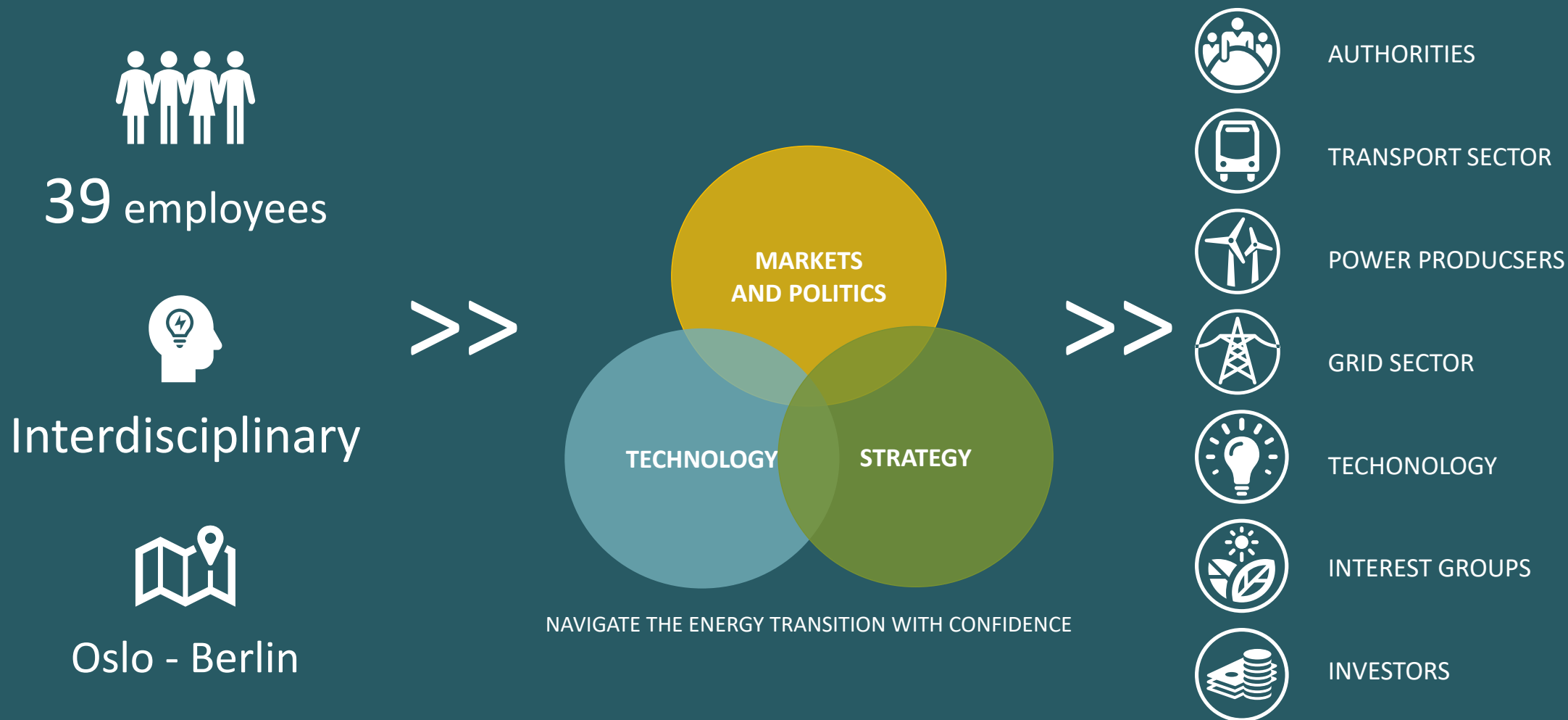


 **THEMA** provides consultancy and market analysis for the energy and transport sectors and combine a solid understanding of market dynamics with advanced modelling.



Strommarkttreffen 31.03.2023

HOW NORWAY'S NEW FLEXIBLE POWER TARIFFS INCENTIVIZES SMART EV CHARGING

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Agenda

- 1 The new power tariffs incentivizes the consumers to remove their peaks
- 2 An example with smart EV home charging
- 3 Backup: A little background about the change to power tariffs

The design aims to incentivize slow EV charging at night, and have the consumers demanding the most power pay the most

ENERGY

POWER

Incentive: Use less energy

Incentive: Use less energy at the same time

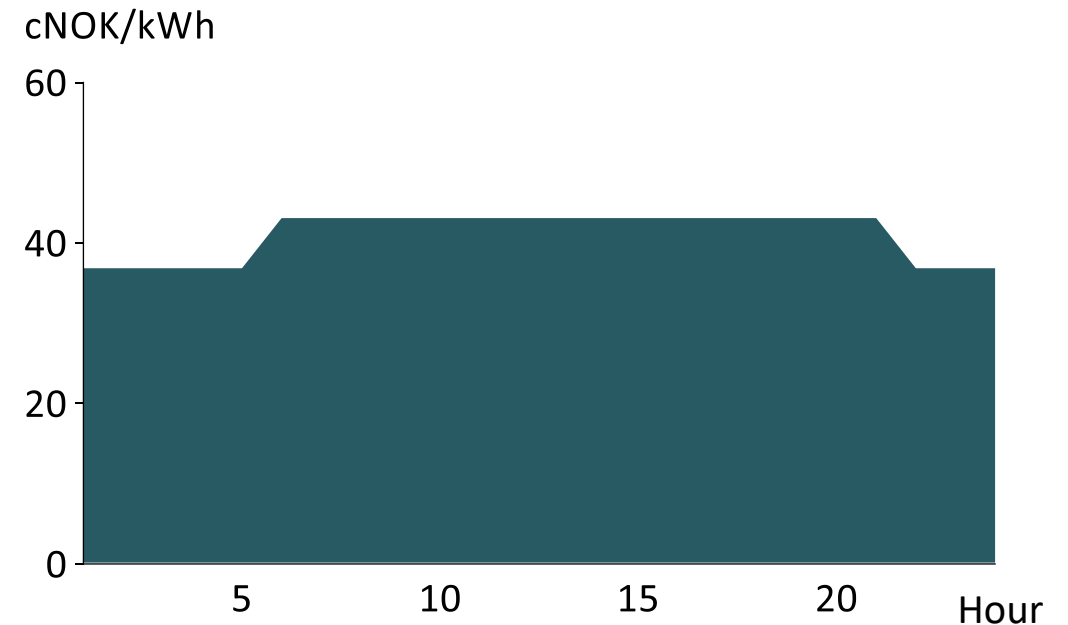
The energy part incentivized lower energy consumption, and moving the usage to the night hours (time of use)

ENERGY

- Cost per kWh (energy)
- Must cover cost of marginal loss
- Can cover other fixed costs
- Can at most make up 50% of DSO's income
- Can be differentiated by time of use

Incentive: Use less energy

The cost for energy has a «time of use» differentiation with lower costs at night and during weekends



... while the power part incentivized lower peaks through the “power staircase”

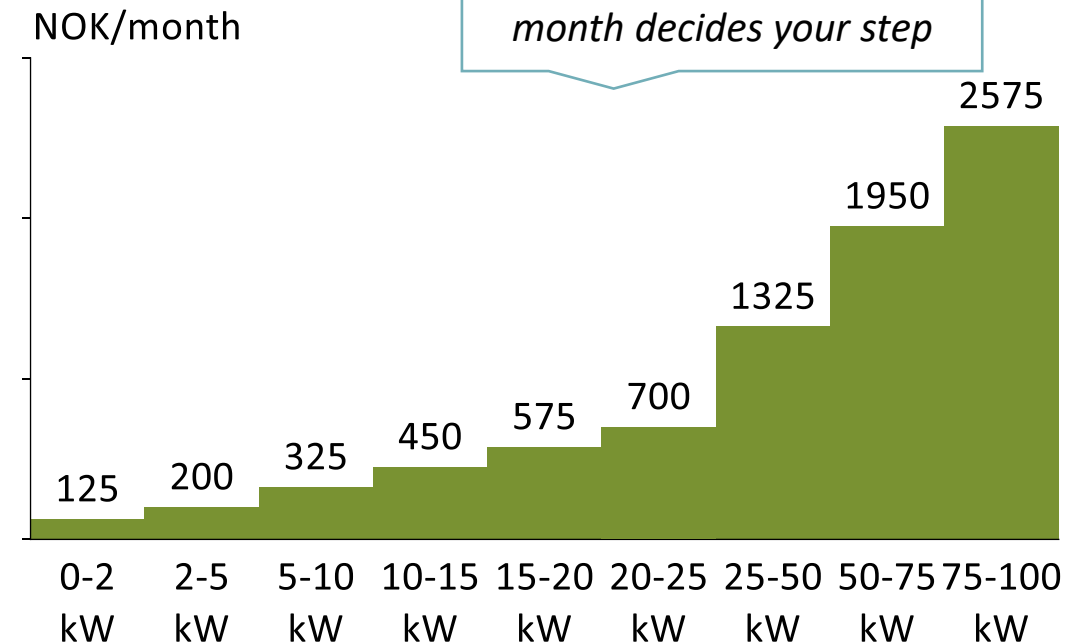
POWER

- Cost per month
- Must be differentiated based on power demand
- Must cover customer specific costs (Billing, measuring..)
- Can cover other fixed costs

Incentive: Use less energy at the same time

The power cost per month is decided through placement in the «power staircase»

The three highest peaks per month decides your step



EXAMPLE: In September of 2022 I consumed 232 kWh in my apartment, resulting in a 293.16 NOK bill for my grid access

ENERGY



Consumption: 122 kWh
Price: 0.43 nok/kWh
Cost: 52.46 NOK

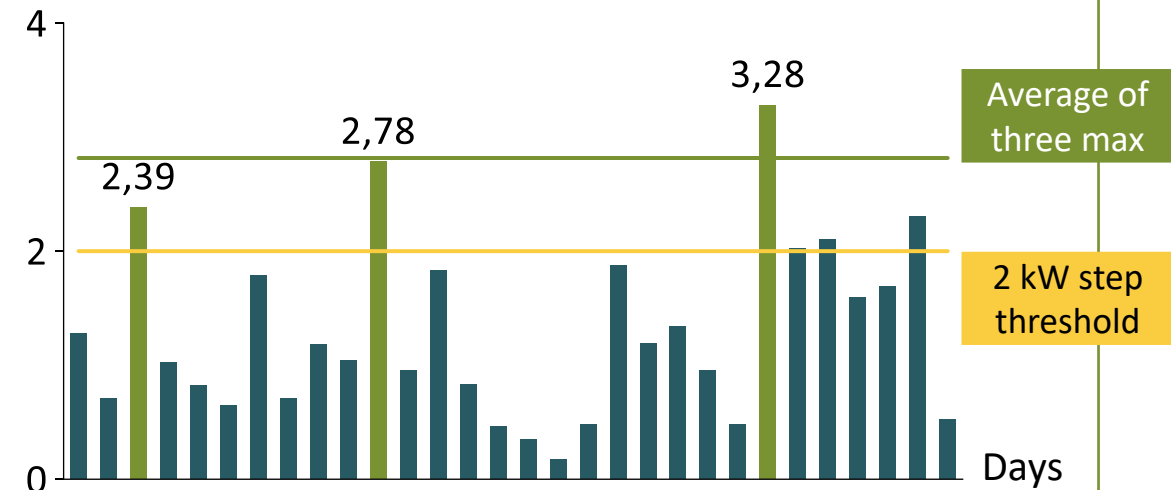


Consumption: 110 kWh
Price: 0.37 nok/kWh
Cost: 40.70 NOK

I total: 232 kWh → Cost: 93,16 NOK

POWER

Consumption in the peak hour per day (kWh/h)



Price for step from 2kW to 5 kW: 200 NOK

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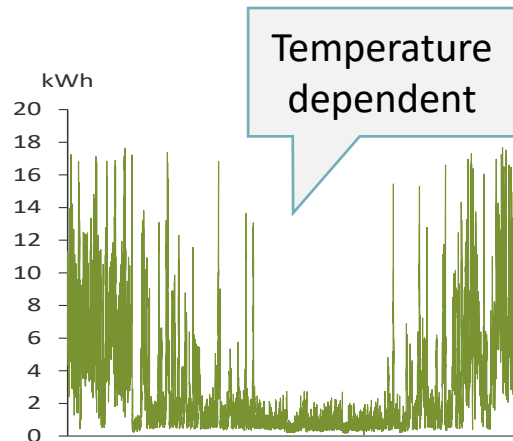
In this analysis we will look at three cases to see how the power tariff affects them: a baseline with no EV-charging, a fast EV-charging and a slow EV-charging

Baseline (no car)



Consumption: 27 000 kWh

Annual consumption profile



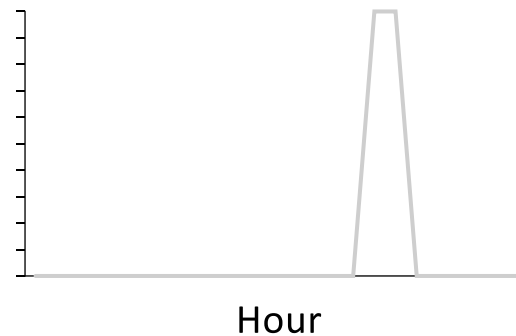
Milage: 0.2 kWh/km

Fast charging



Charging: 2400 kWh = 12 000 km

Daily charging profile (1 hour at 17:00)

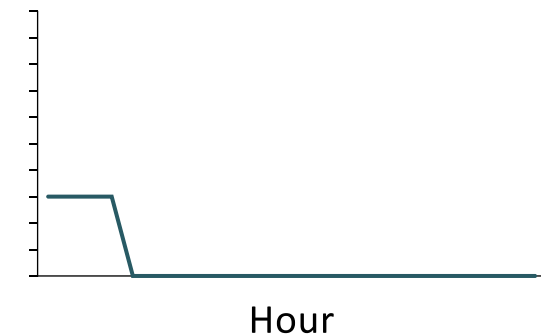


Slow charging



Charging: 2400 kWh = 12 000 km

Daily charging profile (3 hours from 00:00 to 03:00)



BASELINE: Our house is heavily affected by the outdoor temperature, with high power peaks in the winter

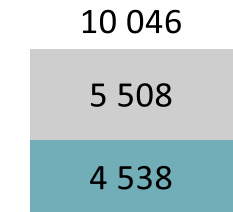
Energy consumption (kWh/year)



Baseline (No car)
27 000 kWh

Yearly tariff (NOK/year)

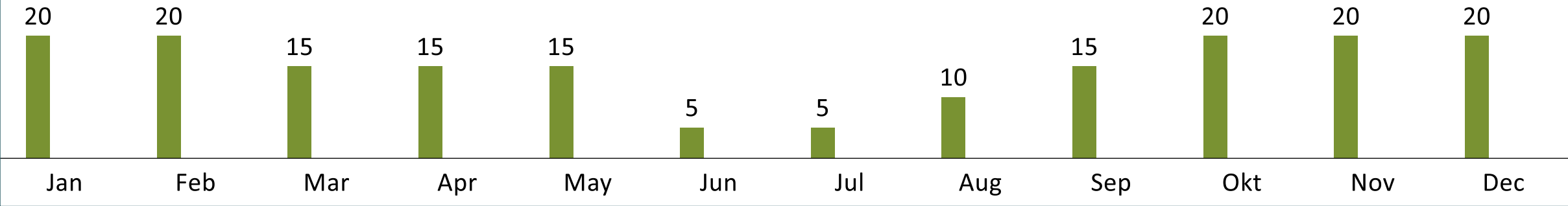
Energy Power



We're only looking at the grid-part of the bill, the electricity bill will come in addition.

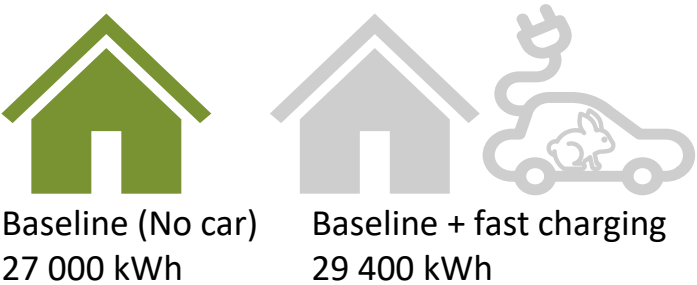
Baseline (no car)

How much capacity is paid for? (kW)
(Average of three highest peaks per month)

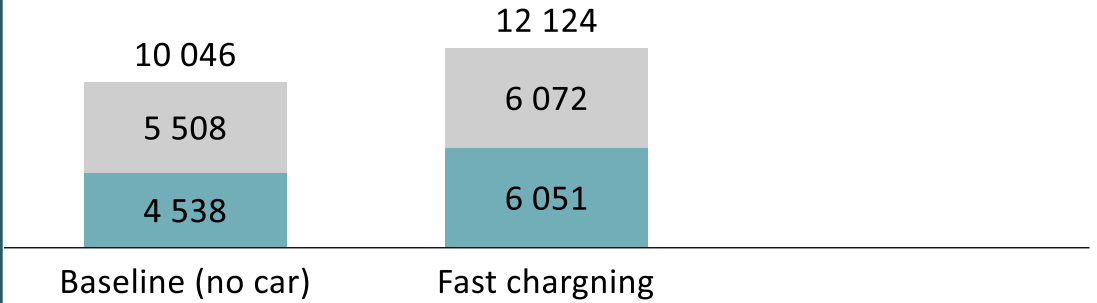


CASE 1: We buy an EV and charge it for 1 hour every afternoon. Every month our power consumption jumps up to the next step in the «power staircase» compared to the baseline

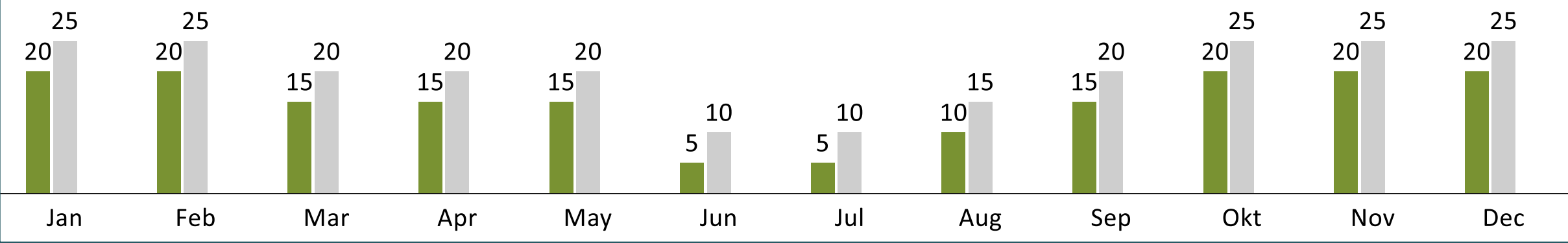
Energy consumption (kWh/year)



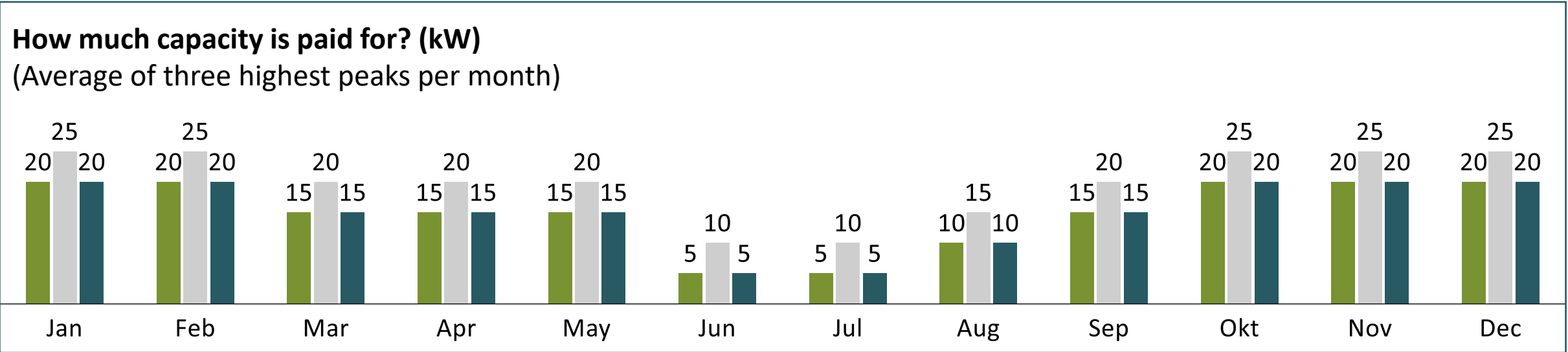
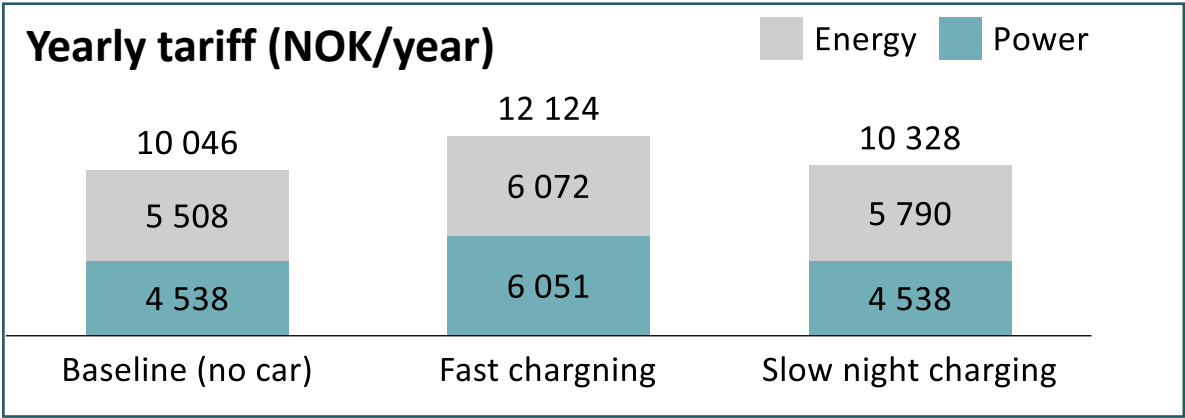
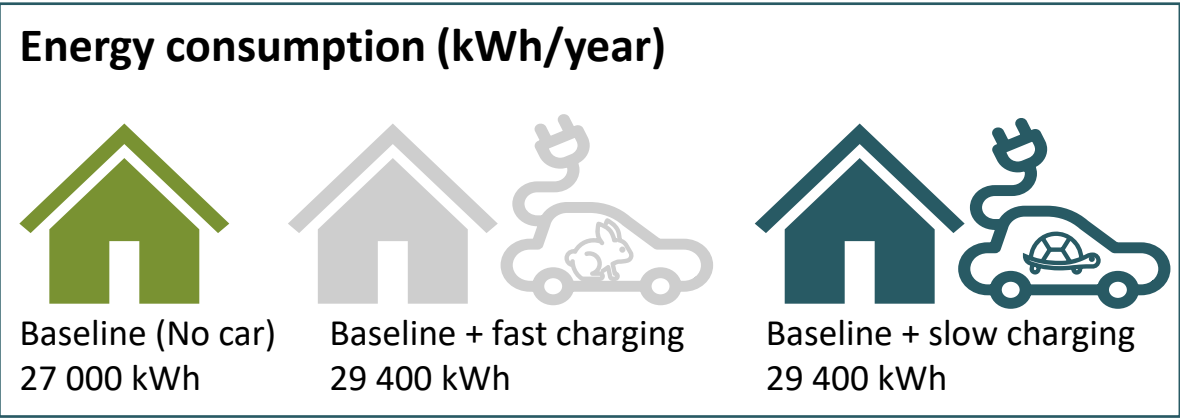
Yearly tariff (NOK/year)



How much capacity is paid for? (kW)
(Average of three highest peaks per month)



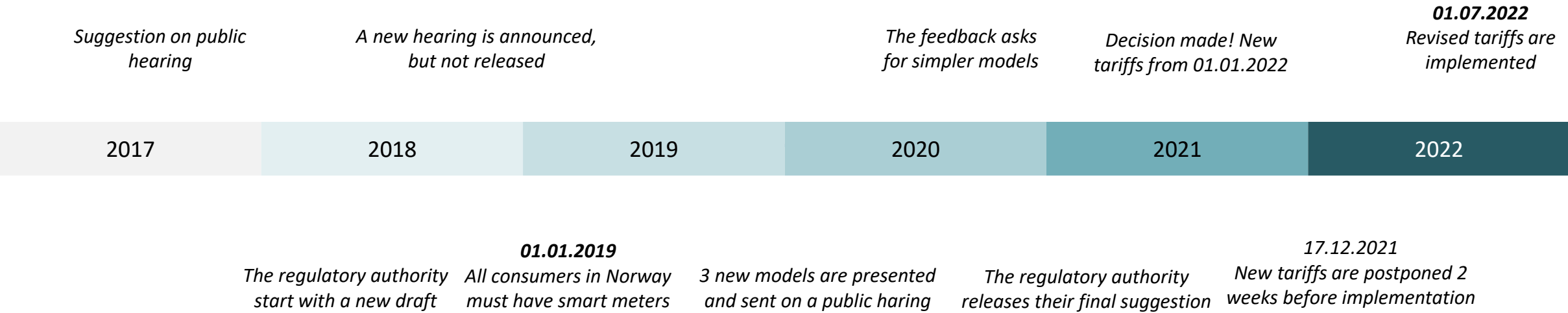
CASE 2: We move our EV-charging to the night hours and slow it down. Compared to the baseline, we only have to pay grid rent for more energy, not more power to charge our EV.



Agenda

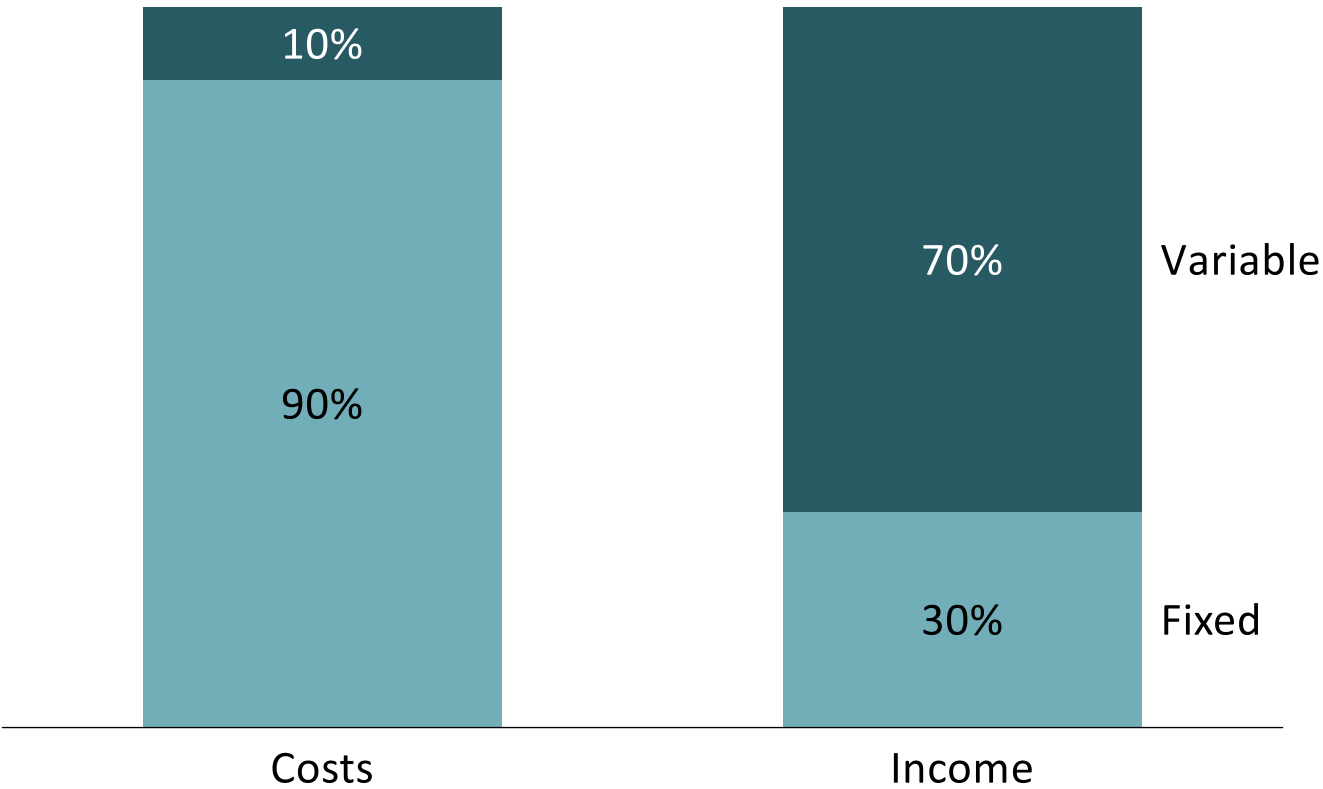
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The process of implementing new tariffs for the low voltage grid customers in Norway has been a long one



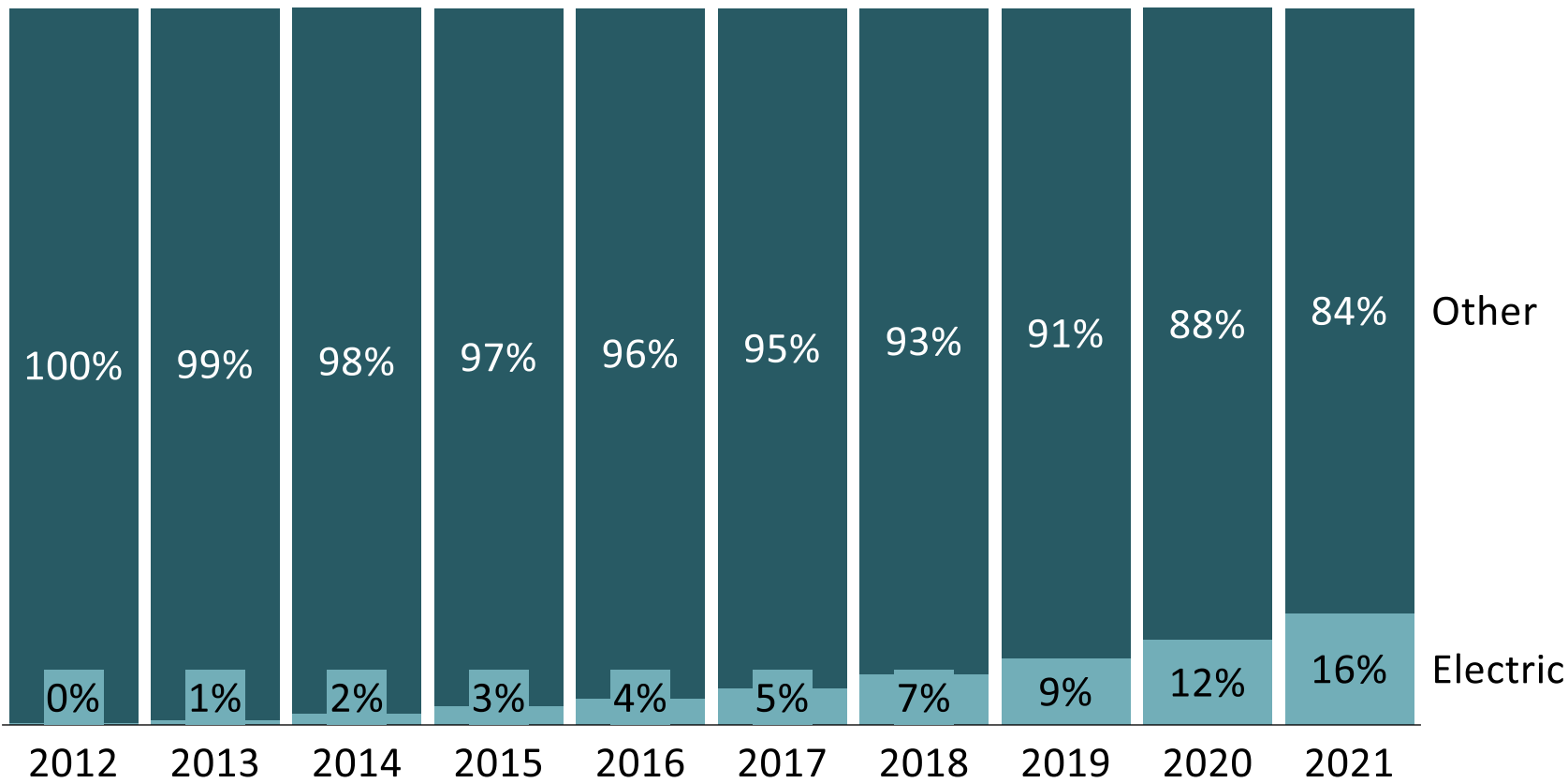
The motivation behind the change was for the tariff to reflect the DSO's actual cost structure...

A DSO's costs and income with the old tariff scheme

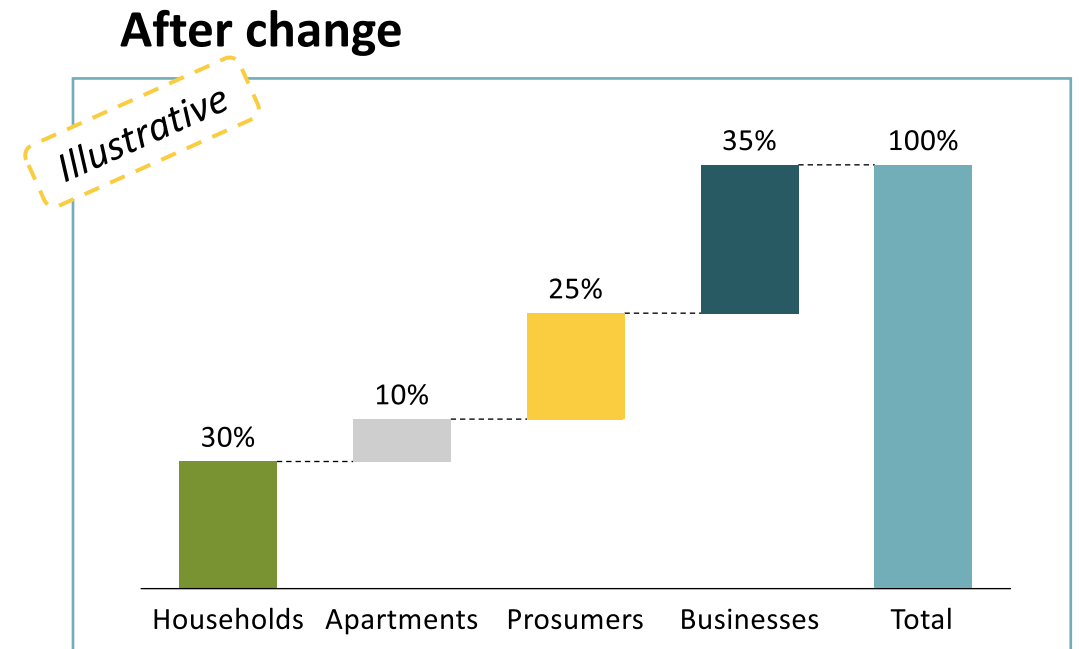
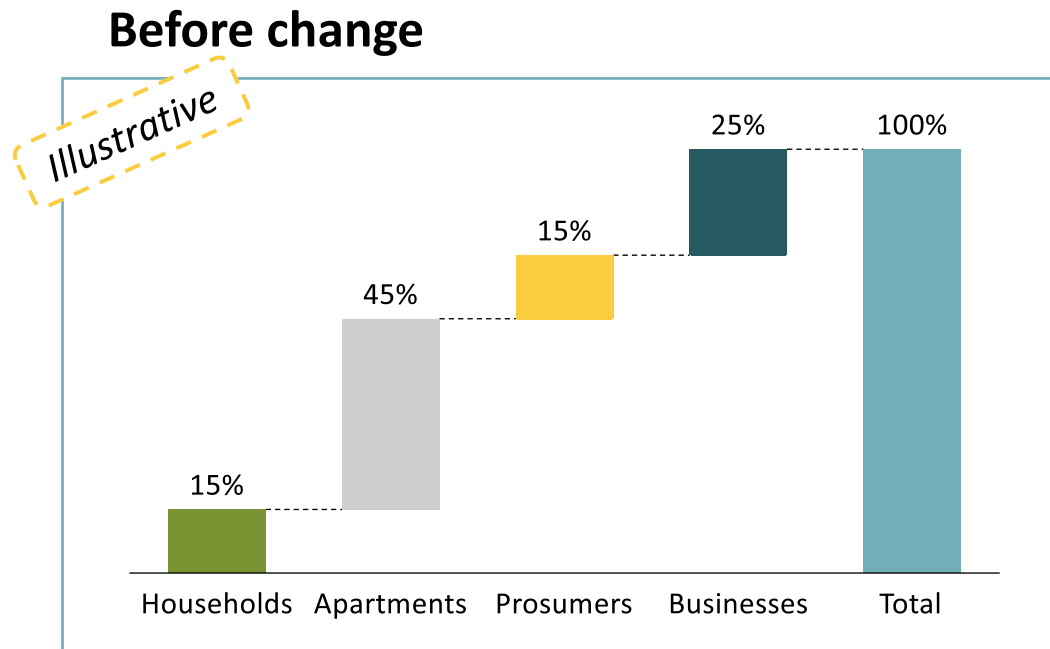


... and to meet the future strain on the grid due to the rise of electric vehicles and charging at home

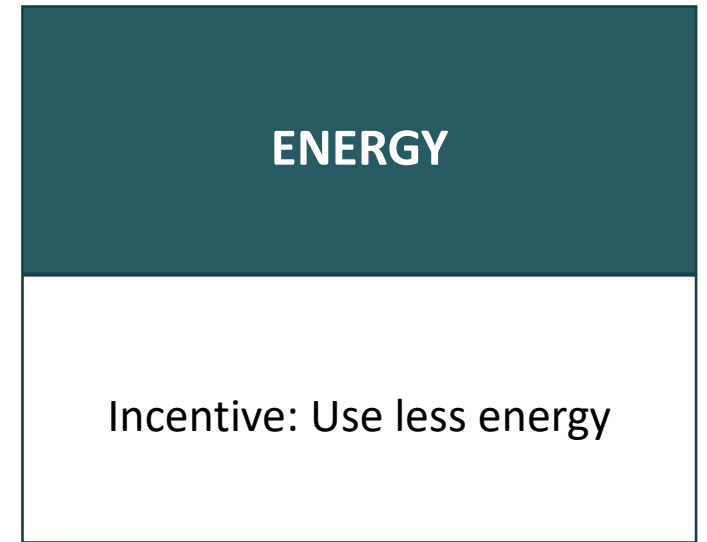
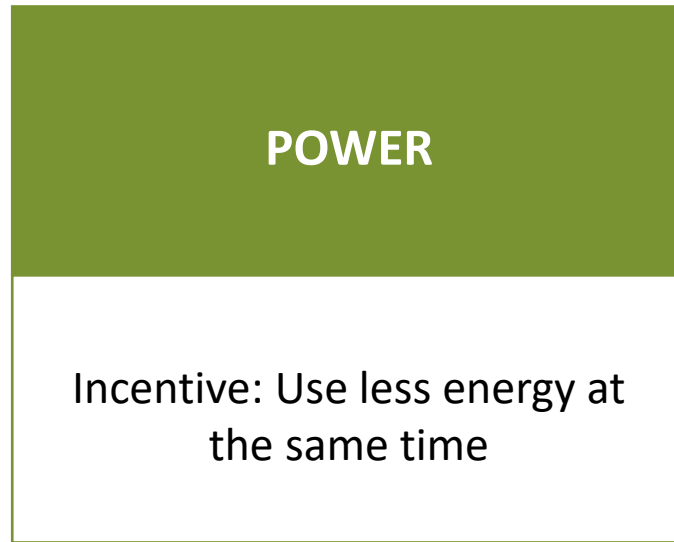
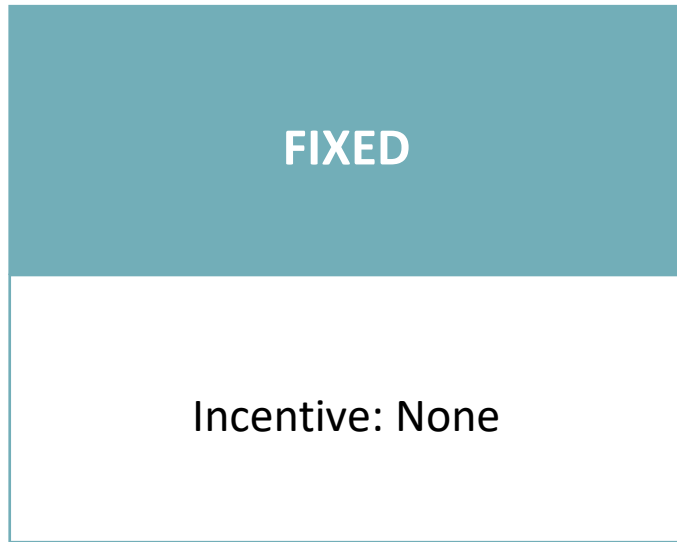
Registered vehicles in Norway



It is important to remember that a change in the tariff design does not make the DSOs earn more money, its just a redistribution of the costs



When designing the tariff, the regulator considered three tariff elements to distribute the costs in a fair manner, each element incentivizing the user in a different way



*The old tariff design had a **fixed** part and an **energy** part. There were large differences in weighting of the two parts between DSOs.*



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