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Network tariffs enabling efficient grid connection and usage: Overview of EU practices

Focus on renewables, decentralized generation, and batteries

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Agenda

- **Importance of network tariffs**
- **ACER's tariff recommendations**
- **National tariff practices in the EU**
  - Cost recovery
  - Tariff basis
  - Time-of-use signals
  - Flexible connection agreements
  - Locational signals
  - Producers
  - Storage facilities
  - Prosumers
  - Emerging network users
  - "Behind the meter", proving demand response, system operation services

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Efficiency is a key ingredient of the energy transition

Ambitious climate and energy targets require additional grid capacity.

Additional grid capacity requires efficient use of existing capacity and efficient grid build-out

Comes with high investment costs. Efficient economic signals to all actors is key!

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Two sides of the same coin, but still different tools

See back up slides

Revenue setting

Network tariff design

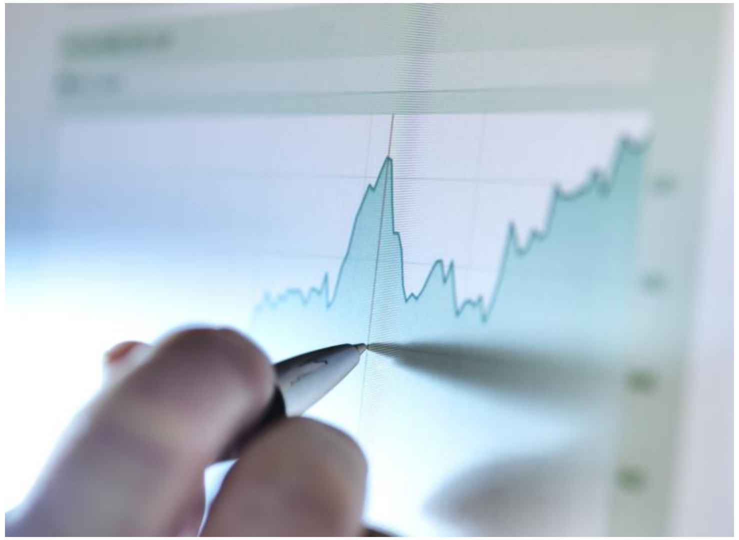
Today's presentation

- ✓ fair return (risk/reward balance)
- ✓ no CAPEX (or any) bias
- ✓ regulatory incentives

- ✓ cost recovery
- ✓ cost reflectivity, non-discrimination
- ✓ cost signals

Network tariffs can be facilitators or barriers of efficiency

- **Ability to provide incentives to network users to adapt their behaviour:**
  - Considerable share within the final electricity bill (20-50% for households in Europe)
  - Effectiveness depends (e.g. user category)
  - Constrained by technology (e.g. meters, automation)



- **Lack of cost reflectivity or transparency can lead to:**
  - Inefficient network use
  - Cross-subsidies among network users
  - Barrier to flexibility, active customers and demand response

- **Distortions can come from various sources:**
  - Tariff structure: e.g. distorted (or lack of) cost signals
  - Unjustified exemptions/discounts to support unrelated policy purposes
  - <u>Taxes/levies – shall not be included in network tariffs</u>, they are unrelated to network costs*,

**For example, an energy tax levied on consumption may incentivise load curtailment but disincentivise increasing demand at a time of excessive production, while this may be more efficient from the system point of view.*

EU harmonisation

Binding harmonisation (network code) of electricity network tariff structures is NOT foreseen

- However, several existing relevant EU provisions, for example:
  - Tariff setting principles
  - Avoiding net metering or double-charging
  - Cap on annual average transmission charges for generators

Current focus is more on increasing transparency and comparability in tariff-setting and identifying and sharing best practices

- ACER shall issue at least every 2 years a best practices report
- NRAs shall duly take the report into consideration when fixing or approving tariffs or their methodologies

Cf. Article 18 of Regulation (EU) 2019/943
For past ACER works on network tariffs please visit: https://www.acer.europa.eu/en/Electricity/Infrastructure_and_network%20development/Pages/Tariffs.aspx

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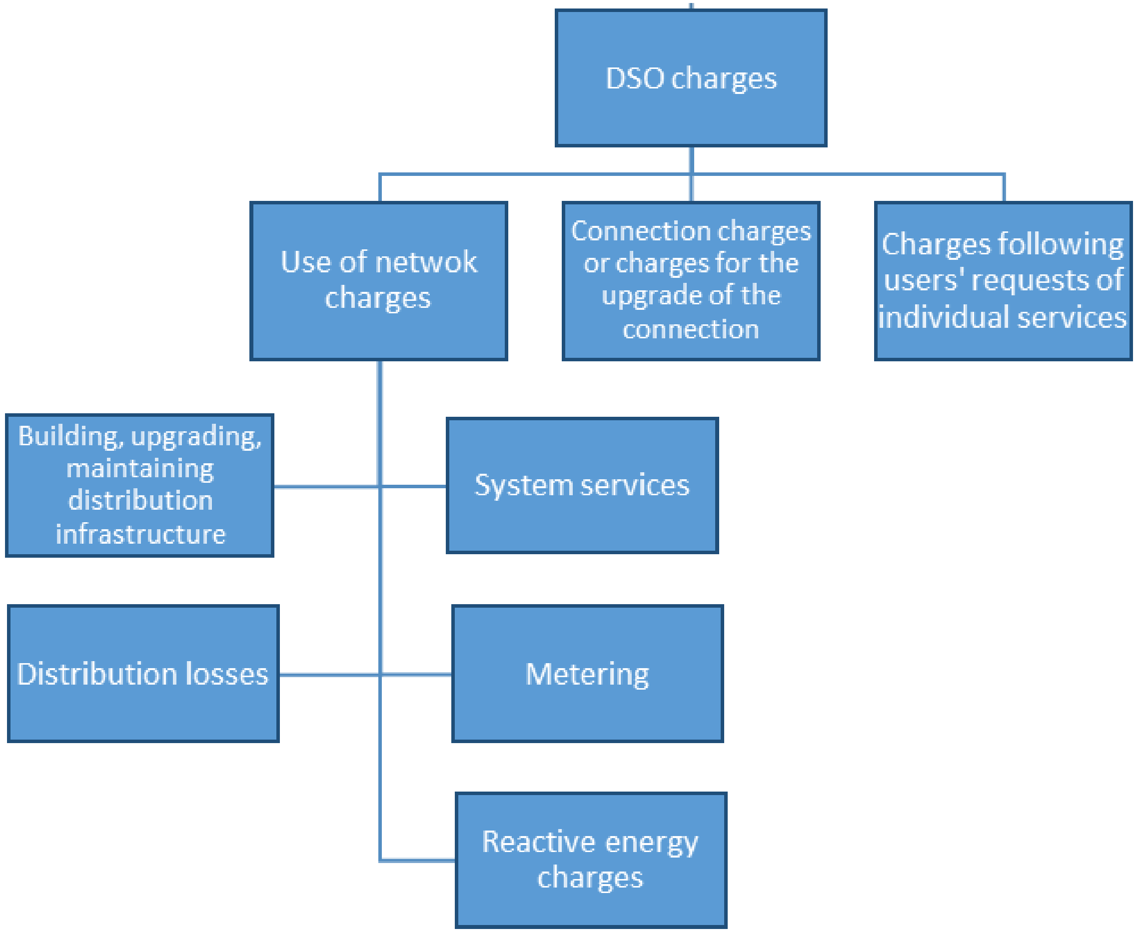
General considerations on tariff setting

1. Complex process
2. Multiple objectives involve trade-offs
3. No one-size-fits-all solution
4. Common terminology enables comparability
5. Transparency is key!



2023 ACER electricity tariff report:
https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER_electricity_network_tariff_report.pdf

ACER’s tariff recommendations

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Several ACER recommendations:

- Evaluating advantages and disadvantages of different cost models
- Separation of costs categories within tariff structure
- Cost cascading: contribution to the costs of each voltage level used
- Consideration of costs of injection and withdrawal and cost-offsetting
- Gradual move to increasingly power-based tariffs
- Further static time-of-use signals (without opt-out)
- Studying interruptible or flexible connection agreements
- Cost-sharing in case of deep-connection charges
- Enhanced NRA role, transparency, stakeholder involvement
- …

See detailed recommendations in 2023 ACER’s tariff report (p.7-8)

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Findings on national tariff practices in the EU

Cost recovery

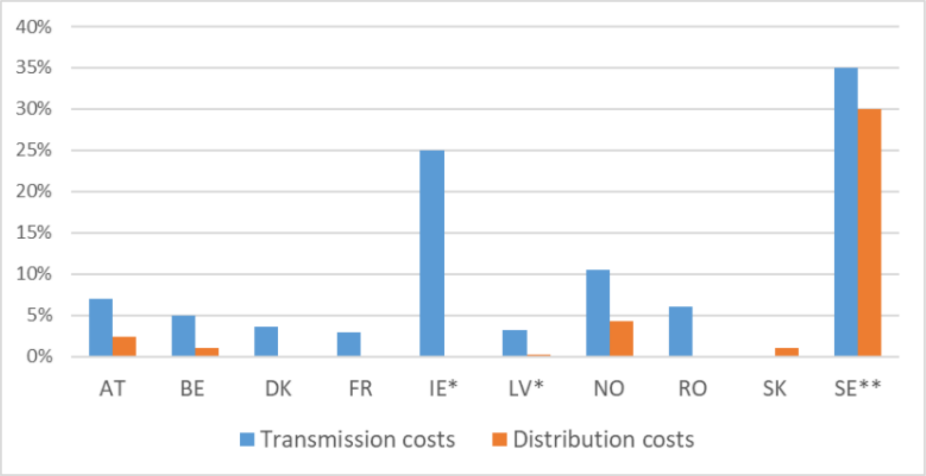
- **System operators' cost recovery is based heavily on withdrawal charges, limited role for injection charges**

- **Injection charge is often set first, and the remaining costs are recovered by withdrawal charges.**

  Different approaches exist:

  - Allocation key based on share of investment related to injection
  - Weighted average of neighbours' injection charges
  - Based on contracted power
  - Using caps (e.g. 0.5 EUR/MWh)
  - Marginal losses
  - 10-year moving historical average of production

Figure 13: Share of network costs recovered via injection charges



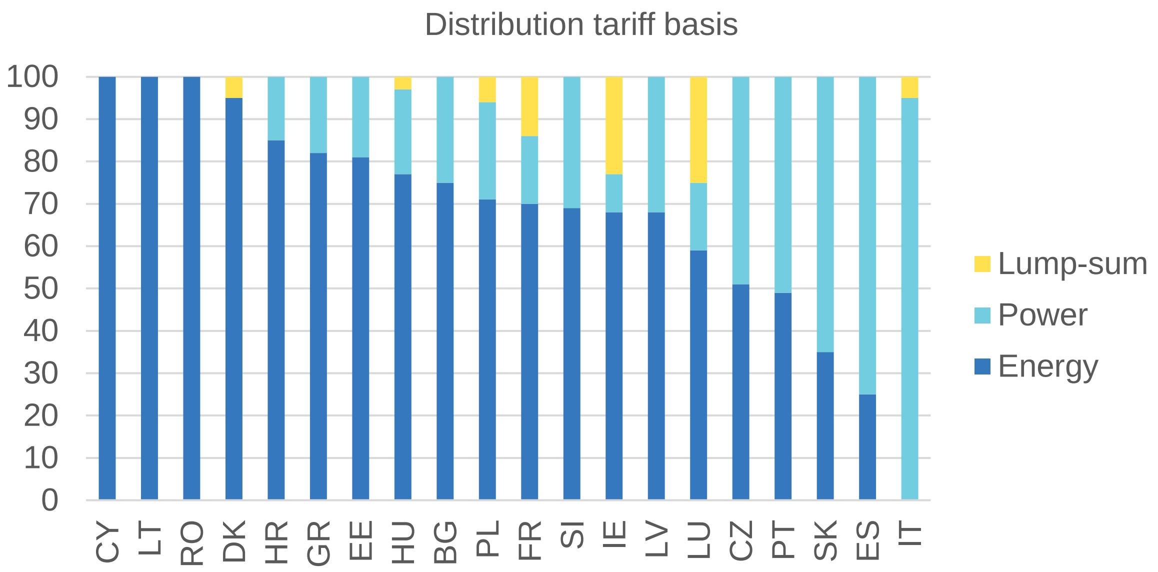
*Note: *data as of 2020, **Distribution costs data is valid for one of the largest DSOs for regional grid only (40-130 kV). In some countries the data was available/provided only for transmission or only for distribution. For some other countries the data was not available or provided.*

- **In some instances, losses or system services are paid by suppliers or provided by generators in form of "in-kind" payments**

Tariff basis

- **Typically, combined tariff basis, but energy-based have a higher weight**

- **Power based charges are defined based on:**
  - Actual maximum power
  - Actual power at system peak periods
  - Contracted or rated power
  - Combination of contracted and actual or penalty for excess of actual over contracted
  - average energy demand during the hours of peak load



*AT, BE, FI, DE MT, NL, NO, SE are energy, power and lump sum based

- **Gradual move towards more power-based charges is observed**

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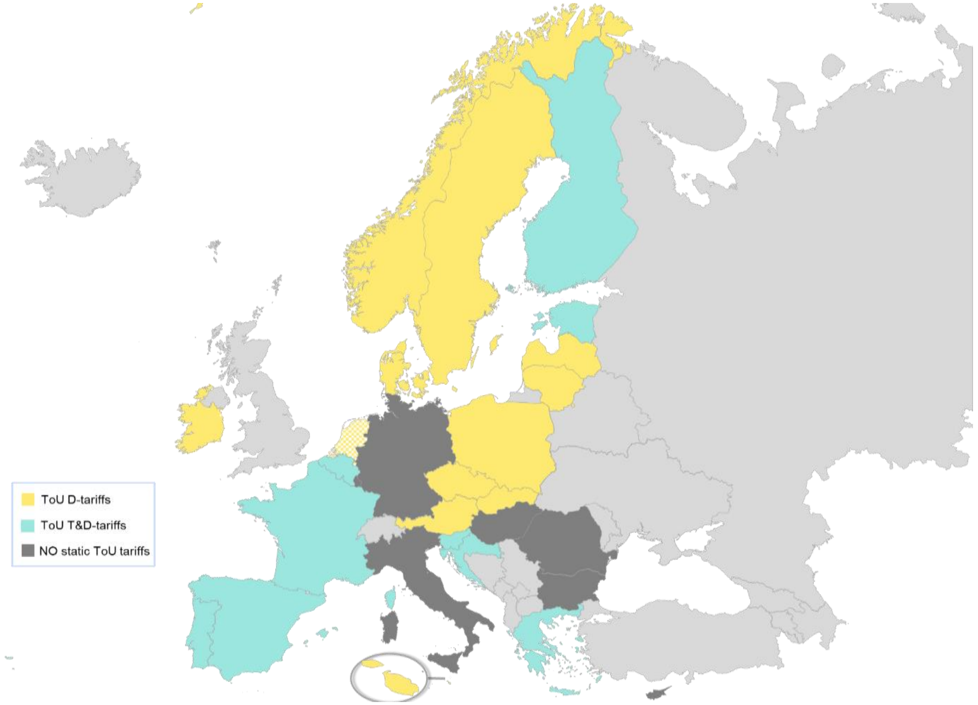
Time-of-use signals

- **Static time-of-use tariffs are widely used in distribution** and **gaining further importance** as a tool for **reducing system peak-load**



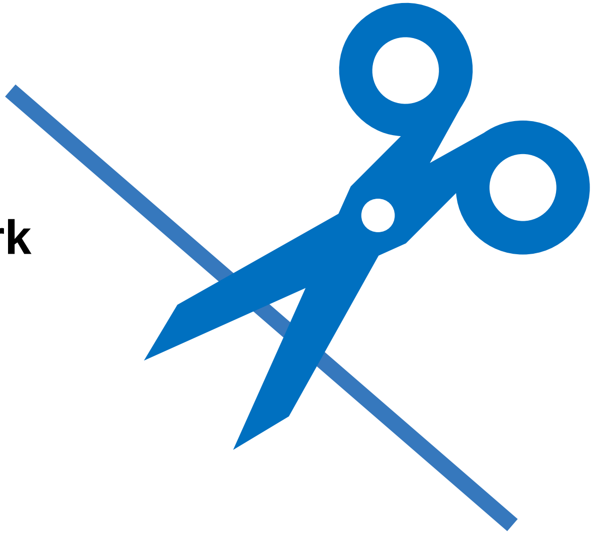
Note: In the Netherlands (NL), time-of-use distribution tariffs apply, but to a very limited extent. Dynamic tariffs or market-based elements in network charging have been reported for three countries (FR, NO, SE)

- **Peak vs. off-peak** tariffs often coexist with other signals (seasonal, weekend)
- **Dynamic network tariffs** are rather complex, require a sufficient level of automation – **very rare**
- For withdrawal charges and typically embedded in the energy-based component, (but not only!)
- **Potential barriers**: option of opt-out, conflicting cost signals from energy markets, lack of studies/pilots, etc.

Italy reported relatively small impact of network tariffs on the final price: https://documents.acer.europa.eu/Events/ACER-webinar-on-time-of-use-electricity-network-tariffs-targeted-consultation/Documents/20211116_ACER-workshop-ToU-tariffs_Presentations.pdf

Flexible connection agreements

- **Flexible or interruptible connection agreements* can be alternatives or complements to time-of-use tariffs to reduce peak load / local congestions**
  - In 2022, it was reported in a third of the countries
- **Only in a few countries there is any tariff differentiation for those network users who are subject to such agreements. Examples**:
  - discounts on connection charges
  - discounts on use-of-network charges
  - mutual agreement between system operator and network user
- **ACER observes increasing interest in using such agreements**



*A flexible or interruptible connection agreement is where the network user is not guaranteed with a firm connection over the entire period

Locational signals

- **Hardly any locational differentiation embedded in “use of network” tariffs:**
  - E.g.: Austria: different network areas; Norway: marginal pricing for losses; Ireland: rural vs. urban areas

- **“Deep connection charges” can provide one-off locational signals,***

- Several countries apply refunds or cost-sharing methods between network users in case of deep connection charges **to avoid a “first connection pays for others problem”**

Figure 16: Application of shallow and deep connection charges

		AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	NO	PL	PT	RO	SK	SI	ES	SE
Transmission	Shallow	●	●	●		●	●	●		●	●	●	●		●	●			●		●		●		●	●	●		
	Deep				●				●					●			●	●				●		●	●		●	●	●
Distribution	Shallow	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●		
	Deep		●		●			●	●	●		●	●	●			●	●		●		●		●	●	●		●	●

Note: MT has no transmission network.

*Deep connection charges: the network users pay (additionally to the connection) for the costs of other reinforcements/extensions in the existing network

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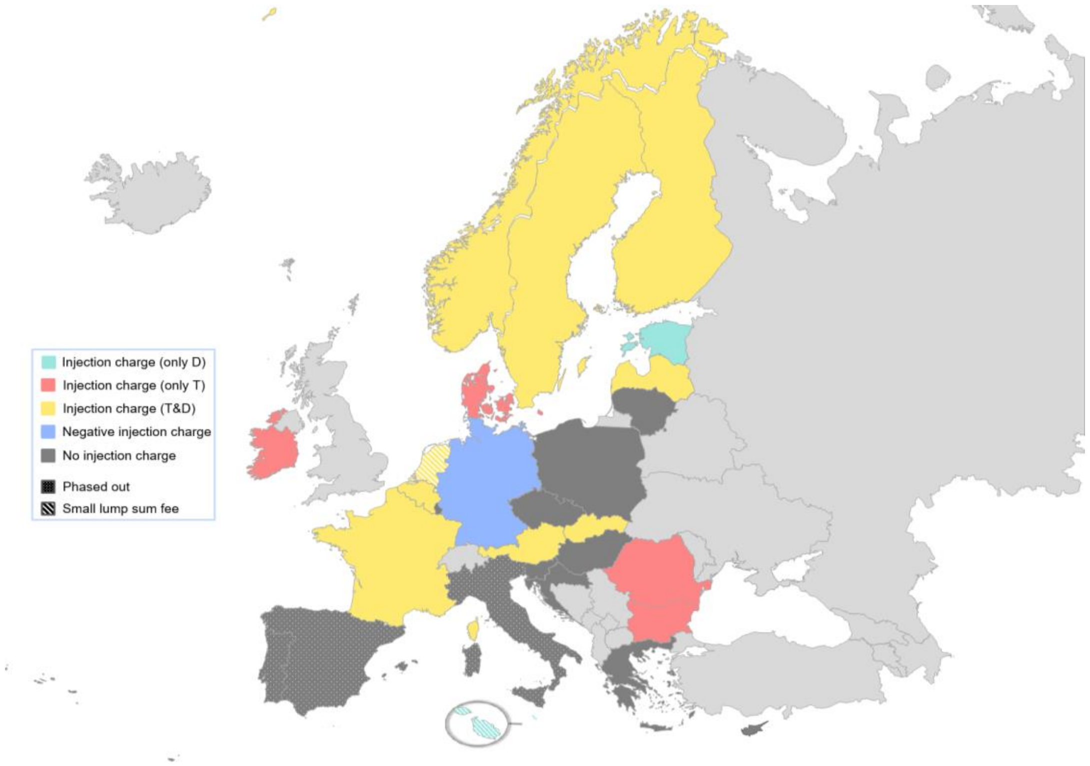
Producers



Note: In France (in distribution), Malta and the Netherlands, the respective charge is only a small lump sum fee for metering, administrative and/or management costs.

Source: ACER network tariff report (2023)

- **About third of the counties charge distribution connected producers for the use of the network**
- **Potential barriers:** competition, national law, overlaps with deep connection charges
- **Negative injection charges:** few instances. Examples:
  - Non-intermittent decentralised generators receive reward for avoided network costs at upper voltage levels
  - Distribution-connected producers get paid when a reduction in losses is identified (applied together with non-negative injection charges)
- **Often discounts/exemptions for some producers:**
  - Small producers
  - RES producers
  - Ancillary services providers

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Storage facilities

- **Most countries have some (standalone) storage facilities (batteries) connected to the distribution grid.**
- **Batteries are typically subject to withdrawal charges**; in some countries also to injection charges.
- **In some countries storage facilities do not pay any network tariff or receive exemptions/discounts under certain conditions:**
  - E.g. technology, commissioning date, size, efficiency, purpose
  - **Reasoning:** beneficial system impacts (cost reduction), security of supply, national law requirement, non-discrimination to auxiliary generation services, etc.

Figure 15: Application of network charges to storage facilities

	Subject to withdrawal charge	NOT subject to withdrawal charge
Subject to injection charge	AT, BE (FLA and WAL), DK, FI, FR[90], IE, NO, RO[91], SK, SE[92]	
NOT subject to injection charge	BE (BRU), BG[93], HR, CZ, FR[94], DE, GR, HU, IE, LT, LU, MT[95], NL, PL, PT	CY, IT, SI, ES

Note: No storage facilities are connected to the transmission grid in: CY, EE, LV, LU, RO, SE; No storage facilities are connected to the distribution grid in: BG, CY, EE, GR, LV, LT, LU; Some countries appear multiple times in the Figure (e.g. due to differences between transmission and distribution); Negative injection charge is not accounted for the Figure.

Prosumers

- **Final energy users with bi-directional use of the grid:**
  - Note: storages have a more balanced profile of injection and withdrawal, which can explain why they are often treated differently compared to prosumers
- Prosumers typically pay both injection and withdrawal charges, but **discounts, exemptions or cost-offsetting often applies to some of them:**
  - Exemption from injection charge where production is low
  - Exemption based on relative position of the generation and consumption facilities (e.g. voltage level, distance)
  - Payment based on either the injection power or the withdrawal power, whichever is higher
  - **Net metering** considering the full amount or part of the injection [Note: EU law has phased-out net metering for new users]

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Emerging network users

- **Emerging network users have gained attention for their potential to improve overall system efficiency.**
  - Note: they may also increase network costs!
- **Some countries implemented specific measures for these users:**

Power-to-X:
- Exemption from withdrawal charges for 15 years

EV-charging points:
- Specific tariff for public EV recharging points
- Different tariff structure or weight of components
- Off-peak withdrawal charge for EV recharging
- DSO interruption in case of network congestion
- Increase of “technically available capacity” for private EV charging

Energy Communities:
- A specific tariff regime
- Reduced system utilisation charges
- Tariff exemptions (e.g. for RES produced and consumed within community)

- **Vehicle-to-grid pilot project in Azores:** can improve the stability of the grid, absorb excess RES during the night and generate additional income for the EV owner.

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‘Behind-the-meter’, providing demand response, system operation services

- **Network tariffs must be technology-neutral and shall not depend on what assets are “behind the meter”**
  - No disadvantage observed for having energy storage installed
- **Only few countries apply any differentiation in the network charges for active customers who participate in balancing or congestion management services** (all of them advantageous measures):
  - Slovenia: reduced peak load charges for the activated quantities needed for provision of the service
  - Slovakia: active customers providing ancillary services are exempt from paying for the connection charge
  - Portugal: the energy activated from active customers for balancing services is exempted from access tariffs
- **Design of network tariffs matters for demand response:**
  - Net metering or pure energy-based charges without any time-differentiation provide disincentives

Short recap

- Additional grid capacity to reach climate goals requires efficient **use of existing capacity and efficient grid build-out**
- **Network tariffs can be facilitators or barriers of efficient grid connection and usage** depending on their design
- **Complexities of tariff setting increased** under today's rapidly evolving energy system (integration of renewable energy sources, electrification, digitalisation, more active role of network users)
- **Regulators follow different approaches** according to the pursued principles in each national context (no binding harmonisation in Europe, no "one size fits all", trade-offs)
- ACER identifies **best practices** and proposes **no-regret solutions** in tariff setting, making sure that **appropriate cost signals are reaching the network users**
- Cost reflective and transparent tariffs also **facilitate demand response and active customers**

Thank you.
Any questions?

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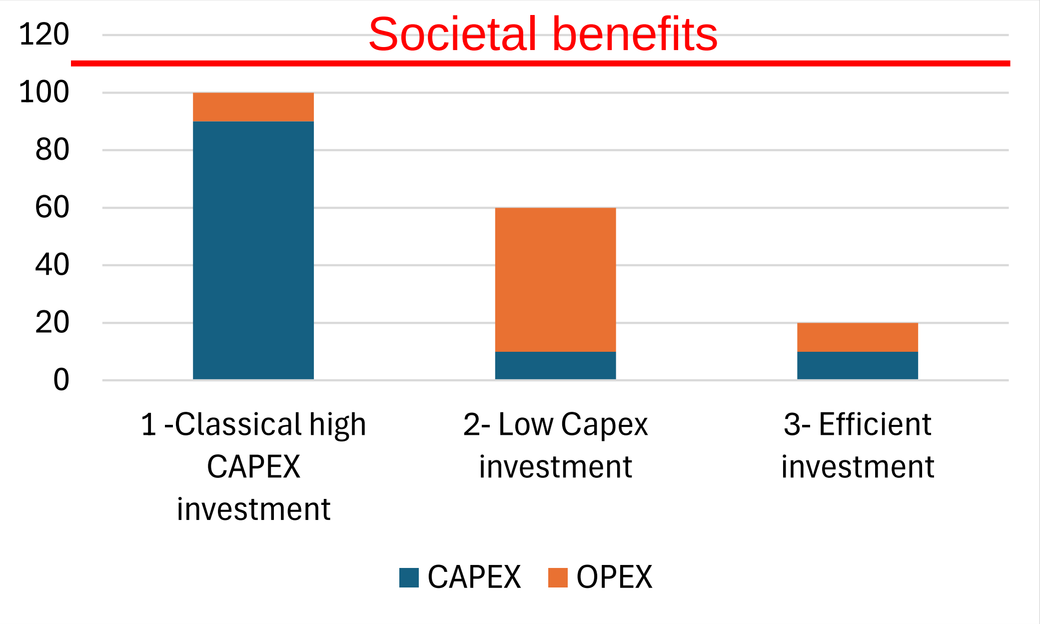
ACER conclusions regarding TSOs' revenue setting

Example - Three different investments: the only common element, the benefits they bring to the society.



- **Efficient usage of infrastructure is difficult to ensure in a classical** "Rate of Return" regulation
- **A TOTEX approach** is often regarded as a robust solution; however, it is only a partial one: it **mostly targets investments with sufficiently high TOTEX** (sol. 2), as it is cost-focused.
- Systematic **benefit-based incentives** linked directly to the measurable project benefits or major performance targets* **have a great potential** as they shift the focus from costs to outputs: (sol. 3)

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No wide-spread use of benefit-based incentives in Europe

- The regulatory frameworks often provide overall incentives with “revenue caps” vs. rewarding the system operators for reaching certain targets* with a more efficient solution.

Some examples of not business-as-usual incentives:

IRELAND

- General cost incentive
- Variety of performance incentives, such as:
  - Investment Planning and Delivery incentive
  - TAO Project Delivery incentive
  - Incentives for RES integration

PORTUGAL

- TOTEX approach
- Benefit sharing
- Incentive to improve technical performance

SLOVENIA

- incentives for some transmission investments linked to KPIs
- incentive related to voltage quality
- efficiency factor for OPEX

GREECE

for interconnections and other major importance projects (MIPs), a WACC adder is set

for major importance projects penalty (reduction of premium WACC) for delays

- plans to discontinue MIP incentives and develop incentive methodology related to KPIs

SLOVAKIA

- WACC+ for innovative investments

ITALY

- reward if the actual CAPEX for an increase of transfer capacities (MW) is lower than the reference CAPEX for that boundary
- benefit-based reward for increases of cross-zonal transfer capacity
- incentive tools for quality of supply

*e.g. interzonal capacity, reducing losses, increasing security of supply, etc.

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Recent ACER works concerning revenue setting

- In 2023 June ACER issued a report on investment evaluation, risk assessment and regulatory incentives for developing energy networks, focusing on electricity transmission: https://acer.europa.eu/sites/default/files/documents/Publications/ACER_Report_Risks_Incentives.pdf

- In June 2024, ACER published a consultancy study carried out by FSR on output-based incentives for efficient investments – the study proposes a holistic solution based on “Benefit-sharing” (also in the form of cost-savings sharing): https://www.acer.europa.eu/sites/default/files/documents/Publications/2024_Report_Benefit_based_remuneration_infrastructure_investments.pdf

- In June 2024, ACER/CEER guidance on smart grid key performance indicators and their use - invited feedback on the guiding principles, after which the aim is to develop concrete smart-grid KPIs for both TSOs and DSOs: https://www.acer.europa.eu/sites/default/files/documents/Position%20Papers/ACER_CEER_Network_Grids_Performance_Indicators.pdf

- Future ACER activity to review DSO revenue setting is under consideration