

HALF OF DEMAND IN THE FUTURE WILL BE FLEXIBLE

Finding flexibility in demand,
ESIG fall workshop, October 2024

Peter Markussen, Senior Director, System Operation,
Energinet

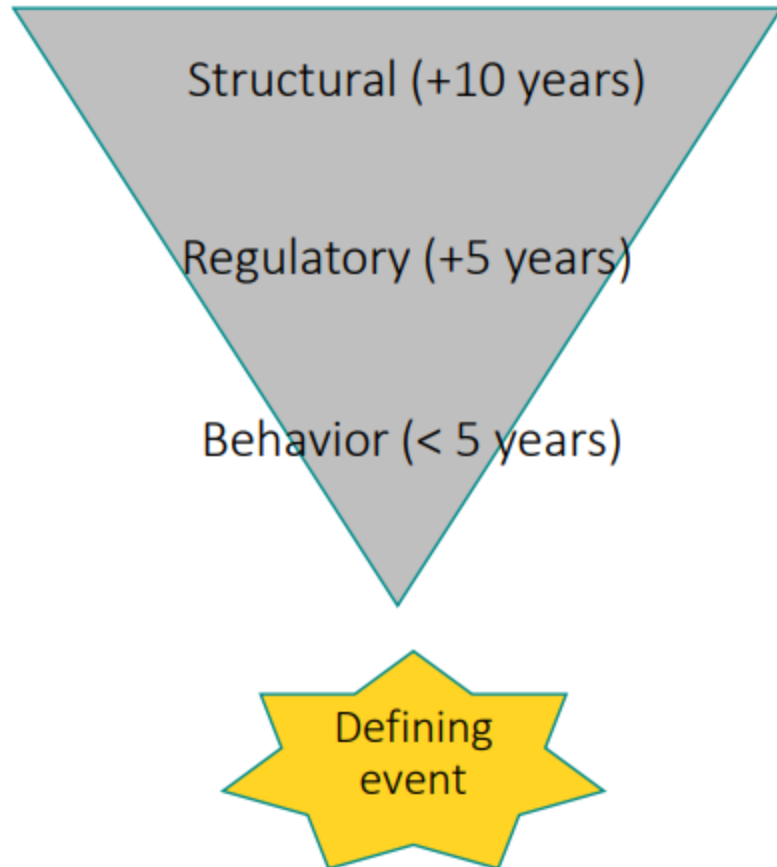


GREEN ENERGY FOR A
BETTER WORLD

ENERGINET



THE DRIVERS FOR INCREASED CONSUMPTION FLEXIBILITY IN DENMARK



- European electricity market and unbundling (day ahead and intraday)
- Energy efficiency regulation and awareness of energy use.
- Technology development (smart meters, apps, digitalization)
- Datahub – consumer centred ownership of consumption data
- Electrification of heating and energy use in general
- Support consumer flexibility/storage as part of energy planning
- New tarif design (time dependent, location, fixed/variable)
- Adaption of ancillary services to VRE and consumption (technology neutral products)
- Large increase in active pro-sumers (roof top solar)
- Green power consumer demand – use electricity when green and price is low
- Electrical vehicles and home charging flexibility

Energy crisis in 2022

ENERGINET

THE ENERGY BACKBONE

We operate and develop the electricity transmission grids, gas pipelines and gas storage in Denmark and are also appointed to build future hydrogen infrastructure

ENSURE BALANCE

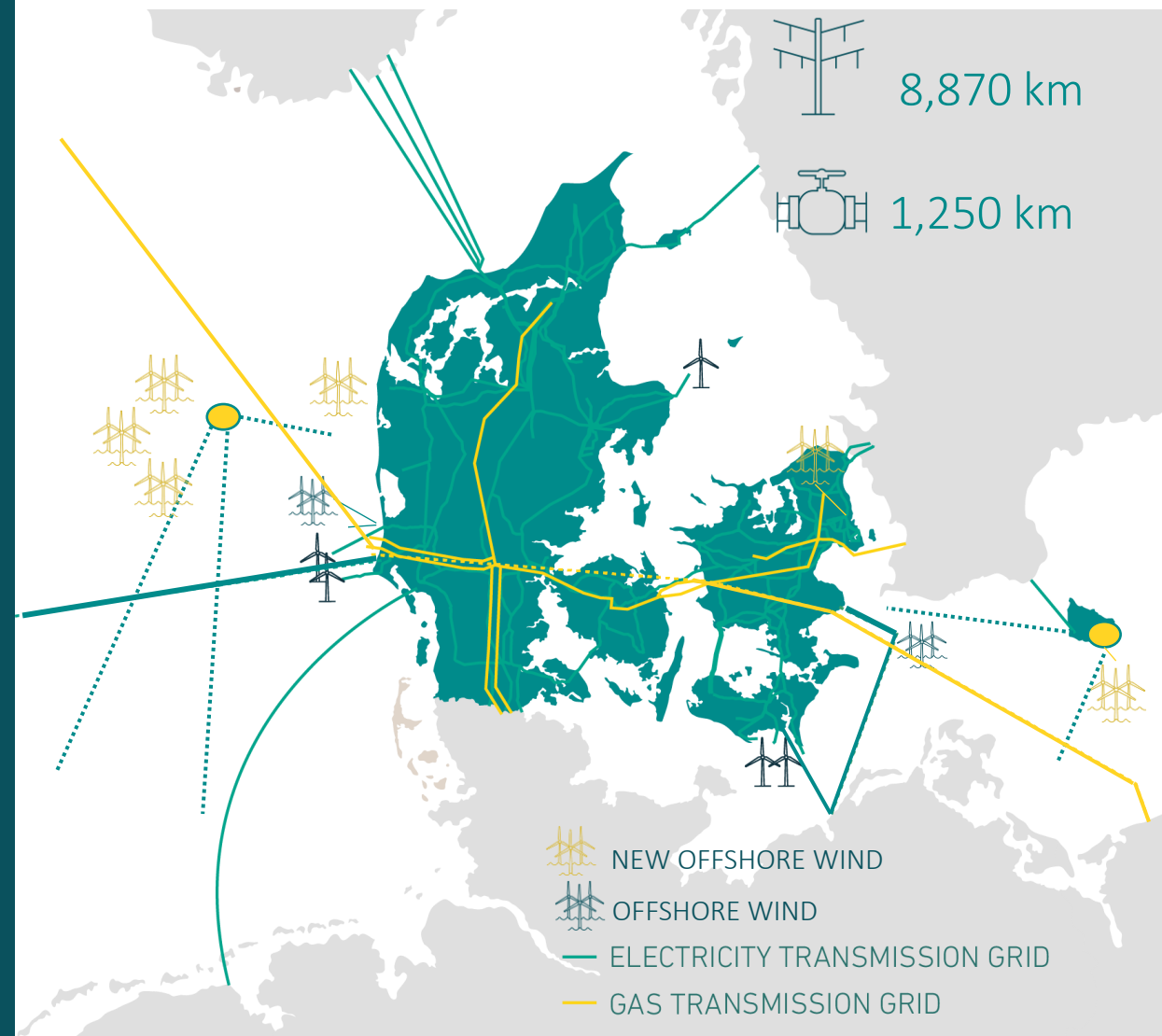
We have the day-to-day and long-term responsibility for the overall electricity and gas system in Denmark.

WORKING FOR THE SOCIETY

Owned by the Danish Ministry of Climate, Energy and Utilities we safeguard society's interests as we move to a 100% green energy system.

Appr. 2500 Employees

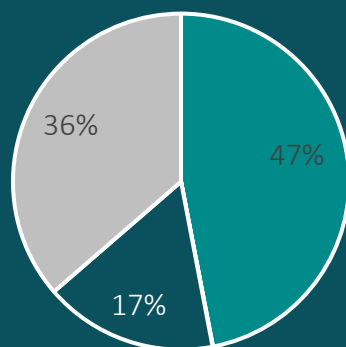
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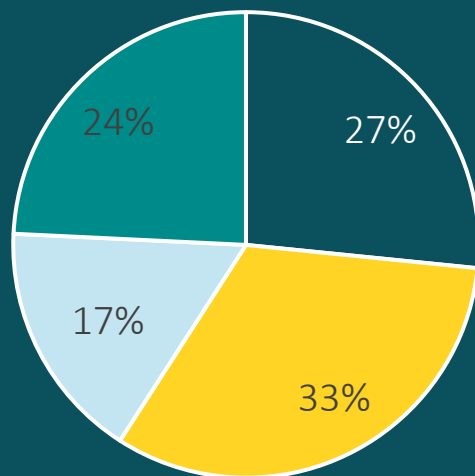
Energy island location, new OSW and connections only illustrative

EUROPEAN ELECTRICITY PRODUCTION

Denmark, 37 TWh



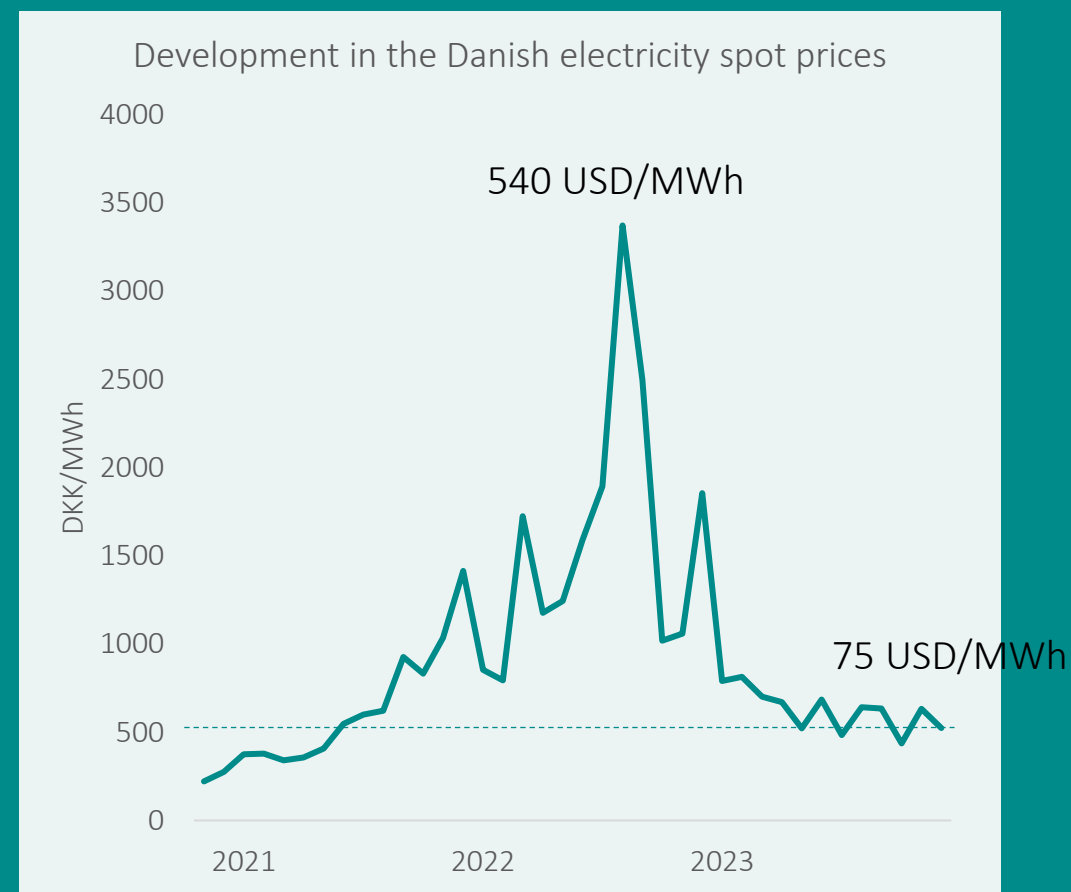
European Union, 2251 TWh



■ wind+solar
■ thermal
■ hydro
■ nuclear
■ Import

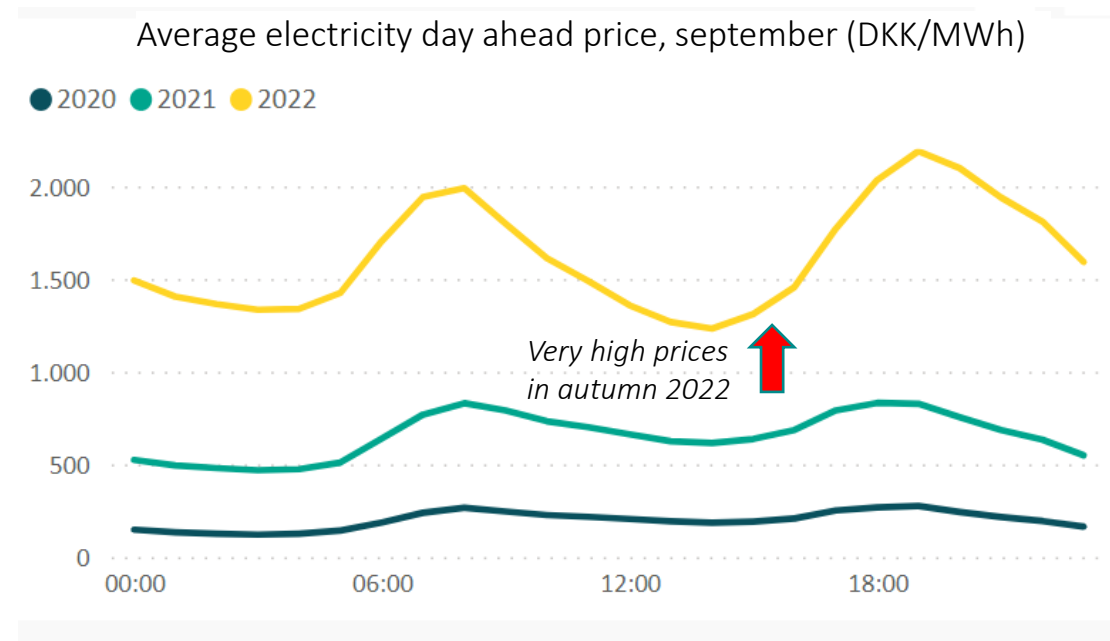
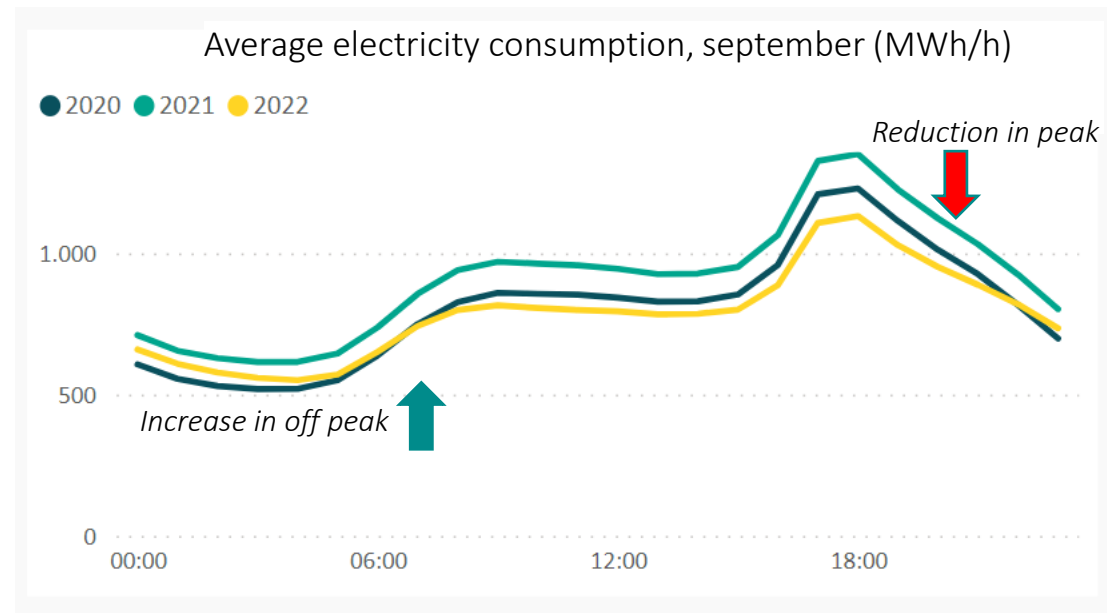
Sources: [Statistics](#) | [Eurostat \(europa.eu\)](#)

"THE PERFECT STORM" IN AUTUMN 2022



CONSUMERS ARE FLEXIBLE!

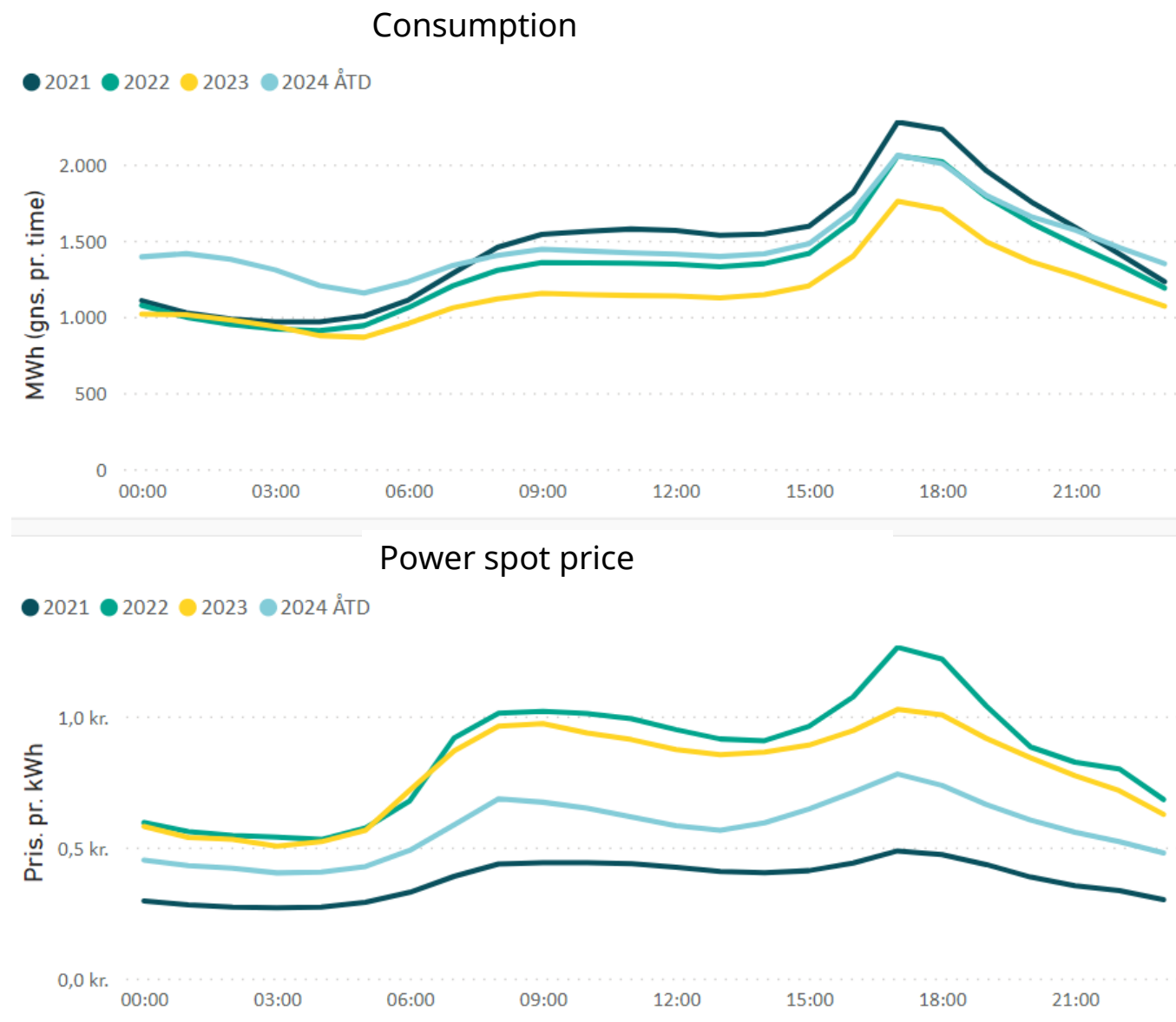
- 15% reduction in consumption in 2022 compared to 2021 (and with increasing electrification)
- Consumption moved to off peak hours with low price (night and noon)
- Flexible consumption important future tool for affordable security of supply
- Denmark: all households have smart meters with hourly measurements
- In 2022 large increase in share of consumers' "pay pr. hour"



...CONSUMERS CONTINUE TO BE FLEXIBLE!

- Electricity price almost back to normal in 2023
- Electricity consumption increased due to new EV's, heat pumps and electrification
- Very large increase in off peak consumption
- Electricity tax exemption from autumn 2022-spring 2023

Average household consumption – month of January

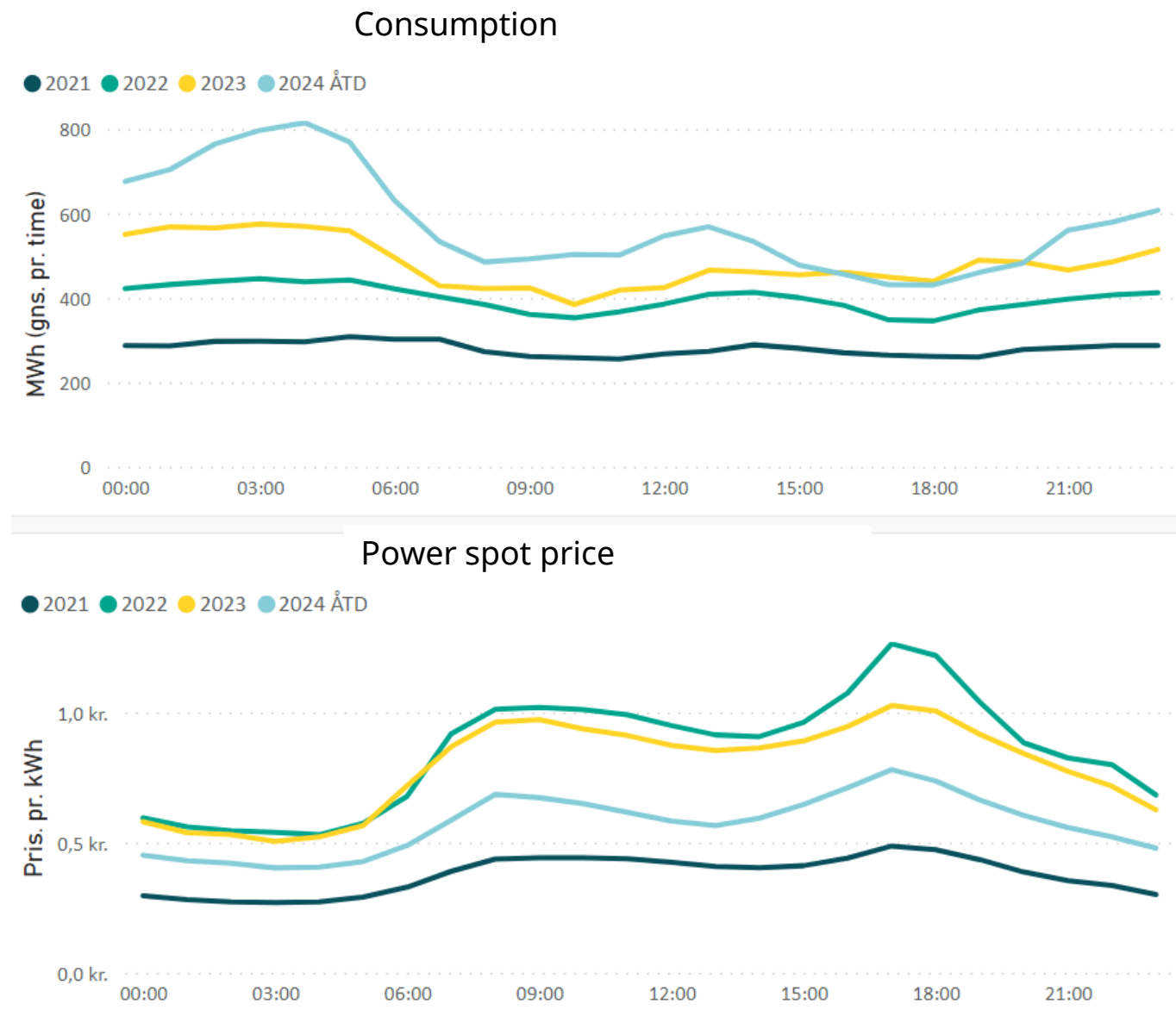


...SECTOR COUPLING IS INCREASING FLEXIBILITY!

Larger effect in the utility sector.

Most likely the effect of a boost in large heat pumps and heat boilers in district heating networks in recent years.

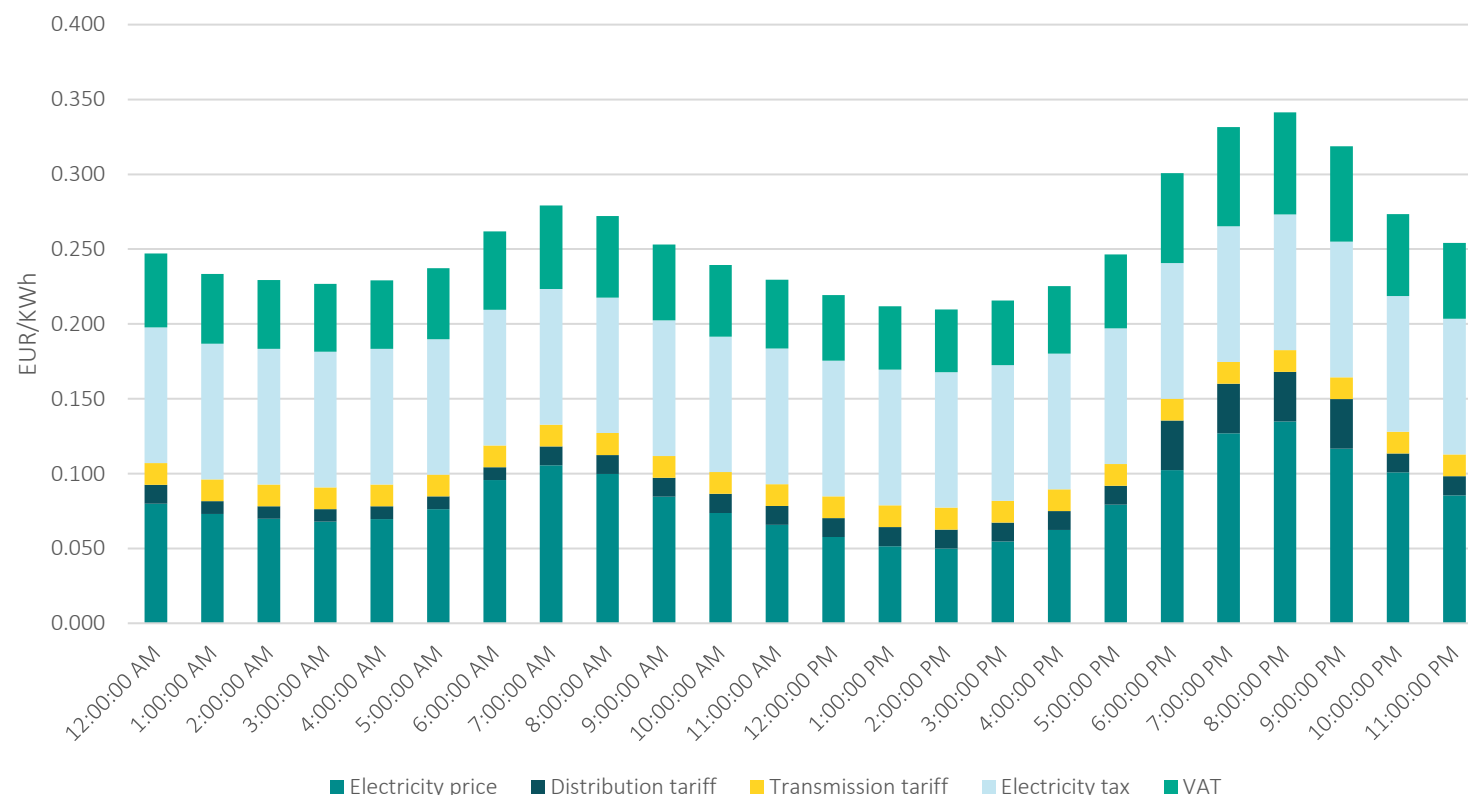
Power consumption in utility sector – month of January



Source: Energinet

TIME DEPENDENT GRID TARIFFS AND TAXES INCREASE INCENTIVE FOR EFFICIENCY AND FLEXIBILITY

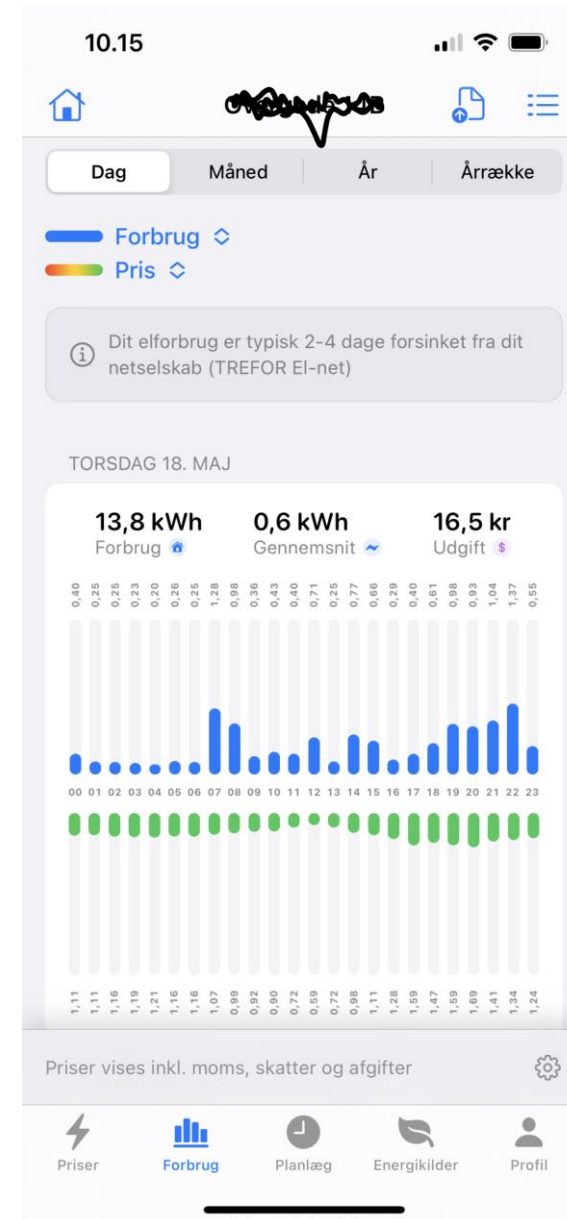
Average hourly electricity spot price August 2023 – with tariffs & taxes added



- The tax and tariffs added to the average spot price
 - From **Energinet**: the transmission tariff
 - The consumption tariff: *0.015* EUR/KWh
 - From **TREFOR**: the distribution tariff
 - Low load: *0.008* EUR/KWh
 - High load: *0.013* EUR/KWh
 - Peak load: *0.033* EUR/KWh
 - The electricity tax rate: *0.091* EUR/KWh
 - 25% VAT on the total price

IMPORTANCE OF PRICE AND CONSUMPTION INFORMATION

- > 70% of all Danish consumers are billed by "time of use rates"
- Most downloaded app in Denmark in 2022 was "Min Strøm" (My Power)
- Daily spot prices+grid tariffs+taxes (today and tomorrow)
- Own consumption with one day delay



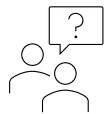
WHO IS BALANCING THE ENERGY SYSTEM TODAY?

Energinet purchases a variety of balancing resources to match production and consumption.

The current Danish portfolio of market participants are strongly dominated of traditional heat producing units for district heating.

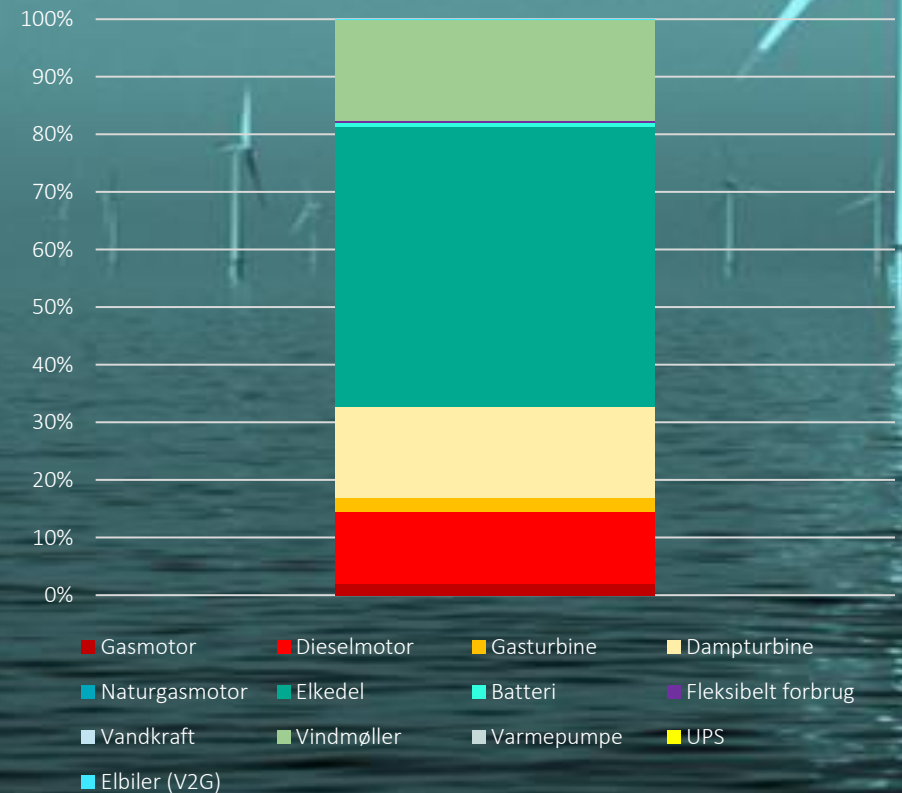
- Ca. 30% traditional thermal plants (diesel- and natural gas engines, gas engines and steam turbines)
- Ca. 50% Boilers
- Ca. 20% Wind power (2 offshore wind parks)

The list describe who can deliver balancing volume, however which technologies that contribute differs a lot on prices and season.



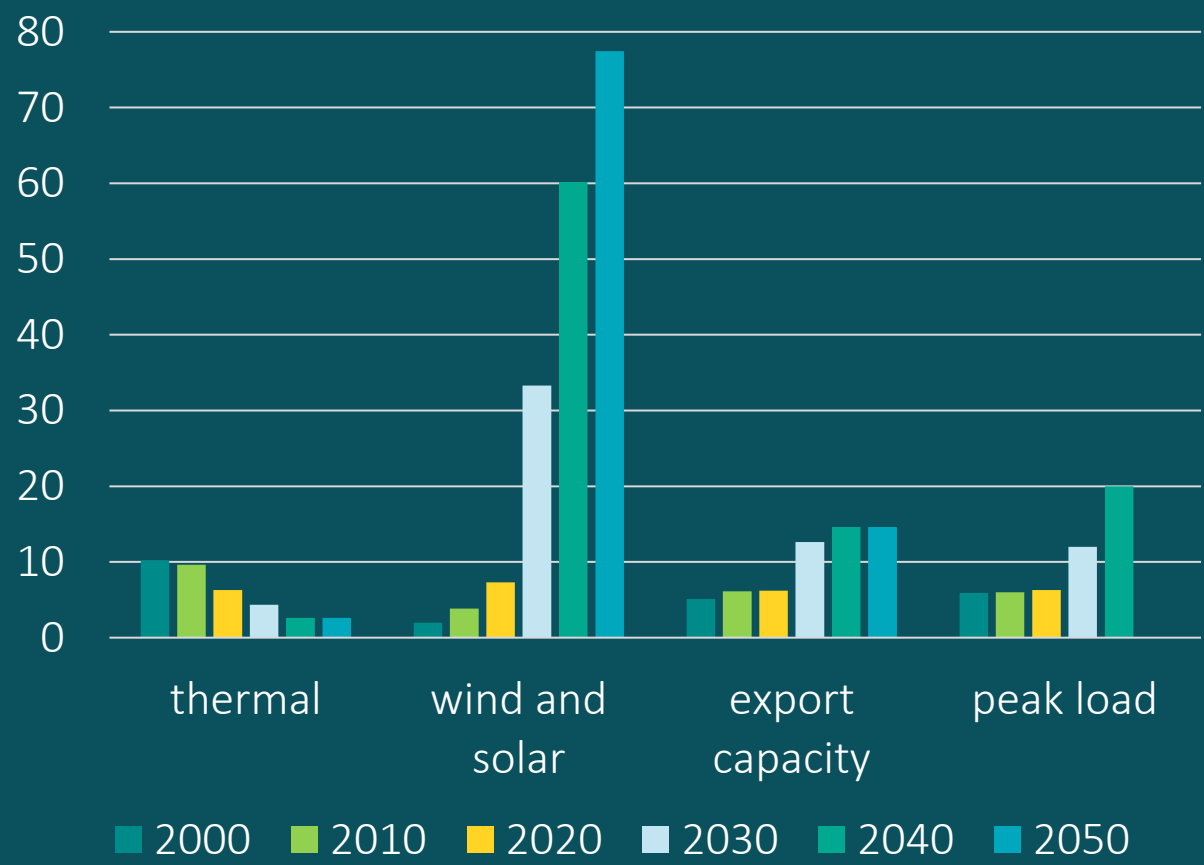
The major problem is that approx. 30% of the asset pool is being phased out and thus lacks new and extremely important resources.

Danish technology portfolio that are able to deliver ancillary services



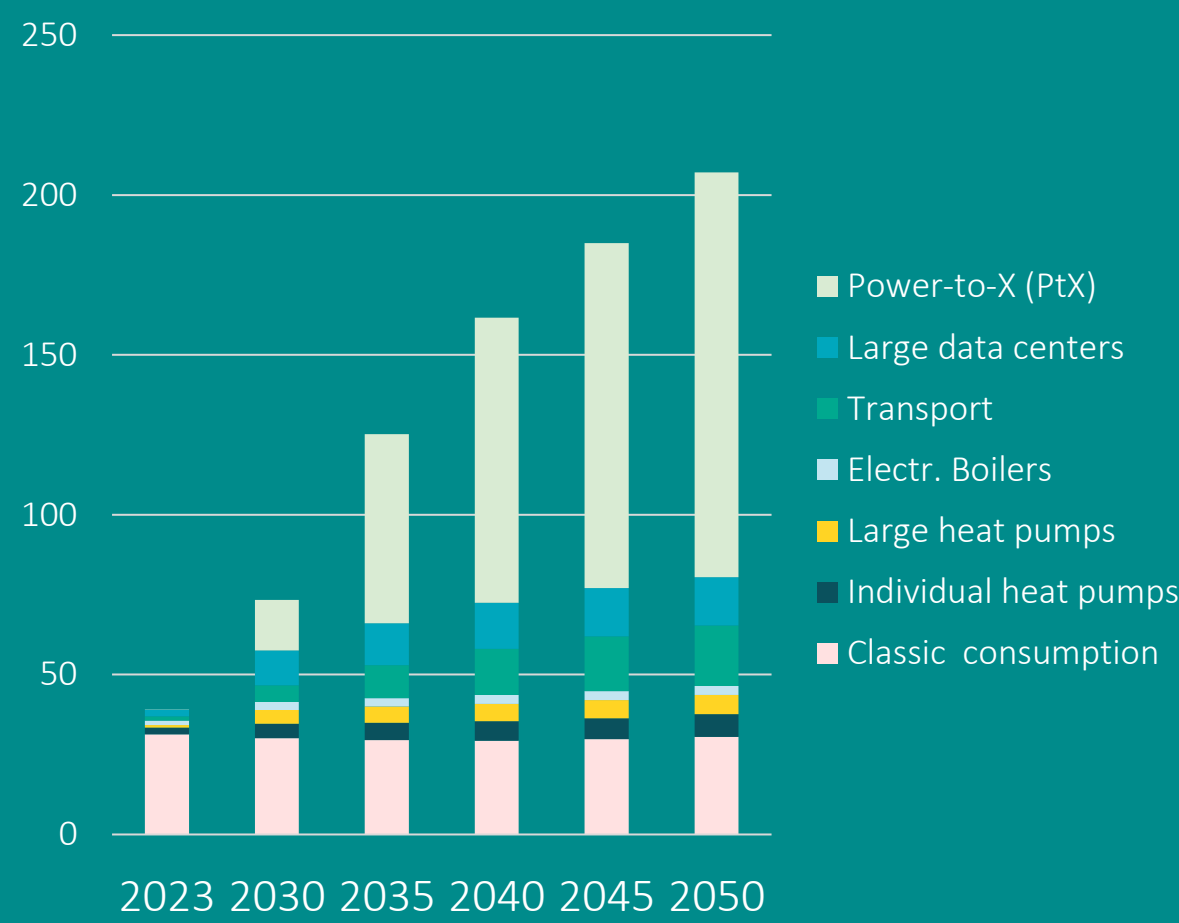
WHAT HAS BEEN ACHIEVED IN THE LAST 20 YEARS, ACCELERATING TOWARD 2040?

Electricity generation and peak capacity, GW



ELECTRIFICATION DRIVES THE CHANGE TO A CLIMATE NEUTRAL ENERGY SYSTEM

Electricity consumption, TWh



Source: Danish Energy Agency, Analyseforudsætninger 2023

BACK UP

EUROPEAN ELECTRICITY MARKET FOR DISPATCH AND BALANCING

