

Organisational models for system operation

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The electricity sector

Generation



Transmission



Distribution



Supply to final consumers



Competition and regulation in the electricity sector

Activities in competition

- Electricity generation
- Commercial activities (supply)

Competition does not happen easily:

- repeal of any legal monopoly (liberalisation) is fundamental, but only a pre-requisite
- conditions for competition are necessary

Monopolistic activities

- Networks are “**essential facilities**”, i.e. infrastructures which are necessary to competitors for serving their customers
- Networks are often a “**natural monopoly**”:
 - cannot be (economically) replicated because of decreasing average costs
 - consequently one producer is socially more efficient than many ... for the relevant amount of demand
- Monopolistic activities needs to be regulated

- The liberalisation of the energy sector, to introduce competition wherever possible, requires:
 - Unbundling between competitive and monopoly activities
 - to remove the conflict of interest between competitive and monopoly (network) activities:
 - Possible cross-subsidies in tariff setting
 - Possible discrimination in access conditions
 - Possible distortions in network development
 - Third-party access conditions to the networks
- Transition to competition implies political choices, overcoming opposition

Forms of unbundling

Accounting separation

Functional separation

Legal separation

Ownership separation

Accounting separation

- Requires separate internal accounts for each of the activities of the same undertaking, in particular separate accounts for regulated and non-regulated activities
- **MAIN AIM:** avoiding cross-subsidisation of the competitive activities by the regulated activities of the same undertaking, by facilitating proper tariff setting for the regulated activities
- **MAIN CHALLENGE:** allocation of joint and common costs, setting of internal transfer values

Functional separation (managerial and decision-making)

- Requires separate management and decision-making of the different activities of the same undertaking, in particular separate management and decision-making for regulated (operation, maintenance and development of the network) and non-regulated activities
- **MAIN AIM:** avoiding that the management and operation of regulated activities favour the competitive activities of the same undertaking
- **MAIN CHALLENGE:** independence of management and decision-making within the same legal entity. “Chinese walls”

Legal separation

- **Requires separate legal entities operating the regulated and non-regulated activities**
- **MAIN AIM: making the relationship between the regulated and non-regulated activities of the same undertaking more transparent, thus more easily avoiding that the management and operation of regulated activities favour the competitive activities of the same undertaking**
- **MAIN CHALLENGE: independence of management and decision-making within the same group. “Chinese walls”**

Ownership separation

- **Requires regulated and competitive activities to be operated by undertakings with separate ownership**
- **MAIN AIM: removing conflicts of interest**
- **MAIN CHALLENGE: requires asset divestment by a vertically-integrated undertaking**

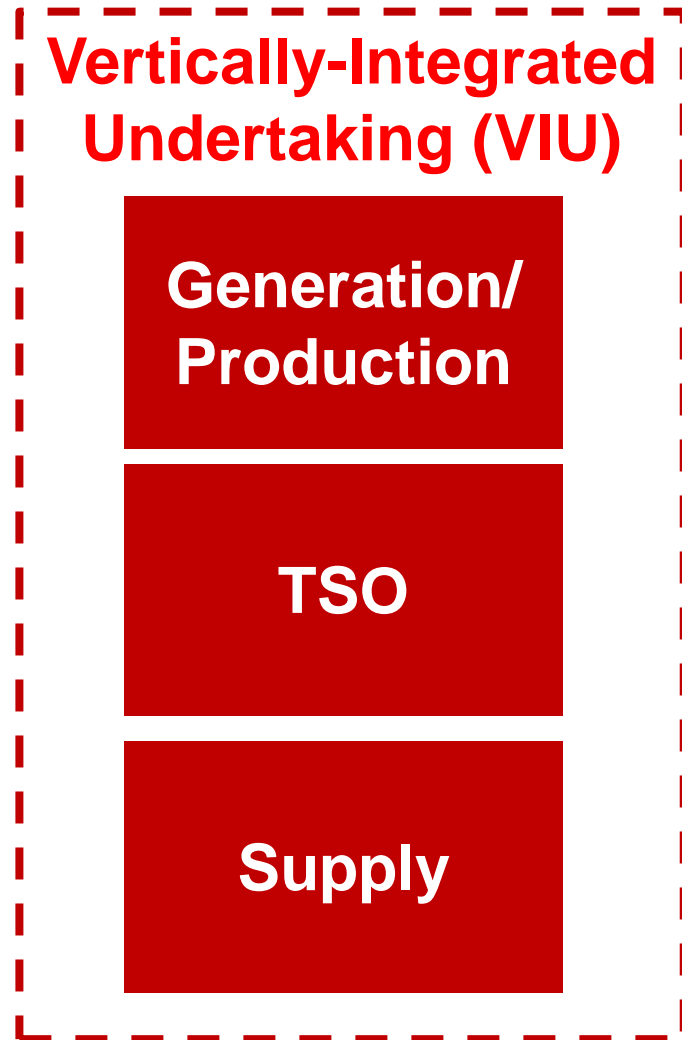
- Operate, maintain and develop under economic conditions a secure, reliable and efficient transmission system
- Manage electricity flows on the system, taking into account exchanges with other interconnected systems
- Contribute to security of supply through adequate transmission capacity and system reliability
- Ensure that sufficient interconnection capacity with neighbouring systems is available to accommodate all economically reasonable and technically feasible cross-border exchanges compatibly with security of supply
- Ensure non-discrimination as between system users or classes of system users, particularly in favour of its related undertakings

The Transmission System Operator does not need to own the transmission assets

Possible organisational models for System Operation activities

- Vertically-integrated Utility (VIU)
- Full Ownership Unbundling (OU)
- Independent System Operator (ISO)
- Independent Transmission Operator (ITO)

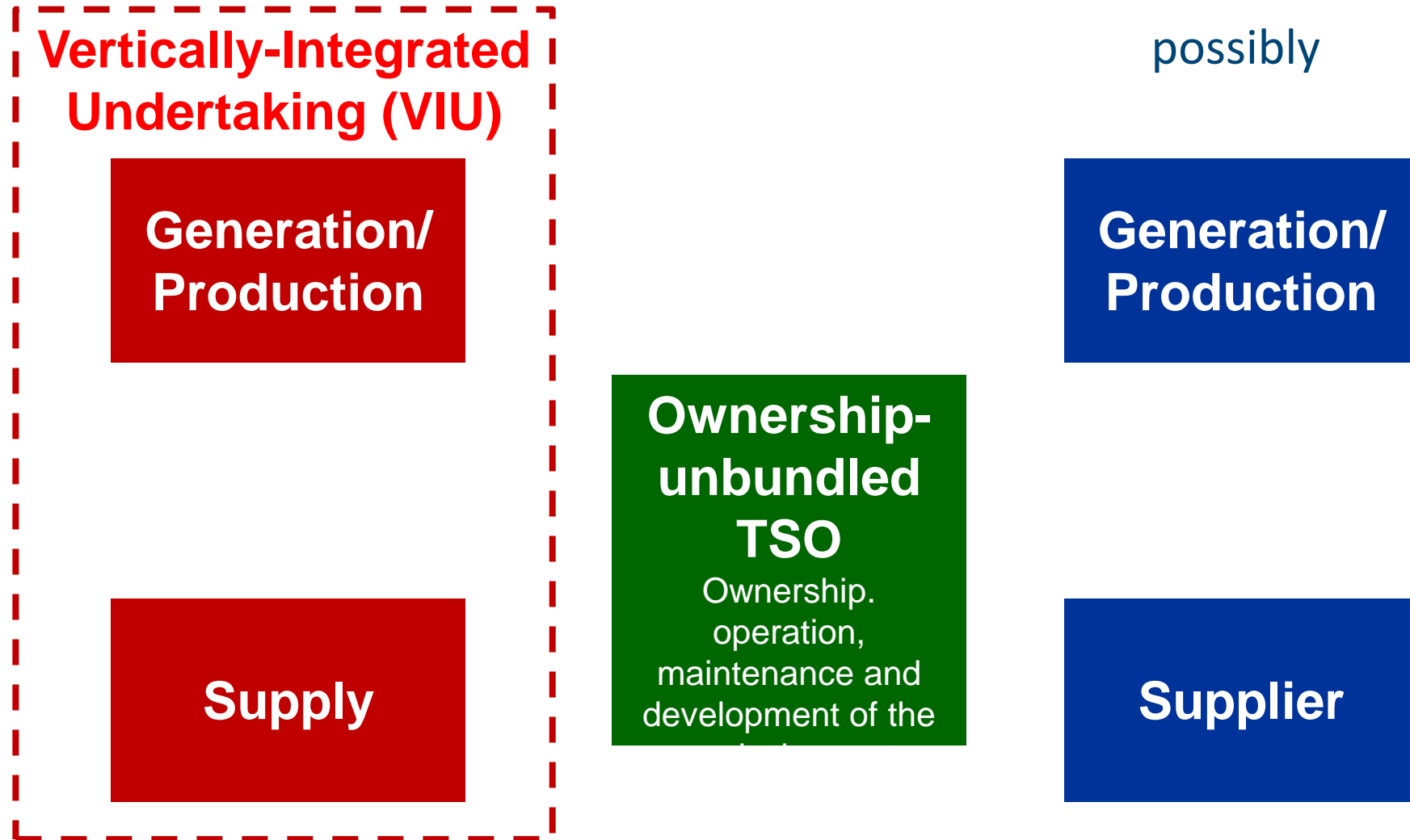
The Vertically-Integrated Utility model



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The Ownership Unbundling model



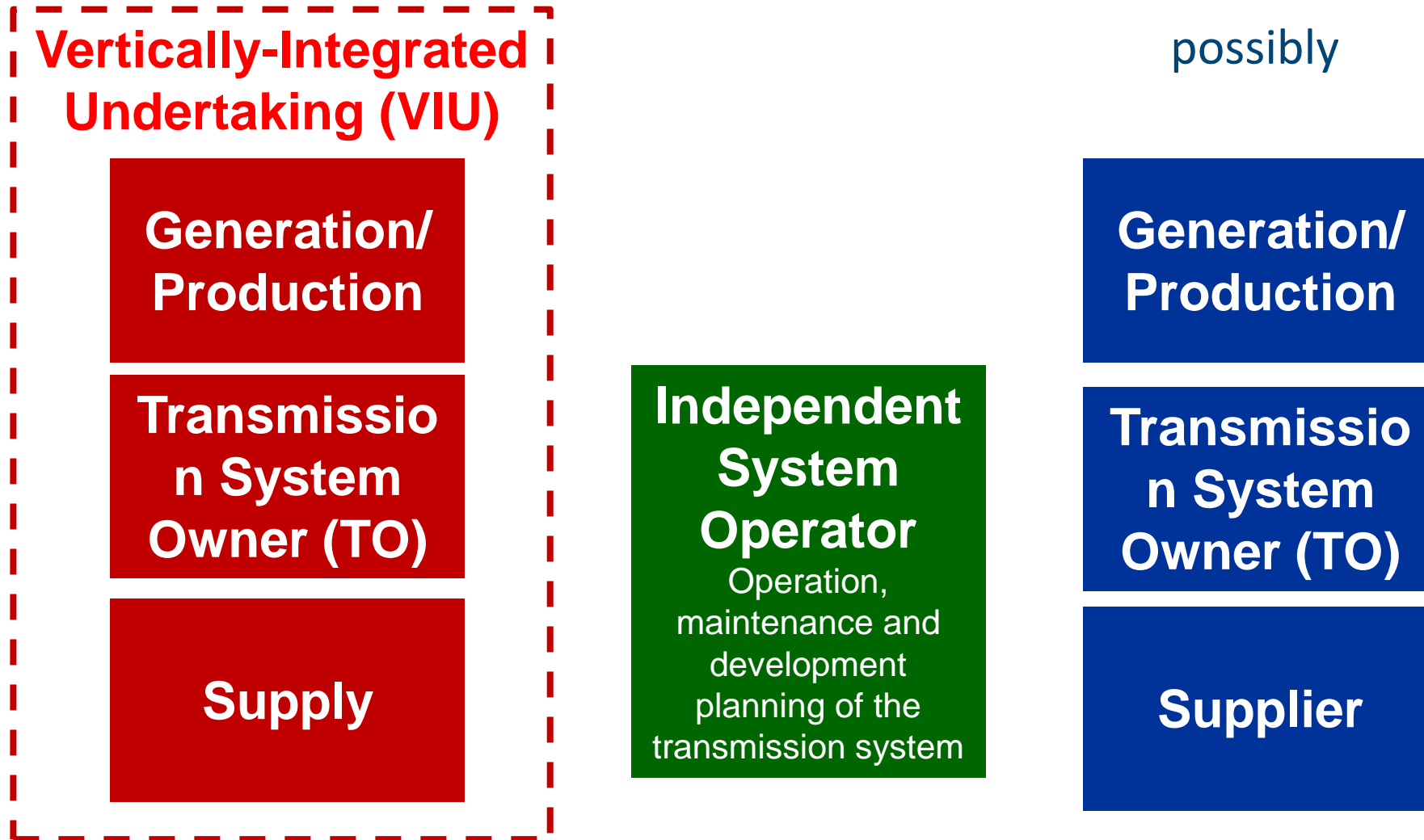
The Ownership Unbundling model (1)

- The undertaking owning the transmission network acts as a TSO, and is separate, in terms of ownership, from any undertaking performing generation and/or supply
- Public ownership of the TSO and of undertakings performing generation and/or supply might be compatible with the OU model as long as the TSO and the undertakings performing generation and/or supply are controlled by separate public bodies (e.g. separate ministries)

The Ownership Unbundling model (2)

- The same person or persons should not be allowed to:
 - directly or indirectly exercise control over an undertaking performing generation and/or supply, and directly or indirectly exercise control or exercise any right over a TSO or over a transmission system
 - directly or indirectly exercise control over a TSO or over a transmission system, and directly or indirectly exercise control or exercise any right over an undertaking performing generation and/or supply
 - appoint members of the supervisory board, the administrative board or bodies legally representing a TSO or a transmission system, and directly or indirectly exercise control or exercise any right over an undertaking performing generation/production and/or supply

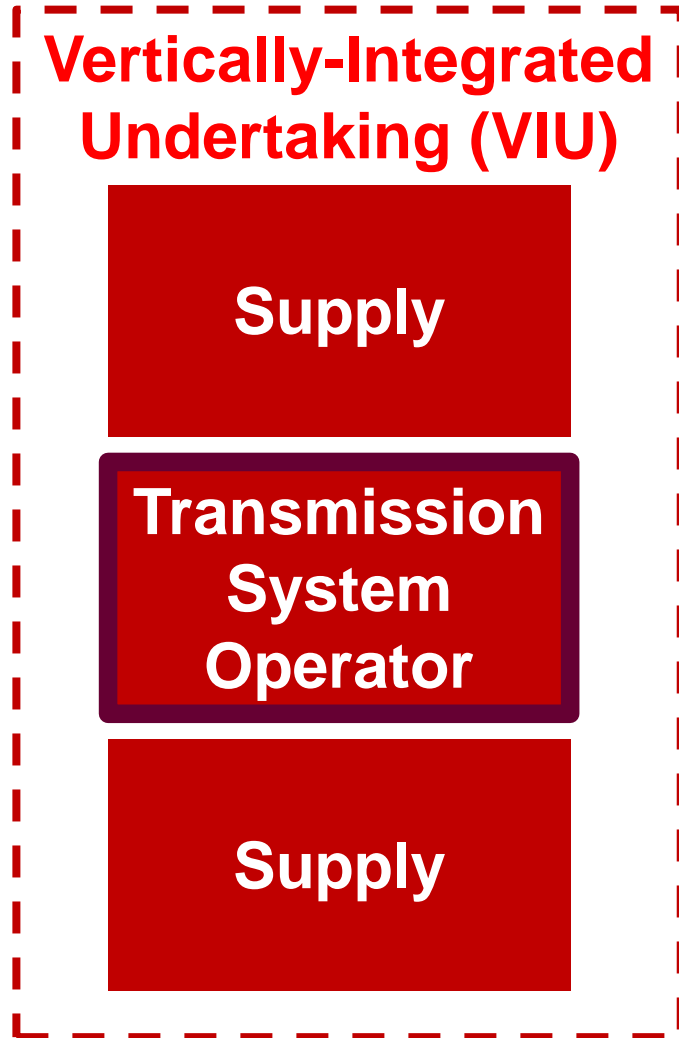
The Independent System Operator model



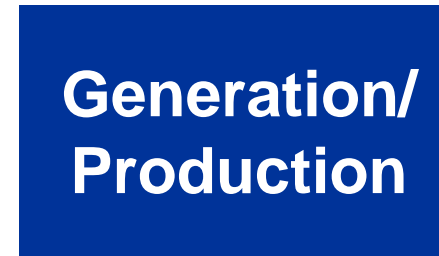
- The ISO performs the TSO tasks (of operating, maintaining and developing the transmission system, ...)
- However, the ISO does not own the transmission system, which is owned by the Transmission Owner (TO), possibly within the VIU
- The ISO:
 - is responsible for granting and managing third-party access
 - is subject to the same unbundling requirements as the TSO under the OU model
 - shall have at its disposal the required financial, technical, physical and human resources to carry out its tasks
 - shall commit to comply with a ten-year network development plan approved and monitored by the NRA

- Under the ISO model, the TO shall:
 - support the ISO for the fulfilment of its tasks
 - finance the investments decided by the ISO and approved by the Regulator, or give its agreement to financing by any interested party, including the ISO
 - provide for the coverage of liability relating to the network assets
 - provide guarantees to facilitate the financing of any network expansions with the exception of those investments where it has given its agreement to the financing by any interested party including the ISO

The Independent Transmission Operator model

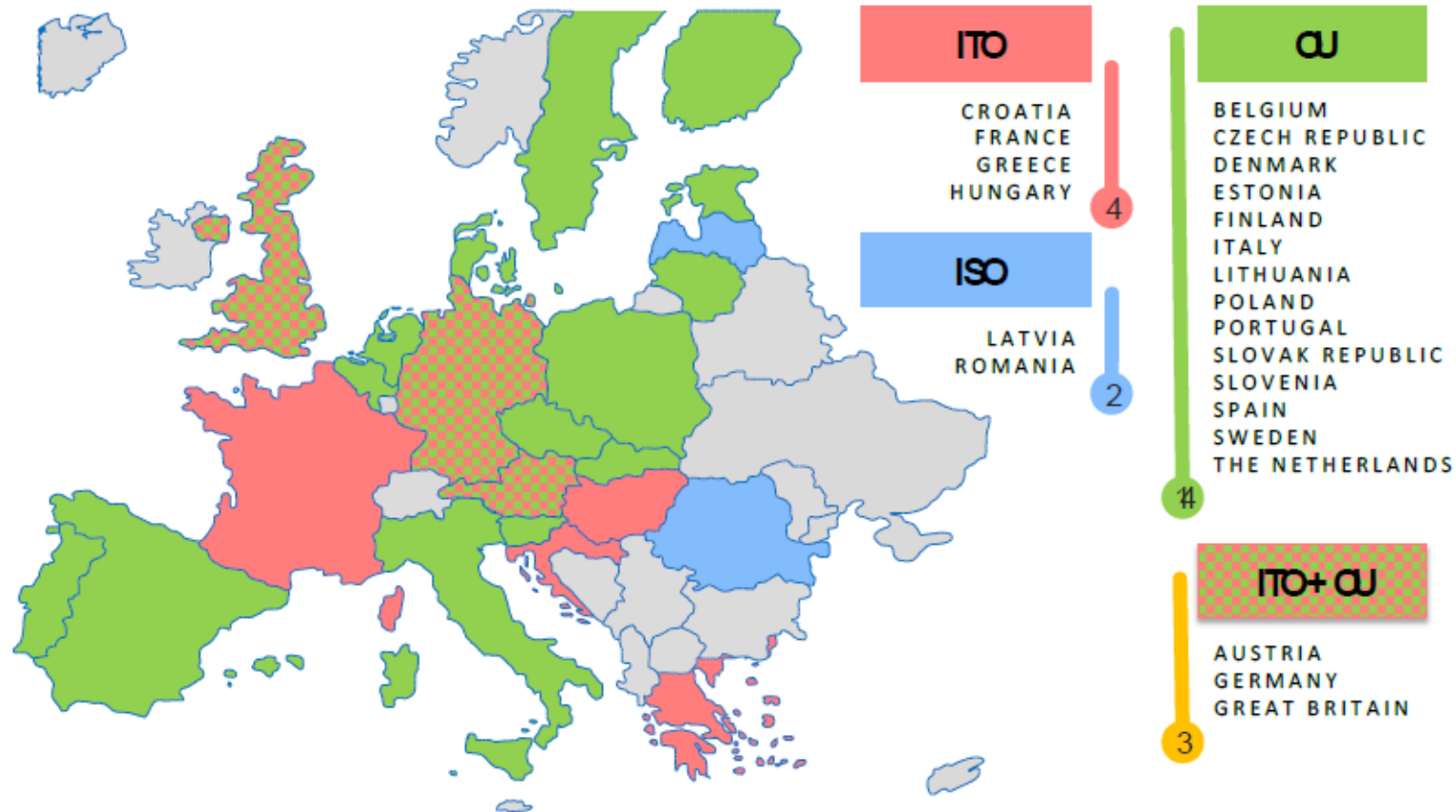


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- Under the ITO model, the TSO remains part of the VIU , subject to a set of behavioural and structural requirements, e.g.:
 - The ViU has to ensure the independence of the ITO in terms of its legal form, organisation and decision-making
 - The ITO and the other parts of the VIU cannot operate in the same precinct
 - Third parties providing services to both the ITO and the other parts of the VIU have to ensure operational and informational separation
 - The ITO has to possess the means necessary for the construction, operation and maintenance of an efficient and secure transmission system
 - The financial situation of the ITO has to allow for new investment mandated by legal obligations or the network development plan
 - Independence of the management and personnel of the ITO from the VIU

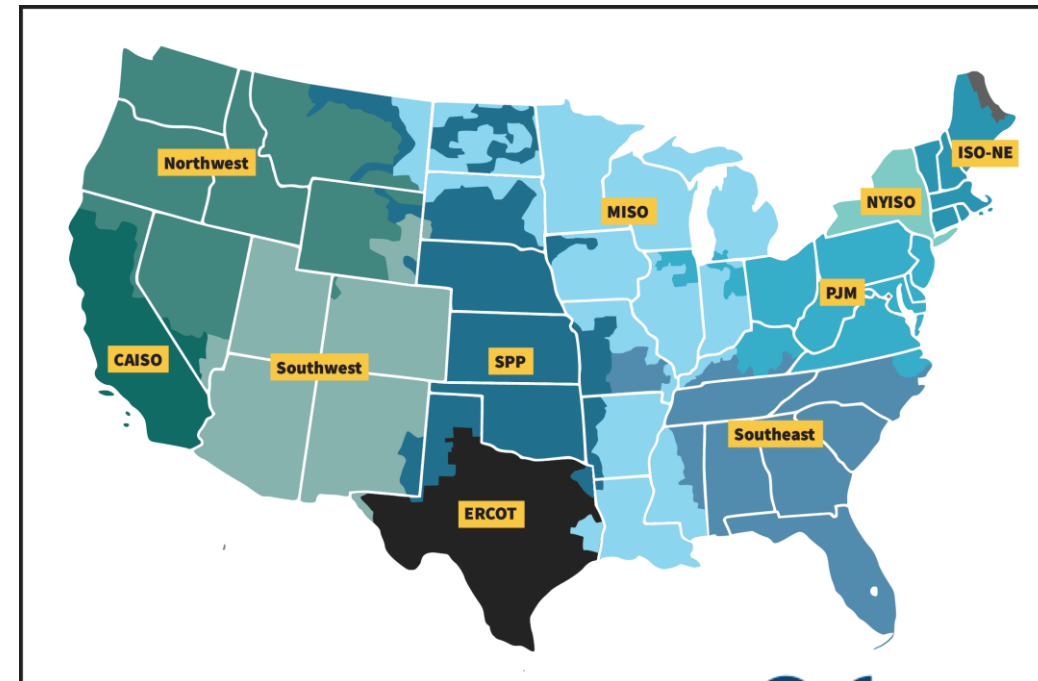
Transmission System Operation models in the European Union



Transmission System Operation models in the United States

- ISO and RTO in the US
 - The ISO coordinates, controls and monitors the operation of the electricity system
 - The Regional Transmission Organization (RTO) coordinates, controls, and monitors a multi-state electricity system

| | ISO | RTO |
|---|-----|-----|
| California Independent System Operator (CAISO) | X | |
| Electric Reliability Council of Texas (ERCOT) | X | |
| Midcontinent Independent System Operator (MISO) | X | X |
| ISO New England | X | X |
| New York Independent System Operator (NYISO) | X | |
| PJM Interconnection (PJM) | X | X |
| Southwest Power Pool (SPP) | X | X |



The justification for the ISO model

- The ISO model could be justified, in a liberalised sector environment, by:
 - The objective of maintaining a plurality of transmission asset owners
 - The intent of introducing competition in the development of new transmission network elements
 - However, competition in construction could be achieved also by a single asset owner, by tendering the construction activities out
 - The political difficulties of stripping the incumbent energy company of its transmission network assets

System Operation models in the context of regional market integration

- Some form of closer cooperation among (transmission system operators is required to support regional electricity market integration
- This could be achieved through:
 - Regional ISOs (e.g. RTOs in the US)
 - Regional Coordination Centres (RCCs) (e.g. in the EU)
- RCCs perform only a subset of TSO/ISO activities
 - EU RCCs do not have responsibility for real-time system operation

- Approving transmission expansion plans
 - Risk of ‘gold-plating’
 - An independent ISO should make regulation of transmission development easier
- Promoting loss and redispatching cost reductions
 - Difficulty of introducing effective incentive-based regulation due to the low capitalisation of ISOs

Transmission System development in the context of regional market integration

- Regional transmission expansion planning
 - by a regional ISO
 - through coordination of national ISOs/TSOs
- Costs and benefits related to a new network asset might accrue differently across the different relevant countries
- The ‘territorial principle’ for cost allocation does not necessarily ensure that all involved countries benefit from the new network asset
- If a project is overall beneficial (total benefits > total costs) there is a cost allocation which makes it beneficial to all relevant countries

Thank you for your attention!