



Analysis of Renewable Energy Auctions in El Salvador, Mexico, and Peru

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Asia Clean Energy Forum

June 8, 2018

USAID CEADIR Activity

This publication is made possible by the support of the American People through the United States Agency for International Development (USAID) and was prepared for the Climate Economic Analysis for Development, Investment, and Resilience (CEADIR) Activity. The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development (USAID) or the United States Government.

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Topics

- El Salvador, Mexico, and Peru's renewable energy (RE) auctions:
 - Background
 - Policy and regulatory environment
 - Auction characteristics and results
 - Financing
- Brief insights from Brazil, India, and South Africa's RE auctions
- Conclusions

Introduction to the Report

- Interviewed 19 financiers, project developers, and government officials in El Salvador, Mexico, and Peru
- Secondary desk research on Brazil, India, and South Africa
 - Policy and regulatory environments in the six countries;
 - Investment risks and mitigants; and
 - Sources of capital and financing.



El Salvador: Background and Enabling Environment

- 1,742 MW installed capacity, total electric power (2016)
- 432 MW (25%) of RE 2016
- Projected to reach 852 MW (33%) by 2021
- Institutional incentives
 - 20-year PPAs
 - Priority dispatch (zero marginal cost)
 - Import tax exemption on equipment
 - Income tax exemption for first 10 years for up to 10 MW and five years above 10 MW
 - Income tax exemption on sale of emission reduction certificates



Source: Chris Lim, Wikipedia Commons

El Salvador: Auction Characteristics

- Transparent, publicly disclosed process
- No local content requirements
- Technology-specific
 - Quotas are reallocated if targets unmet, other technologies contracted
- Pay-as-bid selection process (prices as bid)
- Ceiling prices disclosed when bids opened
- 20-year PPA (winning bidders commit to deliver all electricity generated from awarded capacity)
- Contracted amounts allocated proportionally to seven private distribution companies
- PPAs paid in U.S. dollars, indexed to U.S. inflation
- Preferential dispatch to transmission grids
- Bidders propose project sites
- Relatively few qualification requirements

El Salvador: Auction Results

- Pilot auction (2013) contracted 15 MW of solar, biomass, and small-scale hydro sources
- Two technology-specific RE auctions (2014, 2016)
 - Total of 263.5 MW of installed capacity (213.5 MW solar, and 50 MW wind)
- Contracted solar price fell from \$101.90-\$123.41 per MWh in 2014 to \$49.55-\$67.25 in 2016

RE Auctions	Installed Capacity	Solar Energy Prices	Wind Energy Prices	Target Volume
1st Auction 2014	94 MW	US\$101.90 - 123.41/MWh (100% of total)	No	94%
2nd Auction 2016	169.5 MW	US\$49.55 – 67.24/MWh (71% of total)	US\$98.78 (29% of total)	99.7%

Mexico: Background

- 73 GW of installed capacity with 29% (21 GW) of clean energy (CE) in 2016
 - 113 GW of installed capacity with 50% (56 GW) projected by 2031
- Minimum CE consumption levels of 5% in 2018
 - Projected to reach 14% by 2022
 - Purchases of CE or Clean Energy Certificates (CELs)



Source: Power Engineering International, Mexico wind facility

Mexico: Enabling Environment

- Long-term PPAs with net metering mechanism to sell surplus energy to grid
- Imbalances of contracted vs. dispatch liquidated annually at wholesale spot market
- Preferential dispatch to transmission
- Tax benefits: 100% accelerated depreciation



Source: Greentech Media

Mexico: Auction Results

- Three energy auctions (March 2016 – November 2017) contracted:
 - Energy: 19.8 TWh (60% solar, 39% wind, and 1% geothermal)
 - CELs: 21 million certificates (60% solar, 37% wind, 2% hydropower, and 1% geothermal)
 - Firm capacity: 1,780 MW (76% natural gas, 12% wind, 11% solar, and 1% geothermal)
- Average contracted prices for CE and CELs fell by 58% (\$47.6/MWh to \$19.8/MWh)

Mexico: Auction Characteristics

- Transparent, publicly disclosed auction process
- Targets for contracting CE and use of CELs
- No local content requirements
- Technology-neutral auctions; bidders can submit offers for one/any of energy, CELs or capacity
- Open technology-neutral firm capacity auctions
- Disclosed ceiling prices per type of technology
- Selection criteria through algorithm formula
- 15-year PPAs (energy-capacity), 20-year (CEL)
- PPA indexed to Mexican pesos or U.S. dollars and inflation rate
- Deliver-or-pay PPAs; net metering mechanism sells surplus energy to wholesale spot market
- Preferential access to transmission grids
- Bidders select project site(s)
- Relatively few qualification requirements

Mexico: Summary of Auction Results

Auction Date	Target Volume	Target CELs	Total Energy	CELs (million)	Solar Power	Wind Power	Firm Capacity (Clean Energy or Conventional)
Auction 1: March 2016	Energy: 85%	85%	5.4 TWh Average price: \$47.6/MWh	5.4	\$45.06/MWh (81% of total)	\$55.33/MWh (19% of total)	No
Auction 2: Sept. 2016	Energy: 84% Firm Capacity: 80%	87%	8.9 TWh Average price: \$33.5/MWh	9.3	\$31.81/MWh (54% energy, 53% CELs)	\$35.77/MWh (44% energy 41% CELs)	1,187 MW at \$32.29/MW-year natural-gas (72%), solar (15%) wind (11%) geothermal (2%)
Auction 3: Nov. 2017	Energy: 98% Firm Capacity: 42%	90%	5.5 TWh Average price: \$19.8/MWh	5.9	\$19.0/MWh (55% energy 58% CELs)	\$18.6/MWh (45% energy 42% CELs)	593 MW at \$35.36/MW-year natural-gas (84%) wind (14%) solar (2%)

Mexico: Auction Results

- First two auctions open only to the Federal Electricity Commission (state-owned electric utility)
- Third auction open to private off-takers with clearinghouse to manage contractual obligations
 - Iberdrola and Cemex awarded contracts: 10% (CE and CELs), 21% of firm capacity
- Nodal price adjustments to incentivize Yucatan, South Baja California sites (reduced from \$45 in first auction to \$13.5 in third auction)
- Ceiling price for firm capacity increased by 172 times in second auction to incentivize bids
- Next RE auction planned for 2018

Peru: Background and Enabling Environment

- 13 GW of installed capacity in 2016 with 9% (1 GW) of RE projected to reach 5% by 2024
- Transparent, publicly disclosed auction process
- Established targets (5%) for RE resources
- No local content requirements
- Quotas and ceiling prices by technology (reallocation mechanism of unmet quotas)
- PPAs awarded with pay-as-bid selection process

Peru: Background and Enabling Environment

- Two-round auction process: price ceilings revealed in second round
- 20-year PPAs with premium feed-in tariffs
- PPA indexed to U.S. dollar and inflation rate
- Preferential dispatch to transmission grids
- Bidders select project site(s)
- Few qualification requirements: underperformance, delay guarantees to ensure bidders commitment
- Institutional incentives:
 - 20-year PPAs signed with the Ministerio de Energía y Minas (Ministry of Energy and Mining) with guaranteed prices through feed-in-tariffs
 - Preferential dispatch (with zero marginal costs)
 - VAT reimbursement
 - Accelerated depreciation

Peru: Auction Results

- Four on-grid RE auctions (2009 to 2015):
 - 6.2 GWh-year energy
- One off-grid solar auction
- 2015 auction:
 - European companies (Enel, Engie): 71%
 - Spanish IPP (Greenergy): 10%

Auction	Technology	Capacity	Energy
Aggregate (four auctions)	Small hydropower	603 MW	3.5 GWh/year
	Wind	394 MW	1.7 GWh/year
	Photovoltaics	281 MW	739 MWh/year
	Biomass and biogas	35 MW	198 MWh/year

Peru: Auction Results

- Contracted prices fell between 2009 and 2015
 - Solar: \$221/MWh to \$48/MWh
 - Wind: \$80/MWh to \$38/MWh
 - Biomass/biogas: \$110/MWh to \$77/MWh
 - Small-scale hydro: \$60/MWh to \$44/MWh
- Auction design changes: larger performance, construction, operation bonds
- Next RE auction in 2018 (auction planned in 2017 postponed due to oversupply)



Source: PV Magazine

RE Auctions in Brazil

- Planned RE auctions with RE targets of 24 GW for wind and 7 GW for solar energy by 2024
- Competition among technologies through hybrid two-phase selection process
- Multi-year settlement lowers generators' volume risk
- 20-30 year PPAs with prices paid in local currency and indexed to local inflation
- No local content requirement, but minimum local content needed to apply for low-cost state-owned financing
- Import/state tax exemptions
- Transmission discount/exemptions
- Net metering

RE Auctions in India

- RE targets: 175 GW by 2022 (100 GW solar and 60 GW wind), commitment to contract RE
- Long-running planned RE auctions
 - 20-year PPAs with prices paid in local currency with no inflation indexation
- Feed-in tariffs for solar energy
- Accelerated depreciation
- Variable remuneration scheme (viability gap funding)
 - capital subsidy paid in initial years with lower price paid during plant's useful life
- Flexible local content requirement as bidders may elect to bid with on/off local content or both with different bidding pricing parameters
- Local currency price contract with no inflation adjustment made it difficult for winners to obtain financing and decreased interest in bidding

RE Auctions in South Africa

- Commitment to procure 13 GW of RE (initial 3.7 MW target with five technology-specific auctions)
- Undisclosed ceiling prices by technology with volume caps for each technology (change made after first auction)
- 20-year PPAs with prices paid in local currency and indexed to local inflation
- PPA signed with Eskom Holdings (state-owned utility) with direct agreements with Energy Department (sovereign payment guarantee)
- Local content requirements with compound selection criteria based on price and economic benefits
 - job creation, management, ownership, enterprise development

Conclusions: RE Auctions and Enabling Policies

- El Salvador, Mexico, and Peru attracted experienced investors and developers
- RE auctions increasing in developing markets, resulting in competitive RE prices
- Countries' commitments through RE enabling policies and incentives raise investors' confidence
 - Transparent procurement of RE resources through reverse auctions
 - Targets of RE resources to be contracted
 - PPAs with stable revenues, some indexed to foreign currency and inflation
 - Fiscal incentives attract investors, enabling long-term project financing to reach target IRRs
 - Timely information on capacities of transmission interconnection grids
 - Preferential dispatch and access to transmission grids to mitigate curtailment risks



Thank you!

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Final report to be published soon on the USAID Development
Experience Clearinghouse.