# Network tariff design with prosumers and electromobility: who wins, who loses?

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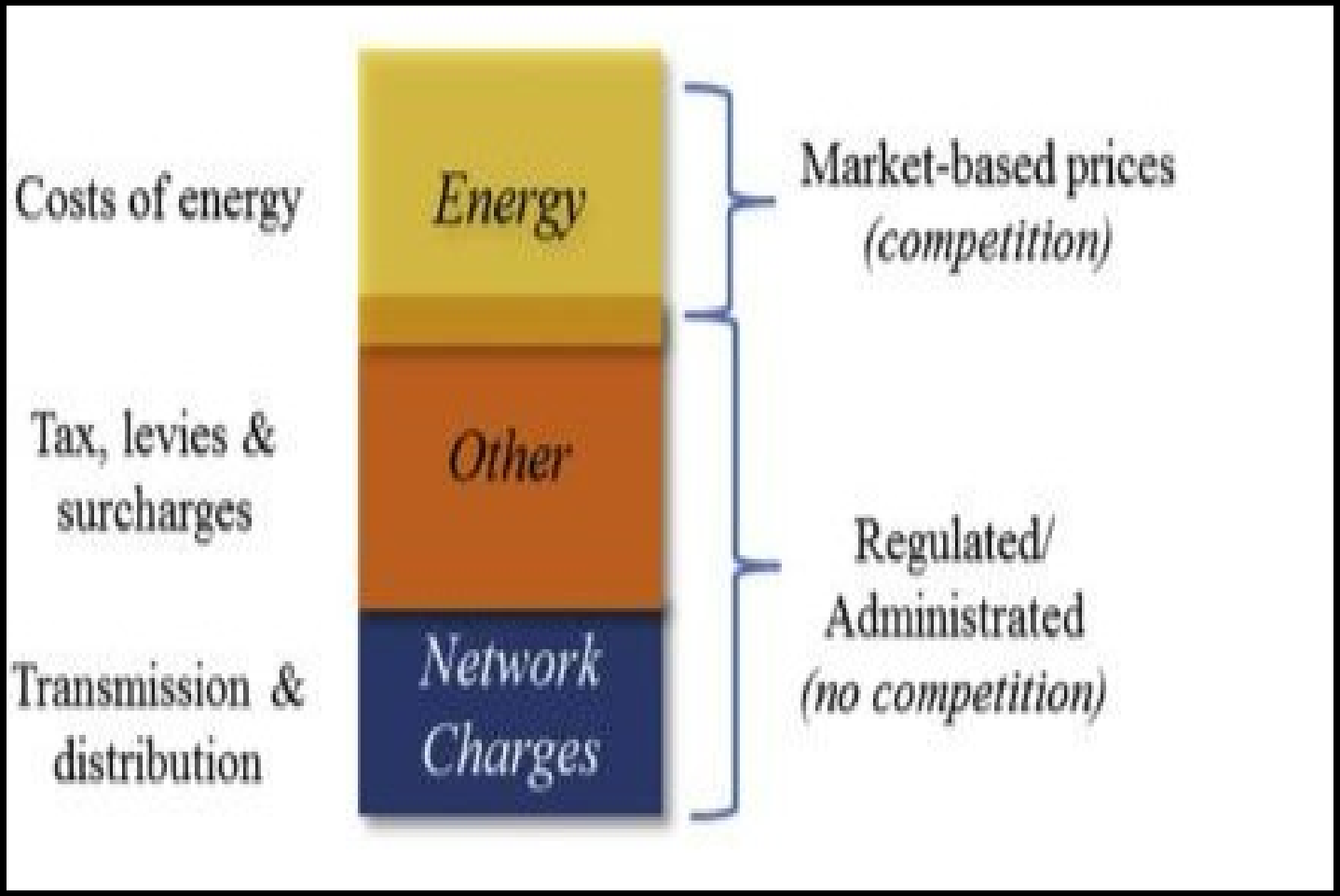
# Common hope

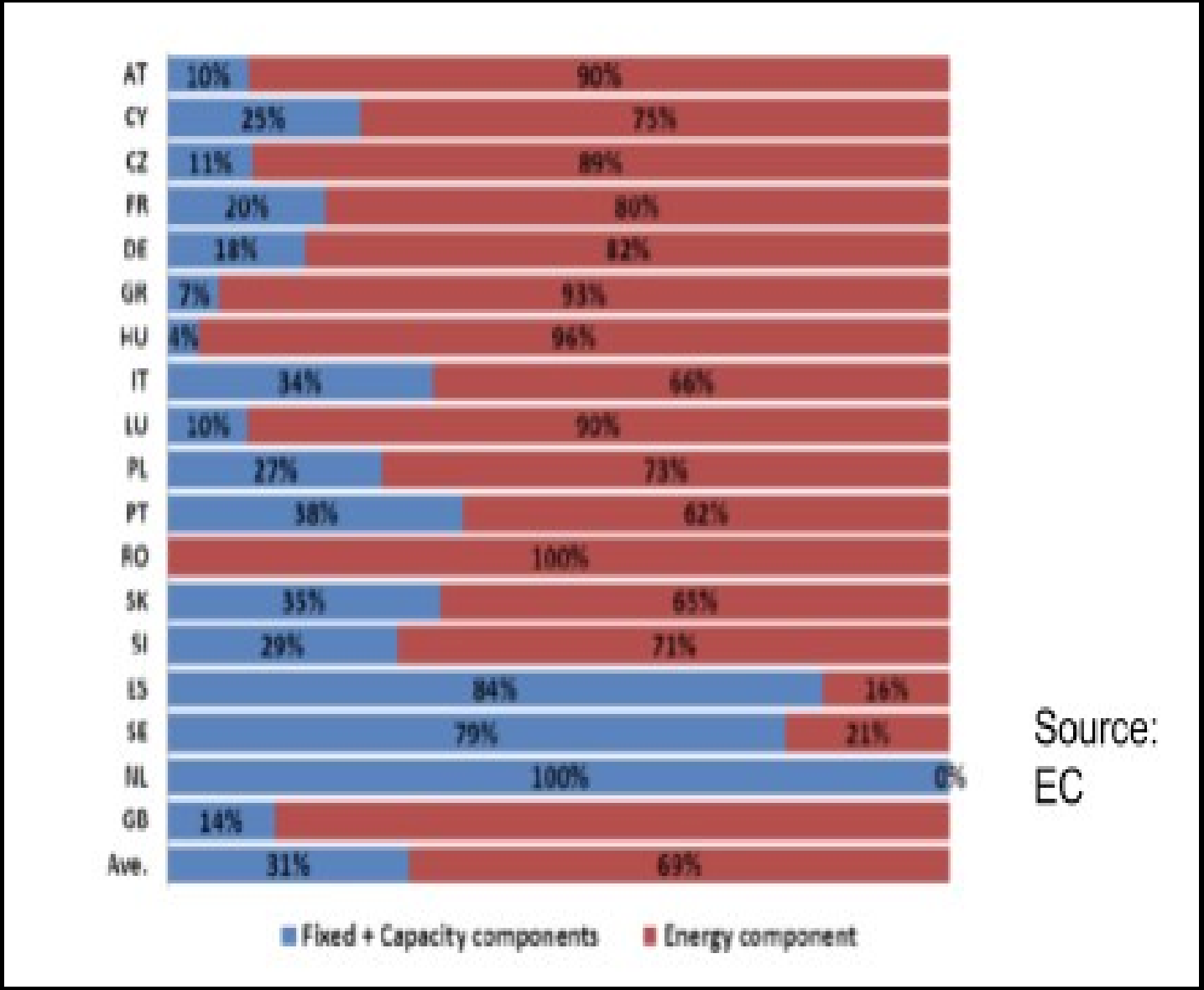
# But

What are the incentives to build a synergy?

# Tariff design

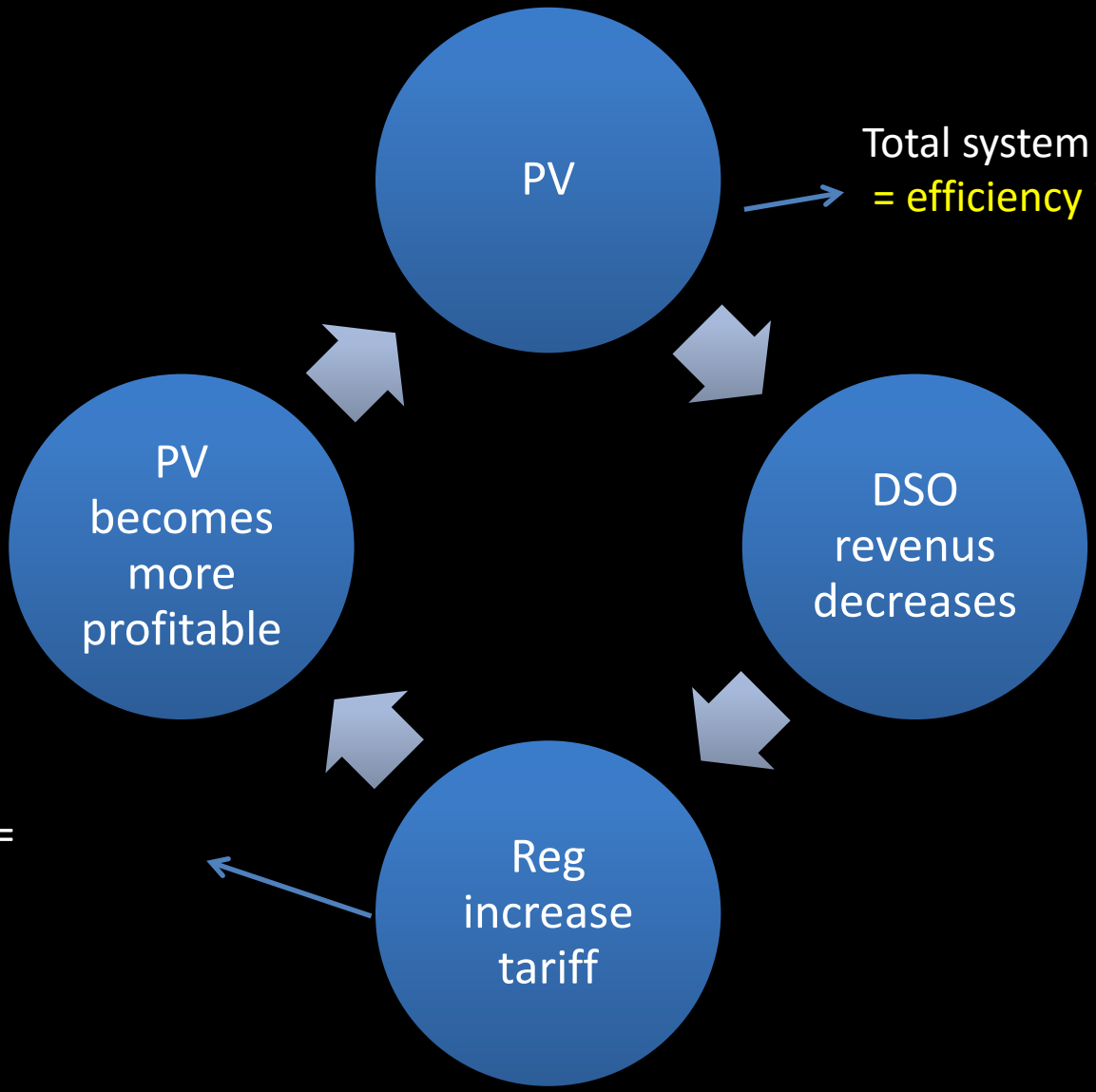


# EU tariffs

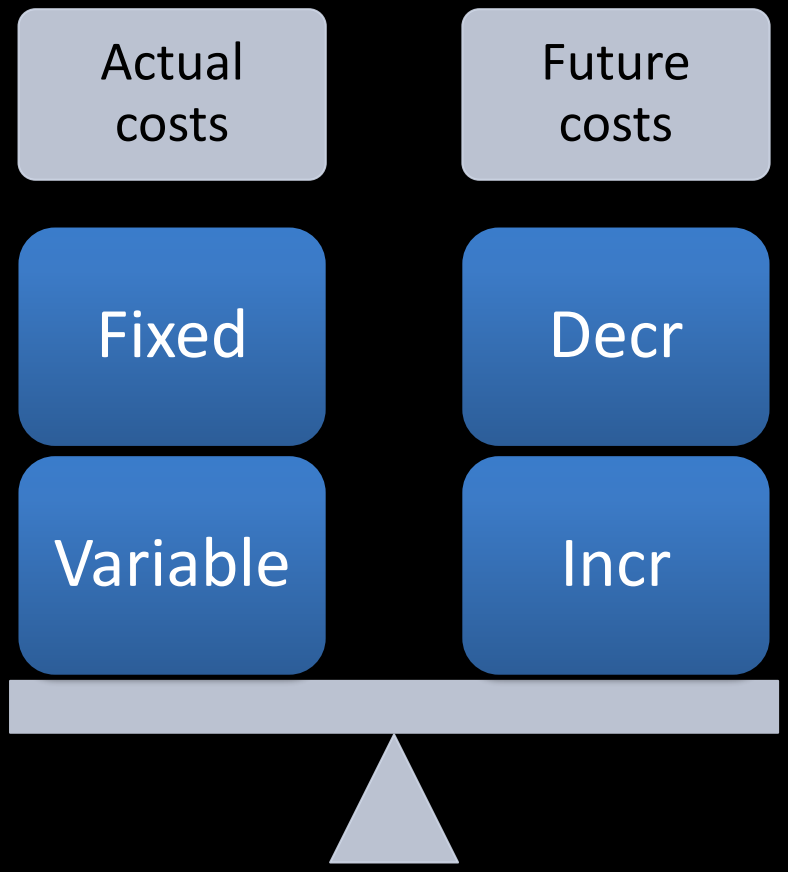



Source: EC

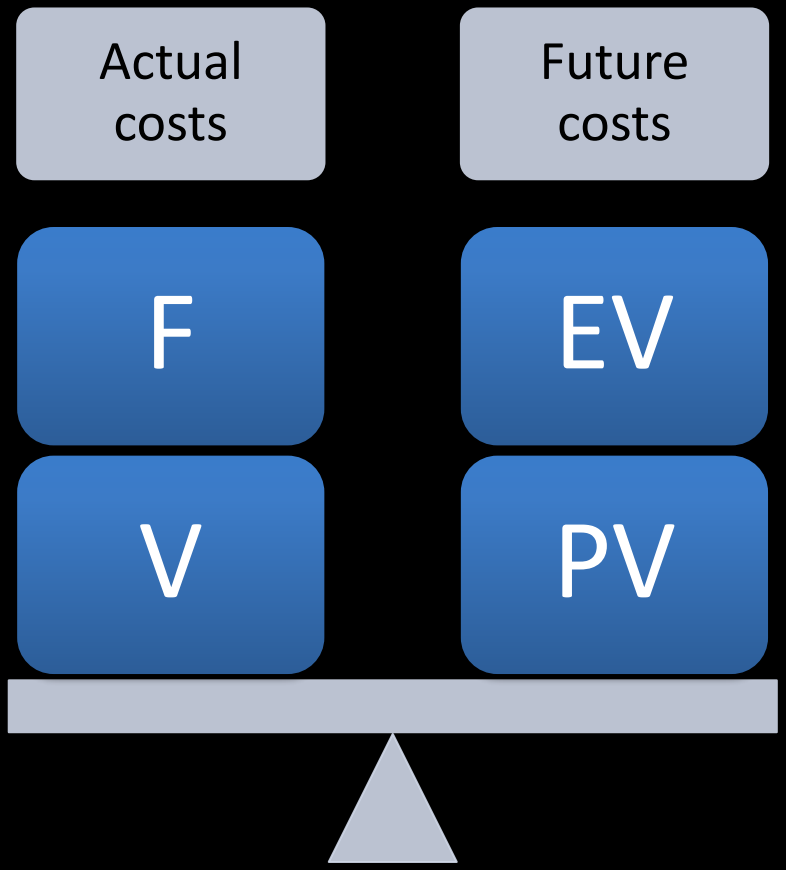
# DSO's Death Spiral of revenues

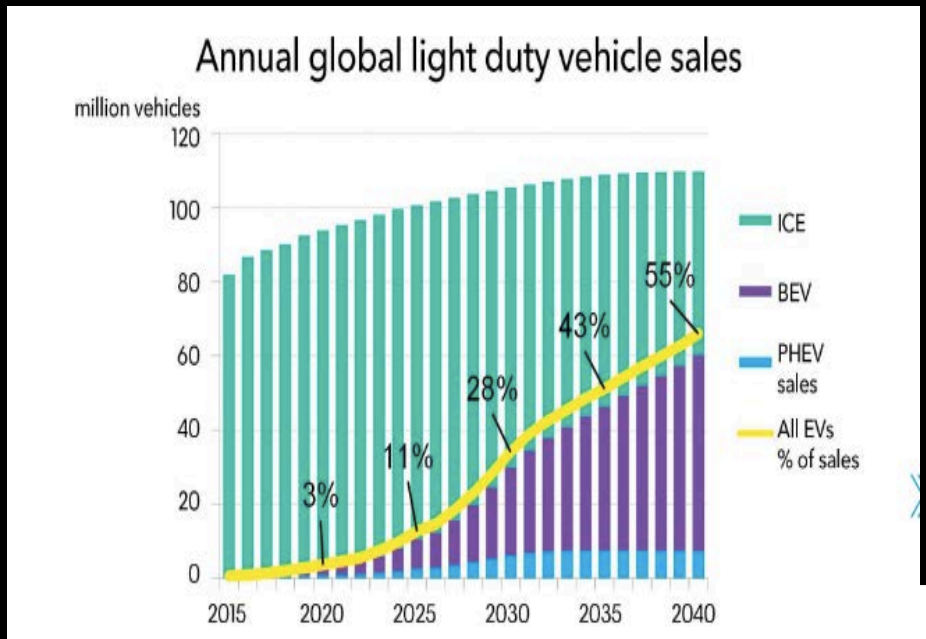


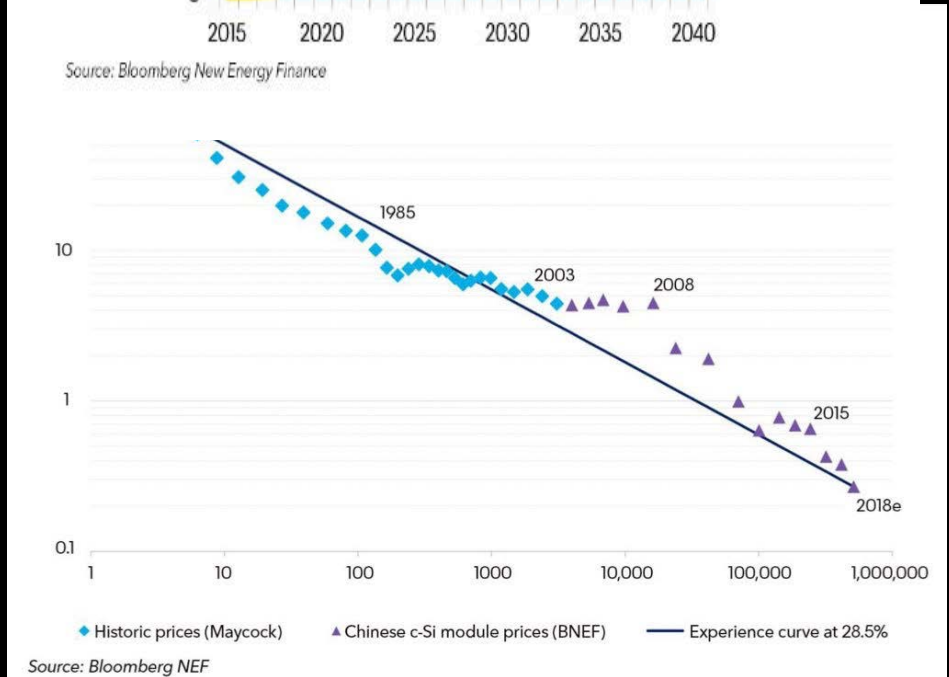
# Equilibrium issues: Tariffs and costs



# Equilibrium issues: Tariffs and costs



# Questions

1. What are the combined effects of DERs and EV adoptions on network tariff design ?
2. What are the feedback effects of tariff design on both DERs and EVs ?
3. How are those mechanisms modified with capacity tariffs ?

# Description of the 4 different network users

| | Prosumers | Passive network users |
|---|---|---|
| **Electric vehicle owners (EV)** | Full innovators | Green mobility only |
| **Traditional Vehicle owners (TV)** | Prosumers | Passive |

# 3 Tariffs

| Design | Description |
| --- | --- |
| **Volumetric with net-metering** | Tariff based on energy<br>**€/ kWh net** |
| **Capacity** | Tariff based on connection size to the network<br>**€/kW** |
| **Fixed** | Tariff based on fixed charge<br>**€** |

# Diffusion scenarios

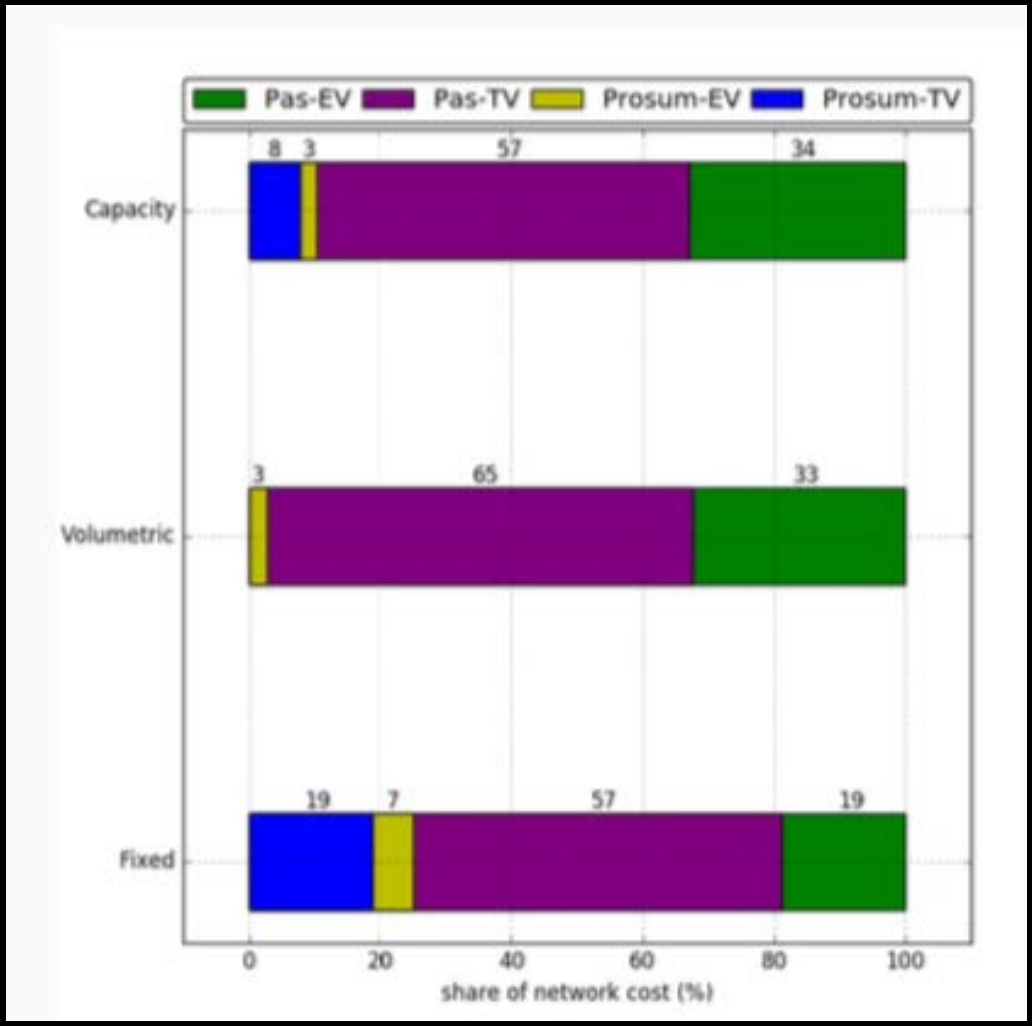
- Reference : (0%-0%) (equivalent to fixed tariff)
  - Low EV - Low Prosumer (5%-5%)
  - Low EV - High Prosumer (5%-25%)
  - High EV - Low Prosumer (25%-5%)
  - High EV - High Prosumer (25%-25%)

# Results

| Tariff structure | EV owners proportion | Prosumer proportion | **Tariff Variation (%)** |
|---|---|---|---|
| Volumetric | 5% | 5% | 1.13 |
| | | 25% | 12.73 |
| | 25% | 5% | -4.10 |
| | | 25% | 6.63 |
| Capacity | 5% | 5% | -0.26 |
| | | 25% | 5.88 |
| | 25% | 5% | -5.63 |
| | | 25% | 0.27 |

- Volumetric tariff strongly incentivizes for solar PV
- EV increases DSO's revenues, which ends up reducing tariffs
- Capacity tariff gives incentives for batteries and lower incentives for solar PV.
- This leads to a similar, but lower, impact than with volumetric tariff

# Who bears network costs ? Case : high EV - high DER (25%-25%)




- TV-Prosumers do not contribute to network costs with volumetric tariff
- EV owners particularly contribute to network costs with both volumetric and capacity tariffs :
- TV-passive users have the same share that with capacity tariffs tariffs

# Conclusion and future works

- EV and DERs have counterbalancing effects on network tariffs
  - Volumetric, capacity and fixed tariffs make winners and losers
  - EV owners may bear a very significant shares of network costs
  - Through the grid cost recovery (and the electricity price), conflicts between EV and DERs
- Future works :
  - Investigate other sources of conflicts between electrification policies and renewable policies
  - Make a case study with real-world data
  - Extend the analysis to higher-voltage networks (including workplaces, charging stations)