

Global Evolution of Power Market Designs

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Abstract

The design of the power market determines how the sector can address complex economic, social, environmental, and engineering challenges to deliver sustainable and reliable electricity at least cost to consumers. This is no simple task, as supply and demand must be balanced every second, multiple resource and network constraints must be satisfied, and the market must send the correct price signals to motivate efficient generation and investment in the sector over time. There is significant heterogeneity in the electricity market designs adopted by countries globally. No “one-type-fits-all” blueprint exists, and for any design to function well, the country, political, and economic context matters. At this

juncture, the experimentation continues. This paper takes stock of the global patterns and trends in the adoption of different power market design options, utilizing a unique new Global Power Market Structures Database (Akcura 2024) covering 230 economies for the period 1989 to 2024. The paths these countries have taken in structuring their power markets provide valuable lessons on the multiple models that can support the development of the power sector in different country contexts. The paper draws on global experience to shed light on promising design options for the future.

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Global Evolution of Power Market Designs

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1 Introduction

Electric power systems emerged in the second half of the 19th century, primarily in the United Kingdom and the United States. Initially, commercial power plants were owned by private investors and provided electricity to small service areas, mainly lighting for local businesses, streets, and government buildings. By the mid-20th century, vertically integrated and often state-owned monopoly companies became the organization of choice. Vertically integrated power utilities were widely seen as the appropriate market structure due to the unique technical characteristics of electricity. Developing nations embraced the model, and most of them created publicly owned national power utilities.

Although integrated power monopolies supported unprecedented economic growth in the second half of the 20th century, the power sector's performance was at times inadequate. Over the past forty years, both advanced and developing countries have looked for alternatives to integrated monopolies through sector reforms that introduced market-type mechanisms to their power systems. An increasing number of developing countries embraced liberalization and market mechanisms to mobilize private investment in power generation and, to some extent, in networks.

Due to a range of unique features of electricity, power markets are among the most challenging to create. The design of the power market determines how the sector can address complex economic, social, environmental, and engineering challenges to deliver sustainable and reliable electricity at least cost to consumers. This is no simple task, as supply and demand must be balanced every second, multiple resource and network constraints must be satisfied, and the market must send the correct price signals to motivate efficient generation and investment in the sector over time.

There is significant heterogeneity in electricity market structures adopted by countries globally. No “one-type fits all” blueprint exists, for any solution to function well, the country, political and economic context matters. At this juncture, the experimentation continues. However, valuable lessons can be drawn from past and current experience of countries under different power market design options.

This paper undertakes a comprehensive stock-take of the evolution of the power market structure in every economy in the world between 1989 and 2024. We rely on a new unique database, the “Global Power Market Structures Database¹” developed by one of the co-authors of this paper. The database examines all 230 global economies, documenting the changes in the power market structure for every year between 1989 and 2024. The database's objective is to present different designs pursued by countries globally in structuring their power markets. To the best of our knowledge this is the first such database and this is the first paper to analyze power markets in such a comprehensive global manner.

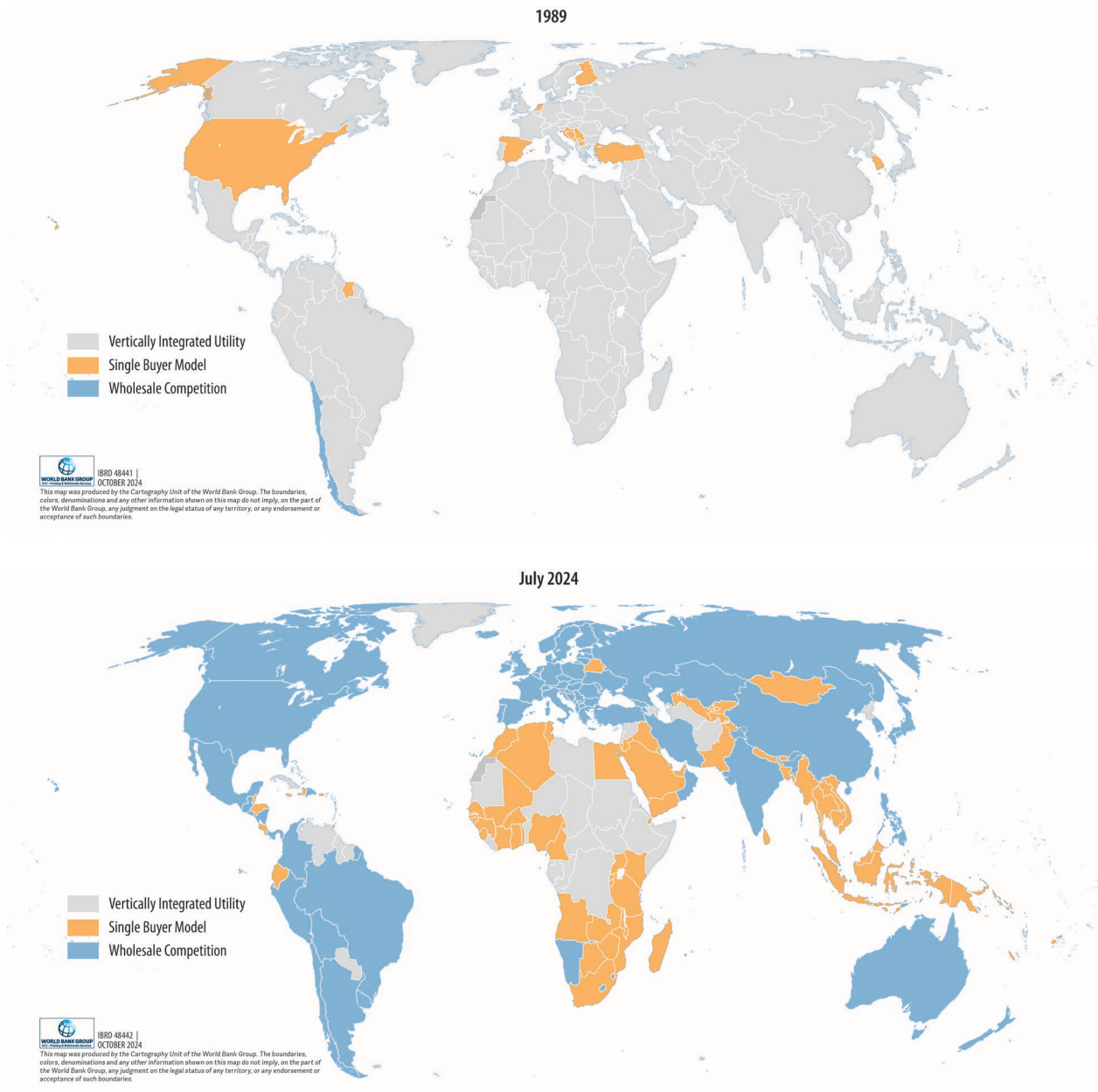
The paper is structured as follows: Section 2 provides a global overview of each power market structure; we also delve into the different design options adopted by countries globally within each structure. Section 3 presents the global experience of countries transitioning between different market structures, highlighting both enablers and challenges countries faced during these transformations. Section 4 discusses the experience of countries that experimented with different designs within their respective power market structure. Section 5 contains our conclusions and distills the key policy recommendations for each power market structure based on 35 years of global experience.

¹ [Global Power Market Structures Database](#) (Akcura 2024).

2 Power Market Structure Design Options

Based on the Global Power Market Structures Database, between 1989 and 2024, 158 countries transitioned from the traditional publicly owned vertically integrated utility (VIU) model to introducing a degree of private sector engagement in the electricity system (Figure 1). This has generally been at the generation segment. Since 1989, 152 economies introduced private independent power producers to their generation segment.

Figure 1: Global View of Power Market Structures 1989 vs 2024



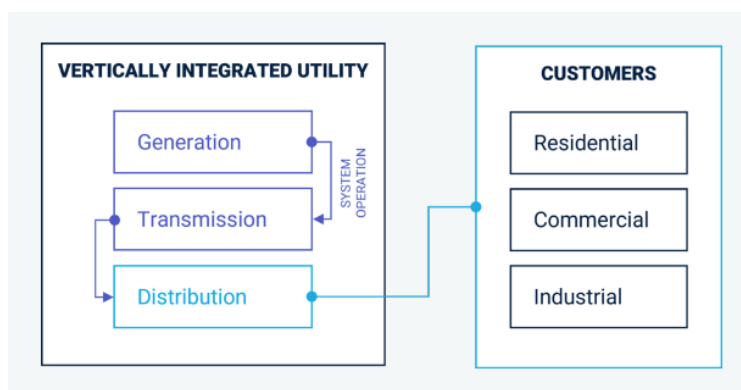
Source: (Akcura 2024)

In this section we review each of the four overarching market structures: (1) VIU, (2) single-buyer model (SBM), (3) competitive wholesale markets, and (4) competitive retail markets. Within each market structure we delve into the different design options adopted by countries globally.

2.1 Vertically Integrated Utility (VIU) Model

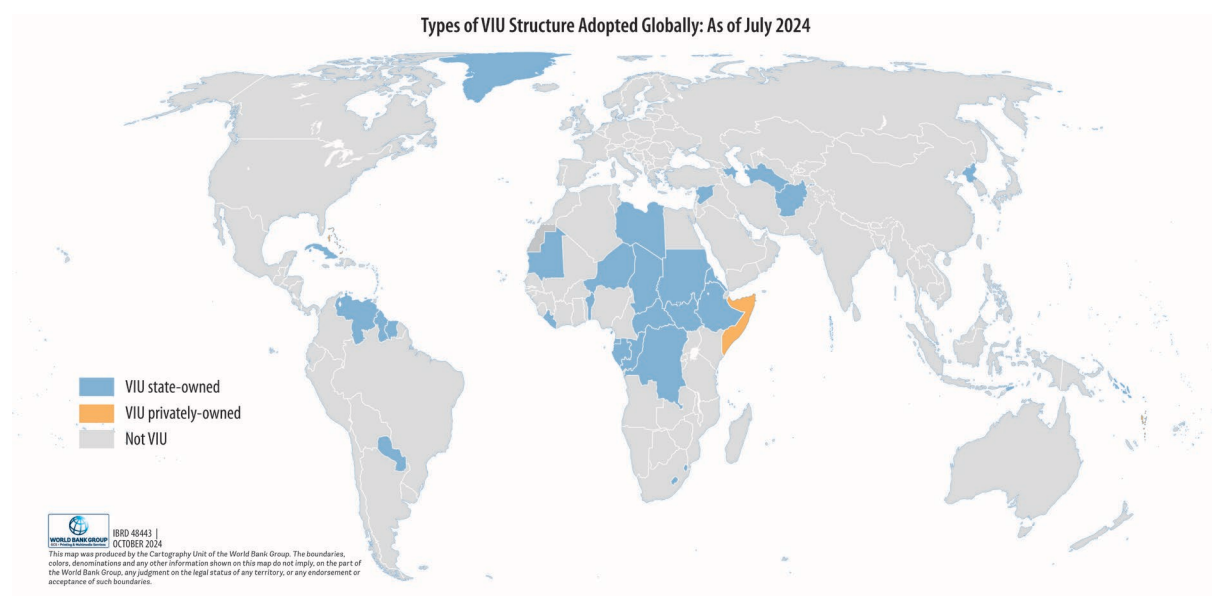
The market structure with the longest history is the vertically integrated utility (VIU) model. Under this market structure, a single entity carries out all functions in the electricity sector, including generation, transmission, distribution, and retail supply (Figure 2). The VIU model arose from the traditional notion of the electricity industry as a natural monopoly, where economies of scale and high sunk costs give a rationale for having a single entity own and operate the network.

Figure 2: VIU Structure



In 1989, 215 economies were using the VIU model, providing electricity to 92 percent of the world's population. By 2023 this number was down to 72 countries and territories (covering 7 percent of the world's population), but it remains the second most prevalent market structure globally especially in Sub-Saharan Africa (Figure 3).

Figure 3: Countries with VIU Structure in 2024



Source: (Akcura 2024)

VIUs are common in countries with small markets, such as small states and island nations with populations of less than 3 million². The small size of these markets and geographic isolation (including fragmentation in archipelagos) limits scale and interconnectivity. These factors result in high power sector costs and financial risks that may discourage entry of multiple players into the power market. In larger countries with VIU structures the VIU is typically state-owned. In some cases, this structure is in line with their state-controlled economies (such as in the Democratic People's Republic of Korea and the República Bolivariana de Venezuela) or due to fragility and conflict situations (as in Afghanistan and the Syrian Arab Republic) where private sector entry is too risky or politically infeasible.

Currently, 84 percent of VIUs are state-owned companies. Only 11 economies have privatized the VIU while still maintaining it as the sole company in the electricity sector providing integrated services. These are mostly small states (9 are island states and one non-island small state of Monaco). The unique context of these countries, including major sector sustainability issues, constrains the scope for private sector entry. Private ownership of the VIU is predominant in high-income island nations, where governments privatized electric utilities such as Bermuda, Cayman Islands, and French Polynesia.

Private VIUs can improve operational performance but rely on effective regulation to mitigate the abuse of market power and ensure that the private monopoly has the right incentives. Restrictions on market entry could also perpetuate market power, even when economic and technological changes support new entrants (Kiesling 2014). This structure faces risk of conflict between the private owner and the government when their priorities do not align. For example, the VIU is the main stakeholder alongside the government in driving any large-scale transition to renewables to meet the sector's sustainability objectives. However, as a private entity, it is unlikely that the VIU's management would encourage the development of third-party renewable energy generation that would put its own market share at risk unless it felt adequately compensated or equipped to profit from generating its own renewable energy.

The technical and financial performance of VIUs has been mixed. Some markets leveraged the model to ensure that investment decisions and operations were coordinated (improving cost efficiency and lowering risks) and to achieve energy security and social objectives such as rural electrification. However, some economies with VIUs have seen investment lags, lack of competition, poor financial performance, low efficiencies, and higher losses. This is because there is typically less incentive to innovate and improve performance, especially for state-owned VIUs that have standing fiscal support available. This market structure can be subject to government interference driven by short-term political objectives that impact VIU operations such as bill collection, tariffs, and fuel procurement.

Countries that succeeded at maintaining high performance under VIU structures have done so by effectively alleviating these risks, for example, through corporatization or public listings of state utilities. The public listing of VIUs tends to improve overall performance, as it engenders more robust financial, corporate governance, and disclosure principles. The corporatization of state-owned VIUs can also be helpful as a step toward setting up a market structure with private sector participation (Box 1). Some highly advanced power market structures were launched on the back of corporatization. For example, Singapore's corporatization of its VIU in 1995 helped the sector gradually transition into one of the world's most liberal electricity markets.

² About half (49 percent) of the World Bank Small States Forum member countries within the database use the VIU model in 2024.

Box 1: Corporatizing and unbundling VIUs en route to privatization: The experience of Kosovo

The Kosovo Energy Corporation (KEK) was the vertically integrated public utility providing power services to Kosovo until 2006. Under KEK, the power sector faced several challenges: a peak capacity gap, high technical and commercial losses, poor billing and collection practices, and high government subsidies to offset energy import costs. The distribution segment alone was losing over €20 million annually through technical losses and low collection rates.

Over the period 2005 to 2006, the government of Kosovo corporatized and unbundled KEK. The transmission and dispatch business was successfully unbundled to a separate public company. The government turned to IFC to help corporatize and privatize KEK Electricity Distribution and Supply (KEDS). IFC was retained as lead advisor to Kosovo's government to execute a transparent and competitive bidding process to allow a private investor to acquire a majority stake in KEDS and operate it.

An international call for Expression of Interest was launched in June 2010. Despite the challenging environment, the project successfully attracted two qualified bids, one from a consortium in the Arab Republic of Egypt and the other from Türkiye. The Turkish consortium, Limak-Çalik, submitted the highest bid and was selected through an open, transparent process. Contractual agreements regulating the sale of KEDS and all future relationships between KEDS and the various stakeholders were negotiated over a four-month period and signed in October 2012. These contracts required the winning bidder to invest at least €300 million in KEDS to bring distribution and supply systems to international standards, as well as improve metering, billing, and collection. The winning bidder was contractually obligated to meet clearly defined targets to reduce technical and commercial losses by a minimum of 13.5 percent during the first five-year regulatory period. The company successfully lowered technical and commercial losses from 42.8 percent in 2012 to 18.5 percent by 2021 (KEDS 2022).

The corporatization and unbundling of KEK set the stage for the country to transition from VIU to a competitive organized wholesale structure as the Kosovan power exchange became operational in February 2024.

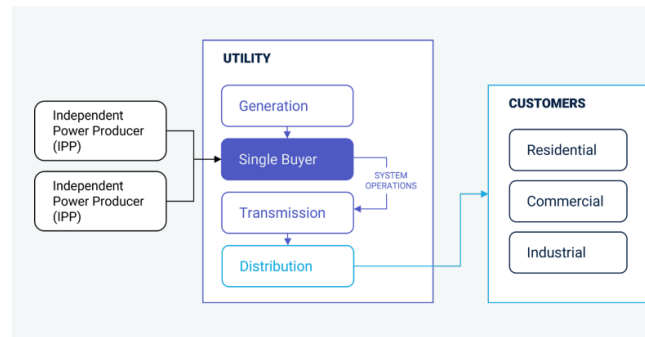
Some countries structured their VIUs as corporates with operational and fiduciary autonomy from the state (for example, in The Bahamas³), although they often have state representatives on their boards. These corporatized utilities also have managerial autonomy and are normally subject to company law and accounting rules with respect to transparency and reporting. With corporatization, the goal is for governments to retain ownership of the utility while ensuring better organized and efficient operations. Corporatization of utilities is also used to alleviate fiscal stress on state budgets.

2.2 Single Buyer Model

Currently, the single buyer model (SBM) is the most utilized power market structure in the world. Eighty-seven countries and territories operate their power sector through this structure, covering 29 percent of the world's population. Under SBM, the state authorizes private investors to construct plants as IPPs to generate electricity and sell it to the national power company or a wholesale purchasing agency with sole legal right to buy grid scale electricity (Figure 4). Usually, IPPs sell their output through long-term power purchase agreements (PPAs).

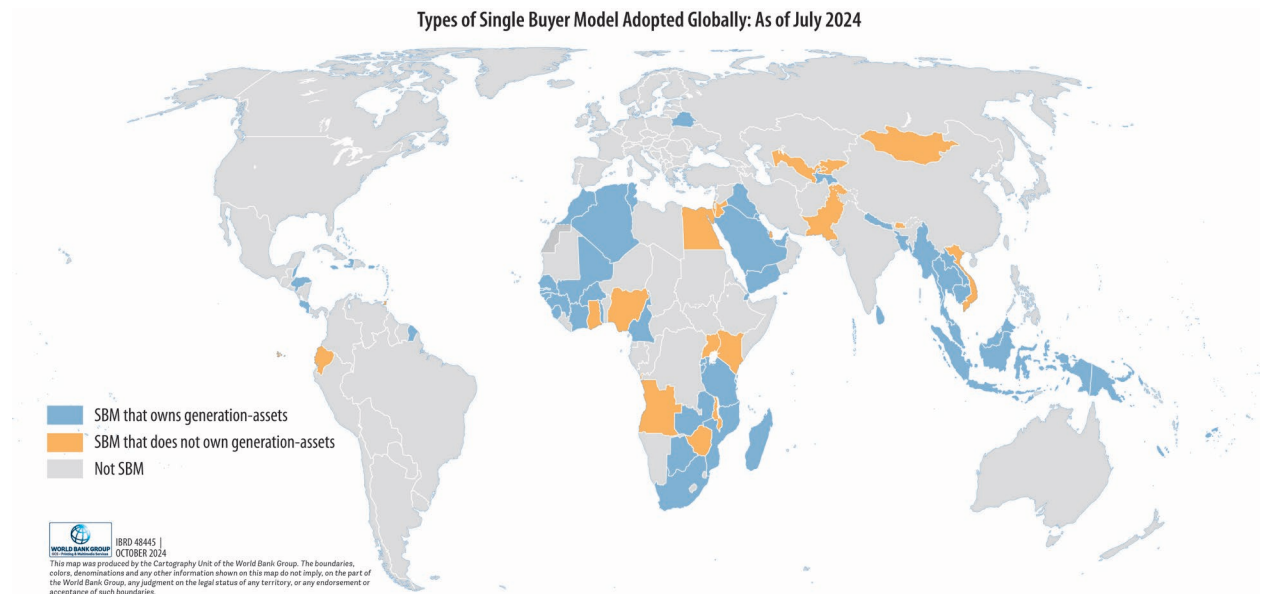
³ The Bahamas Power and Light Company, Ltd. (BPL) were established in 1956 by the Electricity Act of 1956, which created The Bahamas Electric Company (BEC) as a government-owned public corporation. The corporation is governed by a board of directors appointed by the government. (Bahamas Power and Light Company 2020)

Figure 4: Single Buyer Model (SBM) Structure



Within this broad categorization, several design variations exist: a single buyer may retain ownership and control of generation assets (and other functions) or be wholly detached from other value chain functions (such as power generation and distribution). The common element is the fact that all these models require some system of centralized purchasing arrangements. The variant adopted by a country depends on specific power sector conditions as well as political and institutional factors, as discussed below. Currently, 69 countries have a single buyer that owns generation assets while in 20 countries the single buyer does not own generation assets (Figure 5).

Figure 5: Countries with SBM Structure in 2024



Source: (Akcura 2024)

Countries have taken different routes to a single buyer model, accounting for their unique economic, institutional, and political landscape. This resulted in several variations in the SBM model, including:

VIU with IPPs: The market design that involves the least structural change from VIU is an SBM structure that allows IPPs to sell power to VIUs that have not been unbundled. In essence the VIU functions as a single buyer that also owns generation assets itself. This entity makes decisions about capacity additions and generation system expansion. Sixty-six economies currently maintain a state-owned or privatized VIUs but permit some IPPs to sell power to the VIU. Examples include Morocco's National Agency for Electricity and Water (ONEE) and Electricity Generating Authority of Thailand (EGAT). This market

design allows limited competition for the market as the VIU procures new generation plants via contracts from private generators. However, the VIU can have a conflict of interest that could lead it to favor its own generators over IPPs. This structure has been predominantly adopted in Sub-Saharan Africa (21 countries) and parts of Asia (19 countries).

Unbundle transmission but place single buyer with the generation & distribution company: Two countries, Bangladesh and Cameroon, unbundled transmission from the VIU but maintain single buyer function with the integrated utility (that owns generation and distribution). Cameroon started structuring its market along this design with reforms under the 1998 Electricity Law that concessioned the VIU (SONEL now ENEO) to a private operator and created a sector regulator (ARSEL) to monitor concession performance, set tariffs, and regulate IPPs. Two thermal IPPs subsequently started selling to the VIU. In 2011, a second wave of reforms were instituted to address bottlenecks that had limited sector investment, including potential conflicts of interest for the partially privatized VIU which also owned generation assets. The reforms unbundled transmission assets from ENEO's concession, and created a new public transmission system operator, Sonatrel. ENEO continues to function as the single buyer. This case illustrates progressive structural advancements that retained the single buyer model.

Create independent transmission operator (ITO): Some countries unbundled generation assets from the VIU, creating a single buyer which is a legally separate entity operating as an independent transmission operator (ITO). This design mitigates conflict of interest, as the single buyer purchases all generation from third parties. For example, Kenya unbundled generation from transmission and distribution, followed by privatization of the generation company Kenya Electricity Generating Company (KenGen) (with partial state ownership). Kenya Power and Lighting Company (KPLC) was created as an independent transmission operator to function as the single buyer. Kengen and KPLC are publicly listed companies, operating on commercial principles and are able to tap into capital markets for financing needs. Broader sector reforms improved the operational efficiency of the sector, and moved the sector closer to cost recovery, resulting in large private capital flows into the sector. At least \$3 billion in private capital were mobilized in the power sector between 1997 and 2018 (World Bank 2019). Simultaneously, the state has remained an important investor, playing a pivotal role in expanding generation capacity, scaling-up electrification, and leading diversification toward geothermal energy. While some of this progress (in particular, the last mile connectivity program) came at high costs and faced some program governance issues that affected KPLC's liquidity,⁴ Kenya recorded one of the fastest electrification rates on the continent between 2013 and 2020.

The SBM is relatively easy to implement and tailor to country contexts. It can significantly increase generation capacity through IPPs in the face of public financing constraints. However, the model also faces considerable risks—the SBM can lock in poorly designed and negotiated long-term PPAs, which could be detrimental to the sector's financial sustainability or prospects for a transition to more competitive structures. Sub-optimal sector outcomes can result if the single buyer, as an off-taker, is financially weak and unable to honor the terms of PPAs.

2.3 Wholesale Competition

Some countries have experimented with introducing competition into the electricity market, a model that supports the active participation of public and private generation companies, distribution and supply

⁴ For the financial year ending 30 June 2023, Kenya Power and Lighting Company PLC reported a pre-tax loss of KShs. 4.43 billion (approximately US\$31.95 million). In the fiscal year ending June 2024, KPLC posted a pre-tax profit of approximately US\$337.3 million (KSh. 43.67 billion) based on a conversion rate of 1 USD to KSh. 129.5. (KPLC 2024)

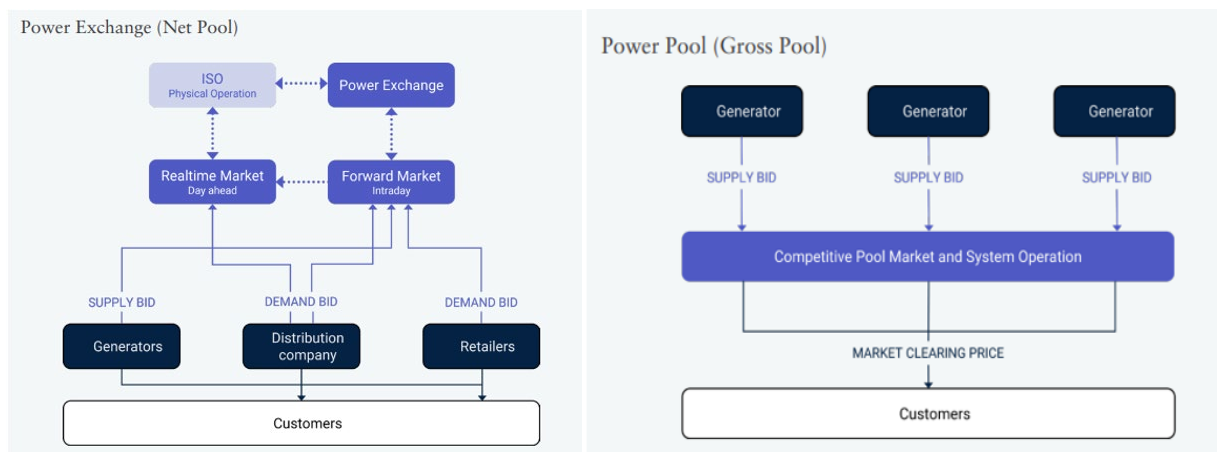
companies, and end-users in the market. Market-determined electricity prices aid price discovery and enable transparent signals for investments, while competition in wholesale and retail segments opens up opportunities for the private sector (Poudineh 2019). There are a variety of wholesale and retail competition market design options.

Currently, 69 countries have some form of wholesale competition, covering 63 percent of the world's population. Majority of these countries allow ***bilateral contracting*** between generators and large energy consumers (distribution companies and industrial consumers). Bilateral contracting enables buyers and sellers to freely enter into short-term trades and long-term PPAs. Since these transactions are private agreements between the two parties, exact terms and conditions of trading deals are easily customized to accommodate the needs of the seller and buyer which allows flexibility. However, they are often not transparent, as the details about the traded price and volume are limited to the two parties involved and are usually not made publicly available.

Most countries complement bilateral contracting with a type of organized spot market (Figure 6). Short-term trades are conducted in the spot market for a day in advance (the day-ahead market) or within a day (the intra-day market) before the actual delivery of power. There are several variations of organized spot markets. They can be designed as ***“power exchange/net pool”*** settlement which involves double auctions where power generators submit bid prices and quantities to sell, and buyers (distribution/supply companies, traders, and large consumers) submit offers to purchase power. The generators' bids are then stacked in increasing order of price offered, and the demand bids are stacked in decreasing order of their prices; their intersection determines the market-clearing price. Currently, 42 countries have this structure.

Alternatively, the organized spot market could be set up as a ***“power pool/gross pool”*** settlement which involves a single auction where only the generators offer bids, and the price is determined by the highest accepted generator's sell bid that intersects with forecasted demand. Currently eight countries have this wholesale structure.

Figure 6: Power Exchange (net pool) vs Power Pool (gross pool) Wholesale Market Structure

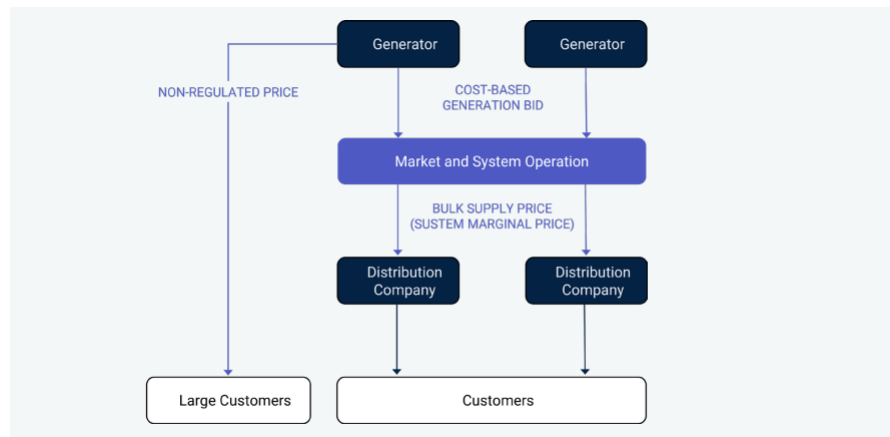


Source: Adapted from Bouddou et al. (2020)

Thirteen countries (primarily in Latin America) adopted wholesale markets under a ***cost-based structure***. This design shares some of the characteristics of bid-based spot markets, but with one significant divergence: the quantity and the price components of the bids are regulated based on administratively set formulas. For example, under this model, the price paid to thermal generators is set by the system operator

at the marginal cost of the plant, based on fuel input prices and the technical characteristics of the plant (Figure 7).

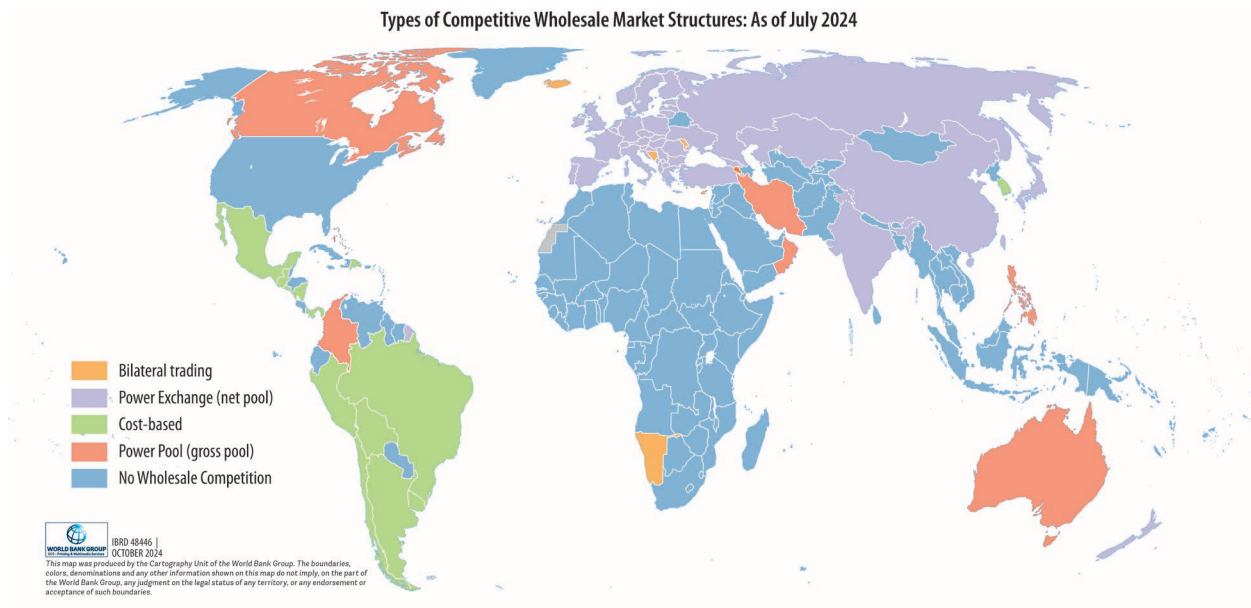
Figure 7: Cost-based Organized Wholesale Market Structure



Source: Adapted from Power Engineering International (2003)

Based on the Global Power Market Structures Database as of July 2024, 63 countries have an organized wholesale power market structure (Figure 8). An additional 6 countries allow bilateral trading between large consumers and generators. Power exchange (net pool) is the most widely adopted version of organized wholesale competition, with 42 countries utilizing it.

Figure 8: Countries with Competitive Wholesale Market Structure in 2024



Source: (Akcira 2024)

The level of competition and degree of private sector participation in wholesale markets vary depending on the type of market design adopted. Some of the main design variations include the following:

Trade based on bilateral contracting: In **Namibia** Nampower, a state owned VIU, is still the main off-taker and buyer of power. However, in 2019 Namibia adopted the "Modified Single Buyer Framework" which

allows IPPs to sell to large users through bilateral contracts. Majority of the electricity is still traded under a single buyer type structure, but bilateral contracting is expanding. In July 2021 bilateral contracting accounted for 191 GWh, by 2023 it increased to 772 GWh, accounting for around 9 percent of total power demand (Amakutuwa, Ngalangi, and Chikova 2023). As of March 2024, there are 31 contestable consumers registered on the regulator's website that can purchase electricity via bilateral contracts with IPPs. There are 18 licensed eligible sellers, many of which are solar IPPs under development. Namibia is currently the only country on the African continent that allows for some degree of wholesale trade in the electricity sector.

It is worth noting that wholesale power trade has occurred in Africa since 2009 at a regional level, through the Southern Africa Power Pool (SAPP). Created in 1995, SAPP is a regional cooperation platform currently comprising of the state-owned utilities and select private companies operating in 12 countries: Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Eswatini, Tanzania, Zambia and Zimbabwe.⁵ SAPP launched a day ahead market in 2009 allowing for real time power trade among the member utilities as a complement to trade governed by bilateral contracts. The trading platform was upgraded with Forward Physical Markets and the Intra Day Market in 2015. A Balancing Market was introduced in 2022. Between January and December 2023, the competitive market accounted for 6-21 percent of total power trade on the SAPP.

Bilateral trading with balancing market: The **Georgian** electricity sector has gone through significant reforms since 1990s. The previously state owned VIU has been unbundled into separate generation, transmission and distribution companies and a market operator. Several generation and distribution companies have been privatized. Georgia's wholesale electricity market currently consists of a mix of direct bilateral trading, a balancing market and long-term PPAs combined with regulated retail prices. Generators can enter into annual bilateral contracts with distribution companies, large consumers or exporters. The annual contracts between generators and buyers define the electricity volumes to be sold and the price is typically defined on a monthly basis. The regulated balancing market administered by Electricity System Commercial Operator (ESCO) clears imbalances between committed volumes and the actual energy delivered. ESCO supplies the balancing electricity through mid- to long-term PPAs signed with generators. However, the prices of these contracts are not publicly disclosed thus there is limited price transparency. Around 85% of electricity is sold through bilateral contracts and the rest through ESCO (Georgian National Energy and Water Supply Regulatory Commission (GNERC) 2022). Georgia has been gradually transitioning to a net pool market structure. In May 2022, the Georgian Energy Exchange was granted a license from the regulator to operate day-ahead and intraday markets. On 1 July 2024, the Georgian Energy Exchange became operational.

Power exchange owned indirectly by dominant state-owned utility: The **Hungarian** Power Exchange (HUPX) was created in 2010 when the country was advancing a liberalization agenda. Since then, the country has moved towards more centralized decision making in the energy sector (Bozókí and Hegedűs 2018; Csoma 2017; Kornai 2015). Although Hungary has a power exchange platform, the ownership of HUPX is not wholly autonomous from the state-owned entity MVM which is the largest Hungarian power company that operates production, distribution and sales functions. MAVIR, a subsidiary of the state-owned

⁵ The SAPP members include: Botswana Power Corporation (BPC), Electricidade de Mozambique (EDM), Mozambique Transmission Company (MOTRACO), Electricity Supply Corporation of Malawi (ESCOM), Rede Nacional de Transporte de Electricidade (RNT), Eskom, Lesotho Electricity Corporation (LEC), Nam Power, Societe Nationale d'Electricite (SNEL), Eswatini Electricity Company (EEC), Tanzania Electricity Supply Company Ltd (TANESCO), ZESCO Limited (ZESCO), and Zimbabwe Electricity Supply Authority (ZESA); in addition to Hidroelectrica de Cahora Bassa (HCB) in Mozambique, Copperbelt Energy Cooperation (CEC) in Zambia, Lunsemfwa Hydro Power Company (LHPC) in Zambia, and Ndola Energy Corporation (Ndola) in Zambia. Source: <https://www.sapp.co.zw/about-sapp#members>.

MVM, is the transmission operator that operates HUPX. The government maintains an interventionist role in the domestic energy market with MVM being the dominant player in the sector (IEA 2022). Competition within the domestic market has been constrained as most of the country's electricity generation is tied up in long-term contracts that inhibit further market opening, with limited spare capacity to offer potential buyers on HUPX. However, in March 2024 HUPX announced that it would be joining the regional Energy Exchange for Central and South-Eastern Europe which will integrate HUPX with the Slovenian and Serbian power exchanges (Derewenda 2024). The integration of the three exchanges is expected to improve market liquidity and facilitate power trade between the three countries.

Long-term PPAs with power exchange: **India** has one of the largest electricity markets globally, with about 600 generators and installed capacity of 429 GW (India Press Information Bureau 2024). Gradual liberalization of the sector increased the number of IPPs, and the private sector's share in generation has increased from 8 percent in 2008 to now about 49 percent (Economics Division, Central Electricity Regulatory Commission 2023). Three power exchanges operate in the market: the India Energy Exchange, and Power Exchange India set up in 2008, and the Hindustan Power Exchange opened in 2018. The exchanges offer several tradable contracts depending on electricity delivery time period including DAM, intraday and term-ahead (delivery up to 11 days) contract. However, only 7 percent of electricity is traded through the exchanges with the remainder priced through regulated long-term PPAs with terms up to 25 years (Sachdeva 2024). While accounting for a minor share of electricity trade, the exchanges offer an instrument for price discovery and distribution companies as well as large industrial consumers can source cheaper power from the exchange to meet any shortages as the exchange prices have overall been cheaper than under long term PPAs. Prices in the India Energy Exchange in 2023 were 45% lower than those discovered under bilateral contracts (Arnand 2024).

Power exchange with nodal pricing & futures market: **Singapore** in 1998 was the first country in Southeast Asia to introduce competition into the wholesale segment by forming the Singapore Electricity Pool (SEP). SEP was a type of DAM, where three IPPs along with a state-owned waste incineration plant, competed to sell electricity to the central system operator. The generators submitted hourly bids a day ahead from which the system operator formed an aggregate supply curve. SEP has since then transformed into National Electricity Market of Singapore (NEMS), a sophisticated wholesale market that facilitates trading between generators, retailers and other market participants. Generators submit price and electricity supply quantity pairs for each half hour dispatch interval. The market clearing software forms the dispatch schedule taking into consideration physical network constraints allowing congestion costs and transmission losses to be included in the market clearing price. This results in different prices by various 'nodes' along the electricity network in Singapore (Loi and Jindal 2019). An electricity futures market also exists, run by the Singapore Exchange that provides hedging instruments for generators and consumers to lock in electricity prices for future time periods. These hedging tools are especially valued by generators given the country's heavy reliance on imported fuels for electricity generation. Singapore is one of the smallest competitive wholesale markets globally, but it has expanded with several new private entrants in recent years. Concentration of generation has declined, with market share of the largest three IPPs decreasing from 79 percent in 2012⁶ to about 55 percent in 2023 (Energy Market Authority 2023).

Mandatory regional pool: Nord Pool is designed as a regional power exchange that spans **Norway, Sweden, Denmark, Finland and the Baltic states (Estonia, Lithuania, Latvia)**, also coupled with several regional electricity markets. Nord Pool has a day ahead market, Elspot, where generators and consumers bid for the

⁶ (Energy Market Authority 2019)

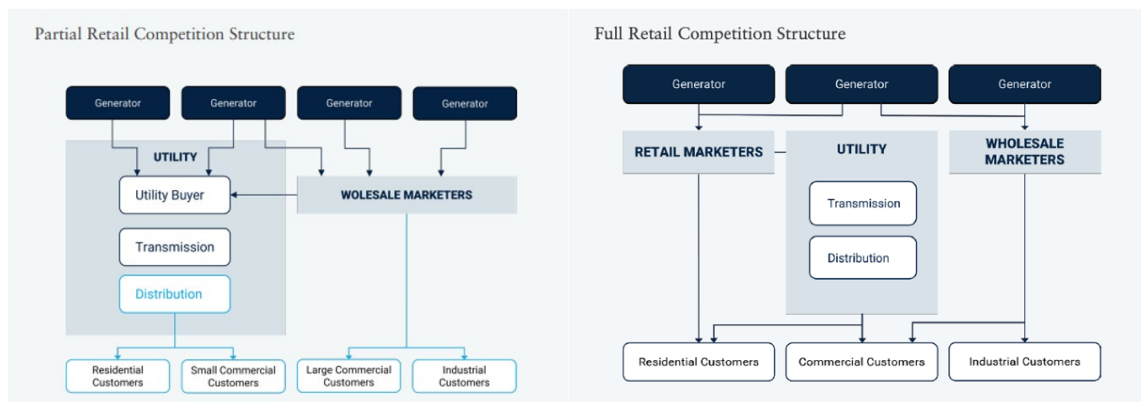
delivery of electricity for the next day. The intraday market (Elbas) trading platform offers 15 minute, 30 minute, and hourly electricity trade products to generators and consumers. It is designed as a mandatory pool where all generators in the member countries are required to sell their generation on these exchanges thus providing significant liquidity and depth to the power market. Financial contracts are used for price hedging and risk management with a time horizon up to ten years, covering daily, weekly, monthly, quarterly and annual contracts.⁷

2.4 Retail Competition

In 164 economies, the adopted power market structure only entails passive customer participation, with no option for choosing a supplier or participating in the market. Currently, 66 economies allow a degree of competition in the retail segment, where end-users of electricity (residential, commercial, and industrial customers) can choose their power supplier and other services. The aim is for the sector to offer pricing and service options tailored to customers' needs and facilitate the introduction of beneficial new technologies and processes. This model allows dynamic price and service discovery by customers.

Retail competition cannot exist without a form of wholesale competition market structure. All countries that have a level of retail competition also have some form of a competitive wholesale power market structure. Thirty-two economies permit partial retail competition (Figure 9.a) where large electricity consumers can freely choose their retail supplier but small consumers like households remain regulated. Thirty-four economies allow full retail choice (Figure 9.b), under this structure all consumers have the option to choose their electricity supplier.

Figure 9 a) Partial Retail Competition Structure, b) Full Retail Competition Structure



Source: Adapted from Enerdynamics (2023b) and Enerdynamics (2023a)

Most countries adopting the partial retail model are in Latin America. Retail competition is usually implemented progressively from *partial* to *full* competition. In the initial stage, only large industrial or commercial users are legally permitted to choose their providers of electricity. Gradually the market is opened to all end-users including households. Competition is expected to drive electricity retailers to offer customers a range of contracts. The best retail contract for a customer will depend on factors unique to that

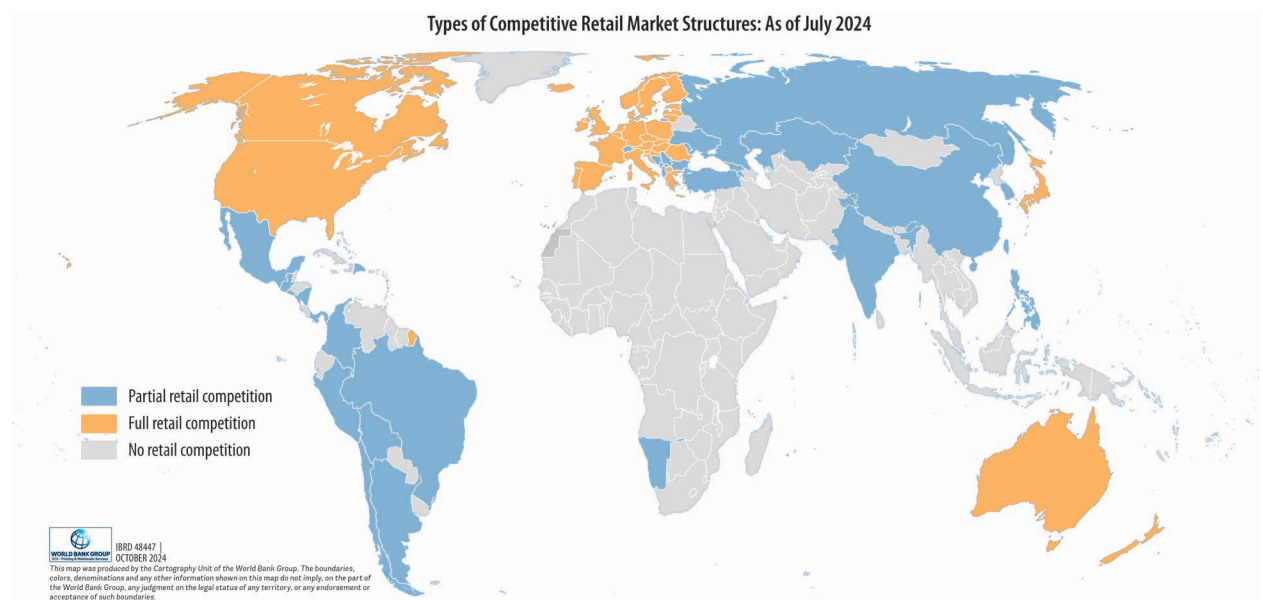
⁷ (Nord Pool 2020)

customer, such as customer preferences of risk, type of meter they have, types of electrical equipment, their daily/weekly demand profile, their willingness to cede a degree of control in their electricity usage.

Currently, full retail competition is primarily adopted in advanced European countries; 82 percent of countries with the full retail competition model are in Europe (Figure 10). However, advances in technology—especially digitalization of the sector through the adoption of smart meters—are creating new avenues for adopting retail competition in developing countries in the future.

Since electricity itself is homogeneous, a supplier needs to exploit heterogeneity in consumer preferences for electricity services in order to differentiate their services from competitors. For example, suppliers can offer differentiated contracts based on guaranteed tariffs, green tariffs and online deals. If environmental protection is a preference of a segment of customers, it can be built into the service offering of retailers for example, guaranteeing that the supplier will purchase a certain amount of electricity solely from renewable energy generators. Although these “green” options do not imply that the electricity received by the specific customer are produced solely from renewables, it does guarantee an increase in renewables in the supplier’s portfolio.

Figure 10: Countries with Competitive Retail Market Structure in 2024



Source: (Akcura 2024)

Advances in technology, especially digitization of electricity through adoption of smart meters, is enabling further avenues for retail competition. Digitization enables innovation in tariffs, payment methods and demand side response. Customer-oriented technologies (solar PV, electric vehicles, smart thermostats, home energy management systems, etc.) are helping accelerate service differentiation by catering to customer preferences on service quality, such as reliability, customer service, simplicity, innovation, and trustworthiness.

The level of competition in retail markets depends on market design. Some of the variants of the design include:

Partial retail competition: **Peru** has a competitive generation segment; prices are determined by freely negotiated bilateral contracts and complemented with a cost-based wholesale market. More than 80 percent of generation capacity is privately owned, and the four transmission networks are also in private hands. The

retail segment has been partially opened to competition. It consists of two categories of electricity users based on user demand: a regulated segment and a free supply segment, where based on demand classifications some consumers can choose their supplier freely.⁸ About 60 percent of the market is regulated, and 40 percent is free. The price of electricity generation for regulated users is established by the regulator, while free users can negotiate a supply contract directly with generators or distributors.

Partial retail competition and online retail platform: After deregulation in 2001 and privatization of its old VIUs (National Power Corporation, NPC) transmission and generation assets, the **Philippine** power sector is fully liberalized and, unlike most others in Asia, predominantly privately owned. The Philippines has operated a wholesale electricity spot market structured as a gross pool since 2006. Retail competition has been gradually introduced since June 2013 when private retail companies were allowed for the first time to supply electricity directly to contestable customers on a competitive and deregulated basis. Currently, consumers with monthly average peak demand of more than 500 kW can choose their retail electricity supplier. The regulator plans to reduce this level until it reaches average household demand; it was reduced in 2023 from 750 kW. The retail market remains relatively concentrated with an incumbent distribution company Meralco accounting for 37 percent of the market in 2021 (Velasco 2021) of about 1,622 total registered contestable customers.⁹ The retail market is an important option for the eligible consumers to choose a supplier offering the most competitive price and best suitable to their power supply requirements especially as the country has one of the highest electricity prices in Asia since the tariffs are not subsidized. Retailers compete on value added services, in addition to price. For example, one of the main retailers, Alboitiz Energy Solutions, offers customers services such as power quality and vibration analysis to increase efficiency and reduce maintenance costs of customers' machinery. Exora, a private online platform launched in 2019, offers a service that eases the process of connecting eligible consumers with energy suppliers. Eligible customers list their contract preferences on the platform and suppliers bid real-time to eligible customers.

Full retail competition with state dominance: **Poland** enacted a series of reforms to liberalize its electricity sector as the country entered the European Union. While private sector is now active in the non-hydro renewable energy generation space, the sector overall remains dominated by state-backed utilities. Following the restructuring and consolidation of the power sector, four vertically integrated players have emerged in the country with different levels of state ownership: Polska Grupa Energetyczna (PGE), Tauron, Energa,¹⁰ and ENEA. The market design has included a power exchange since 2000 but with limited activity until recent years as generation volumes were stuck under legacy long-term contracts. Poland has gradually opened the retail segment, commencing with 21 large consumers in 1998 to now where all consumers are able to choose their retail supplier. There are five large (mainly publicly owned) distribution companies and over 100 independent supplier companies active in the retail segment. All suppliers are legally obliged to publish the terms of their sales and contract information to enhance transparency. In addition, there is an online tariff calculator made available on the energy regulators website to help household consumers compare different supplier offers. The incumbent distribution companies still hold

⁸ Users with a demand between 200 kW and 2,500 kW can choose to be a regulated or free user while consumers with demands greater than 2,500 kW are considered free users.

⁹ (Businessworld 2019)

¹⁰ In late-2019, the country's largest oil refiner, PKN Orlen, announced that it would acquire majority state-owned utility Energa in a bid to expand into the power and renewables sector. In 2020, PKN Orlen acquired an 80% interest in the Energa Group.

majority of the retail market as switching rates of consumers to alternative suppliers is still limited (Energy Regulatory Office 2023).

Full retail competition with private sector dominance: Many Western European countries implemented full retail competition dating back to 1999, when the **United Kingdom** launched its retail market. This significantly lowered the incumbent utilities' (all now privately owned) market shares, as new suppliers entered the market, increasing the number of suppliers from 12 to now 32 (Neely 2023). However, the six largest utilities that are the former monopoly suppliers still account for about 61 percent of the retail market. The regulator, Ofgem, monitors competition through periodic assessments, and has intervened in the market at several points to introduce measures to enhance competition. Customer switching rates among retailers have increased since 2014, reaching a record high of 21 percent in 2019. The key driver of switching is savings which average £260 per year (explaining more than 80 percent of switching, according to Ofgem's 2018 customers survey). Customer switching of retailers has declined significantly in the last 2 years (3% in 2022) according to McKinsey (2023) as the government has intervened in the market to cap retail tariffs to mitigate impact of price volatility. As a result, retailers could not compete on prices as they were capped by the regulator.

Several retailers in European countries have enhanced retail competition by utilizing technology to drive product heterogeneity and innovation. For example, [Tibber](#) is the first fully digital energy company in the world (Tibber 2024). Founded in 2016, it currently operates as a power retailer in **Germany, Norway and Sweden**. The company's intelligent energy platform continuously searches for the cheapest green energy for its customers. Tibber's customers can install a smart appliance in their home to monitor their smart home technology (such as heating systems and electric vehicles) and communicate with Tibber's mobile app. They can use the app to automatically shift their power consumption to times of the day when prices are lower (Amazon Web Services 2021).

Virtual community power pools and peer-to-peer retail electricity trading: Advances in technology are also enabling formation of localized electricity retail markets through peer-to-peer (P2P) electricity trading where community members buy or sell directly with each other without intermediation by conventional suppliers. In this system the end consumer becomes a prosumer (functioning as both producer and consumer) and exchanges excess electricity with other consumers in the community coordinated by a community manager (provider of controlling software or market platform), who can also be in charge of selling the collective surplus energy to third parties, providing residual power, and managing the balancing group. **Netherlands** started the world's first P2P trading platform in 2014 allowing consumers to purchase electricity directly from independent renewable energy producers including from households with distributed generation. Germany is advancing P2P trading with some companies utilizing blockchain-based software platforms (for example, *enway*) to allow consumers to directly buy electricity from local RE producers without intermediaries. Some communities in **Germany** have also started to form virtual electricity pools (for example, *sonnenCommunity*) connecting households with batteries and solar panels, allowing them to share electricity through a decentralized power community. In the US, the Brooklyn Energy Grid project consists of a microgrid energy market where community members can trade (locally

generated) energy P2P with their neighbors.¹¹ This is a type of virtual power pool of prosumagers,¹² utilizing a central software linking and monitoring all community members' electricity demand-supply, balancing it automatically. Community member' batteries often serve to provide ancillary grid services.

2.5 Countries with a Mix of Power Market Structures

Currently, 12 countries have several different power market structures operating within their borders. These include geographically large countries that are a federation of states and provinces such as Canada and the United States. Some Canadian provinces operate their power sector under a VIU while others have opted for a gross power pool structure. Some Chinese provinces structured their power sector under SBM while others are experimenting with a net pool power market structure.

In some countries there are parts of the country that are not connected to the main power network and operate under a different market structure. For example, the Bolivian power sector operates under a cost-based organized wholesale market structure but there are sections of the country operating under isolated systems in a VIU type structure.

There are also instances of island states, such as The Bahamas and St. Kitts & Nevis, where different islands function under different power market structures. All of The Bahamas' electricity is supplied by two VIUs operating on different islands. Bahamas Electricity Company (BEC) is a state owned VIU (produces about 80 percent of electricity) while the Grand Bahama Power Company is a private VIU for the island of Grand Bahama. Each island of the two main islands in the federation of St. Kitts and Nevis has its own electric utility—St. Kitts Electricity Company (SKELEC) on St. Kitts, and Nevis Electricity Company Limited (NEVLEC) on Nevis. On St. Kitts the power is fully supplied by the VIU while on Nevis there is a wind IPP selling to the VIU since 2010. Thus, Nevis is under a type of SBM structure while St. Kitts is a VIU.

3 Global Evolution of Power Market Structures

In this section we analyze the global experience in transitioning between power market structures to assess the main trends and enabling conditions for successfully implementing reforms to transition to an alternative market structure.

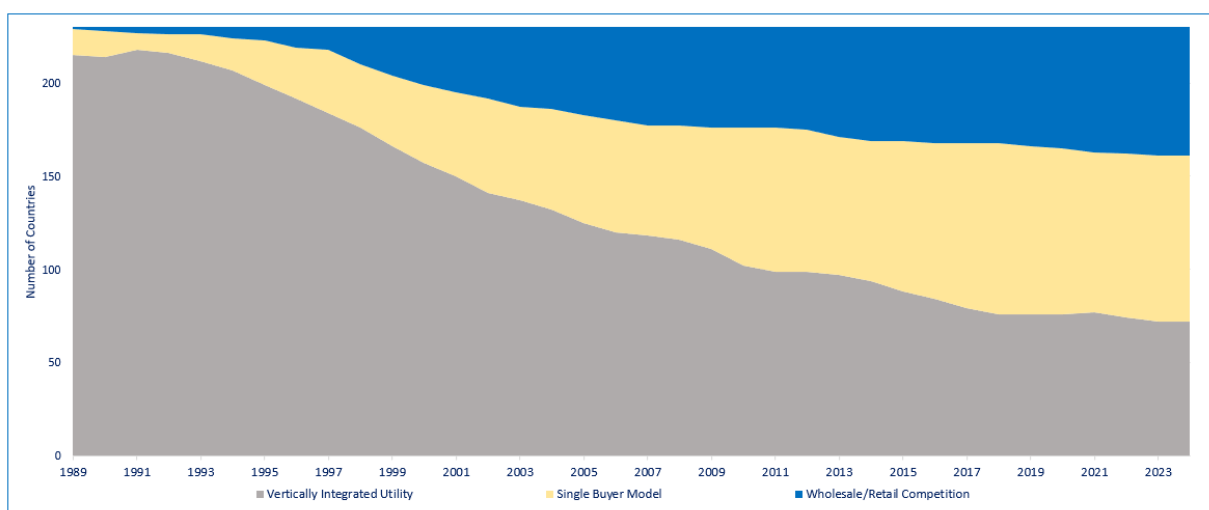
3.1 Transition Paths

There has been significant evolution in power market structures adopted globally between 1989 and 2024. Many countries transitioned between different power market structures seeking to enhance sector efficiencies while improving electricity access, affordability, quality of supply, and sustainability (Figure 11). Seventy-one economies currently retain the power market structure they had in 1989. All except one are VIU. In contrast, 159 economies moved between different power market structures in the past 35 years.

¹¹ (Mengelkamp et al. 2017)

¹² Prosumers are agents that both consume and produce energy. Prosuming refers to when energy customers actively manage their own consumption and production of energy. It often describes consumers — households, businesses, communities, organizations and other agents — that rely on smart meters and solar PV panels to generate electricity and/or combine these with home energy management systems, energy storage, electric vehicles and electric vehicle-to-grid (V2G) systems. Source:(Parag and Sovacool 2016).

Figure 11: Global Electricity Market Structure Transitions from 1989 to 2024



Source: (Akcura 2024)

A combination of economic, technological (e.g., distributed generation technologies that challenged the concept of economics of scale and centralized production), and political (e.g., public distrust of monopolies alongside evidence of mismanagement in some cases) developments resulted in abandoning the state controlled monopolistic structure of the power sector, to seek alternative market structures. In the past 35 years, 124 economies changed their power market structure once and 33 economies changed it twice (**Table 1**).

Table 1: Number of transitions between Market Structures 1989-2024

	East Asia & Pacific	Europe & Central Asia	Latin America & the Caribbean	Middle East & North Africa	North America	South Asia	Sub-Saharan Africa	TOTAL
No Change in Market Structure	16	12	20	3	1	1	20	71
Changed Market Structure Once	21	25	26	17	2	6	29	126
Changed Market Structure Twice	4	23	3	1	0	1	1	33

Source: (Akcura 2024)

The most prevalent transition was from VIU to SBM, 121 economies made this transition since 1989 (Table 2). Thirty-two of these countries then transitioned from SBM to wholesale-retail competition structure (WRC) in addition to six countries that already had SBM structure in 1989. Only 30 countries transition directly from VIU to WRC. These were mainly in Europe. Ecuador is the only instance of a country moving from a WRC structure to SBM. There were 9 countries that moved from SBM to a VIU structure. Seven of these are ex-Yugoslav states which in 1989 were part of the Yugoslav power pool and after the dissolution of Yugoslavia each had a VIU structure for several years. Some countries transitioned from VIU directly to competitive markets – for example Chile and Argentina.

Table 2: Types of transitions between Market Structures

Transitions between Market Structures	East Asia & Pacific	Europe & Central Asia	Latin America & the Caribbean	Middle East & North Africa	North America	South Asia	Sub-Saharan Africa	TOTAL
VIU to SBM	22	27	18	17	0	7	30	121
SBM to WRC	5	26	3	1	1	1	1	38
VIU to WRC	2	16	10	1	1	0	0	30
WRC to SBM	0	0	1	0	0	0	0	1
SBM to VIU	0	8	1	0	0	0	0	9

Source: (Akcira 2024)

3.2 Transition Drivers

While countries followed a wide range of paths to transition between different market structures, most market movements observed over the past three decades were from state-owned VIU into the SBM. This transition route reflects the standard reform model, which placed the SBM as the first step before moving into more competitive structures. Historically, SBM has been favored by countries as it allows governments to retain some control, thought to be essential to meet certain political and social objectives. In addition, some markets do not yet meet the preconditions to transition to more competitive market structures.

The historical global mapping of market structures highlights several overarching factors that have prompted countries to transition from a VIU to an alternative market structure. These factors include the following:

Sector performance issues: In the early 1990s, many public utilities in developing regions experienced inadequate financial and operational performance. Revenue flows were insufficient to cover a reasonable share of investment costs, as well as O&M due to multiple factors including low tariffs, revenue collection and high losses. Technical, operational and maintenance issues, as well as management and staff performance, were also causing frequent plant breakdowns and unreliable service. In this adverse scenario, many countries started a reform process in the power sector, as a first step, followed by introducing IPPs.

Large power demand growth: During the same period, electricity demand in developing countries was on the rise, with a projected growth rate of 7 percent per annum. This affected countries with otherwise well-performing utilities, for example, the Republic of Korea, Costa Rica, Thailand, and Morocco among others (Escay 1990).¹³ Additional growth in GDP required much larger additions of electricity per unit of output because of the ongoing process of industrialization, which in turn meant large investment needs, estimated at about \$100 billion per year in developing countries at the time. For context, concessional financing from multilateral banks to the power sector in emerging markets amounted to \$12 billion at the time (Schramm 1993). Private sector investment was seen by many countries as a bridge to finance growing needs of the sector.

¹³ Based on data retrieved from: (Escay 1990).

Exogenous factors: General economic reform efforts saw many countries that implemented structural adjustment programs in the 1990s also liberalize their power sectors to allow private sector engagement. The depth of reforms reflects contextual differences (e.g., market size, policy environment). Deep reforms were often driven by bold policies sometimes adopted in the face of a macro crisis. Some of the deepest reforms were triggered by economic crises that propelled countries to implement bold reforms, or by regionalization, for example, EU accession requirements for the previously centralized economies in central and eastern Europe. In the case of Türkiye, market transformation can be linked to the country's planned accession into the EU, which included a set of the EU's electricity directives, dating back to 1996. However, it was the major macro crisis of 2000/01, which left the government with a large debt overhang, that provided the impetus for radical reforms. Argentina's two-phased reform was also triggered by macro and political crises (Wolfram, Shelef, and Gertler 2012).

3.3 Common Trends

The mapping of power market structures highlights several common features across countries that transitioned between market structures. These include the following:

Long lead time: Transition from VIU into SBM occurred within a time frame of 15.7 years on average. As part of the transition, countries implemented a series of reform measures including unbundling the VIU. In many cases it took several years for any IPPs to enter the market following these reforms. The move from SBM to WRC took on average 9.7 years. Türkiye, for example, took 13 years to develop a fully functional wholesale market, gradually introducing key building blocks, including the temporary balancing and settlement mechanism that enabled the introduction of merchant plants within three years of launching reforms. On average it took countries 6 years to transition from partial retail competition to full retail competition. Romania had the longest transition. It took 21 years for retail competition to be operational for all Romanian consumers. Retail competition in Romania started in 2000 when the government allowed market opening to the largest industrial power consumers (Indre, Indre, and Conecini 2001). In July 2005 retail market was further expanded, allowing all industrial consumers to choose their power supplier. At the time, there were 8.6 million power consumers in Romania, of which 8 million were residential and 600,000 were industrial consumers (Mihaela and Bădileanu 2014). Thus, only 7% of the total consumers were able to choose their suppliers. The majority of the consumers remained under regulated tariffs until 2021. In January 2021, the government fully liberalized the retail market with the aim of enhancing competition between suppliers on the market and the increasing availability of bundled energy products (Botezatu Estrade Partners 2021).

Lead times also reflect hurdles faced by countries in the transition process, with numerous documented instances of countries transitioning to a new structure but having difficulties fully operationalizing this new structure. A common example is countries that changed market structure from VIU to SBM but operationalization was delayed due to no IPP entry. Ethiopia in 2013 initiated reforms to attract private sector investment to increase generation capacity amid demand growth and significant load shedding. The government partially unbundled the VIU separating distribution and created an institutional framework for establishing IPPs in the sector. There were two tendering rounds to procure 1,000 MW of electricity from IPP projects; the first tender for two solar photovoltaic (PV) projects led to the signing of a PPA that was hailed as one of the cheapest tariff rates in Sub-Saharan Africa, at US\$2.526 cents/kilowatt hour (kWh) over 25 years (Ayele et al. 2021). However, none of the projects have yet become operational due to a range of macroeconomic issues including risk of foreign currency availability.

Strong regulators: Based on the Global Power Market Structures database, majority of countries established an energy regulator between 1991 and 2010 (Table 3). During this period 125 countries transitioned

between market structures and 92 of these countries established an energy regulator within this period – usually several years prior to the market structure transformation. Regulators that led the transition helped design the tariff structure, maintain system reliability, expand access, encourage private investment, increase energy security, and manage risk. They were also empowered to implement difficult decisions. In Romania, the energy regulator’s capacity and independence improved significantly with the adoption of a new law transposing the European Union (EU) Third Energy Package—conditionalities that came with the IMF program to reform electricity and gas sectors—and eliminate several large contracts between state-owned energy companies and favored players. The regulator, Romanian Energy Regulatory Authority, enjoyed independence, stable management, and capacity. It could promote politically difficult reforms despite pressure from the large energy consumers that benefited from the regulated prices.

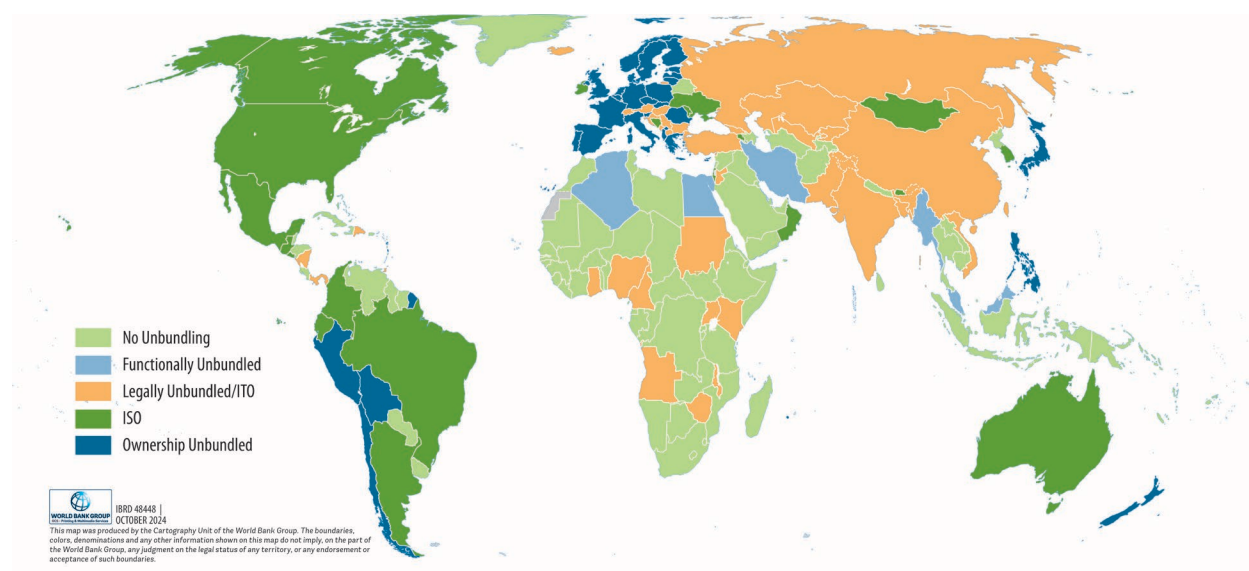
Table 3: Number of countries & territories that established an energy regulator by region in each time period

	East Asia & Pacific	Europe & Central Asia	Latin America & the Caribbean	Middle East & North Africa	North America	South Asia	Sub-Saharan Africa	TOTAL
Pre-1991	0	2	2	0	2	0	0	6
1991-2000	0	21	16	1	0	2	10	50
2001-2010	15	18	6	8	0	4	11	62
2011-2020	2	6	6	1	1	0	16	32
2021-2024	2	1	0	0	0	0	0	3
Total	19	48	30	10	3	6	37	152

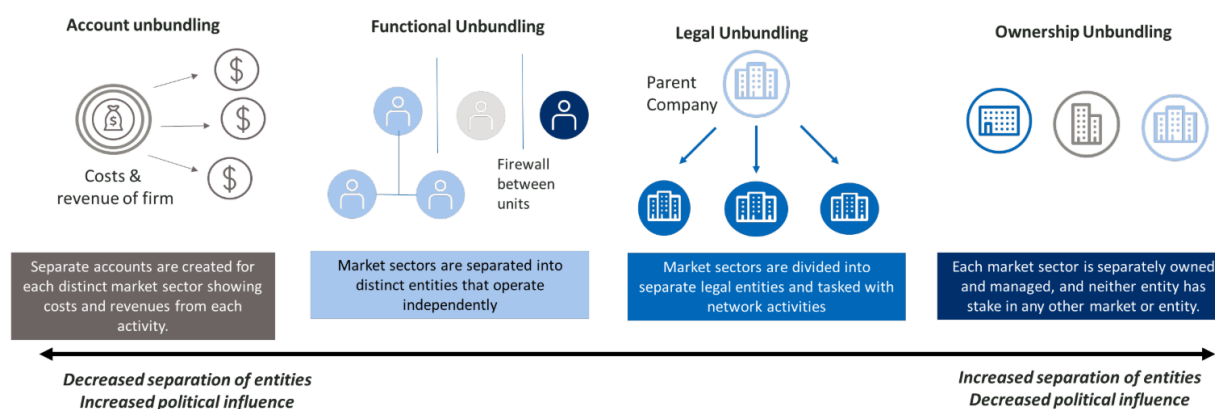
Source: (Akcura 2024)

Unbundling: One of the key sector reforms has been separating network from generation and retail functions. Transmission unbundling in particular has been pursued as countries transitioned out of VIU into SBM and WRC structures, although the degree of unbundling varies between countries (Figure 12). Based on Global Power Market Structures Database, as of July 2024, 93 economies have instituted some type of unbundling of their power transmission. Most have unbundled transmission in phases starting with separating the financial accounts of the VIU for each segment, then to organizationally separate functions, and progressing to create separate legal entity responsible for transmission which formalizes the separation created through accounting and functional unbundling. In some countries, primarily in Western Europe, ownership unbundled transmission such that the company owning and operating a network is not allowed to be active in any competitive segment of the electricity supply chain nor have an interest with respect to those activities. This ensures that there is no conflict between those who control the network and market participants (IPPs, traders, retailers).

Figure 12: Type of Transmission Unbundling in place as of July 2024



Source: (Akcura 2024)



Source: (USAID 2022)

Other trends are common to countries following similar transition paths. The global experience shows that markets adopting more competitive markets had the following features:

Larger market size: Market size has been an important determinant for transition into wholesale or retail competition. A large pool of stakeholders that push for more open alternatives to buy and sell energy has been instrumental for countries that transition to more competitive structures. Thus far, markets that transitioned into competitive market structures have a *median* electricity consumption of 50,255GWh as of 2022. This new finding is in line with the findings from past studies indicating that the retail model becomes feasible with a power system capacity of around 3 gigawatts and a wholesale power market turnover of around \$1 billion (Rudnick and Velasquez 2018). But advances in digitalization is enabling small scale retail, providing a bypass option to retail competition for less advanced markets.

Higher incomes: Thus far, the transition to retail competition has rarely occurred in countries with less than 1 million people and not classified as high income (gross national per capita income of more than \$14,005). Within the group, the average income in countries with full retail competition is about five times greater than the average income in countries with partial retail markets. More importantly, these markets could

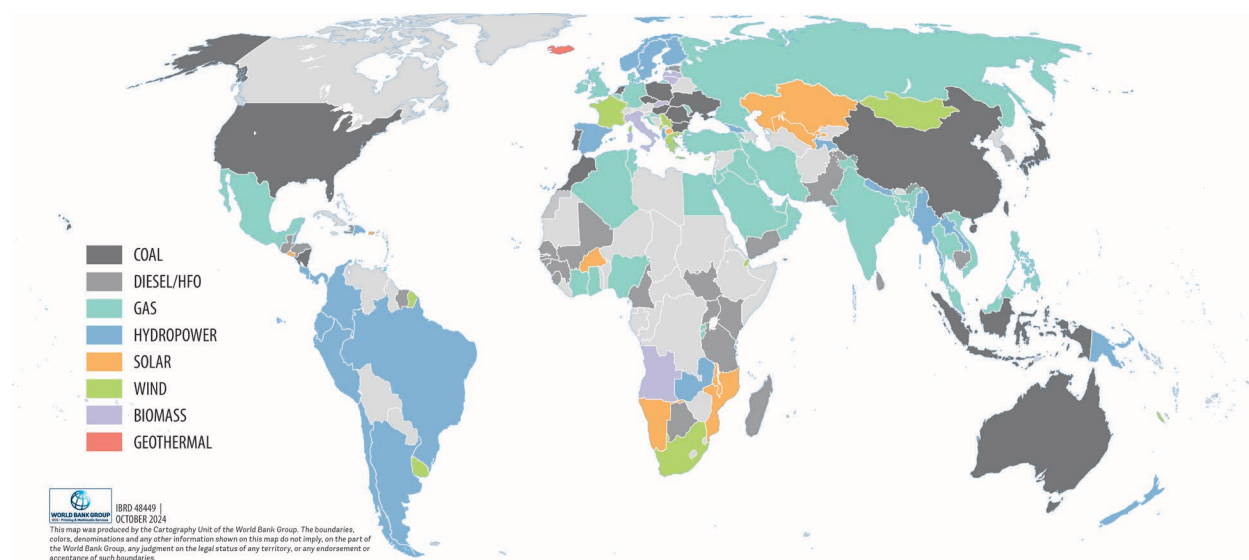
implement tariff reforms, achieve cost reflective tariffs, and establish creditworthy off-takers which enabled flow of adequate cash into the sector necessary to ensure successful market operations. All countries that transitioned into some form of full retail competition model have stuck with it, with sample countries having 16.4 years of experience, on average, operating retail markets.

3.4 Spotlight on IPPs as Catalysts for Market Evolution

Independent power producers played a decisive role in catalyzing adoption of competition in markets, as IPPs and merchant plants have been pioneers in the broader transition of markets into single buyer, and wholesale merchant markets, respectively.

Since 1989, 152 economies introduced private independent power producers (IPPs) to their generation segment. In nearly all cases IPPs were the trigger to operationalize the transition out of the VIU into SBM. Based on the Global Power Market Structures Database, there is significant heterogeneity in the technology type of the first IPP entry into countries globally and the technology adopted by pioneering IPPs has shifted over time (Figure 13).

Figure 13: Technology type of the first IPP entrant in countries



Source: (Akcura 2024)

Historically, IPP entrants were primarily thermal or hydropower generators. Since 2021, the first IPP entrants into countries are predominantly solar IPPs. Currently, in 19 countries the first IPP project is under preparation/construction and 15 of these are solar IPPs (Table 4). The fall in cost of solar power generation in recent years explains this trend. Indeed, several countries with VIU structure have transitioned to a type of SBM structure through the entry of solar IPPs that sell power to the VIU. This market design allows limited competition for the market, whereby private generators compete to supply power to the VIUs via contracts. Examples include the following.

VIU to SBM through solar IPPs - Burkina Faso: When a country experiences a deep and prolonged economic or political crisis but wants to attract private sector investment to meet sector objectives—such as improving access and service quality—adopting the simplest SBM design by allowing IPPs to sell to the VIU may initially be the best approach. Implementing deep structural power sector reforms and attracting private investors during a period of high economic and political turmoil is extremely challenging (Krishnaswamy and Stuggins 2003). Burkina Faso has faced several political challenges, including conflicts

in neighboring countries, a popular uprising in 2014 that forced President Compaoré into exile, a military coup attempt in September 2015 in the midst of the country's political transition, and a terrorist attack in Ouagadougou in 2016. The country long struggled to meet fast-growing power demand due to a shortage of installed capacity, poor availability of existing power plants, and fluctuations of import volumes during the peak demand season (February–June). The combination of dependence on imported fuel for power generation, oil price fluctuations, and a lack of cost-reflective tariffs adversely affected the sector's financial performance between 2011 and 2015. In 2022, the country transitioned to a type of SBM structure as a 30MW solar IPP, the first IPP in the country, became operational selling to the VIU. The project was entirely developed, financed and built by a private company which will also operate and maintain the plant.

VIU to SBM through wind IPPs - Djibouti: Djibouti, strategically located at the convergence of the Red Sea and the Gulf of Aden, faces challenges in meeting its electricity needs due to limited natural resources. Less than half its population (42 percent) have access to electricity and the country relies heavily on electricity imports from Ethiopia and aging fossil fuel generators. Despite its abundant wind, sun, and geothermal potential, the country struggled to attract foreign private investment, often citing the lack of electricity as the primary constraint. In April 2020, the Multilateral Investment Guarantee Agency (MIGA) provided \$91.6 million in guarantees to two international investors, Africa Finance Corporation and Climate Investor One. These investors were part of a public-private consortium that developed the groundbreaking 58.9 MW Ghoubet wind farm, Djibouti's first IPP. The plant became operational in September 2023. With the operationalization of this IPP, Djibouti transitioned to an SBM type market structure from the VIU structure it had operated under since 1960. It is also the latest example of solar and wind IPPs prominence in initiating countries' transition out of VIU structures.

Table 4: First privately owned IPP entrant's technology by decade

First privately owned IPP entry	Coal	Gas	Oil (HFO or diesel)	Hydropower	Wind	Solar	Biomass	Geothermal	Battery	TOTAL
Pre-1991	1	2	3	4	0	0	0	0	0	10
1991-2000	11	10	10	12	2	1	3	0	0	49
2001-2010	4	16	13	7	4	1	1	1	0	47
2011-2020	0	12	5	2	7	8	4	0	0	38
2021-2024	0	0	0	0	1	6	0	0	1	8
Currently under construction or preparation	0	0	0	2	2	15	0	0	0	19

Source: (Akcura 2024)

IPPs as catalysts for the wholesale market - Türkiye: As markets progress to advanced structures such as wholesale markets, merchant schemes for renewable energy can also be the trigger for the development of a spot market. In the last two decades Türkiye's electricity sector has transitioned to a competitive wholesale market, as the government adopted market-based reforms with private sector participation, which has delivered improvements in sector outcomes. Until the 1980s Türkiye's energy sector was dominated by a state owned vertically integrated company, the Turkish Electricity Authority. Following legislative reforms in 1984, the first IPPs were introduced to combat shortfalls of electricity generation. However, these plants were seen as very expensive and required public guarantees from the Treasury. The government launched

further structural reform of the state-owned energy companies in 2001, culminating in the establishment of a competitive market. Installed generation capacity more than doubled between 2008 and 2018, with new capacity growth achieved mainly through merchant IPPs. Concurrently, Türkiye introduced a centralized electricity trading platform and private sector participation in networks; these strategies together contributed to the successful transformation of the market.

4 Experimentation in Power Market Designs

In the past 35 years, many countries experimented with different design options within their market structure. This section provides an overview of the experience of countries switching between different power market designs in each of the four market structures.

4.1 Public vs Private VIUs

Twenty-nine countries, mainly in Latin America and the Caribbean and Sub-Saharan Africa, shifted between having VIUs that were majority state owned and VIUs that are majority privately owned. Seventeen of these countries that moved their VIU into private management and/or ownership have retained this design to this day. For example, Côte d'Ivoire's VIU has been operating under a private concession from the government since 1990. In 2020, the government renewed the concession agreement for a further 12 years through 2032 (US Department of Commerce 2024). The VIU now acts as a single-buyer purchasing electricity from IPPs.

Twelve countries renationalized their VIU. The main reasons for renationalizing VIUs include the below.

Political shifts favoring state ownership: The República Bolivariana de Venezuela had a hybrid of regional VIUs owned by state and private entities between 1980s and 2007. In the 1990s, the República Bolivariana de Venezuela started to reform the sector for its gradual opening to private sector participation in generation and distribution. Between 1998 and 2003, about \$142 million¹⁴ in private sector investment flowed into the Venezuelan electricity sector. However, with a new political regime taking over in 1999, privatization efforts were ceased, and all private sector assets were eventually re-nationalized in 2007. In that year, state-owned VIU (Corpolec) was created to consolidate the power sector under full state ownership reversing previous privatization efforts. Renationalization was advanced by the Chavez regime to improve the quality of service and to maximize usage of local energy sources for electricity production. Since 2007, the República Bolivariana de Venezuela's power sector operates under the state-owned VIU without any IPP presence. Unfortunately, the sector's performance has deteriorated considerably since 2007, and the República Bolivariana de Venezuela has the highest transmission and distribution losses¹⁵ in the Latin America region, resulting in nationwide recurring electrical blackouts since March 2019 (Taylor 2023).

Private investors fail to get their anticipated returns on investment: Cabo Verde's VIU (Electra) was created as a state-owned company on April 17, 1982. In 2000, the government sold 51% of the company's share capital to the strategic partner formed by the Portuguese companies EDP- Electricidade de Portugal, SA and IPE - Águas de Portugal SGPS, which held respectively 30.6% and 20.4% of the capital of Electra. This private consortium took over the management of the company for six years. In 2006, the VIU was renationalized when investors who had not realized their anticipated returns sold controlling stake of their

¹⁴ (Balza, Jimenez, and Mercado 2013)

¹⁵ A rate of 26.2 percent in 2019, with losses valued at \$830 million.

shares back to the government. The country has since then transitioned to a type of single-buyer model with several IPPs selling to Electra. The government is currently considering unbundling Electra and seeking further private sector participation in the sector.

Private investor unable to improve services: Liberia's VIU, Liberia Electricity Corporation (LEC), in 2017 entered a long-term concession with Ireland-based ESB International Engineering and Facilities Management to operate and manage the utility (All Africa 2018). However, the private company experienced a number of issues including rising commercial losses and arrears by the government to LEC that restricted its capacity to provide reliable power supply while achieving profitability. The company estimated a loss of 60 percent of its revenue to power theft, amounting to more than US\$4 million monthly — depriving the management firm of much-needed funds to expand power supplies (Liberian Observer 2022). In July 2022, the government did not extend the private company's management contract, thus bringing the VIU back into state control.

Misalignment between the government and private VIU on sector objectives such as renewable energy acceleration: Dominica Electric Power Company (Domlec) is currently a state owned VIU. Its ownership has fluctuated between private and state three times in the past 30 years. In 2022, Domlec's ownership reverted to the state when the government reacquired majority stake in the company replacing previous private owner Emera which had acquired majority shares in the company in April 2013. The government and Emera were not reported to have any disputes, rather, the government's main position was the desire to accelerate geothermal generation expansion which they felt would be better served under state ownership (Joseph 2022). The Dominican power market is in theory open to IPPs but currently there are no IPPs operating and Domlec is the only generator and supplier in the country. Similar but a more contentious case is Grenada's experience with private VIU design (**Box 2**).

Box 2: Challenges implementing private VIU structures - Experience of Grenada

Since 1989, Grenada's VIU has switched between public and private ownership twice. Grenada sold a controlling stake in its state-owned VIU to the U.S.-based company WRB Enterprises in 1994, transferring management of the utility to the private sector. The utility had been operating poorly for 15 years owing to chronic underfunding. Electricity shortages were common. Grenada Electricity Services Ltd. (GRENLEC) became the new sole provider of electricity services in Grenada and assumed a public-private ownership structure. The company was publicly listed on the Eastern Caribbean Securities Exchange in 2008, further diluting government share to 10 percent, with 40 percent publicly owned.

During this time, access to electricity improved from 85 to 95 percent and WRB invested around USD 350 million between 1994 and 2019 to develop the island's generation and network infrastructure (Torrance 2021). However, electricity costs remained high as the country heavily depends on imported fuel-based generation. The rate-setting framework allowed GRENLEC to pass on any increase in the imported fuel price to consumers. The arrangement between the private owner WRB Enterprises and the government came under stress in 2017 ending in litigation proceedings at the International Centre for Settlement of Investment Disputes (ICSID), an arm of the World Bank. WRB disputed that certain clauses of the government's 2016 Electricity Supply Act that allowed distributed generation from households/commercial users were in breach of the 1994 privatization agreement which imposed restriction on other entities seeking to generate electricity. Government of Grenada was seeking to encourage uptake of distributed renewable energy (such as residential rooftop solar) to reduce dependence on imported fuels. However, according to GRENLEC the scheme was negatively impacting the company's financials.

The two parties were not able to reach an agreement and at the end of a two-year court case which ruled in favor of WRB, on 24 December 2020, the government bought back the shares from WRB under a share repurchase agreement. Grenada's government in 2022 signaled its intention to seek a new strategic private partner to help finance the operations of the utility.

Grenada's experience showcases some of the restrictions of this market structure. Private VIU structures may be too rigid to accommodate new sector objectives such as increasing renewable generation. The initial privatization agreement and subsequent regulation in Grenada was not structured in a way to encourage the private VIU to improve sector sustainability through investment in renewables as this was not a key sector objective at the time. As a private entity, it was unlikely that the GRENLEC management would encourage the development of third-party renewable generation that would put its own market share at risk unless it felt adequately compensated or equipped to profit from generating from its own renewable generators. GRENLEC as the monopoly would have to drive any large-scale transition to renewables.

4.2 *Bundled vs Unbundled SBM*

Ten economies switched from an integrated single buyer model where the VIU acted as a single buyer, purchasing power from IPPs alongside its generation assets, to an unbundled single buyer design. No country that unbundled its single buyer has reverted to an integrated SBM structure. These countries had several overarching objectives for this switch, including the following.

Incentivize private sector entry: From 1995 until 2005, Viet Nam's state-owned VIU, EVM, was the only player in the market. In 2005, the country's first IPP started operations and selling electricity to EVN. For seven years EVN acted as an integrated single buyer purchasing electricity from IPPs. There were power supply shortages as investment in generation did not keep pace with growing demand. EVN also faced financial issues as the regulated power tariffs did not cover its costs (Lee and Gerner 2020). Furthermore, the PPAs with the IPPs were denominated in foreign currency (USD and yen) resulting in financial stress for EVN when the currency depreciated. In 2012, the government legally unbundled EVN to create a separate Electricity Power Trading Company that purchases power both from state owned generators and IPPs. The government's vision for unbundling EVN was to trigger further private sector investment into the sector, including privatization of the state-owned generators. Under this market design private sector investment increased. By 2023, private players were estimated to own 42% of installed capacity (Thu and Ha 2023). EVN retains monopoly in the transmission segment but changes to the Electricity Law in 2022 now allow private sector investments in the grid. One private company in 2023 has taken advantage of this change in the law by building the transmission line from its solar plant to the grid (Thu and Ha 2023).

Prepare for a transition to a competitive wholesale market structure: A few countries created independent separate single buyers to gain experience in power trading before transitioning to a competitive wholesale market structure. For example, Oman Power and Water Procurement Company (OPWP) was an integrated power and water VIU that functioned as a single buyer purchasing power from IPPs starting in 1996. In 2005, the government unbundled the company creating a separate Oman Electricity Transmission Company as an independent system operator while OPWP became the market operator. OPWP envisaged moving to a more competitive wholesale market structure as the long-term PPAs with IPPs gradually expired. It began operational trials of a gross pool wholesale spot market in 2019. On January 2022, Oman formally transitioned to a gross pool market structure operated by OPWP. Currently, all generators that do not have existing PPA obligations are mandated to sell on the pool. The generators submit daily offers via a single unified portal. They can access market data such as schedules and prices and receive payment for electricity sold through the spot market. The market has created new revenue opportunities for generators especially for solar and wind projects (Al Arabiya English 2022).

4.3 Multiple Options for Competitive Market Structures

Countries have experimented with different designs for competitive wholesale power market structures. Examples of the main trends observed in the past 35 years include the following.

Bilateral trading to net pool design: Most countries started by only allowing bilateral trading between generators and large industrial consumers. Twenty-four countries gradually created a net pool alongside bilateral trading. Twenty-one of these countries are in Europe and Central Asia region. For example, Bulgaria in 2003 allowed bilateral contracting between generators and large industrial consumers with annual consumption over 40GWh. It gradually reduced the consumption restriction on consumers. In 2016, the Independent Bulgarian Energy Exchange (IBEX) operationalized a day-ahead market alongside bilateral trading. In 2018, IBEX started an intraday market. IBEX currently maintains 24-hour trading and trades can be placed up to 60 minutes before the delivery begins. IBEX coupled with the Greek power exchange in May 2021. Bulgaria is now able to trade electricity continuously on any given day via the Greek border.

Bilateral trading to cost-based wholesale market design: Five countries, all in Latin America, transitioned from bilateral trading to a cost-based organized wholesale market. For example, Peru in 1994 started allowing bilateral contracting between large consumers and generators as part of a first-wave of reforms to liberalize its power sector. A second wave of reforms in 2006 introduced an organized cost-based wholesale market operated by Comité de Operación Económica del Sistema Interconectado Nacional (COES). COES estimates the cost of producing electricity for every thermal generation plant based on the technical characteristics of each plant including the unit's heat rate. The price paid by the unit owner for input fuel is based on invoices submitted to COES by the generator. For hydropower plants COES determines prices based on an estimation of the opportunity cost of hydropower utilizing a stochastic discrete dynamic program to compute the opportunity cost of water (Wolak 2021). The thermal unit costs and opportunity cost of water are used by COES to solve generation output levels that minimize cost of meeting demand at all locations taking into account transmission network constraints. COES repeats this calculation every 15 minutes.

Gross pool to net pool design: Four countries changed their wholesale market design from gross pool to net pool. The United Kingdom was one of the first countries globally to adopt a gross pool power market design. The Thatcher government explored options in the early 1980s to introduce "competition in the market" to the electricity system in response to widespread concerns about high electricity prices. British policy makers developed an innovative market mechanism called "the Pool" which began trading on 1 April 1990. This was one of the first gross pool spot markets in the world. All electricity was bought and sold on a daily and half-hourly basis. Trades were concluded at a single marketplace assuming no transmission constraints; then, the system operator dispatched electricity taking into account physical realities (such as transmission constraints) and charged any resulting additional costs to market participants on a pro-rata basis. UK switched to a net pool design on 27 March 2001. The main reason for the switch was government's concern that the Pool was biased against coal-fired generators and the price setting rule of the Pool where all generators are paid the bid of the marginal unit unduly inflated wholesale prices (Green 1998).

Suspension of WRC operations: Some countries that created structures to enable wholesale market operations may, occasionally, not operate these markets. Argentina, one of the early adopters of power markets, when faced with macroeconomic challenges de facto moved back to a system where contracts were government-regulated and not the result of market forces. Between 1992 and 1999 following its first wave of reforms, Argentina's market was structurally sophisticated, well ahead of other emerging markets,

and became a model for deregulation. This progress came under threat due to a series of measures adopted in response to the 2001 macro crisis. Faced with massive devaluation, the government converted the electricity tariffs from US dollars to pesos, froze transmission and distribution tariffs, revoked all price adjustment provisions and inflation indexation mechanisms in public utility concessions, empowered the executive branch to conduct blanket renegotiation of concessions, and required that spot prices be calculated based on the regulated price of natural gas, regardless of actual fuel used. A competitive wholesale market structure was retained, although not allowed to support competitive market operations. Market operations were later restored during the second phase of reforms launched in 2015.

Ecuador illustrates a case when a country has reverted from a competitive market structure to a more centralized one. Ecuador had a state-owned VIU structure in 1989 and in the period 1996-1999 liberalized the sector to allow private sector participation by corporatizing, unbundling and privatizing parts of the VIU. In 1999, Ecuador moved further to create a cost-based spot market run by the system operator (National Center for Energy Control, CENACE). In 2007, following the election of a leftist political party, state influence on the sector increased, as part of the government's socialist policies that sought to reduce inequality in the country. However, reversal was mainly driven by multi-faceted sectoral issues that led to a crisis in the sector. First, the sector had failed to generate the level of private sector interest that had been expected from the implementation of reforms, due to tariffs that were not cost-reflective (approximately 44 percent lower) resulting in large deficits and heavy debt burden in the sector (Ponce-Jara et al. 2018). Ecuador's economic crisis in 1999 worsened this situation, as the end-user tariff was lowered further. Subsequently, the end-user tariff increased gradually but never reached cost-recovery levels. In addition, high technical and nontechnical losses (reaching about 23 percent in 2006) especially high customer arrears to distribution companies compounded the sector's problems (nontechnical losses were about 20 percent higher than the technical losses). Within this context, the state intervened in the sector by establishing a regulated unique tariff by consumer groups. Ministry of Finance was given the responsibility to cover any deviations from cost-recovery tariffs and the state took over all investments in the electricity sector. The sector moved to be dominated by state-owned utilities with only a few private generators remaining.

4.4 Dealing with Complexity in Retail Markets

Retail designs add complexity to power market operations that explains past performance in markets that adopted this structure. Only four countries immediately allowed retail competition for all customers. Most countries opened their retail market to competition gradually. Twenty-nine countries¹⁶ followed a gradual approach starting with allowing bilateral contracting between generators and large industrial customers, then expanding competition further to commercial customers and finally to all consumers including households. Some strategies adopted by countries with retail competition in power market to deal with complexity are discussed below.

Market power—The market power of incumbent energy companies can threaten effective competition and market entry of new supply companies. Large energy incumbents dominate the retail market due to legacy customers and a broader cost base, unlike independent supply companies seeking to enter this segment. The contestability of retail markets is necessary for the cost associated with setting up these complex market structures to deliver expected efficiency results. In some emerging markets, this constraint may justify long durations before a transition to full retail competition. The market power of incumbent energy companies

¹⁶ These are predominantly in the Europe and Central Asia region, 23 of the 29 countries.

can threaten effective competition and market entry of new supply companies. Strong sector regulation is needed to limit and eliminate uncompetitive behavior in the market.

Price volatility—For a fully liberalized market to be competitive, all entities along the value chain need to be exposed to price signals. However, this is not desirable for most small consumers as they tend to be risk-averse and do not want to be exposed to unpredictable price variations. Some countries have only opened up the retail segment partially to alleviate this risk. Alternatively, some European markets manage the price volatility risk for small consumers by having retail suppliers or aggregators take on active risk management through sophisticated risk hedging strategies to manage volatile and uncertain market prices so that these are not passed onto the consumer.

Transaction costs—Supply companies face significant challenges to maintain profitability by expanding and maintaining their customer base, improving business margins from existing customers, and minimizing both the cost to acquire and the cost to serve customers without sacrificing customer experience. Compared with a single incumbent provider, marketing costs increase when several retailers compete for the same customers. Transaction costs are lower for sales to larger industrial and commercial consumers; thus, most countries with retail competition opt to introduce retail choice in a phased approach. Slim margins in a competitive retail market lead to a need for product differentiation. Several European countries have boosted retail competition by using technology to drive product heterogeneity and innovation to capture higher margins.

Consumer participation—There are significant actual and perceived research costs for small consumers to participate in the retail market. For residential and small commercial customers, the time and effort required to shop around suppliers often exceed the expected benefit of finding a better provider. As a result, most consumers may not switch suppliers when given a choice and remain with their incumbent suppliers. In some countries, customers are confused about the complex contracts on offer by suppliers and have switched to contracts that are worse for them with higher prices. Such consumer inertia allows incumbents to price-discriminate against the least active consumers. Regulators can play an important role in putting in place regulations to enhance and incentivize more consumer participation in the market by reducing search and switching costs. For example, complex tariff structures can discourage customers from switching suppliers. Regulators can standardize the information in the electricity bill received by consumers across all suppliers, which simplifies the comparison of tariffs between energy retailers (Hampton et al. 2022). Improving the availability of websites where consumers can compare different offers by suppliers is another strategy to improve consumer participation (Huisman et al. 2024).

4.5 Off Grid and Distributed Generation

Formal market structures may not capture the whole story of how power markets function in practice in some parts of the world, especially lower income countries and fragile states. In several low-income or fragile states, functioning, modern, interconnected grids are hard to operate. Governance and management capacity are also often inadequate to run effective, integrated systems that deliver a continuous, stable power supply. In such countries, there may be alternative private suppliers of power outside the centralized power system. This is evident in fragile and conflict-affected states (e.g., Somalia) where private energy service suppliers primarily provide electricity through mini-grids or off-grid solutions.

In countries where the central grid network only covers a share of the population or where the system is plagued by electricity shortages, customers usually have the option to buy their own “captive” generation equipment. In some cases, it may be cheaper to share captive generation capacity among multiple users via

a mini-grid. In recent years, several countries have allowed mini-grids to develop, especially in regions not yet connected to the centralized grid network.

In Nigeria, poor service provision of the centralized grid has driven the growth of both mini- and off-grid solutions. Estimates of private captive generation capacity of 14 gigawatts serving some 100 million people significantly exceed the official capacity of the system 13 gigawatts, of which nearly two-thirds are usually not available (Ferrero 2018; Enerdata 2024). While traditionally forbidden, there is now a move to more independent localized systems, not only in remote areas but also in the largest city, Lagos. The government of Lagos state has promoted local power plants exploiting the local distribution system to wheel power to local customers. Private developers can also feature mini-grids for their housing projects.

5 Conclusions

Over the past four decades, alternatives to integrated monopolies have been deployed in all types of countries. More and more countries are moving toward allowing private sector participation in their power market, citing the need to address performance issues and to meet significant funding needs in the face of high growth in demand and tight fiscal space.

In 1989, the VIU model was the dominant market structure adopted by 215 countries. Today it remains the second most used structure, but its usage has significantly reduced to 72 countries. Countries mainly retain VIU structures either as a policy choice or due to exogenous binding constraints. It is the preferred structure especially by small economies and island states, some of which have retained the VIU structure but put it under private management and ownership.

In contrast, SBM and competitive wholesale market structures have been increasingly adopted. SBM, often viewed as an intermediary step in market liberalization, has become the most prevalent structure, adopted by 87 countries. Wholesale-retail competition models are less widespread (69 countries) but more common in advanced economies.

There is no one-size-fits-all solution to design and implementation of a smooth transition between stages. It takes time to design power markets that provide clear, correct signals that encourage private sector entry. This paper has taken a uniquely comprehensive global historical stock-take of different market structures and design options countries experimented with in the past 35 years. Their experience highlights some common principles that have enabled countries to successfully transition to more competitive power market structures. These include (a) as the first step, creation of a regulator or an independent body empowered with new missions and new business strategies; (b) optimal market size; (c) preconditions for a transparent market platform including sector restructuring by unbundling transmission; and (d) strong political will. Below we summarize the policy recommendations for enhancing the operationalization of each market structure based on the global experience to date. Further information on these strategies can be found in an upcoming IFC report (IFC 2024).

Policy recommendations for implementing private VIU structures

Countries may opt to retain VIU structures either as a policy choice or due to exogenous binding constraints. Based on the global experience with this structure, several key insights can be discerned:

- VIU market structures should be designed to engender commercial principles and create a genuinely arms-length relationship between the VIU and its owner(s), especially in cases where the state retains partial ownership.

- Where feasible, the public listing of the VIU can be pursued to improve the efficiency of operations and reduce fiscal stress. Countries lacking institutional capacity can seek advisory support, for example, from DFIs such as IFC, to facilitate public listings.
- Continuous and effective sector regulation is critical to ensure that the VIU's incentives are aligned with emerging sector objectives.

Policy recommendations for implementing SBM structures

Based on the global experience with this structure, several policy lessons emerge.

- The design of the single-buyer model should not be restrictive but seek to broaden competitive features to the extent feasible. This could entail privatization of the single buyer or unbundling it from other market functions.
- Unbundling generation assets from the single buyer should be considered to reduce the risk of preferential selection of bids from the bulk buyer's own generation subsidiary (or bias of competition in favor of the subsidiary).
- The single-buyer model should be designed to minimize indirect fiscal obligations and other risks that could undermine its benefits to be a reliable method of adding generation capacity in fiscally constrained markets.
- The single buyer model can serve as an interim market structure between VIUs and wholesale competition by showing the benefits of private investment and management before the conditions for a competitive market are satisfied. If this is the objective, PPAs must be designed so as not to lock the market in the SBM state.

Policy recommendations for implementing competitive wholesale markets

Based on the global experience with this structure, several policy lessons emerge, including the following:

- The use of competitive market mechanisms reaches its greatest scope when power markets operate with multiple buyers and sellers. Smaller markets can expand the market size by integrating with neighboring markets.
- The financial sustainability of the sector is a key requirement for effective market operation. The financial health of distribution companies, which are typically the main buyers in the market, must be in good standing to ensure their payment integrity to honor their obligations with generation companies under both bilateral contracts and the organized spot markets.
- The availability of risk hedging and contracting tools is critical in developing countries to ensure investors have the necessary financial instruments to balance their risks (for example, spot market volatility risk).
- Bilateral contracting between large power consumers and generators provides a practical way to introduce wholesale market competition since these transactions are easily customized to accommodate the needs of the seller and buyer which allows flexibility. However, they are often not transparent, as the details about the traded price and volume are limited to the two parties involved and are usually not made publicly available. Countries can complement bilateral contracting with a type of organized spot market to improve transparency in the market.

- While accounting for a relatively minor share of electricity trade in most countries, power exchanges offer an instrument for price discovery. Exchanges can also provide helpful hedging instruments for generators and consumers to lock in electricity prices for future time periods providing some protection from price volatility.

Policy recommendations for implementing competitive retail markets

Based on the global experience with this structure, several key insights can be discerned:

- Product differentiation is key for retail supply companies to capture higher margins associated with differentiated and a unique product in a segment that traditionally has slim margins.
- The contestability of retail markets is necessary for the cost associated with setting up these complex market structures to deliver expected efficiency results. In some emerging markets, this constraint may justify long durations before a transition to full retail competition.
- Transaction costs are typically lower for sales to larger industrial and commercial consumers. In some markets, a phased approach to opening up the retail market first to these customer groups and then extending it over time to households may be preferable.
- The market power of incumbent energy companies can threaten effective competition and market entry of new supply companies. Strong sector regulation is needed to limit and eliminate uncompetitive behavior in the market.
- Advents in disruptive digital technology hold promise to lower the cost barriers to independent supply companies that do not have these legacy advantages. Retail companies can deploy digital technologies to improve their competitiveness. For example, by utilizing advanced analytics on pooled customer data on customers' usage patterns, segmentation, and preferences, they can identify target customer segments and potential opportunities to deploy new products and services.
- Technological advances are placing sophisticated competitive market structures within reach of emerging markets by providing solutions to the traditional constraints that make this structure difficult to manage under weak regulations, a lower income customer base, and high transaction costs.

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