WEBINAIRE ATEE

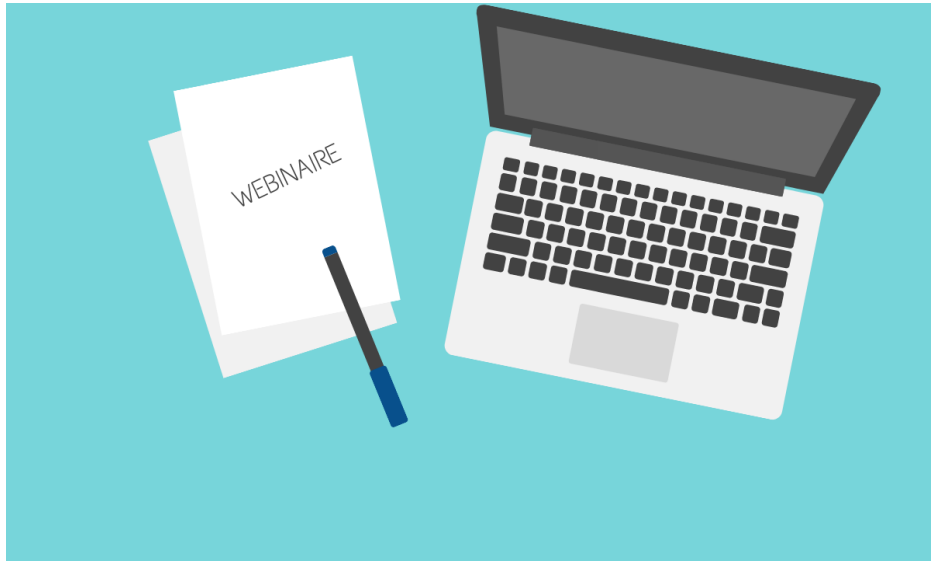
Efficacité énergétique | Stockage d'énergies | Cogénération | Biogaz | CEE | Power to Gas | Pyrogazéification

atee Club Cogénération

Etat des lieux de la cogénération raccordée en basse tension en Europe

Alexandra Tudoroiu – COGEN Europe

02 février 2022



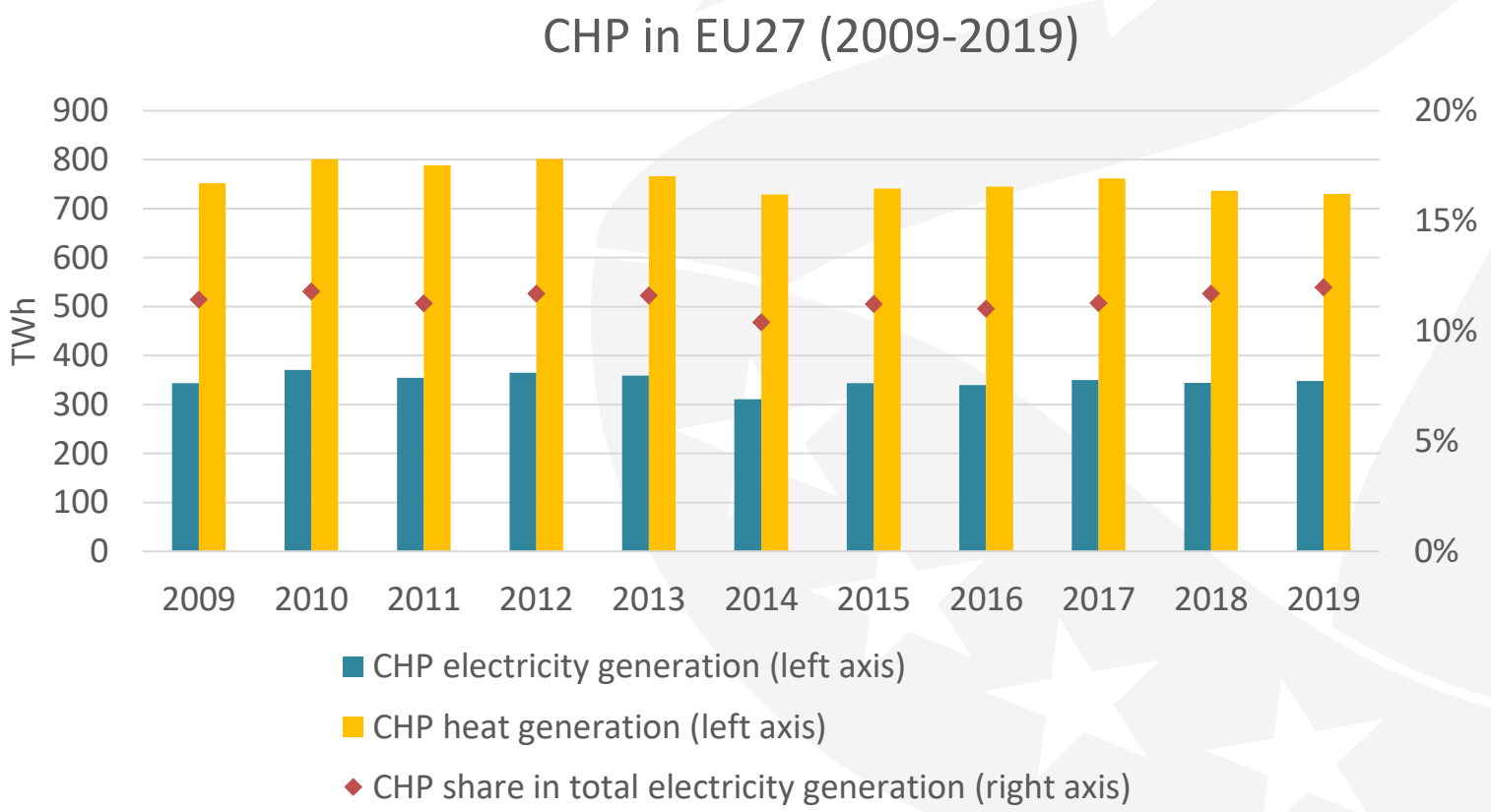
Avec le soutien et la participation de

le cnam | GRDF Gaz Réseau Distribution France | femto-st Sciences & Technologies | SFT Société Française de Thermique | lemta Laboratoire Énergies & Mécanique Théorique et Appliquée | ENGIE | cnrs | SATIE

Overview of CHP in Europe

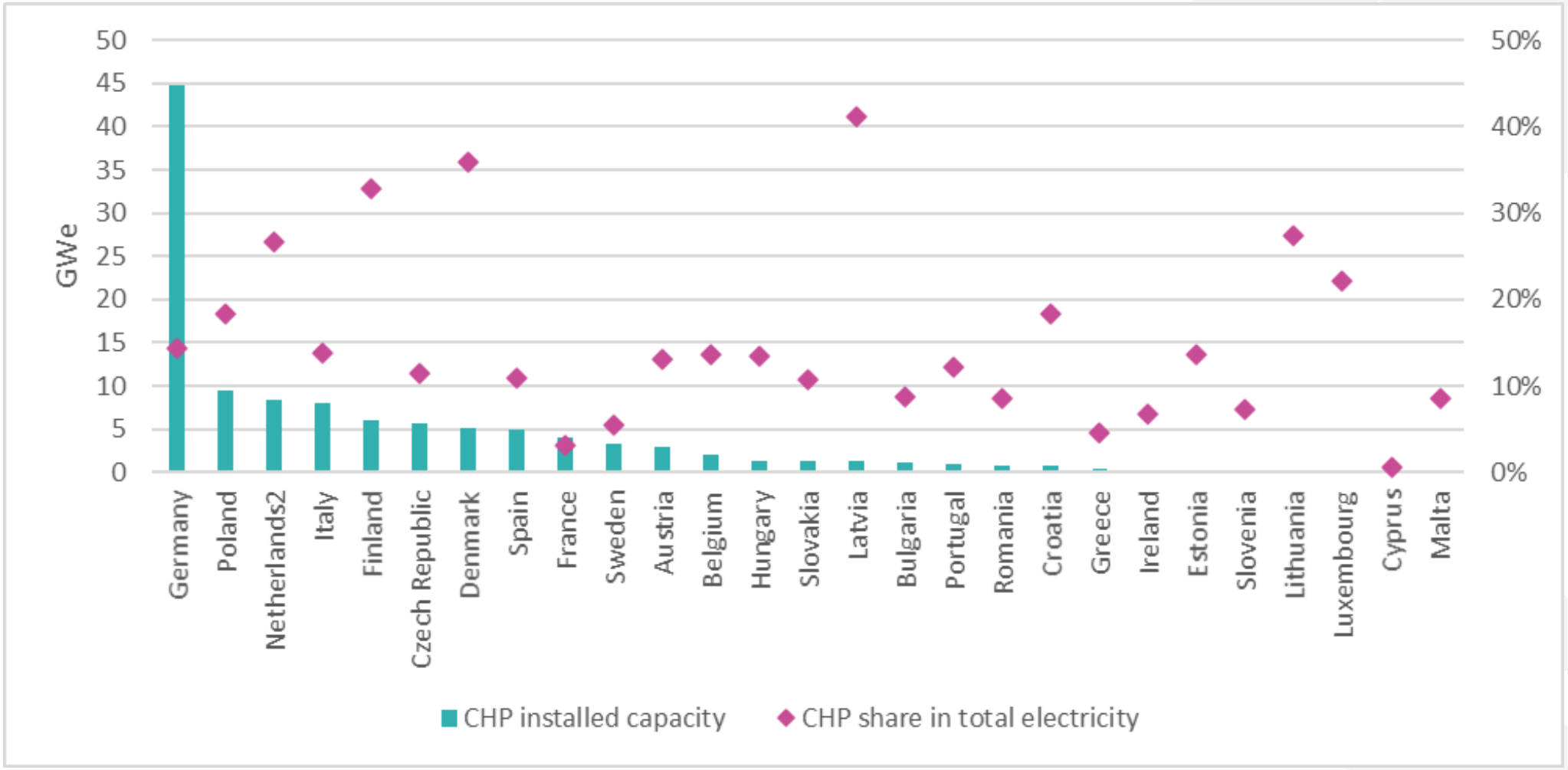
CHP in Europe – Overview

- 113 GWe of high efficiency CHP installed in 2019
- CHP represents 12% of total electricity and ~14% of the heat in EU27, with potential for it to double by 2030
- CHP across the EU reduces up to 150 Mt of CO2 & ~30 Mtoe of primary energy today (equivalent to the emissions of ~90 million cars)



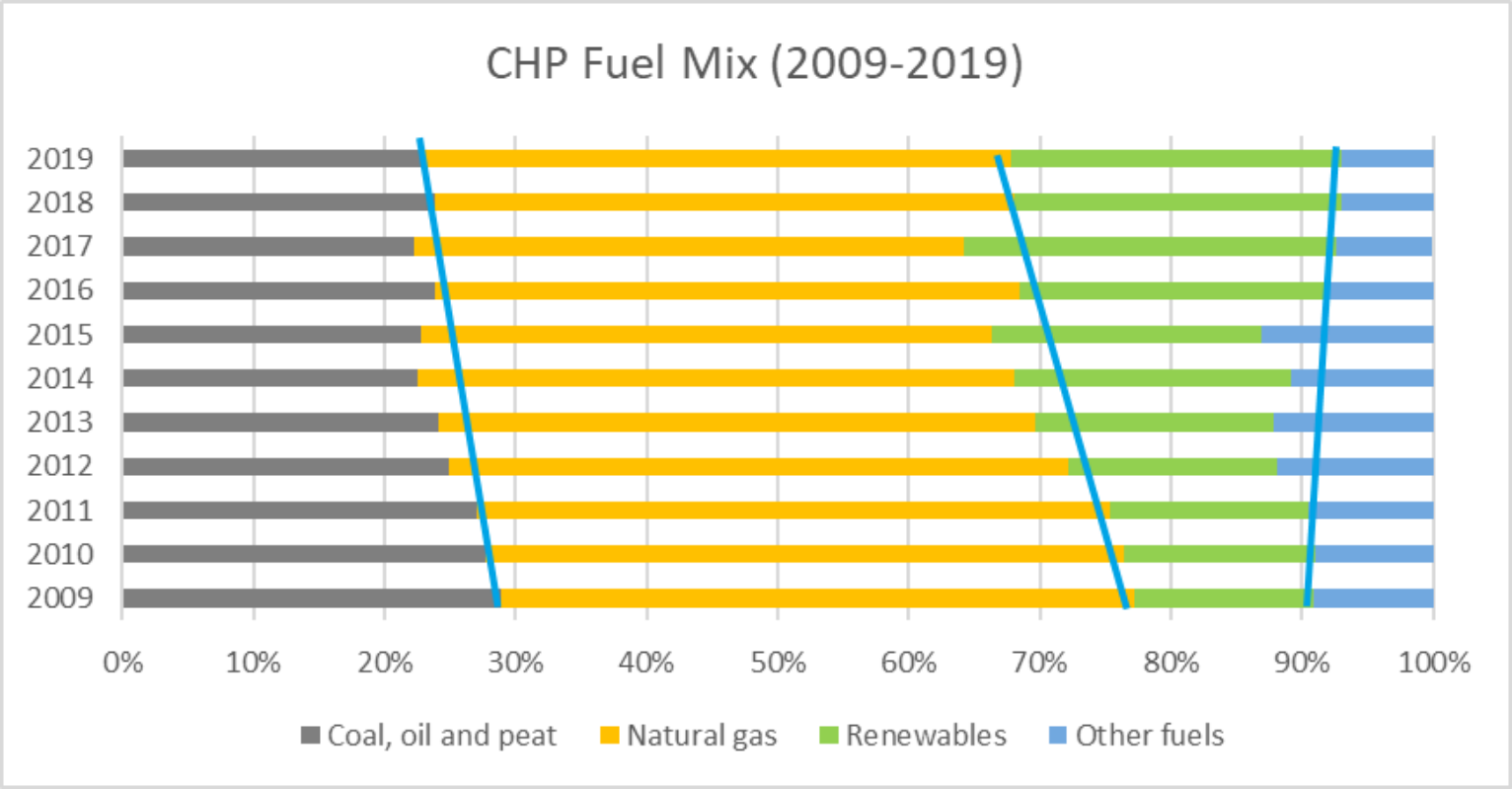
Data source: European Commission, Eurostat, 2021

CHP by country in 2019



Data source: European Commission, Eurostat, 2021

CHP Fuel Mix in the EU (2009-2019)



CHP fuel mix influenced by fuel price dynamics, support schemes and availability of renewable fuels at local level

- Stable share of natural gas use in CHP
- Rapid increase of RES, reaching close to 25% in 2019 (from 13% in 2009)
- Steady decline in solid fossil fuels and oil use in CHP

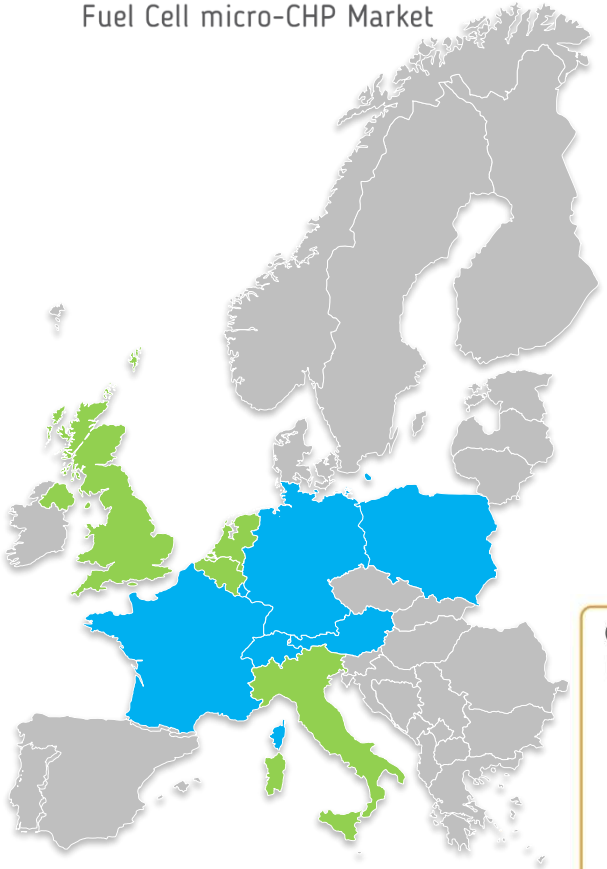
Data source: European Commission, Eurostat, 2021

PACE

Pathway to a Competitive European Fuel Cell micro-CHP Market

PACE at a glance

Promoting a successful transition to the large-scale uptake of Fuel Cell micro-Cogeneration across Europe



Field trial + installer training + targeted market & policy development activities

Field trial + local installer training

10
Partners
Representing manufacturers, utilities & research community

> 2,800
Fuel Cell micro-Cogeneration units
To be deployed across Europe between 2016-2022

>500
Systems per manufacturer
Established production capacity per manufacturer

10
Countries
Where the units will be installed

4
Countries
Selected for policy & market development (Belgium, Italy, Netherlands and UK)

€90m
Total budget
Including €33.9m Horizon 2020 funding via FCH JU

Coordination & Dissemination Partner

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Manufacturers

VIESMANN · BDR THERMEA GROUP · SOLID POWER · BOSCH Invented for life · sunfire · HEXIS

Research Partners

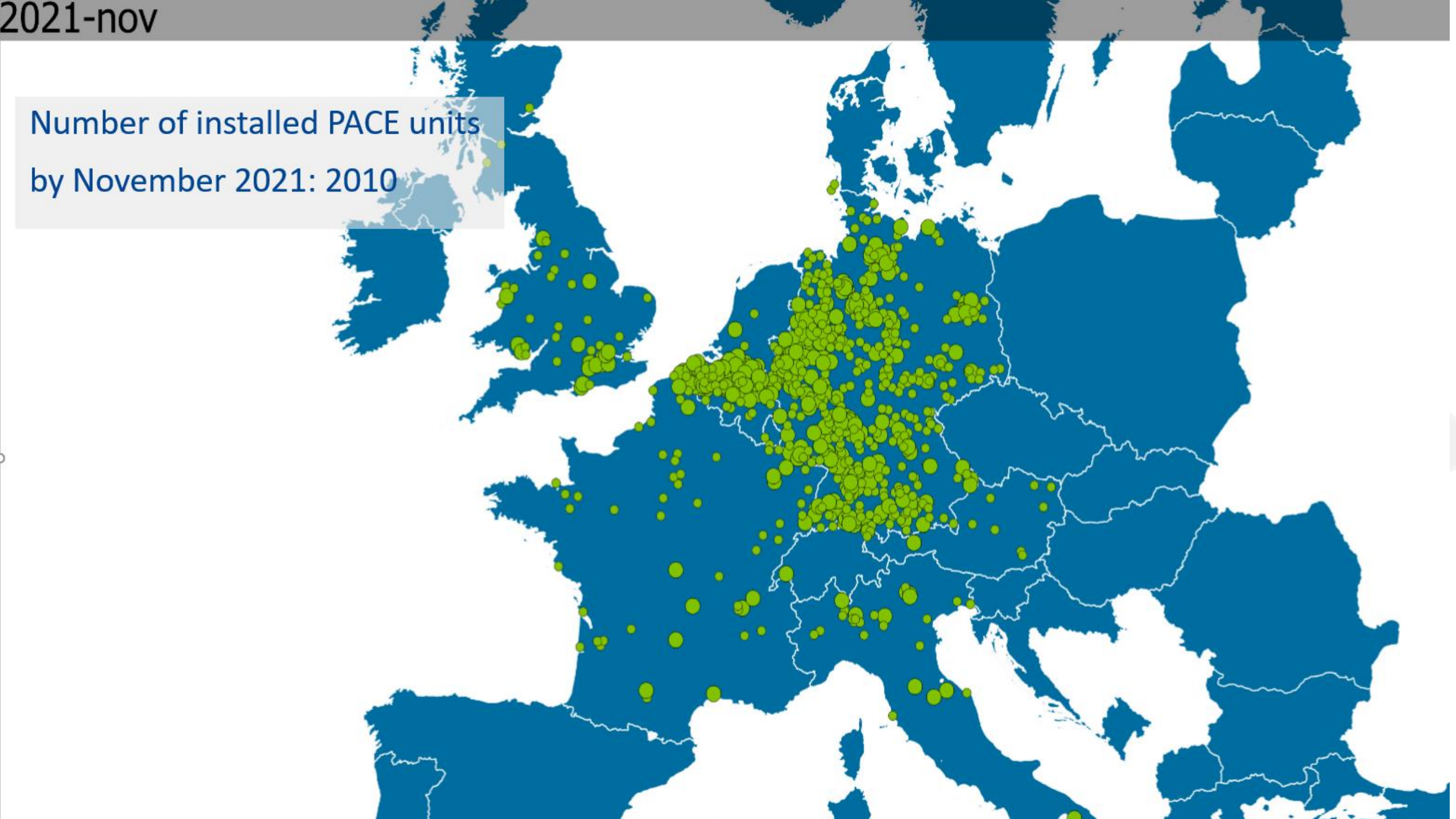
elementenergy an ERM Group company · DTU · Applied Sciences and Arts HOCHSCHULE LUZERN Engineering and Architecture

>10,000
FC micro-cogeneration units/year post 2020

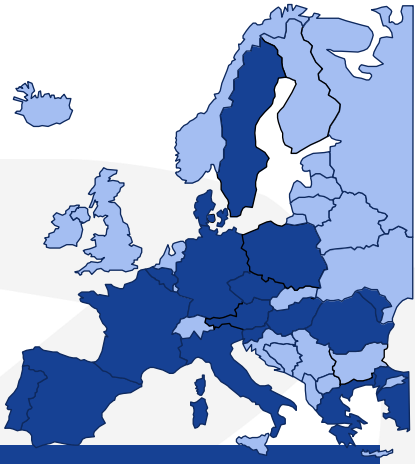
2021-nov

Number of installed PACE units

by November 2021: 2010



Expert contributions from **17** CHP national experts...



2021 Cogeneration National Snapshot Survey

...representing **85%** of installed capacity **in EU27, Turkey & Moldova**

...capturing the **European CHP industry sentiment**

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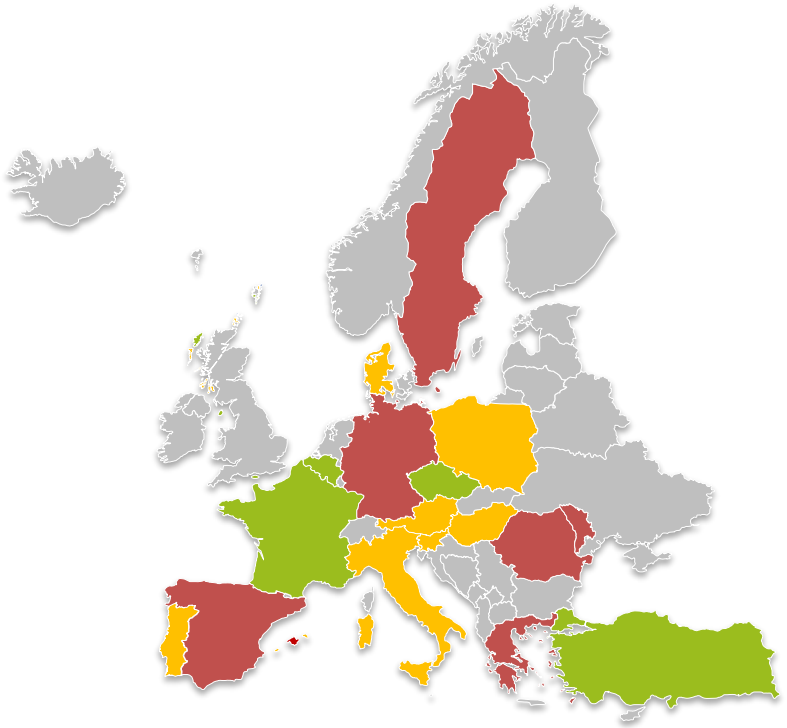
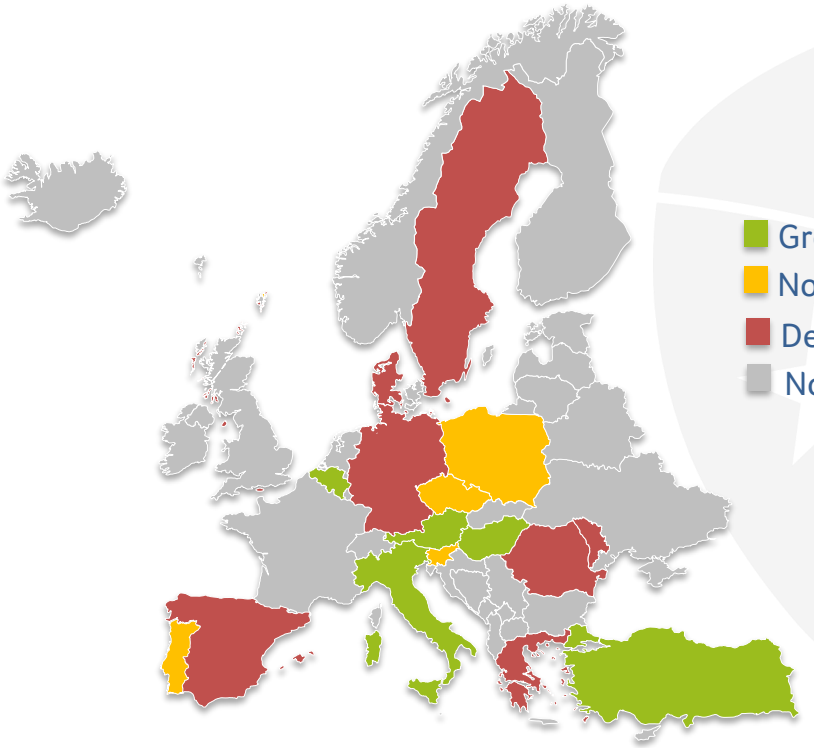
CHP Market Developments in Europe (2018-2021)

CHP Installed Capacity



CHP Generation



CHP installed capacity and generation declining in ~50% of markets*

* Percentages in all slides represent the aggregated answers weighted by the installed capacity in each country.

CHP support available, but insufficient

Favourable policy framework in ~55% of markets

Most common support: Feed-in Tariffs, Feed-in Premiums & Tenders	Capacity payments are emerging & flexibility tariffs	Other support includes: tax incentives, investment aid & certificate schemes

Level of support insufficient & unpredictable

Not always correlated with fluctuating spark spreads	Complexity of regulation & administrative burden	Support schemes not adapted to CHP particularities

Focus on flexibility services

CHP role in providing flexibility services increasingly recognised

Access of CHP to ancillary services markets (BE,PL,DE), but increasingly extended to smaller generators (e.g. CZ)

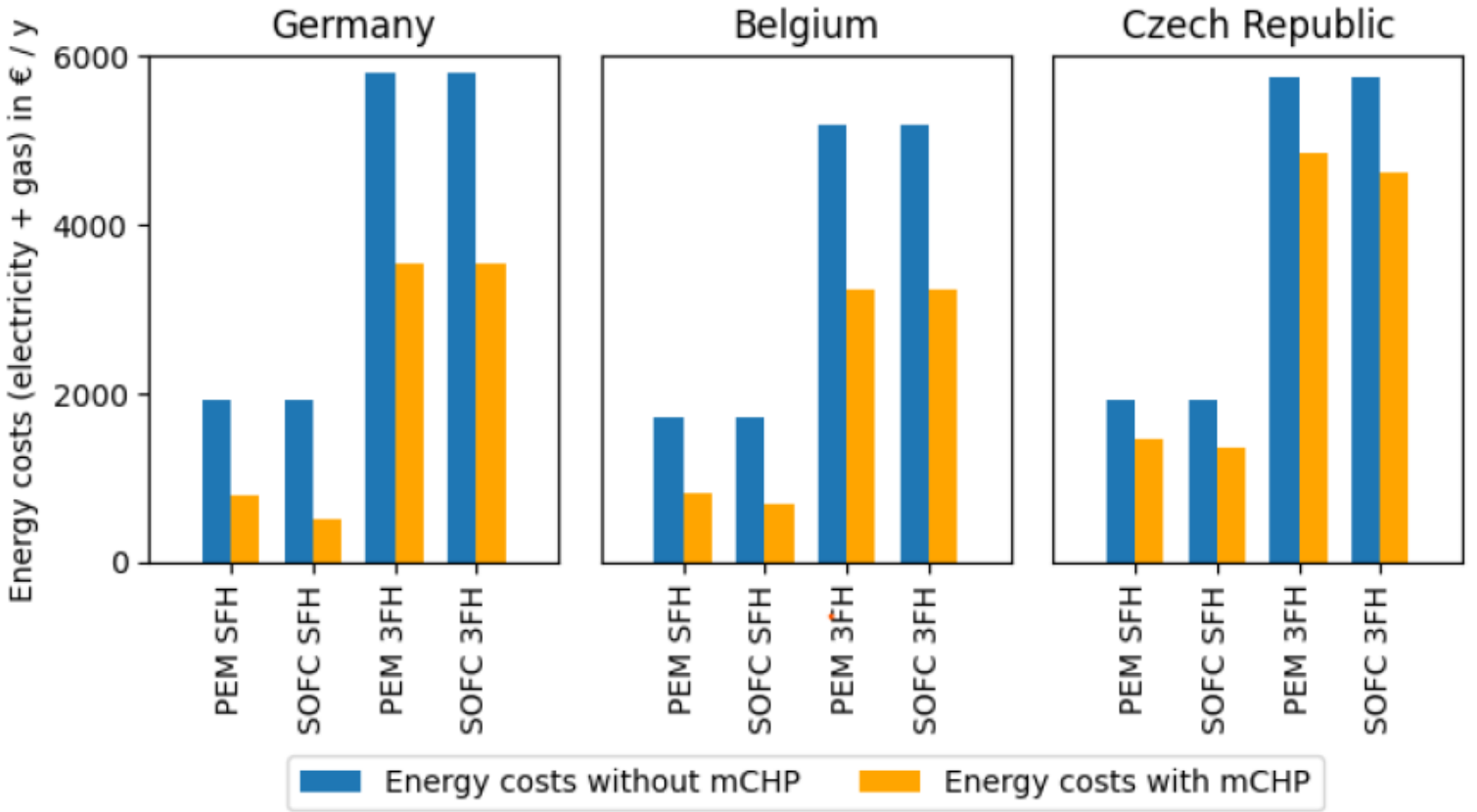
Plans to adapt grid tariff structures to recognise prosumer benefits in Denmark and Poland

Flexible future-proof CHPs formally recognised in RO NECP

PACE
Pathway to a competitive European Fuel Cell micro-CHP Market

Results of self-consumption policy optimisation

- Four different scenarios were simulated for all countries
  1) Domestic installation in a single family house
  2) Small industrial consumer, exhibiting an annual consumption of 12 MWh
  3) and 4)
     Each of the above for both PEM and SOFC technology



PEM: Proton exchange membrane
SOFC: Solid Oxide fuel cell
SFH: Single family house
3FH: Small-industrial consumer

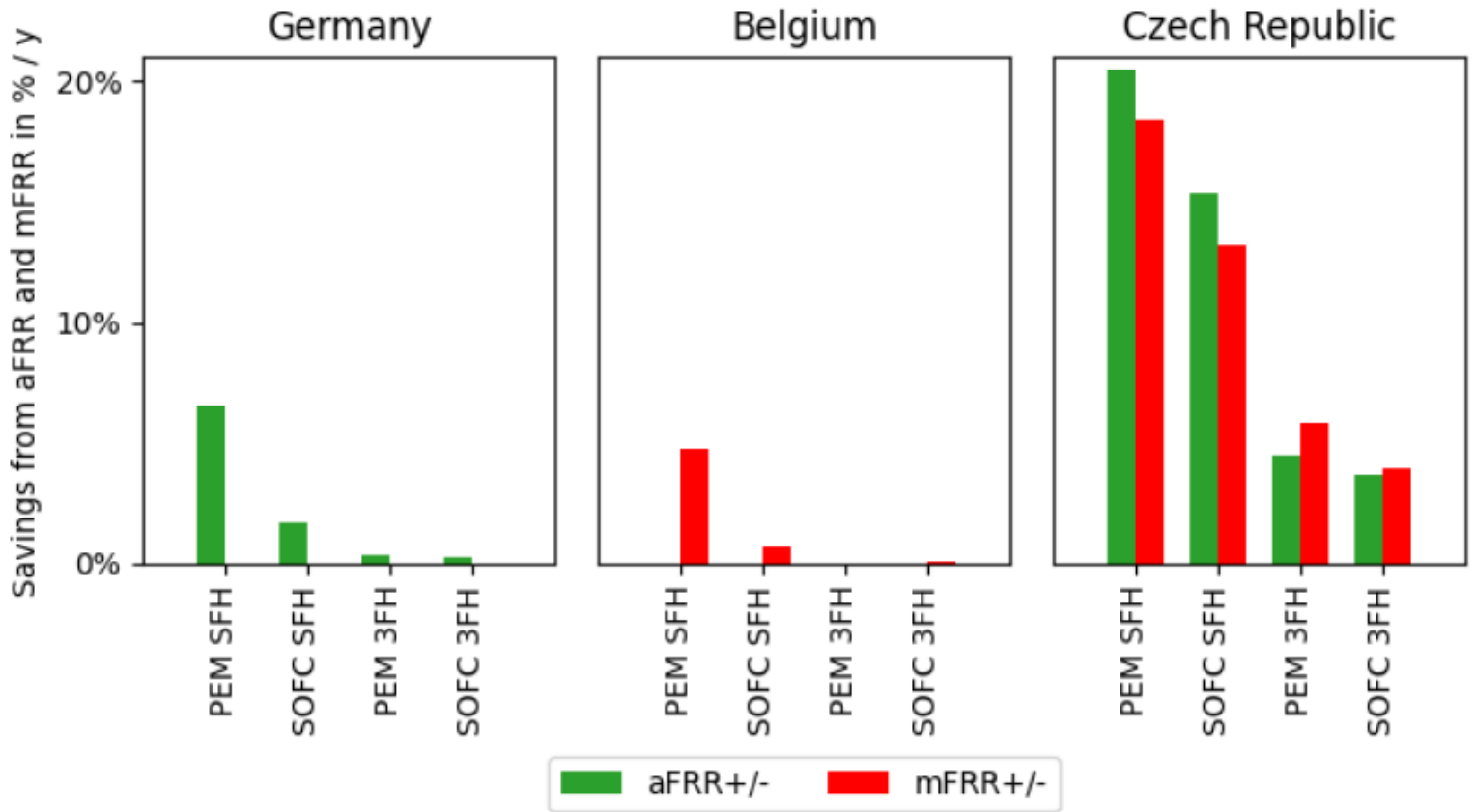
PACE

Pathway to a competitive European Fuel Cell micro-CHP Market

Additional revenues streams from TSO grid services

Focus on providing secondary (aFRR) and tertiary (mFRR) reserves

- Two balancing products are investigated:
  - **aFRR** (secondary control reserves): faster response time
  - **mFRR** (tertiary control reserves): longer activation time
  - For both of them, positive (+) and negative (-) balancing is analysed
- The balancing income depends on:
  - Availability income results directly from self-consumption optimisation
  - Market prices for each country
  - Activation probability depending on bidding strategy and market behaviour
  - Subsidy schemes

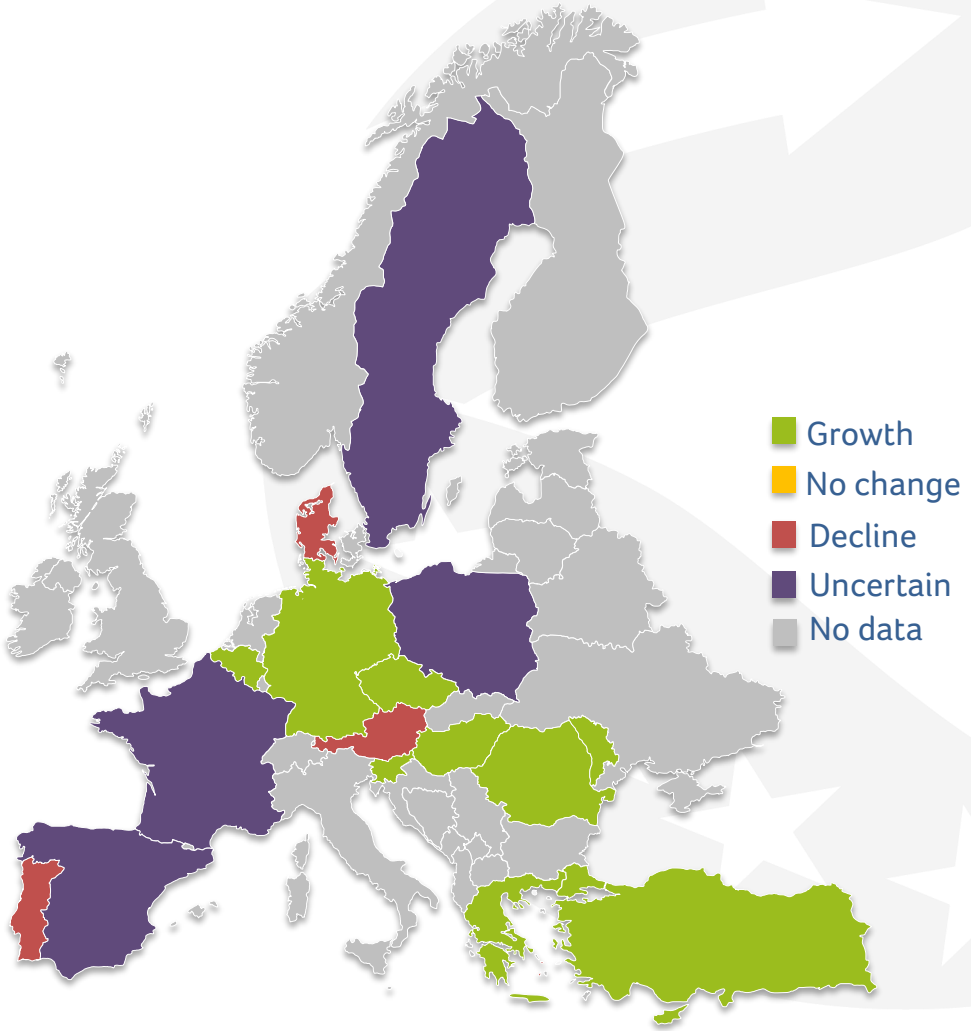


Overview of CHP support schemes

	Feed-in Tariff	Tender schemes	Feed-in Premium	Investment Aid	Certificates Scheme	Tax Incentives	Capacity mechanisms	Other	No support
Belgium				✓	✓		✓		
Czech Republic			✓	✓					
Denmark	✓					✓			
Germany	✓	✓	✓	✓					
Greece			✓						
Spain	✓								
Austria				✓					
Poland		✓					✓		
Portugal	✓							✓	
Romania		✓						✓	
Slovenia	✓	✓							
Sweden					✓				
Turkey								✓	
Moldova	✓	✓							

5-year CHP Outlook

Growth expected in **60% of the CHP markets** in Europe, in the next 5 years.



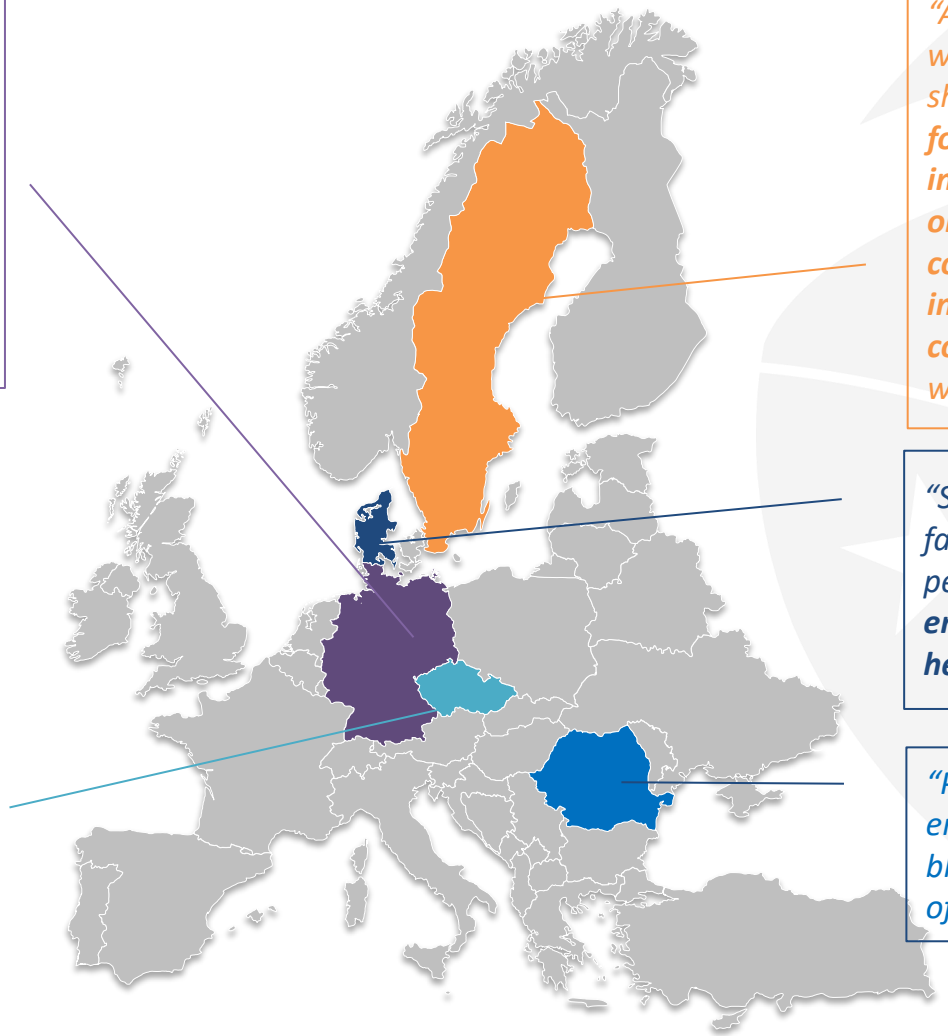
CHP growth trends by segment

Segment	Current trend*	Outlook*	Key markets
RES	62%	65%	Across EU
Natural gas	60%	61%	CZ, DE, ES, HU, PL, SI, TK
DHC	57%	61%	BE, CZ, DE, HU, PL, RO, SI, TK, MD
Industrial	9%	20%	BE, CZ, PL, RO, SI, TK, MD
Commercial	8%	59%	CZ, DE, PL, SI, SE, TK
Domestic	45%	46%	CZ, DE, IT

CHP positively covered in 2020 National Heating & Cooling Assessments/NECPs/RRPs

*"The **smart use of** large heating pumps, electric boilers **and cogeneration units (with heat storage)** will especially help with integrating renewable electricity production […], **reducing pressure on the grid in times of high residual load as well as reducing grid shortages and the need for grid extensions**."*

*"The **remaining heat supply from current coal-fired thermal energy systems**, which will not be provided through heat production in cogeneration plants, **will be provided by small heat-only plants and small decentralised cogeneration sources**."*



*"Although the profitability of new cogeneration will be relatively weak over the next few years, it should be borne in mind that **once the demand for controllable electricity increases significantly in the future, it may be partly too late to count on cogeneration**…For us it is about **safeguarding cogeneration due to benefits in the form of system support services and contributions to a robust energy system** with a secure energy supply.*

*"Surplus heat and waste cogeneration remain fairly constant throughout the analysis period…**cogeneration based on renewable energy provides the largest amount of district heat generation**"*

*"Promotion of **future proof cogeneration** by ensuring hydrogen-readiness, including H2 blending and flexibility to accept different blends of H2"*

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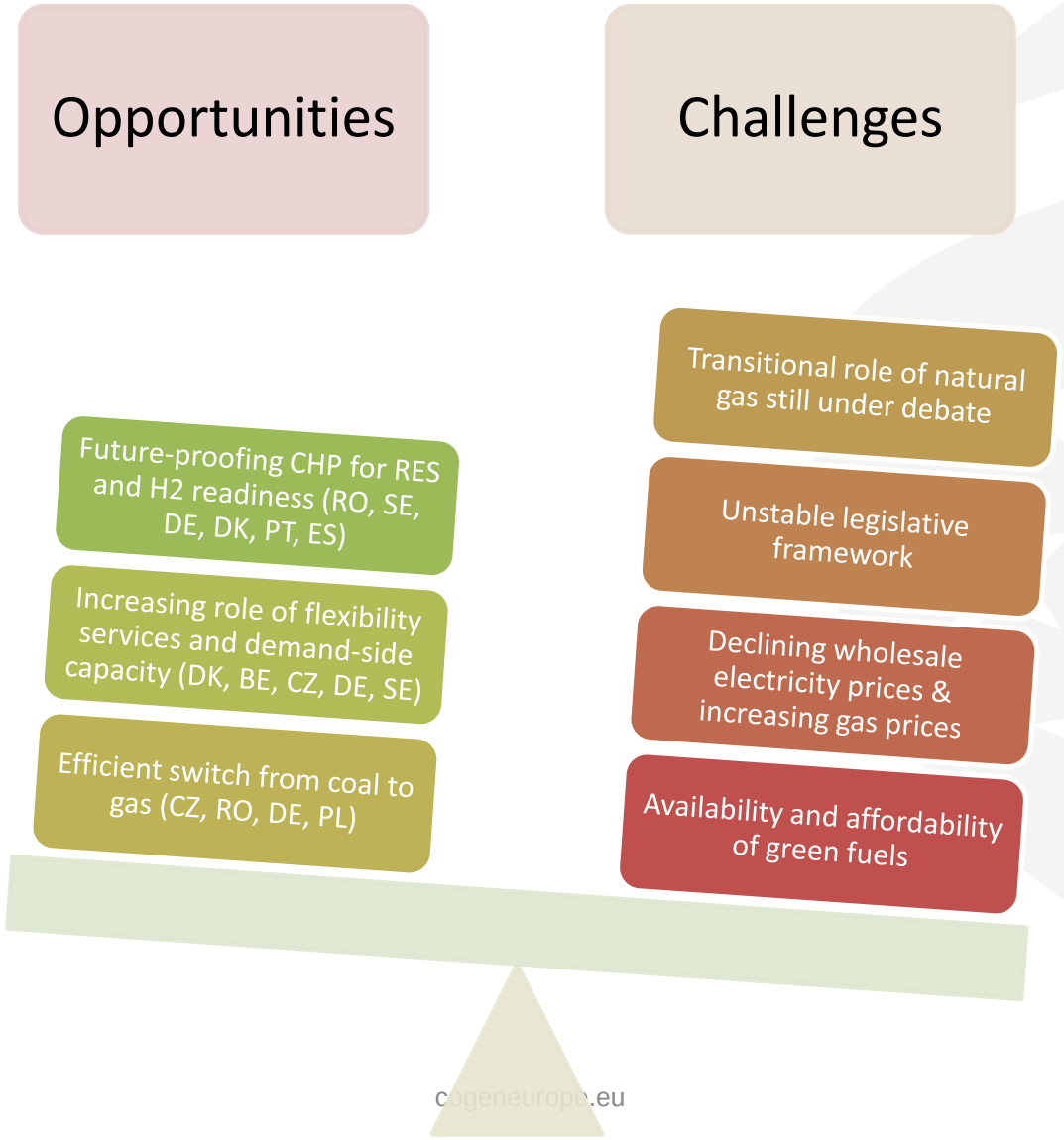
Conclusions

Upcoming opportunities and risks



Factors impacting CHP growth

Political

- Phase out of coal (most MS) & nuclear (DE, BE)
- Transitional role of natural gas, switching from coal (CZ, RO, PL, SI) and to ensure security of supply (SE, DE)
- Push for RES uptake and electrification

Policy

- Support schemes available in most countries
- Uncertain status for gas based CHP for upcoming years
- High administrative burden and complex procedures

Markets

- Uncertainty over volatile and increasing energy prices
- High retail electricity prices supporting the customer case for CHP (BE, CZ, DE)
- Declining wholesale power prices eroding competitiveness of CHP (DK, SE)
- Availability and affordability of green fuels for CHP
- Increasing demand for system adequacy and flexibility services

Upcoming EU legislation

- Energy Efficiency Directive Revision
- Energy Performance of Buildings - Revision
- Energy Labelling of Space Heaters – Revision
- Extension of ETS to buildings
- Green Gas Package
- EU Taxonomy

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