ACHIEVING A SUSTAINABLE AND EFFICIENT ENERGY TRANSITION IN INDONESIA

A POWER SECTOR RESTRUCTURING ROAD MAP

FEBRUARY 2023

ASIAN DEVELOPMENT BANK

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6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 8632 4444; Fax +63 2 8636 2444
www.adb.org

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Abbreviations

ADB	Asian Development Bank
BoC	Board of Commissioners
BPK	Badan Pemeriksa Keuangan (state auditor)
BPP	*biaya pokok penyediaan* (accounting production cost)
BPPTL	Badan Pengatur Pasar Tenaga Listrik (electricity market regulator)
CPI-X	consumer price index-efficiency improvement factor
DJEBTKE	Direktorat Jenderal Energi Baru dan Terbarukan dan Konservasi Energi (Directorate General of New and Renewable Energy and Energy Conservation)
DJK	Direktorat Jenderal Ketenagalistrikan (Directorate General of Electricity, which is under MEMR)
DPR	Dewan Perwakilan Rakyat (People's Representative Council)
EPC	engineering, procurement, and construction
HV	high voltage
IPP	independent power producer
ISO	independent system operator
LV	low voltage
MEMR	Ministry of Energy and Mineral Resources
MOF	Ministry of Finance
MSOE	Ministry of State-Owned Enterprises
MV	medium voltage
NRE	new and renewable energy
PBR	performance-based regulation
PJB	PT Pembangkitan Jawa Bali
PLN	PT Perusahaan Listrik Negara (Persero) (state electricity corporation)
PMK	Peraturan Menteri Keuangan (Minister of Finance Regulation)
PPA	power purchase agreement
RUKN	Rencana Umum Ketenagalistrikan Negara (National Electricity Plan)
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik (Electricity Business Supply Plan)
SB	single buyer
SO	system operator
SOE	state-owned enterprise
TNB	Tenaga Nasional Berhad (national power utility of Malaysia)
TSO	transmission system operator

Executive Summary

Over the period 2020–2022, the Asian Development Bank (ADB) conducted a series of studies regarding the potential restructuring of PLN (Indonesia's State Electricity Corporation). These studies discussed the rationale for PLN restructuring, the experience with electric utility restructuring in selected countries around the world, and the identification and evaluation of options for the restructuring of PLN. This work identified the "Independent System Operator (ISO) as Single Buyer" as a preferred model for implementation. This report proposes a sequence of actions by PLN and the Government of Indonesia to implement this proposed industry structure.

> *Selama periode 2020–2022, Asian Development Bank (ADB) melakukan serangkaian studi terkait potensi restrukturisasi PT PLN (Persero). Studi-studi tersebut membahas tentang alasan mendasar restrukturisasi PLN, pengalaman restrukturisasi utilitas kelistrikan di negara-negara tertentu di seluruh dunia, serta identifikasi dan evaluasi opsi restrukturisasi PLN. Pekerjaan ini mengidentifikasi "Independent System Operator (ISO) as Single Buyer" (Operator Sistem Tenaga Independen sebagai Pembeli Tunggal) sebagai model yang dipilih untuk diimplementasikan. Laporan ini mengusulkan langkah-langkah yang perlu diambil oleh PLN dan Pemerintah Indonesia untuk mengimplementasikan struktur industri ketenagalistrikan yang diusulkan.*

There is no single universal model or process for electric utility restructuring. Restructuring should be carried out as a means to an end, and each country has its own objectives and context. In many countries, restructuring was necessary for the introduction of wholesale and/or retail competition. That is not the objective in Indonesia. Rather, restructuring of PLN aims to improve efficiency and performance, and facilitates the energy transition. Moreover, restructuring takes place within the unique country-specific context of the preexisting industry structure and ownership, the prevailing legal and constitutional framework, the existing institutional setting, geographical conditions, level of economic development, etc. The approach proposed here is tailored to Indonesia.

> *Tidak ada model universal atau proses tunggal dalam restrukturisasi utilitas kelistrikan. Restrukturisasi dilakukan sebagai sarana untuk mencapai tujuan, dan setiap negara memiliki tujuan dan konteksnya masing-masing. Di berbagai negara, restrukturisasi merupakan kondisi yang diperlukan untuk memperkenalkan kompetisi "wholesale" dan/atau "retail". Ini bukan merupakan tujuan akhir yang ingin dicapai di Indonesia. Sebaliknya, restrukturisasi PLN bertujuan untuk meningkatkan efisiensi dan kinerja, serta memfasilitasi transisi energi. Selain itu, restrukturisasi terjadi dalam konteks khusus negara yang unik dari struktur dan kepemilikan sektor ketenagalistrikan yang sudah ada sebelumnya, kerangka hukum dan konstitusional yang berlaku, pengaturan kelembagaan yang ada, kondisi geografis, tingkat perkembangan ekonomi, dan lain-lain. Pendekatan restrukturisasi yang diusulkan pada dokumen ini juga disesuaikan dengan kondisi Indonesia.*

The benefits of restructuring PLN can be achieved fully only if it is implemented in conjunction with improved governance and regulation, along with the introduction of a new revenue model. The financial viability of the power sector must be assured for any reforms to succeed. A new revenue model is therefore required to more accurately determine the revenue requirements of the sector in the future as a basis for setting tariffs, subsidies, and other government support. This would help establish a resilient financial foundation for delivering reliable and affordable power supply, while funding the investment necessary for the energy transition.

Manfaat restrukturisasi PLN dapat dicapai sepenuhnya hanya jika dilaksanakan bersamaan dengan perbaikan tata kelola dan regulasi, seiring dengan pengenalan model pendapatan baru. Kelayakan finansial sektor ketenagalistrikan harus dijamin agar setiap reformasi yang dilakukan dapat berhasil. Oleh karena itu, model pendapatan baru diperlukan untuk menentukan kebutuhan penerimaan sektor ini di masa depan secara lebih akurat sebagai dasar untuk menetapkan tarif, subsidi, serta dukungan lainnya dari pemerintah. Hal ini akan membantu membangun pondasi keuangan yang tangguh untuk memberikan pasokan listrik yang andal dan terjangkau, seraya mendanai investasi yang diperlukan untuk transisi energi.

Better governance and regulation can address the inconsistencies now found among various government policies, drive efficiency and decarbonization more effectively, and accommodate greater transparency and public participation. Regulatory strengthening and PLN restructuring are mutually reinforcing activities: restructuring that mitigates conflicts of interest and increases transparency will facilitate regulation, and improved regulation that leads to more rigorous scrutiny of planning, procurement, and operations will help maximize the benefits of restructuring and accelerate PLN's energy transition.

Tata kelola dan regulasi yang lebih baik dapat mengatasi inkonsistensi yang sekarang ditemukan pada berbagai kebijakan pemerintah, mendorong efisiensi dan dekarbonisasi secara lebih efektif, dan mengakomodasi transparansi dan partisipasi publik yang lebih besar. Penguatan regulasi dan restrukturisasi PLN adalah kegiatan yang saling memperkuat: restrukturisasi yang mengurangi konflik kepentingan dan dapat meningkatkan transparansi akan memfasilitasi regulasi, serta penguatan regulasi yang akan mengarah pada pemeriksaan yang cermat terhadap proses perencanaan, pengadaan, dan operasi yang nantinya akan membantu memaksimalkan manfaat restrukturisasi serta mempercepat transisi energi PLN.

This road map therefore distinguishes the steps that should be taken with respect to each pillar of a sector reform program—revenue model, regulation and governance, and restructuring—and the linkages among them. The objective is to establish a healthy power sector in Indonesia that is financially and environmentally sustainable, provides affordable and reliable supply, and strengthens the ability of the government to meet its constitutional obligations to control the sector for the benefit of the people through better governance.

Oleh karena itu, peta jalan ini membedakan langkah-langkah yang harus diambil sehubungan dengan setiap pilar program reformasi sektor — model pendapatan, regulasi dan tata kelola, dan restrukturisasi — dan melihat keterkaitan antar program-program tersebut. Tujuannya adalah untuk membangun sektor ketenagalistrikan Indonesia yang sehat, yang berkelanjutan secara finansial dan lingkungan, mampu menyediakan pasokan listrik yang terjangkau dan andal, serta memperkuat kemampuan pemerintah untuk memenuhi kewajiban konstitusionalnya dalam mengendalikan sektor ini untuk kepentingan rakyat melalui tata kelola yang baik.

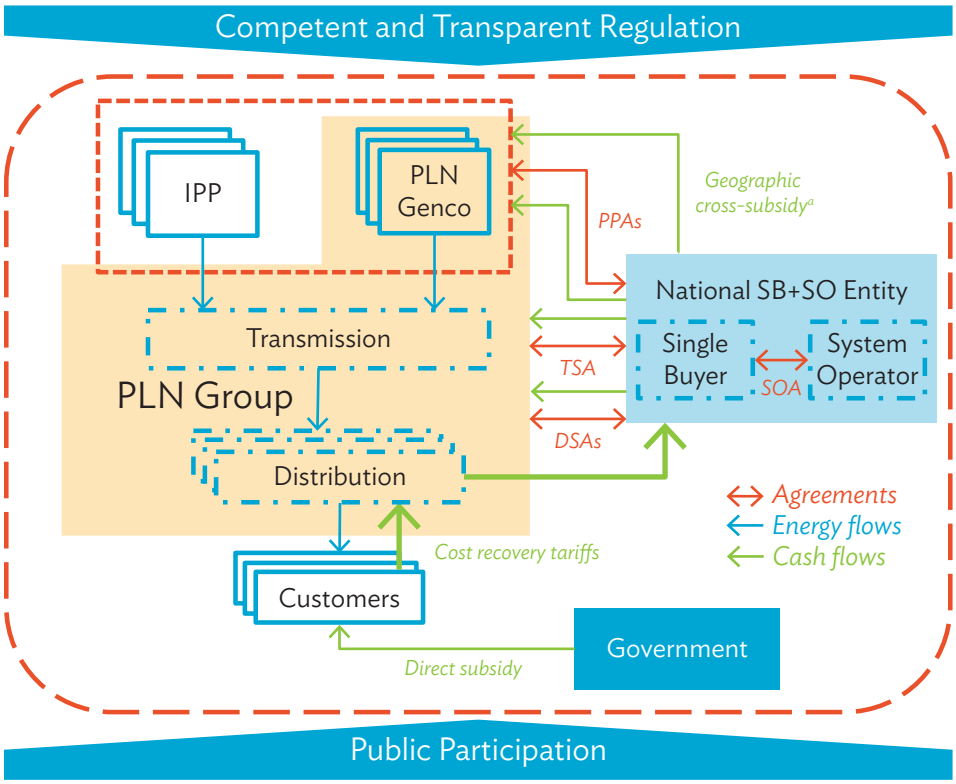
Ultimate targets for the industry structure and relationships between industry players are shown in the following figure. To achieve this, PLN generation is to be transferred entirely to subsidiary companies; and system planning, resource procurement and contracting, and system operations are to be separated from PLN and migrated into a new single buyer and system operator ("New SB+SO") established as a *perusahaan umum* or *perum*, a state-owned enterprise established to serve the public interest. This process would start with the Java–Bali system, but other major power systems (Sumatera, Kalimantan, and Sulawesi) would also eventually be managed by the New SB+SO. Key features of this structure are as follows:

- Consumers pay full cost recovery tariffs, but eligible customers also receive direct subsidies from the government to ensure affordability among vulnerable consumer groups.
- All consumer revenues are paid to the PLN distribution and regional units, but instead of those funds being swept into the PLN treasury as they are at present, they are sent to the New SB+SO.
- The New SB+SO will plan generation and transmission in the systems that it covers. This will mitigate conflicts of interest inherent in PLN's multiple roles as system planner, generator, system operator, and single buyer. This plan will be subject to more rigorous regulatory review and approval, and will accommodate inputs from PLN and the public. Integrating system planning, procurement, and system operations within a single, leaner entity can facilitate the innovation required for PLN to invest in the grid flexibility that is needed to accelerate uptake of variable renewable energy and reduce carbon emissions.
- The New SB+SO procures all new generation on a competitive basis (i.e., PLN and its subsidiaries must compete to build new generation). This will help to minimize investment costs.
- The New SB+SO serves as the contract counterparty to all generation (PLN subsidiaries and independent power producers [IPPs]), as well as to transmission and distribution service providers (PLN) on the systems it operates, as per the commercial, arm's length contracts that have been put in place.
- Given that a national uniform tariff is expected to continue, the New SB+SO will collect more revenue than the actual cost of supply on these large systems, and will be obliged to transfer a geographic cross-subsidy to PLN, under the supervision of the regulator.

Target akhir dari struktur industri dan hubungan antar berbagai pelaku industri ditunjukkan pada gambar berikut. Untuk mencapai hal ini, pembangkitan PLN harus ditransfer sepenuhnya ke anak perusahaan, dan perencanaan sistem, pengadaan dan kontrak sumber daya, serta sistem operasi dipisahkan dari PLN dan dialihkan ke pembeli tunggal baru dan operator sistem baru ("SB+SO Baru") yang didirikan sebagai perusahaan umum atau perum, perusahaan milik negara yang didirikan untuk melayani kepentingan umum. Proses ini akan dimulai dengan sistem Jawa-Bali, tetapi sistem tenaga listrik utama lainnya (Sumatera, Kalimantan, dan Sulawesi) juga pada akhirnya akan dikelola oleh SB+SO Baru. Fitur/karakteristik utama dari struktur ini adalah sebagai berikut:

- *Konsumen membayar tarif pengembalian biaya penuh, namun pelanggan yang memenuhi syarat akan menerima subsidi langsung dari pemerintah untuk memastikan keterjangkauan di antara kelompok konsumen yang rentan;*
- *Semua pendapatan konsumen dibayarkan ke PLN distribusi dan unit wilayah, tetapi dana tersebut tidak dimasukkan ke dalam kas PLN seperti saat ini, melainkan diteruskan kepada SB+SO Baru.*
- *SB+SO Baru akan menyusun perencanaan pembangkitan dan transmisi dalam sistem cakupan pelayanannya. Hal ini dimaksudkan untuk memitigasi konflik kepentingan yang melekat pada berbagai peran PLN, yaitu perencanaan sistem, pembangkitan, operasi sistem, dan pembeli tunggal. Rencana ini akan tunduk pada peninjauandan persetujuan lebih ketat dari badan pengatur serta akan mengakomodasi masukan dari PLN dan masyarakat. Integrasi perencanaan sistem, pengadaan, dan operasi sistem dalam satu entitas yang lebih ramping dapat memfasilitasi inovasi PLN dalam rangka investasi fleksibilitas jaringan, sebagaimana yang dipersyaratkan dalam percepatan penyerapan energi terbarukan variabel dan mengurangi emisi karbon.*
- *SB+SO Baru melakukan pengadaan semua pembangkit baru secara kompetitif. Oleh karena itu, PLN dan anak perusahaan harus berkompetisi membangun pembangkit baru. Kompetisi ini akan membantu dalam memastikan investasi dengan biaya yang paling rendah.*
- *SB+SO Baru berfungsi sebagai rekanan kontrak untuk semua penyedia layanan pembangkit (anak perusahaan PLN dan produsen listrik independen), transmisi, dan distribusi (PLN) dalam sistem yang dioperasikannya sesuai dengan kontrak komersial yang bersifat antara pihak independen.*
- *Karena tarif yang seragam nasional diperkirakan akan terus berlanjut, SB+SO Baru akan mengumpulkan lebih banyak pendapatan daripada biaya pasokan aktual di sistem ini dan akan diwajibkan untuk mentransfer subsidi antar wilayah ke PLN di bawah pengawasan badan pengatur.*

Proposed Structure of the Indonesian Power Sector



DSA = distribution service agreement, genco = generation company, IPP = independent power producer, PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), PPA = power purchase agreement, SB = single buyer, SO = system operator, SOA = system operating agreement, TSA = transmission service agreement.

[a] As collected from lower-cost systems under a national uniform tariff.

Source: Asian Development Bank.

Several of these reforms have been adopted in Malaysia. Malaysia is not cited here as a model to be replicated, but simply to highlight that some of the key measures proposed here have been successfully adopted elsewhere. As noted above, the path of restructuring is unique to each country based on historical and institutional contexts. Malaysia shared many of the same conditions that still exist in Indonesia: a legacy, vertically integrated national utility—which apart from some IPPs, operates as a monopoly; a history of electricity pricing below the cost of supply; and an intention to manage electricity supply and pricing as part of economic development.

Beberapa reformasi sektor di atas telah diadopsi di Malaysia. Malaysia tidak dikutip di sini sebagai model yang akan direplikasi, tetapi untuk menyoroti bahwa beberapa langkah kunci yang diusulkan telah berhasil diadopsi di tempat lain. Seperti disebutkan di atas, pola restrukturisasi untuk setiap negara berdasarkan konteks historis dan kelembagaan, Malaysia memiliki banyak kesamaan kondisi dengan Indonesia yang masih terus berlanjut hingga saat ini seperti: peninggalan model utilitas kelistrikan nasional terintegrasi vertikal sebagai monopoli meskipun beberapa produsen listrik independen (IPP) beroperasi, riwayat penetapan harga listrik di bawah biaya ekonomi suplai kelistrikan, intensi pengelolaan pasokan dan penetapan harga listrik sebagai input untuk pembangunan ekonomi, dan lain-lain.

This road map proposes a phased sequence of reforms as summarized in the table below. Given that the final stage of reform entails a number of steps outside the control of the government, such as the passage of a new electricity law by the Dewan Perwakilan Rakyat (DPR) (People's Representative Council) and the assignment of power purchase agreements (PPAs) to the New SB+SO, it is uncertain whether or when that stage can be achieved. The intermediate stages of Internal Single Buyer and Ring-Fenced Single Buyer have been designed to provide substantial benefits even if the reform process does not reach the final stage described above. The process aims to preserve existing PPA terms, conditions, and risk profiles during these intermediate stage—so that treatment of IPPs does not impede the reforms.

Peta jalan ini mengusulkan urutan reformasi bertahap seperti yang dirangkum dalam tabel di bawah. Mengingat bahwa tahap akhir reformasi memerlukan sejumlah langkah di luar kendali pemerintah, seperti pengesahan undang-undang ketenagalistrikan yang baru oleh DPR (Dewan Perwakilan Rakyat) dan pengalihan perjanjian jual beli tenaga listrik (PPA) kepada SB+SO Baru, terdapat beberapa ketidakpastian bentuk dan waktu tahapan yang dapat dicapai. Tahap peralihan dari model Pembeli Tunggal Internal (Internal Single Buyer) dan Pembeli Tunggal yang dipisahkan pencatatan keuangannya (Ring-Fenced Single Buyer) dirancang untuk dapat memberikan manfaat yang substansial meskipun proses reformasi tidak mencapai tahap akhir seperti yang dijelaskan di atas. Proses ini bertujuan untuk mempertahankan profil risiko serta syarat dan ketentuan dari perjanjian jual beli tenaga listrik saat ini, sehingga perlakuan terhadap pengembang listrik swasta (IPP) tidak menghambat proses reformasi.

Alternatives to the Full Single Buyer as a separate state-owned enterprise are possible. For example, it may be more feasible to establish the Single Buyer as a subsidiary of PLN rather than as a separate state-owned enterprise. However, establishing it as a completely separate company would avoid the conflict of interest inherent in serving as both generator and single buyer.

Alternatif-alternatif terhadap skema pembentukan Pembeli Tunggal Penuh (Full Single Buyer) sebagai perusahaan milik negara yang terpisah dimungkinkan. Misalnya, mungkin lebih layak untuk menetapkan Pembeli Tunggal sebagai anak perusahaan PLN daripada sebagai badan usaha milik negara yang terpisah. Namun, hal ini tidak akan mengurangi konflik kepentingan yang melekat dalam fungsi PLN saat ini, baik sebagai perusahaan pembangkitan maupun sebagai pembeli tunggal, tidak akan seefektif apabila Pembeli Tunggal sebagai entitas yang dipisahkan.

Given that a key element of the reforms is to separate the system planning, single buyer, and system operator functions from PLN generation and retail, another alternative is to retain system planning, single buyer, and system operator functions within PLN along with the transmission system, effectively making PLN Single Buyer and Transmission System Operator (SB+TSO) that is also responsible for system planning. Distribution, retail, and generation would be moved to subsidiaries—and perhaps eventually transferred. This would avoid the issue of PPA assignment, but would not mitigate the conflict of interest inherent in serving as both TSO and system planner.

Mengingat bahwa elemen kunci dari reformasi adalah pemisahan fungsi perencanaan sistem, pembeli tunggal dan operator sistem dari PLN pembangkitan dan retail, alternatif lainnya yaitu mempertahankan fungsi perencanaan sistem, pembeli tunggal dan operator sistem dalam PLN bersamaan dengan sistem transmisi, secara efektif menjadikan peran PLN sebagai Pembeli Tunggal dan Operator Sistem Transmisi (SB+TSO) yang bertanggung jawab dalam perencanaan sistem. Distribusi dan retail serta pembangkitan dijadikan sebagai anak perusahaan dan pada akhirnya dimungkinkan untuk dipisahkan. Skema seperti ini akan memperkecil permasalahan dalam pengalihan perjanjian jual beli listrik, tetapi tidak dapat mengurangi konflik kepentingan yang melekat dalam menjalankan perannya sebagai TSO dan perencana sistem..

In September 2022, PLN formally launched the restructuring of its business following the strategy laid out by the Ministry of State-Owned Enterprises (MSOE) that serves as the government's shareholder representative. Subsidiary companies were established to own and operate all generation, supply primary energy, and conduct activities not directly related to power supply. The internal structure of the holding company was reorganized from a mixed regional and value chain structure to a pure value chain structure, with separate directorates for generation management, transmission and system planning, distribution, and retail. Supporting directorates were established for finance, corporate planning and business development, project management and new and renewable energy, and legal and human capital management.

Pada September 2022, PLN secara resmi meluncurkan restrukturisasi bisnisnya mengikuti strategi yang ditetapkan oleh Kementerian Badan Usaha Milik Negara (BUMN), yang berfungsi sebagai perwakilan pemegang saham milik pemerintah. Anak perusahaan didirikan untuk memiliki dan mengoperasikan semua pembangkitan, memasok energi primer, dan melakukan kegiatan yang tidak terkait langsung dengan pasokan listrik. Struktur internal perusahaan induk telah direorganisasi dari struktur regional dan rantai nilai campuran menjadi struktur rantai nilai murni, dengan direktorat yang terpisah untuk manajemen pembangkitan, transmisi dan perencanaan sistem, distribusi, dan ritel. Direktorat pendukung telah dibentuk untuk keuangan, perencanaan perusahaan dan pengembangan bisnis, manajemen proyek dan energi baru dan terbarukan, serta manajemen hukum dan sumber daya manusia.

Key features of this new structure include (i) separation of all generation from the holding company; (ii) consolidation of system planning, transmission, and system operations under the Directorate for Transmission and System Planning; and (iii) consolidation of generation procurement and single buyer functions under the Directorate for Generation Management. These three changes are key features of the Internal Single Buyer stage proposed in this report. To maximize the benefits of this restructuring, the government will need to strengthen the policy and regulatory groundwork as well as embark on changes to PLN's revenue model as described in this report. Given this promising start, it is hoped that this report can serve as a guide for the further evolution of the Indonesian power sector.

> *Fitur fitur utama dari struktur baru ini meliputi: (i) pemisahan semua pembangkitan dari perusahaan induk; (ii) konsolidasi perencanaan sistem, transmisi, dan operasi sistem di bawah Direktorat Perencanaan Transmisi dan Sistem; dan (iii) konsolidasi pengadaan generasi dan fungsi pembeli tunggal di bawah Direktorat Manajemen Pembangkitan. Ketiga perubahan ini adalah fitur utama dari tahap Pembeli Tunggal Internal yang diusulkan dalam laporan ini. Untuk memaksimalkan manfaat restrukturisasi ini, pemerintah perlu memperkuat landasan kebijakan dan regulasi serta memulai perubahan model pendapatan PLN sebagaimana dijelaskan dalam laporan ini. Sebagai permulaan yang baik, diharapkan laporan ini dapat menjadi pedoman untuk evolusi lanjutan sektor ketenagalistrikan Indonesia.*

The intermediate government actions to complement this restructuring are within the authority of the President and ministers. An important step has been taken in this direction through Presidential Regulation No. 112/2022, which requires the Ministry of Energy and Mineral Resources (MEMR) to coordinate with the MSOE and the Ministry of Finance (MOF) for the periodic preparation of PLN's electricity supply business plan. This will help ensure PLN's planning is aligned with the availability of government financial support and corporate performance targets.

> *Tindakan lanjutan pemerintah untuk melengkapi restrukturisasi ini berada dalam kewenangan Presiden dan para menteri. Langkah penting telah diambil ke arah ini melalui Peraturan Presiden No. 112/2022, yang mengharuskan Kementerian Energi dan Sumber Daya Mineral (ESDM) berkoordinasi dengan Kementerian BUMN dan Kementerian Keuangan (Kemenkeu) untuk penyusunan berkala rencana usaha penyediaan listrik PLN. Hal ini akan membantu memastikan perencanaan PLN selaras dengan ketersediaan dukungan keuangan pemerintah dan target kinerja perusahaan.*

Nonetheless, there is the challenge of forging a consensus across the government regarding the nature and timing of broader sector reforms. As an indicative timetable, it is conceivable that it would take 2–3 years to fully implement the Internal Single Buyer (including associated government actions) once a decision to proceed has been made, and another 3–4 years for the Ring-Fenced Single Buyer.

> *Meskipun demikian, terdapat tantangan untuk mencapai kesepakatan di jajaran pemerintahan mengenai sifat dan waktu reformasi sektor yang lebih luas. Sebagai jadwal indikatif, dapat dibayangkan bahwa akan memakan waktu 2 hingga 3 tahun untuk sepenuhnya mengimplementasikan model Pembeli Tunggal Internal setelah keputusan ditetapkan, serta 3 hingga 4 tahun lagi untuk mengimplementasikan Pembeli Tunggal yang dipisahkan pencatatan keuangannya (Ring Fenced).*

Under the direction of MSOE, PLN has put considerable effort into developing its restructuring vision. However, further work will be required for implementation. For reference, the Minister of Mines and Energy issued a white paper for power sector reform in 1998, and by 2002, a new electricity law was enacted as the legal foundation for the vision presented in the white paper. By the time the Constitutional Court revoked that electricity law in 2004—6 years after the white paper—restructuring of PLN and regulatory reform had advanced considerably, but the Electricity Market Regulator *(Badan Pengawas Pasar Tenaga Listrik, BPPTL)* had not yet been formally established. This experience suggests that an indicative duration of 7 years to progress through the Internal Single Buyer and Ring-Fenced Single Buyer stages is reasonable, counting from the time the government formally commits to the reform.

> *Di bawah arahan Kementerian BUMN, PLN telah berupaya keras untuk mengembangkan visi restrukturisasinya. Namun, pekerjaan lebih lanjut akan diperlukan untuk implementasi. Sebagai referensi, Menteri Pertambangan dan Energi mengeluarkan buku putih untuk reformasi sektor ketenagalistrikan pada tahun 1998, dan pada tahun 2002 undang-undang ketenagalistrikan baru diberlakukan sebagai landasan hukum untuk visi yang disajikan dalam buku putih tersebut. Ketika Mahkamah Konstitusi mencabut undang-undang ketenagalistrikan pada tahun 2004 -enam tahun setelah buku putih tersebut diterbitkan-, restrukturisasi PLN dan reformasi regulasi telah berkembang pesat. Namun, Badan Pengawas Pasar Tenaga Listrik (BPPTL) belum dibentuk secara resmi. Pengalaman ini menunjukkan bahwa durasi indikatif adalah tujuh tahun untuk maju melalui tahap Pembeli Tunggal Internal dan Pembeli Tunggal yang dipisahkan pencatatan keuangannya* (Ring Fenced)*, dihitung sejak pemerintah berkomitmen pada reformasi secara formal.*

The Proposed Staging of Reforms

		Current Situation	Internal Single Buyer Indicative duration: 2–3 years	Ring-Fenced Single Buyer Indicative duration: 3–4 years	New Single Buyer
Governance and Regulation	Legal basis	Law 30/2009	Law 30/2009	Presidential regulation	New power sector law
	Form	DG Electricity	Strengthened BoC and DGE	Interministerial committee	New government regulatory agency
	Main functions	Policy development, planning review, pricing, licensing, technical	BoC: Advise policy impacts, review planning and procurement. DGE: pricing, technical, policy	Same as preceding stage plus public participation, transparency, and enhanced operations supervision.	Same as preceding stage
	Development activities	• Capacity building • Assess enhanced role for BoC	• Capacity building • Formulate new regulations and processes	• Capacity building and staff recruitment • Updating of regs and processes	• Capacity building and staff recruitment • Updating of regs and processes
	Prerequisites for next stage	MEMR, MSOE & MoF agreement on reform objectives and road map	• Preparation of new PerPres • New regulations for planning, procurement, and pricing	Preparation of new power sector law and establishment of regulatory agency	Not applicable
Revenue Model	Key features	• BPP + margin • Subsidy and compensation paid to PLN	• New rate of return or cash flow model adopted • Subsidy and compensation paid to PLN	• Rate of return or cash flow • Reduced subsidy and compensation paid to PLN • Start of direct subsidies	• Rate of return or cash flow • Full cost recovery tariffs and commercial transactions • Direct and cross subsidies only; no further compensation or subsidies paid to PLN
	Development activities	• Analyze cost of service and supply cost drivers • Continued work on data quality and subsidy targeting	• Identify and evaluate options for new revenue model and direct subsidies • Pilot implementation of direct subsidies • Initiate tariff adjustment	• Improve implementation of direct subsidies. • Strengthen efficiency incentives in the revenue model • Continue tariff adjustment to full cost recovery	• Introduce mechanisms to facilitate competition among generators as PPAs expire • Explicit recognition of ancillary service costs incorporated in revenue model
	Prerequisites for next stage	Government agreement on reform objectives and road map	• Satisfactory result for direct subsidies pilot • Social and political acceptance of tariff adjustments	• Satisfactory results of new revenue model • Continued social and political acceptance of tariff adjustments and direct subsidies	Not applicable
PLN Structure	Organizational Features (Java–Bali as initial system)	• PLN HQ plans all systems, procures all IPPs, manages all cash, owns some generation • Generation subsidiaries not paid commercial tariffs • PLN P2B operates system	• All PLN generation in subsidiaries with arm's length commercial PPAs • Improved planning of G&T • All new gen. competitively procured • P2B and J-B planning merged under a new director for PLN Transformation • Cash mgmt. remains centralized, but separate accounts for J-B transactions	• J-B transactions, treasury, accounting, and generation procurement moved to PLN Transformation Directorate • J-B bulk power cash flows separated from rest of PLN • Internal transmission and distribution service agreements established	• J-B transformation directorate spun off to new BUMN ("New SB+SO") with functions of transactions, treasury and accounting; system planning; generation procurement and contracting; and system operations • Bulk power transactions conducted on arm's length basis with IPPs and PLN gen subsidiaries • PLN provides T&D through service agreements
	Development activities	Identify and evaluate PLN restructuring options	• Change management and new process design • Initiate PLN reorganization • Move all PLN generation into subsidiaries • Develop new planning & procurement	• Continue change management and new process design • Explore and initiate assignment of IPP PPAs • Prepare PPAs and T&D service agreements • Prepare geographic cross-subsidy mechanism	• Develop procurement of ancillary services and bulk power market for generators with expired PPAs • Migrate other systems to the New SB+SO company
	Prerequisites for next stage	PLN and Government of Indonesia agreement on reform objectives and road map.	• All PLN generation in subsidiaries • New PLN Transformation Directorate functions well	• Legality of multiple sellers in a single business area resolved • New company established and capitalized • PPAs can be assigned	Not applicable

The Proposed Staging of Reforms

		Situasi saat ini	Pembeli Tunggal Internal Prediksi waktu: 2–3 tahun	Pembeli Tunggal dengan *Ring Fencing* Prediksi waktu: 3–4 tahun	Pembeli Tunggal Baru
Tata Kelola & Regulasi	Dasar Hukum	UU 30/2009	UU 30/2009	Peraturan Presiden	Undang-undang sektor tenaga listrik yang baru
	Bentuk	Dirjen Ketenagalistrikan	Dewan Komisaris dan Dirjen Ketenagalistrikan yang Diperkuat	Komite antar kementerian	Badan pengatur pemerintah baru
	Fungsi utama	Pengembangan kebijakan, tinjauan perencanaan, penetapan harga, lisensi, teknis	Dewan Komisaris: Menyarankan dampak kebijakan, meninjau perencanaan & pengadaan. DGE: penetapan harga, teknis, kebijakan.	Sama seperti tahap sebelumnya ditambah partisipasi publik, transparansi, & pengawasan operasi yang ditingkatkan.	Sama seperti tahap sebelumnya
	Kegiatan pengembangan	• Peningkatan kapasitas • Mengkaji peran Dewan Komisaris yang ditingkatkan	• Peningkatan kapasitas • Perumusan peraturan & proses baru	• Peningkatan kapasitas dan rekrutmen staf • Pembaruan regulasi dan proses	• Peningkatan kapasitas dan rekrutmen staf • Pembaruan regulasi dan proses
	Prasyarat untuk tahap selanjutnya	Kesepakatan Kementerian ESDM, Kementerian BUMN, & Kemenkeu tentang tujuan reformasi dan peta jalan	• Persiapan Perpres baru • Peraturan baru untuk perencanaan, pengadaan, & penetapan harga	Persiapan undang-undang sektor tenaga listrik baru dan pembentukan badan pengatur	Tidak dapat diterapkan
Model Pendapatan	Fitur kunci	• BPP + margin • Subsidi & kompensasi dibayarkan ke PLN	• Tingkat pengembalian atau model arus kas yang baru diadopsi • Subsidi & kompensasi dibayarkan ke PLN	• Tingkat pengembalian atau arus kas • Pengurangan subsidi & kompensasi yang dibayarkan ke PLN • Mulai subsidi langsung	• Tingkat pengembalian atau arus kas • Tarif pemulihan biaya penuh & transaksi komersial • Subsidi langsung dan antar wilayah saja; tidak ada kompensasi atau subsidi lebih lanjut yang dibayarkan kepada PLN
	Kegiatan pengembangan	• Analisis biaya layanan dan stuktur biaya pasokan • Terus bekerja pada kualitas data dan penentuan subsidi	• Identifikasi & evaluasi opsi untuk model pendapatan baru & subsidi langsung • Implementasi percontohan subsidi langsung • Inisiasi penyesuaian tarif	• Perbaikan pelaksanaan subsidi langsung • Penguatan insentif efisiensi dalam model pendapatan • Melanjutan penyesuaian tarif ke pemulihan biaya penuh	• Pengenalan mekanisme untuk memfasilitasi persaingan di antara pembangkit saat PPA berakhir • Pengakuan eksplisit atas biaya layanan tambahan digabungkan dalam model pendapatan
	Prasyarat untuk tahap selanjutnya	Kesepakatan pemerintah tentang tujuan reformasi dan peta jalan	• Hasil yang memuaskan untuk percontohan subsidi langsung • Penerimaan sosial dan politik tentang penyesuaian tarif	• Hasil yang memuaskan dari model pendapatan baru • Melanjutkan penerimaan sosial dan politik atas penyesuaian tarif & subsidi langsung	Tidak dapat diterapkan

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Struktur PLN	Fitur organisasi (Jawa-Bali sebagai sistem awal)	• Kantor Pusat PLN merencanakan semua sistem, pengadaan semua IPP, mengelola semua kas, memiliki beberapa pembangkit • Anak perusahaan pembangkit tidak membayar tarif komersial • PLN P2B mengoperasikan sistem	• Semua pembangkit PLN di anak perusahaan dengan PPAS komersial setara dan independen. • Penguatan perencanaan G&T. • Semua pembangkit baru diperoleh secara kompetitif. • Perencanaan P2B & J-B digabung di bawah direktur baru untuk Transformasi PLN • Manajemen kas tetap terpusat, tetapi akun terpisah untuk transaksi J-B	• Transaksi J-B, perbendaharaan, akuntansi dan pengadaan pembangkit dipindahkan ke Direktorat Transformasi PLN. • Arus kas listrik massal/curah J-B terpisah dari PLN lainnya. • Perjanjian layanan transmisi dan distribusi internal dibuat	• Direktorat transformasi J-B dipecah menjadi BUMN baru ("SB+SO Baru") dengan fungsi transaksi, perbendaharaan & akuntansi; perencanaan sistem; pengadaan & kontrak pembangkit; dan operasi sistem • Transaksi listrik massal/curah yang dilakukan secara wajar dengan IPP dan anak perusahaan PLN • PLN menyediakan T&D melalui perjanjian layanan
	Kegiatan pengembangan	Identifikasi dan evaluasi opsi restrukturisasi PLN	• Perubahan manajemen & desain proses baru • Inisiasi reorganisasi PLN • Pemindahan semua pembangkit PLN ke anak perusahaan • Pengembangan perencanaan & pengadaan baru	• Kelanjutan perubahan manajemen & desain proses baru. • Penjajakan/memulai pengalihan IPP PPAs • Penyiapan perjanjian layanan PPA dan T&D • Penyiapan mekanisme subsidi antar wilayah	• Pengembangan pengadaan layanan tambahan & pasar tenaga listrik massal/curah untuk pembangkit dengan PPA yang kedaluwarsa • Migrasi sistem lain ke perusahaan SB+SO Baru
	Prasyarat untuk tahap selanjutnya	Kesepakatan PLN dan Pemerintah tentang tujuan reformasi dan peta jalan.	• Semua pembangkit PLN berada di anak perusahaan • Direktorat Transformasi PLN baru berfungsi dengan baik	• Legalitas beberapa penjual dalam satu area bisnis diselesaikan • Perusahaan baru didirikan & dikapitalisasi • PPA dapat diberikan	Tidak dapat diterapkan

BoC = Board of Commissioners, BPP = *biaya pokok penyediaan*, DGE = Director General of Electricity, G&T = generation and transmission, HQ = headquarters, IPP = independent power producer, J-B = Java-Bali, MEMR = Ministry of Energy and Mineral Resources, MoF = Ministry of Finance, MSOE = Ministry of State-Owned Enterprises, P2B = *pusat pengatur beban* (load dispatch center), PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), PPA = power purchase agreement, SB = single buyer, SO = system operator, T&D = transmission and distribution.

Source: Asian Development Bank.

Successful implementation of the Internal Single Buyer and the Ring-Fenced Single Buyer stages will require substantial technical assistance. The 1998–2004 reforms entailed about $20–$30 million in technical assistance. Bringing those costs to current terms suggests a cost of $30–$40 million in technical assistance, plus costs incurred by the government for recruitment, capitalization of new entities, etc.

> *Agar pelaksanaan tahap Pembeli Tunggal Internal dan Pembeli Tunggal yang dipisahkan pencatatan keuangannya* (Ring Fenced) *berhasil, dibutuhkan dukungan teknis yang cukup besar. Reformasi pada 1998–2004 memerlukan bantuan teknis sebesar US$ 20 hingga 30 juta. Jika dihitung dengan keadaan saat ini, biaya bantuan teknis yang dibutuhkan adalah US$ 30 hingga 40 juta, ditambah biaya yang dikeluarkan oleh pemerintah untuk perekrutan, kapitalisasi entitas baru, dan lain-lain.*

The immediate next step is socialization of the comprehensive reform vision and road map presented in this report among key stakeholders, including relevant ministries, PLN, labor unions, academia, and civil society, building upon PLN's restructuring to date. As highlighted in this report, complementary actions are required by government to maximize the benefits of PLN's restructuring and accelerate Indonesia's energy transition. The vision and road map can be updated to incorporate feedback received, and could provide the basis for discussions with multi- and bilateral development agencies to support the government's agreed program.

> *Langkah selanjutnya yang harus segera diambil adalah sosialisasi visi dan peta jalan reformasi yang disajikan dalam rangkaian laporan restrukturisasi ini kepada para pemangku kepentingan, termasuk kementerian terkait, PLN, serikat pekerja, akademisi, dan masyarakat sipil. Visi dan peta jalan dapat diperbarui untuk menampung masukan yang diterima, dan dapat menjadi dasar diskusi dengan lembaga pembangunan multilateral dan bilateral untuk membantu mendanai program yang disepakati pemerintah.*

Introduction

The Indonesian power sector has made significant progress since the Asian financial crisis of 1998. Over the past 20 years, the electrification ratio has increased from 52% to 98%, PLN (State Electricity Corporation) has been able to tap global bond markets for its financing needs with the same investment-grade credit rating as the Government of Indonesia, PLN's operational performance has improved, and, until recently, the sector had operated on a financially viable basis.

However, the sector in general and PLN in particular now face the most serious challenge to financial viability since 1998. The uptake of renewable energy lags far behind its peers, and government targets are unlikely to be achieved. Regional disparities in the quality of electricity supply persist, and PLN is finding it increasingly difficult to provide coverage to the remaining households without electricity.

A consensus has emerged among key stakeholders in the sector, including the Ministry of Energy and Mineral Resources (MEMR), the Ministry of Finance (MOF), the Ministry of State-Owned Enterprises (MSOE), and PLN itself, that fundamental change is needed. To support PLN's contribution to charting the path forward, the Asian Development Bank (ADB) conducted a comprehensive study on restructuring the company under the technical assistance to Indonesia for Sustainable and Efficient Energy Policies and Investments.[1] This study was intended to inform PLN's Transformation Program Office of the issues and options available to the company.

The study covered the following topics:

- challenges in the Indonesian power sector, and the rationale for PLN restructuring;
- electric utility restructuring experience in selected countries;
- restructuring options for PLN;
- evaluation of these options and identification of a preferred option; and
- formulation of a PLN restructuring road map.

This report presents the result of the study, the restructuring road map.

[1] ADB. Indonesia: Sustainable Infrastructure Assistance Program Phase II – Supporting Sustainable and Efficient Energy Policies and Investments (Subproject 2).

The restructuring of PLN will yield meaningful benefits only if it is carried out in conjunction with regulatory strengthening and the introduction of a new revenue model. This report therefore also proposes a sequence of steps to strengthen regulation and develop and apply a new revenue model.

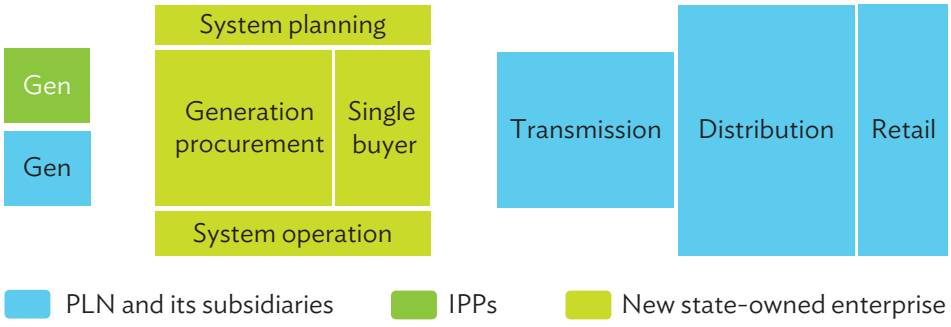
The Future Sector Structure

PLN's operations currently span the entire electricity value chain. This broad scope of operations creates inherent conflicts of interest. For example, PLN is a generator, but it also plans and operates the system and procures new generation—creating a bias to plan, build, and dispatch its own generation first, regardless of whether such planning, construction, and dispatch decisions are the most cost-effective.

In addition, PLN's monolithic structure impedes transparency, which is essential for effective regulation and healthy financial performance of the sector. Operations across the value chain by a single entity are not subject to the daylight of commercial, arm's length transactions. This can conceal poor performance and hide unintended or dysfunctional cross-subsidies.

The new structure should therefore eliminate or remove these conflicts of interest while enhancing transparency. This can be accomplished by separating the system planning, system operations, and single buyer functions from the rest of PLN, leaving PLN responsible for the core functions of generation, transmission, distribution, and retail (Figure 1). This structure is referred to as the Independent System Operator (ISO) as Single Buyer.

Figure 1: The Option for Independent System Operator as Single Buyer



gen = generation, IPP = independent power producer, PLN = Perusahaan Listrik Negara (State Electricity Corporation).

Source: Asian Development Bank.

Of course, this separation of functions and establishment of a new state-owned enterprise (SOE) cannot happen overnight. It will take time as processes are developed, new organizational structures are prepared and staffed, and external prerequisites—such as a new revenue model and stronger regulation—are fulfilled. This report presents the road map for achieving this target structure.

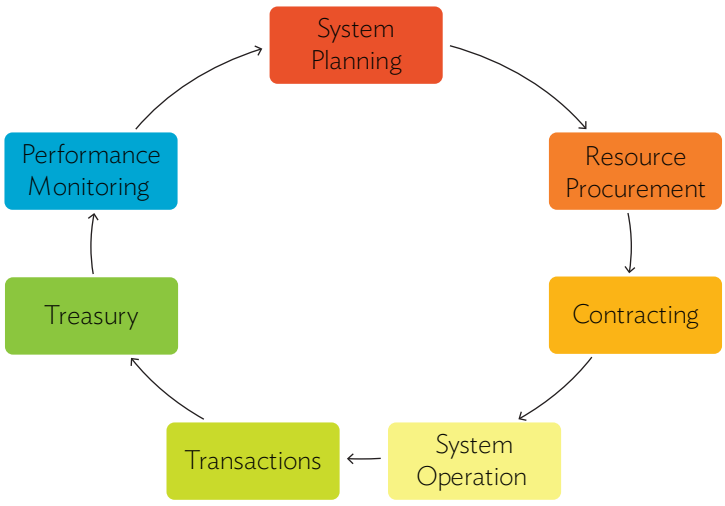
Moreover, there is a geographic dimension to these changes in addition to the temporal. These changes cannot be implemented throughout PLN at the same time. PLN operates many systems, each functioning at a different level of technical and institutional maturity. Given that the Java–Bali system is the most technologically advanced and institutionally mature, it is anticipated that it will be the first to reach the desired structure. Over time, other systems can transition to the same new structure. It is nonetheless assumed that a uniform national tariff is retained.

Mapping the Current PLN Organization to the Independent System Operator as Single Buyer

From an external perspective, PLN appears to be a monolithic entity with a span of control encompassing the entire electricity value chain. This results in the conflicts of interest and lack of transparency noted above. Internally, however, PLN's organization is fragmented, resulting in operational silos. This impedes business efficiency and PLN's ability to achieve renewable energy targets.

The ISO as Single Buyer will facilitate an integrated and more efficient cycle of planning, procurement, and operations for the power systems it manages. This business process cycle (Figure 2) begins with generation and transmission-expansion planning based on load forecasts provided by PLN transmission and distribution units. This will involve co-optimization of possible generation and transmission investments, and eventually non-network resources such as demand response. This planning will be based on the regulator's criteria, reflecting coherent national policy objectives, including tariff levels, and any government financial support. On a competitive basis, the ISO as

Figure 2: High-Level Business Process Flow for the Independent System Operator as Single Buyer



Source: Asian Development Bank.

Single Buyer will then procure the resources to meet future load demand—subject to planning criteria and policy objectives—at the lowest cost. It will contract these resources and operate the system.

System operations will involve buying bulk power from generators, and selling it to PLN distribution and retail units. The ISO as Single Buyer will need to manage these funds through its treasury function. It will continuously monitor performance of this process and report this performance to the regulator, considering the results as it plans the system in the future.

During this report's preparation, this process was conducted across six PLN directorates (PLN had not yet released details of its new internal holding company structure, announced in September 2022). Figure 3 shows the spread of these functions for the Java–Bali system across PLN's current organization using the same color coding of process steps as in Figure 2. Conflicts of interest will be mitigated by separating these functions from PLN and consolidating them in a leaner entity, improving transparency through arm's length relationships with generation, transmission, distribution and retail operations; business efficiency and renewable energy developments will also be advanced.

Given the prevailing organizational fragmentation of this process, it is unsurprising that PLN faces difficulty in achieving the renewable energy targets that have been set for it. Grid flexibility is key to greater penetration of low-cost variable renewable energy such as photovoltaics. To maximize flexibility, system planning should consider operational aspects holistically and recognize the potential contribution of new technologies like resource forecasting, while procurement and contracting should encompass ancillary services, including non-network resources like demand response. Innovation is stifled by conducting each step of the process within separate organizational silos—and adherence to each silo's separate guidelines, prior to the imperative of energy transition, hinders progress toward decarbonization.

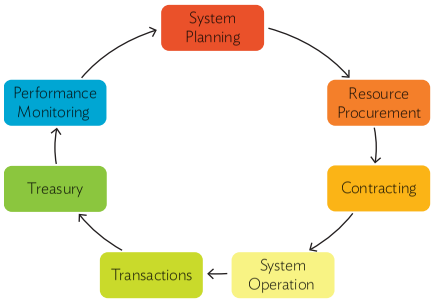
Functions from PLN's current organizational structure that would migrate to the ISO as Single Buyer include the following. Some of these functions would be duplicated between the residual PLN and the ISO as Single Buyer, e.g., legal. Within the ISO as Single Buyer, these functions no longer distinguish between engineering, procurement, and construction (EPC) and independent power producer (IPP) projects that currently exist within PLN organizational roles, since all generation and transmission projects will be carried out by other parties under contract with the ISO as Single Buyer. This list assumes that the ISO as Single Buyer commences operation of the Java–Bali system. The following major systems (e.g., Sumatra, Kalimantan, and Sulawesi) will be added to the operation of the ISO as Single Buyer as they mature:

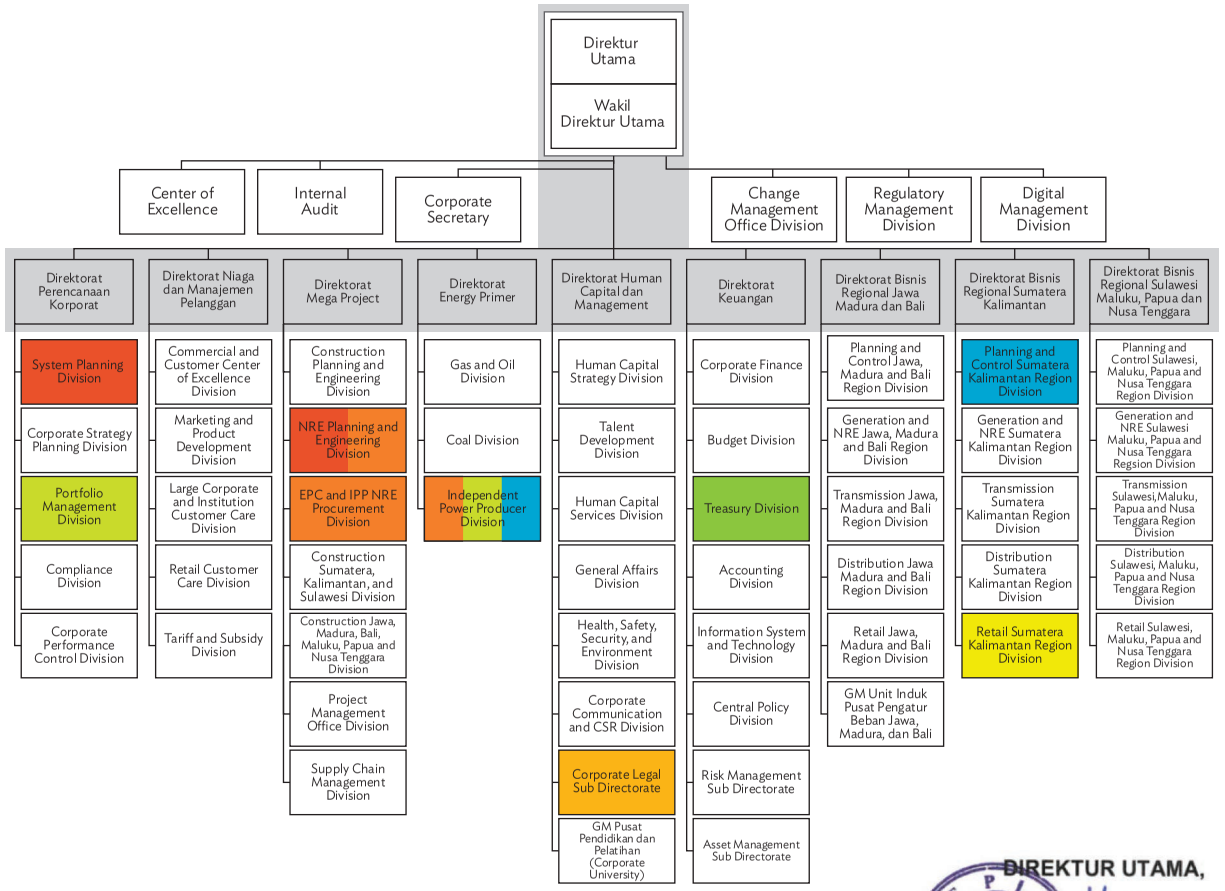
Figure 3: Mapping of Independent System Operator as Single Buyer Functions to the Current PLN Organization

Tanggal: 11 December 2020

PLN

A. Bagan Organisasi PT PLN (Persero)





DIREKTUR UTAMA,

ZULKIFLI ZAINI

- System Planning Division:
  - Establish general policies and basic assumptions for demand forecasting by PLN.
  - Review and confirm the demand forecasts submitted by PLN units.
  - Determine the cheapest new resources (generation, transmission, and non-network), consistent with planning criteria and other policies set by the regulator and government, while considering potential new technologies.
  - Evaluate and approve project feasibility studies from new resource providers.
  - Prepare, socialize, and process for government approval the Electricity Business Supply Plan (RUPTL).
  - Maintain a Project Management Information System (PMIS) and monitor implementation progress for new resources.
  - Manage international relations and cooperation.

- Portfolio Management Division for transactions:
  - Develop strategies, policies, and management mechanisms for the single buyer.
  - Manage the single buyer and energy transactions from a corporate perspective.

- New and Renewable Energy (NRE) Planning and Engineering Division for system planning and resource procurement:
  - Provide data required to properly represent renewable energy resources for system expansion planning.
  - Review feasibility studies for NRE projects from operational and financial perspectives.
  - Evaluate and process approval of procurement plans and power purchase agreements (PPAs) for NRE projects.
  - Develop standards and guidelines for feasibility studies, engineering design, bid documents, and engineering cost estimates for NRE projects.
  - Compile and approve engineering designs, bid documents, and engineering cost estimates for NRE projects.
  - Manage the list of selected suppliers (DPT) for NRE project development.
  - Monitor the progress of all NRE projects, including the status of required licenses and permits, land acquisition, provision of subsidies (if any) and financing, and coordinate project development and implementation among stakeholders.

- EPC and IPP NRE Procurement Division for resource procurement:
  - Formulate and socialize procurement policies and guidelines and develop corporate procurement competencies.
  - Develop and implement procurement strategies and processes for the acquisition of specific resources as well as consultancy, including market sounding, procurement packaging, tender terms and conditions, identification of possible vendors, process supervision, post-tender evaluation, and procurement database maintenance.

- IPP Division for resource procurement, treasury, and performance monitoring:
  - Formulate strategies, policies guidelines, and policies for procurement of new generation.
  - Align planning of generation and transmission procurement.
  - Implement procurement of generation and transmission, including preparation of procurement documents and selection of winners.
  - Monitor the financing and construction of projects, and report progress to the regulator and other relevant authorities.
  - Monitor the operational performance and dispatch of generators and transmission in line with contract terms and the grid code.
  - Ensure that payments to generators comply with contract conditions and generator performance.

- Corporate Legal Sub-Directorate for contracting:
  - Prepare and implement corporate legal policies and strategies.
  - Prepare and negotiate contracts without outside parties, including generation, transmission, and distribution entities.
  - Provide regulatory inputs, ensure regulatory and legal compliance and anticipate changes to laws and regulations.
  - Provide legal representation for the company toward courts and outside parties.

- Treasury Division for treasury:
  - Develop strategies and policies for liquidity management, considering the receipt of cash for electricity sales and payments for bulk power purchases.
  - Manage company liquidity and operational cash flow.
  - Prepare management reports to facilitate treasury management.
  - Prepare and implement treasury business processes and systems.

- Planning and Control Division for the Java, Madura, and Bali Region for performance monitoring:
  - Prepare the regional development plan in alignment with the long-term corporate plan and RUPTL and ensure harmonization of organizational development with these plans.
  - Prepare the regional work plan and budget.
  - Ensure that regional budgets are aligned with 5-year cash flow projections and the financial feasibility of projects. This should include analysis of projected payments to generators, transmission, and distribution and retail to cover their investments and operations relative to projections of revenue received from electricity sales and subsidies. If projected costs exceed projected revenues, then propose adjustments to the expansion plan and/or planning criteria.
  - Monitor and report actual financial performance.
  - Monitor and report performance against agreed service levels, both internally and as agreed with external parties (e.g., generators, transmission, distribution, and retail).

- Jamali Load Control Center for system operation:
  - Establish operational planning (up to year-ahead).
  - Schedule and commit units.
  - Conduct real-time dispatch and system operations.

Four Stages of Power Sector Reform

The root causes of the problems that currently characterize the power sector—slow decarbonization, financial unsustainability, and regional disparities in access to and quality of supply—are not due solely to the conflicts of interest, lack of transparency, and organizational silos associated with PLN's current structure. They also arise from the consolidation of policy making and regulation, inadequate capacity in government, poor policy coordination across ministries, and ineffective regulation.

Reform of the sector to address the prevailing challenges therefore rests on the following three pillars:

- restructuring of PLN;
- strengthening of sector governance and regulation, building on principles of public participation, greater transparency, improved policy coordination, separation of regulation and policy making, and acquisition and/or development of qualified human resources; and
- establishment of a new revenue model for PLN based on proven international practice that will be applied to ensure revenue sufficient to maintain the financial viability of the company in particular and the sector as a whole.

The development of a new revenue model is a regulatory issue, but it is so critical for establishing a sound financial foundation for the sector that it is highlighted as a distinct pillar. A revenue framework that can ensure financial sustainability is necessary for any reforms to yield durable benefits.

These three pillars create the foundation for a healthier and more accountable PLN while enabling the government to more effectively discharge its constitutional obligation to control the sector. These reforms are not intended to weaken PLN or dilute government control of the sector in any way. On the other hand, PLN should embark on a restructuring program only if government commits to the other two pillars of reform.

These three pillars will be developed in parallel across four stages of transition. The following sections describe the activities to be conducted in each stage, and the prerequisites for progression to the next stage, summarized as follows:

- **Stage 1: Current Situation**. This is the starting point for sector transformation. Stage 2 commences upon the approval of the government and PLN of the reform program.

- **Stage 2: Internal Single Buyer**. Sector transformation starts with the following:
  - The government establishes a new revenue model, implements the initial adjustment of tariffs and subsidies in accordance with the resulting revenue requirement, and reactivates a tariff adjustment mechanism. This new revenue model would be based on either a rate of return or cash flow methodology.
  - Efforts to improve governance and regulation during this stage include expanding and strengthening the role of the Board of Commissioners; preparation of a presidential regulation for interministerial sector governance; preparation of new regulations regarding planning, procurement, and pricing; and capacity building for the Directorate General of Electricity (DJK), the Directorate General of New and Renewable Energy and Energy Conservation (DJEBTKE), and relevant officials in the Ministry of Finance (MoF) and the Ministry of State-Owned Enterprises (MSOE).
  - Restructuring of PLN includes MSOE approval of a restructuring plan; establishment of internal transformation teams, charters, and a change management program; transfer of all PLN generation assets into generation subsidiaries; and initial reorganization of PLN to create a "Directorate of PLN Transformation" that will handle system planning and system operations on Java–Bali and serve as the embryo of the ISO as Single Buyer.

- **Stage 3: Ring-Fenced Single Buyer**. This stage will further broaden and deepen sector reform through the following:
  - With respect to the new revenue model, the government would commence the introduction of direct subsidies to targeted consumers, reduce subsidies and compensation paid to PLN, adjust base tariffs, and continue application of the tariff adjustment mechanism.
  - Governance and regulatory activities for the issuance of the new presidential regulation on sector reform, including establishment of an interministerial committed with representation from MEMR, MSOE, and MoF to advise on policy impacts, propose pricing adjustments, and supervise planning and procurement. Public participation, transparency, and operations supervision are enhanced. Capacity building as well as the development and application of new regulations continues. The preparation of a new electricity law commences.
  - PLN restructuring would progress to the establishment of a completely ring-fenced Single Buyer + System Operator (SB+SO) unit within PLN. Generation procurement, contracting, transaction management, treasury, and performance monitoring functions will be added to the system planning and system operation functions that were transferred to the Java–Bali transformation directorate in the preceding stage. Cash flows would be segregated within PLN.

- **Stage 4: New Single Buyer**. This represents the final target structure, which is characterized by the following:
  - The government implements full cost recovery tariffs (as determined by the new revenue model) and arm's length commercial transactions across the entire electricity value chain. Only direct- and cross-subsidies will be

applied, and there will be no further compensation or subsidies paid to PLN. Explicit recognition of ancillary service costs is incorporated into the revenue model.

- Establishment of a new government agency is empowered by law to regulate the sector, with associated staff recruitment and capacity building. Mechanisms are introduced to facilitate competition among generators as PPAs expire. Regulations and regulatory processes continue to be updated.
- Spin-off of the PLN Transformation directorate to become an SOE separate from PLN. All legacy PPAs are assigned to the New SB+SO, and all bulk power transactions are conducted on commercial arm's length basis between the New SB+SO and IPPs, PLN generation subsidiaries, and PLN distribution and retail units. PLN provides transmission and distribution through service agreements with the New SB+SO. The New SB+SO starts procurement of ancillary services and initiates a bulk power market for generators with expired PPAs.

The ultimate vision is to establish a New SB+SO as an SOE separate from PLN that will be responsible for system planning, generation procurement and contracting, system operations, and bulk power transactions on all major power systems in Indonesia (Java–Bali, Sumatera, Kalimantan, and Sulawesi). Because Java–Bali is the most mature system, it is proposed to start the transformation with this system and add others to the scope of operations of the New SB+SO as they are ready.

There are three alternative approaches for restructuring PLN. One is to consolidate all necessary functions within a PLN single buyer unit, then transfer these to a new company when the prerequisites have been fulfilled. Another approach is to spin off one function into a separate new company at the outset, for example, system operations, and then transfer additional functions from PLN to the new company until all desired functions have been transferred. A third approach is to retain all required functions within the legacy PLN holding company, and gradually spin off primary energy, generation, transmission, distribution, retail, and non-power supply operations into subsidiary companies. While this report presents a road map for the first approach, all three can lead to the same end structure.

The first approach has been adopted in Malaysia (though the single buyer remains a ring-fenced unit within the national utility, TNB, and has not yet been established as a company).[2] Malaysia is not used here as a model to be replicated, but simply to highlight that several of the key measures proposed here have been successfully adopted elsewhere. As noted at the outset of the paper, the path of restructuring is unique to each country based on its preexisting industry structure, legal and constitutional framework, institutional composition, geographical conditions, etc. Malaysia shared many of the same conditions that continue to exist in Indonesia: a legacy vertically integrated national utility that apart from the existence of some IPPs, operates as a monopoly; a history of electricity pricing below economic cost of supply; an intention to manage electricity supply and pricing as an input to economic development, etc.

[2] M. Kumar, R. Poudineh, and A. Shamsuddin. 2021. Electricity Supply Industry Reform and Design of Competitive Electricity Market in Malaysia. *OIES Paper* EL 44. Oxford Institute for Energy Studies. January.

This approach is also adopted here because there is no guarantee that all prerequisites for operation of a complete single buyer as a separate company will be fulfilled. It is therefore unnecessary to incur the cost, time, and effort of establishing the new company until it is clear those prerequisites can be fulfilled. For example, it is envisioned that existing PPAs will be assigned to the New SB+SO, but if this is not possible, it is likely better to retain the single buyer as a ring-fenced unit within PLN.

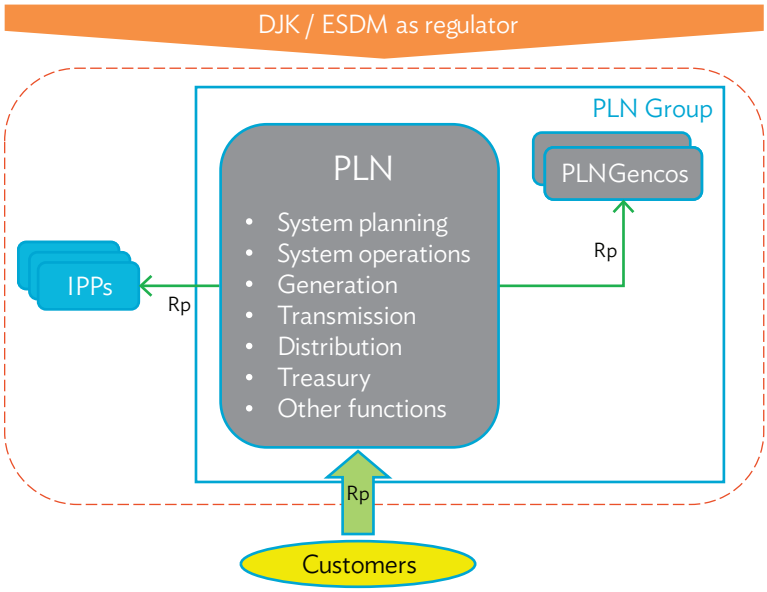
In particular, establishing a new company at the outset would require not only the transfer of a core function (probably system operations), but also transferring or establishing back office functions, capitalizing the company, and transferring personnel—which can delay operations and hamper the main objective of transferring consolidated functions from PLN to a complete single buyer.

Stage 1: The Current Situation

This section summarizes the current situation with respect to the revenue model in use, prevailing governances and regulatory arrangements, and present industry structure. These topics were discussed in detail in Paper 1, and the preceding chapter in this report has provided further information on PLN's current internal organizational structure (Figure 4).

The prerequisite for moving to the next proposed stage (Stage 2: Internal Single Buyer) is government and PLN concurrence regarding the target industry structure and arrangements and road map described in this report. In particular, MEMR, MoF, and MSOE would have to agree on reform objectives and road map for meaningful changes in governance and regulation. Given the interministerial nature of the proposed changes, this likely requires presidential commitment and leadership. While the revenue model for tariff formulation is under the authority of MEMR and for subsidy and compensation

Figure 4: Current Structure of the Indonesian Power Sector



Current conditions:

1. PLN consolidates all functions other than generation; there are inherent conflicts of interest.
2. Planning, procurement, and system operations separated in different directorates
3. Limited transparency across value chain
4. PLN revenue insufficient for healthy commercial operations
5. Payments to IPPs on commercial basis, payments to PLN generation at less than cost
6. DJK and ESDM serve as regulator
7. No public participation
8. Conflicting government policies

DJK = Direktorat Jenderal Ketenagalistrikan (Directorate General of Electricity), ESDM = Kementerian Energi dan Sumber Daya Mineral (Ministry of Energy and Mineral Resources), gencos = generation companies, IPP = independent power producer, PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), Rp = Indonesian Rupiah.

Source: Asian Development Bank.

under MoF, broader agreement across government, including the President, would be necessary to provide a foundation for an eventual transition to cost recovery tariffs and direct subsidies. Restructuring of PLN requires PLN and MSOE agreement on reform objectives and restructuring road map, with the concurrence of MoF as the agency responsible for fiscal support to the sector and MEMR as the sector policy maker and regulator.

Revenue Model

Since the release of MoF Regulation (PMK) 117/2005, the Government of Indonesia has applied a revenue model based on PLN's accounting cost of electricity supply (BPP) plus a margin to determine subsidy payments to PLN. The use of BPP to determine subsidies payable to PLN appears to originate in Law 19/2003 on State-Owned Enterprises, which states in the elucidation of Article 66 that if the government assigns an SOE a function that is not financially feasible, the government is obliged to compensate the SOE for the costs incurred plus a margin.

The MoF first applied the BPP+margin revenue model for subsidy determination in 2007 and continues to apply this model to calculate both subsidies and compensation to PLN. The MEMR subsequently adopted this model for setting tariffs for selected classes starting in 2014 along with a reintroduction of a tariff adjustment mechanism.

BPP is calculated as total allowable expenses booked by PLN for the previous year divided by PLN electricity sales, as audited by the State Auditor of the Republic of Indonesia (BPK). The regulation also stipulates various unallowable costs to be excluded from the BPP calculation. Allowable expenses have been defined most recently by PMK 174/2019 as follows:

- power purchases, including generator rentals;
- fuel costs, including lubricants and water levies for hydropower;
- maintenance costs, including materials and maintenance services;
- employment and personnel costs;
- administration costs;
- depreciation on operational fixed assets; and
- interest and other financial costs incurred for electricity supply.

There are several problems with the use of BPP+margin as PLN's revenue model. The first is that it considers PLN's audited costs from the previous year, while current and future costs are sure to differ. The tariff adjustment mechanism attempts to keep tariffs current by considering changes in certain cost drivers, but the prevailing formulation only partially captures the factors that affect PLN's costs. Moreover, the tariff adjustment mechanism has been applied only once in the past 5 years.

The second problem is that BPP does not adequately compensate fixed asset costs. Remuneration of fixed assets should be based on projected debt service (from a

cash flow approach) or from the cost of capital (debt and equity) associated with the projected mix of assets. This is a potentially serious problem for a company like PLN working in a capital-intensive industry that is growing rapidly.

The final problem is that the margin applied to BPP is not derived from transparent and systematic evaluation of revenue required to maintain PLN liquidity and solvency under a set of targets for performance improvement, but is a process of negotiation with various ministries and the national legislature, which approves the State budget.

It is therefore unsurprising that PLN faces a difficult financial situation. These financial problems began when load growth failed to materialize as forecast starting in 2015. This resulted in PLN excess generation capacity, the adverse financial impacts of which have now been exacerbated by the downturn in demand growth due to the coronavirus disease (COVID-19) pandemic. Consequently, in 2020, PLN had to cut capital expenditure by nearly one-third from the previous year, while loan repayments increased by roughly one-third. (Capital expenditure in 2021 was 40% below the 2019 level, and for the first half of 2022 is running at two-thirds lower on an annualized basis.) The fact that the partial application of the tariff adjustment mechanism in late 2020 resulted in a decrease in tariffs is symptomatic of its deficiency.

DJK, together with PLN and the National Team for Acceleration of Poverty Reduction (TNP2K), started work several years ago on combining data from various sources to improve electricity subsidy targeting. This work continues and provides a foundation for the transition to direct subsidies. DJK has also been working on a better representation of cost drivers in the tariff adjustment mechanism. This provides a basis for analysis of electricity supply cost drivers and improvements to both the revenue model and the tariff adjustment mechanism.

Governance and Regulation

DJK, under MEMR, serves as Indonesia's power sector regulator as well as supporting the policy-making functions of the ministry. Its principal regulatory functions on behalf of the ministry include

- licensing,
- review and processing of approval for plans such as the RUPTL,
- preparation of tariffs and administration of tariff adjustments,
- preparation of technical standards and codes, and
- monitoring and reporting utility operational performance (e.g., losses, reliability, emissions, etc.).

DJK also analyzes and prepares policies for issuance by MEMR. As such, it does not provide an independent review of MEMR policies, nor does it formally review policies and regulations issued by other ministries. As noted in earlier papers, there is no agency responsible for reviewing the overall impact on the sector of policies issued by various ministries, sometimes resulting in inconsistent or conflicting policies.

The MSOE appoints PLN's Board of Commissioners (BoC), which supervises PLN on behalf of the government as shareholder. These supervisory duties encompass human resource and organizational management; work planning, annual budgeting, and associated key performance indicators (KPIs); risk management; and auditing, financial performance, and quality of management reporting. The BoC includes representatives from the MSOE, MoF, and MEMR.

The BoC includes members with a power sector background as well as members with broader government experience. The BoC benefits from training throughout the year to build relevant competencies. However, the BoC has traditionally focused on corporate governance rather than sector governance. Given the representation on the BoC from the three ministries that are most involved in sector governance (MSOE, MEMR, and MoF) as well as PLN's dominant role in the sector, the BoC could potentially take a more prominent role in sector governance by analyzing and highlighting the impacts of often-conflicting policies and regulations issued by various government agencies, and bringing these conflicts to the attention of relevant agencies for resolution. No government agency currently fills this much-needed function. This would require allocation of additional resources to the BoC.

At present, there are no structured opportunities for public input on power sector policy making or regulation. Moreover, while the MEMR makes various plans and high-level data publicly available, little data are released that would facilitate meaningful input to policy making or regulation even if opportunities were available.

PLN and Industry Structure

As noted in previous papers, PLN operations span the entire electricity value chain, from primary energy acquisition and transport to electricity retailing. In several key segments, such as transmission and distribution, it holds a monopoly, while in others, like generation, it has a dominant position. This end–to–end span of operations gives rise to inherent conflicts of interest, and the conduct of much of these operations within PLN itself rather than in a subsidiary company impedes transparency.

While PLN may appear from the outside as a monolithic entity, the previous chapter highlighted that, like many large organizations, it suffers from a greater span of control than can be effectively managed by the Board of Directors. This, in turn, leads to organizational silos. This is a particular impediment for PLN's energy transition to a less carbon-intensive supply of electricity. Closer integration of system planning, generation procurement, and system operations can help unlock the operational flexibility required to accelerate the uptake of variable renewable energy resources.

This study is only one activity to support PLN's business transformation initiatives. Internal PLN initiatives to formulate a restructuring strategy as well as map out its energy transition to eventually achieve net-zero emissions are ongoing and provide a basis for restructuring implementation.

Stage 2: Internal Single Buyer

As soon as PLN and the government agree on reform objectives and pathways across the three pillars of regulation and government, revenue model, and PLN restructuring, implementation can begin. With PLN's recently announced restructuring and the provision of Presidential Regulation No. 112/2022 for MEMR to coordinate with MSOE and MOF for the issuance of the RUPTL, the first steps have been taken in this regard.

Revenue Model

There are two main alternative methodologies to estimating required revenues: cash needs and building blocks. The building block is applied by numerous regulators in North America, Europe, and Australasia, although not always by this name; in the United States, it is referred to as the rate of return approach. It is combined in many cases with a price/revenue cap (CPI-X) regime for remuneration of transmission and distribution services going forward. The revenue requirement is the sum of individual building blocks, with the costs of making investments recovered through depreciation (return of capital) and financial return (return on capital) building blocks. It tends to suit mature electricity systems markets that involve privately owned or corporatized entities.

The cash-needs methodology tends to be applied in emerging countries that have high investment needs, most notably throughout Latin America. It is often used in government-owned electricity systems as a tool for transitioning to cost-reflective tariffs before moving to a building-block methodology.

Under current conditions, a cash-needs methodology might better suit PLN's high investment needs and makes the cost of financing more transparent. Once PLN's investment program stabilizes, it could shift to a building-blocks methodology to ensure that customers pay a tariff that reflects the true cost of electricity supply and that PLN's equity is fully remunerated. Either of these approaches would provide a better estimate of the revenue required for PLN to remain financially healthy than the current BPP+margin approach, and provide a basis for PLN restructuring to yield maximum benefits.

The principal activities that MEMR will carry out at this stage include the following:

- Identify and evaluate options for a new revenue model and direct subsidies.
- Select a new revenue model and establish guidelines or regulations for its application. This would ideally involve concurrence of MoF. At this stage, the new revenue model would not be used directly to set tariffs, but rather to monitor the alignment of total tariff revenue, subsidies, and compensation with the sector revenue requirements.

- Together with TNP2K and the Ministry of Social Affairs, conduct a pilot for administration of direct subsidies.
- Recommence application of a tariff adjustment mechanism and initiate the gradual adjustment of tariffs toward a cost-recovery basis.

During this stage, PLN would continue to receive subsidies and possibly compensation from the government depending on the speed of a transition to cost-recovery tariffs. Prerequisites for advancing to the next stage include satisfactory results from the direct subsidy pilot and social and political acceptance of the tariff adjustment.

Governance and Regulation

This stage aims to strengthen sector governance through an expansion of the BoC's scope of supervision from corporate governance to advice on broader sector governance, and to further build the capacity of DJK to function as regulator.

The expansion of the BoC's role would entail activities such as the following:

- Identify all government policies and targets relevant to PLN and sector development.
- Analyze the impacts of these various policies and targets on PLN finances and consistency among these policies and targets. The BoC would of course not be in a position to change these policies or targets, but rather to highlight the impacts and any conflicts to the relevant government agencies, and to help facilitate resolution.
- Analyze generation procurement mechanisms, not only from the standpoint of good corporate governance and compliance with prevailing regulations, but from a more general standpoint of whether they yield least-cost outcomes. Again, the BoC would not have the authority to change underlying regulations, but as a first step, it could identify potential improvements for the ministries that do hold such authority.

To accommodate this expanded role, the BoC would require additional resources. It is proposed that a new secretariat be established and funded to allow the BoC to engage full-time qualified staff to carry out this analysis and help make recommendations. The prevailing representation of BoC members from MSOE, MEMR, and MoF would facilitate the circulation of the findings and recommendations for consideration and action by these ministries.

In parallel, DJK would embark on capacity building to strengthen the following existing regulatory functions:

- Evaluate PLN's proposed system expansion plans more rigorously. Modern system planning tools can co-optimize generation and transmission expansion, explore trade-offs between reliability and cost, better assess the role of variable renewable energy in the generation mix, explicitly account for uncertainty in the planning process, and consider the greenhouse gas emissions associated with any given expansion plan to assess the financial impacts of carbon taxes and carbon

market participation. Such tools are required to critically assess proposed PLN expansion plans. DJK has made progress in this regard, for example, its adoption of the Balmorel planning model for preparation of the national electricity plan (RUKN).

- Apply a new revenue model in place of BPP+margin, as discussed in the previous section.
- Explicitly determine the linkages between various performance targets (reliability, losses, electrification, etc.), the expansion plan, the revenue requirement, and affordability.

In addition, there are a number of new regulatory functions that should be initiated:

- **Procurement processes**. Though DJK currently prepares procurement guidelines and has oversight of some procurement processes, a fundamental realignment procurement regulation is required that qualifies as an entirely new function. To secure least-cost investment for the sector, all new generation should be procured competitively, rather than relaxing requirements for PLN subsidiaries, and outright allocation of many generation projects to PLN.
- **Public participation**. Structured opportunities for public participation are needed as a basis for sector management and regulatory decision-making. Meaningful public participation requires transparency and the release of data on operations that until now have been restricted, subject of course to commercial confidentiality requirements. This is a critical requirement for improving the quality of regulatory decisions and can be implemented in parallel with the introduction or strengthening of other regulatory functions.

The performance of these strengthened and new functions will require a substantial upgrading of regulatory capacity, especially with respect to skills requirements. This will require several years of capacity building, similar to the effort preparing the Electricity Market Regulatory Commission (BPPTL) from 1998 to 2003.

During this stage, a new presidential regulation would be prepared to formalize an interministerial committee drawn from MEMR, MSOE, and MoF to coordinate policy and regulate the sector. (An initial step in this direction has been stipulated under Presidential Regulation No. 112/2022, which requires MEMR to coordinate with MOSE and MoF to issue the RUPTL.) DJK would remain the secretariat for this committee. Prerequisites for moving to Stage 3 include:

- the release of this new presidential regulation and adoption of new regulations and guidelines governing the review and approval of the RUPTL;
- the use of competitive tendering for all new generation;
- the introduction of public participation and public reporting of transactions, planning inputs, and utility performance to the extent it does not breach commercial confidentiality;
- establishment and use of a new revenue model to assess the adequacy of tariffs, subsidies, and compensation; and

- a regulatory process to align planning criteria, performance targets, and associated investment and revenue requirements as a framework to benchmark the adequacy of the current sector revenue.

PLN and Industry Structure

During this stage, PLN commences a fundamental reorganization of the business, as follows. Restructuring would start around establishing a Java–Bali single buyer plus system operations unit as that system is the most mature; other systems would migrate to this unit as they are ready. PLN will carry out the following principal activities:

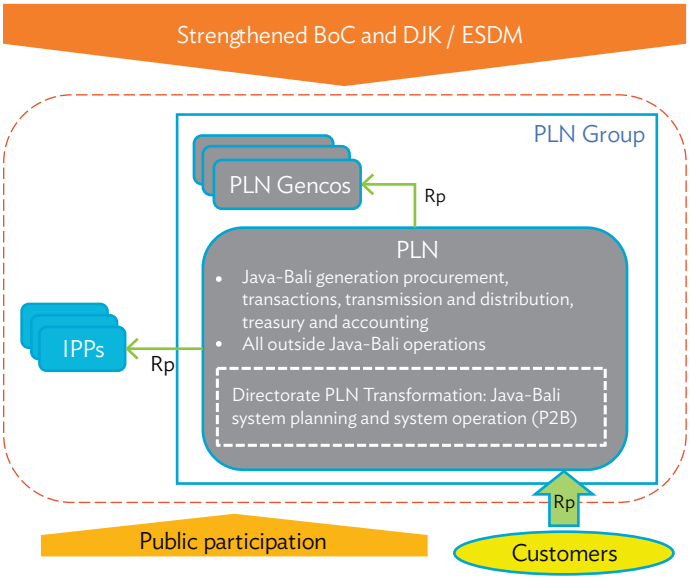
- The company initiates a comprehensive change management process, including establishment of transformation teams and associated charters as well as a human resource management process and communications strategy.
- It transfers all generation assets into generation subsidiaries. There are a number of ways to break out generation, e.g., by technology or geographically. Under the restructuring that PLN launched in September 2022, it appears that all generation will be moved to PLN's existing generation subsidiaries, formerly known as Indonesia Power and Pembangkitan Jawa Bali (PJB), and their subsidiaries. Those two companies will have two joint venture subsidiaries, one for biomass power and the other for geothermal power.
- The company implements arm's length commercial power purchase agreements for all PLN generation subsidiaries, with provisions to increase bulk power tariffs and timeliness of payments in line with the transition toward full funding of the revenue requirement as determined by the new revenue model.
- PLN establishes a new Transformation Directorate, which would consolidate and cultivate the functions from across PLN that would eventually migrate to New SB+SO that would function as the ISO as Single Buyer. At this stage, this directorate would consolidate system planning and system operations for the Java–Bali system as it is most mature. Other systems would migrate to this directorate (or later, to the new company) as they are ready. Under the restructuring announced in September 2022, PLN combined system planning and system operations under the Directorate for Transmission and System Planning.
- The company adopts improved system planning techniques, such as generation and transmission co-optimization, and explicit consideration of the flexibility needed to facilitate the uptake of variable renewable energy as part of the energy transition.
- PLN implements a procurement process that relies on open competitive procurement of all new generation, in line with regulatory changes described in the previous section.

All cash flows and cash management remain centralized within PLN during this stage, but PLN's accounting system would be adapted to begin to track the revenue and expenses of the Java–Bali system separate from the rest of PLN.

The structure of the industry after this stage is shown in Figure 5. The prerequisites for PLN restructuring to move to the next stage include the following:

- all PLN separated into generation subsidiaries with commercial, arm's length PPAs (allowing for the gradual increase of funding to PLN in line with the new revenue model) and
- successful combination of Java–Bali system planning and system operations within a single directorate, as measured in terms of the penetration of renewable energy and plans for increased flexibility of the system.

Figure 5: Structure of the Indonesia Power Sector During Stage 2—Internal Single Buyer



BoC = Board of Commissioners, DJK = Direktorat Jenderal Ketenagalistrikan (Directorate General of Electricity), ESDM = Kementerian Energi dan Sumber Daya Mineral (Ministry of Energy and Mineral Resources), G&T = generation and transmission, gencos = generation companies, IPP = independent power producer, P2B = pusat pengatur beban (load dispatch center), PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), PPA = power purchase agreement, Rp = Indonesian Rupiah.

Source: Asian Development Bank.

Key features:

1. Strengthened BoC, especially to review planning, procurement, and transformation
2. Transfer of all PLN Java–Bali generation into subsidiaries
3. P2B and Java–Bali system planning merged under one PLN director for PLN Transformation. Separation of accounting begins. (assets remain under existing regional directors, cash control still centralized)
4. Establishment of arm's length PPAs for all PLN gencos. Bulk pricing moves toward commercial basis
5. All new Java–Bali generation competitively procured
6. Introduce improved economic least-cost planning with G&T co-optimization
7. Adjustment of tariffs and subsidies commences
8. DJK improves regulatory capacity and begins to implement mechanisms for public participation and greater transparency

Stage 3: Ring-Fenced Single Buyer

The third stage of the reform program completes the establishment of the ISO as Single Buyer within PLN, and creates the conditions necessary for a spin-off of this unit as a separate SOE.

Revenue Model

During this stage, the subsidy and compensation paid to PLN are reduced, and the new revenue requirement starts to directly guide tariff setting. Tariff adjustment would continue toward full cost recovery, and the use of direct subsidies will become the principal mechanism to ensure affordability for vulnerable groups of consumers.

Efficiency incentives through restrictions on allowable costs could be strengthened through the application of performance-based regulation (PBR). However, the application of PBR to state-owned utilities faces an agency problem, as the government is both the owner of the utility and the regulator. Government ownership is driven by factors much broader than pursuit of shareholder returns, which consequently blunts the effectiveness of PBR to drive performance improvement in state-owned utilities. Moreover, the bulk of restructuring benefits will derive from improved investment planning rather than operational improvements, but it is difficult for PBR to directly drive better investment planning. At a minimum, for PBR to yield tangible impacts, employment contracts for senior management of the utility would have to provide substantial incentive compensation.

The fourth stage of reform is characterized by full cost recovery tariffs and commercial transactions along the entire value chain. Prerequisites for transition to that stage include continued social and political acceptance of tariff adjustments, and satisfactory implementation of the new revenue model and direct subsidy system.

Governance and Regulation

During this stage, regulation is conducted by an interministerial committee consisting of personnel assigned from MEMR, MoF, and MSOE. This committee would be established by presidential regulation. Drawing on personnel from all three ministries would help ensure that the scope of regulation, and linkages between targets, investment needs, subsidy design, and funding availability as discussed are considered in a consistent and comprehensive manner. It would be essential to ensure that this committee is funded sufficiently to engage the specialized advisors that would be necessary while capacity is

being developed within the organization. The committee would be supported by a secretariat drawing personnel from DJK and the BoC secretariat established in the preceding stage. Further capacity building and recruitment of qualified staff will be essential.

More sophisticated regulations regarding planning, procurement, and operations will be introduced. In addition, structured opportunities for public participation will be formalized as an input to regulatory decision-making, and information regarding transactions, planning inputs, draft plans, and utility performance will be made publicly available to the extent it does not breach commercial confidentiality.

Governance and regulatory prerequisites to progress to the final stage include the preparation and enactment of a new power sector law that would, among other things

- establish a separate government regulator for the sector, distinct from MEMR and its policy-making role;
- stipulate requirements for transparency and public participation; and
- provide for the existence of two sellers within a single electricity business area: a bulk seller (the single buyer) and a retailer that sells to medium- and low-voltage consumers.

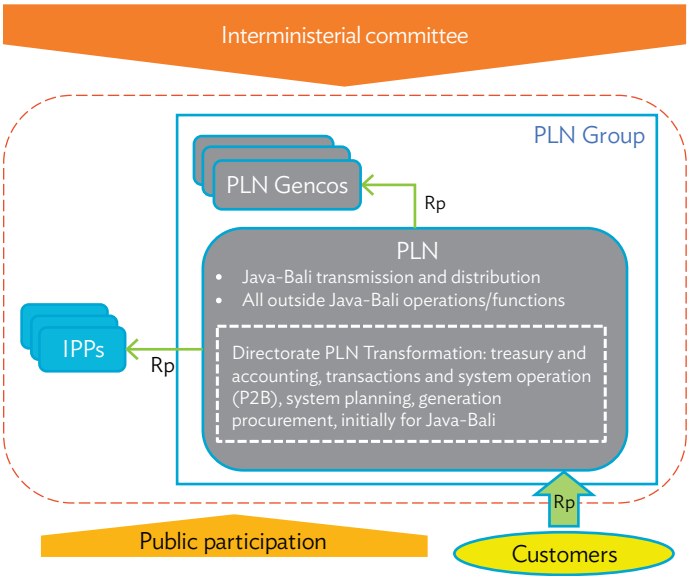
There is precedence in Indonesia for establishing regulatory agencies by law, with examples for toll roads and telecommunications. While this should remain the desired basis for establishment, Indonesian legislative processes are notoriously long. Proposed laws often take years to make it onto the legislative agenda of the People's Representative Council (DPR), and then sometimes take years to be finalized and enacted.

PLN and Industry Structure

During this stage, all of the functions of the ISO as Single Buyer are consolidated within a single PLN directorate as shown in Figure 6. Generation procurement, bulk power transactions, treasury, and accounting functions would join system planning and system operations functions within the PLN Transformation Directorate. Cash flows for Java–Bali operations would be separated from the rest of PLN, which would require the development of geographic cross-subsidy mechanisms to maintain the uniform national tariff. Internal transmission and distribution service agreements will be established.

One benefit of combining the planning, procurement, and system operating functions within a single unit is the ability to holistically develop and adopt new means to achieve greater grid flexibility and utilization of non-network resources to achieve lower costs and facilitate decarbonization. Until now, PLN specifies, procures, and contracts generation on a plant-by-plant basis to meet future capacity and energy needs. The New SB+SO will be better placed to consider potential generation and network additions holistically within the context of the system, explicitly considering, for example, how different types of resources can be combined to facilitate flexibility and lower costs.

Figure 6: Structure of the Indonesian Power Sector During Stage 3—Ring-Fenced Single Buyer



Key features:

1. Java–Bali generation procurement, treasury and accounting for bulk power transactions, and transaction management established within Java–Bali transformation directorate; separation of cash flows from rest of PLN.
2. Java–Bali transmission and distribution assets remain with regional director
3. Establishment of transmission and distribution service agreements
4. Interministerial committee established for power sector regulation
5. Continuing adjustment of tariffs and subsidies to facilitate commercial treatment of all players including PLN and its gencos

gencos = generation companies, IPP = independent power producer, P2B = pusat pengatur beban (load dispatch center), PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), Rp = Indonesian Rupiah.

Source: Asian Development Bank.

The following are the three main prerequisites to transition from this to the final stage, a New SB+SO as a separate SOE:

- Confirm the legality of multiple sellers at different voltages within a single business area.
- Confirm the ability to assign PPAs from PLN to the New SB+SO.
- Establish and capitalize the New SB+SO.

Regarding the legality of multiple sellers within a single business area, Article 10 of Law 30/2009 stipulates that there can be only one integrated supplier, or one distributor and/or retailer of electricity in any business area. Since a single buyer is also the single seller, there has been concern that bulk power sales by the New SB+SO within PLN's business area might conflict with this provision of the law.

Law 30/2009 defines retailing as selling to consumers. It presumably accommodates IPPs, which sell power to PLN within PLN's business area, because PLN is not a consumer as such. Hence, the sale of bulk power by the New SB+SO to PLN for onward distribution and retail does not seem to conflict with this restriction within the law for the same reasons that IPPs can sell to PLN: PLN is not a consumer. Moreover, the New SB+SO would be selling high-voltage (HV) bulk power to PLN, which differs from the medium-voltage (MV) and low-voltage (LV) power sold by the PLN to consumers. Business areas are defined in terms of distribution and retail, not transmission and bulk power sales.

However, while Law 30/2009 does not appear to explicitly prohibit operation of a single buyer distinct from PLN, it also does not explicitly provide a basis for it. In practice, within the Indonesian legal system, the absence of a provision within law to establish a particular function or entity and the associated subsidiary regulations makes it difficult to subsequently establish such functions or entities. Further legal consideration of this point is needed.

Existing PPAs would have to be assigned from PLN to the New SB+SO. This is only possible with the consent of the IPPs. While IPPs might welcome the reforms described in this report, they would likely see assignment as an opportunity to negotiate for more favorable terms as a basis for their consent. While this may be time-consuming, it does not preclude assignment. (The alternative pathway of transferring all generation, transmission, distribution, and retail operations out of the legacy PLN and into subsidiaries and eventually spun-off so that only the New SB+SO functions remain in the PLN holding company might avoid this problem, but would require transfer of the vast majority of PLN fixed assets and corresponding liabilities into new companies, a time-consuming process).

Of course, there is also the issue of the creditworthiness of the New SB+SO. IPPs have made their investments and secured financing on the basis of PLN's creditworthiness, and a necessary condition of assignment would be for the New SB+SO to have at least as good a credit rating or better. Credit rating agencies and other financial advisors should be engaged to ensure that proposed arrangements preserve the creditworthiness of the New SB+SO at the same level as legacy PLN.

The government must therefore extend to the New SB+SO the financial support and implicit guarantees it currently extends to PLN that enable it to borrow on international bond markets with the same sovereign rating as the government. The creditworthiness of PLN does not derive in the first instance from its asset base or financial performance. Rather, as the ratings agencies point out, PLN enjoys the same credit rating as government because of the government's support to PLN, as required by Law 19/2003 on State Enterprises. The redirection of cash flow arising from electricity sales from the PLN distribution/retail units to the New SB+SO would also enhance the creditworthiness of the new entity.

Finally, given that the New SB+SO would be responsible for paying all generation, PLN, and IPP, it will have to manage the majority of sector cash flow and will therefore have to be capitalized adequately to perform this role. While the government may have the latitude to create new SOEs, the authority to capitalize them ultimately rests with the DPR through the state budget process.

Stage 4: New Single Buyer

The final stage is characterized by the establishment of a new SOE to serve as the single buyer and system operator for Indonesia's large grids. Alternatively, as cited previously, this could be achieved by transferring all ownership of PLN generation, transmission, distribution, and retail ownership and operations into new companies, leaving the legacy PLN to serve as the New SB+SO. The key feature of this final stage is the full separation of the New SB+SO from other PLN operations, however achieved.

Revenue Model

At this stage, tariffs reach full cost recovery, transactions along the entire electricity value chain are performed on an arm's length, fully commercial basis, and only direct subsidies and cross-subsidies are utilized. No further compensation or subsidies are paid to PLN.

The revenue model will become more sophisticated. Explicit recognition of ancillary service costs will be incorporated, as well as the implementation of mechanisms to facilitate competition among generators as their PPAs expire.

Governance and Regulation

During this final stage, regulation will be conducted by a new power sector regulatory agency established by law. The new electricity law, which is a prerequisite for this final stage, will also provide for public participation in policy making and regulatory decision-making, and will provide a firm foundation for the operation of the New SB+SO.

MEMR will remain responsible for sector policy making, and will retain technical regulation related to codes, standards, and certifications. The new regulatory agency, on the other hand, will be responsible for the following:

- review, analysis, and inputs to government policy making relevant to the power sector, including analysis of policy impacts on the sector;
- specification of planning criteria to guide the planning process for generation, transmission, distribution, and non-network resources;
- review and approval of resource and investment plans at both the distribution level (prepared by PLN distribution/retail units) and the generation and transmission level (as prepared by the New SB+SO);
- preparation of guidelines for and supervision of resource procurement;

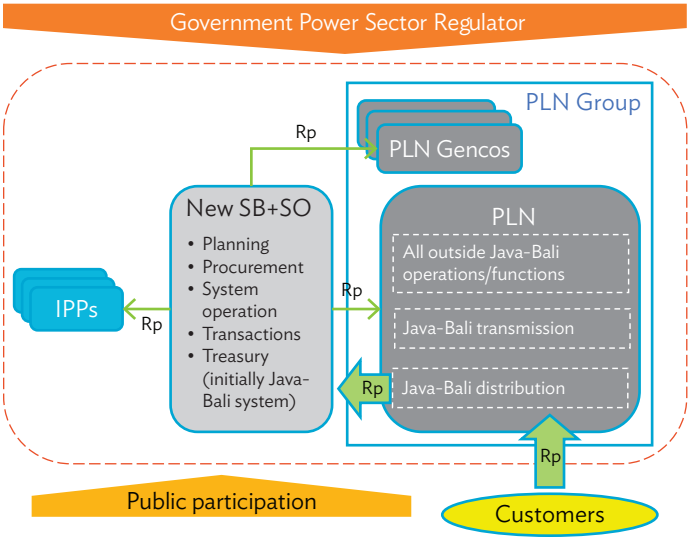
- licensing of new generation;
- application of the updated revenue model to determine revenue requirements;
- formulation of tariffs, implementation of a tariff adjustment mechanism, and specification of consumer eligibility for direct subsidies;
- supervision of system operation and compliance with planning criteria;
- compilation and public provision of data on entity performance, transactions, and draft plans;
- structured opportunities for public participation in regulatory processes;
- review of sector performance with a view toward updating regulations; and
- recruitment of qualified staff and building capacity of existing staff.

PLN and Industry Structure

In the final stage, the PLN Transformation directorate is divested as a new SOE (Figure 7).

The New SB+SO would be established as a perum (an SOE established to provide a public service rather than seek profits), rather than as a persero (an SOE established to operate profitably). This would allow it to function commercially and offer competitive compensation for staff, but recognizes that it is not expected to earn a profit but rather simply recover costs. A recent

Figure 7: Structure of the Indonesia Power Sector During Stage 4—Full Single Buyer



Key features:

1. Establishment of new Java–Bali SB+SO entity to absorb transformation directorate functions
2. Assignment of PPAs and credit enhancement to new SB+SO entity
3. Payments to both IPPs and PLN gencos on commercial basis
4. Establishment of new power sector regulatory agency
5. Tariffs and subsidies set at levels that facilitate commercial treatment of all players including PLN; no stranded assets.
6. Periodic tariff reviews and intra-period tariff adjustment mechanism applied.

gencos = generation companies, IPP = independent power producer, PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), PPA = power purchase agreement, Rp = Indonesian Rupiah, SB = single buyer, SO = system operator.

Source: Asian Development Bank.

example of government establishing a perum for an independent controlling function in a commercial environment is AirNav Indonesia, which was established in 2012 as Indonesia's air traffic controller.

It is proposed that only one New SB+SO be established for all Indonesia. Different power systems would be brought under the operation of the New SB+SO as they are ready. Each system that currently operates with a load dispatch center (Java–Bali, Sumatera, Kalimantan, and Sulawesi) will require extensive technical, commercial, and organizational preparation for incorporation into the operations of the New SB+SO. There are many smaller power systems in Indonesia that do not utilize a load dispatch center, particularly in eastern Indonesia, and these would remain under the operation of the PLN Group.

Due to its maturity, it is anticipated that the New SB+SO would be initially established for the Java–Bali system, and other large systems subsequently added to its operations as they are ready.

The New SB+SO will operate the system, and will pay industry participants (PLN Group, its subsidiaries, and IPPs) according to the distribution and transmission service agreements, and their power purchase agreements. Revenue will be paid by customers, some of whom receive direct subsidies from government. Based on its evaluation of performance against the policies and targets that government has set, it will update these policies and targets, with input from the regulator. The cycle will start anew.

This structure is intended to impose greater transparency by establishing arm's length commercial relationships for bulk power contracting and transactions, and mitigate conflicts of interest inherent in PLN's current span of operations. In particular, separation of the system planning, generation procurement, and system operation functions from PLN will help ensure that planning, procurement, and system operations are not biased toward PLN and are conducted on a truly least-cost basis. And while the PLN Group would still own generation subsidiaries and the transmission network, the provision of transmission services including generator interconnection under a transmission services agreement with the New SB+SO would help ensure open access and prevent PLN from discriminating against new generation entrants.

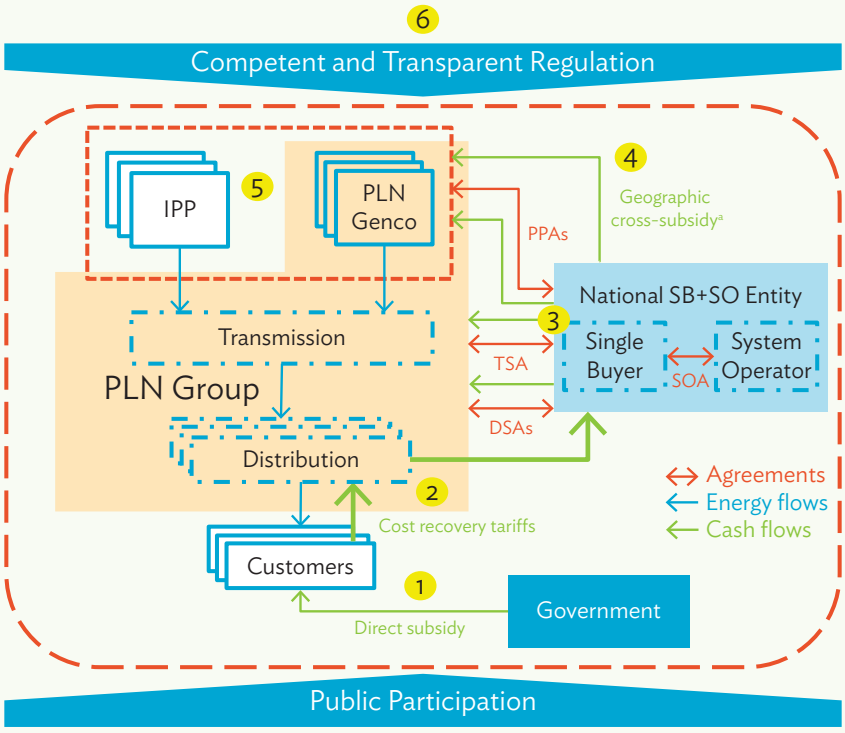
The principal drawbacks to this and the other options that rely on an independent system operator are the difficulties in coordinating transmission and generation maintenance and investment planning, and the connection of new generation to the grid. However, these weaknesses can be addressed through regulatory supervision and the arm's length contracting between the PLN Group and the New SB+SO for bulk supply and generation services. The benefits of the proposed structure in mitigating conflicts of interest outweigh this weakness.

Under this arrangement, all new generation requirements would be fulfilled through competitive bidding; there would be no automatic allocation to PLN, or relaxation of competitive procurement requirements for PLN subsidiaries. PLN should move

all generation into subsidiary companies. This would make it easier to ensure that PLN is not cross-subsidizing generation from its transmission, distribution, and retail operations. Ideally, this would involve the establishment of other generation subsidiaries besides Indonesia Power and PJB. Other generation companies could be established along technology lines, e.g., a hydro generation company, photovoltaic, or wind generation companies, etc. The government's intention to establish a separate geothermal power generation holding company to own Pertamina Geothermal, GeoDipa, and PLN Geothermal aligns well with this concept. The PLN restructuring announced in September 2022 takes a step in this direction by establishing technology-specific companies for biomass and geothermal generation as joint venture subsidiaries of the former Indonesia Power and PJB.

Figure 8 describes how the industry structure ultimately contemplated under this proposal would operate. Each of the numbered activities is described in more detail in the figure.

Figure 8: Proposed Structure of the Indonesian Power Sector



DSA = distribution service agreement, genco = generation company, IPP = independent power producer, PLN = PT Perusahaan Listrik Negara (Persero) (State Electricity Corporation), PPA = power purchase agreement, SB = single buyer, SO = system operator, SOA = system operation agreement, TSA = transmission service agreement.

[a] As collected from lower cost systems under a national uniform tariff.

Source: Asian Development Bank.

1. PLN's revenue requirement is completely funded, based on the new revenue model. It is assumed here that consumers pay full cost recovery tariffs, possibly with class cross-subsidies, certainly with geographic cross-subsidies if a uniform national tariff is retained. Subsidies provided by the government are administered as direct subsidies to improve targeting. The complete funding of the sector's revenue requirement is a necessary condition for any durable reform, and the long-term strengthening of PLN and its subsidiaries.

2. Consumers pay their bills directly to bank accounts held by PLN distribution or regional units as they do now. At present, these funds are swept daily by PLN treasury. Under the proposed industry structure, these funds would instead be swept by the New SB+SO. All customer revenue would therefore be sent to the New SB+SO for onward payment to industry participants according to their contracts with the New SB+SO.

3. The New SB+SO has the following main functions:
   (i) **Cash management**. Manage sector cash flow from the receipt of customer funds to payment to industry participants according to the terms of their respective contracts with the New SB+SO. Treasury will be an essential function within the New SB+SO.
   (ii) **System planning**. Plan the system, including transmission and generation capacity additions as well as non-network resources such as demand-side management. Planning will be carried out on a least-cost basis considering the reliability criteria set by the regulator and other government policy targets, such as the utilization of renewable energy resources, and will be aligned to the funding projected to be available for future investment. The New SB+SO will prepare the plan using load forecasts from PLN, which it will critically review. It will then submit the draft plan to the regulator for review and public comment. PLN and other industry participants such as IPPs will also have the opportunity to review and comment on the plan. It is expected that this planning will rely on advanced software tools for co-optimized generation and transmission expansion planning, production simulation, and power system analysis. Distribution level planning will be carried out by PLN, and will also be subject to public review and regulator approval, taking into account electrification targets.
   (iii) **Generation procurement**. Once the regulator and government approve the plan, the New SB+SO will procure the generation additions identified in the plan. All new generation will be subject to competitive procurement carried out by the New SB+SO; PLN and its subsidiaries will no longer be entitled to develop

generation without having won the right through a competitive procurement. This may also include procurement of ancillary services, interruptible load, or other non-network resources. The development of transmission additions identified in the approved plan will be carried out by PLN under regulatory supervision of open access and terms and conditions of transmission services.

(iv) **Contracting and transaction**. The New SB+SO will contract with industry participants for various services, and pay these participants from consumer receipts that have been swept from the PLN distribution unit accounts. These services will include generation, transmission, distribution, and retailing (power purchase agreements, transmission service agreements, and distribution/retailing service agreements). These will not be the only contracts governing the operation of the sector; for example, there will be connection agreements between generators and PLN as transmission operator. All of these agreements, and the associated pricing, will be approved by the regulator as part of the revenue requirement proposal submitted by the New SB+SO. The arm's length nature of these agreements will help ensure transparency, the commercial transactions behind them will impose discipline, and the separation of these functions from planning, procurement, and operations will reduce, if not eliminate, the conflicts of interest inherent in the current sector structure and the reach of vested interests.

(v) **System operations**. The New SB+SO will then operate the system to minimize costs subject to the need to maintain system security and reliability. This will include utilization of the other services it has contracted, such as ancillary and other non-network services. This operation will follow the stipulations laid out in the grid code.

4. The New SB+SO will not operate in all power systems currently operated by PLN. The New SB+SO would ultimately operate on the main grids of Java–Bali, Sumatera, Kalimantan, and Sulawesi, which represent about 97% of all PLN sales at present. PLN would continue to operate smaller systems throughout the country that do not utilize load dispatch centers, and would continue to serve as PPA counterparty on these systems. The cost of supply on these smaller systems is generally higher, and as a result, the uniform national tariff creates a geographic cross-subsidy that is funded by sales on the larger, lower cost systems. The revenue the New SB+SO will receive from PLN on these larger systems under a uniform national tariff will exceed the cost of supply on these systems. The regulator will determine and subsequently supervise the transfer of the resulting geographic cross-subsidy from the New SB+SO to PLN for its operations on the smaller grids.

5. PLN subsidiary generation companies as well as IPPs will contract with the New SB+SO to provide bulk power and other ancillary services. PLN and its subsidiaries would have to compete with IPPs, both state-owned and private, for the right to develop new generation. The implementation of true cost recovery tariffs will ensure that PLN generation companies have the financial resources to compete with IPPs, and subjecting all future generation capacity additions to competitive tendering will help ensure truly least-cost outcomes.

6. The regulator will supervise all of these activities, in line with its functions as described in the previous chapter and summarized in Figure 8. Effective regulation is necessary to ensure compliance with the new processes that form the essence of the reforms, to help drive consistency among government targets and policies that set the direction for the sector, and to rigorously review and scrutinize plans, cost calculations, and other proposals from industry participants, in a transparent manner that allows for public participation.

Figure 8 indicates the use of a system operations agreement between the single buyer and system operator functions within the New SB+SO. Strictly speaking, this will not be an agreement as such since these are units within a single entity. Rather, this will be published guidelines, approved by the regulator and consistent with the grid code, that describe how the single buyer and system operation functions will work together. For example, the single buyer will require information from the system operator as to the availability, production, and provision of reserves of other ancillary services from generators and other industry participants so as to assess compliance with contract terms and approve payments.

Discussion and Summary

Key Dependencies and Timing

Given that the final stage of reform entails a number of steps outside the control of the government, such as the passage of a new electricity law by the DPR and the assignment of PPAs to the New SB+SO, there is some uncertainty whether or when that stage can be achieved. The intermediate stages of Internal Single Buyer and Ring-Fenced Single Buyer have been designed to provide substantial benefits even if the reform process does not reach the final stage described above.

These intermediate steps are within the authority of the President and ministers. There is the challenge of forging a consensus across the government regarding the nature and timing of sector reform, but it is nonetheless reasonable to target 2–3 years to implement the Internal Single Buyer once a decision to proceed has been made, and another 3–4 years for the Ring-Fenced Single Buyer.

For reference, the Minister of Mines and Energy issued a white paper for power sector reform in 1998, and by 2002, a new electricity law was enacted as the legal foundation for the vision presented in the white paper. By the time the Constitutional Court revoked that electricity law in 2004—6 years after the white paper—restructuring of PLN and regulatory reform had advanced considerably, but BPPTL had not yet been formally established. This experience suggests that an indicative duration of 7 years to progress through the Internal Single Buyer and Ring-Fenced Single Buyer stages is reasonable.

Indicative Costs

The successful implementation of the Internal Single Buyer and the Ring-Fenced Single Buyer stages will require a substantial amount of technical assistance. The 1998–2004 reforms required about $20–$30 million in technical assistance. Bringing those costs to current terms suggests a cost of $30–$40 million in technical assistance, plus costs incurred by the government for recruitment, capitalization of new entities, etc.[3]

Next Steps

The immediate next step is socialization of the reform vision and road map presented in this report among key stakeholders, including relevant ministries, PLN, labor unions, academia, and civil society, building upon PLN's restructuring to date. As highlighted in this report, complementary actions are required by government to maximize the benefits of PLN's restructuring and accelerate Indonesia's energy transition. The vision and road map can be updated to incorporate feedback received, and could provide the basis for discussions with multi- and bilateral development agencies to support the government's agreed program.

[3] Multilateral development bank technical assistance associated with Indonesian power sector reform over the period 1997–2004 is documented in World Bank. 1996. Staff Appraisal Report for the Second Power Transmission and Distribution Project. 22 January and ADB. 2007. *Completion Report: Capacity Building for the Establishment of a Competitive Electricity Market*. Manila. In addition, resident advisors were provided by the United States Agency for International Development and other bilateral programs. This technical assistance encompassed regulatory development within MEMR, restructuring and business process redesign in PLN, market design and associated software development, organizational communications and change management, consumer outreach, etc. Similar activities would be required over a comparable time frame for the implementation of the road map described in this report, assuming a reform process that leads to the fourth stage of a new single buyer. Likely, technical assistance activities would include (i) regulatory capacity building within government, including creation of new regulatory institutions; (ii) preparation and implementation of a new revenue model and subsidy framework; (iii) restructuring, business process reengineering, communications, and change management within PLN; (iv) development and implementation of operational control and financial information systems required to support above changes; (v) preparation and implementation of human resource transfer schemes in government and PLN; (vi) development and support for a legal support for PPA assignment, corporate establishment, and preparation of new laws; and (vii) consumer outreach. Activities (iii) and (iv) would likely be the costliest within this program. While not all of these activities would necessarily need to be delivered through external technical assistance, the alternative would be for the government and PLN to fund these activities from their own resources.

Achieving a Sustainable and Efficient Energy Transition in Indonesia

A Power Sector Restructuring Road Map

As Indonesia's power sector needs to resolve major issues of slow decarbonization, financial viability, and unreliable supply, this report presents a comprehensive vision for its reform—with a road map for transforming the nation's State Electricity Corporation (PLN). Reviewing international approaches to electric utility restructuring, this detailed study analyzes challenges across the Indonesian power sector, explores options for restructuring PLN, and identifies an optimal framework. Proposing steps to achieve this reformed structure while strengthening governance and regulation, the study recommends a new revenue model for PLN, based on proven international practice, to assure financial and environmental sustainability for Indonesia's power sector.

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ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org