the transport costs.

Figure 7: Electricity Generation Mix in Mexico 2002 – 2012



Source: SENER

⁹ Weblink: http://www.sener.gob.mx/portal/Default_Intermedia.aspx?id=2615 Gas Natural y Gas L.P. Cuadro 5.3

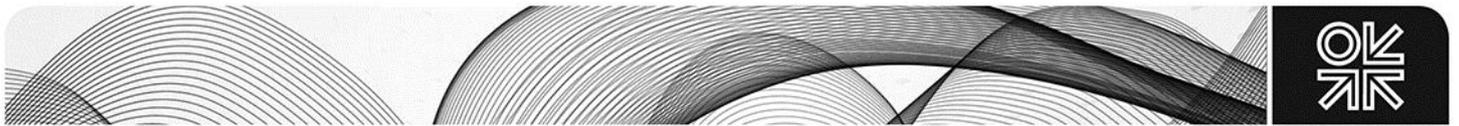
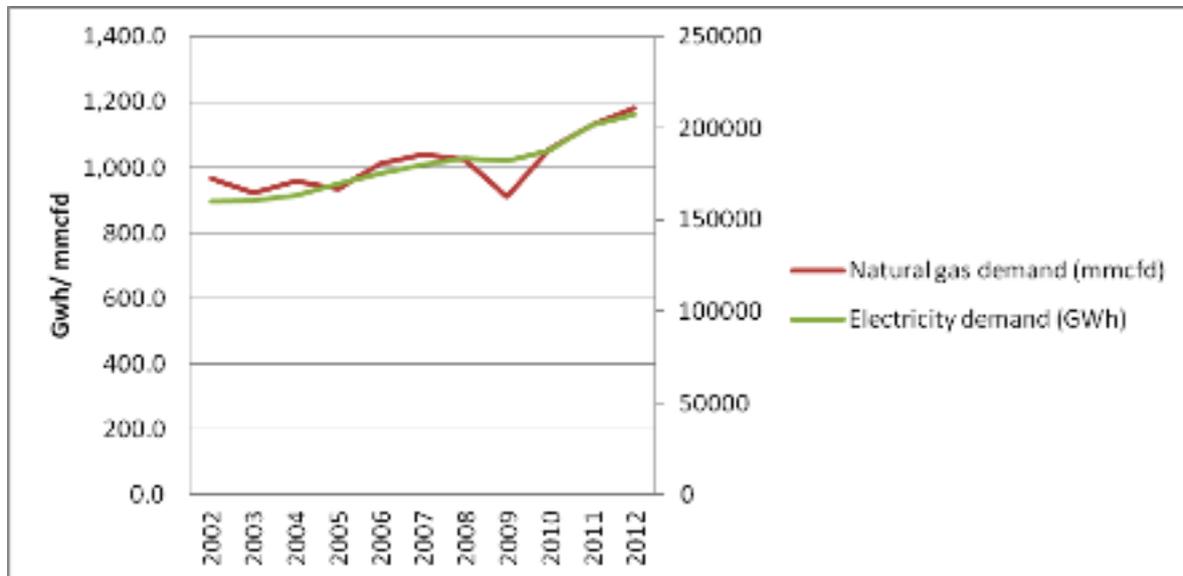


Figure 8: Electricity Sales versus Natural Gas Demand 1980 – 2012



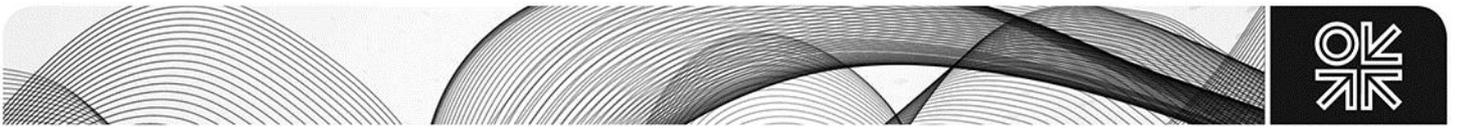
The new constitutional changes call for an independent gas pipeline system operator and for outside investors to explore for and exploit Mexico's gas reserves. However, the current price of gas in Mexico is indexed to USA gas prices, which have been driven down by the sudden increase in shale gas supply. In effect, the indexation of gas prices to USA prices has reduced the incentive to invest in gas exploration and gas pipeline systems except close to and over the USA border. Allowing the owners of gas fields to site a gas-fired power station on a field and produce electricity is problematic as it imposes the investment cost of building transmission lines to transmitting the electricity to load centers.

The shortage of natural gas makes it very difficult for new IPP generators to enter the market. Without cheap, plentiful and reliable gas supply it is hard to imagine how prices of electricity can be made competitive and reliable enough even for industrial users who want to build their own CHP or buy from an IPP.

The role of Pemex in natural gas production is potentially in conflict with the objectives of the electricity market reform. Pemex currently sees little point in exploiting its significant shale gas reserves when prices of USA gas are so low and, in fact, lower than the Pemex long-run marginal production costs. This could change if reform in the hydrocarbon sector triggers new investments in Mexican indigenous shale gas that would be exploited by private companies who have the expertise and the interest in these resources. However, it is difficult to see how a USA-style shale gas revolution could take place in Mexico. Although the geology of basins is similar, the exploration conditions are different, not to mention the complicated security situation in northern Mexico where drug cartels operate.

If natural gas prices do eventually rise, then Pemex may become interested in natural gas projects¹⁰, and as the Mexican state oil company it has a dominant presence in the energy sector and therefore

¹⁰ Nevertheless, Pemex showed no real interest in shale gas projects in its Round Zero bid to SENER. Round Zero was designed in the transitory regime of the constitutional reform to allow Pemex to have enough reserves that give it sustainability in the medium and long term, while giving the market sufficient resources to develop through the private sector.



could potentially provide a counterbalance to the dominance of CFE. An ever increasing source of competition would be provided if, for example, Pemex were to begin exploiting its underutilized gas resources to sell to new entrant electricity generators, or even invest in its own capacity. However, the role of a second, dominant state entity in the electricity sector is unclear and might ultimately undermine the reform process by deterring potential IPP investors. If it were to withhold natural gas from its own fields and refuse to sell it to new entrant IPPs but instead build its own CCGT power stations it could very effectively form a duopoly position with CFE.

In any case, for Pemex or independent natural gas producers to begin exploiting shale gas, the price of natural gas would have to rise in order to incentivize exploitation of Mexican natural gas resources. This would increase the fuel's availability and allow new IPPs to invest in the electricity sector. However, that could cause major political problems if household gas prices rose and could potentially damage economic competitiveness if industrial consumers were to face higher natural gas costs.

As things stand today, the amount of gas available to new entrant IPPs will be severely restricted until 2020 and depends on the successful building of all planned investment in pipeline capacity. As pipeline capacity does not yet exist, IPPs are unlikely to risk contracting natural gas in Texas and commence construction of a new CCGT power station without a guarantee that it will be able to economically transport the fuel. Political decisions about the taxation of natural gas destined for electricity generation versus natural gas produced as a by-product of oil exploration could also increase investment risk and be used to give Pemex a cost advantage over outside investors.

Without natural gas supply, there can be no new generation capacity built either by IPPs or by incumbent commercial and industrial groups wishing to generate their own electricity. While CFE would also be restricted from building new CCGT capacity, without the threat of entry by IPPs it would have virtually unlimited freedom to raise tariffs without fear of losing market share.

3. An Alternative Model for Reform

To overcome the issues identified above we propose Mexico take an alternative path to the one that appears to be being currently followed by the proposed energy reform.

3.1 Defining and Limiting the Role of CFE

The transformation of CFE into a commercial enterprise may prove problematic. Instead, CFE should be retained as a state-owned enterprise with its role defined and limited to serving only household consumers.

This would have two effects:

- i. Reserve the large industrial demand market for new entrant capacity which would encourage, for example, large industrial groups to build CHP for their own use, merchant generators to come in to supply a large numbers of smaller industrial customers and/or get together in 'power parks' to build their own shared capacity; and

- ii. Remove the need for CFE to build new power stations to meet growing domestic household consumer demand. If CFE stopped serving industrial customers, it would be left with spare generating capacity to meet future demand growth - mainly with its hydro, nuclear and CCGT capacity - and perhaps even able to close some of its oldest, least efficient and polluting power stations like fuel oil plants. Some fuel oil plants, however, would still be needed on occasion to balance the system. CFE could transfer these plants to the system operator for this use.

In essence, this would kick-start competition in the industrial sector that is most able and most in need of a reduction in electricity prices (i.e. large industry) that will make Mexico's exports more competitive. Political opposition would be minimal, because households would be protected against rising prices and progress much quicker. The commercial and industrial market would therefore be open to full competition and investment in new capacity would be made purely in response to market price signals.

The greatest failure would be if no new investment is made once the reform is approved in its secondary legislation; a failure that has occurred in countries such as Spain and Italy. Reserving the commercial and industrial market for new entrants and self-generators by law would prevent CFE abusing its dominant market position and its status as a state-backed entity to deter new entry by competitors. Reserving expected demand growth in the industrial and commercial sector, so that it could only be met by new entrant IPPs, would provide confidence to investors. Removing CFE as a competitor would reassure investors that there would be a market for their capacity of whilst at the same time ensuring competitive market prices.

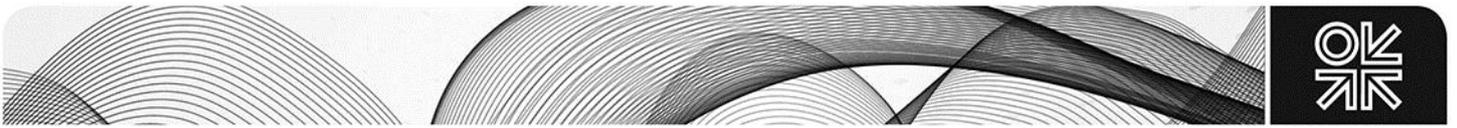
3.2 Opening the Commercial and Industrial Market

Preventing CFE – and other state-owned enterprises such as Pemex – from investing in any new generation capacity and limiting CFE to providing electricity to the 'subsidized' sectors' would automatically create a capacity surplus at CFE to meet future demand growth from those sectors. This would also eliminate the need for CFE to raise fresh capital.

Achieving lower prices for industrial and commercial consumers will be a complex process however, and will depend on more than simply the size of new investments entering the sector as a result of reform implementation.

This major benefit of allowing competition to flourish in the commercial and industrial sector cannot happen overnight. The separation of transmission and distribution, and creation of a national control center, would have to occur before any market could begin operation. The entry of new capacity to serve commercial and industrial consumers would also be limited until new natural gas pipelines have been completed.

For all practical purposes, the opening of the industrial and commercial sector would therefore have to be a staged process with a gradual lowering of the demand threshold above which CFE would no longer be permitted to retain monopoly supply status. The largest industrial consumers are already generating a substantial portion of their own electricity, thus allowing these 'self-generators' to sell any surplus electricity to other large industrial groups would be an easy first step with minimal physical or procedural change required to the electricity transmission system's operation. It would though allow



systems and procedures to be developed, implemented and tested to deal with practical operational matters such as resolving transmission constraints, charging for imbalances between contracted supply and demand, and allocating transmission losses and system operator costs.

It is vital to set a timetable, well in advance, for a staged lowering of the CFE monopoly threshold so that consumers and potential investors in new generation capacity and natural gas supply pipelines can plan with a high degree of certainty. Consideration must be given in the secondary legislation to allow smaller industrial and commercial consumers to group together around the locations of larger industrial facilities in 'power parks' to take advantage of surplus electricity generated within the site through a direct transmission connection off the main grid. This would allow some smaller industrial and commercial consumers to jump ahead of the reform process and access competitive electricity before the formal lowering of the threshold.

It is technically feasible to establish a fully competitive market for all commercial and industrial consumers over the period of a decade once the open access arrangements to the transmission grid have been established. In practice this would mean that CFE would gradually have its license to supply and compete in selling electricity to commercial and industrial consumers as the threshold is lowered. In turn, these consumers would have no right to demand electricity be supplied by CFE and only a right to connect to the transmission system to transport electricity to or from its own generation capacity or that owned by other IPPs or industrial 'self-generators'.

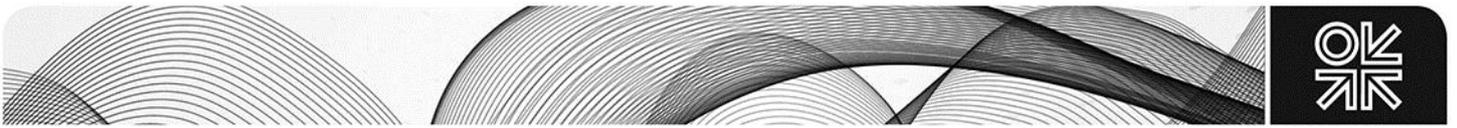
3.3 Reforming Subsidies

The controversial nature of reforming household subsidies means that it will have to be the last item on the reform agenda to be tackled. Such reforms will provoke public displeasure and strong political opposition. . Add to that the serious need to cut electricity theft, which is in effect another subsidy, and it becomes politically impossible to reform the household electricity supply market in the short term. It is clear that subsidies will have to be retained in Mexico for some years to ensure continued public support. CFE would be the best vehicle to administer a more focused subsidies system.

We therefore suggest a gradual reform of household tariffs so that some electricity, up to a subsistence level, would always be provided to a household free of charge equal to approximately the current level of theft. Households with demand above a defined level would pay a subsidized tariff and those households with demand above the median level would pay a tariff above the marginal production cost. This final tariff band would gradually converge with the commercial tariff, and in the long run could eventually rise to a level that in effect was set by reference to a competitive market price paid by commercial consumers.

This form of subsidy reform would take a decade or more to implement but would ultimately reduce the burden on the state of subsidizing electricity tariffs, while retaining the historic socio-economic role that CFE has played in providing basic electricity provision to the poorest sections of the Mexican population.

To the extent that CFE is commercialized, this would be limited to reducing theft of electricity, perhaps by installing smart metering, reducing administrative costs and incentivizing management to produce a surplus. CFE would continue to receive an explicit subsidy as part of the Mexican state budget to cover the cost of providing electricity to the poorest households at prices below the cost of production.



In return for continued state support, CFE would be prevented by law from supplying commercial and industrial customers and barred from investing any further capital in new power stations. This would have the effect of reserving the commercial and industrial load for new entrant IPPs and self-generation.

That means logically that only those industrial sectors that currently have to pay very high tariffs will benefit from the reform. This means de facto that CFE will always be the supplier to households so long as subsidized tariffs exist.

The great advantage of retaining CFE as a state-owned monopoly with a duty to serve all household and SME businesses (below a certain annual demand and at regulated prices for the foreseeable future) is that it would remove a substantial source of political opposition to electricity market reform. Attempting to reform electricity tariffs and remove subsidies from households and politically sensitive sectors typically dominated by small businesses, such as agriculture and services, would delay the benefits that could be achieved in the industrial sector.

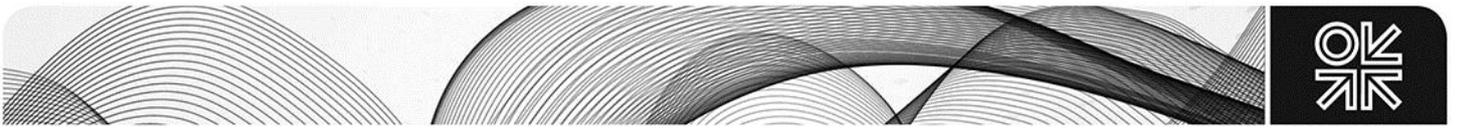
3.4 Limitations of this proposal

There is no doubt that our proposal to reserve an exclusive role for CFE in serving the household market could potentially cause some problems and is not without risk: maintaining CFE as a dominant state-owned entity could ultimately allow it to completely frustrate reform.

As it stands, deregulation without breaking up the CFE state monopoly position or forcing it to face direct competition from commercial competitors would create fewer incentives for efficiency gains than true commercialization and privatization. Allowing it to retain its dominant position within the economy may also encourage rent-seeking behavior. In the short term, household consumers would not see any direct benefit from electricity reform, however, in the medium term, increasing economic growth, reduced unemployment and higher wages should flow through from enhanced export competitiveness as a result of lower electricity prices. The proposal to retain the CFE monopoly over the household sector has the virtue of making the phase-out subsidies in other sectors more easily implemented, but could also lead to a lack of transparency in relation to the subsidies if cross subsidies continue and CFE has discretion over how those are allocated.

From a political economy viewpoint, a powerful constituency of an unreconstructed CFE combined with populist politicians, and household consumers who distrust commercialization as a conduit for creeping privatization, all have an interest in frustrating the legislative process to halt and reverse the proposed reforms. In India, for example, politicians tried to separate the problem of new private investment from the problem of cost-reflective pricing and the deteriorating finances of state utilities. This was done through encouraging open access and captive/merchant generation separately from the financial/commercial reforms of state-owned utilities. However, the electricity-politics nexus remained as electricity tariffs continued to be used as a political carrot.

While these are valid risks, this proposal acknowledges the thorny and difficult political issues embedded in the Mexican energy sector. It cannot be denied that many voters and politicians see the energy sector as a symbol of national identity. The proposal we have presented in this paper acknowledges the restrictions of attempting to reform the electricity sector in Mexico without privatization – a word that is not in the vocabulary of any politician of any party. Therefore, what has



been proposed is a politically feasible 'second best' alternative, but with the objective of significantly increasing the probability of success as compared to trying and ultimately failing to implement the 'first best' standard solution.

4. Conclusion

The energy reform has set an objective that is economically desirable in the long term but politically impossible to deliver within one electoral cycle. We propose a more realistic alternative: that CFE be retained as a state-owned enterprise with its role defined and limited to serving only household customers below a certain annual demand at regulated prices that are set by the state. This would kick-start competition in the industrial sector, which is in great need of lower tariffs, while protecting households against rising prices.

CFE is the best vehicle to administer a more focused subsidy system. The decision about what level of tariff to apply for supplying domestic households and how quickly that can be raised to a sustainable level is highly political and must be separated from overall electricity reform. We suggest household tariffs be reformed gradually so that some electricity, up to a subsistence level, would always be provided to a household free of charge - equal to approximately the current level of theft.

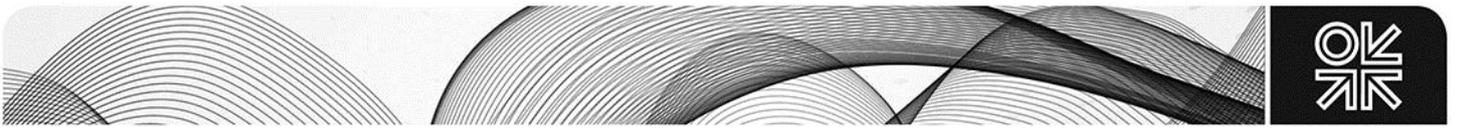
The above would diminish opposition to the reform that would prevent Mexico obtaining the promised gains. Reform of the electricity market in Mexico can only proceed in the sectors that do not currently receive subsidies and even then can only become real if access to a low-cost and reliable gas supply can be assured.

Other unresolved questions that need to be addressed in the secondary legislation include:

- i. What happens when an industrial or merchant generator fails to deliver contracted energy, perhaps due to an outage, or delivers too much, when demand is lower than expected?
- ii. Will CFE be expected to be the supplier of last resort?
- iii. Will there be a balancing mechanism in which electricity imbalances between contracted supply/demand and actual metered supply/demand can be traded?
- iv. Who will pay for transmission reinforcement if a generator builds a power station a long distance from the main industrial demand centers?
- v. Will CFE be forced to buy in surplus electricity generated by IPPs and industrial generators, say at weekends, if it is cheaper to do so than run its own power stations?

The successful implementation of the constitutional electricity reform is a long-haul endeavour. The creation of

the legal framework to allow an electricity market to exist in Mexico is only a first step and it has little chance of success unless stakeholders and interested parties recognize and take account of political, economic, and social realities.



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