CAREC Energy Reform Atlas:
Manual on Unbundling
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A.J. Goulding has been engaged as Lead Consultant for the Energy Sector Reform initiative, which the Asian Development Bank ("ADB") has implemented as part of the Central Asia Regional Economic Cooperation ("CAREC") Program. This document, the Manual on Unbundling, reviews the different forms of unbundling that exist across the generation, transmission, and distribution functions, and offers an unbundling implementation approach that can be applied to countries in the CAREC region to various degrees. The Manual is accompanied by a separate Case Studies Report, which exemplifies the range of approaches to unbundling that are in place around the world through three case studies:

- ***Malaysia: an example of corporatization;***
- ***Ontario, Canada: an example of partial unbundling; and***
- ***New South Wales, Australia: an example of full unbundling.***

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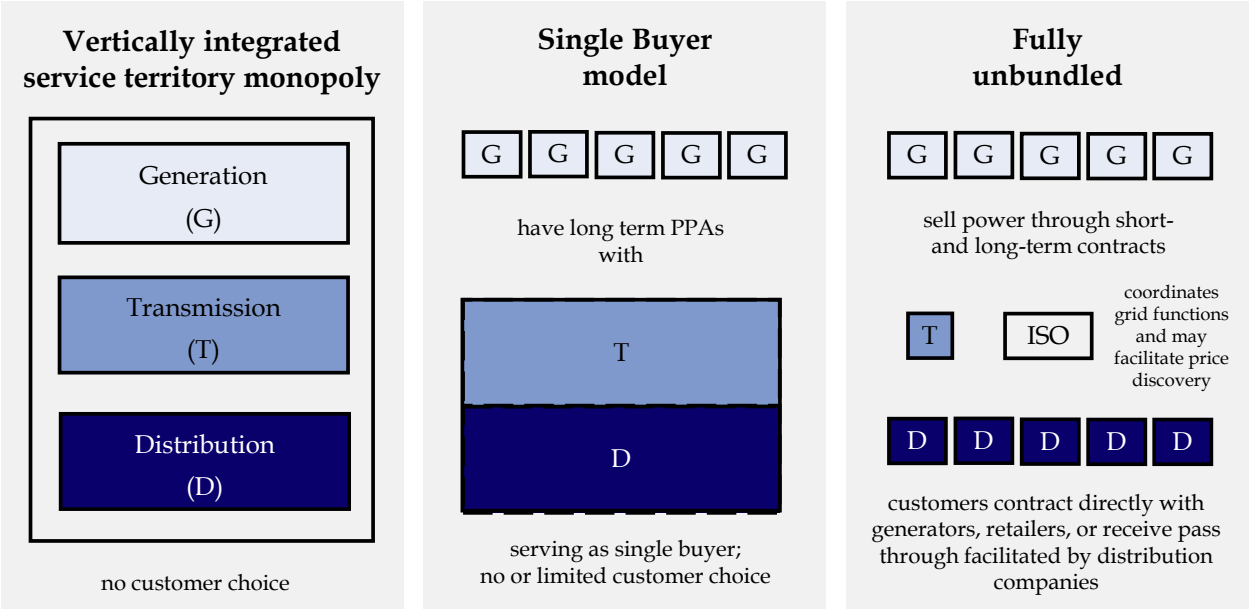
List of acronyms

ADB	Asian Development Bank
CAREC	Central Asia Regional Economic Cooperation
CTC	Competitive Transition Charge
DER	Distributed energy resource
DR	Demand response
DSPP	Distributed system platform provider
EV	Electric vehicle
FERC	US Federal Energy Regulatory Commission
GSO	Grid System Operator
HHI	Herfindahl-Hirschman Index
IESO	Independent Electricity System Operator
IPP	Independent power producer
ISO	Independent system operator
IT	Information technology
LBMP	Locational based marginal pricing
NEB	National Energy Board
NOPR	Notice of Proposed Rulemaking
NSW	New South Wales
NWA	Non-wires alternative
O&M	Operation and maintenance
OEFC	Ontario Electricity Financial Corporation
OPG	Ontario Power Generation
PPA	Power purchase agreement
REV	Reforming the Energy Vision
SB	Single Buyer
TNB	Tenaga Nasional Berhad
UK	United Kingdom
WACC	Weighted average cost of capital

1 Executive summary

The electricity sector was historically organized under a traditional ***vertically integrated monopoly model***, whereby utilities handled all aspects of the electricity value chain, from generation through to transmission and distribution (see Figure 1). Under this model, utilities had a monopoly over their own service territory, such that customers within it had no choice in selecting their electricity provider.

Figure 1. Options for market design and associated degree of customer choice



Note: PPA – power purchase agreement; ISO – Independent System Operator.

Since then, advances in generation technology and a propensity for over-capitalization by utilities have prompted market reforms, with the goal of separating generation and retail supply as competitive markets from the regulated monopoly businesses of electricity transmission and distribution. As illustrated in Figure 1, there are generally two main approaches to introducing competition into the sector.

First, under the ***single buyer model***, independent power producers ("IPPs") compete to provide power through long-term power purchase agreements ("PPAs") to a single buyer entity, which may or may not be independent from the utility operating the transmission and distribution functions.

Second, under the ***fully unbundled model***, competition is introduced in the distribution sector, where transactions between all parties (namely generators, customers, and intermediaries) take place relatively freely. On the demand-side, customers can choose their electricity provider and negotiate their own contracts, while on the supply-side, generators are able to sell their electricity

to any market participant.[1] Additionally, under the fully unbundled model, an independent system operator ("ISO") is established to coordinate grid functions, among other responsibilities.

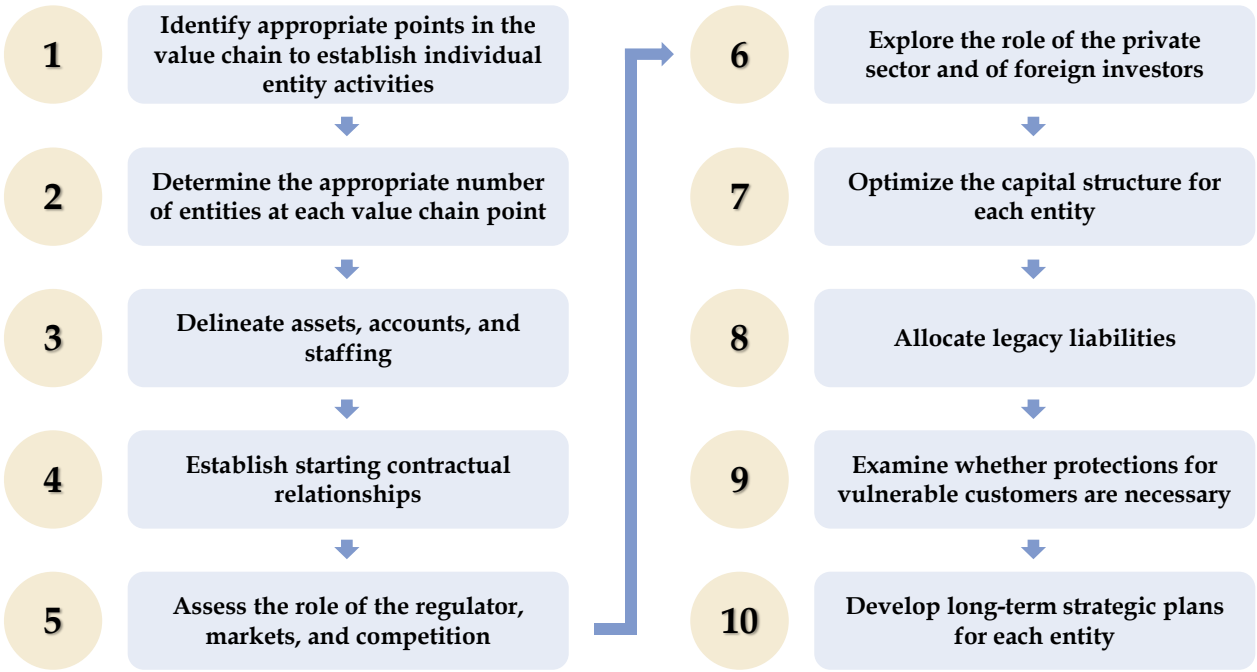
Global experience in the restructuring of electricity markets indicates that liberalization is a process that evolves as issues arise, and that a critical component of this process is ensuring that transitional mechanisms are put in place to mitigate the potential initial price volatility that may occur as reforms begin. Also, while multiple players in the generation sector create efficient competition that ensures market sustainability, predictability of changes (by avoiding inconsistent policies that result in disruptive changes) is vital. Overall, the success of electricity sector reforms and restructuring should not be judged solely by electricity price impacts, but instead should be evaluated by assessing the degree of achievement of stated goals/objectives. In most cases, the three key objectives of restructuring are:

i. improving efficiency and reducing prices;

ii. mobilizing investment by providing opportunities for investors to earn a reasonable return; and

iii. providing reliable electric service to customers.

Figure 2. Overview of the unbundling implementation approach



The following **Manual on Unbundling** ("the Manual") reviews the various degrees of unbundling that exist under energy market liberalization in detail, providing policymakers and interested stakeholders with a comprehensive document to inform their unbundling efforts.

[1] International Energy Agency. *Energy Market Reform: Competition in Electricity Markets.* February 20, 2001. P. 55.

Unbundling may commence with corporatization of an existing government department, or restructuring of a government-owned utility. The Manual is structured as follows:

- **unbundling basics** (Section 2): the opening chapter presents the underlying theory of unbundling, discusses the relative advantages and disadvantages of each form of unbundling, and outlines key considerations in deciding on a restructuring approach; and
- **unbundling implementation approach** (Section 3): this chapter proposes a 10-step basic action plan, which policymakers can use to begin the unbundling process in their respective markets. Each step in the 10-step approach is illustrated in Figure 2, and builds on the knowledge and principles introduced in the opening chapter.

In this paper we refer to degrees of unbundling (Figure 6), phases of unbundling (Figure 11), and steps to unbundling (Figure 2). Degrees of unbundling describes the extent of unbundling; phases describe the way in which various unbundled entities interact with one another; and steps are the concrete actions required to achieve unbundling, regardless of the degree or phase.

The Manual is also accompanied by a separate **Case Studies Report**, which looks to jurisdictions across the world to survey the various unbundling approaches that have been implemented to date. Specifically, the Case Studies Report focuses on three informative case studies:

- **Malaysia:** an example of corporatization;
- **Ontario, Canada:** an example of partial unbundling; and
- **New South Wales, Australia:** an example of full unbundling.

We refer to these three case studies throughout the Manual, using textboxes to highlight examples of how certain steps in the unbundling process have been tackled in selected jurisdictions. Further details regarding the unbundling approach used in each jurisdiction are available in the separate Case Studies Report, which also includes an overview of the electricity market in the respective jurisdictions to provide further context.

To assist in reading the Manual, we also review key energy sector terminology in a glossary (see Section 5). These terms are used throughout the Manual and are highlighted in ***bold italics.***

2 Unbundling basics

2.1 Introduction to the electricity sector value chain and practice of unbundling

The electricity sector value chain (see Figure 3) consists of several key components, which are often organized into four categories: (i) ***generation***, (ii) ***transmission***, (iii) ***distribution***, and (iv) ***retail supply***. For the purposes of this paper, retail supply means the purchase of electricity in wholesale markets or directly from generators for resale to final consumers. In turn, each of these segments may have other subdivisions. For example, generation includes fuel supply, plant construction, plant operation, and wholesale trading; transmission includes transmission line construction, planning and coordination of flows, and transmission line operations and maintenance; distribution, in addition to construction, operation, and maintenance, includes metering and billing.

Electricity value chain

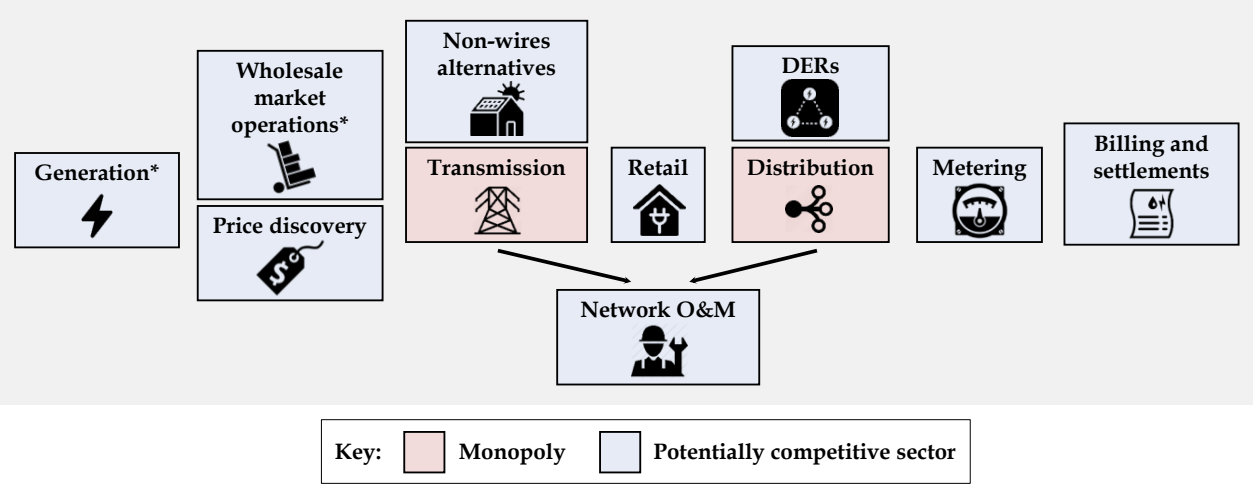
Generation: process of producing electric energy from other forms of energy

Transmission (high-voltage): bulk transfer of electric energy from generating stations to substations near load centers

Distribution (low- and medium-voltage): final stage in the delivery of electricity to end users

Retail supply: final sale of power from an electricity provider to end users

Figure 3. The electricity supply value chain



* ISO may be deployed.

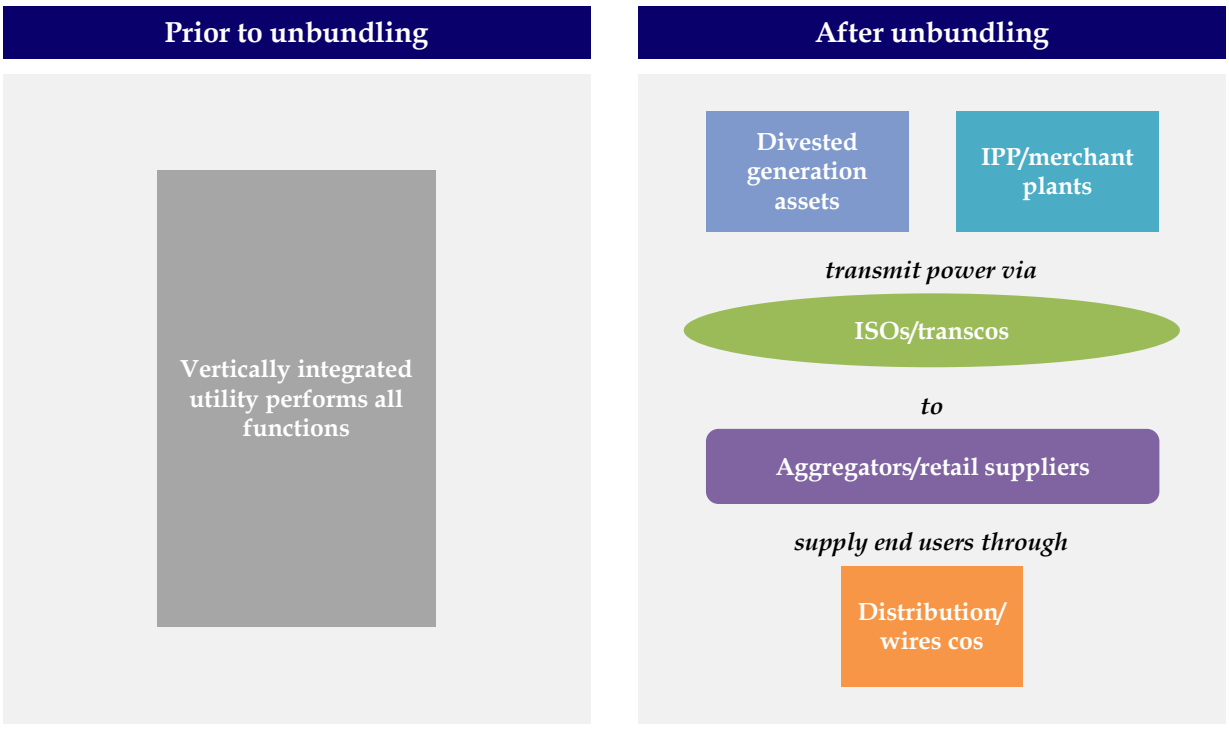
Note: DERs – distributed energy resources; O&M – operation and maintenance.

Historically, in many parts of the world, all of these functions would have been performed by a single, vertically integrated monopoly utility, which was either publicly or privately owned. Utilities were identified within a particular defined geographic service territory, and their system was built specifically to serve the needs of this particular area. Examples of such arrangements still exist in jurisdictions which have chosen not to liberalize their power sectors, or which have chosen different ways to attempt to improve the efficiency of incumbents.

The term ***unbundling*** refers to a process in which the traditional monopoly utility is gradually disaggregated into its constituent parts, in an attempt to achieve efficiencies through the introduction of competition, transparency, and achievement of ***horizontal economies of scale***.[2]

Unbundling results in a vertically integrated utility being divided into several new companies. For example, generating stations may be grouped into multiple new companies (gencos), or sold off individually to new owners. The transmission network may be split off into a separate company (transco), and an ISO created. ISOs coordinate flows on transmission lines but do not own or physically maintain the underlying assets. Creation of an ISO is particularly important if at any point the same entity controls both generation and transmission assets, as an ISO prevents self-dealing and maintains "open access". Open access is a regime whereby all those desiring to use the transmission system are treated in a non-discriminatory manner, with a transparent framework for identifying and contracting for spare transmission capacity using published tariffs. A power exchange may be formed, which may or may not be part of the ISO. Several new distribution companies may also emerge. Figure 4 compares the entities that are typically involved in the electricity value chain before and after unbundling.

Figure 4. Entities involved in the electricity value chain before and after unbundling



[2] For example, horizontal economies of scale may arise in a jurisdiction where, after unbundling, distribution companies are able to outsource billing systems or call centers more readily than they would have been inclined to do under their previous holding company structure.

The textbook case of electricity sector restructuring envisions full unbundling of the generation, transmission, distribution, and retail supply functions, where ownership ties are severed through divestiture and reorganization.[3]

2.2 Why were utilities integrated in the first place, and why unbundle them now?

Vertical integration is not unique to utilities. Industries tend to be vertically integrated when coordination between intermediate suppliers and customers is difficult, quality control is challenging, or reliability of timely delivery is in question. For example, at one time, automakers also made steel, glass, and many of the parts that went into the car; today, independent suppliers may make integral components such as seats and dashboards shipped partially assembled, and steel and glass are purchased from third-party suppliers. Airlines may own neither the planes they fly nor the reservation systems that put passengers on them, and contract out catering; several decades ago, all of these activities would have been performed by a single company. However, in countries where infrastructure is more poorly developed, contractual enforcement is weak, and communication between companies is more difficult, a higher degree of vertical integration continues to exist.

In the case of the electric sector, utilities at one time, in addition to generating stations, poles, and wires, may have owned coal mines and barges to transport the coal, and had extensive in-house engineering capabilities to build and maintain their generating stations. Utilities may also have owned the transit systems that used the power they generated, completing a cycle from primary fuel exploitation to end use. When the industry began, utilities were largely isolated from one another; networks for transporting electricity had yet to be built. If a utility wanted to assure that its customers had power, it had to build a power station; in some cases, if it wanted to assure a supply of coal at a predictable price to fuel the power station, it had to dig the mine. Gradually, as markets, networks, and enforceable contract relationships expanded, the number of activities a utility had to engage in to assure reliable supply decreased. In a way, the unbundling process is not new, but rather a continuation of trends that have been present since the beginning of the industry.

Many of the same technological trends that make just-in-time manufacturing possible facilitate unbundling. Policymakers explore utility unbundling for the same reasons commercial businesses exited peripheral businesses and streamlined their activities – because unbundling has the potential to increase transparency and management focus, and reduce the likelihood of preferential dealing (see Figure 5).

[3] Joskow, P.L. "Lessons Learnt from Electricity Market Liberalization," *The Energy Journal*. Special Issue. The Future of Electricity: Papers in Honor of David Newbery. 2008.

Figure 5. Benefits of unbundling

2.3 Further rationale for unbundling

The motivation to liberalize the electricity sector can be triggered by different events, such as: significant increases in the price of supplied electricity (as was the case in numerous US states, including New York, Massachusetts, and California); a revision of views of the role of the state (as was the case in the United Kingdom); and/or the mismanagement of important functions (as was the case in Ontario). The separate Case Studies Report explores how the mismanagement of nuclear operations at Ontario Hydro led the province to initiate their unbundling efforts – see the textbox below for a brief discussion.

Case study example: Ontario's transition to a hybrid market

The electricity market in Ontario, Canada is often characterized as a "hybrid" market, as it contains elements of both a centrally planned and competitive electricity market. Prior to restructuring, Ontario had a vertically integrated, provincially-owned monopoly, Ontario Hydro, which was responsible for generation, transmission, and distribution. In the 1990s, Ontario Hydro suffered major cost overruns, excessive debt, and poor nuclear performance, which caused electricity rates to rise by nearly 30%.

By 1996, Ontario began considering the restructuring of its electricity sector – policymakers called for the injection of competition and suggested the possibility of breaking Ontario Hydro into a number of competing generation companies, some of which would remain publicly owned. Pursuant to the *Electricity Act* of 1998, Ontario Hydro was eventually separated into five companies:

- **Ontario Power Generation ("OPG"):** which assumed Ontario Hydro's generation assets and the direct customer, retail, and wholesale operations;
- **Hydro One:** which inherited the transmission and distribution business of Ontario Hydro;

continued…

- **Independent Electricity Market Operator:** which assumed responsibility for administering the electricity markets and directing the operation of the transmission grid, and was later renamed to the Independent Electricity System Operator ("IESO") in 2005;
- **Ontario Electricity Financial Corporation:** which assumed all other assets and liabilities of Ontario Hydro; and
- **Electricity Safety Authority:** which is responsible for enacting regulations on a broad range of operational matters relating to the generation, transmission, distribution, retail, or use of electricity in Ontario.

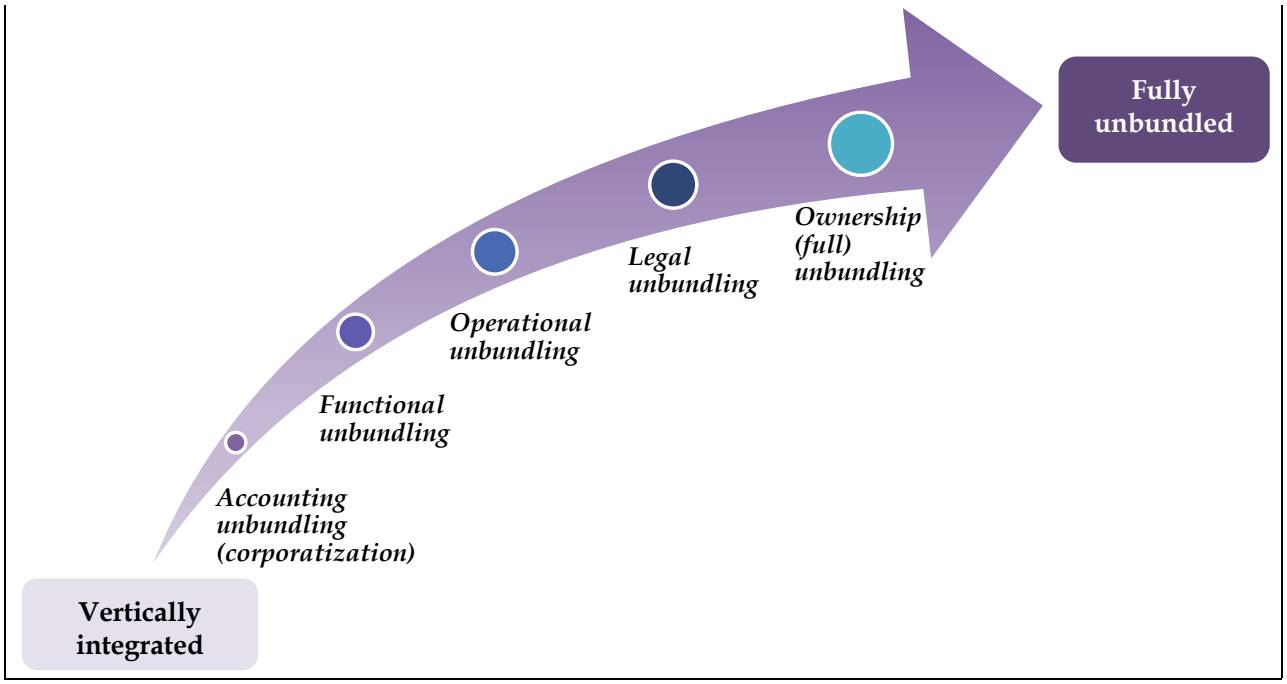
Regardless of the underlying reasons or motivations for beginning the unbundling process, the objectives of restructuring tend to focus on three main areas:

- **improving efficiency and arriving at lower prices than they would have been otherwise:** creation of a competitive marketplace for wholesale electricity (generators) and retail services (suppliers) has the objective of improving efficiency and reducing costs to end users. The use of performance-based ratemaking for monopoly businesses at the wires level (distribution and transmission) mimics competitive pressures of an open marketplace and contributes to reducing end-user costs by constraining the price increases of distribution and transmission services;
- **providing a reasonable opportunity to earn a return on investment:** earning a return on investment ensures that companies are financially sustainable and able to meet their financial and operational obligations. This is critical to the ability to continue to mobilize investment. Companies must be able to earn a return on their investments via competitive markets (generation and retail services) or as regulated monopolies (transmission and distribution networks); and
- **providing reliable electric service to customers:** restructuring efforts need to balance the objective of affordability with ensuring the provision of reliable electric service to customers through reliability standards, often including reliability and customer service performance standards and incentive schemes.

2.4 Degrees of unbundling

There are five degrees of unbundling that are typically recognized in the industry with respect to utility restructuring, as illustrated in Figure 6 and described in further detail below. The unbundling implementation approach discussed later in Section 3 can be used to reach any of these five degrees of unbundling, and any of the various unbundling phases, depending on the local appetite for restructuring.

Figure 6. Degrees of unbundling



The various degrees of unbundling are:

1. ***accounting unbundling (or corporatization):*** the least substantial form of unbundling, which takes place only at the accounting level and involves the separation of accounts for different functions or services. It may also involve conversion of a government department or board into a corporation. The ownership and governance of the company itself is unchanged (i.e., it remains vertically integrated), and no separate corporate identities are created for individual segments of the value chain;
2. ***functional unbundling:*** separates different functions or services into different divisions within the same company;
3. ***operational unbundling:*** occurs when the original owner continues to hold title to the assets (and therefore receives the economic benefit of the assets), while another independent entity controls the operation of such assets;
4. ***legal unbundling:*** separates different functions or services into different corporate entities, but maintains some or all of them within a common (holding company) ownership structure; and
5. ***ownership unbundling (or full unbundling):*** separates different functions or services into unaffiliated entities, which are then owned by different parties. These separate companies have separate and distinct boards, legal identities, premises, staff, and shareholders.

Notably, not all forms of unbundling are mutually exclusive – for instance, the generation segment can be fully unbundled with separate ownership, while the transmission segment can remain only operationally unbundled. This can be seen for example in the Northeast United States, where the transmission segment is operated by an ISO, and the generation segment is fully divested. The relative advantages and disadvantages associated with these various degrees of unbundling are summarized in Figure 7, and are discussed in detail later in Section 2.5.

Figure 7. Advantages and disadvantages of various degrees of unbundling

Unbundling approach	Advantages	Disadvantages
Legal unbundling	• Provides the ability to allocate capital more efficiently between wires and generating assets	• Both regulated and unregulated affiliates have common shareholders, which could lead to anti-competitive behavior and potential cross-subsidization • Requires comprehensive, ongoing oversight and enforcement to ensure no abuse of market power
Ownership (full) unbundling	• Provides a stronger guarantee that the newly unregulated businesses will not be advantaged by potential ties to regulated affiliates • Each entity able to focus on its own competitive objectives	• Most complex, time and resource intensive approach to implement, as each segment of the value chain is unbundled

The separate Case Studies Report exemplifies this range of unbundling approaches by presenting three case studies, which are briefly summarized in the textbox below.

Case study examples of the various degrees of unbundling

- **Malaysia (corporatization):** Malaysia's electricity supply industry has evolved from a centralized market structure upon inception to the single buyer model in place today. Privatization efforts began in the late 1980s, when the Government of Malaysia became concerned with the low efficiency and productivity of state-owned enterprises. By 1990, the National Energy Board ("NEB"), which was a state agency responsible for the planning and operation of the electricity supply industry in Peninsular Malaysia, was corporatized as Tenaga Nasional Berhad ("TNB"). In 1993, five companies were granted generation licenses to establish power plants and sell their output to TNB, as the first IPPs in the country. By 2010, the sector continued to evolve, as TNB was functionally unbundled, with its regulatory accounts separated into six business entities: (i) the Transmission Division; (ii) Distribution Network; (iii) Grid System Operator ("GSO"); (iv) Single Buyer ("SB – Operations"); (v) Single Buyer ("SB – Generation"); and (vi) Consumer Services. Crucially, the Single Buyer entity was set up as a ring-fenced department within TNB.

(continued…)

- **Ontario, Canada (partial unbundling):** throughout the late 1990s and early 2000s, Ontario transitioned from having a vertically integrated, provincially-owned monopoly (Ontario Hydro) to a "hybrid" market, which contains elements of both a centrally planned and competitive electricity market. Currently, competitive power generators bid into and receive dispatch instructions from a wholesale market administered by the province's Independent Electricity System Operator ("IESO"), with retail choice at the consumer level. However, Ontario's electricity market still largely consists of a principal buyer, with this role being served by the IESO. Some generation assets were privatized, and the bulk of new build has been privately owned. The primary transmission owner also serves a significant number of distribution customers.
- **New South Wales, Australia (full unbundling):** New South Wales ("NSW") is a pioneer in electricity restructuring in Australia. Prior to the reform process, electricity in southeast Australia was provided by vertically integrated, centrally planned, state-owned monopolies operating in each state and territory. Electricity market restructuring in NSW began in the 1990s and was driven in large part by inefficient investment and poor operational performance by state-owned generators. Over the period from 1991 to 1996, three generation businesses were legally unbundled, transmission assets were separated into TransGrid, and the fragmented distribution sector was consolidated into six distribution businesses. Full unbundling occurred later between 2010 and 2014, with privatization of the generation and retail sectors.

2.5 Expected benefits and challenges

While the benefits of unbundling in general have been discussed previously in Section 2.2 and Section 2.3 (including increased transparency and management focus, as well as a reduced potential for preferential dealing), one must consider the range of factors that may impact these expected benefits, such as the potential for:

- **increased transaction costs:** opponents of unbundling argue that the greater number of entities resulting from unbundling leads to higher aggregate transaction costs, as internal responsibilities that were once managed by one vertically integrated company are instead replaced by various (independent) entities with external/contractual duties and obligations to support ultimately reliable service. The increased number of stakeholders involved in regulatory decisions also has the tendency to increase regulatory costs;
- **loss of economies of scope and scale related to vertical integration:** a loss of economies of scope is thought to arise because savings once enjoyed by the vertically integrated entity can no longer be derived from common costs among various segments of the business, as these segments have been disaggregated into separate and distinct entities with their own internal processes;
- **price increases for small customers who choose to take default service (i.e., electric service from the incumbent utility):** this risk arises when large customers depart from utilities and choose to take electric service from competitive suppliers instead. As such, the utilities' costs can only be recovered from the remaining small customers; and

- **new challenges related to organization and coordination:** under the unbundled structure, where prices are largely set by competition, new functions of market power monitoring and mitigation must be undertaken by regulators. Furthermore, ensuring reliability becomes a more complex task as ISOs must coordinate with transmission owners and a multitude of generators. In addition, new entry is triggered primarily by market dynamics, which are not under the control of the regulator or the ISO.

To ensure that unbundling achieves the expected benefits, policymakers must approach the question of restructuring methodically and at a holistic level (i.e., taking into account other key factors affecting wholesale and retail competition). As a start, it is important for policymakers to clearly lay out their objectives. Once these objectives have been defined and a general approach to restructuring has been outlined, policymakers can begin to implement the steps discussed later in Section 3.

The benefits and challenges unique to each degree or form of unbundling also need to be considered when evaluating the best restructuring approach for a specific market.

Proponents of ownership/full unbundling usually argue that, compared with legal unbundling, it provides a stronger guarantee that the newly unregulated businesses will not be advantaged by potential ties to regulated affiliates. Under legal unbundling, both the regulated and the unregulated affiliates have common shareholders; some regulators have expressed concern that such a structure could lead to anti-competitive behavior and potentially cross-subsidization of deregulated activities with ratepayers' funds from regulated business operations.

Some regulators have determined that this concern could be satisfactorily addressed by directing affiliated entities to adopt ***codes of conduct*** (as was the case in Texas, for example). An effective code of conduct establishes the rules governing the relationship between regulated utility subsidiaries and their competitive affiliates. The aim of a code of conduct is to behaviorally restrict the incentive to maximize profits through cross-ownership at the holding company level. A code of conduct does not, however, change the structure of the market, and therefore the incentives to discriminate, cross-subsidize, or abuse market power may still be present. As a result, legal unbundling requires comprehensive, ongoing oversight and enforcement from the regulator, in order to ensure compliance. This incentive does not exist under ownership/full unbundling because each entity answers to different owners, without having to consider competitive objectives of any subsidiaries.

Compared to ownership/full unbundling, legal unbundling may also be viewed as providing the ability to allocate capital more efficiently between wires and generating assets.[4] However, under legal unbundling, regulated affiliates run the risk of being financially drained by the holding company, if not effectively ring-fenced.

[4] For example, borrowing at lower cost for regulated businesses with relatively low risk revenues and leveraging unregulated businesses outside of the thresholds dictated by regulators for regulated businesses.

2.5.1 Evaluative tools for measuring the outcomes of unbundling

Unbundling cannot be evaluated as a process independent of the overall liberalization objectives it is intended to achieve. An unbundling process can be considered successful when it achieves greater transparency, serves as a foundation for sectoral evolution consistent with government policy, and drives each of the new companies to seek greater efficiencies than they would have if unbundling had not occurred.

Another measure of the success of an unbundling program is the extent to which disputes associated with the process do not linger; a well-designed unbundling process should address most of the topics of potential future litigation pre-emptively. A successful unbundling approach also changes the corporate culture of the resulting entities; if the resulting entities are less dynamic than their former parent, unbundling has yet to succeed. Arguments that unbundling creates additional bureaucracy overlook the fact that the "new" bureaucracy was generally a pre-existing layer in the "old" bureaucracy; spinning it out makes the new firm more nimble, without requiring additional human resources.

Figure 8 outlines an illustrative scorecard for measuring the outcomes of unbundling, which demonstrates the range of impacts that can result from sector restructuring. Policymakers can use this scorecard to evaluate the unbundling process as it unfolds, and can customize the scorecard to add or remove certain evaluative elements, or to place more or less weight on outcomes that are relatively more or less important to the local context.

Figure 8. Illustrative scorecard for measuring the outcomes of unbundling

2.5.2 Key factors to aid the transition process

The relative success of unbundling is based on a multitude of factors that are important determinants of private sector involvement, including the **longevity** of the restructured market design, a **low frequency of intervention** that results in major changes to the course or approach

to unbundling, evidence of **efficiency improvements**, and the availability and effectiveness of **hedging instruments**.

Similarly, barriers to success include factors that impede the unbundling process, such as a **lack of due process** (i.e., failure to subject policy changes to robust analysis), **insufficient education for stakeholders**, **overlapping jurisdictional authorities**, and a significant **lack of goodwill among stakeholders** (particularly when parties have a zero sum mentality). Moreover, **over-ambitious targets/goals** may also be a recipe for not achieving the intended unbundling outcomes – for instance, a "big bang" approach (which involves implementing all the reforms at the same time without analyzing the impact of individual features, and without sufficient time for stakeholders to recognize the new realities) can lead to unbundling challenges.

It is important to recognize that electricity sector unbundling is a process. It requires careful planning and pragmatic implementation, coupled with the openness to consider and the ability to adjust the approach to account for changing conditions. While there is no perfect recipe for unbundling, a review of literature and experience to date suggests that there are several key factors that aid the transition process, and help to create properly functioning competitive markets and regulated utilities:

- **commitment to reforms and abstaining from politically expedient changes:** the experience of restructured electricity jurisdictions suggests that a key barrier to success is the unwillingness to commit to reforms and reluctance to expose customers to electricity price volatility.[5] These concerns exhibit themselves through price-protection schemes on the user side (e.g., default services at regulated rates) or price caps of the wholesale market on the generator side;
- **clear path for the restructuring program with well-defined milestones:** defining a clear path for reforms with associated milestones allows investors to prepare for the changes in the marketplace. This creates an environment that facilitates investments in new generation capacity during the transition stage, where the market signals may not be fully transparent, or may not be sustained long enough to indicate the opportunity for private sector involvement;
- **careful planning that includes proper tools to facilitate the transition:** the transition process (a period when stakeholders are starting to familiarize themselves with the new marketplace realities, and new mechanisms and relationships are being established) is a critical stage in the restructuring process. The availability of transitional mechanisms is an important factor in ensuring the smooth and gradual change in the market dynamics, that mitigate the risks that are difficult or impractical to hedge;
- **avoiding regulatory capture:** creation of a strong independent regulator is necessary for a well functioning electricity system. The regulator needs to have skills in both price regulation for the monopoly aspects of the sector, and competition regulation for the parts of the value chain where competition is feasible. When creating regulated entities, it is important to do so reflecting minimum efficient scale considerations, while being

[5] Joskow, P.L. "Lessons Learnt From Electricity Market Liberalization," *The Energy Journal*. Special Issue. The Future of Electricity: Papers in Honor of David Newbery. 2008

attentive where possible to creating multiple entities. Creation of multiple entities helps the regulator to benchmark performance, and it avoids an imbalance of power between the regulator and the regulated entities. The fact that one segment of the value chain is viewed as a natural monopoly is not justification for putting all activities of that segment into a single entity;

- **creation of competitive markets that consist of multiple players and minimal regulatory barriers to entry:** failure to create a competitive market with a sufficient number of players and minimal regulatory barriers to new entry is equally important for both generation and retail supply markets. This has been the experience in Ontario in the initial stages of its market evolution of the generation sector and in many states in the US on the retail side;
- **availability of hedging instruments:** a wholesale market without the availability of proper hedging instruments is likely to test the stability of the market in the event of exogenous events. Hedging instruments should provide opportunity for sellers and buyers to limit their exposure to price volatility and help stabilize the prices when the market is experiencing extreme events (for example, during extreme cold or hot temperatures and transmission and power failures). The textbox below provides one example of a hedging instrument, namely the three-year vesting contracts implemented in the United Kingdom ("UK") during its transition to a competitive market;

Dealing with volatility in the spot market: UK vesting contracts

During its market reform process, the UK imposed vesting contracts for generators and distributors as a transitional mechanism towards a competitive market. From April 1st, 1990, to March 31st, 1993, regional electricity companies were obliged to purchase a fixed amount of electricity from generators at a price that would guarantee margins for both parties. Vesting contracts protected the generators and distributors from high coal prices and the volatility in the pool market. In this way, the three-year vesting contracts helped to stabilize the functioning of the market.

Source: Bower, John. *Why Did Electricity Prices Fall in England and Wales?* September 2002. Oxford Institute for Energy Studies EL 02.

- **be attentive to new technologies and how they are changing the industry:** the growing installation of distributed energy resources ("DERs") and the potential for increased use of electricity in transportation (electric vehicles or "EVs") along with the declining cost of battery storage are all factors that will potentially change the organization of the sector. The textbox below highlights how New York is exploring the distributed system platform provider ("DSPP") model to address these changes. While emerging economies need to be cautious about adapting overly complex sector organization frameworks as they begin unbundling, among other issues eventually all policymakers will need to explore:
    - markets for distribution-level connected resources;
    - tariffs which provide appropriate incentives for charging EVs at the most economically efficient times;

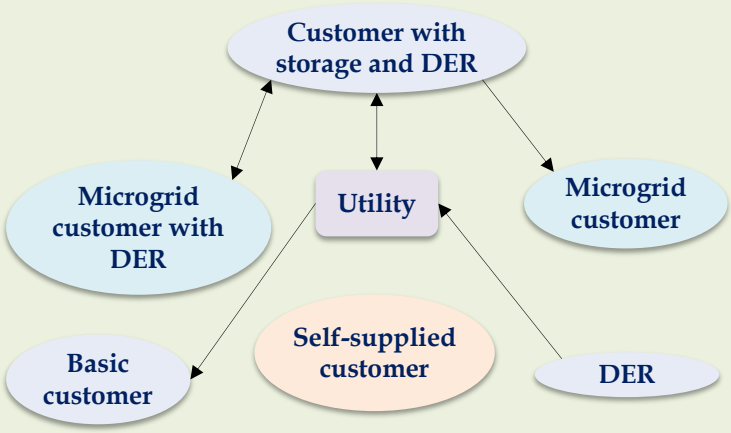
- the role of batteries to serve as non-wires alternatives ("NWAs") to defer capital investments in transmission and distribution; and
- creation of robust arrangements to encourage demand response ("DR") and energy efficiency.

New York's distributed system platform provider ("DSPP") model

Reforming the Energy Vision ("REV") is New York's strategic plan for motivating DER deployment and other changes to the power sector. One of the objectives under the REV initiative for the distribution segment is to explore the utility's evolving role as a DSPP.

Under the DSPP model (shown graphically below), utilities are incentivized to consider DER solutions as an alternative to traditional grid investments. The DSPP role can be thought to comprise of the following functions:

- **coordinating customer activities** and their interaction with the bulk power system;
- **enabling resource providers** (e.g., a customer with rooftop solar) **to monetize products** that provide value to the utility system;
- **integrating DERs as a primary means of meeting system needs**, supplementing traditional functions; and
- **providing DER service pricing structures** that reflect the benefit of DERs to the system.



However, transforming utilities into DSPPs requires new and enhanced capabilities in the areas of distribution system planning, grid operations, and market development. As a result of this complexity, the DSPP concept is being developed in New York through a multi-year process involving utilities, the state regulator, and other stakeholders.

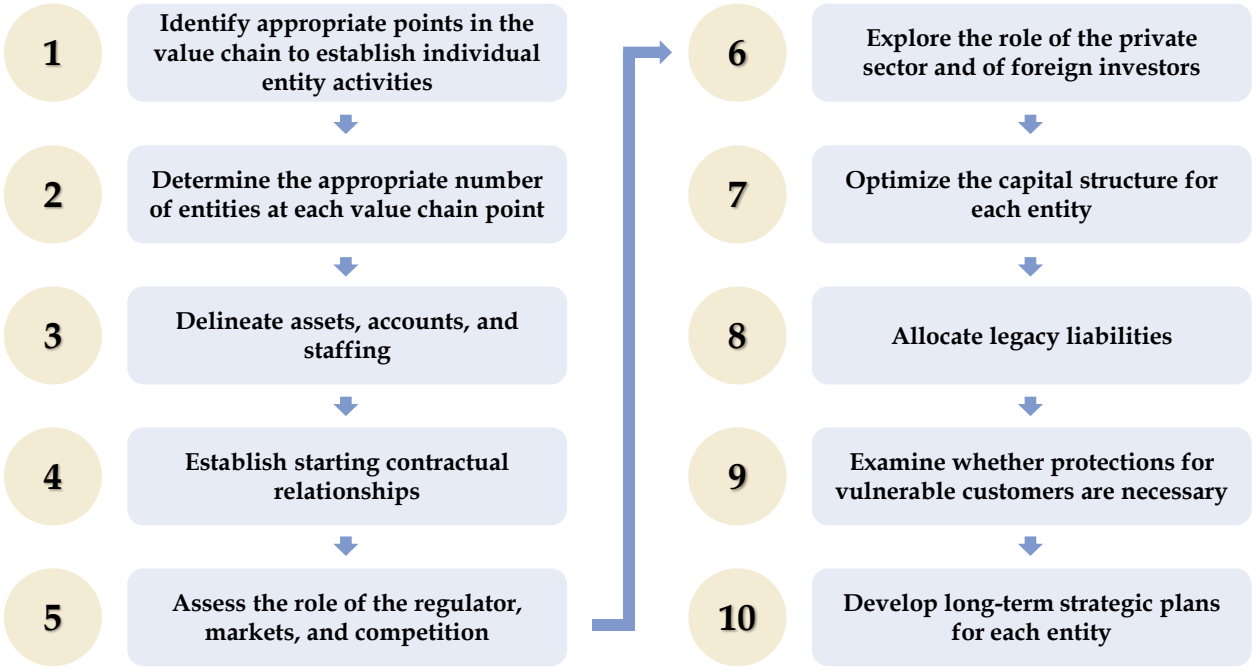
Source: *Reforming the Energy Vision Whitepaper.* March 2016.

3 Unbundling implementation approach

3.1 Overview

The following chapter outlines a 10-step approach that policymakers can use to implement unbundling in their respective markets. Figure 9 illustrates the 10-step approach, which will be described in detail in the sections that follow. Notably, the approach builds on the concepts and knowledge introduced previously in Section 2. Where there are any overlaps in concepts, the following chapter keeps discussion concise – we refer the reader to Section 2 for a more thorough overview of the basics of unbundling.

Figure 9. Overview of the unbundling implementation approach

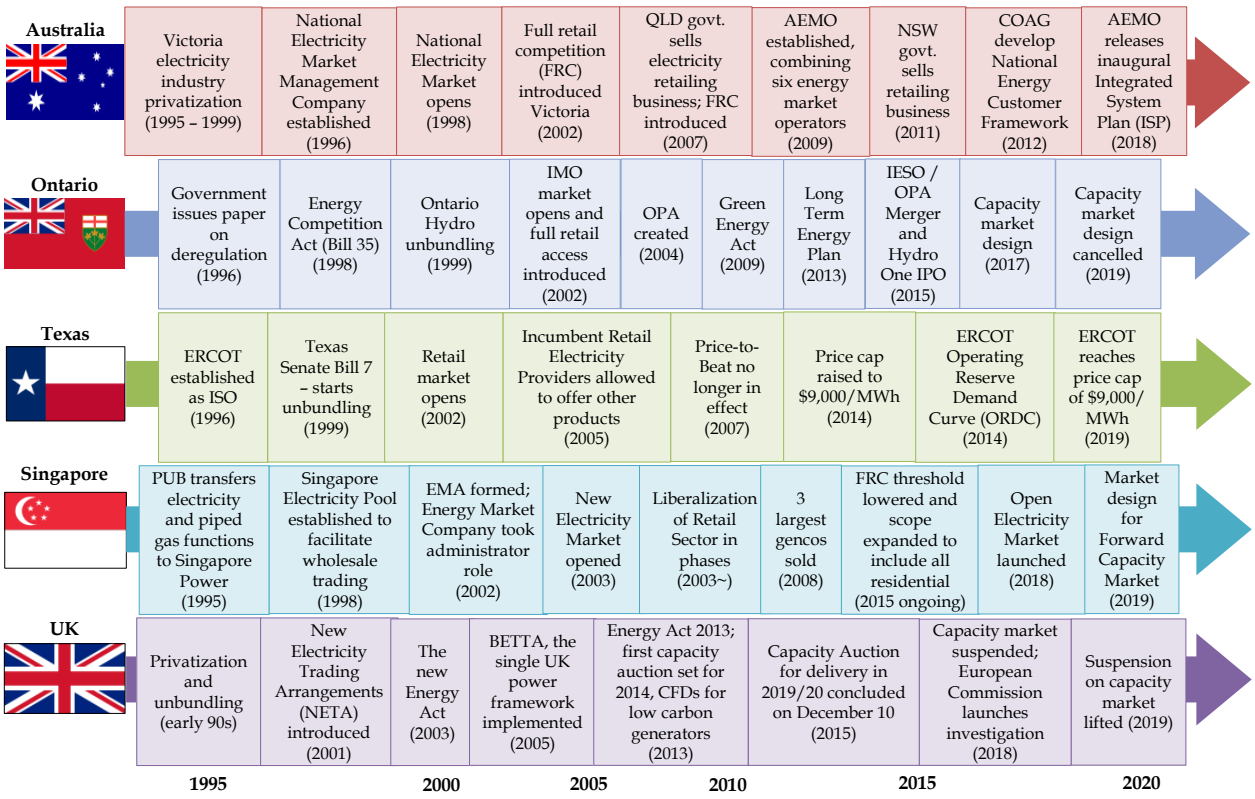


It is important to note that the process of unbundling takes several years, and may proceed in phases. Jurisdictions vary greatly in their starting point; some may have a tradition of independent, cost of service regulation, but not of competition; others may not even have an existing regulator. Thus, not all of the steps listed here may be relevant for all regions – they can instead be thought of as some of the typical steps to unbundling an electricity market. Figure 10 below illustrates the timeline of restructuring for multiple jurisdictions – Australia, Ontario, Texas, Singapore, and the UK – which spanned decades in each case.

Broadly speaking, the initial phase of an unbundling process may take 3 to 5 years, with gradual evolution thereafter. Generally, the process is kicked off with an inclusive and in-depth stakeholder consultation; this is followed by a process of presenting various options, again consulting with stakeholders, and selecting an option that is politically feasible and capable of being implemented. The broad outline of this plan is then normally converted into legislation,

with the details worked out by the responsible regulatory and market institutions in regulations and market rules after the legislation has been promulgated.

Figure 10. Timelines for electricity market liberalization



3.2 Step 1: Identify points in the value chain to establish individual entity activities

Overview: Step 1 (value chain analysis)

Step 1 of the 10-step unbundling implementation approach involves identifying the points in the electricity sector value chain (i.e., generation, transmission, distribution, and retail supply) at which individual entity activities should be established. The appropriate degree of unbundling for a particular jurisdiction will depend on the current structure of the sector, as well as the local appetite for restructuring.

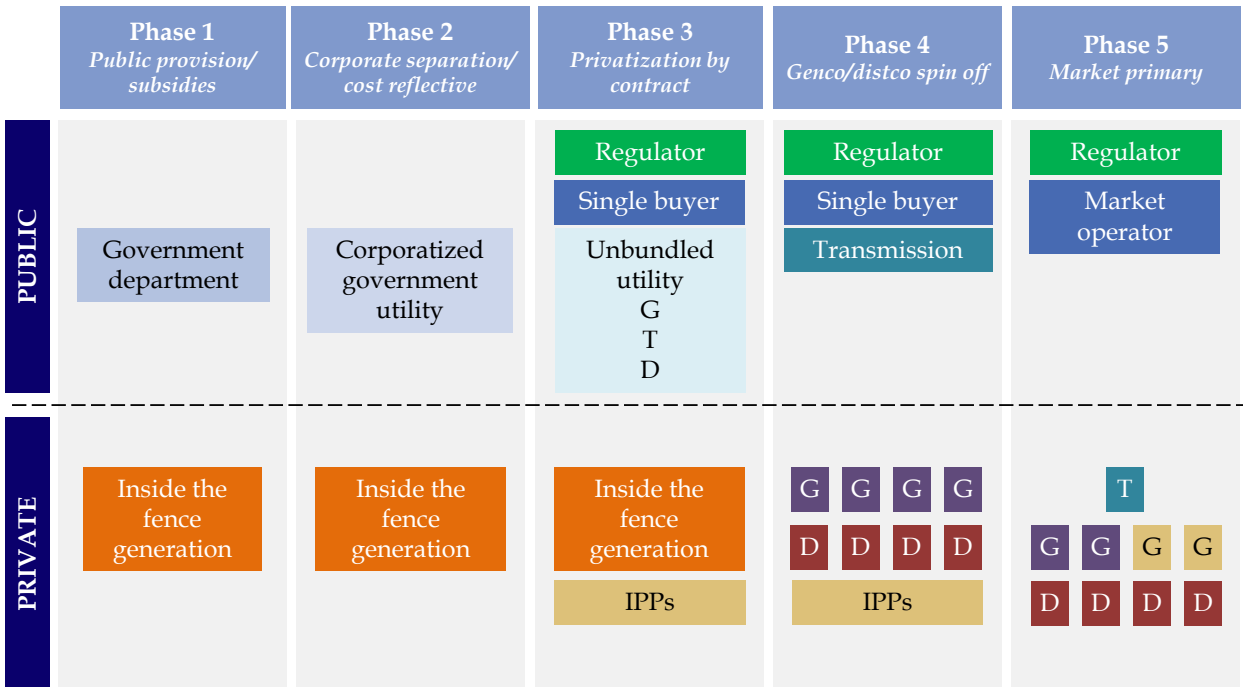
As discussed in Section 2, prior to unbundling, electricity in most jurisdictions has been provided through either government- or privately-owned vertically integrated utilities. As a result, the first step of unbundling is to identify where in the value chain (from generation, transmission, distribution, and retail supply) individual entity activities can be introduced and to determine the extent of restructuring required.

Generally, power sector evolution in emerging economies tends to follow a familiar progression, as demonstrated in Figure 11. The phases of sector evolution align with the degrees of unbundling

presented previously in Section 2.4 – the first stage in the unbundling process (Phase 2 in Figure 11) involves the corporatization of former government departments, if they exist, into a corporatized utility. Next, an independent regulator is created to oversee the sector, and the vertically integrated utility is unbundled into separate generation, transmission, and distribution entities. These companies may remain within the holding company (i.e., a form of functional or legal unbundling, as seen in Phase 3), or be spun-off into independent companies (i.e., akin to ownership or full unbundling, as seen in Phase 4). As the sector evolves, competitive wholesale and retail markets begin to take form (Phase 5). These phases involve the potential formation of several new entities, including an independent regulator (discussed later in Section 3.6.1), a single buyer (see Section 3.6.3), and/or an ISO (see Section 3.6.2).

It is important to note that Figure 11 is intended as an illustrative example of the potential phases that a jurisdiction may choose to progress through on its unbundling journey. However, where a jurisdiction ultimately ends up in the unbundling process depends on the local context – there is no rule that all jurisdictions must strive to reach Phase 5.

Figure 11. Power sector evolution in emerging economies



Note: G – generation; T – transmission; D – distribution; IPP – independent power producer.

As such, determination of the points in the value chain where individual entity activities ought to be established will depend primarily on the current stage of power sector evolution that the country finds itself in.

Regardless of the approach taken, the main objective is to assure that the various companies deal with one another on an arms-length basis, and that cross-subsidies are eliminated. In this sense, if some degree of mixed vertical ownership continues, an affiliate code of conduct may be required. In addition, in the event of continued joint generation and transmission ownership,

formation of an ISO is likely required. Ultimately, distribution is normally further fragmented by splitting off the retail supply function.

3.3 Step 2: Determine the appropriate number of entities at each value chain point

Overview: Step 2 (number of entities)

Step 2 of the 10-step unbundling implementation approach involves determining the appropriate number of entities to establish at each unbundled value chain point. For example, when unbundling the generation segment, generally four or more generation companies (gencos) may be created to ensure a competitive market. Each genco should be of an equal or similar size and should be geographically diverse to ensure a reasonably level playing field is achieved.

Once policymakers have identified the points in the value chain where individual entity activities will be established, the next step in the unbundling process is to determine the appropriate number of entities required at each unbundled value chain point.

The number of new companies created depends largely on the size of the previous incumbent. Provided each is above ***minimum efficient scale***, four or more generation companies (gencos) may be created, although ultimately the minimum number of gencos required will be determined so as to create a competitive market (see the textbox below). It may also be helpful to avoid grouping generation by region, to prevent the creation of local monopolies. In this sense, individual gencos should have portfolios spread across geographic regions, own a mix of generating technologies, and illustratively speaking, should not own more than 25% of generation assets in the country.

Tools to determine market concentration

Market concentration determines the competitiveness of any market, including the generation market. From a regulatory perspective, the intervention options range from a laissez-faire (free market) position, to actively pursuing a policy to reduce market power (usually in a market concentrated with very few large players).

The Herfindahl-Hirschman Index ("HHI") is often used to determine the market competitiveness level; a HHI value of less than 1,000 is considered a sign of a fully competitive market (i.e., at least 10 suppliers, each controlling 10% or less of the total supply in the market). HHI values range from close to zero (a large number of suppliers each controlling a minimal share of the market) to 10,000 (a complete monopoly). When reorganizing the generation sector, considerations of minimum efficient scale may make creation of ten players problematic. The presence of at least four players of equal or similar size without geographic concentration can be sufficient to achieve a reasonably level playing field.

As for the number of distribution companies (distcos), this may depend on factors such as geographic cohesiveness, the desire for multiple comparators for regulatory purposes, and a balance between minimum efficient scale and a size at which constant returns to scale are reached. For example, distcos may initially be based on existing regional geographic territories. The

creation of multiple distcos will not only allow for performance benchmarking among the companies by regulators, but will also create entities that are closer to the customer, and allow for more nimble decision making.

Some issues that need attention from a regulatory perspective when approaching the competitiveness of the market are as follows:

- **estimates of market shares need to be developed as early as possible**;
- **consider a nuanced approach to estimating the market share:** in the case of generation, the market share could be considered across all hours, during peak hours only, or for a subset of other hours depending on the characteristics of demand and existing power plants. In the case of retail, the market share could reflect the type and number of customers being served by various retailers, and not just the entire market; and
- **implement market power mitigation measures:** divestiture and creation of multiple players is feasible in large systems; smaller systems would make vesting contracts an attractive choice. If possible, there should be no specific timetable for how long the market power mitigation instruments are in place.

3.4 Step 3: Delineate assets, accounts, and staffing

Overview: Step 3 (resource allocation)

Step 3 of the 10-step unbundling implementation approach involves allocating the assets, accounts, and staffing from the previously vertically integrated monopoly to the newly formed, unbundled entities. The assets, accounts, and staffing will first need to be identified and then will need to be allocated to the new entities in accordance with established, agreed upon principles.

After identifying the points of the value chain which will be subject to unbundling (Step 1), and determining the number of new entities to be created at each unbundled point (Step 2), the next step in the reform process is to allocate the assets, accounts, and staffing from the vertically integrated monopoly among the newly formed companies. Activities, assets, employees, and costs need to be assigned to a particular division, which then becomes a company.

3.4.1 Identification of assets and accounts

To identify the assets to be transferred to the new companies, it will be necessary to determine the physical and operational constraints of the network. Technical and policy considerations will impact the physical and operational boundaries between the newly formed entities, and will be based on a consideration of the practicalities of the network as it exists today. Aspects of this process include:

- assets will be identified, recorded in asset registers, and allocated to the relevant new entities in accordance with established principles;

- in the event that records are unavailable or do not exist, assets will need to be valued based on their current condition, which involves both an engineering and financial analysis;
- the principles for the allocation of assets to relevant divisions will be established and approved by the regulator, in consultation with stakeholders;
- the rules for the transfer of staff to the new divisions will need to be developed, agreed upon, and consulted on with relevant trade unions;
- disputes over any allocation of assets, accounts, and staff should be resolved prior to formal unbundling;
- as discussed further in Step 8, stranded assets (i.e., those assets no longer able to recover their capital and operating costs under new market arrangements) and bad debts need to be isolated, sometimes into a separate entity;[6] and
- the use of shared corporate resources (e.g., HR, Finance, IT, etc.), if any, will need to be agreed upon and a basis for charge-out rates by these services will need to be established. Transitional contracts may need to be put in place to deal with such matters. All entities will need to be right-sized in terms of staff and balance sheet prior to commencing operations; to the extent that excess staff cannot be terminated they can be moved to the entity managing legacy liabilities.

3.4.2 Organizational structure

A comprehensive understanding of the staffing inventory at the vertically integrated monopoly is essential. This will require an analysis of existing employee records. A concise manpower inventory will enable a human resource audit that will establish current staffing size and composition, including the distribution of the workforce by age, location, and position, and help in identifying employees that will be transferred to the different companies.

The newly created companies will require their own terms and conditions of service for their respective employees. Two principles should guide the development of the Terms and Conditions of Service. First, the new terms should not, to the extent practicable, reduce the scope of benefits and flexibility afforded to staff at the present time within the vertically integrated utility, including those established under any collective bargaining agreements. Staff transfer is a sensitive issue potentially involving substantial change in employment structures.

[6] In Ontario, a new entity called the Ontario Electricity Financial Corporation ("OEFC") was created to address legacy liabilities.

3.5 Step 4: Establish starting contractual relationships

Overview: Step 4 (contractual relationships)

Step 4 of the 10-step unbundling implementation approach involves establishing starting contractual relationships between newly formed entities. Generally, these will include: generator supply contracts between generation companies (gencos) and the retail supply arm of distribution companies (distcos); generator contracts for use of the transmission system; and contracts for any shared services (e.g., human resources, engineering, accounting, compliance).

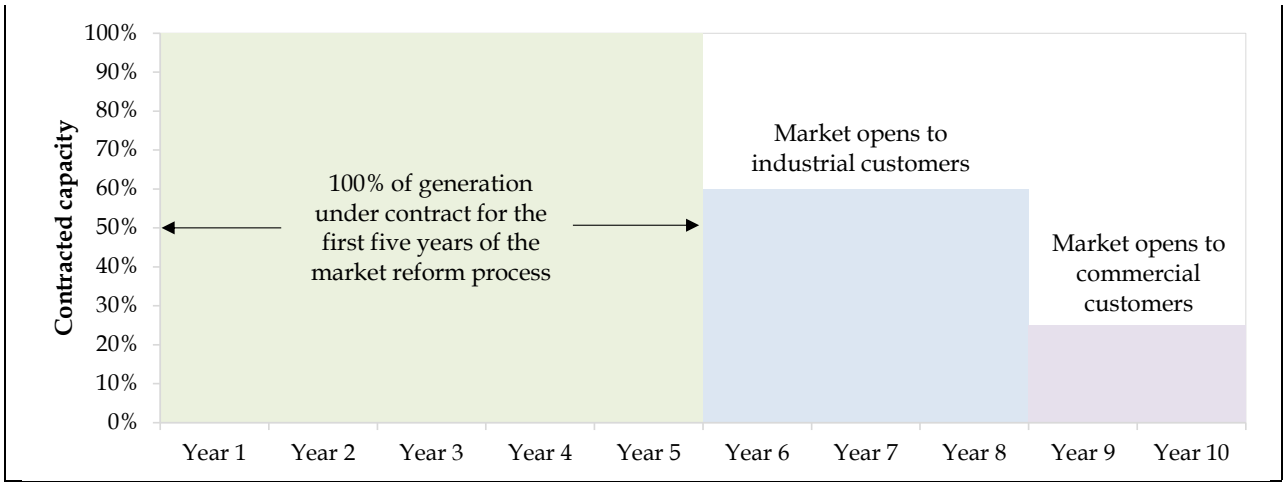
Designing initial contractual relationships between generators and distribution companies will assist in providing revenue and supply price stability for each, thereby smoothing the transitional period. Each link in the value chain requires a set of contractual arrangements; generally, this will include generator supply contracts with retailers, and generator contracts for use of the transmission system, as well as contracts for any shared services.

Initially, it is common for the retail supply function to be housed within distribution companies, and subsequently divested from them. Because developing competitive wholesale markets takes time, and is best accomplished gradually with a focus on the largest consumers first, a well designed unbundling process incorporates a series of starting contracts between the newly created gencos and the retail supply arm of the distribution companies. These initial power purchase agreements ("PPAs") may run for five or more years, and serve to stabilize both the revenues of the generators and the costs of generation supply to final consumers.

The amount of power covered under the PPAs needs to be synchronized with the pace of market opening, if a competitive wholesale market is envisioned immediately. Thus, in the initial years, 90-100% of generation may be under contract. However, if market opening is focused first on industrial customers, and industrial customers are 40% of load, the contracted capacity may fall to 60%, to free generation to be traded in the wholesale market with industrial customers or sold under contracts directly with them. If we presume that an additional 35% of load is commercial, and that commercial customers are to be allowed to enter the market a few years following industrial customers, then contracts between gencos and retailers would fall to 25% [100%-40%-35%] – see Figure 12, which presents this example graphically.

Extending retail competition to small consumers has less of an overall impact on overall sector efficiency and should be postponed until several years after market opening; in the meantime, retailers should hold competitive procurement rounds for any projected shortfalls relative to the remaining PPAs they hold with the gencos.

Figure 12. Contracted capacity during market opening



In addition to contracts between gencos and retailers, there will also be arrangements to use the transmission system. Capacity on the transmission system will likely be managed by the ISO, or by a ring-fenced entity within the transmission company. The ISO and transmission companies will work with the regulator to develop tariffs which set forth payment amounts for use of the transmission system; transmission users will enter into agreements with the ISO in respect to those agreements. In addition to developing system usage contracts, the ISO will also develop interconnection agreements, which set forth the physical requirements for connecting to the system, and the financial rights and responsibilities of the parties. Generally, generators will be the counterparties to the use of system and interconnection agreements, with costs passed through to final customers in contracts with retailers or those customers that have competitive market access.

As mentioned above, some functions may continue to be shared. While it is possible that all entities will have their own human resources, engineering, accounting, and compliance divisions, initially that may not be the case. One entity may contract these functions out to all of the others. If so, there will need to be agreements in place covering the nature of the services, their cost, and attribution of liabilities in case the services provided are not of sufficient quality.

3.6 Step 5: Assess the role of the regulator, markets, and competition

Overview: Step 5 (institutional roles)

Step 5 of the 10-step unbundling implementation approach involves establishing an independent regulator to oversee aspects of the electric supply chain which retain elements of a natural monopoly – i.e., transmission and distribution. To the extent that markets and competition are introduced in the sector, policymakers may choose to establish a regulator to oversee the competitive aspects of the electric supply chain as well – i.e., generation and retail supply.

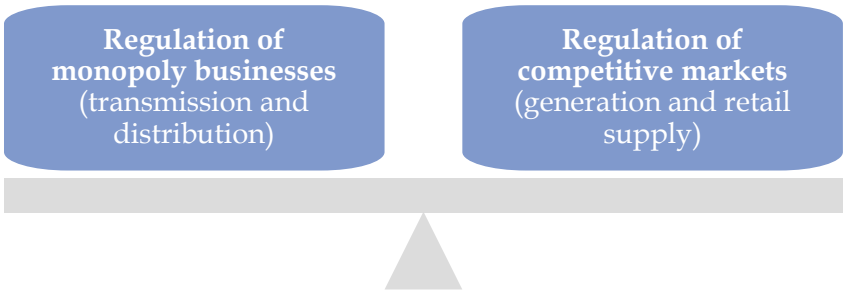
As part of the unbundling process, policymakers and stakeholders will need to assess the role of the regulator, an independent system operator, markets, and competition in the restructured electric sector. Each is discussed in turn in the subsections below.

3.6.1 Role of the regulator

One of the challenges of unbundling is distinguishing between two very different regulatory functions (see Figure 13). Each needs to be performed, but not necessarily by the same institution. The first function is the **regulation of networks**. These are the elements of the electric power supply chain which currently retain elements of a natural monopoly. The network regulator thus regulates access, pricing, connection, and service quality for transmission and distribution. For transmission, this means open access, and for both transmission and distribution, this means a clear definition of expectations for network operators, including potential penalties for failure to meet established standards. In terms of price regulation, regulators in unbundled markets focus on efficiency targets and incentives, in addition to an understanding of underlying costs.

The most important staring point for regulation of monopoly businesses like networks is development of a cost reflective tariff. Regulated entities need to provide the regulator with a clear understanding of their full costs, including the cost of capital using a reasonable debt to equity ratio. At the point of unbundling, costs for the system should be clear: asset values for new entities should be known, the balance sheet established, and operating costs substantiated. If a particular customer class is receiving subsidies, those subsidies should be transparent, and ideally time limited. Ideally, the customer bill will show the full cost of power, and the amount of the subsidy, if any, they are receiving. The regulated entity will be entitled to recover the full cost of service; however, some portion of this may be covered by the government with the remainder coming from customer payments. Failure to calculate cost reflective tariffs means all parties are acting with limited information: the regulator is unable to determine whether the utility is operating efficiently, policymakers do not know how to target subsidies, and customers do not know how to moderate their consumption behavior. **Any unbundling process that does not result in the inputs to create cost reflective tariffs is incomplete.**

Figure 13. Role of the regulator in an unbundled market



The skill sets needed to regulate networks are very different from those required to regulate the commodity side of the electricity business. **Regulation of competitive markets** is less about costs and more about price. Specifically, for competitive segments, this process involves "writing the rules of the game" and creating "referees" who are able to identify, fairly try, and if proven, penalize inappropriate behavior. To achieve this, regulators need to be clear about how they define competitive pricing, and how they will address deviations from it. Because competition regulators exist for other industries in most jurisdictions, a question which arises is whether a specialized competition authority is necessary for electricity markets, or if existing economy-wide competition authorities are sufficient. Competition regulation may also include a market

surveillance function, so that competition regulators have the ability to identify anomalous trading patterns and investigate and explain them.

The need for an independent regulator is paramount

One keystone of a well-regulated market is that the regulator be independent. For both competitive and monopoly aspects of the business, it is essential to assure that an independent regulator exists. For example, as Paul Joskow (Economist) opines, "the standard prescription for designing good regulatory institutions typically includes the words 'independence,' 'transparency,' 'accountability,' 'expertise,' and 'credibility.'" Bernard Tenenbaum (World Bank) adds "private investment requires new-style regulation that is limited, transparent, and 'let's managers manage.'"

Several factors contribute to regulatory independence, but commonly accepted attributes include that the regulator be self-funding, that board members be appointed for fixed terms that are not co-terminus with the government, that board members cannot be removed in the absence of criminal activity or mental health issues, and that the regulator have access to trained and qualified staff.

While the regulator does not make policy, it is a key stakeholder in discussions about the industry. Once policy is set, the regulator shapes it through the regulations it issues. Regulators also have a quasi-judicial function; they serve as a forum for complaints about market participants, as well as adjudicating disputes between parties.

Ultimately, any changes to regulations should involve significant analysis and deliberation with stakeholders. The United States is a good example of using a consultative approach before making any changes to rules or policies, where all stakeholders are given the opportunity to review the evidence and express their views. The consultative process to reach decisions on policy and rule changes includes multiple stages and is a relatively lengthy process, but inevitably produces outcomes that under most circumstances are a compromise that meet the needs of various stakeholders.

Best practice for rule changes in a regulatory setting usually involve a draft, comment period, revision, and issue approach, with any final rule change subject to appeal. In the US, the US Federal Energy Regulatory Commission ("FERC") generally issues a Notice of Proposed Rulemaking ("NOPR") to provide stakeholders guidance on expected rule changes; the content of the final rule may vary from the NOPR based on feedback from stakeholders. As regulators mature, they build a body of precedent that lays a foundation for future decisions. While current regulators are not bound by the decisions of previous regulators, the body of decisions from prior regulators helps create a framework in which to explain decisions. Best practice regulators issue a "decision with reasons" which provides background for the decision, summarizes the positions of various stakeholders, highlights relevant laws, regulations, or policy mandates, may discuss the available options, and then clearly describes the decision taken and the reasons for it. Good regulators are also timely; proceedings occur according to an announced schedule with a predictable timing for the issuance of decisions.

3.6.2 Role of an independent system operator

Functional unbundling of network services and open access is required to enable competition; this means new generators and third-party suppliers must have non-discriminatory rights to use transmission networks. Thus, there needs to be an entity to manage the complex short-term interactions on the network and monitor/maintain system reliability, as well as long-term system planning, transmission tariff design, and allocation of transmission tariff revenues. Generally, there are two options for how to organize the coordination and control of the transmission system:

- **ISOs:** an independent system operator has responsibility for managing use of the grid and coordinating the spot market, but does not own the transmission network. An ISO can also be structured to allow for separate operation of a power exchange; or
- **transcos**: an independent company that combines ownership of the transmission network and responsibility for system operations; may be a for-profit or not-for-profit entity.

The key objective of either entity is to assure reliability, which requires collaboration on the part of ISOs, transmission owners and electric utilities. This includes coordination of existing system components and processes to guarantee delivery of electricity upon demand; cooperation in monitoring and coordinating generation and transmission; communication and information sharing among all control areas to identify and isolate problems as they occur; and a commitment by all electric utilities to continuously coordinate, cooperate, and communicate to protect and ensure system balance.

Under an **ISO structure**, certain responsibilities are performed by the ISO, while others remain with the transmission owners; as such, it may be appropriate to identify respective ISO functions and transmission owner functions. For example, ISO functions may include: operational control of the transmission system; allocation of available transfer capability; provision or coordination of ancillary services; involvement in transmission planning; implementation of congestion management procedures; coordination of transmission and generation; and maintenance scheduling. Transmission owners, on the other hand, may be responsible for: maintaining ownership of transmission facilities; physically operating transmission facilities; maintaining transmission facilities; power system analysis; conducting transmission planning studies as directed by the ISO; and constructing new transmission facilities.

Under a **transco structure**, the transmission owner takes over all of the above-mentioned responsibilities. As such, size and independence play a crucial role. First, transmission owners need to be of a significant size – a small transco may not have sufficient system information gathering and control capability to ensure reliability. Second, with regards to independence, one of the principal requirements of an ISO is to be independent and to allow stakeholders to participate in governance. Transcos can be independent affiliates, however, open governance may need to be demonstrated to ensure that stakeholders' interests are considered, and shareholders' interests do not always prevail.

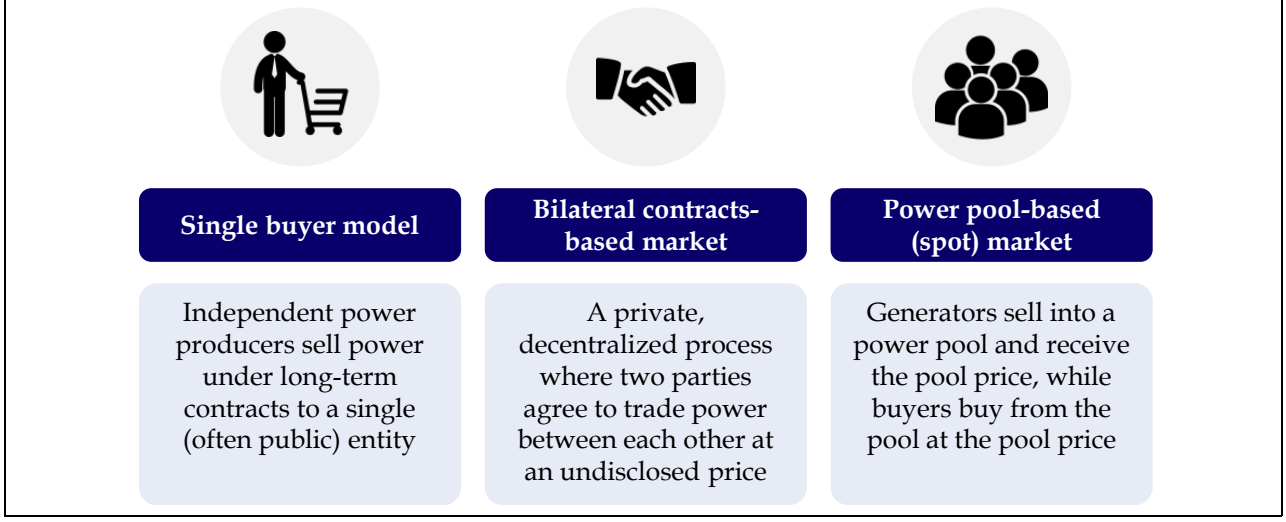
3.6.3 Role of market

When components of a previously integrated utility are unbundled (as in the case of generation assets, discussed above), it is necessary that industry-level methods, such as wholesale markets

and open access protocols, be established for coordinating activities that had previously been coordinated through management direction within a firm. The resources devoted to establishing and fine-tuning such methods, such as setting up an independent regulator, ISO, and wholesale market, are properly perceived as a cost of restructuring in the short-term. Over the longer-term, to the extent industry-level coordination can be systematically more effective than existing organizational routines, potential benefits arise as resources are deployed more efficiently. As long as the benefits from more efficient operation exceed the transition costs by a meaningful amount, creation of new industry arrangements is sound policy.

Generally, there are three ways of organizing wholesale electricity trades in an unbundled sector to establish wholesale prices and related terms of delivery, as illustrated in Figure 14 and described in further detail below.

Figure 14. Market models for wholesale electricity trading



A **single buyer** model is generally employed as a steppingstone towards a fully competitive wholesale generation market, and has been used in many jurisdictions in Eastern Europe and Asia. Under the single buyer model, independent power producers sell power under long-term contracts to a single, often public, entity. In this way, the single buyer, by serving as the counterparty to all contracts with generators, functions as essentially a purchasing agent on behalf of distribution companies. The centralization of the contracting process has the benefit of not only eliminating (or, more precisely, delaying, since this is most often conceived as a temporary arrangement) the need for each distribution company to develop procurement skills, but also establishes a central repository of information. Thus, the single buyer is positioned to effectively support the economic dispatch and generation planning process. The separate Case Studies Report explores Malaysia's implementation of the single buyer model – see the textbox below for a brief discussion.

Case study example: Malaysia's Single Buyer

Malaysia's Single Buyer ("SB") is a ring-fenced department within Tenaga Nasional Berhad ("TNB"), the utility which serves Peninsular Malaysia. SB is the authorized entity responsible for electricity planning and management of electricity procurement services in the region. SB procures electricity primarily through power purchase agreements with independent power producers, or through service level agreements with TNB generators. SB comprises of six major functions, including: (i) Contract & Resources Management; (ii) Finance & Enterprise Management; (iii) Legal Management; (iv) Market Operation and Assessment; (v) System Planning; and (vi) Technical Advisory & Industrial Development.

Source: SB. *About Single Buyer.*

In contrast, a **bilateral contracts-based market** is a private, decentralized process, where two parties agree to trade power between each other at an undisclosed price. As a result, bilateral contracting results in a less transparent market (unless provisions are put in place to require disclosure of the details of bilateral contracts), where buyers of electricity pay differentiated prices based on their negotiating power, delivery terms, volumes, etc. Participants in such a market likely include large industrial companies and distribution companies.

A **power pool-based (spot) market** allows greater transparency and clearer price discovery, as the power pool coordinates dispatch between different companies. Under this model, generators sell into a power pool and receive the pool price, while buyers buy from the pool at the pool price, and are thus exposed to the same prices. Energy trading in pool-based markets may be conducted on a real-time or a day-ahead basis. **Real-time trading** requires the matching of electricity offers and demand bids in real-time at hourly intervals (or 5- or 15-minute intervals, depending on the market). Under a **day-ahead trading** structure, buyers and sellers agree on electricity deliveries for the following day, usually at hourly intervals. As such, the day-ahead market structure needs to be supplemented with a balancing market to trade in any energy needed to balance the real-time changes in the availability of power plants. Furthermore, participants can enter into financial hedges which help manage price risk; these can be bilateral or exchange traded products based on prices at particular ISO nodes.

In practice, most markets support a mixture of spot and bilateral transactions. The implications of the market design on final consumers depends less on the extent to which bilateral versus spot transactions are relied upon, and more upon the number of buyers and sellers and the complexity of associated product markets. While the lack of transparency in bilateral markets can be troubling, the ultimate determinant of whether the market works well is whether there are sufficient sellers offering a variety of contracts. This would be equally true in a spot-only market. In practice, spot and bilateral markets are symbiotic in nature; the spot market provides a benchmark price against which contracts can be struck, and bilateral contracts allow for hedging against spot market volatility.

Markets should not be overly complex at the outset of unbundling

All markets evolve; long term success is more likely if policymakers opt for simple markets from the onset that gradually increase in complexity and product types over time. Some markets are designed to include various sorts of capacity and ancillary services markets, in addition to markets for energy. Locational based marginal pricing ("LBMP") helps to manage congestion on transmission systems, and transmission rights can be used as hedges, but these should only be explored after the market has become well-established. In general, the more complex the market design, and the more interlinked the various product markets, the greater the opportunities for gaming. Consumers are less likely to receive the full benefits of unbundling in markets with few sellers and highly complex multiproduct market structures.

3.6.4 Role of competition

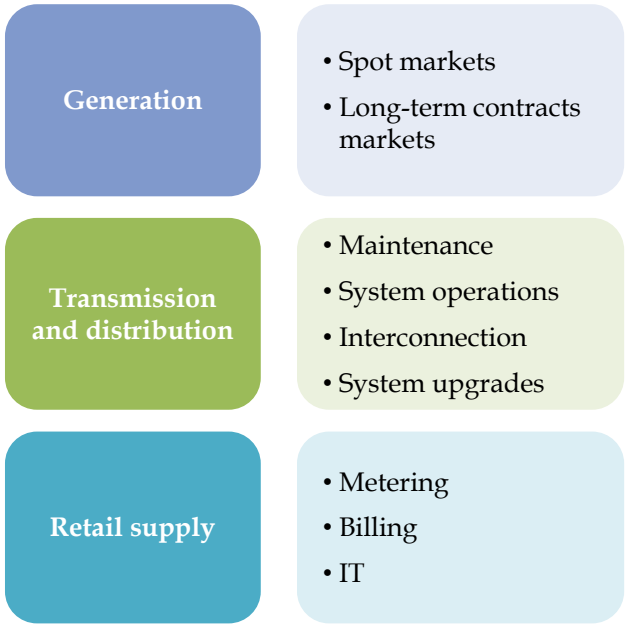
Competition is a means to an end, not an end unto itself. When examining the electricity sector value chain, policymakers need to ask themselves not only where competition *can* be introduced, but whether it *should* be. Competition is intended to provide consumers with the lowest sustainable long-term prices. Properly structured markets improve risk allocation, making producers responsible for the consequences of poor decisions.

However, competition requires an institutional infrastructure, just as regulation does. Although the benefits from improved incentives compatibility under competition may be large, they need to be balanced against both the costs of transition and the costs of maintaining (and nurturing) competition. Even if theoretically possible, competition provides fewer benefits relative to the traditional cost of service model in small markets, countries at very low levels of economic development, or specific niches of the electricity sector value chain. It is important to note, however, that competition need not mean only wholesale energy market competition in which spot markets produce prices in five-minute intervals every hour of every day. For example, competition may also mean competition by generators for long-term contracts with an existing utility, even if a spot market does not exist. At an even more micro level, it may mean simply assuring that the utility contracts out for as many goods and services as possible, rather than doing everything in-house, so as to benefit from third-party economies of scale. Self-generation using DERs also serves as a form of competition; if delivered prices exceed the cost of self-generation, customers will make an assessment of the relative reliability benefits and costs and may fully or partially disconnect from the system.

Almost every point on the electricity sector value chain is open to some form of competition (see Figure 15). Generators can compete in spot markets and in long-term contracts markets. Transmission companies could theoretically contract out maintenance of their entire network. System operations (coordination of flows on the transmission lines) could be performed by a private company competing for a contract periodically. Interconnections, as well as system upgrades, need not be performed by the incumbent utility, provided proper engineering practices are followed. A wide range of price discovery institutions compete in a number of markets; power exchanges as well as conventional exchanges provide means to trade electricity both physically and financially. As with transmission, one can envision distribution companies contracting out

maintenance of the network in its entirety. Some countries have implemented competition in the metering sector, and contracting out of billing and information technology ("IT") is common.

Figure 15. Potentially competitive activities along the value chain



Introducing competition in each of these areas requires hard work on the part of policymakers and stakeholders. A large number of details need to be addressed, and their implications considered. The primary cost-benefit analysis for policymakers considering introducing competition into generation, for example, is whether the corresponding increase in the cost of capital is exceeded by the benefits of such an increase. Competition increases risks to shareholders; the costs of equity capital for an IPP can be nearly twice as high as for a corresponding utility. The increased cost of capital, however, can be compensated by improvements in operating efficiency and reduced bias towards large capital projects, which are both potential benefits to competition. Policymakers are constrained by the minimum efficient size of generating companies; in a system with a peak load of 5,000 MW it is more difficult to create multiple gencos than in one with a peak load of 50,000 MW. However, the development of DERs has reduced the minimum efficient size of gencos; DERs can effectively discipline market power on the part of large generators and inefficiencies in the operation of networks.

3.7 Step 6: Explore the role of the private sector and foreign investors

Overview: Step 6 (role of private and foreign investors)

Step 6 of the 10-step unbundling implementation approach involves determining the role of the private sector and foreign investors in the electric sector, if any. Typically, private sector involvement enables electricity assets to perform operationally better and frees up government resources to be reallocated to areas of higher social return.

For jurisdictions where electricity sector assets are wholly or majority government-owned, one of the aspects of unbundling that requires attention is deciding whether the government should continue to own and operate those electricity assets, or whether it should reduce its stake or completely withdraw from the sector.

There is a general consensus that state ownership of economic resources can lead to wasteful resource utilization and subordination of the purposes of such resources to a political agenda. Although government ownership may at times be justified if there is genuine market failure (rural electrification, for example), private ownership allows government resources to be reallocated to areas of higher social return, such as primary education. Governments face a conflict of interest when regulating government-owned entities; it is difficult for a government to regulate itself. While reduced (or eliminated) government involvement is not a prerequisite for unbundling efforts, it is often expected that electricity assets in private hands may perform operationally better, with capital utilized efficiently through investment decisions that reflect economic and business sense, void of political considerations. As such, the share of government-owned assets generally decreases, and consequently, the share of investor-owned assets increases as the unbundling process evolves.

There are a few issues that present themselves when considering privatization of electricity assets:

- **When should government entities be privatized?** One logical step may be to privatize government entities during the same process of reorganization and corporatization, so that the market starts with a clean slate. However, this approach causes concerns regarding the valuation of these government entities, as there may not be much history in a corporatized form to serve as a basis for valuation. In contrast, privatization after market opening (which provides a better basis for valuation) may be fair and efficient for both private investors (as it reduces the chances of overpaying) and the government (ensures a better value for the asset can be secured).
- **What control mechanisms should be in place after privatization?** For example, the United Kingdom in its unbundling approach retained a "golden share" when privatizing its assets. The golden share (i.e., a nominal share that outvotes other shareholders) in the privatized firms limited the opportunity for any private investor to obtain controlling shares. The underlying rationale for this approach was to allow the government to monitor and ensure that operations of the companies were not negatively impacted by the private interests.

Finally, the decision to maintain, reduce, or eliminate the share of government ownership in the electricity sector is dependent, to some extent on the following factors:

- the **political leanings** of the jurisdiction;
- the **segments considered for privatization** (i.e., whether the entire sector will be privatized, or for example, whether only generation is privatized while the government retains the wires businesses);
- whether the current ownership results in **positive benefits to the government** – for example, it is easier to make the argument for privatization if the government has to support the entities from a given budget; and

- whether the **current and future benefits of privatization** (i.e., lump sum payments upfront, as well as a continuous tax revenue stream in the future) **outweigh the future benefits of continued ownership** (i.e., future profits).

Policymakers should be aware of conflicting perspectives during privatization. Finance ministries may seek to maximize proceeds from sales. The greater the monopoly protections, or the higher the projected rates, the greater the potential sales proceeds. However, the loss in economic efficiency from a failure to introduce competition where feasible or to set rates based on appropriate asset valuations, is likely to be more costly in the long run than any short term increase in proceeds.

3.8 Step 7: Optimize the capital structure for each entity

Overview: Step 7 (capital structure optimization)

Step 7 of the 10-step unbundling implementation approach involves optimizing the capital structure for each newly unbundled entity. Importantly, unbundling enables a more precise targeting of cost of capital determinations for the newly formed entities operating in each segment of the electric sector value chain. Compared to a vertically integrated utility, generation entities will generally face greater risks, while transmission and distribution entities will typically face lower risks.

Utilities face risks related to the setting of an allowed return on the regulated asset base. If the allowed rate of return does not reflect the prevailing cost of capital, the long-term ability of the company to invest will be constrained. Furthermore, any changes to the utility's rate of return impacts consumers through price changes.

These risk factors can change depending on the structure of the market. There are relative levels of risk associated with the various segments of the value chain, from generation, transmission, and distribution – a vertically integrated utility can be considered to have a weighted average risk of all these businesses. In contrast, unbundling allows for a more precise targeting of cost of capital determinations, which can be targeted to each of the three business functions independently.

Generally speaking, the unbundled generation business will have greater risks than the vertically integrated utility, as generators are exposed to price volatility and are not guaranteed to recoup their costs, in particular their investment costs. Competition increases risks to shareholders, and as a result of this transformation, the engineering component of the generation business becomes less dominant, while the economic, financial, and legal components become increasingly important. On the other hand, the basic fundamentals of estimating the appropriate level of returns on equity for transmission and distribution remain similar under both unbundled and vertically integrated structures. As such, the transmission and distribution businesses will typically have lower risks than the vertically integrated utility. The higher risk businesses should expect to see higher returns.

Debt levels for wires companies (transmission and distribution) can approach or in some cases exceed 60% of total capitalization (see Figure 16 for some examples); by contrast, while IPPs with

fixed price long term contracts can in some cases achieve leverage as high as 85% of total capitalization, gencos with significant merchant exposure (that is, exposure to fluctuating wholesale prices for their output) may struggle to achieve a capital structure that is even 40% debt. Ultimately, debt levels are determined by a set of financial ratios designed to assess the extent to which future net revenues are able to cover interest and principal payments on debt. The more volatile the expected net revenues, the less debt that can be raised.

Figure 16. Debt ratio trends in the UK and Australia

Jurisdiction	Utility	Period	Debt ratio
UK	Distribution utilities	2011-2015	65.0%
		2015-2023	65.0%
	Transmission utilities	2013-2020	58.8%
		2021-2026	55.0%
Australia	Network utilities	2013-2017	60%
		2018-2021	60%

Sources: Ofgem; AER.

3.9 Step 8: Allocate legacy liabilities

Overview: Step 8 (allocating liabilities)

Step 8 of the 10-step unbundling implementation approach involves honoring pre-existing contractual arrangements and allocating legacy liabilities from the former vertically integrated utility to the newly formed, unbundled entities.

Successful unbundling programs worldwide have tended to be those which respected (or compensated for) pre-existing contractual arrangements, while not allowing such arrangements to serve as barriers to an appropriately functioning competitive power sector. As such, existing contracts should be honored throughout the unbundling process.

3.9.1 Legacy contractual and commercial arrangements

All legacy contractual arrangements should continue to be honored, though the benefits and obligations will be transferred from the former vertically integrated utility to the newly formed entities. As markets evolve, however, it is often the case that pre-existing contracts may be silent on important issues that may arise. For example, contracts may be vague about delivery points, fail to specify whether ancillary services are included in the sale, or have limited treatment of force majeure issues. The newly formed entities to which these legacy contracts are allocated will need to be prepared to have discussions on contract addendums or modifications to address new issues that arise during the unbundling process.

3.9.2 Stranded costs

Stranded costs arise during the process of electricity sector unbundling when market participants are able to obtain power at a lower cost from the market or new assets than they can by paying the full cost of existing assets. The difference between the market value of the existing assets and their remaining book value can be referred to as a "stranded cost." It is important to note that any divestiture that requires the incumbent utility to sell segments of its portfolio will carry stranded cost risks. Conversely, some utility assets may be more valuable than is reflected in the corporate accounts; during a sales process, proceeds above book value for some assets may off set negative valuations for others.

Thus, an appropriate methodology for how to fairly assess, compensate and allocate any arising stranded cost risks must be considered when making transitional arrangements. The amount of the stranded costs should be converted to a financial asset on the utility's books, or moved to a separate entity, and a plan should be established for recovery from customers or through government payments over time. It is not advisable to simply abrogate contracts to reduce stranded costs, as this can impact investor confidence in the economy as a whole and in the sector. However, in the event that a government holding company is divesting assets, it may be easier for the government owned entity to take a write down rather than to seek to recover the stranded costs. Where the costs are passed through to customers, a "Competitive Transition Charge" ("CTC") may be added to the bill. The length of the recovery period may be adjusted to manage costs on customer bills or the impact on government finances.

3.10 Step 9: Examine whether protections for vulnerable customers are necessary[7]

Overview: Step 9 (vulnerable customers)

Step 9 of the 10-step unbundling implementation approach involves examining whether protections for vulnerable customers are needed throughout the reform process. Transitional mechanisms, such as price freezes or lifeline tariffs, can be implemented to limit customer exposure to potential price volatility.

Extensive consultation is crucial to ensuring that stakeholders are aware of and understand the objectives of the unbundling process, and are not left with the impression that unbundling and liberalization will result in lower electricity prices. While a properly designed unbundling process should result in prices being lower than they *otherwise might have been*, this may not mean that they are lower in absolute terms after restructuring than they were before. There are a variety of reasons for this:

- **artificially suppressed prices:** the biggest reason is often that electricity prices may have been artificially suppressed prior to unbundling, either by not incorporating an

[7] A key strategic priority of the CAREC Energy Strategy 2030 is 'Protecting Marginal and Vulnerable Customers' (under Work Stream 2 – 'Policy Reform and Liberalization'), which envisions developing a definition of 'vulnerable energy consumers' and options for social protection measures (*see* ADB. *CAREC Energy Strategy 2030.* November 2019)

appropriate cost of capital, or by failing to account for the need for new investment in the sector;

- **cross-subsidization** may also contribute to distortions in electricity rates;
- **rising input prices**, such as fuel costs; and/or
- in systems facing **tight supply-demand conditions**, the need to rapidly build new capacity that is more expensive than reflected in existing historical cost-based rates.

If any of these conditions exist, electricity prices are likely to rise for at least some consumers as a result of unbundling. While this should lead to more efficient usage of electricity, it inevitably leads to some disgruntlement on the part of affected customers.

Unfortunately, price increases in the midst of an unbundling process can lead to sudden, poorly conceived mid-course policy changes in which, over time, the "cure" proves to be worse than the possibly short-term pain it was expected to address. Overall, the lesson is that policymakers need to be circumspect in the way that they discuss the price impacts of unbundling, and if price increases are expected, find ways to mitigate (but not unduly delay or eliminate) the increase during a transitional period. In this sense, design of transitional mechanisms is critical, so that customers are exposed to price volatility gradually. This includes the vesting or transitional contracts discussed above, as well as the use of deferral accounts to spread costs over time. As noted elsewhere, small customers should only be exposed to price volatility, if at all, after the market has significantly matured.

Important elements include extensive customer education, so that customers are aware of their options, and assuring that some form of medium-term (i.e., less than three years) fixed price alternative is available for smaller customers. However, it is important to note that long-term price freezes for any customer category are counterproductive; these often postpone price adjustments rather than gradually preparing customers for them. The longer the price freeze, the greater the risk of a price shock if the price freeze ends at an inopportune time.

Notwithstanding the above, development of lifeline tariffs for the truly needy is an essential part of assuring the political acceptance of any unbundling process. The costs for these lifeline tariffs can be paid by the government, or through interclass subsidies in rates, but low income consumers must be protected.

3.11 Step 10: Develop long-term strategic plans for each entity

Overview: Step 10 (strategic planning)

Step 10, the final step of the 10-step unbundling implementation approach, involves developing long-term strategic plans for each newly formed entity. These plans will provide guidance as to each entity's priorities and key objectives over the longer term, and can be used to measure performance over time.

The final step of the implementation approach will be to develop long-term strategic plans for each newly created entity. These plans should establish strategic guidelines and develop each

entity's priorities and key activities over the long-term (with milestones established at shorter increments to facilitate implementation – e.g., a 100-day plan, followed by a 2-year plan, etc.). Stakeholder consultation during the development of the strategic plans would contribute to identifying key areas of concern, and gauge which activities are considered achievable within the set timeframes, and given the existing regulatory and legal context.

Ideally, a measurable goal should be created for each priority and activity that is identified, which will allow for the entity to track its progress and performance during subsequent periodic reviews. Periodic evaluation of each entity's performance relative to its stated goals will be important for assessing the success of the market arrangements, and will highlight potential areas for recalibrating and improving the framework going forward.

4 Concluding remarks

The Manual on Unbundling has presented the various degrees of unbundling that policymakers and regulators may wish to implement as part of their energy sector reform efforts. These unbundling approaches range from ***corporatization*** (the least substantial form of unbundling, which takes place only at the accounting level), all the way to ***ownership (or full) unbundling*** (which separates different functions into unaffiliated entities, each of which have separate and distinct boards, legal identities, premises, staff, and shareholders).

The experience of electricity sector restructuring to date highlights that there is no one-size-fits-all approach to unbundling. However, there are elements of restructuring that are likely to work across jurisdictions (such as the inclusion of multiple generators to assure competition, or limiting political intervention to build market confidence among future market participants). We note a few key conclusions below, as takeaways for readers:

- **unbundling is a means to an end, not an end unto itself –** before initiating discussions around the various forms of unbundling, policymakers need to ascertain whether unbundling is required at all. In jurisdictions where reliable electric service is maintained at cost effective but relatively inexpensive rates, it may not make sense to restructure;
- a **strong policy commitment from decisionmakers** is necessary to ensure that market reforms are fully implemented. Importantly, stakeholder engagement with both government and industry is essential to refining market reforms and ensuring buy-in from market participants;
- it is important to clarify **the objectives for restructuring** upfront – these objectives may include, but not be limited to: improving efficiency and reducing prices; continuing to provide opportunities for utilities to earn a reasonable return on investment; and providing reliable electric service to customers;
- **establishing cost-reflective tariffs** is essential for competitive markets, whether in bilateral contracting or in a wholesale market. A mechanism to establish the true cost of power will allow for competition across all market participants;
- while reviewing best practices is important, each jurisdiction will need to **alter the approach depending on its objectives**. Policymakers and regulators face several choices regarding the main features of electricity sector organization the regulatory regime. Market designers should be pragmatic and recognize that there will be transitional costs; theoretical perfection may not be an appropriate goal in practice, depending on system size and costs of administration;
- policymakers should create a **clear due process** to revise the unbundling strategy and adjust the course of implementation, should the need arise; and
- ultimately, **electricity sector reforms are complex endeavors** that can be lengthy, require careful planning of the specific sequence of actions, and training across all institutions and market participants.

5 Glossary

Ancillary services: those services required to deliver electricity to end-users at stable frequencies and voltages.

Bilateral contract: a contract between two named parties.

Competition: arises whenever two or more parties strive for something that all cannot obtain.

Competitive market: a market in which there is a sufficient number of buyers and sellers so that no single market participant has the ability to influence the price of the good or service.

Default supply: supply, under a competitive retail market, to end-users who do not wish to choose a retailer.

Deregulation: process of removing or reducing regulations, usually implemented to allow competition within the industry as an alternative means of controlling costs.

Distco: distribution company.

Distribution: transfer of electricity over medium- and low-voltage lines to end-use customers.

Divestiture: process of an integrated utility selling assets as part of the restructuring process.

Forward contract: a contract for delivery at some point in the future.

Genco: generation company.

Hedging: a strategy designed to minimize exposure to an unwanted business risk, while still allowing the business to profit from an investment activity. This is done by performing a hedge which is an investment that is taken out specifically to reduce or cancel out the risk in another investment.

Horizontal market power: horizontal market power is exercised when a firm profitably drives up prices through its control of a single activity, such as electricity generation, where it controls a significant share of the total capacity available to the market.

Incumbent: refers to the existing large utility in place before restructuring.

Independent system operator ("ISO"): a system operator independent from control by any single market participant or group of market participants.

Legacy assets: assets owned by the incumbent utility that have been paid for by taxpayers prior to restructuring.

Liberalization: practice of introducing increasing levels of competition in the electricity sector and of improving incentives in segments where competition may not yet be practical.

Market power: the ability of a seller to reduce the output supplied to the market so as the raise the market price, and do so profitably.

Merchant plants: privately financed plants, generally used to mean not dependent on long-term power purchase agreements.

Open access: ability of third parties to use transmission to freely contract between eligible buyers and sellers of electricity in a manner that is non-discriminatory by the transmission service provider.

Power pool: term used for an organization coordinating dispatch between different companies.

Privatization: sale of government-owned generation, transmission, or distribution assets to private investors.

Procurement: is the process of purchasing goods or service for the direct benefit or use of the governments, corporations, or individuals generally via, but not limited to a contract.

Restructuring: developing new companies/regimes in an industry sector by either splitting some functions or combining others; changing existing companies.

Retail competition: the environment where different energy providers (retailers) can compete in the electricity market to sell residential, commercial, or industrial end use customers power at unregulated rates.

Retailer: a company that purchases electricity in wholesale markets or directly from generators and resells that electricity to end-use customers.

Spin-off: physical and financial separation of entities.

Spot market: a market where delivery is immediate.

Transco: transmission company.

Transmission: transport of electricity from generators to local distribution networks through high voltage lines.

Vertical integration: provision of generation, transmission, and distribution by a single entity.

Vertical market power: vertical market power is exercised when a firm involved in two related activities, such as electricity generation and transmission, uses its dominance in one area to raise prices and increase profits for the overall enterprise.

Wholesale market: market that enables trades between eligible bulk power purchasers and retail sellers of electricity.

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