Challenges in the Brazilian Power Sector: The Big Picture

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Critical Challenges

- Diversification of Energy Resources
  - Hydro Limits
  - Dysfunctional Natural Gas Market
  - Creation of Regional / Multi-National Markets
- Pricing Reform
  - Wholesale
  - Transmission and Ancillary Services
  - Distribution Pricing

Diversification of Energy Resources: Problems

- Problems
  - Approaching Hydro Limits
  - Environmental / Political Constraints
  - Diminution of Rain Forest
  - Inability to Build Reservoirs / Reduced Storage
    - Increased Susceptibility to Drought
  - Itaipu Agreement Expires 2023

Options for Diversification

- Coal: Small Supply / Environmental Issues
- Nuclear: Expensive and Politically Risky
- Renewables: Logical But Intermittency Limits value
- Natural Gas: Logical Choice But Gas Market Dysfunctional

Dysfunctional Natural Gas Market (1)

- Concession Process Outdated and Counterproductive
- Limited Pipeline Access
- Limited / Inflexible Supply (Poorly Suited for Electric Generation)
- One Company Has Monopoly in Both Gas and Oil

Needed Reforms in Natural Gas Market

- Non-Exclusive Concessions
- Concessions that Incentivize Exploration and Development
- Unbundling Pipeline / LNG Terminals and Commodity Business
- Secondary Markets for Pipeline and Commodity Businesses
- Remove Entry Barriers to Pipeline / LNG Terminal Business
- Create Market Monitor
- Diversity Supply Options (Move Away from Take or Pay)

Impact of Natural Gas Reforms on Electricity Market

- Increases Supply
- Makes Fuel and Variable and Not Fixed Cost
- Increases Competition and Encourages Innovation
- Spreads Risk of Pipeline Investment
- Makes Capacity and commodity Markets Transparent

Regional Markets

- Multi-Nation Region Has Vast Diversity of Energy Resources
- Itaipu Treaty Requires Re-Negotiation in 2023
- Argentina Will Have New government in Two Years
- Uruguay Shares Wind with Brazil
- Peru and Guyana Have Potential Hydro Supply
- Bolivian Natural Gas

Pricing Reform:
Purposes of Regulated Pricing

- Provide Sufficient Revenue to Enable Acceptable Level of Service
- Provide Incentives (Positive and Negative) to Regulated Companies to Improve Productivity
- Protect Consumers Against Abuse of Monopoly Power
- Provide Consumers with Signals to Use Energy More Efficiently
- Query: How Many of These Criteria Does Brazil Meet?

Wholesale Prices (Generation and Transmission)

- Focuses Almost Exclusively on Capacity No Energy or Location
  - Understandable Historic Reasons for This (Hydro, *Apagao*)
  - Consequences:
    - Non-Optimal Locational Decisions for Generation and System Enhancements
    - No Opportunity for Demand Response / Load Management
    - No Ability to Send Time sensitive Price Signals to Consumers
    - Reliance on Administrative Actions Rather than prices to Manage Shortages
    - Exclusive Reliance on New Construction (Generation and Transmission) to Accommodate Load Growth
    - Fully Dependent on Planning Not Market

Potential Wholesale Price Reforms

- Locational Marginal Cost Transmission Pricing
- Competitive Ancillary Services Market
- Posted Day Ahead Pricing for Energy*
- Provide Distributors More Flexibility in Power Purchases (Including Some Exposure to Spot Prices)

*This may require a functional natural gas market.

Distribution Pricing

- Wider Deployment of Smart, Bi-Directional Meters
- Movement toward Dynamic Pricing (Begin with Pilots)
- Provide Distributors with Incentives to Engage in Demand Side Management
  - e.g., Decoupling Sales and Revenues
  - Allow Shared Savings
  - Permits a Return on Demand Side Efficiency Investments