

# Understanding the Future of the Electricity Distribution System Operator: *An examination of the largest national firms*

by  
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# Outline

1. About the paper
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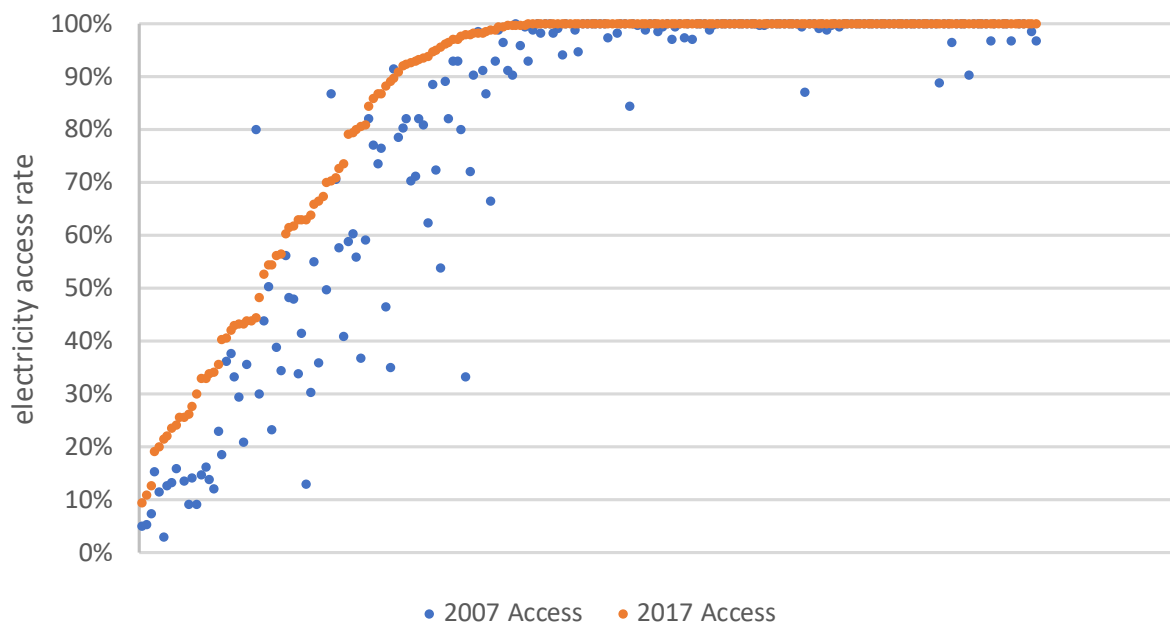
# 1. About the paper

- To evaluate the evolution and maturity of the electricity distribution sector worldwide
- Looks at the largest national electricity distribution firms in over 170 countries
- The largest firms provide an important indicator of the current situation and the capacity for involvement of the firms (DSOs) in the future of electricity sector

## 2. Background

### 2.1 Electricity access rate (2007 vs 2017)

Figure 1: Electricity access rate



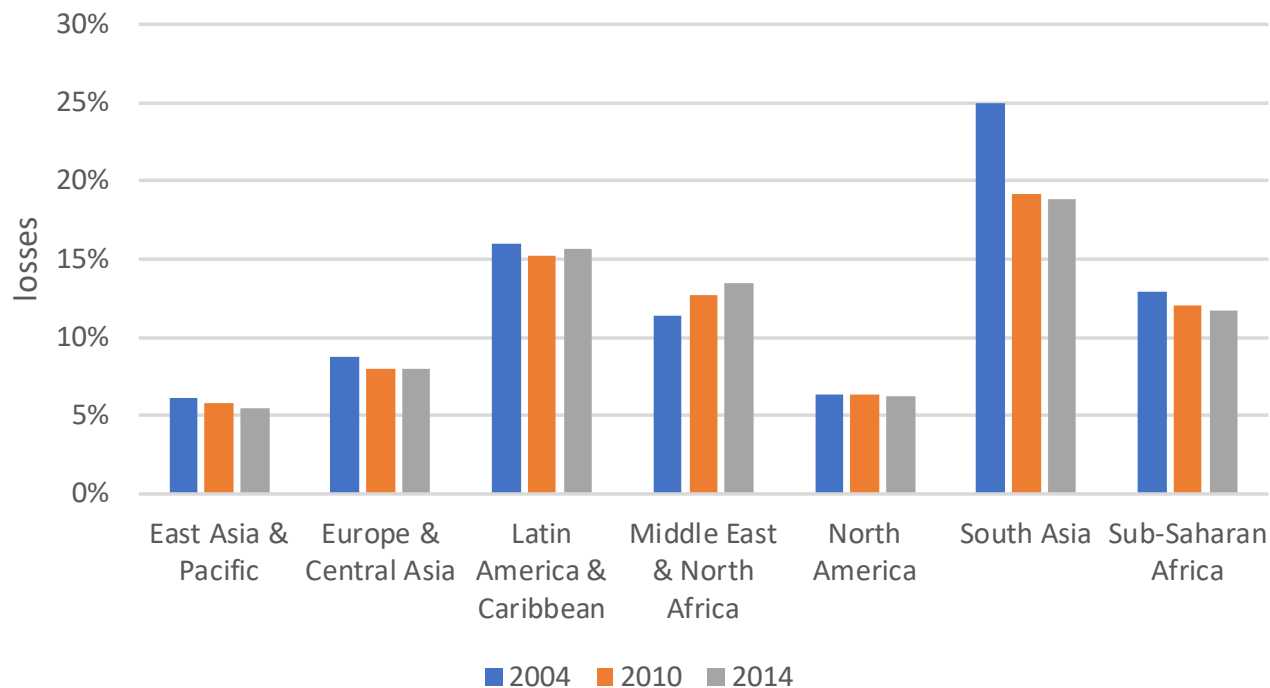
Source: World Bank

- *In 2017: 30 countries with less than 50% access and 121 with 100% access (out of around 220 countries).*
- *Access rate increased only 7 percentage points between 2007 and 2017*
- *Population without electricity access still significant by 2017: 810m*

# 2. Background

## 2.2 Losses (T&D)

Figure 2: Trend of energy losses at T&D

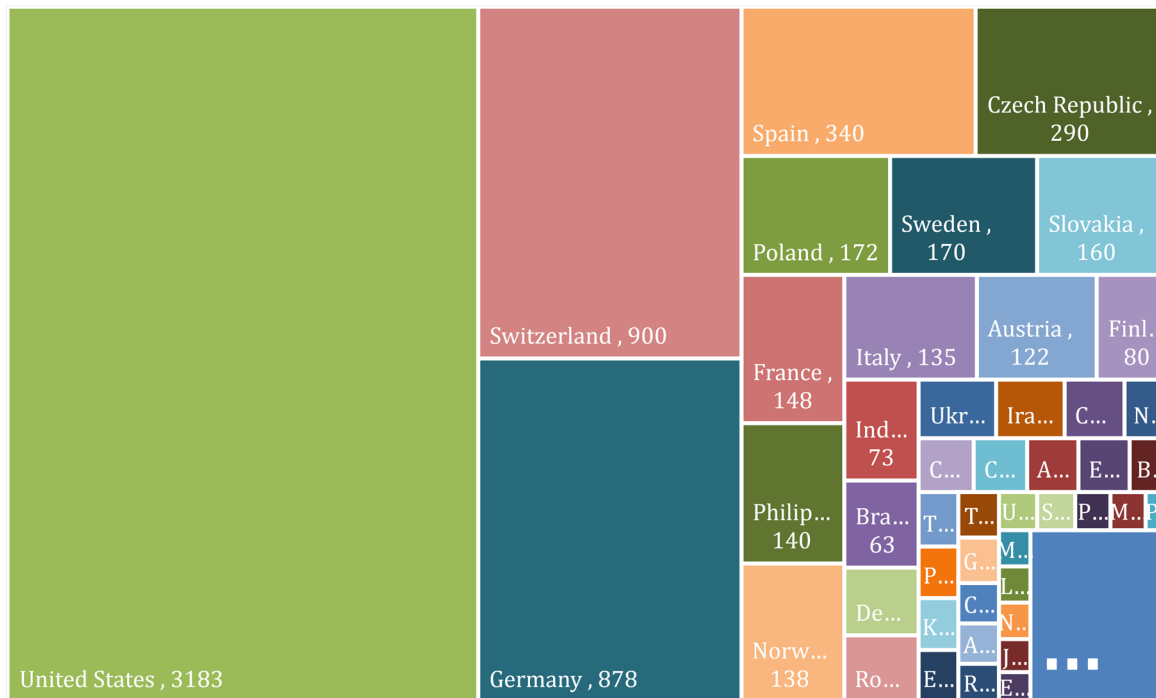


- *A slightly decrease in T&D losses is observed between 2004 and 2014*
- *A large diversity, some countries with over 60% in T&D losses (Togo, Libya, Haiti)*

# 3. DSOs facts

## 3.1 Number of DSOs

Figure 3: Number of DSOs around the world

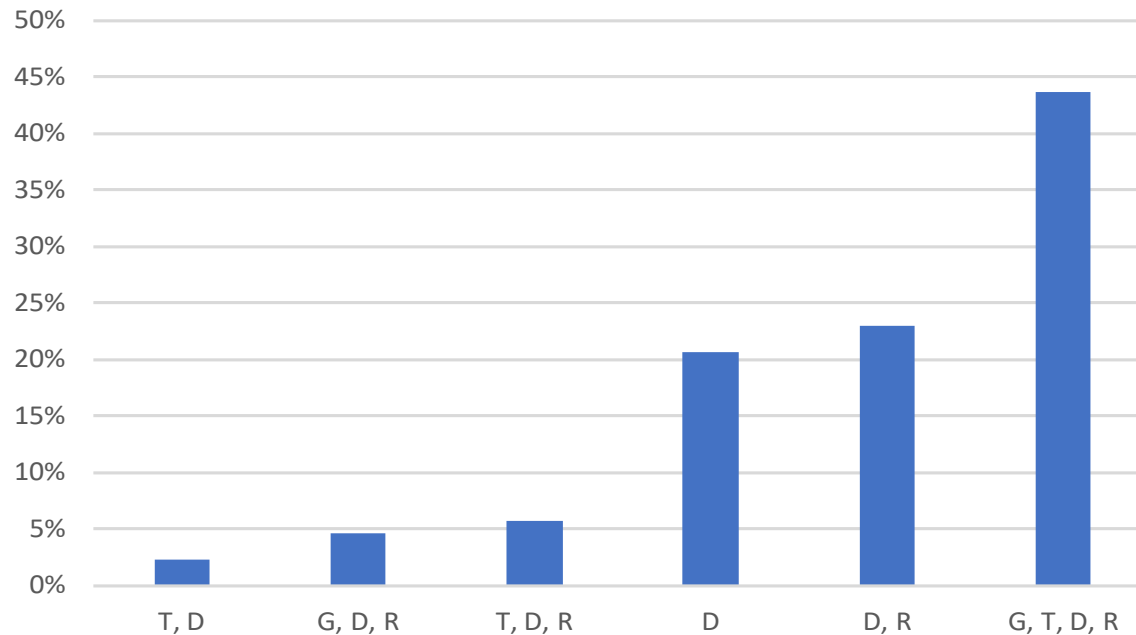


- Over 7,800 across 175 countries, largest DSO with 447m customers
- Large diversity, from 1 to over 3000 DSOs in one country
- 54% countries with one DSO

# 3. DSOs facts

## 3.2 Legal Structure

Figure 4: Largest DSOs legal structure

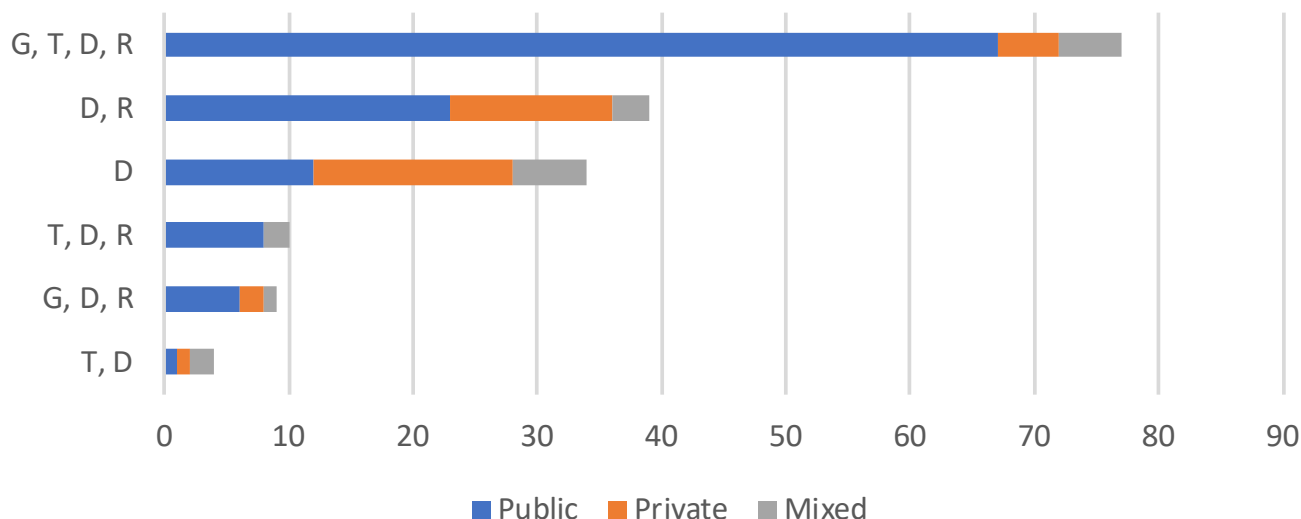


- *Around 20% of DSOs legally unbundled (only D)*
- *Many of them (44%) still vertically integrated (G, T, D, R)*
- *Operation of other sectors is observed (water, gas)*

# 3. DSOs facts

## 3.3 Ownership

Figure 5: Largest DSOs ownership



Mixed ownership: means a share of less than 85%.

Source: Companies' annual reports, World Bank, IADB, ADB.

- *Around 67% of the DSOs with public ownership*
- *Most of those with public ownership still vertically integrated*





# 3. DSOs facts

## 3.4 Looking at the largest DSOs in the most populated countries

Table 1: Largest DSOs in the 15<sup>th</sup> most populated countries

Ranking (most populated)	Country	Total No of DSOs	Largest DSO	Largest DSO legal structure	DSO ownership	No. Of customers (m)	No. Of employees	Electricity sold (GWh)	Network length (km)	Energy losses
1	China (mainland)	16	State Grid Corporation of China	T, D, R	public	447	1,581,000	4,236,000	3,690,000	6.47%
2	India	73	Maharashtra State Electricity Distribution Company	D, R	public	25.5	80,198			
3	United States	3183	Duke Energy	G, D, R	private	7.7	30,000		450,520	
4	Indonesia	1	Perusahaan Listrik Negara (PLN)	G, T, D, R	public	71.92	54,124	234,618	887,000	7.37%
5	Brazil	63	Enel Brazil	D, R	mixed	16.5		61,720	463,300	12.80%
6	Pakistan	11	Multan Electric Power (MEPCO)	D, R	public	6.45	17,175	15,851	116,000	16.60%
7	Nigeria	11	Ibadan	D, R	private	1.78		2,932	18,914	50.00%
8	Bangladesh	6	Bangladesh Rural Electrification Board (BREB or REB)	D, R	public	26.4	35,866		468,000	10.91%
9	Russia	15	Rosseti	T, D, R	public	na	217,000		1,771,000	8.39%
10	Mexico	1	Comision Federal de Electricidad (CFE)	D	public	42.8	91,369	218083	838,800	11.21%
11	Japan	10	TEPCO Power Grid	T, D	mixed	29.5	17,760	230,000	360,000	4.10%
12	Ethiopia	1	Ethiopian Electric Utility (EEU)	D, R	public	2.7		6,087	156,841	19%
13	Philippines	140	Manila Electric Company (MERALCO)	G, D, R	private	6.6	5,602	44,313	18,748	5.67
14	Egypt	9	Egyptian Electricity Holding Group (EEHG)	D, R	public	35.1	97,043	131,150	486,608	16.0%
15	Vietnam	5	Electricity of Vietnam (EVN)	D, R	public	24.85	104,000	177,000	496,000	5.21%



## 4. About the future/ideal DSO

### Looking for :

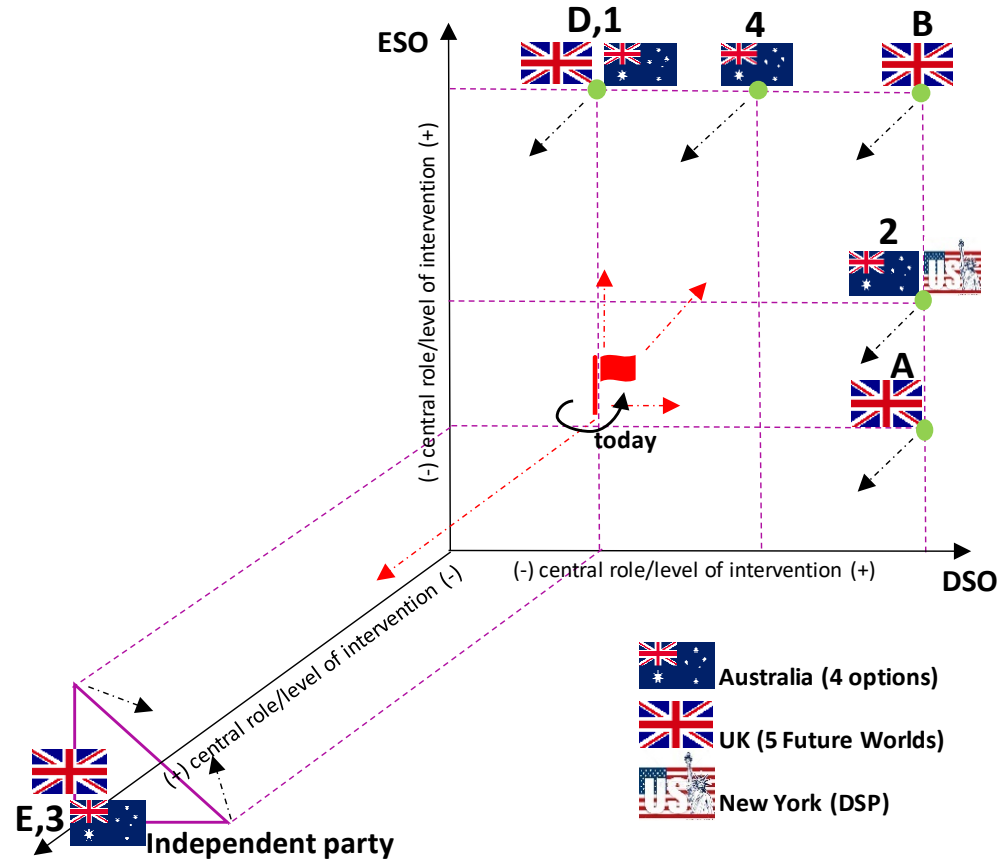
- Ideally unbundled from other competitive sectors (but not necessary ownership unbundling) – lower conflict of interest
- Cost reflective tariffs and different composition (higher capacity tariff and less volumetric tariffs), dynamic tariffs
- High penetration of smart meters (facilitate more efficient prices and charges)
- DSO regulation: based on TOTEX (cost savings & operation)
- Capture the value of DER (better utilisation of existing assets)

# 4. About the future/ideal DSO

## Looking for:

- Better coordination between TSO-DSOs and new roles (some are doing better than others)
- DSO as a neutral market facilitator for trading DER services (recent initiatives in UK, Australia, NY )

Figure 6: Options for TSO-DSO roles



Source: CERRE (2019)

## 5. Final Remarks

- An important dispersion is observed across the largest DSOs across countries
- The electricity distribution sector is changing but the level of the progress differs worldwide
- The role that firms have in the transition to a low carbon economy and the incentives for innovation are very different (supported by a set of interventions)
- The future DSO is diverse with different kinds of arrangements around the world

# Q&A

**Thank you!**