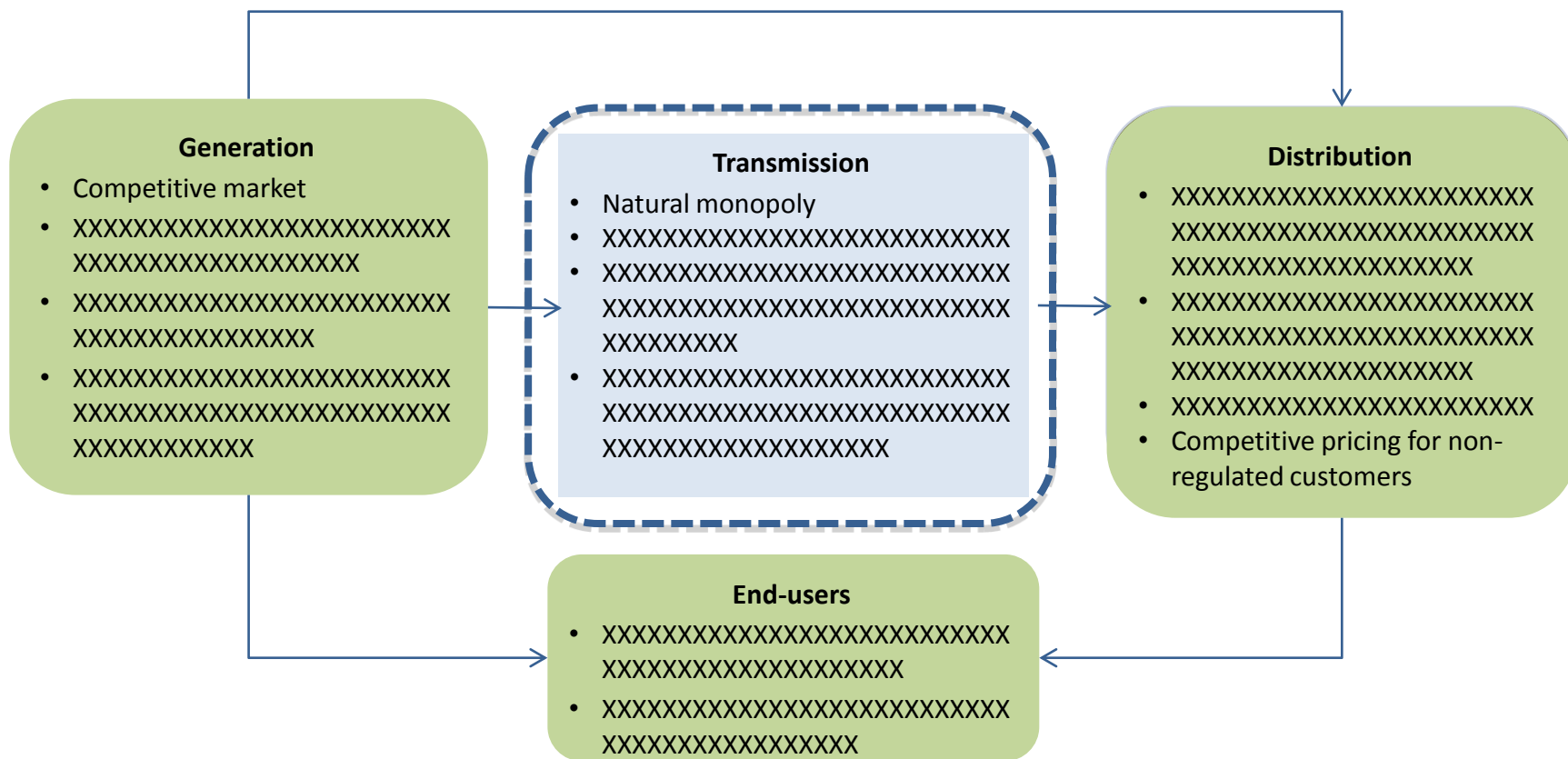


Brazil

- Electricity sector overview
- Electricity market structure
- Snapshot of electricity sector
 - Growth in capacity and production
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Electricity market structure

- Sector reforms initiated in mid-90s with unbundling and privatisation of state-owned assets. Privatisation drive stalled after the 2001 energy crisis.
- Majority of generation and transmission assets continue to be state-owned .
- Eletrobras dominates the electricity sector, accounting for 33% of installed capacity and 47% of high voltage transmission network.
- Distribution segment is largely in private hands. About 73% of electricity sales are by private distribution companies.



Snapshot of electricity sector — Growth in capacity and production

- As of 2017, Brazil had more than XXX GW of installed capacity, of which XX% was based on hydroelectric power. During 2008–17, the power generation capacity grew at a CAGR of X%. A major contributor is wind and solar projects, which grew at a CAGR of XX% over the last decade.
- Generation grew at a CAGR of XX% and reached XXXXXX GWh in 2017.

Table 1: Installed capacity and generation, 2017

Installed capacity (MW)	XXXXXX
Generation (GWh)	XXXXXX

Figure 3: Installed electricity capacity by fuel-type, 2017 (%)

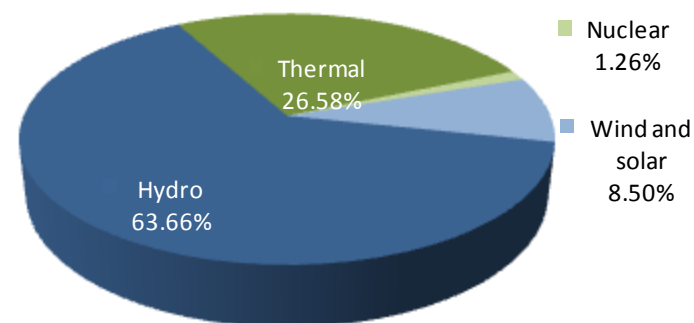


Figure 4: Growth in installed capacity, 2008–17 (MW)

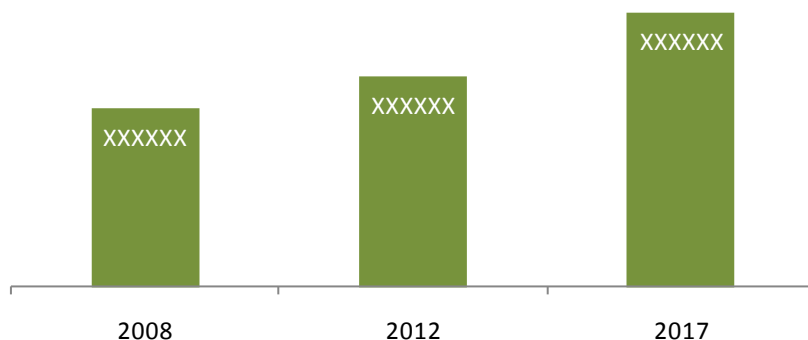
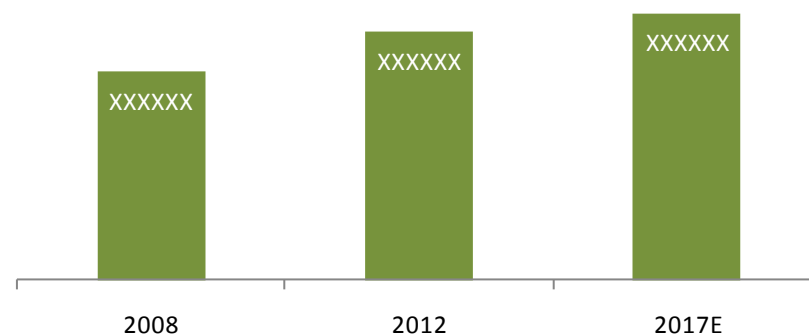


Figure 4: Growth in electricity generation, 2008–17 (GWh)

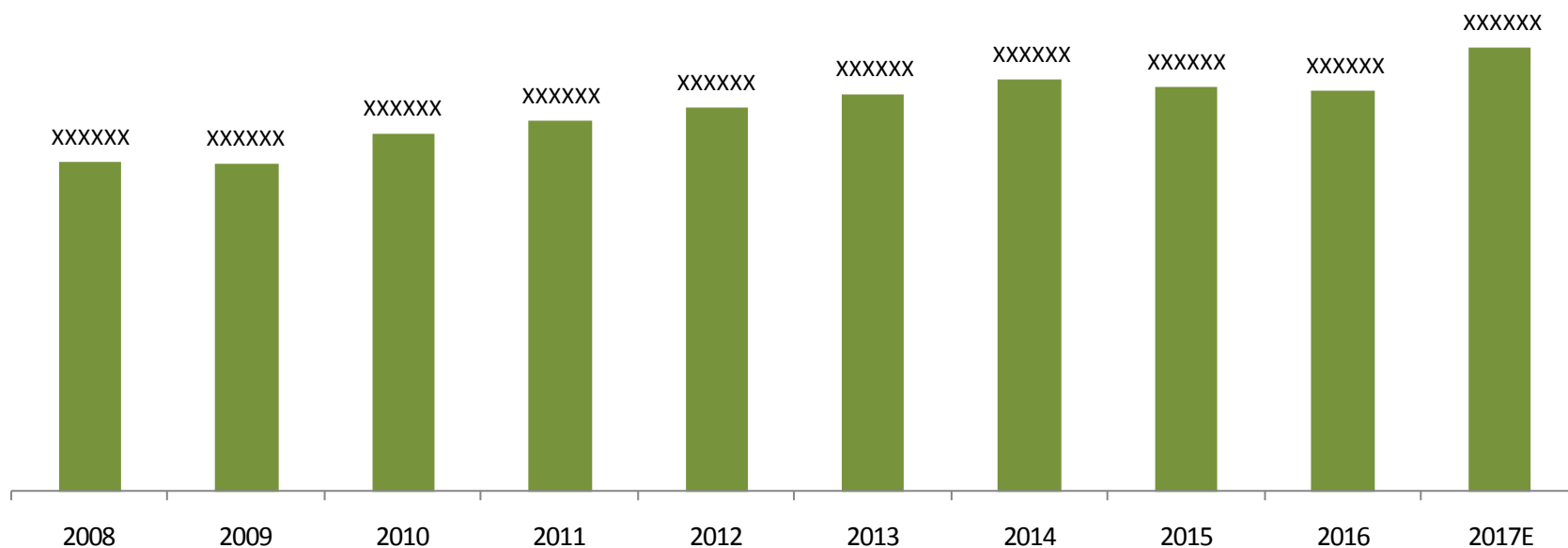


Note: Generation data for 2017 is based on past CAGR.
 Source: MME, Brazil; ANEEL; Global Transmission Research

Snapshot of electricity sector — Growth in consumption

- During 2017, Brazil's consumption reached XXXXX GWh. Since 2008, consumption has increased at a CAGR of XX%.

Figure 4: Growth in electricity consumption, 2008–17 (GWh)



Note: 2017 data is based on actual figures till November.

Source: MME, Brazil; ANEEL

Snapshot of electricity sector — Growth in transmission line and transformer capacity

- As of 2017, Brazil had an estimated transmission network of XXXXXX km of line length and XXXXXX MVA of transformer capacity at 230 kV to 750 kV AC lines and ± 600 kV HVDC line. During 2006–17, the transmission line network increased at a CAGR of about XX% and substation capacity by XX%.
- Brazil's grid is connected with those of Uruguay, Argentina, Venezuela and Paraguay.

Transmission line length and transformer capacity, 2017

Voltage	Line length (km)	Transformer capacity (MVA)
230 kV AC	XXXXX	XXXXX
345 kV AC	XXXXX	XXXXX
440 kV AC	XXXXX	XXXXX
500 kV AC	XXXXX	XXXXX
± 600 kV DC	XXXXX	XXXXX
750 kV AC	XXXXX	XXXXX
± 800 kV DC	XXXXX	XXXXX
Total	XXXXX	XXXXX

Figure 4: Growth in line length, 2008–17 (km)

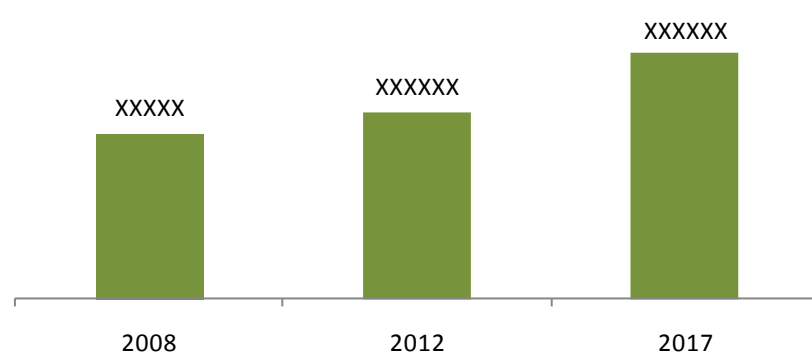
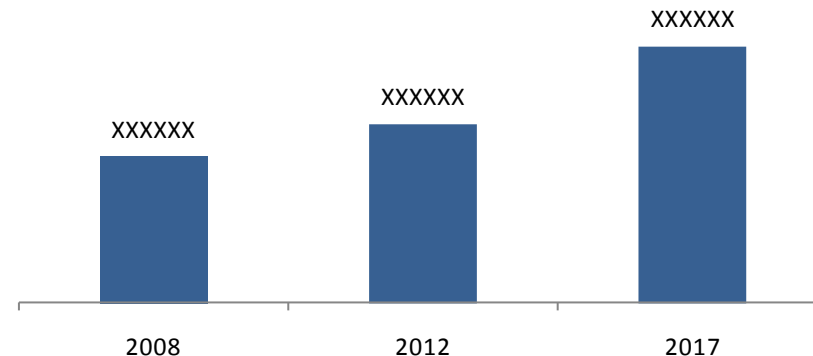
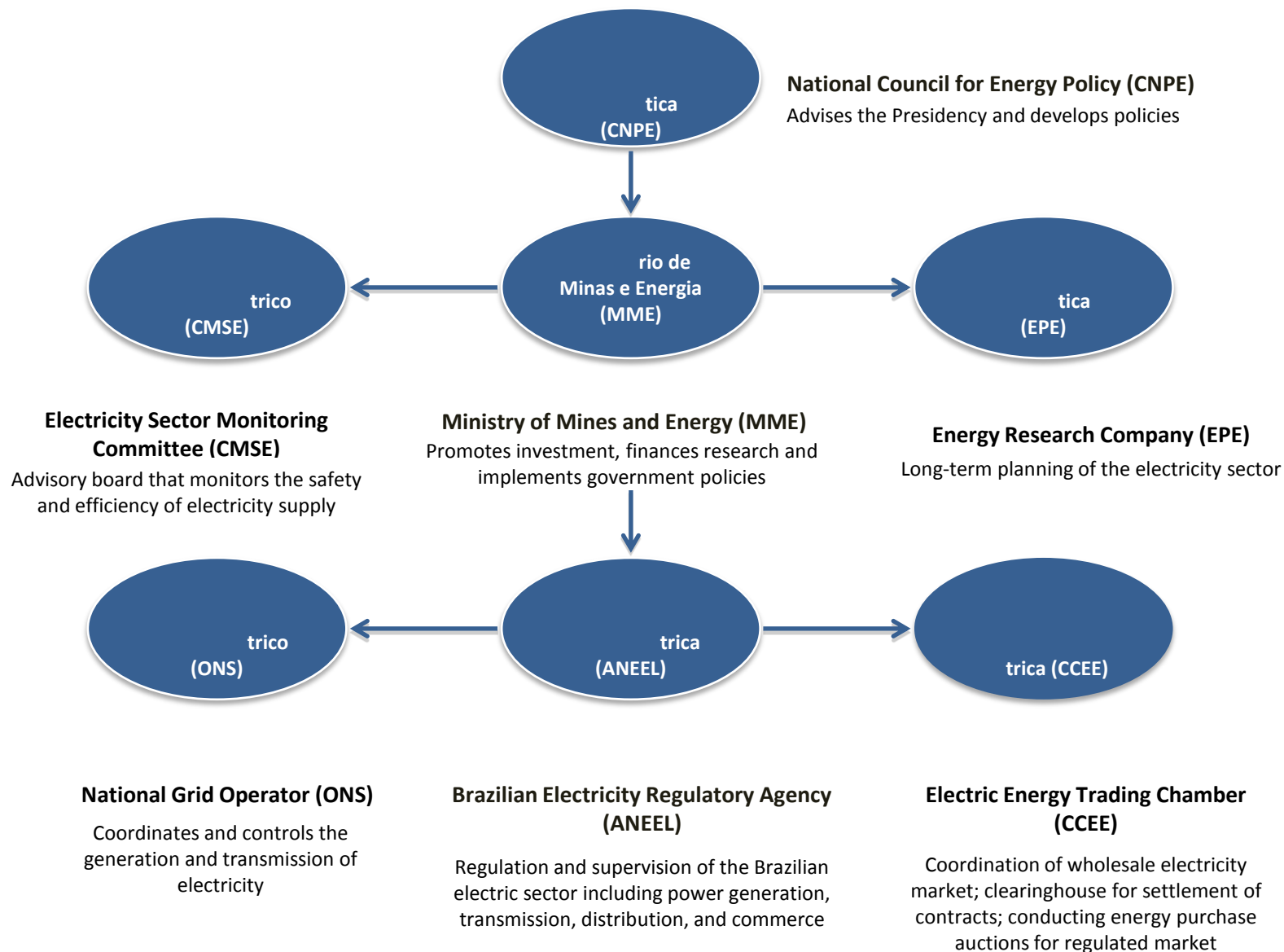


Figure 4: Growth in transformer capacity, 2008–17 (MVA)



Source: Ministry of Mines and Energy, Brazil; Global Transmission Research

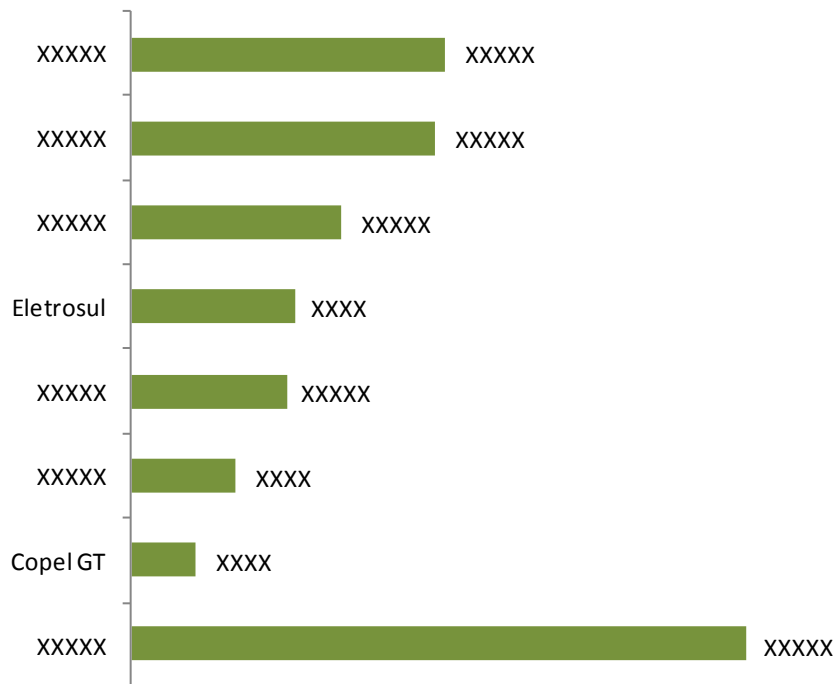
Institutional and regulatory structure



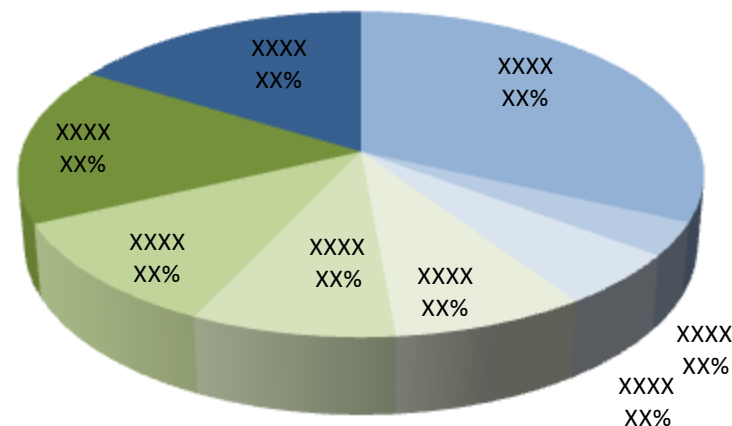
Key players in transmission

- Transmission sector is dominated by Eletrobras' subsidiaries – Chesf, Furnas, Eletronorte and Eletrosul.
- There are several foreign companies that have won tenders in recent years.
- State Grid Corporation of China (SGCC) through its Brazilian holding company State Grid Brazilian Holding (SGBH) is emerging as strong contender. It has recently won several tenders, especially in a joint bid with Eletrobras' subsidiaries.

Estimated share of key players in line length, 2017 (%)



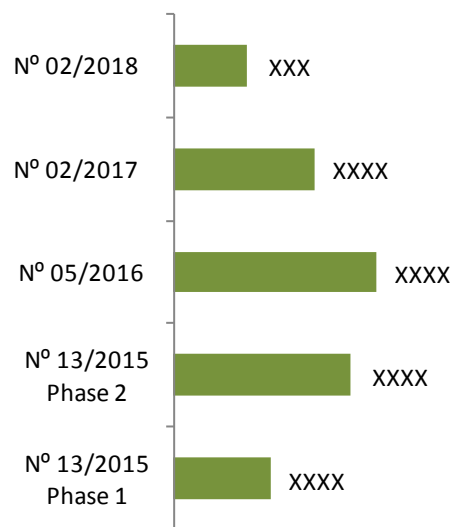
Line length of key players, 2017 (km)



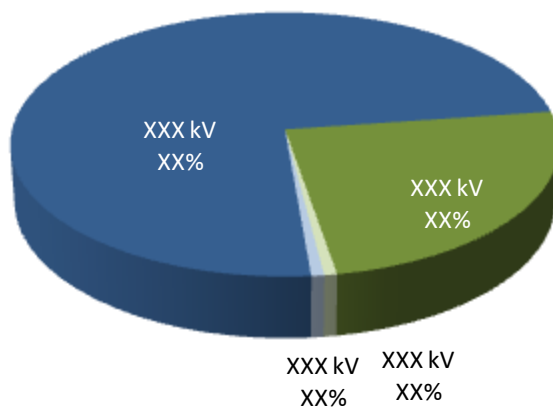
Note: The line length is for 230 kV and above transmission lines only.
 Source: Ministry of Mines and Energy, Brazil; Global Transmission Research

Recent experience in PPP in transmission — Project award analysis by line length

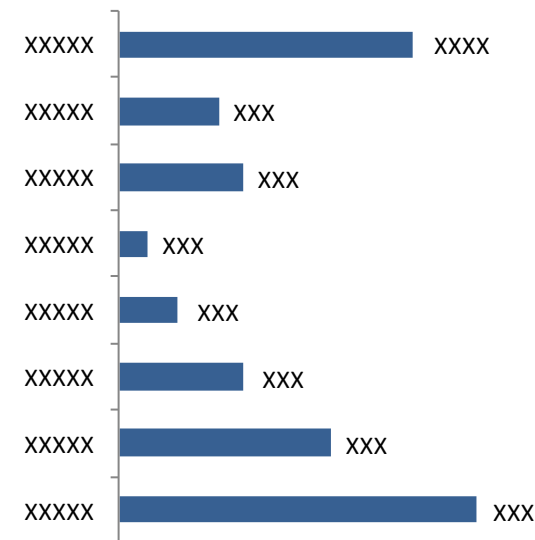
Line length awarded by auction (km)



Line length awarded by voltage (km)



Line length awarded by company (km)

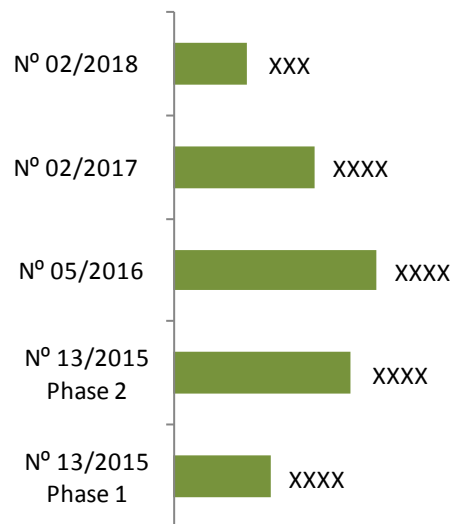


Project line length awarded by voltage (km)

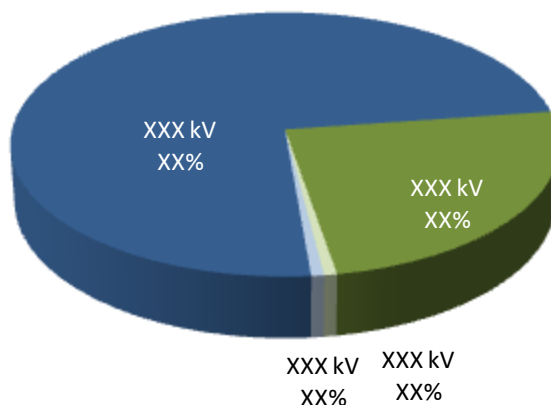
Voltage	N°13/2015 Phase 1	N°13/2015 Phase 2	N° 05/2016	N° 02/2017	N° 02/2018	Total
230 kV	XXX	XXX	XXX	XXX	XXX	XXX
345 kV	XXX	XXX	XXX	XXX	XXX	XXX
440 kV	XXX	XXX	XXX	XXX	XXX	XXX
500 kV	XXX	XXX	XXX	XXX	XXX	XXX
Total	XXX	XXX	XXX	XXX	XXX	XXX

Recent experience in PPP in transmission — Project award analysis by investment

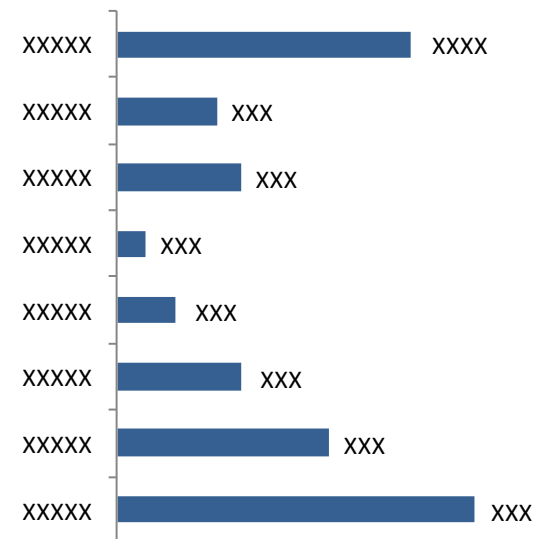
Investment secured by auction (BRL million)



Investment secured by voltage (BRL million)



Investment secured by company (BRL million)



Investment secured through recent awards by voltage (BRL million)

Voltage	Nº13/2015 Phase 1	Nº13/2015 Phase 2	Nº 05/2016	Nº 02/2017	Nº 02/2018	Total
230 kV	XXX	XXX	XXX	XXX	XXX	XXX
345 kV	XXX	XXX	XXX	XXX	XXX	XXX
440 kV	XXX	XXX	XXX	XXX	XXX	XXX
500 kV	XXX	XXX	XXX	XXX	XXX	XXX
Total	XXX	XXX	XXX	XXX	XXX	XXX

Source: Global Transmission Research

Expected growth in the electricity sector — Expected growth in transmission network

- During 2018–26, about XXXXXXXX km of line length is expected to be added in the Brazilian network along with more than XXX GVA substation capacity. Of the total line length capacity, XX% is likely to be based on direct current (DC) technology at ± 800 kV level and rest on alternating current (AC) technology based.
- About XX% of line length is likely to be added at 500 kV level, XX% at 230 kV level, XX% at 800 kV level and the remaining at 345 kV and 440 kV levels. Majority of the substation capacity is also likely to be added at 500 kV level.

Table 3: Planned transmission network additions, 2018–26

Voltage	2018–21	2022–26	2018–26
Transmission line length (km)	XXXXX	XXXXX	XXXXX
± 800 kV DC	XXXXX	XXXXX	XXXXX
500 kV	XXXXX	XXXXX	XXXXX
440 kV	XXXXX	XXXXX	XXXXX
345 kV	XXXXX	XXXXX	XXXXX
230 kV	XXXXX	XXXXX	XXXXX
Transformer capacity (MVA)	XXXXX	XXXXX	XXXXX
750 kV	XXXXX	XXXXX	XXXXX
500 kV	XXXXX	XXXXX	XXXXX
440 kV	XXXXX	XXXXX	XXXXX
345 kV	XXXXX	XXXXX	XXXXX
230 kV	XXXXX	XXXXX	XXXXX

Figure 11: Planned line length addition by voltage (%)

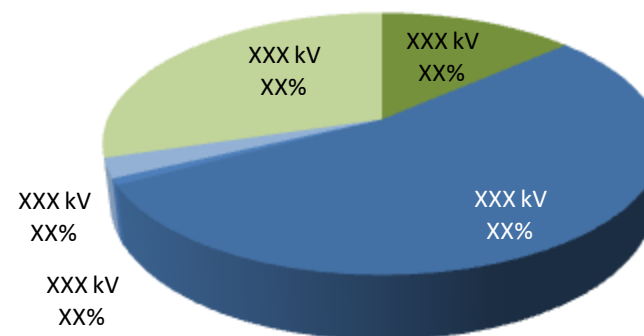
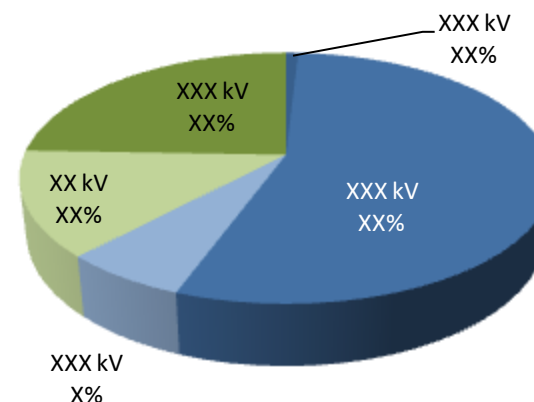


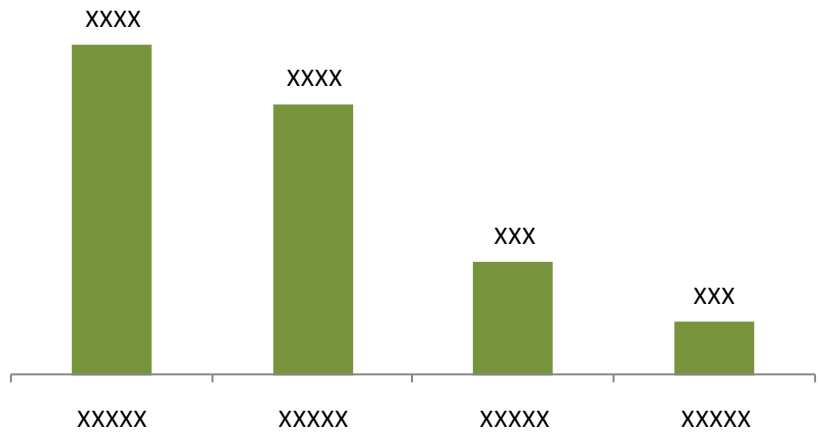
Figure 12: Planned transformer capacity addition by voltage (%)



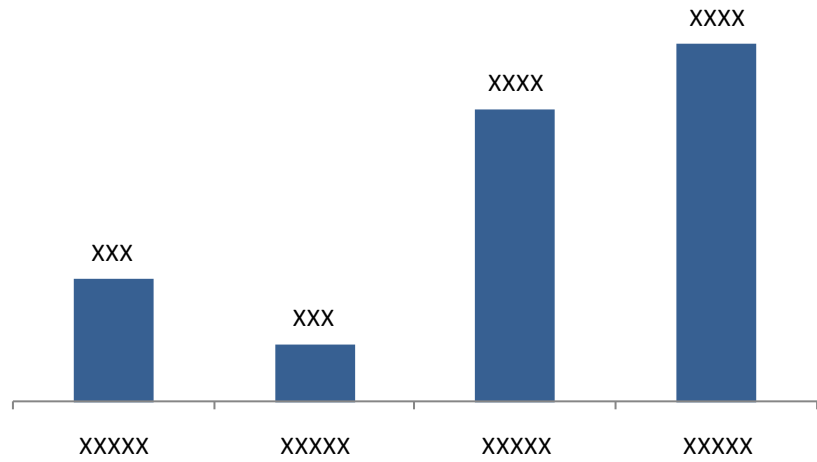
Source: Plano Decenal de Expansão de Energia 2026, EPE; Global Transmission Research

PPP opportunities in transmission — Project pipeline

Number of projects expected to be awarded by voltage



Line length expected to be awarded by voltage (km)



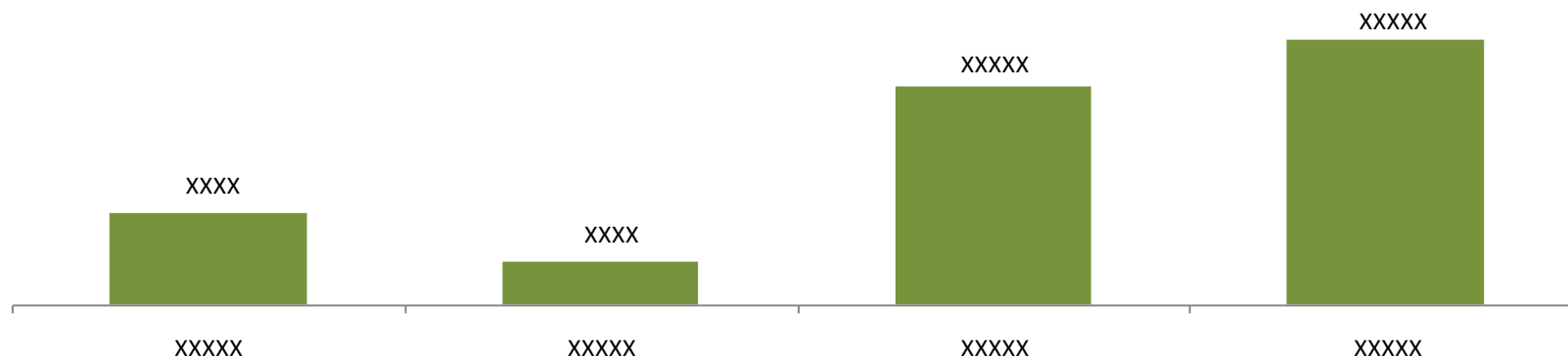
Line length expected to be awarded by voltage (km)

230 kV	XXXXX
345 kV	XXXXX
440 kV	XXXXX
500/525 kV	XXXXX
Total	XXXXX

Source: ANEEL; Global Transmission Research

PPP opportunities in transmission — Expected investment

Investment to be secured by voltage (BRL million)



Investment expected to be secured through awards by voltage (BRL million)

230 kV	XXXXX
345 kV	XXXXX
440 kV	XXXXX
500/525 kV	XXXXX
Total	XXXXX

Contacts of key agencies and authorities

Key contacts for ANEEL

Name	Designation	Email	Phone
XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXX	Superintendent Superintendence of Concessions, Permissions and Authorizations of Transmission and Distribution	XXXXXXXX@aneel.gov.br	+55 61 XXXXXXXX
XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXX	Deputy Superintendent Superintendence of Concessions, Permissions and Authorizations of Transmission and Distribution	XXXXXXXX@aneel.gov.br	+55 61 XXXXXXXX
Address	SGAN 603 – Modules “I” and “J”, 70830-110, Brasilia, Federal District, Brazil		
Website	www.aneel.gov.br		