III. Lifting a Constraint on Growth: Achievements and Challenges of Nicaragua's Electricity Sector [1]

Adopting a medium-term framework to guide tariff-setting policies is essential to ensure the sector's solvency, attract the needed investment to change the generation matrix, and decrease electricity costs. Successful policies could result in savings in the oil bill in the range of 3– 4 percent of GDP per year.

A. Introduction

1. **By the middle of the last decade, Nicaragua was suffering frequent and unplanned electricity shortages that caused significant economic and social losses and exposed structural problems in the sector**. The problems included insufficient electricity generation capacity, widespread electricity theft, and accumulated crossed arrears between the sector's actors, including state institutions. These problems peaked in 2007, when electricity shortages reached the equivalent of more than 15 percent of domestic generation.

2. **These problems prompted policy makers to act in three different fronts**. First, the government would adjust tariffs to reflect actual generation costs, and it would temporarily subsidize the consumption of disadvantaged neighborhoods, while non-technical losses were reduced; in turn, the private distribution company would undertake an aggressive investment program with the purpose of reducing non-technical losses and improving the quality of service (GON 2009). The government would also enact legislation to strongly penalize electricity theft. Such legislation was passed in 2008, and strengthened in 2010 (GON 2010). Finally, the government would promote investment in electricity generation, in particular from renewable sources.

3. **The policy action produced positive results relatively fast, though the rebound in oil prices since 2010 has resulted in renewed stress on the sector**. Generation capacity increased and shortages were eliminated. Infrastructure improvements in distribution and a stronger legal framework contributed to reduce non-technical losses by about 5 percentage points through 2011. The government and the sector's stakeholders eliminated their crossed arrears, which contributed to more clarity in the sector's balance sheets. However, the large increase in the long-term price of oil (which resulted in increases in generation costs exceeding 70 percent since 2006), combined with still-large (unrecognized) non-technical losses, began to significantly dent the aggregate value of distribution operations. This resulted in renewed crossed arrears among the sector's main agents, while tariff-cost gaps caused an increase in public contingent liabilities.

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4. **This chapter argues that electricity tariff-setting policies should be underpinned by a medium-term framework**. The chapter describes ongoing challenges facing the electricity sector in Nicaragua, in particular those brought about by higher long-term oil prices. The chapter further concludes that if ongoing challenges are left unaddressed, they could hamper the sector's normal functioning, act as a disincentive for private investment in generation from renewable sources, and leave Nicaragua in a "low equilibrium" of large non-technical losses of distribution and high electricity costs (Di Bella, 2012; Strand, 2011). This, in turn, would constrain economic growth, and hurt Nicaragua's regional competitiveness.[2]

B. Ongoing Challenges: High Oil Prices, Tariff-Costs Gaps, and Unrecognized Distribution Losses

5. **The still-large electricity theft and the significant increase in generation costs present a difficult policy dilemma**. Electricity produced from non-renewable sources (mainly fuel oil) still represents about 70 percent of the total. Moreover, non-technical losses and delinquency represent about ¼ of electricity purchases by the distribution company. Adjusting electricity tariffs upwards to match increasing generation costs and to recognize actual non-technical losses would contribute to preserve the sector's solvency, but would raise the cost of producing goods and services, and the cost of living, thus limiting GDP growth. Keeping the gap between electricity costs (including theft) and tariffs open would provide a short-term cushion to the economy, but, if sustained, would also put the electricity sector's solvency at risk and distort the use of resources in the economy.

6. **Eventually, policy-makers addressed this dilemma by establishing a dual tariff system**. Although, initially, tariff increases lagged and were lower than those in generation costs, since 2011, the regulator began establishing two different tariff schedules. Concretely, "notional" tariffs would reflect the best available annual forecast for electricity generation costs, while "effective" tariffs would be those applied to clients. Any difference between the two tariff concepts would be financed with Venezuela-related resources received in the context of the oil-collaboration scheme. However, non-technical losses of distribution recognized in tariffs continued to lag their actual level.

7. **Although the dual tariff system constitutes a step forward with respect to discretion, the existing gap between notional and effective tariffs may prove difficult to sustain**. The dual tariff system is better than a discretion-based system, as it allows assessing the tariff-cost gap originated in generation costs; moreover, the associated financing flows ease the constraint on electricity distribution's cash-flow. However, the gap between

[2] ECLAC (2010) includes a summary of electricity indicators in Central American countries. In particular, it shows that Nicaragua's generation matrix compares unfavorably with that in other Central American countries. World Bank (2009a, 2009b) summarize cross-country experience in reducing non-technical losses.

effective tariffs and notional tariffs (about 43 US$/MWh in 2011) resulted in a generalized transfer to consumers that (only last year) amounted to about 1.5 percent of GDP.[3] Even though the gap between effective and notional tariffs was reduced at the beginning of 2012, it continues to be significant (about 28 US$/MWh), which would imply an additional 1-percent-of-GDP transfer to final consumers during the year.

8. **The large difference between non-technical losses recognized in tariffs and actual losses further compounds the problem.** Technical and non-technical losses of distribution still represent more than 21 percent of the electricity purchases by the distribution company (about 25 percent when including delinquency), and losses recognized in tariffs amount to only 11.5 percent. While actual losses have been larger than those recognized in tariffs for some time now, the dramatic increase in generation costs have turned such gap into a binding constraint for electricity distribution, and as a result, the sector is again suffering from generalized crossed arrears. Concretely, the large unrecognized distribution losses (plus, at times, payment arrears in the electricity bill of public sector institutions, including SOEs), have caused the distribution company to run arrears with some electricity generators (mainly ENEL and ALBANISA).[4] In turn, electricity generators ran arrears with their fuel supplier, ALBANISA, which finances itself with Venezuela-resources from the oil-collaboration scheme. This adds to the Venezuela-related financing that from 2011 onwards is filling the gap between effective and notional tariffs. In this connection, total cumulated financing from Venezuela to the sector reached an estimated US$ 250 million (about 3.5 percent of GDP) as of end-2011, out of which about 1.5 percent of GDP correspond to arrears with electricity generators.

C. Preserving the Sector's Solvency: Underpinning Policies in a Medium-Term Framework

9. **Preserving the sector's solvency requires tariff policies to be underpinned in a medium-term framework.** If the policy choice is to continue using a dual tariff system instead of recognizing in tariffs, at all times, actual generation costs and non-technical losses, all decisions regarding tariffs should take into consideration the medium-term outlook for a

[3] Even though the distribution company acts as the recipient of the financing, the actual debtors are final consumers. The authorities announced that such financing would be long-term and at zero-interest; they also expressed that lower generation costs would be brought about by investment in electricity generation from renewable sources.

[4] ENEL is the state-owned electricity generation company. ALBANISA, a bi-national company in which PDV Caribe (a subsidiary of *Petroleos de Venezuela SA*, PDVSA) owns 51 percent of the shares and PETRONIC (the Nicaraguan state-owned oil company) owns the remaining 49 percent, produces about 20 percent of electricity and imports about 90 percent of crude and oil derivatives coming into Nicaragua.

range of variables affecting the sector.[5] Failure to do so may result in the sector facing both liquidity and solvency problems. Solvency problems may result in Nicaragua getting stuck in a "low equilibrium" of high electricity generation costs, large non-technical losses and lack of investment in generation from renewable sources.

10. **To illustrate this, Table 1 shows baseline and alternative scenarios for Nicaragua's electricity sector, assuming no further adjustments in effective tariffs**. In addition, the baseline assumes a static generation matrix while the alternative scenario shows the implications of a change in the electricity generation matrix towards renewable sources. Although both scenarios are only indicative, they provide a concrete application of the type of framework that should underpin tariff determination in case the current dual system is kept through the medium-term.[6]

11. **The baseline scenario underscores the need to adjust effective tariffs to avoid unsustainable dynamics in the sector.** Concretely, in case of unchanged policies and a static generation matrix, the debt of consumers and that of the distribution company with generators would keep climbing through the medium term, to reach a combined 12 percent of GDP by the end of the decade. In contrast, changing the generation matrix would allow such debt to stabilize around 2–3 percent of GDP.

12. **Moreover, the contrast between the results of both scenarios highlights the importance of implementing policies ensuring a change in the generation matrix.** While in the baseline scenario notional tariffs and electricity costs continue to climb through the medium term, they significantly decrease in the alternative scenario. The implications for economic growth are clear: while in the baseline scenario the electricity sector's oil bill stays at about 4–5 percent of GDP through the medium term, it decreases to about 1 percent of GDP in the alternative scenario; in other words, a change in the generation matrix would bring about permanent savings in the range of 3–4 percentage points of GDP per year.

13. **These results are sensitive to changes in the assumptions, in particular with respect to the oil price.** Table 2 shows the effect of a 15 percent increase in long-term oil prices, while Figure 1 compares the path for some key variables in the baseline and

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[5] These include the expected paths for the price of oil, for technical and non-technical losses of distribution, and for ongoing and prospective investment in generation, among other variables.

[6] The alternative scenario assumes that a number of planned investments in electricity generation from renewable sources become operational during the next five years, involving investment flows for about US$ 2 billion (30 percent of GDP). Concretely, about 102 MW of new geothermal projects, 118 MW of new wind-based projects, 20 MW of new biomass projects, and 266 MW of new hydroelectric projects are assumed to become operational by end-2016. This would increase the share of electricity produced from renewable sources from the current 30 percent to about 75 percent by 2020.

alternative scenarios, and shows the implications of an oil price shock on both scenarios.[7] Given the different electricity generation matrices in both scenarios, the impact of such a change is felt more strongly in the baseline than in the alternative scenario. The obvious conclusion is that going beyond more active pegging of actual tariffs with notional tariffs, a change in the generation matrix would contribute to eliminate one source of macroeconomic vulnerability, namely the negative impact of oil price increases in electricity generation costs. It would also contribute to decrease GDP growth volatility and to increase the competitiveness of Nicaraguan firms.

D. Policy Implications

14. **If investment in generation from renewable sources does not occur, tariff policy should consider the impact of long-term oil price increases on electricity costs as permanent.** In such a case, effective tariffs should be increased so as to match the increase in generation costs, and subsidies should be strictly focused on low-income households. In contrast, if investment in generation from renewable sources is expected to proceed relatively fast and in significant quantities, the adjustment in effective tariffs could lag somewhat the increase in generation costs, as the change in the electricity matrix would bring about a long-term decrease in costs. However, the extent to which notional and effective tariffs can diverge (and the time period in which they could diverge) will depend on the amount of resources available for such a purpose. In the end, the specific timing for new investments in generation from renewable sources, and the impact of such investment in generation costs is subject to uncertainty. Thus tariff-setting policy should be embedded in a medium-term framework that establish procedures to update policy variables, (including notional and effective tariffs, recognized electricity losses, and public transfers to finance the consumption of disadvantaged neighborhoods), should the ex-post paths for the relevant sector variables differ from original assumptions. A framework like this would contribute to anchor expectations, provide clear rules for the sector, and contribute to attract more investment in generation. In short, such a framework would contribute to move Nicaragua to a "high equilibrium" of low generation costs and low non-technical losses. This, in turn, would contribute to lift an ongoing constraint on economic growth.

[7] This is about equivalent to one standard deviation in oil prices for a 10-year period through 2017, as included in the WEO forecast.

Table 1. Nicaragua: Electricity Sector's Medium Term Sustainability

	2011	2012	2013	2014	2015	2016	2020
Baseline Scenario							
Electricity Tariff (US$/MWh)							
Notional	248	260	264	261	261	261	272
Effective	205	223	223	223	223	223	223
Tariff Gap (US$/MWh)	43	36	41	38	37	38	49
Electricity Generation Cost (US$/MWh)	174	183	186	183	181	180	186
Electricity from Non-Renewable Sources (percent of total)	68	66	67	68	70	71	75
Electricity Sector's Oil Bill (percent of GDP)	4.9	5.0	5.0	4.8	4.7	4.6	4.4
Electricity Sector Debt (percent of GDP)	2.9	4.1	5.5	6.7	7.8	8.8	12.1
Transfer to Consumers	1.9	3.0	4.1	5.1	6.0	6.8	10.1
Net Debt to Generators	1.0	1.2	1.4	1.7	1.9	2.0	2.0
Alternative Scenario							
Electricity Tariff (US$/MWh)							
Notional	248	243	230	230	229	201	208
Effective	205	223	223	223	223	223	223
Tariff Gap (US$/MWh)	43	20	7	7	5	-23	-16
Electricity Generation Cost (US$/MWh)	174	168	156	155	153	127	132
Electricity from Non-Renewable Sources (percent of total)	68	54	43	44	43	10	13
Electricity Sector's Oil Bill (percent of GDP)	4.9	4.1	3.2	3.1	2.9	0.6	0.8
Electricity Sector Debt (percent of GDP)	2.9	3.5	3.7	3.9	4.0	3.1	2.4
Transfer to Consumers	1.9	2.4	2.5	2.5	2.6	1.7	1.2
Net Debt to Generators	1.0	1.1	1.2	1.3	1.4	1.4	1.2
Memorandum Items							
Loss Factor recognized in tariffs	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Subsidy for Disadvantaged Neighborhoods (percent)	1.50	0.50	0.00	0.00	0.00	0.00	0.00
Technical and Non Technical Losses of Distribution (percent)	22.0	21.5	21.5	21.5	21.5	21.5	21.5
Transmission Fee (US$/MWh)	6.4	6.5	6.6	6.8	6.9	7.0	7.6
AVD in tariffs (US$/MWh)	50.0	52.7	53.7	54.8	55.9	57.0	61.7
WTI (US$/barrel)	95.0	103.2	103.6	99.7	97.0	95.2	94.2
Spread (Price Fuel Oil No. 6 "Bunker" - WTI, US$/barrel)	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Real GDP growth (percent)	4.7	3.7	4.0	4.0	4.0	4.0	4.0
US Inflation (percent)	2.0	2.0	2.0	2.0	2.0	2.0	2.0

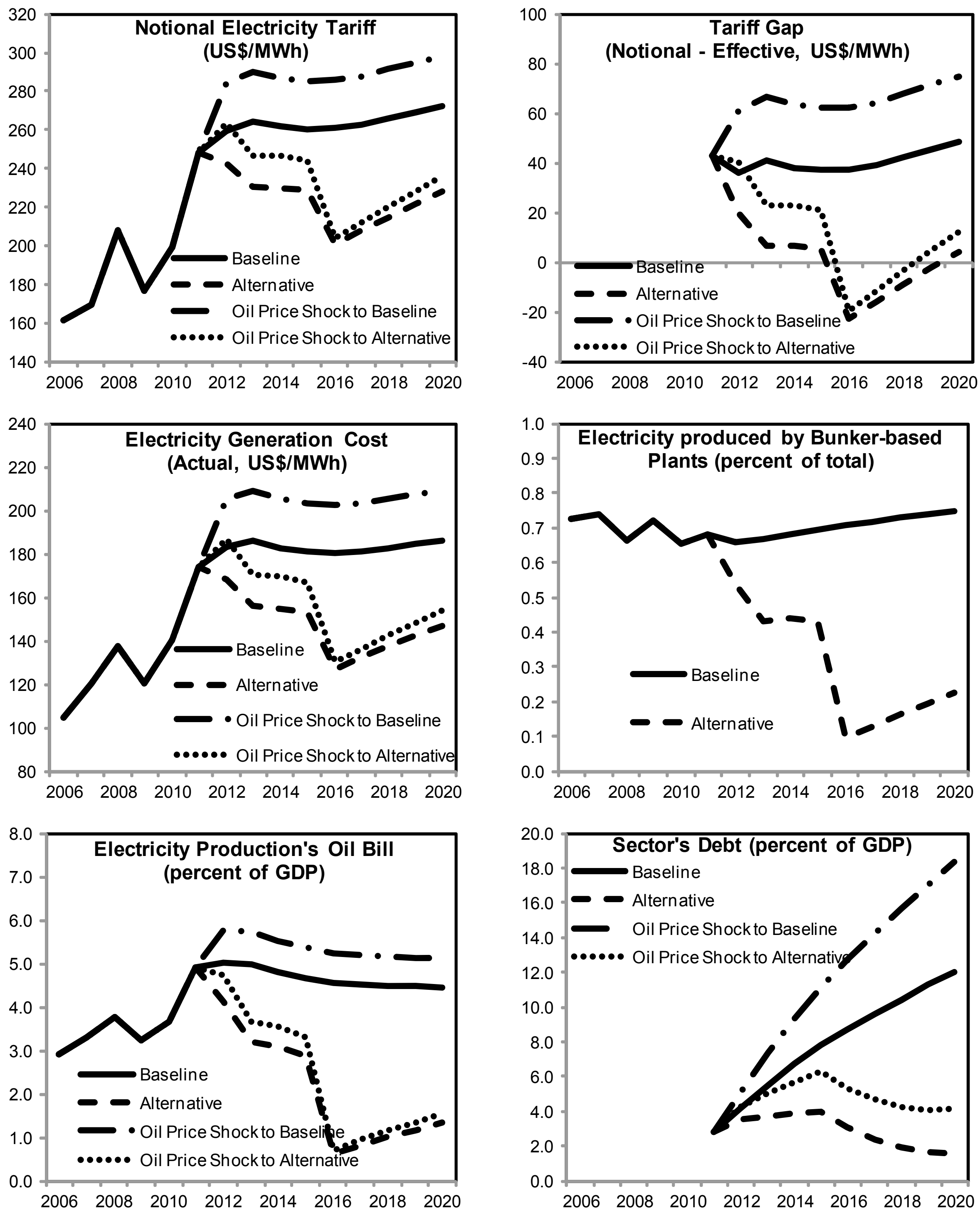
Source: IMF staff calculations

Table 2. Nicaragua: Effect of a 15 percent increase in oil prices on Electricity Sector's Sustainability

	2011	2012	2013	2014	2015	2016	2020
Baseline Scenario							
Electricity Tariff (US$/MWh)							
Notional	248	285	290	287	285	286	298
Effective	205	223	223	223	223	223	223
Tariff Gap (US$/MWh)	43	61	66	63	62	62	75
Electricity Generation Cost (US$/MWh)	174	205	209	205	203	202	209
Electricity from Non-Renewable Sources (percent of total)	68	66	67	68	70	71	75
Electricity Sector's Oil Bill (percent of GDP)	4.9	5.8	5.7	5.5	5.4	5.3	5.1
Electricity Sector Debt (percent of GDP)	2.9	5.1	7.4	9.4	11.2	12.8	18.3
Transfer to Consumers	1.9	3.8	5.7	7.4	8.9	10.3	15.7
Net Debt to Generators	1.0	1.3	1.6	1.9	2.2	2.4	2.7
Alternative Scenario							
Electricity Tariff (US$/MWh)							
Notional	248	264	247	246	244	204	212
Effective	205	223	223	223	223	223	223
Tariff Gap (US$/MWh)	43	40	23	23	21	-19	-11
Electricity Generation Cost (US$/MWh)	174	187	171	169	167	130	136
Electricity from Non-Renewable Sources (percent of total)	68	54	43	44	43	10	13
Electricity Sector's Oil Bill (percent of GDP)	4.9	4.7	3.7	3.6	3.3	0.7	0.9
Electricity Sector Debt (percent of GDP)	2.9	4.3	5.0	5.7	6.3	5.3	4.7
Transfer to Consumers	1.9	3.1	3.6	4.2	4.6	3.7	3.2
Net Debt to Generators	1.0	1.2	1.4	1.5	1.7	1.6	1.5
Memorandum Items							
WTI (US$/barrel)	95.0	118.7	119.1	114.6	111.5	109.5	108.4
Spread (Price Fuel Oil No. 6 "Bunker" - WTI, US$/barrel)	-0.1	0.0	0.0	0.0	0.0	0.0	0.0

Source: IMF staff calculations

Figure 1. Nicaragua: Electricity Sector's Medium Term Sustainability



Source: IMF staff calculations

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