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# La transizione del mercato energetico europeo

corso del prof. Lorenzo De Vidovich

SOCIETA', TERRITORIO E TRANSIZIONE  
ENERGETICA

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# Energy and markets: why?

- Is there a good connection between the energy sector and markets?
- Why introducing competition in energy supply?
- The market failure in energy: goods vs service, security of supply, long term investments, strategic input, ...
- Public owned companies can be efficient? Do they pursue an economic target?

# Energy and markets

- The idea to introduce competition in the energy market dates back in the '80, when the limits of the vertically integrated monopolies (often state owned) were evident
- The Thatcher-Reagan era spread markets everywhere
- Some technical innovations (ICT, combined cycles, RES ...) made energy supply more controllable
- Chile was the first test, and then the UK, USA, until the EU Directive 1996/92/EC, that liberalised access to the grid, de facto opening to competition
- At the same time, a cleaner energy was demanded, starting in parallel the liberalisation and decarbonisation of the electricity sector
- Independent regulators were created to make a fair playing field
- Consumers had great expectations from the change. Was it worth?

# Market vs hierarchy

- The liberalisation has been carried on first by Nordic countries and the UK; it has been hosted by Latin countries (France first of all), that wanted to keep a PLANNED APPROACH, typical of the idea that electricity supply is a PUBLIC SERVICE.
- FULL LIBERALISATION is oriented to the market, under the conviction that the market can address the resources better than any central planner.
- Under the liberalization the coordination of **hierarchical relationships** inside the vertically integrated industry, is substituted by **contracts** among companies.
- The level of integration can be evaluated by the part of the value chain controlled by a single company.

# Electricity industry's organization models

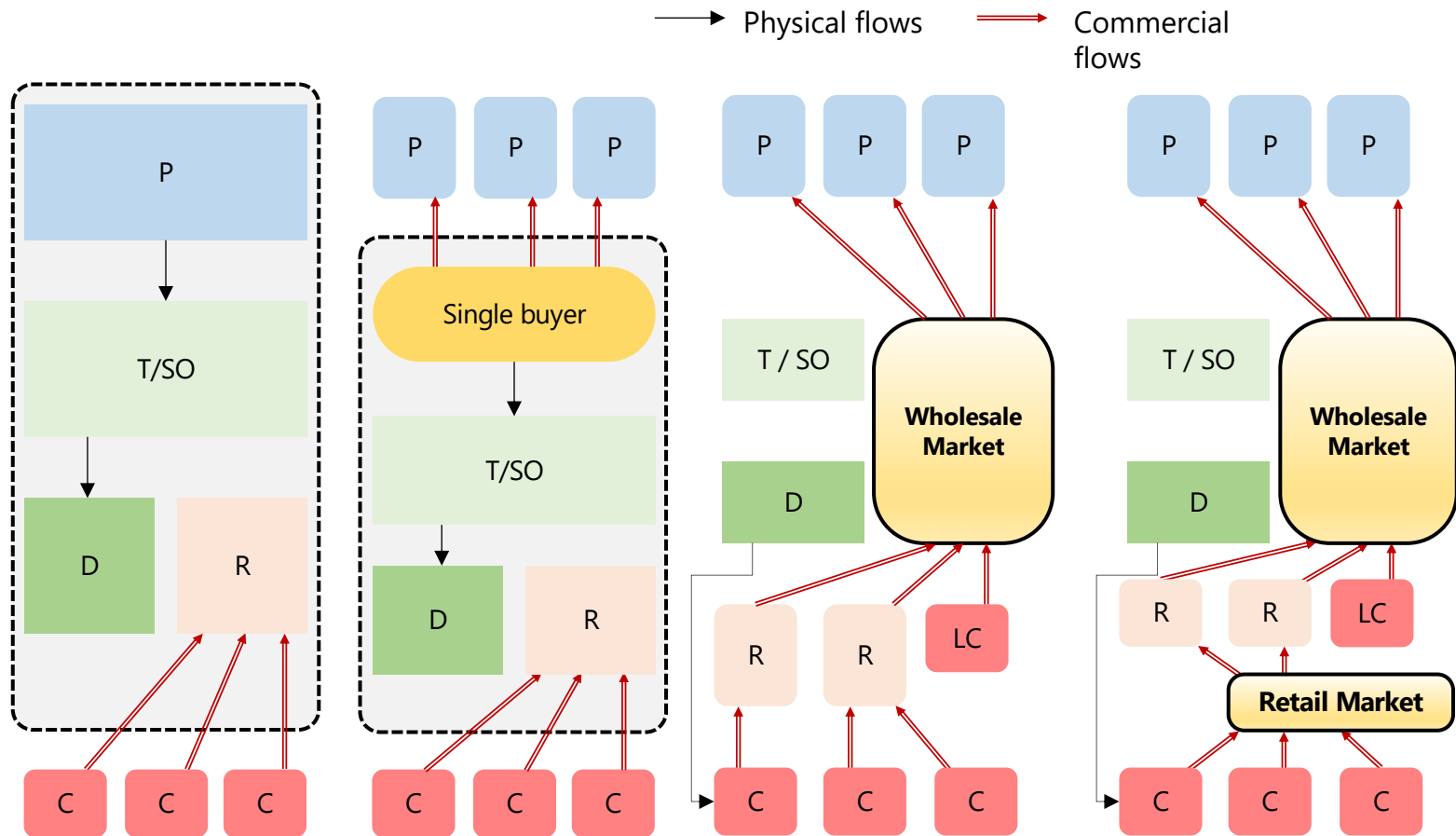
1. Vertically integrated utility,
2. Competition in generation (purchasing agency),
3. Wholesale competition (large consumers have access to the market),
4. Retail competition (market access for all)

Market's  
condensibility



The combination of structure, rules, property changes in time according to the targets of the State/regulator

# Electricity industry's organization models



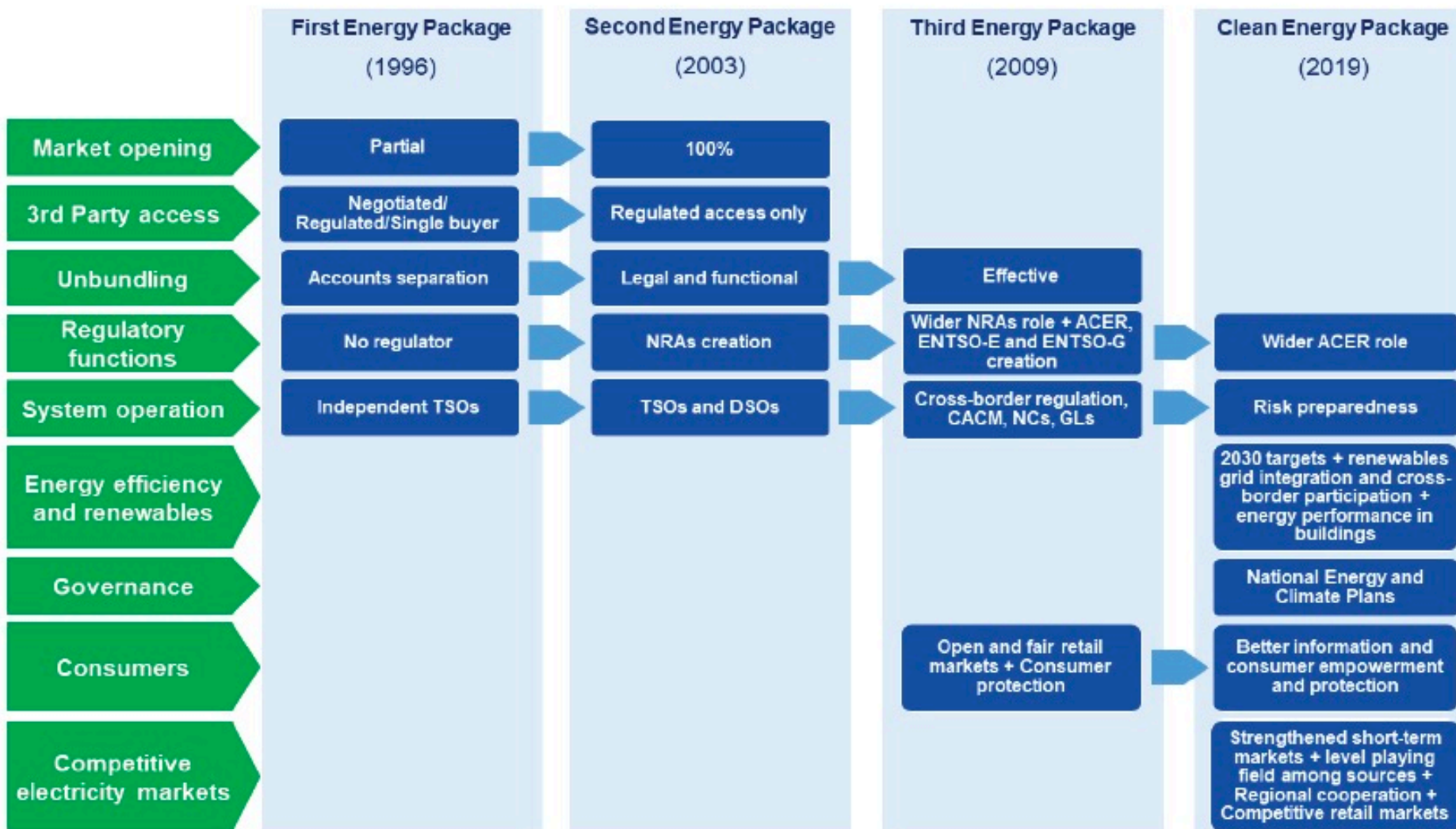
P=Production T/SO=Transmission and System Operation D=Distribution R=Retailing C=Consumer LC=Large Consumer

**Retail market:** the equilibrium in a wholesale market is intrinsically unstable, any threshold can be discussed and is rapidly discarded. The markets evolve fast towards full liberalisation.

# The path in Europe and Italy

- Different visions about liberalisation were proposed during the '80 and they found a compromise with the Directive 96/92/CE (1996) that gave free access to the transmission grid (free trade). In practice, it opened the market to some consumers.
- The process went ahead with Directive 2003/54/CE that stated free purchase for all consumers from July 2007 and the following Directive 2009/72/CE, that reinforces the process of grid opening (third liberalization package). The present rules come from Directive 2019/944/EU
- Recent steps in Europe are made with Clean Energy for All Europeans in 2019, Fit for 55 in 2021 and RepowerEU in May 2022

**Figure 7: Evolution of EU energy legislation to build the market and support the clean energy transition**



Source: ACER elaboration.



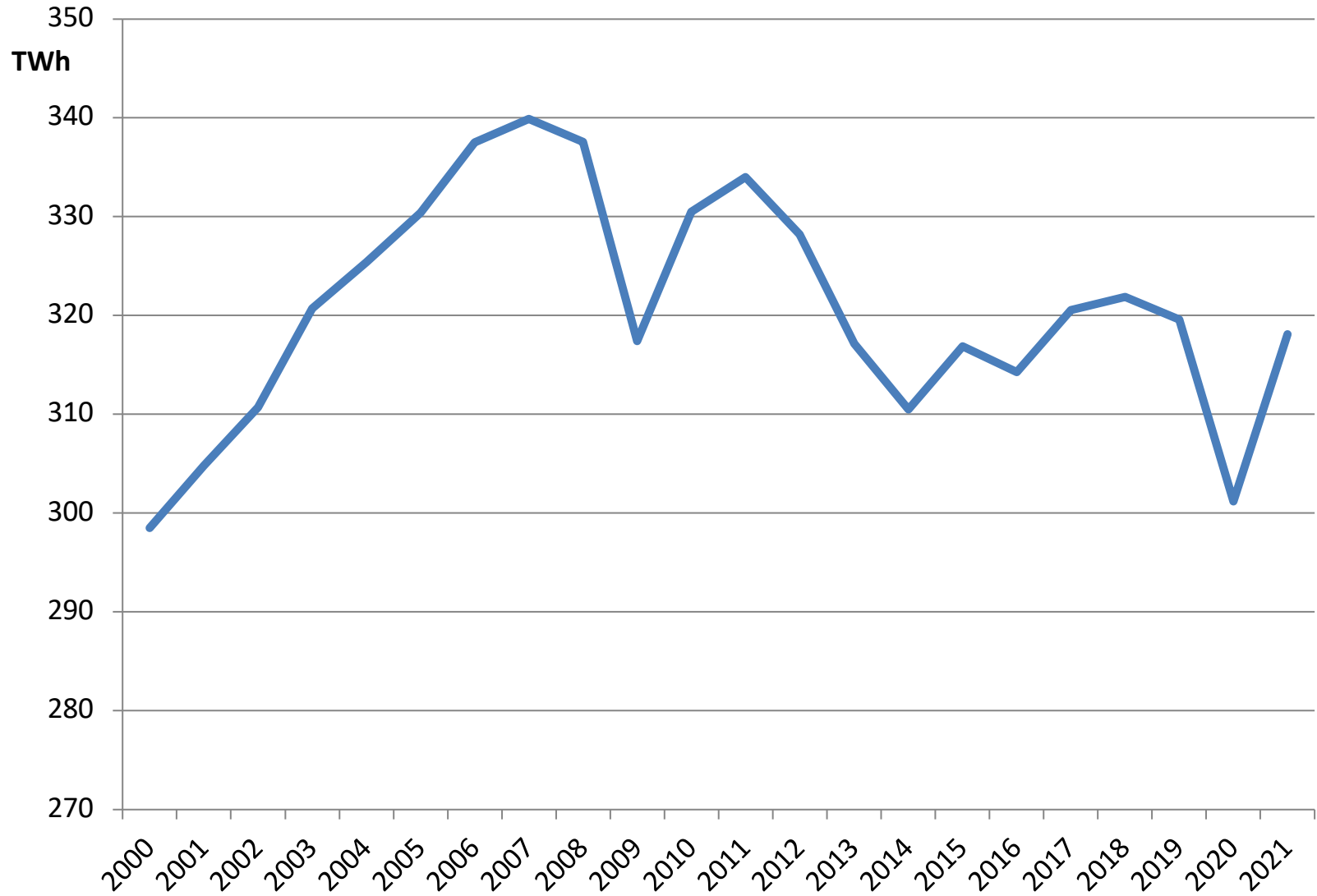
# Clean energy for all Europeans package

	European Commission Proposal	EU Inter-institutional Negotiations	European Parliament Adoption	Council Adoption	Official Journal Publication
Energy Performance in Buildings	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>17/04/2018</u>	<u>14/05/2018</u>	<u>19/06/2018 - Directive (EU) 2018/844</u>
Renewable Energy	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>13/11/2018</u>	<u>04/12/2008</u>	<u>21/12/2018 - Directive (EU) 2018/2001</u>
Energy Efficiency	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>13/11/2018</u>	<u>04/12/2018</u>	<u>21/12/2018 - Directive (EU) 2018/2002</u>
Governance of the Energy Union	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>13/11/2018</u>	<u>04/12/2018</u>	<u>21/12/2018 - Regulation (EU) 2018/1999</u>
Electricity Regulation	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>26/03/2019</u>	<u>22/05/2019</u>	<u>14/06/2019 - Regulation (EU) 2019/943</u>
Electricity Directive	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>26/03/2019</u>	<u>22/05/2019</u>	<u>14/06/2019 - Directive (EU) 2019/944</u>
Risk Preparedness	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>26/03/2019</u>	<u>22/05/2019</u>	<u>14/06/2019 - Regulation (EU) 2019/941</u>
ACER	<u>30/11/2016</u>	<u>Political Agreement</u>	<u>26/03/2019</u>	<u>22/05/2019</u>	<u>14/06/2019 - Regulation (EU) 2019/942</u>

# Recent policy EU policies for energy

- ✓ Proposal for a Council Regulation laying down a framework to accelerate the deployment of renewable energy (COM/2022/591) 9/11/2022)
- ✓ REPowerEU plan (COM(2022) 230)
- ✓ Recommendation on speeding up permit-granting and PPAs (COM/2022/3219)
- ✓ Proposal for amending the directives on Renewable Energy, Energy Efficiency and Energy Performance of Buildings (COM/2022/222)
- ✓ Speeding up permit-granting and PPAs (SWD/2022/149)
- ✓ Interim study report: Technical support for RES policy development and implementation (May 2022)
- ✓ REPowerEU: Joint European Action for more affordable, secure and sustainable energy (COM/2022/108)

# Electricity demand in Italy 2000 – '21

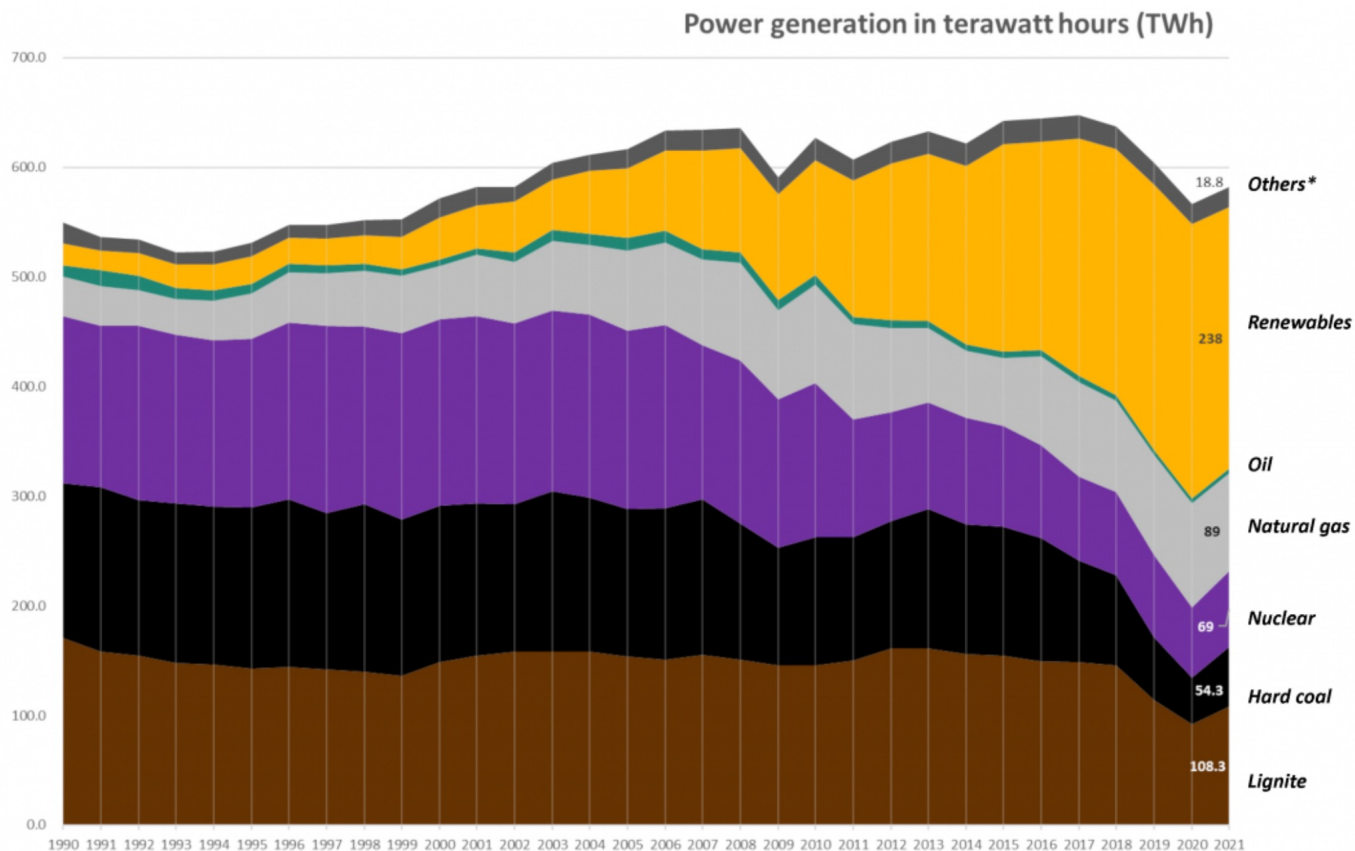


Electricity demand is flat in EU countries. But electrification could soar demand...

# Germany: a similar trend in electricity demand

## Gross power production in Germany 1990 - 2021, by source.

Data: BDEW 2021, data preliminary.

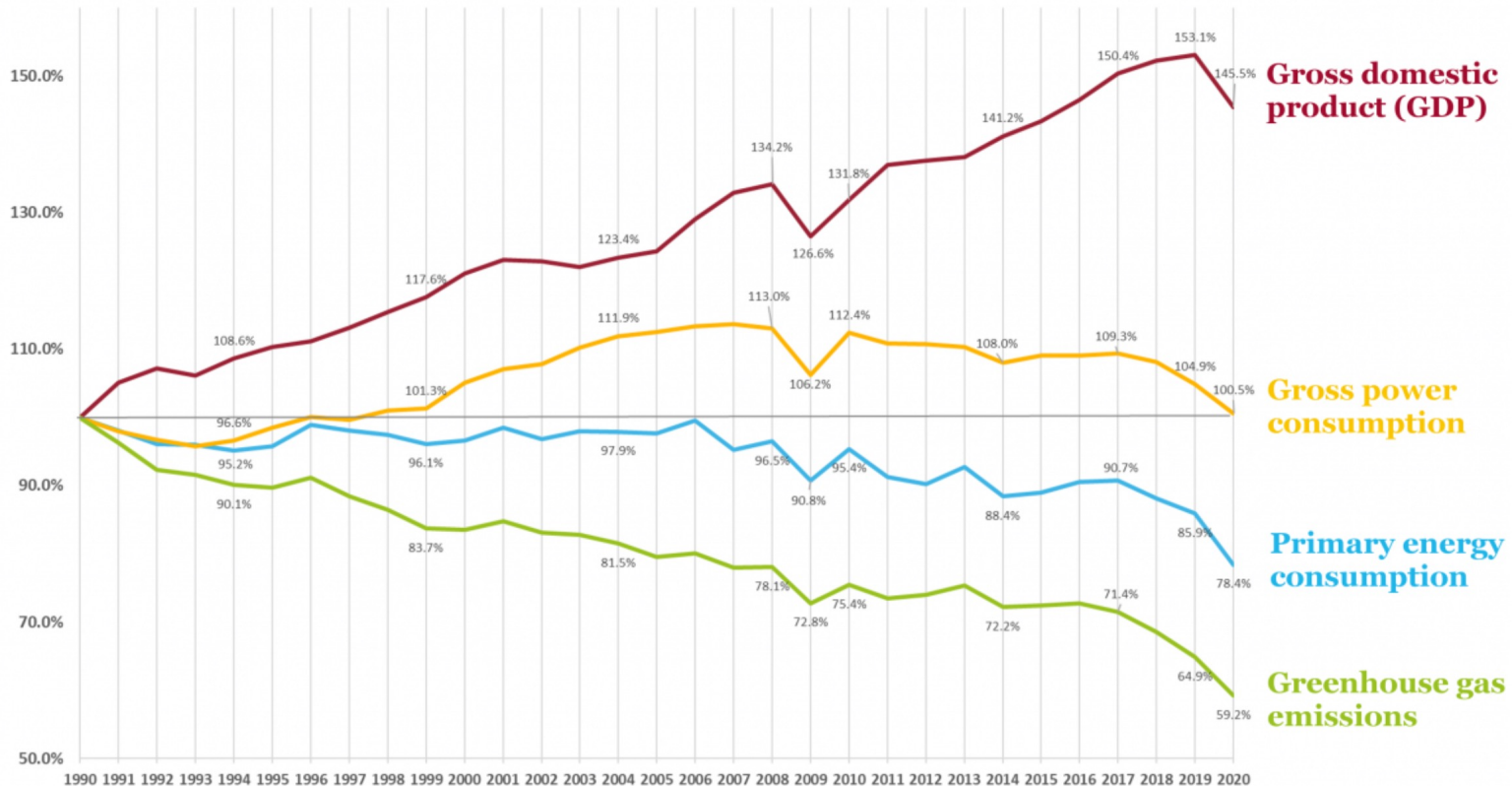


\* Without power generation from pumped storage.

# But the trend in Germany is interesting

## Economic growth, power & energy consumption, GHG emissions 1990 - 2020.

Data: BMWi 2021, UBA 2021.

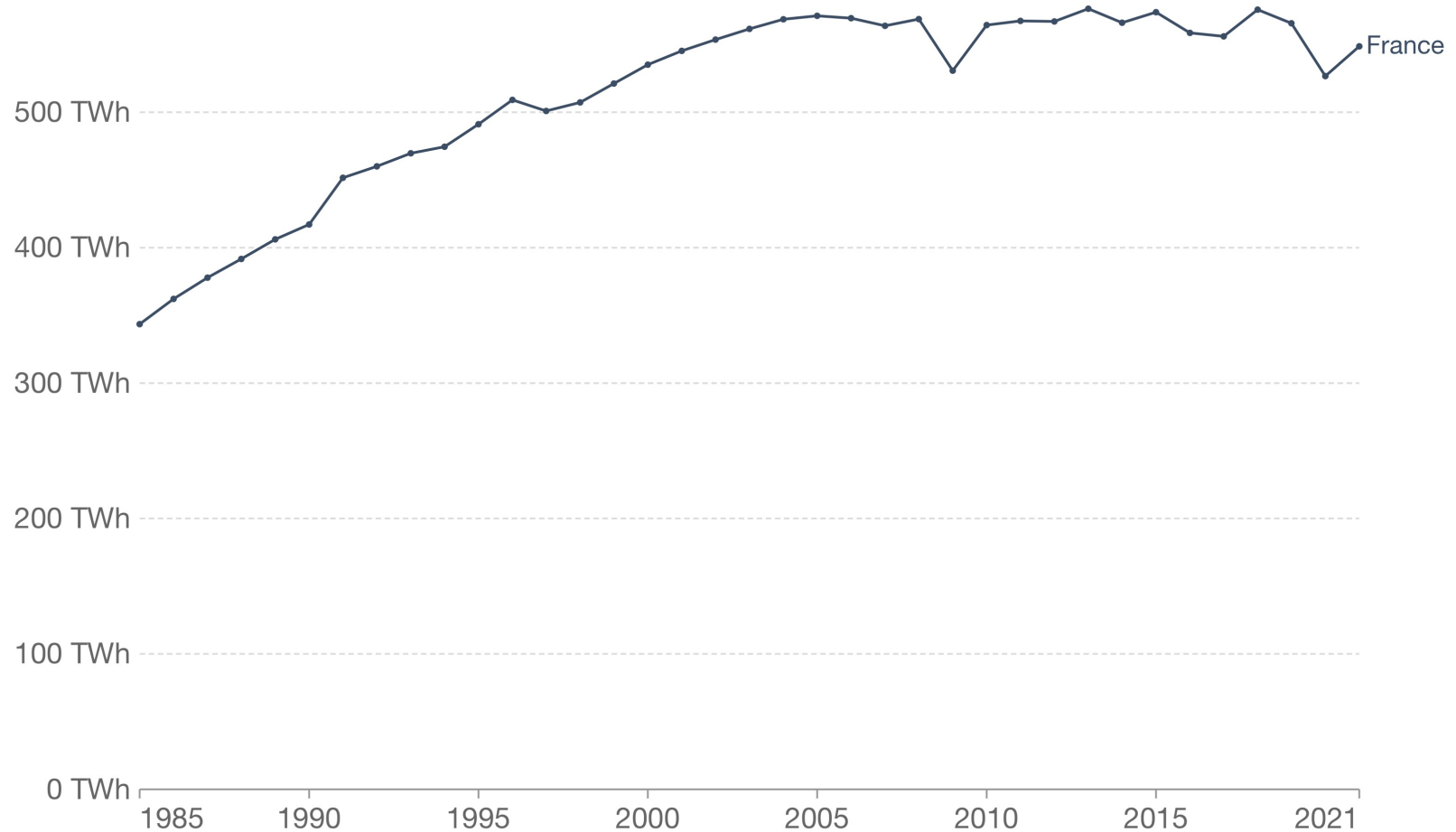


Note: As a general rule, emissions data for the last year shown can be expected to be preliminary.

# And in France as well

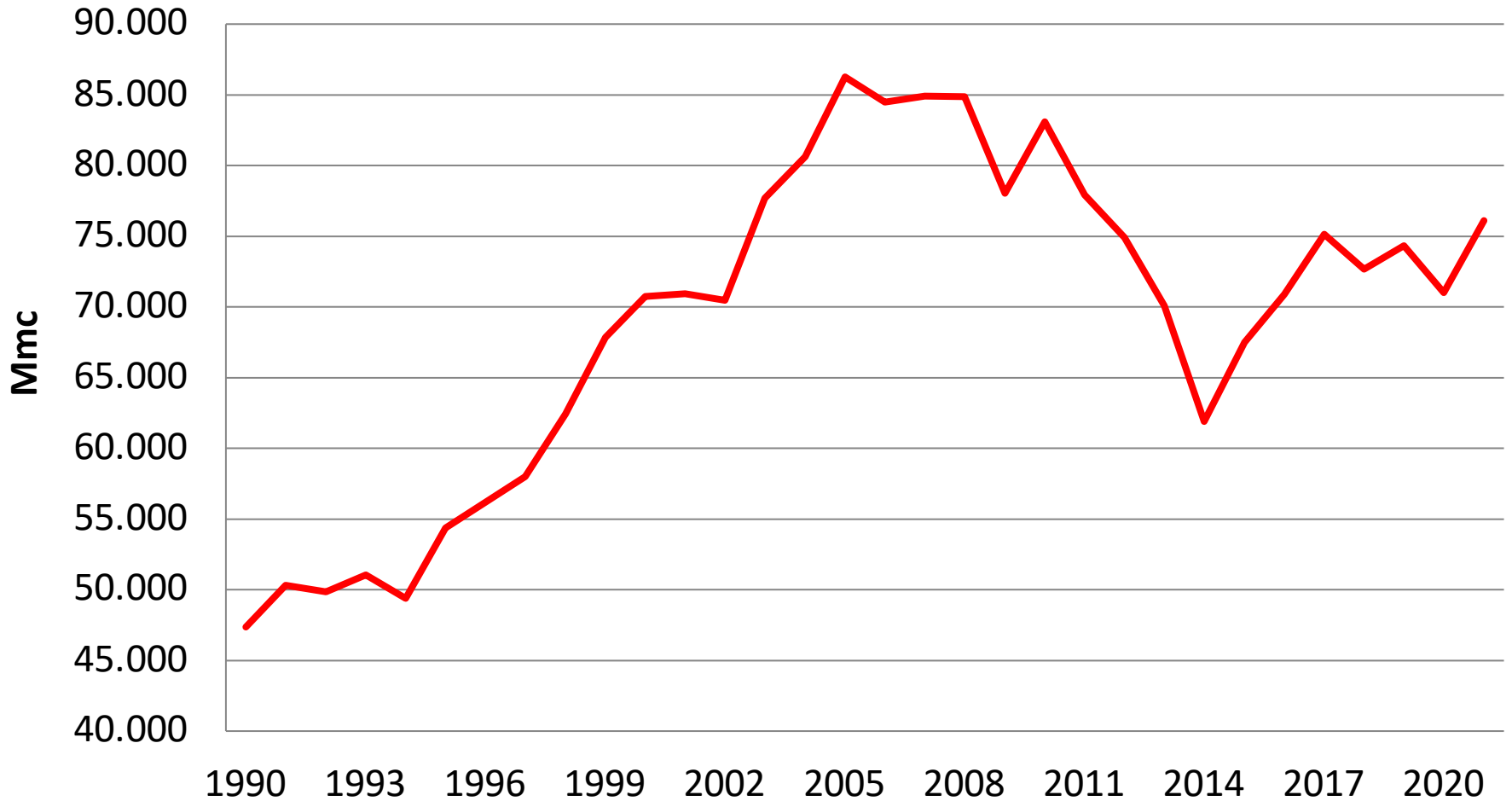
## Electricity generation

Our World  
in Data



Source: Our World in Data based on BP Statistical Review of World Energy, Ember Global Electricity Review (2022) & Ember European Electricity Review (2022)  
OurWorldInData.org/energy • CC BY

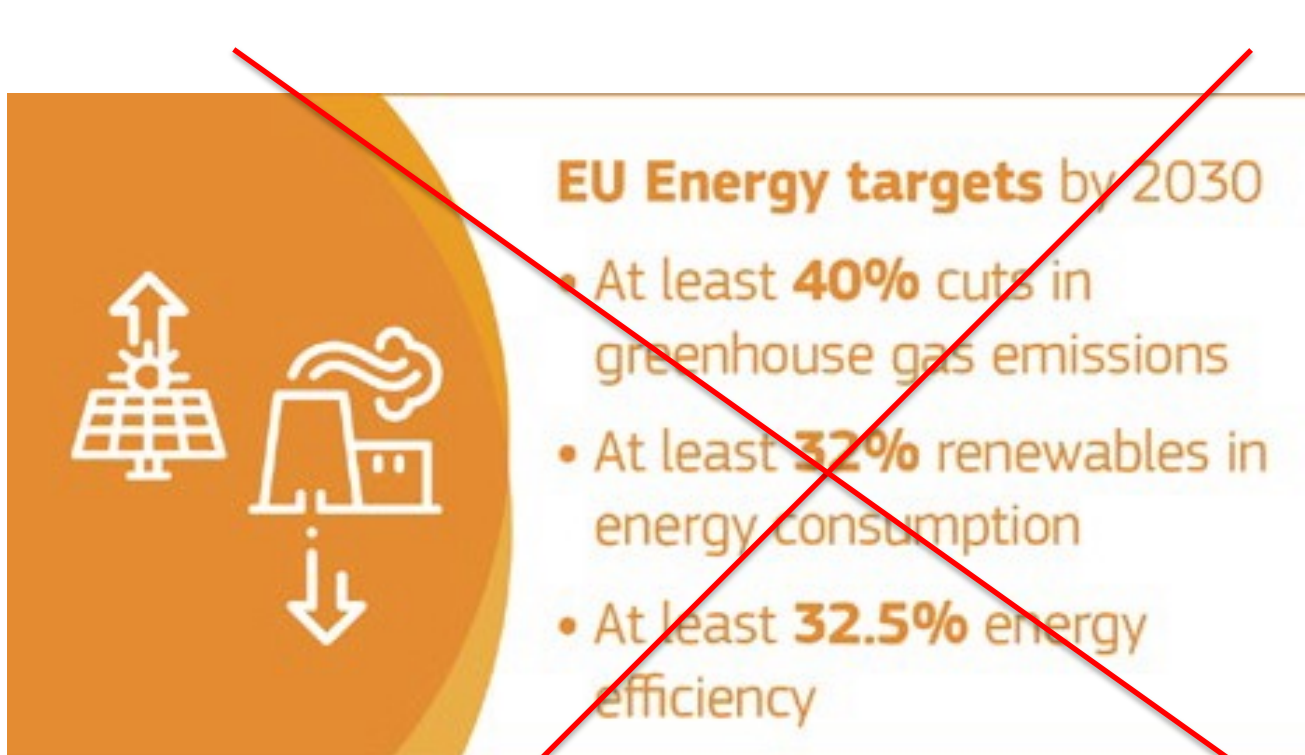
# Not only electricity: Italian gas consumption



Variazione attesa nel 2022: -9%, in ottobre 2022 – 25%

# Europe moved first with the Clean Energy Package then with Repower EU

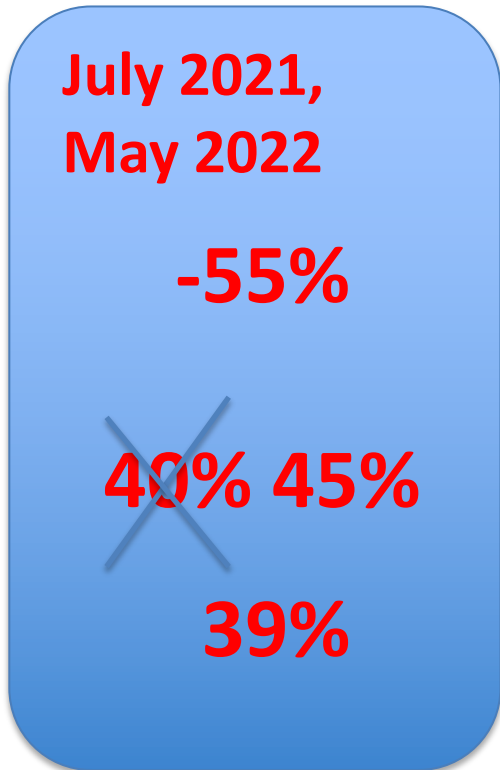
The EU was one of the first to move on clean energy: it was the first major power in the world to set ambitious energy and climate targets for 2020 in 2009 (20% reduction in greenhouse gas emissions, 20% in renewable energy and 20% in energy efficiency). The 2020 target has been met and the EU is on track to reach new targets for 2030, showing that it is possible to reduce emissions and at the same time achieve GDP growth.



**EU Energy targets by 2030**

- At least **40%** cuts in greenhouse gas emissions
- At least **32%** renewables in energy consumption
- At least **32.5%** energy efficiency

The graphic includes icons for solar panels, a factory with smoke, and arrows indicating energy flow. A large red 'X' is drawn over the entire graphic.



**July 2021,  
May 2022**

**-55%**

~~40%~~ **45%**

**39%**

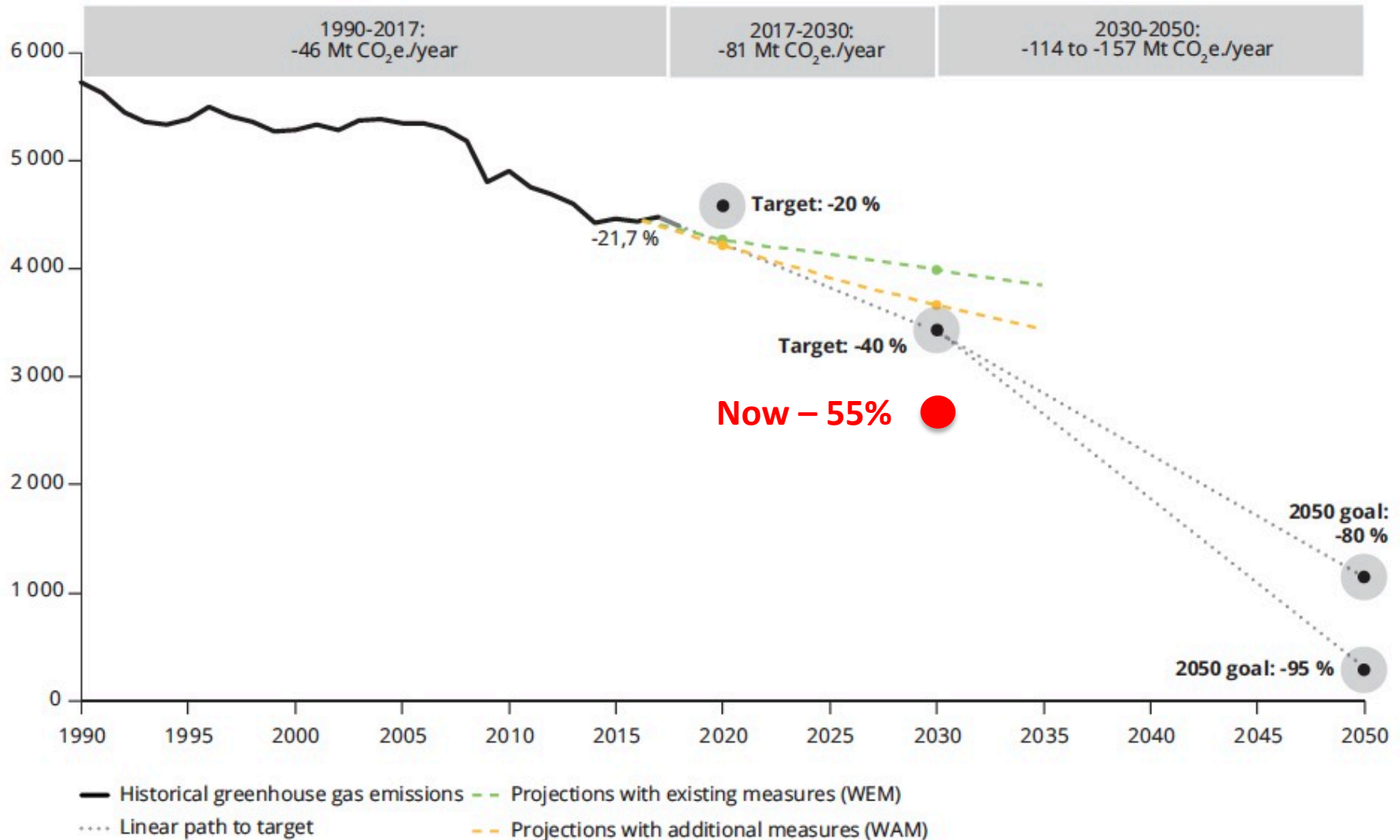
A blue rounded rectangle containing updated target information. The text is in red. A blue 'X' is drawn over the '40%' and '45%' values.



# EU targets at 2050: CO<sub>2</sub> emissions

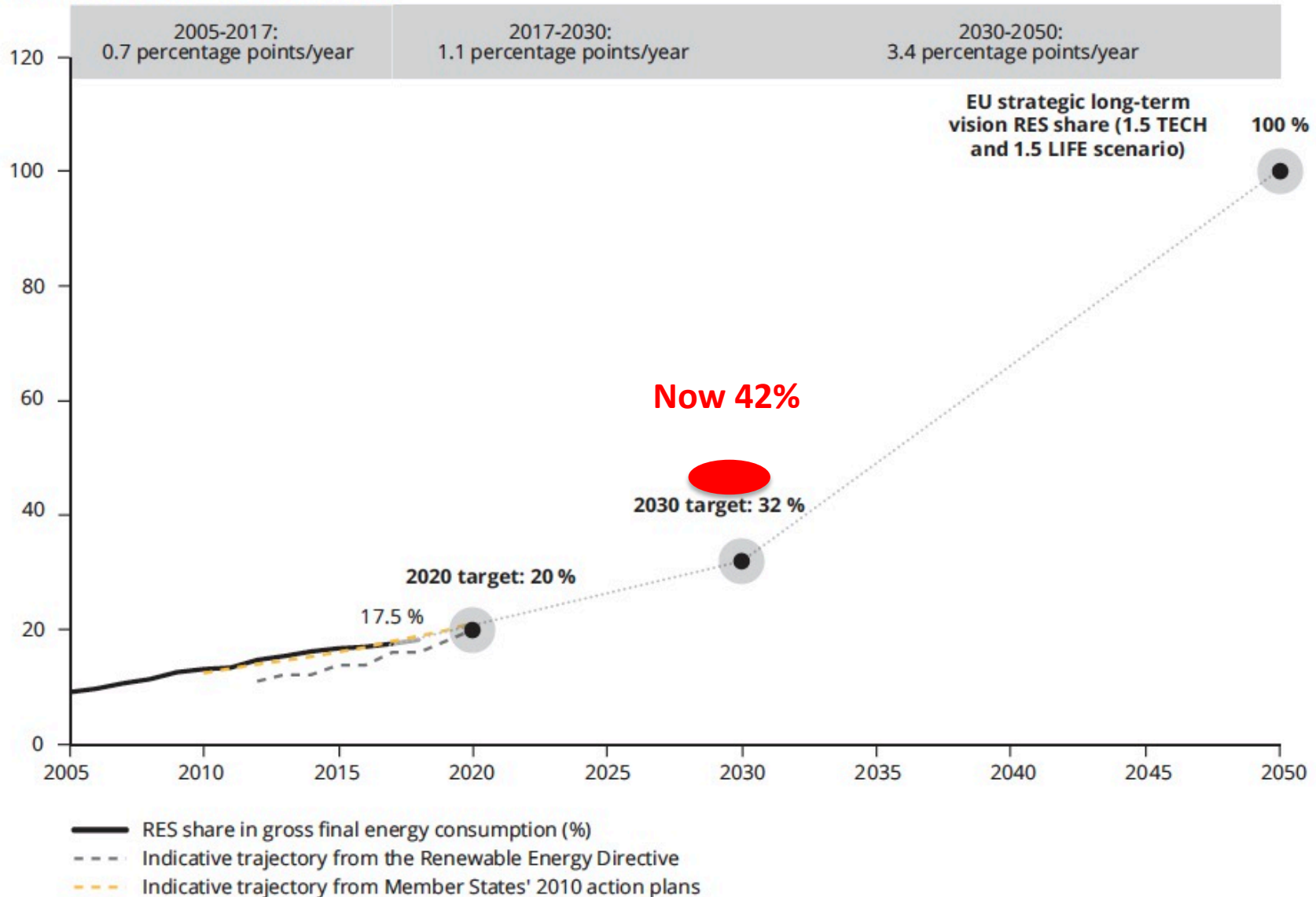
Source: EEA

Million tonnes of CO<sub>2</sub> equivalent (Mt CO<sub>2</sub>e)



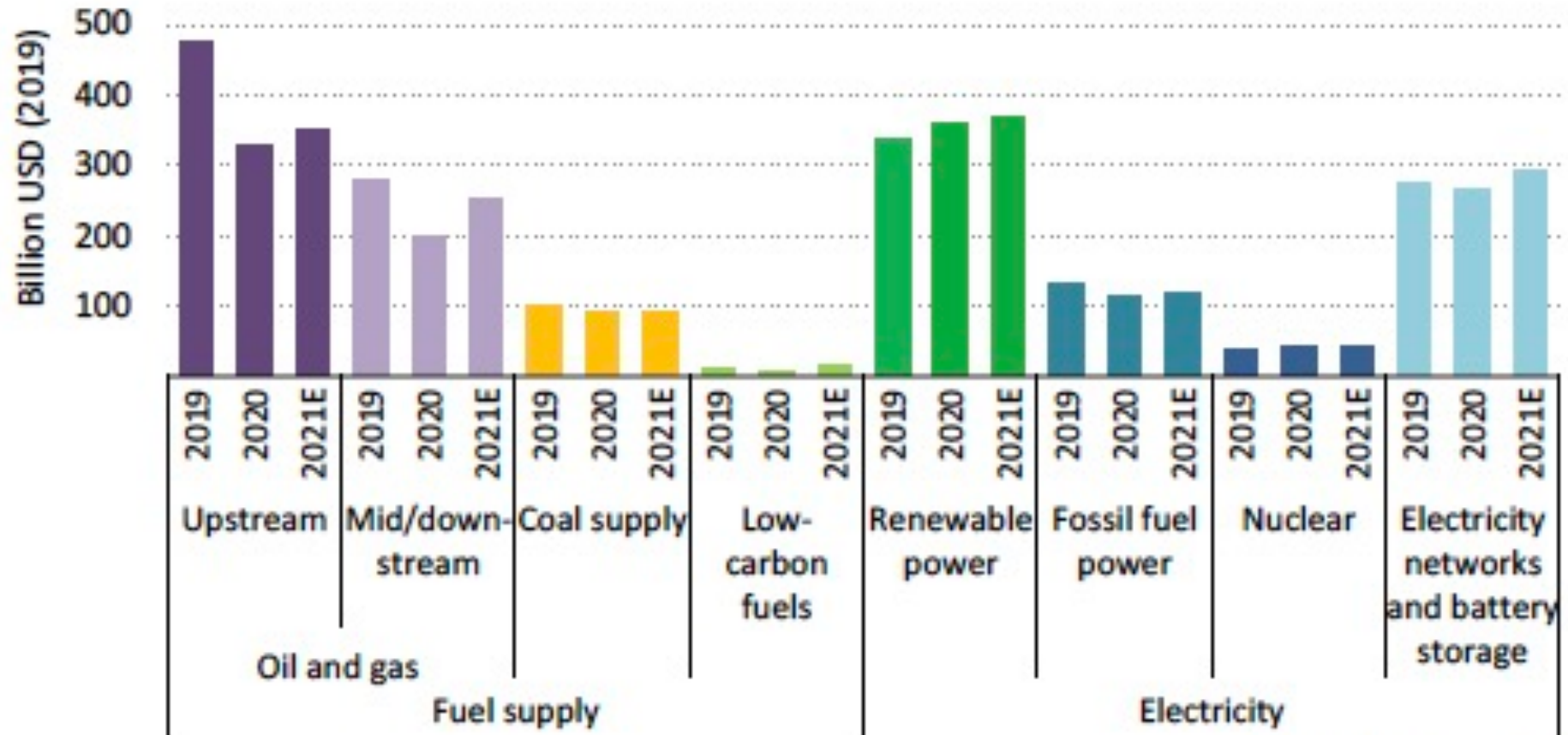
# The growth of renewable sources in EU

RES shares in gross final consumption (%)



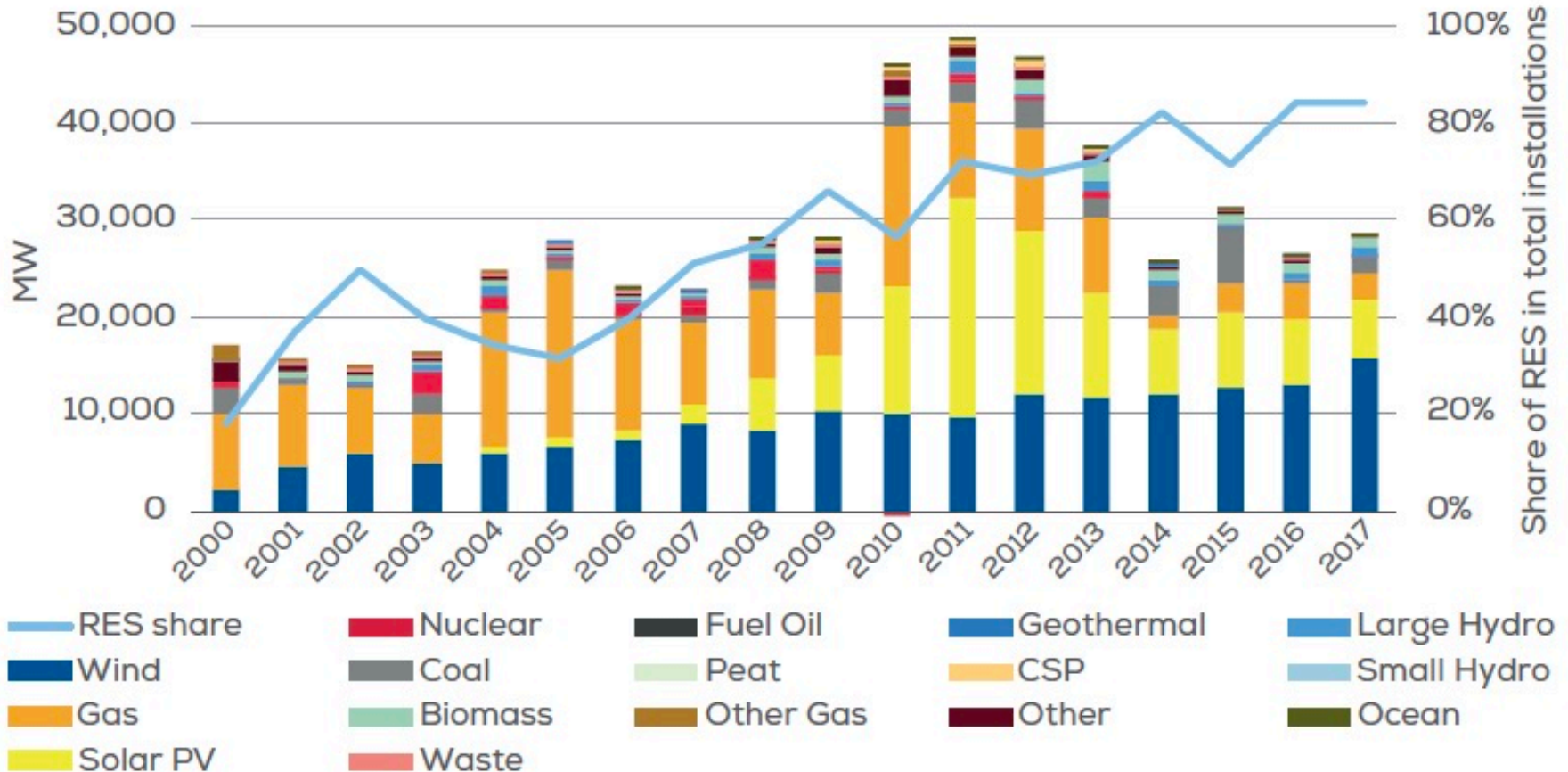
# Investments in energy in the world

Global energy supply investment by sector



# New capacity in EU

Annual installed capacity and renewable share

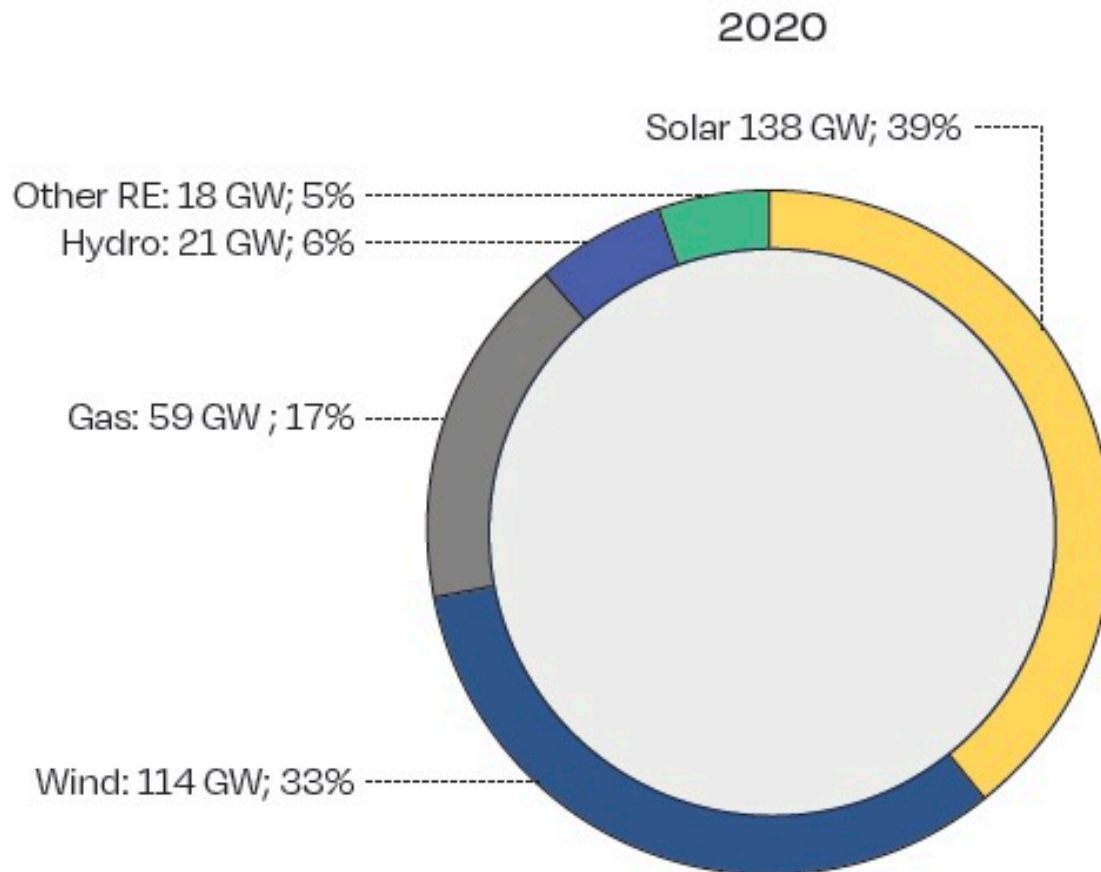


Source: WindEurope

New target for EU in 2030: 42% of energy demand for RES

# Where do they invest?

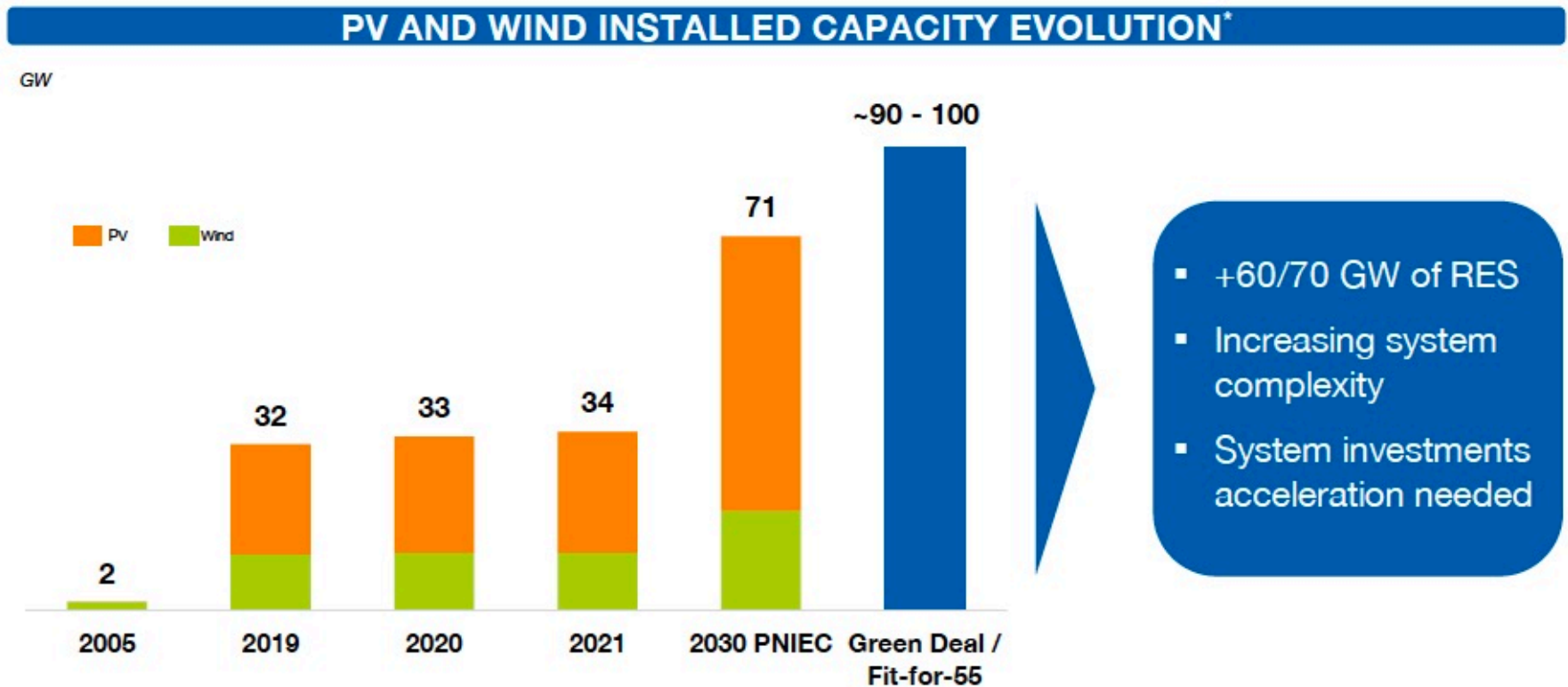
FIGURE 1 NET POWER GENERATING CAPACITY ADDED IN 2020 BY MAIN TECHNOLOGY



Source: Solar power Europe

# The trend of this decade: renewables

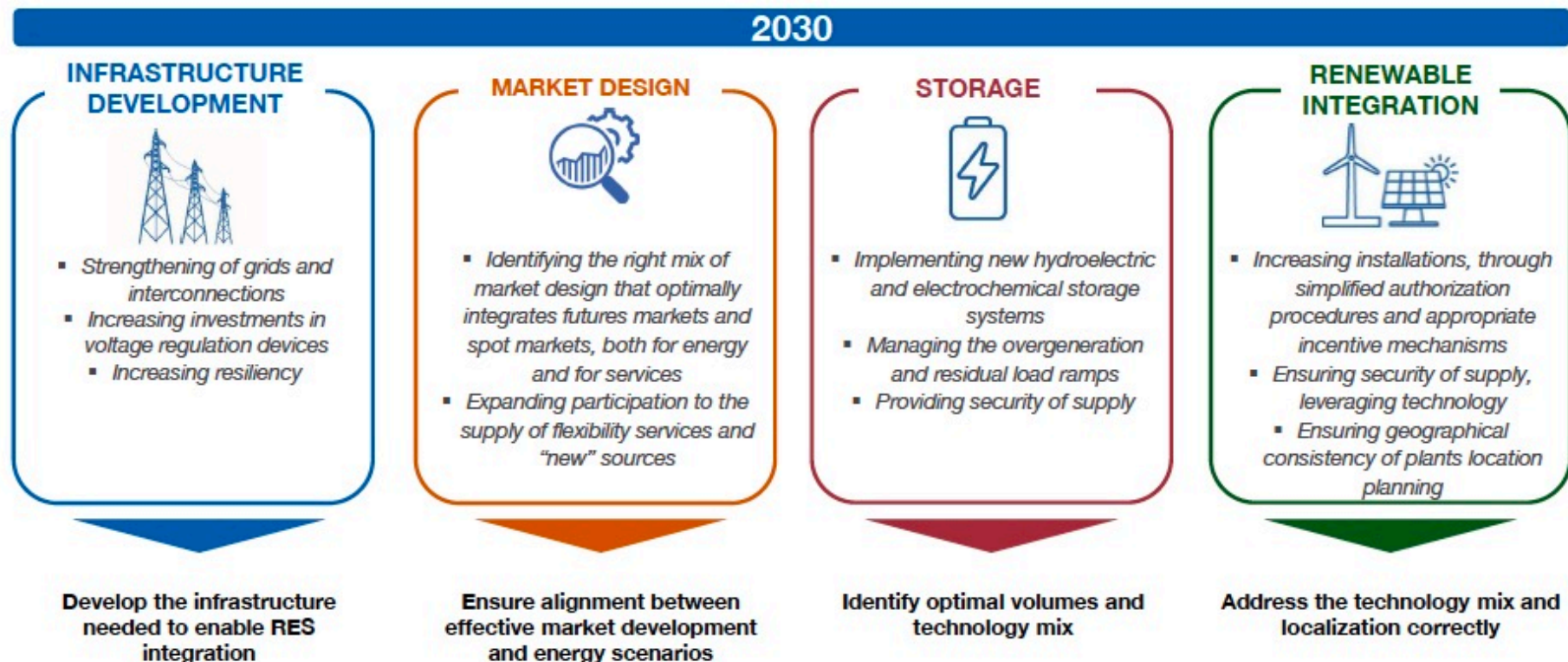
RES Evolution in Italy



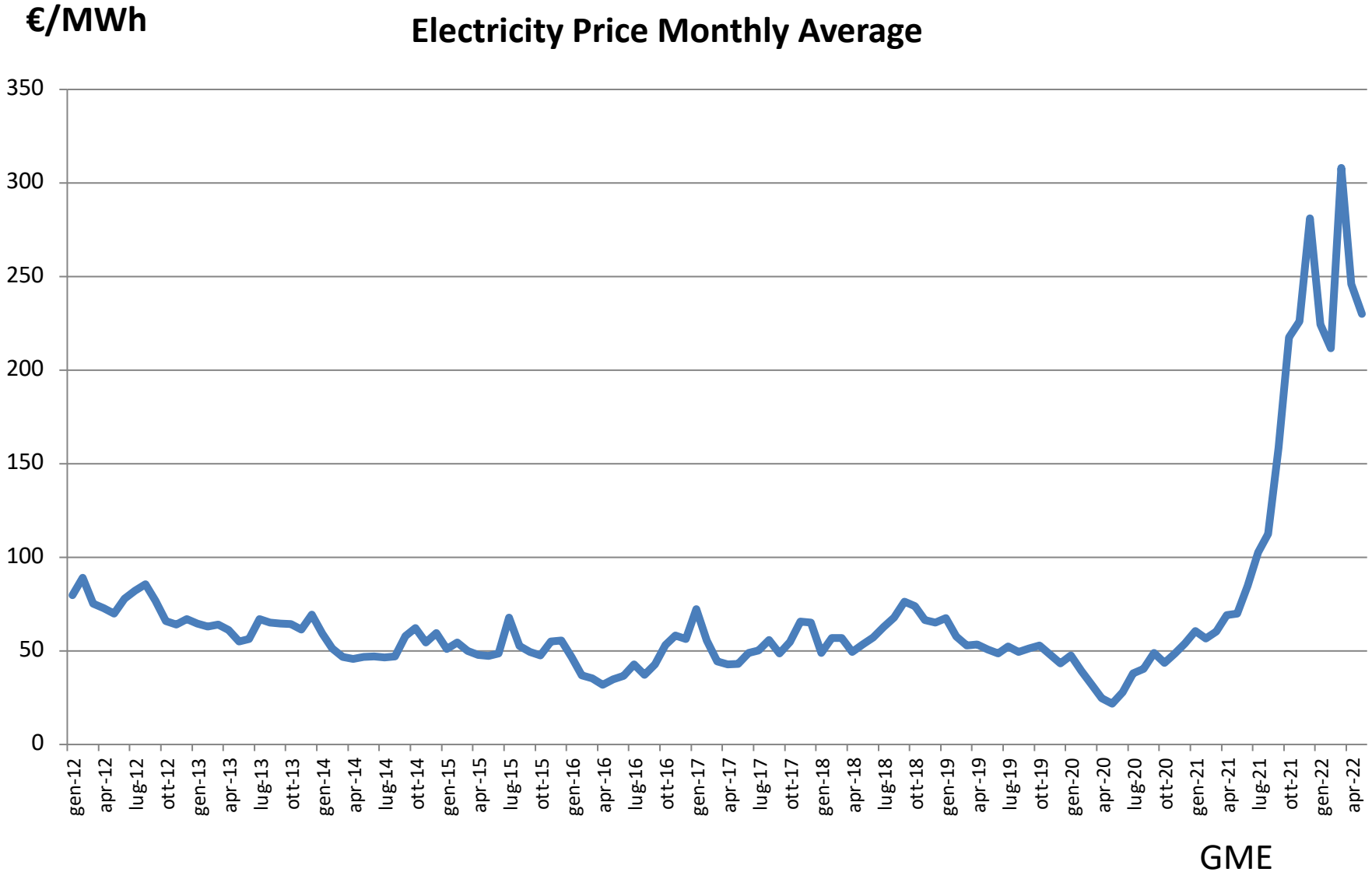


# The transformation of the power system

System Strategy towards Energy Transition



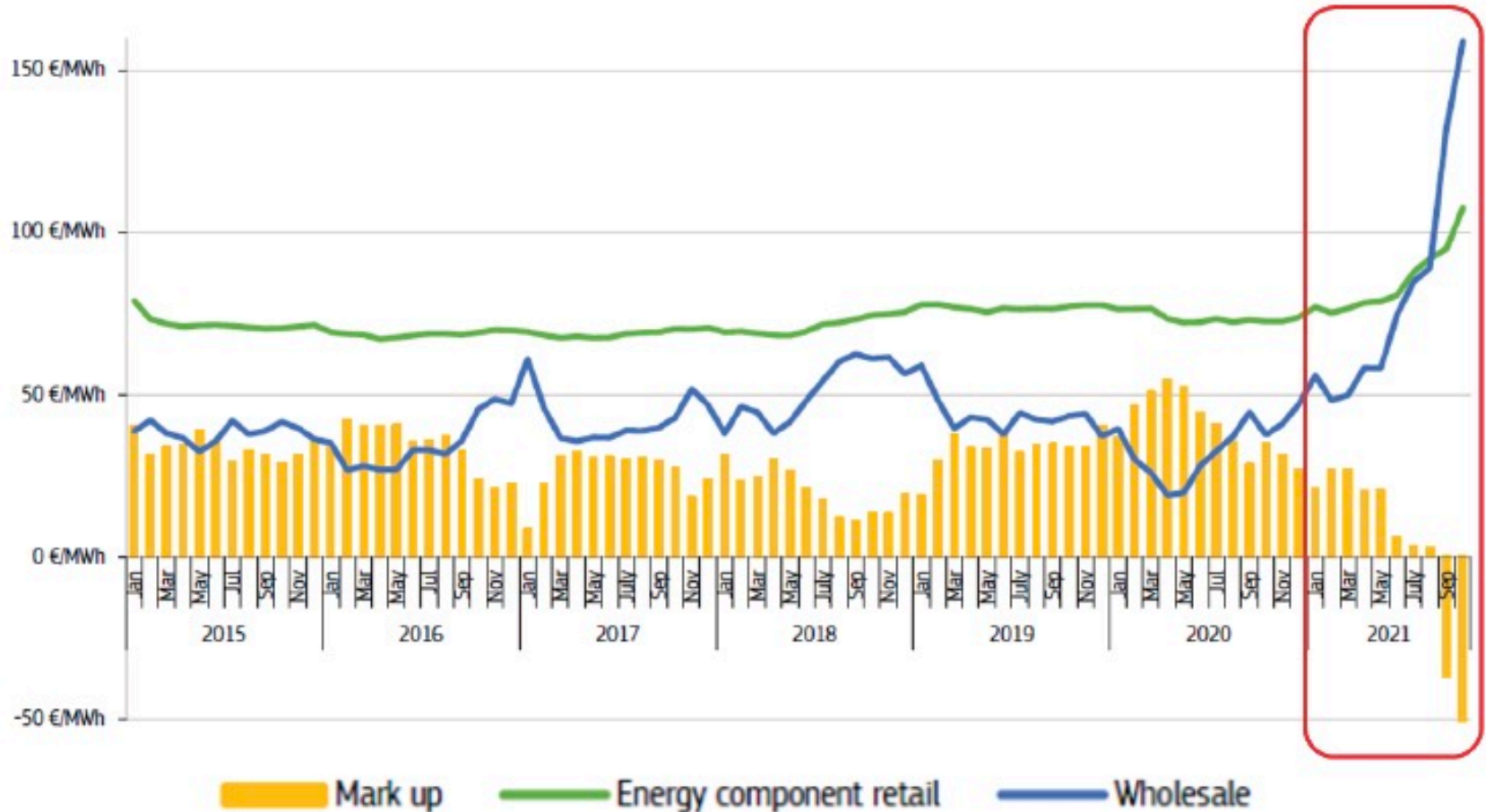
# But the market has its drawback! Italian electricity prices: crazy!





# Crazy prices, negative profits

**Figure 33:** European wholesale and retail electricity component prices (EUR/MWh) (2015 – 2021)



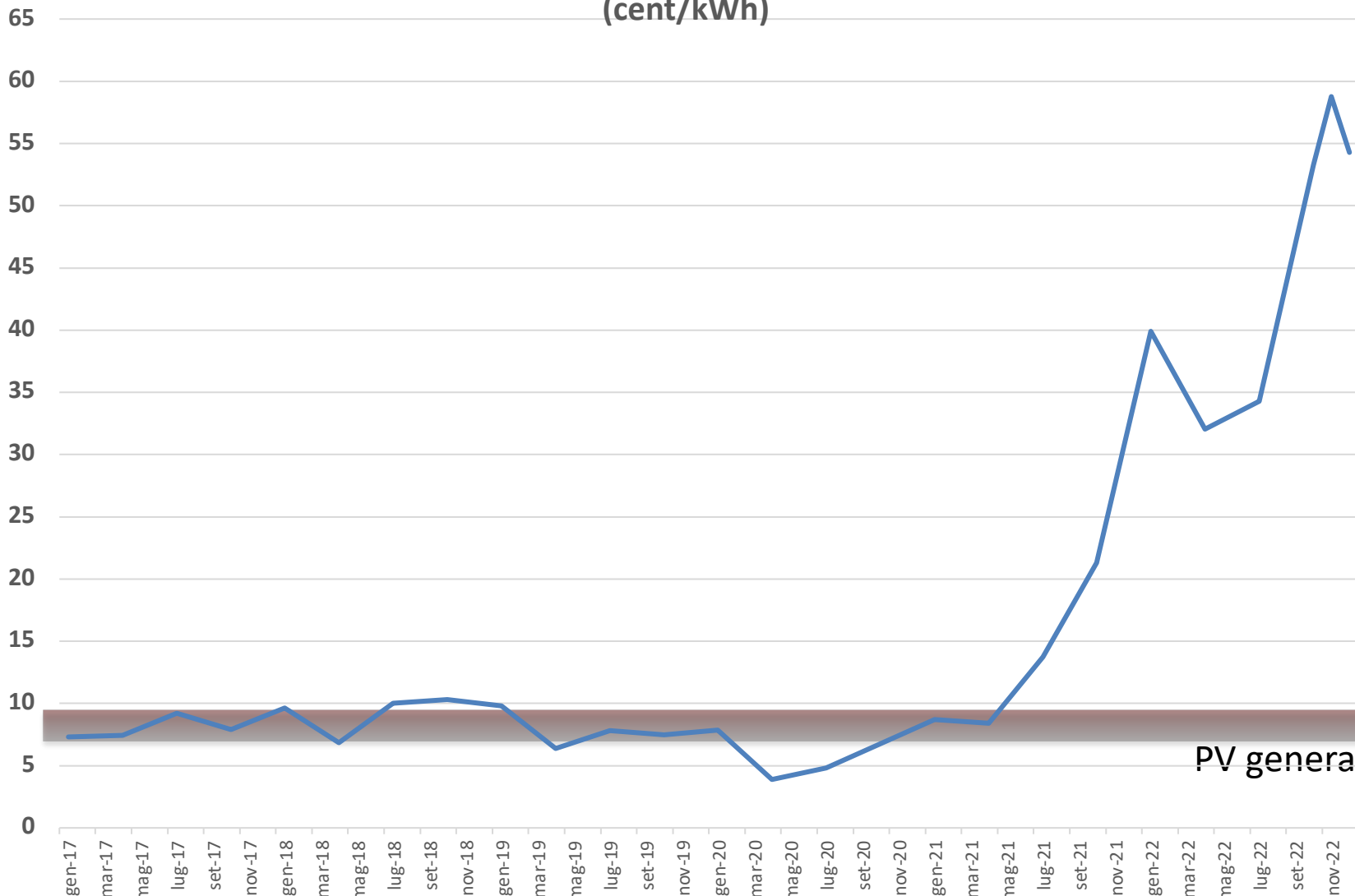
Source: European Commission: '[Quarterly Report on European Electricity markets Q3 2021](#)'.

Source: ACER

# Electricity Prices for commercial users

c€/kWh

Componente energia F1 consumatore non domestico 10- 15 kW  
(cent/kWh)



PV generation cost

# The electricity industry paradigm is changing

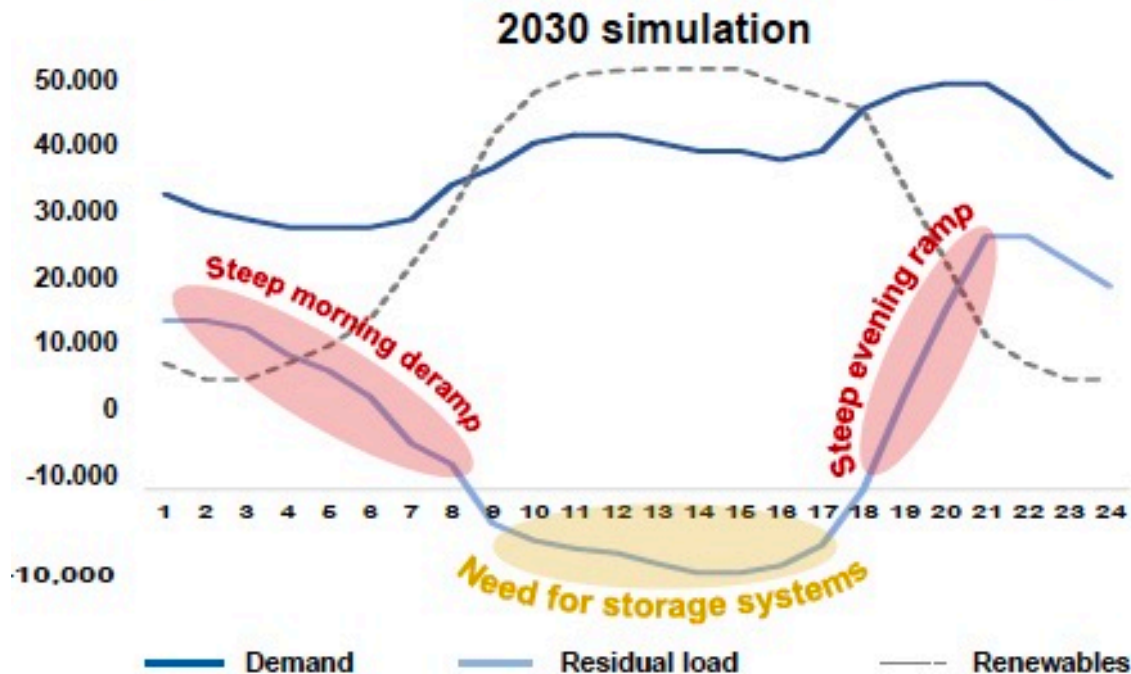
- Fading scale economies
- Cost reduction of renewable energies
- Availability of low cost control technologies

All these factors are changing permanently the technological pattern of the electricity industry, moving away from a vision of large, integrated, (monopolistic) utilities, towards a distributed system, with many investors, local energy

- Disruptive factors are not environmental or political, are economic

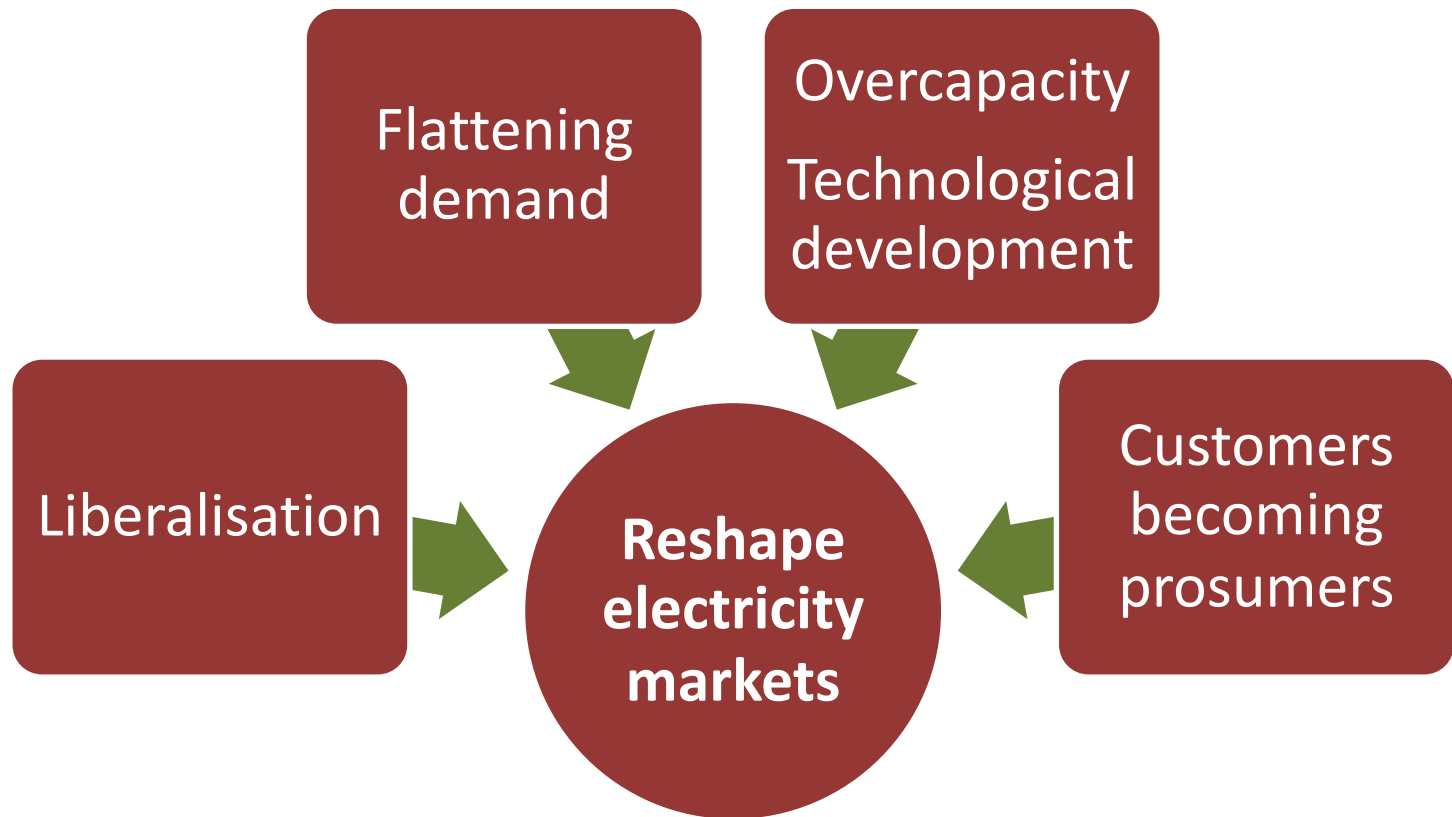
# New challenges for system operators

## Consumption and 'residual load' curves



Increased need of **flexible resources** (gas-fired turbines, pumped hydro storage and batteries, industrial & households demand response, interconnectors, active grid management, e-vehicles, power-to-gas, power-to-heat, etc.), **and market options** to unlock flexibility.

# Energy transition in on the way



The traditional **low-cost volume-based** business model for electricity generated by **large centralised plants** with **limited customer engagement** and **standardized supply contracts** is not profitable anymore.

# From electricity supply to energy services

- Many utilities are leaving the business of electricity supply, that gives very low margins, to move towards the offer of energy services
- Energy efficiency is becoming a business for many companies that have higher profits in selling equipment and services, instead of simply supplying fuel and electricity:
  - Small cogeneration, digital control, led lighting, new motors.... are installed without costs, but locking the customers for long periods

# Investments on supply vs demand side

- In the electricity sector it is not always convenient supplying energy at any cost, following demand.
- Investing on demand side can be less expensive and bring long term advantages.
- A **responsive demand** can be the next big change: a real time Uber of electricity is not wishful thinking (see [www.enelx.com](http://www.enelx.com)) ....

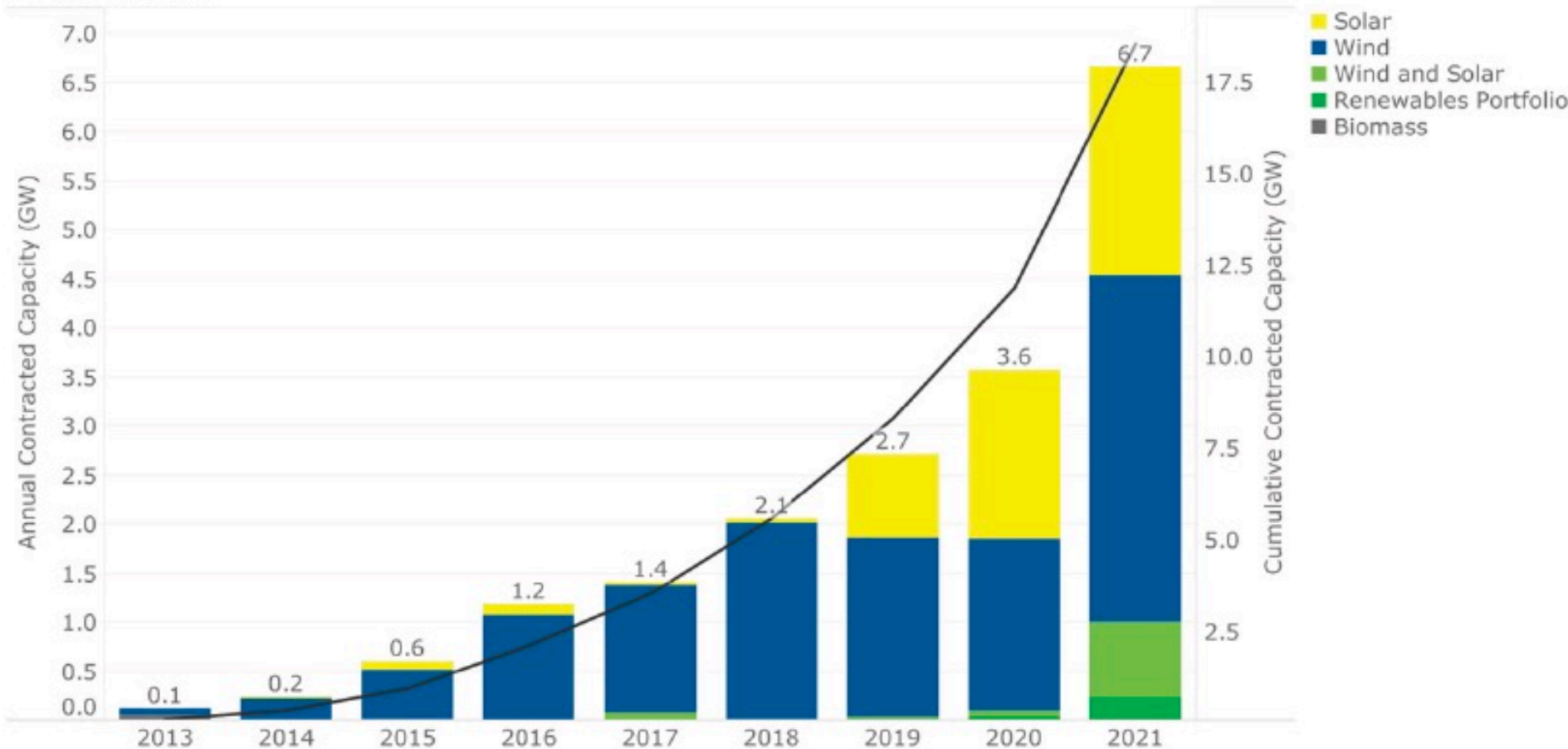
# New sources, new market design

- The electricity markets have been designed under a strong presence of fossil fuel based power stations, with the cost minimisation based on the merit order and the system marginal clearing price (MCP) principle.
- With the growing penetration of renewable energy generation, with a nihil marginal cost, is it still the MCP the best market design?
- Wind, solar, running hydro bid @zero in the market and prices go negative
- Power Purchase Agreements could be an answer?
- The ancillary service market is also to be redesigned: with only few rotating machines the inertia for the frequency stability has to be given with other means



# The growing role of PPA for RES

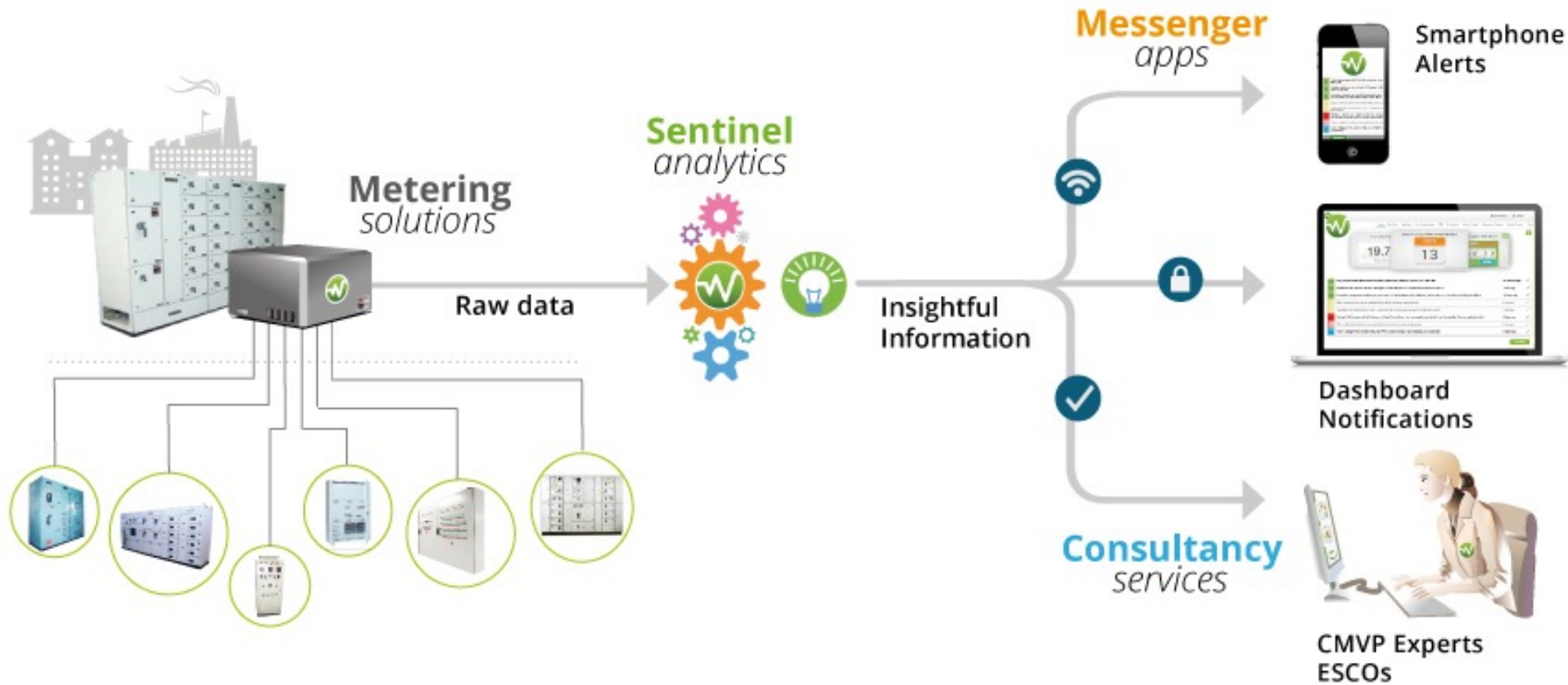
PPA Announcements



Source: RE-Source (2021).

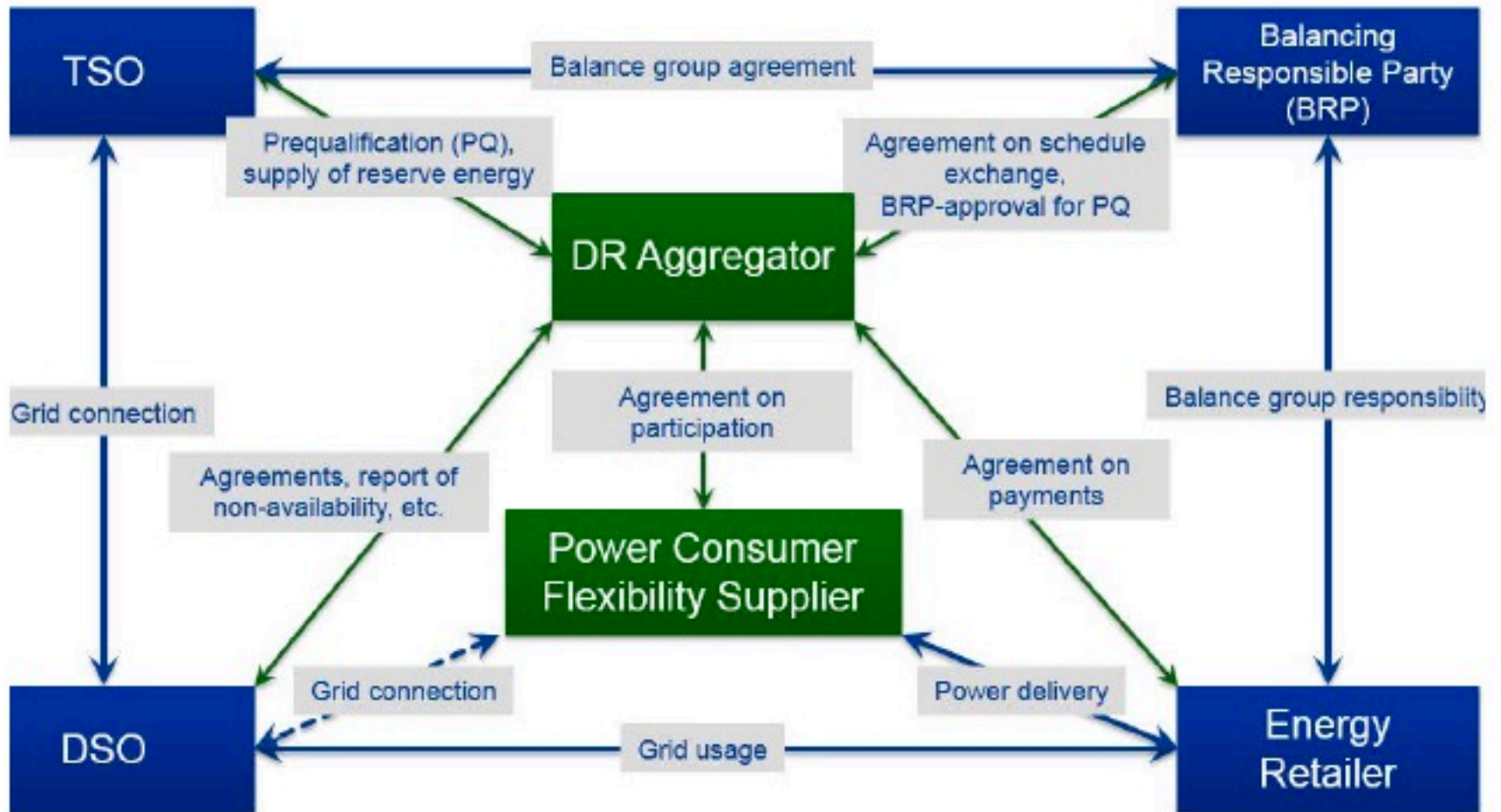
Irena su due mercati

# Energy real time data monitoring



Up to 30% can be saved with good consumption data management!

# New roles in electricity markets



# The business model in energy supply is changed. Forever

- Energy economic fundamentals have changed in the last decade and competitive supply requires new business models:
  - Scale economies,
  - Role of utility,
  - Market access and contendibility
  - Digital control
- Regulation can push the technical progress or displace it. Its role is crucial
- We will never go back to the model of XX century
- Renewable energy is gaining market shares worldwide

# Market and innovation

The benefits of liberalization must be evaluated non only by the price level for consumers

- Choice is a value
- The presence of multiple suppliers has created many new services (billing, portfolio of energy sources, gas + el., ...)
- Much more is progressively done with a more elastic regulation: virtual networks, demand management, integration of distributed generation, distributed generation of ancillary service
- Innovation should not be curbed by old rules: prosumers are already there and the aggregation of loads and productions should be encouraged → **self despatching portfolios** and **energy communities**
- In Europe the active role of distributed generation and of the “aggregators” is evolving fast and puts pressure on the reform of market design

# Electrification of Everything (EoE)?

- The use of ICT in energy supply makes electricity more competitive in many applications
- Electricity penetration is growing in all advanced economies
- Are we going towards a ALL ELECTRIC society?  
(electric vehicles, heat pumps, induction cooking, 3D printing, ...)
- The energy market is moving towards electricity

# Energy poverty is an issue

- The focus of electricity market design on competition and the reduced role of social goals made the problem of energy poverty emerge.
- In many countries small consumers are exposed to lack of energy because they can't afford high bills
- In the UK with the liberalisation the pre-paid meters have been adopted for consumers with unpaid bills
- Is it the market we want?
- We started an Observatory on Energy Poverty @ unipd



# The market and the value

- **Power Purchase Agreements (PPA)** are becoming popular
- But the value is elsewhere: ancillary services are giving more and more profit to power companies
- Electricity is becoming a commodity, but electricity regulation is getting more valuable for operators.
- Final consumers as well can participate to the bonanza
- Energy communities and aggregators are new comers in the electricity arena

# Energy communities

With the publication in the Official Gazette of the ministerial decree "Incentives" of the Ministry of Economic Development (**DECREE 16 September 2020**), the discipline that makes the creation of energy communities a reality is completed.

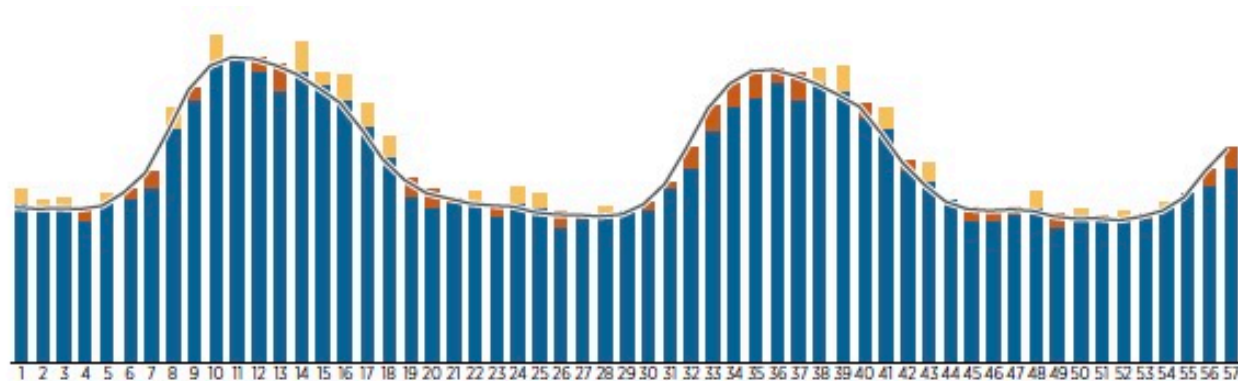
Thanks to the advance with which Italy has regulated the transposition of the RED II Directive making it possible to share electricity produced by plants powered by renewable sources between several citizens, electricity consumers can join together to create configurations of collective self-consumption and energy communities, a possibility that did not exist previously, since there was the regulatory limit for which the energy produced by a plant powered by renewable source was self-consumed at most by the user with whom the system was installed.

**Energy Communities** and **Collective Self-Consumption** are the possibility for families (in condominiums or in individual housing units), Public Bodies and companies to take action to produce and self-consume locally and "collectively" the energy produced by renewable energy plants, which entered into operation after March 1, 2020.

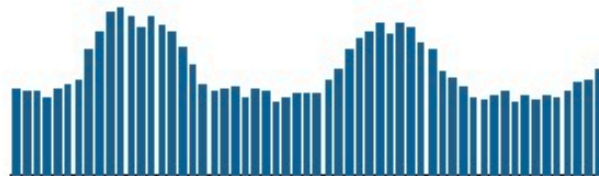
The current regulatory framework identifies two types of configurations:

- **COLLECTIVE SELF-CONSUMPTION**, which can be activated by families and other subjects who are in the same building or condominium, provided that the subjects other than families do not produce energy as the main activity;
- **ENERGY COMMUNITIES**, in which natural persons, small and medium-sized enterprises, local authorities or local authorities, including municipal administrations, located in a wider perimeter than the condominium one, can participate, provided that they are all connected to the same medium/low voltage energy transformation cabin and participation in the Renewable Energy Community does not constitute the main commercial and industrial activity

# Market redesign becomes necessary



■ Renewable energy (LT-RE)   ■ Net load - surpluses   ■ Net load - shortfall   — Load



Long term procurement - securing Renewable energy

Short term procurement - securing flexibility

Irena 2022

The dual procurement

# ACER view on market design (4/22)

## 13 measures for the consideration of policymakers, future-proofing the EU wholesale electricity market design



**1.** Speed up electricity market integration, implementing what is already agreed



**2.** Improve access to renewable Power Purchase Agreements (PPAs)



**3.** Improve the efficiency of renewable investment support schemes



**4.** Stimulate 'market making' to increase liquidity in long-term markets



**5.** Better integrate forward markets



**6.** Review (and potentially reduce, if warranted) collateral requirements



**7.** Preserve the wholesale price signal and remove barriers to demand resources providing flexibility



**8.** Shield those consumers that need protection the most from price volatility



**9.** Tackle avoidable supplier bankruptcies, getting the balance right



**10.** Tackle non-market barriers, ensuring generation and infrastructure is built at pace



**11.** Consider prudently the need for market interventions in situations of extreme duress; if pursued, consider tackling 'the root causes'



**12.** Consider public intervention to establish hedging instruments against future price shocks



**13.** Consider a 'temporary relief valve' for the future when wholesale prices rise unusually rapidly to high levels



### Want to learn more?

Check out the full report on ACER's Final Assessment of the EU Wholesale Electricity Market Design.