



European Union Agency for the Cooperation  
of Energy Regulators

# Electricity network tariffs enabling efficient grid connection and usage

Akos Hofstadter

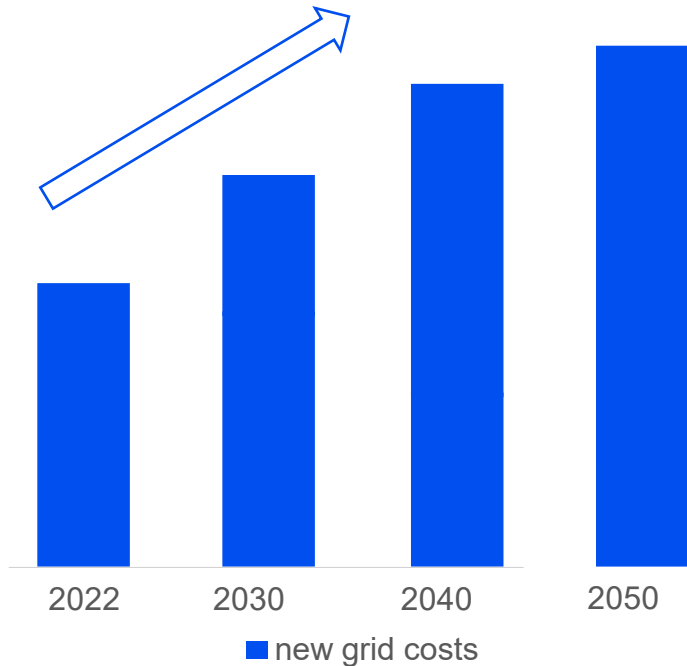
9 April 2025, Regional Workshop on New Roles of DSOs under  
the Clean Energy Package,

Online presentation

- **Today's context and importance of electricity network tariffs**
- **National tariff practices in the EU**
- **ACER's recommendations**

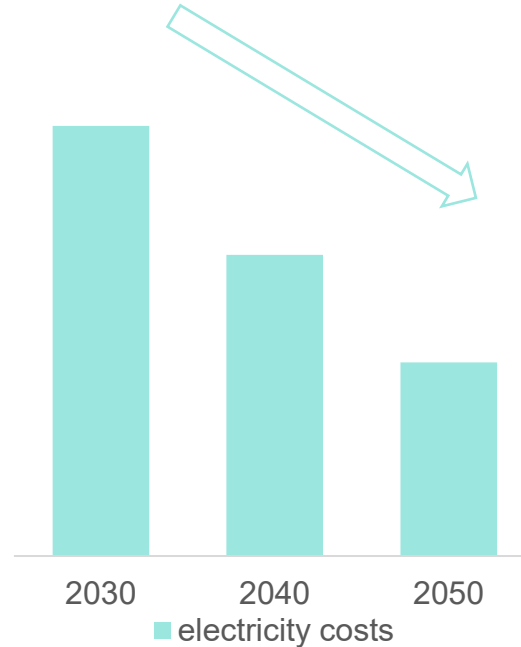
# EU energy targets require additional grid capacity

**Grid costs expected to increase**

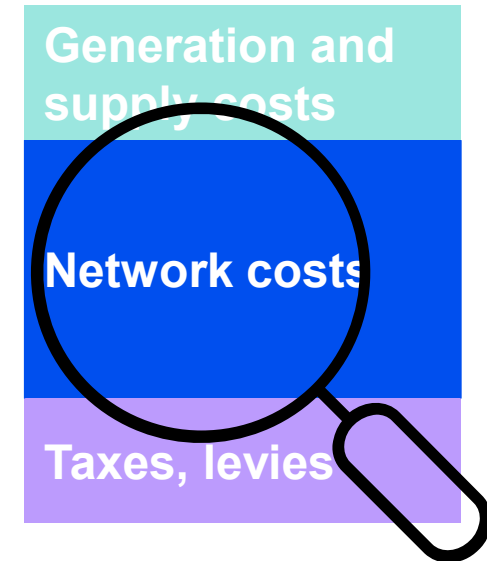


Source: ACER, high investment scenario

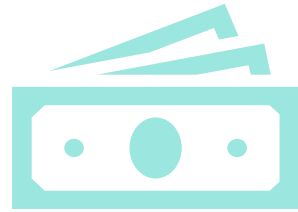
**while electricity costs should decrease**



**trigger changes in cost components of the final bill...**



**...and shift in focus?**



## System operator revenues

- Fair return (risk/reward)
- No CAPEX (or any) bias
- Regulatory incentives



## Network tariff design

- Cost recovery
- Cost reflectivity
- Applicability

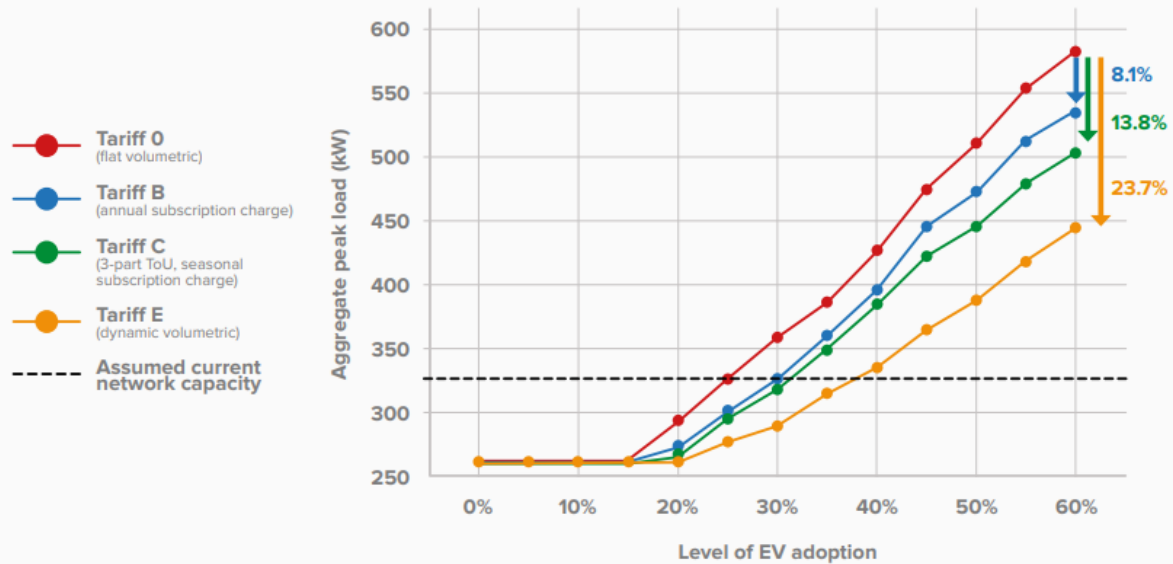


**Efficient use of existing grid and build-out**

## Potential

## Challenges

FIGURE 1 — Aggregate peak load on the distribution network under each modelled tariff design (kW)



Source: FTI Consulting

- Complex process
- Multiple objectives involve trade-offs
- No one-size-fits-all solution; local context matters
- Sensitivity; distributional effects

- **No binding harmonisation** via network code, but **EU provisions** on tariff setting principles do exist
- ACER's **best practices report** every two years; national regulators shall **duly consider it\***
- **European Commission** will put forward (Q2 2025) a **design of network charges\*\***

*Art. 59(1) of Directive (EU) 2019/944: NRAs shall fix/approve transmission/distribution tariffs/methodologies*

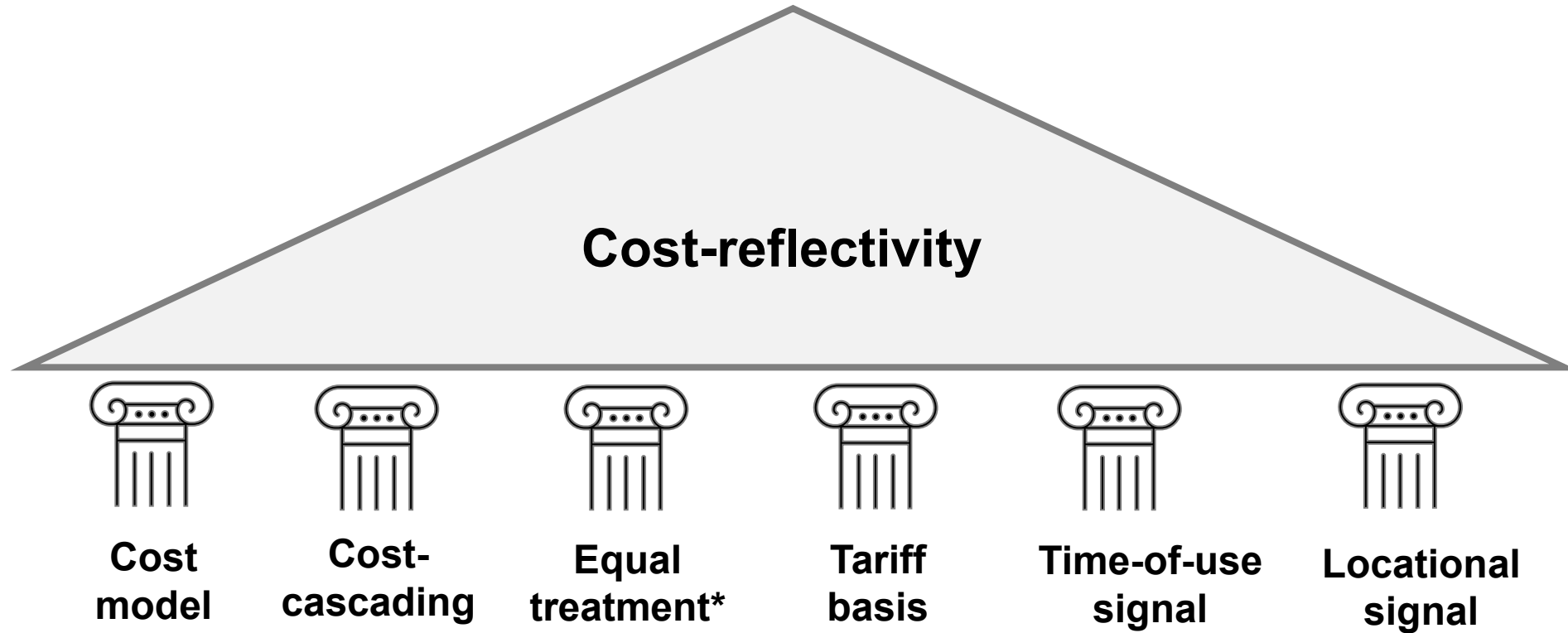
*Art. 18 of Regulation (EU) 2019/943: network tariffs shall*

- *be cost reflective, transparent, non-discriminatory*
- *account separately for the electricity fed into the grid and the electricity consumed from the grid,*
- *neutrally support overall system efficiency through price signals to customers and producers,*
- *not create disincentives for self-generation, self-consumption or demand response.*

*Commission Regulation (EU) 838/2010 stipulates that the annual average transmission charges for producers shall be within a range of 0 to 0.5 EUR/MWh, except in Denmark, Sweden and Finland (0 to 1.2 EUR/MWh), in Ireland (0 to 2.5 EUR/MWh), and in Romania (0 to 2.0 EUR/MWh).*

\*[ACER's report on network tariff practices: "Getting the signals right: electricity network tariff methodologies in Europe"](#), March 2025. In [ACER/CEER position paper \(July 2024\)](#) regulators committed to jointly develop best practices.

\*\*European Commission: [Affordable Energy Action Plan](#) puts forward a design of network charges incentivising flexibility and efficient investments in electrification



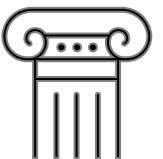
\* i.e. in the sense of avoiding unjustified exemptions, discounts or specific tariff treatment

Note: Sufficiently granular data on network development and utilisation is essential to design cost-reflective tariffs

- **80% of the countries follow an average cost approach**, while 20% apply either an incremental or a forward-looking cost model\*
- In the incremental or forward-looking cost models, the residual costs are recovered via
  - (a) additive or multiplicative adjustment of the unit prices,
  - (b) network operator’s request for approval of new charges or
  - (c) separate charges

| Cost model           | Description  | Cost recovery  |
|----------------------|--|--|
| Average cost         | The allowed or target revenues of network operators are allocated to the cost drivers as an average cost, meaning the ratio between revenues and quantities.   | Full cost recovery is ensured by design, if the quantities are correctly forecasted      |
| Incremental cost     | Increments in network costs are associated to increments in cost drivers, where data used refers mainly to historic data. The incremental cost per cost driver represents an average long-run marginal cost.                   | May result in residual costs that need to be accounted for to ensure full cost recovery. |
| Forward-looking cost | Increments in network costs are associated to increments in cost drivers, where data used refers mainly to forecasted data and/or simulation models. The incremental cost per cost driver represents a long-run marginal cost. |  |

Cost allocation models for setting network tariffs



**Cost  
model**

\*Out of 29 European countries reviewed in the report, 6 countries apply incremental or forward-looking cost model: Croatia, Estonia, France, Norway, Portugal, Sweden

# Network costs are cascaded in a top-down paradigm

- **All countries apply cascading of transmission costs to distribution level** (~90% of the transmission costs); to decide on how much to cascade a simplified cost cascading proxy can be applied

$$\text{Proxy} = [G \times (C + c) / (G + g) - C] / [G \times (C + c) / (G + g)]$$

Where:

**G** = generation at transmission (MWh)

**g** = generation at distribution (MWh)

**C** = consumption at transmission (MWh)

**c** = consumption at distribution (MWh)

Example

Where **G** = 80 MWh, **g** = 20 MWh, **C** = 20 MWh and **c** = 60 MWh:

Proxy = 69% = 44/64  $[80 \times (20 + 60) / (80 + 20) - 20] / [80 \times (20 + 60) / (80 + 20)] = (64 - 20) / 64$

Cost cascading proxy

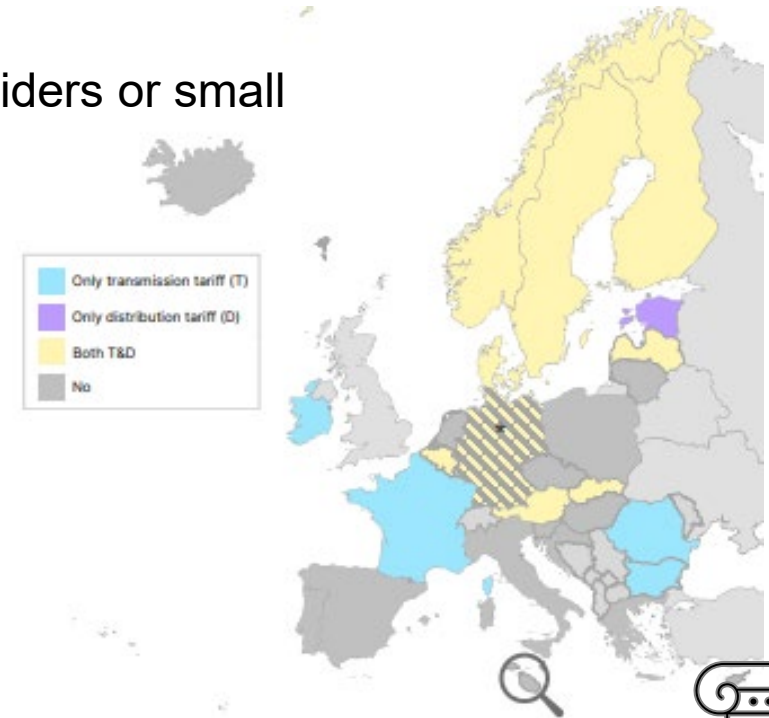
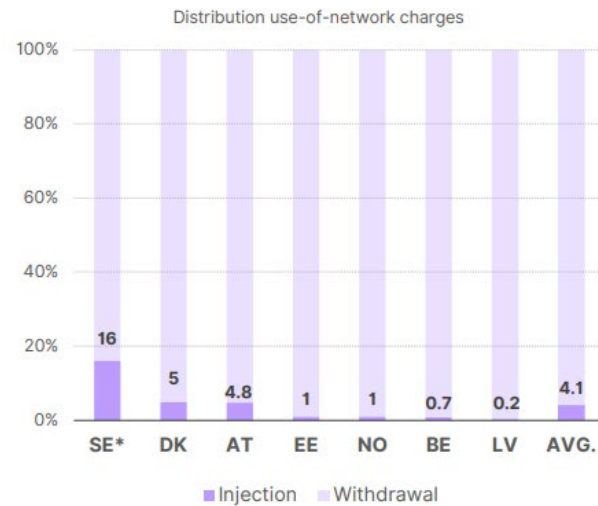
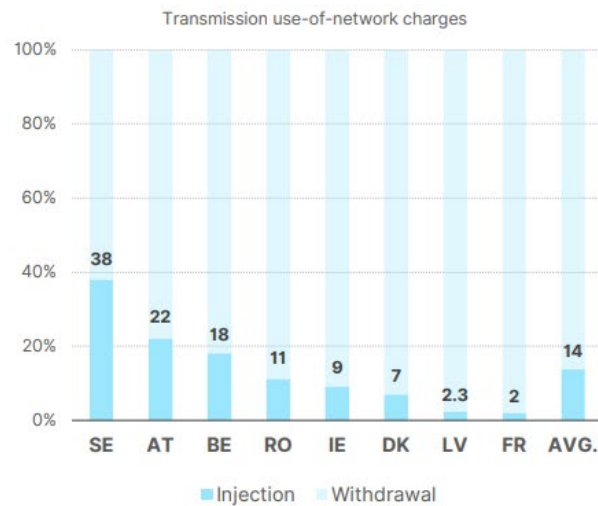
- Cost cascading across distribution voltage levels is also very common, unlike cost cascading across transmission voltage levels
- **Inverted power flows** (due to distributed generation) may challenge former practice?



**Cost-  
cascading**

# Producers may need to pay more to increase efficiencies

- In half of the countries, generation does not (or marginally) pay network charges for injection
- Exemption/discounts for renewable, offshore, ancillary service providers or small producers observed. Negative injection charges also exist



(\*) Germany applies negative injection charges

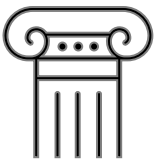
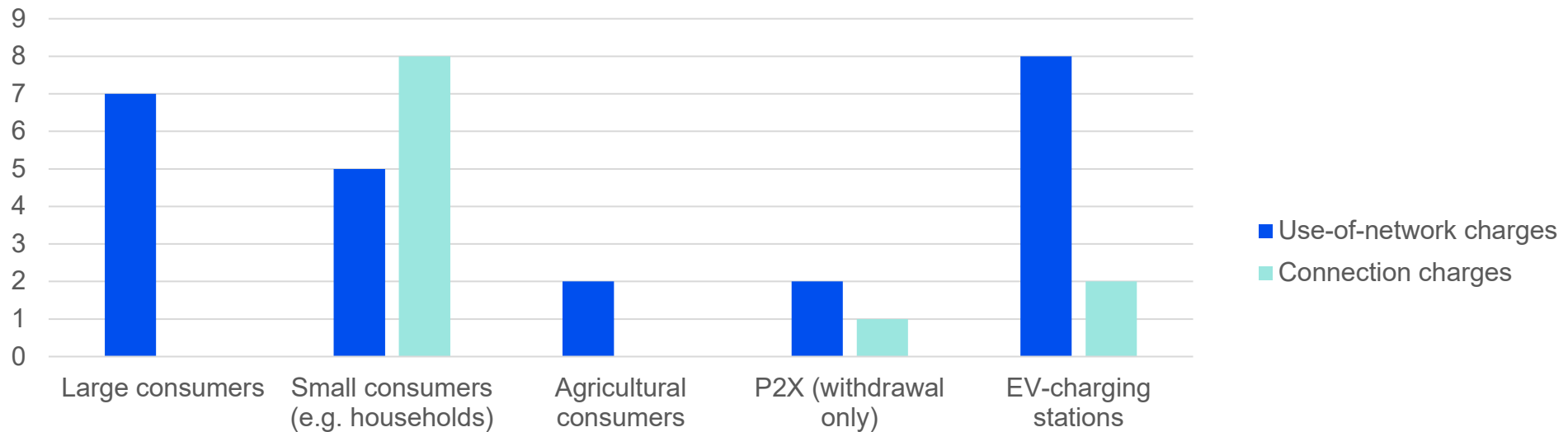
(\*) In Sweden, for regional DSOs, the share is approximately 16% (as shown in the figure), while for local DSOs the share of generation is approximately 1%.

Generation/load split within use-of-network charges, 2023

Application of injection charges in Europe



- **Exemptions or discounts** on network charges to different consumer groups (subject to certain criteria, up to certain number of years or without restriction)
- **Specific tariff regimes for EV-charging:** e.g. different tariff structure or **weight of components**, lower off-peak withdrawal charge, increase of “technically available capacity”

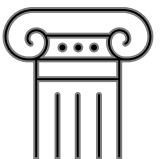


**Equal  
treatment**

- Storage facilities are **typically subject to withdrawal charges**; in some countries also to injection charges → not necessarily a “**double-charging**”
- Exemptions/discounts under certain conditions (e.g. technology, commissioning date, size, efficiency, purpose) often justified by **beneficial system impacts**

|                  | Withdrawal charges                    |  | Injection charges        |          | Connection charges |                   |
|------------------|---------------------------------------|--|--------------------------|----------|--------------------|-------------------|
|                  | Exemption                             | Discount   | Exemption                | Discount | Exemption          | Discount          |
| <b>Countries</b> | 5: CY, IT, ES, PT <sup>101</sup> , SI | 13: AT, BE, HR, FI, FR, DE, HU, IE, LT, PL, RO, SK, SE | 2: BG, FR <sup>102</sup> | 0        | 2: CZ, SK          | 4: AT, HU, LT, PL |

Exemption, discount or different treatment of storage facilities



**Equal  
treatment**

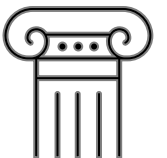
- Prosumers are often subject to **net-metering**; may **shift cost burdens** to other users
- Portugal: specific tariff regime for self-consumption** using the public grid, reflecting their network use

|                  | Injection charge exemptions  | Withdrawal charge exemption           | Net-metering  | Cost-offsetting | Different tariff structure                     | Connection charge discount |
|------------------|--|---------------------------------------|---|-----------------|--|----------------------------|
| <b>Countries</b> | 12: AT, BE <sup>167</sup> , CZ, DK, FI, FR, DE, IE, LT, NO, RO, SE | 5: BE <sup>167</sup> , BG, DK, FI, IE | 9: BE <sup>168</sup> , HR, CY, FI, HU, LU, NO, PL <sup>169</sup> , SI | 2: LV, SK       | 3: (DK) <sup>170</sup> , EE, IT <sup>171</sup> | 3: HU, LT, PL              |

Tariff treatment of individual prosumers

|                     | Energy communities connected to the grid                       | Specific tariff regime    |
|---------------------|--|---------------------------|
| <b>Transmission</b> | 3: BG, GR, PT  | 1: PT                     |
| <b>Distribution</b> | 15: AT, BE, BG, DK, FI, FR, GR, IE, LV, LT, LU, NL, PT, SI, SE | 6: AT, BE, FR, LU, PT, SI |

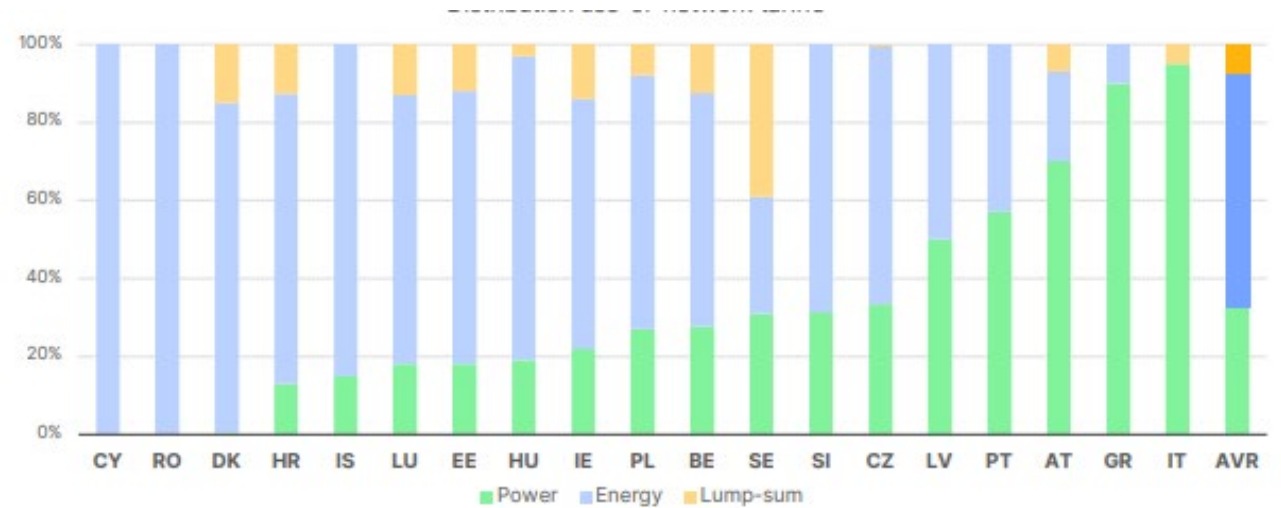
Tariff treatment of energy communities



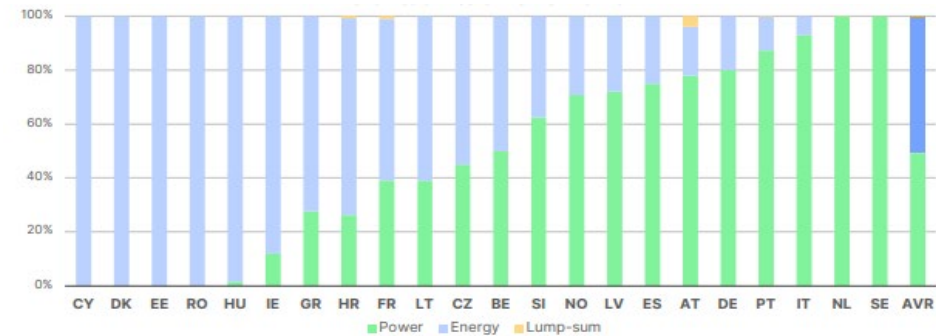
**Equal  
treatment**

## Correlation with capacity usage, energy volume, both or none

- Bulk of the cost shows correlation with **peak capacity**
- Vast majority of the countries apply **mix of different tariff basis**
- Gradual shift towards **more capacity-based charges**



Share of tariff bases in distribution use-of-network charges



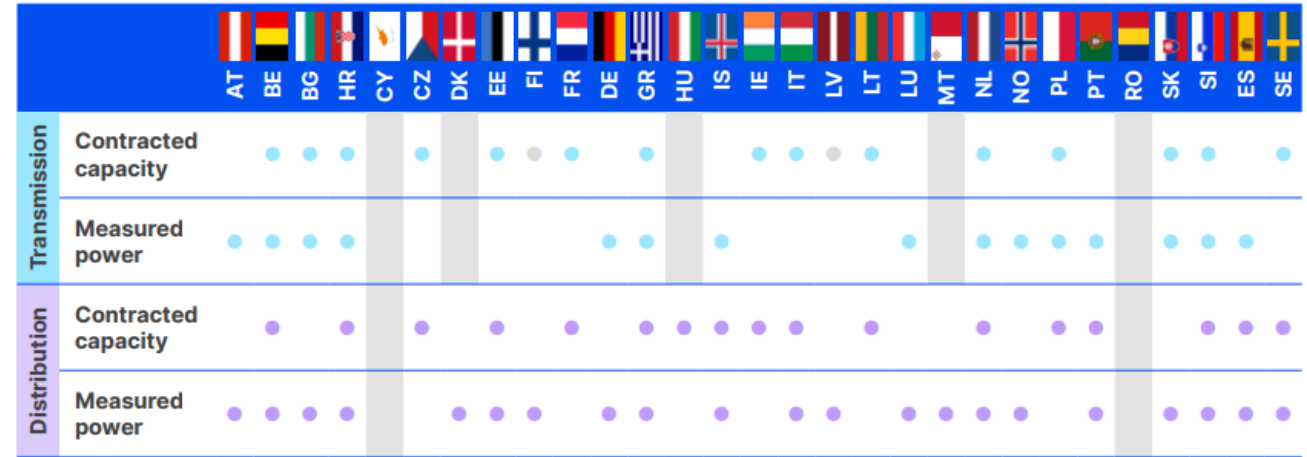
Share of tariff bases in transmission use-of-network charges



**Tariff  
basis**

# Great variety in the design of capacity-based charges

- Network charges can be barriers or facilitators of demand response
- Several elements to be considered by regulators



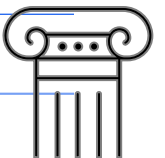
Capacity/power-based network charges in Europe

| Basis   | Transmission  | Distribution  |
|---|---|---|
| Individual peak (yearly)  | BE <sup>(a)</sup> , DE <sup>(a)</sup> , LU, PL <sup>(b)</sup> , PT <sup>(a)</sup> | DE <sup>(a)</sup> , LU, MT, PT <sup>(a)</sup>                                 |
| Individual peak or average of multiple individual peaks (monthly) | AT, BE <sup>(a)</sup> , DE <sup>(a)</sup> , NL <sup>(c)105</sup> , SI             | AT, BE, EE, DE <sup>(a)</sup> , IT, NL <sup>(c)</sup> , SI, SE <sup>106</sup> |
| Individual peak during system peak hours                          | HR <sup>107</sup>   | HR <sup>107</sup>   |
| Energy withdrawal during peak hours converted into power (kWh/h)  | GR, NO, PT <sup>(a)</sup>   | DK <sup>108</sup> , NO, PT <sup>(a)</sup>                                     |

Setting measured power-based network charges

|  | Transmission                          | Distribution                          |
|--|---------------------------------------|---------------------------------------|
| Disconnection / cost of fuse replacement     | SI                                    | PT, SI, ES <sup>(a)</sup>             |
| Increase of subscription                     | HR <sup>(b)</sup> , NL <sup>(c)</sup> | HR <sup>(b)</sup> , NL <sup>(c)</sup> |
| Charge for excess using energy-based charges | IE, LT, PL, SE                        | HU, PL                                |
| Charge for excess using power-based charges  | EE, ES                                | EE, HU, ES <sup>(a)</sup>             |

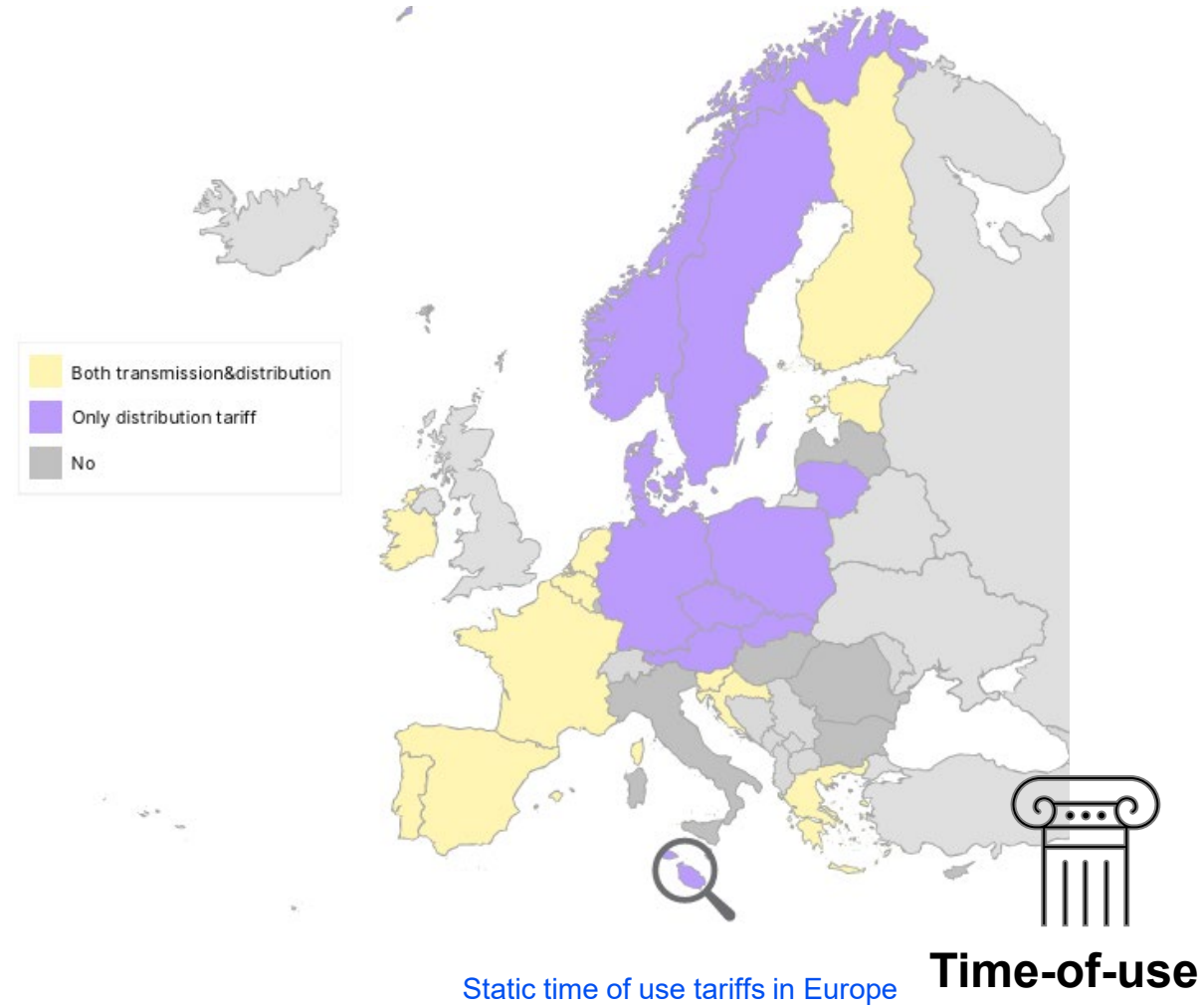
Consequences of exceeding the contracted capacity



**Tariff basis**

# Flexibility needs make flat grid tariffs costly

- **Time-of-use (ToU) tariffs change user behaviour** (e.g. at system peak) - this reduces the need for new capacity
- **Static ToU signals for withdrawal are very common** in Europe at the distribution level
- **Dynamic network tariffs** (peak period and/or price of network use is set only at short notice, close to real time) **are very rare**



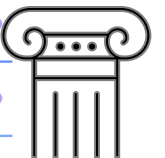
- Peak vs. off-peak tariffs **often coexist with other signals**
- Typically (but not only) **embedded in the energy-based component**
- For inspiration:
  - **Belgium:** combination of yearly and monthly peak power-based charges
  - **Spain and Slovenia:** multiple time variations of the power-based network tariff component

|              |                     | AT | BE | BG | HR | CY | CZ | DK | EE | FI | FR | DE | GR | HU | IS | IE | IT | LV | LT | LU | MT  | NL  | NO | PL | PT | RO | SK | SI | ES | SE |
|--------------|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|----|----|----|----|
| Transmission | Daily peak/off-peak |    | •  |    | •  |    |    |    | •  | •  | •  |    | •  |    |    | •  |    |    |    |    | N/A | •   |    | •  |    |    | •  | •  |    |    |
|              | Weekdays/weekend    |    | •  |    |    |    |    |    | •  |    | •  |    | •  |    |    |    |    |    |    |    |     | N/A | •  |    | •  |    |    | •  | •  |    |
|              | Seasonal            |    | •  |    | •  |    |    |    | •  | •  | •  |    | •  |    |    |    |    |    |    |    |     | N/A | •  |    | •  |    |    | •  | •  |    |
| Distribution | Daily peak/off-peak | •  | •  |    | •  |    | •  | •  |    | •  | •  |    |    |    |    | •  |    |    | •  |    |     | •   | •  |    | •  |    |    | •  | •  | •  |
|              | Weekdays/weekend    |    | •  |    |    |    | •  |    | •  |    |    |    |    |    |    |    |    |    | •  |    |     |     | •  | •  |    | •  |    | •  | •  | •  |
|              | Seasonal            | •  |    |    | •  |    |    |    | •  |    |    |    |    |    |    |    |    |    |    |    |     |     |    | •  | •  |    |    | •  | •  | •  |

Time-of-use tariff variants

|              |                | AT | BE | BG | HR | CY | CZ | DK | EE | FI | FR | DE | GR | HU | IS | IE | IT | LV | LT | LU | MT  | NL  | NO | PL | PT | RO | SK | SI | ES | SE |
|--------------|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|----|----|----|----|
| Transmission | Energy (€/MWh) |    | •  |    | •  |    |    |    | •  | •  | •  |    | •  |    |    | •  |    |    |    |    | N/A | •   | •  |    | •  |    |    | •  | •  | •  |
|              | Power (€/MW)   |    | •  |    | •  |    |    |    |    |    | •  |    | •  |    |    |    | •  |    |    |    |     | N/A | •  | •  |    | •  |    |    | •  | •  |
| Distribution | Energy (€/MWh) | •  | •  |    | •  |    | •  | •  | •  | •  | •  |    | •  |    |    | •  |    |    | •  |    |     | •   | •  |    | •  |    |    | •  | •  | •  |
|              | Power (€/MW)   |    |    |    | •  |    | •  |    | •  | •  | •  |    | •  |    |    |    |    |    |    |    |     |     |    | •  | •  |    | •  |    | •  | •  |

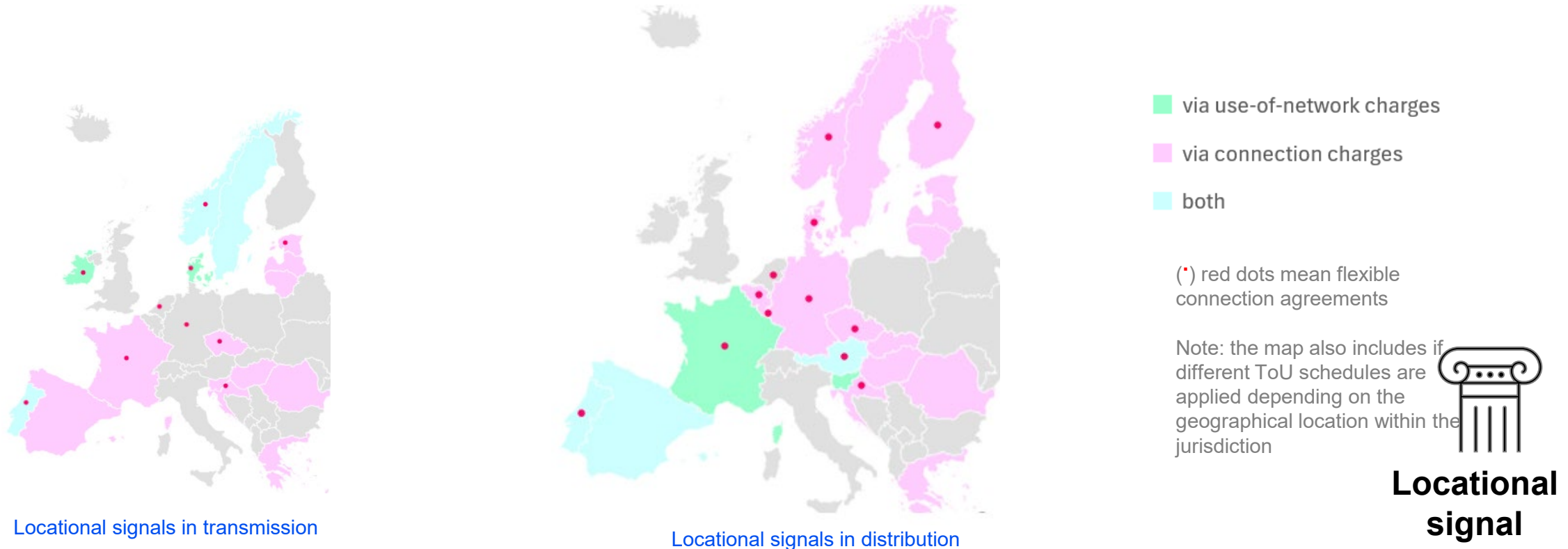
Tariff basis embedding the time-of-use signal



**Time-of-use signal**

# Siting of generation and consumption is often uncorrelated, resulting in congestion

- Spatially differentiated charges can steer investments to the ‘right’ geographical locations
- **Locational signals** - beyond deep connection charges - **are hardly used anywhere in the EU**
- Increased interest in **flexible connection** agreements



## For inspiration:

- **Norway:** Tariffication based on marginal grid losses, differentiated in each network node
- **Denmark:** Lower connection and use-of-network charges for producers in areas with high demand surplus
- **Ireland:** Locational element embedded in the generation charge
- **Romania:** Injection charge for producers connected to distribution networks covering losses due to excess generation that needs to be carried to other geographical zones
- **Slovenia:** Locational dynamic pricing to address unpredictable congestions
- **The Netherlands:** Three different types of flexible connection agreements with discount on use-of-network charges



**Locational  
signal**

**2/3 of Member States** introduced or planned changes recently; often **in line with ACER recommendations**

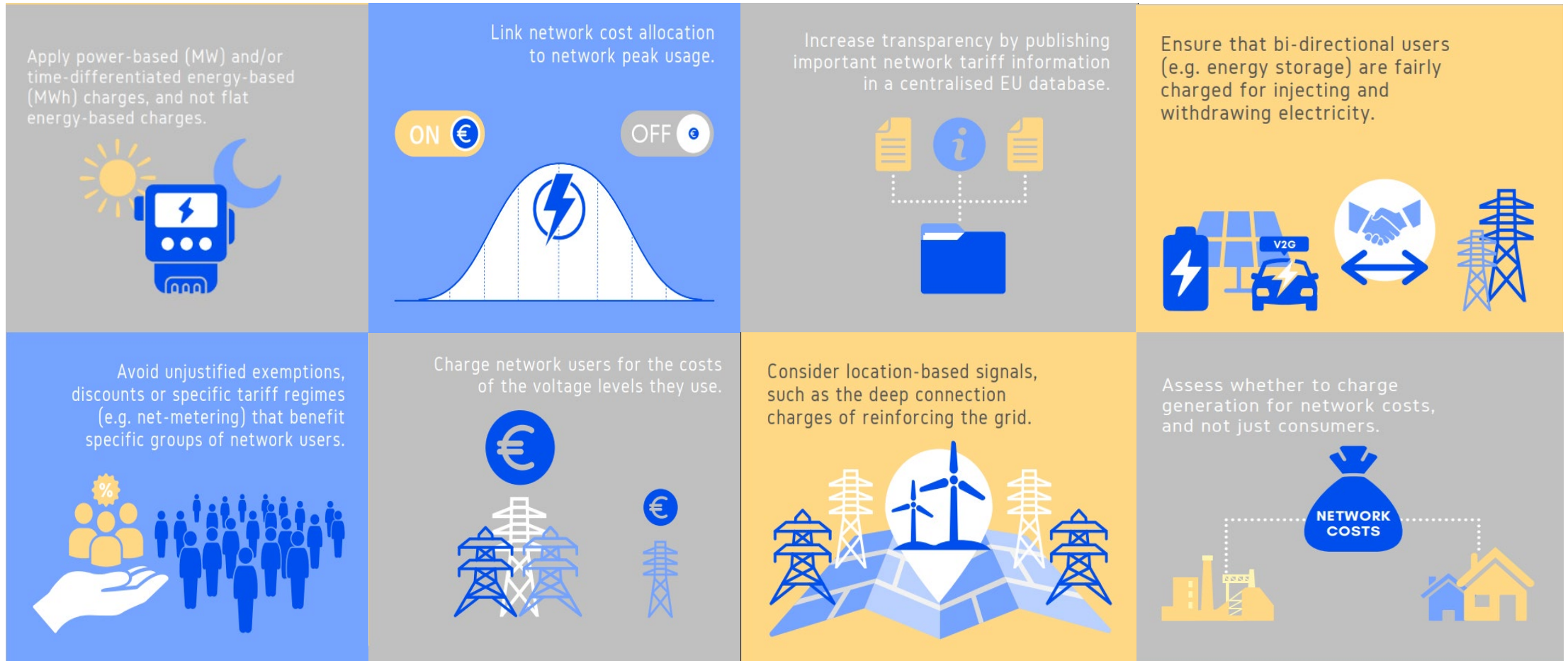
Network tariff design involves **many trade-offs**:

- **Regulatory independence** in network tariffs is key for enduring benefits.
- **Early engagement with stakeholders** is instrumental

Consult the public and explain proposed changes in network tariff design.



## ACER's tariff report offers recommendations to regulators for cost-reflective network tariffs



# Thank you!

# Any questions?



European Union Agency for the Cooperation  
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# Back up slide

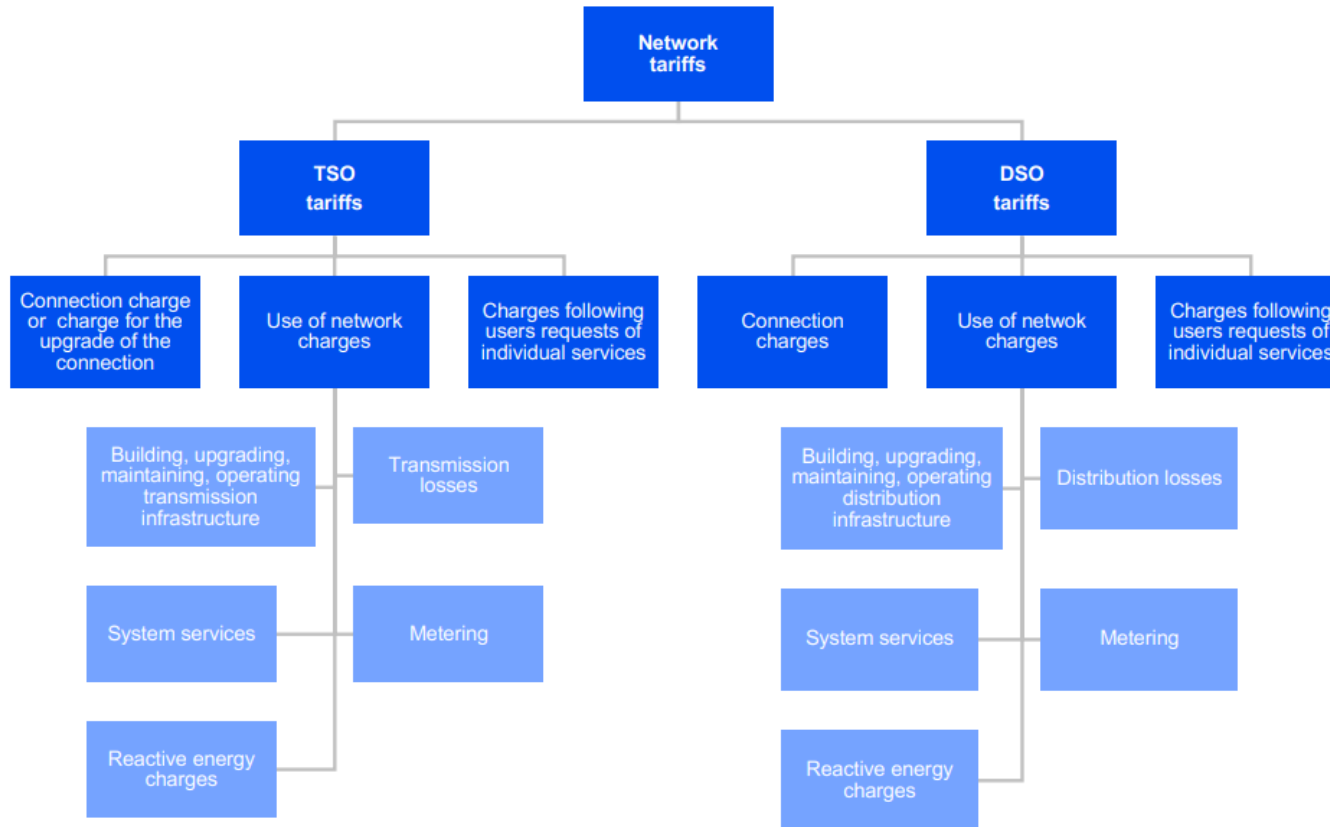


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# Different terminology hinders comparability



~~unrelated policy costs~~

Definition of network tariffs