

Montel French Energy Day

Going nowhere : A French energy path with no map ?

May 2024

CONFIDENTIAL

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Introduction to Compass Lexecon

Presentation, Facts and figures

- One of the world's leading economic consulting firms, Compass Lexecon provides corporations, government clients and law firms with clear analysis of complex issues.
- We have been involved in a broad spectrum of matters related to economics and finance – providing critical insight in legal and regulatory proceedings, strategic decisions and public policy debates. Our experience and expertise apply to virtually any question of economics, in virtually any context of the law or business, and in any industry.
- We have more than 500 professionals worldwide and more than 90 professionals in Europe – based in Brussels, Berlin, Düsseldorf, London, Madrid and Paris

Services

- Economic and financial regulation
- Market design
- Accounting litigation services
- Antitrust, Competition and M&A
- International litigation & arbitration
- Valuation & Financial Analysis
- Market or sector inquiries
- State aid
- Damages
- Econometric analysis

Sectors

- Energy
- Healthcare
- High Technology
- Pharmaceuticals
- Telecommunications
- Financial services
- Transportation
- International Trade
- Internet
- Entertainment & media

Facts and Figures

500+

Economists

22

Offices worldwide

182

Merger-related matters advised on in the last 12 months

319

Antitrust litigation matters advised on in the last 12 months

175+

Ph.D. economists

2

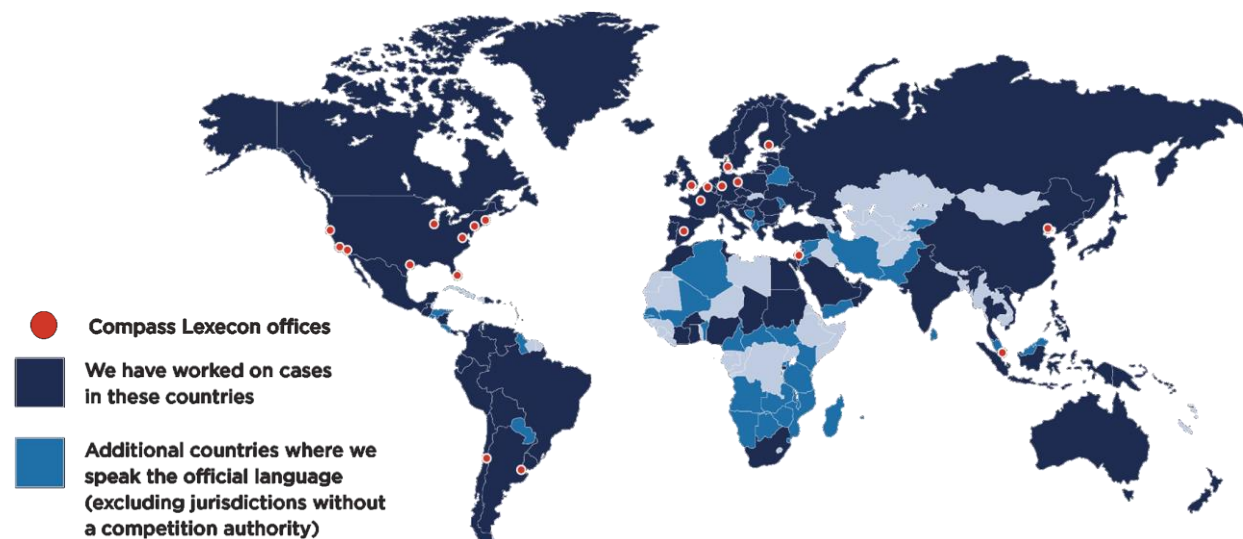
Nobel Prize winners

84%

Of the Fortune 100 companies advised

90+

Jurisdictions in which we have advised clients



About FTI-CL Energy team

Our EMEA team comprises senior energy experts

Senior energy experts in Europe

FTI-CL's senior energy experts are supported by a team of 100+ experienced consultants.



Lorenzo Coppi



Boaz Moselle



Jason Mann



Nicholas Brooks



Martina Lindovska



Ljubo Mitrasevic

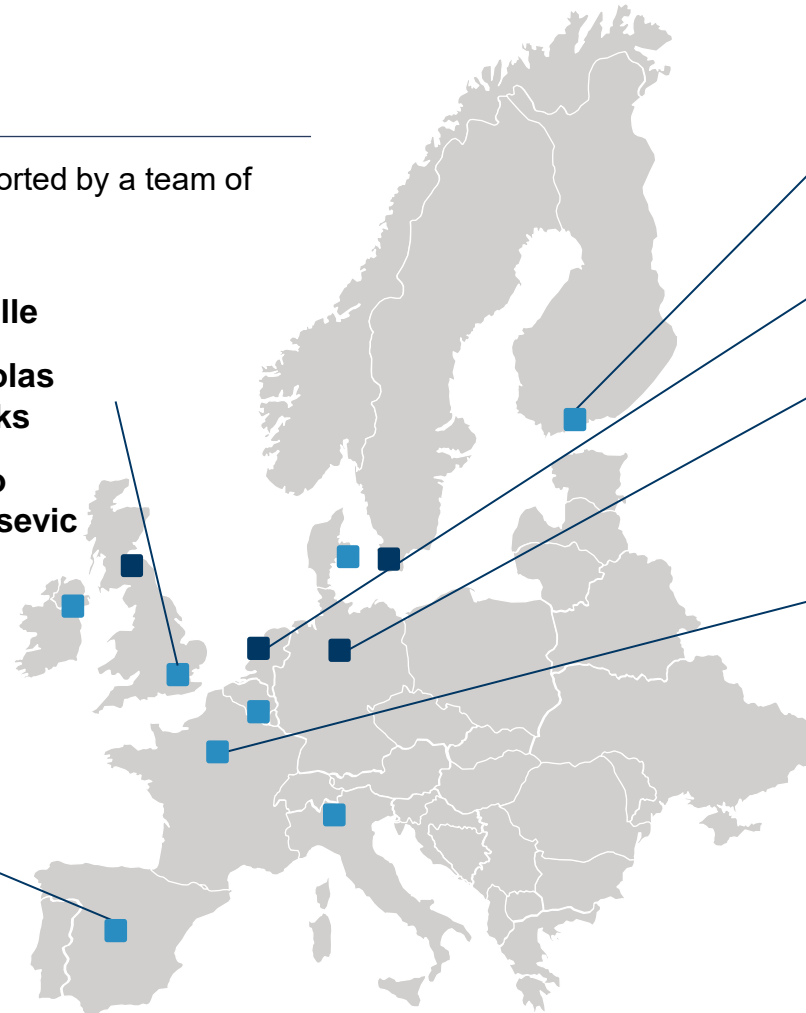


Blanca Perea



Anton Garcia

- Main energy offices
- Other FTI-CL offices



Petr Spodniak



Guillaume Duquesne



Anton Burger



Gerald Aue



Fabien Roques



Charles Verhaeghe



Yves Le Thieis

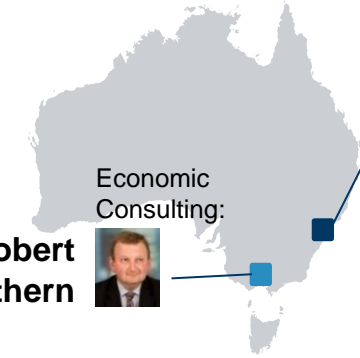


Dmitri Perekhodtsev



Emmanuel Grand

Experts in Australia



Economic Consulting:



Robert Prydon

Strategic Communications:



Ben Hamilton



Robert Skeffington

Robert Southern



Economic Consulting:

Experts in the US



William Scott Hogan



Scott Harvey



Susan Pope



John Cochran

Compass Lexecon provides comprehensive services for clients in all positions in the energy industry value chain

Our services for the energy sector

Policy and Regulation

- Market design
- Design of infrastructure access regulations
- Design of economic infrastructure regulations
- Third Party Access regulation definition

M&A and Due Diligence

- Target screening
- Commercial Due Diligence
- Regulatory Due Diligence
- Financial Due Diligence

Strategy

- Overall strategy
- Regulatory strategy
- Marketing strategy

Competition Economics & State Aid

- Abuse of dominant position, Antitrust
- Merger control
- State Aid compliance of support scheme

Disputes

- Expertise in Price Review, Hardship, Force Majeure disputes
- Expertise in construction disputes

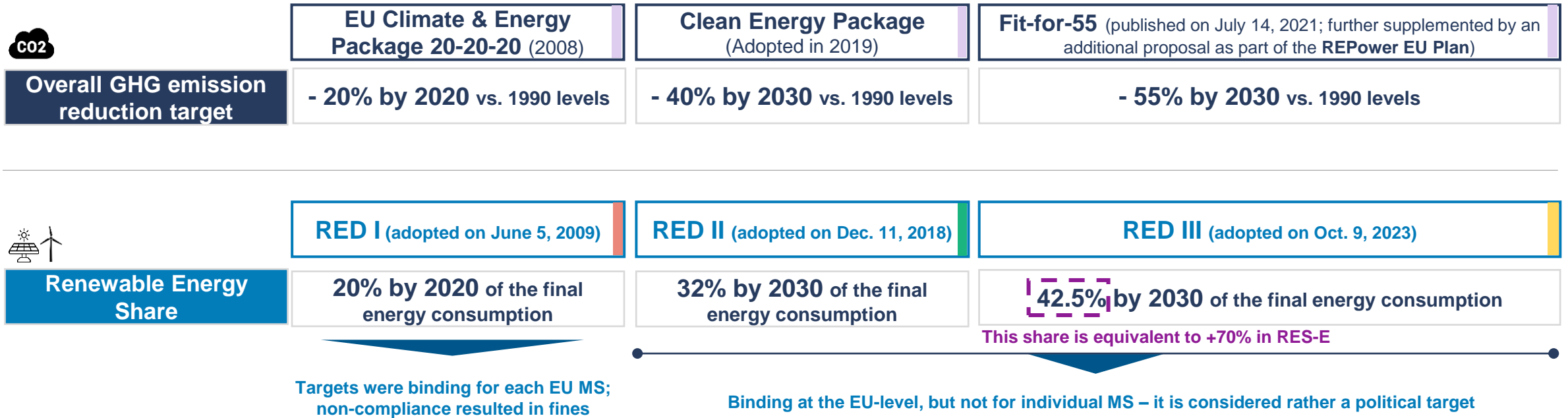
Compass Lexecon's Clients in the power industry



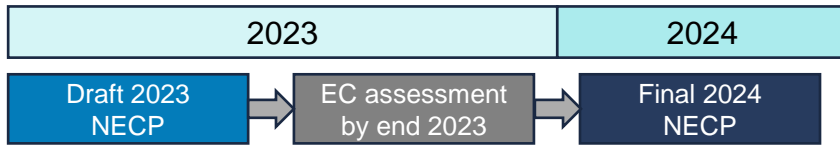
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The EU is accelerating on decarbonisation objectives with (i) more ambitious targets and (ii) acceleration of RES deployment by 2030



While only 4 countries' targets are aligned with the RED III⁽²⁾ target of 42.5% EU RES share; France wants to use a 'decarbonised' target that may not be compatible w/ RED III



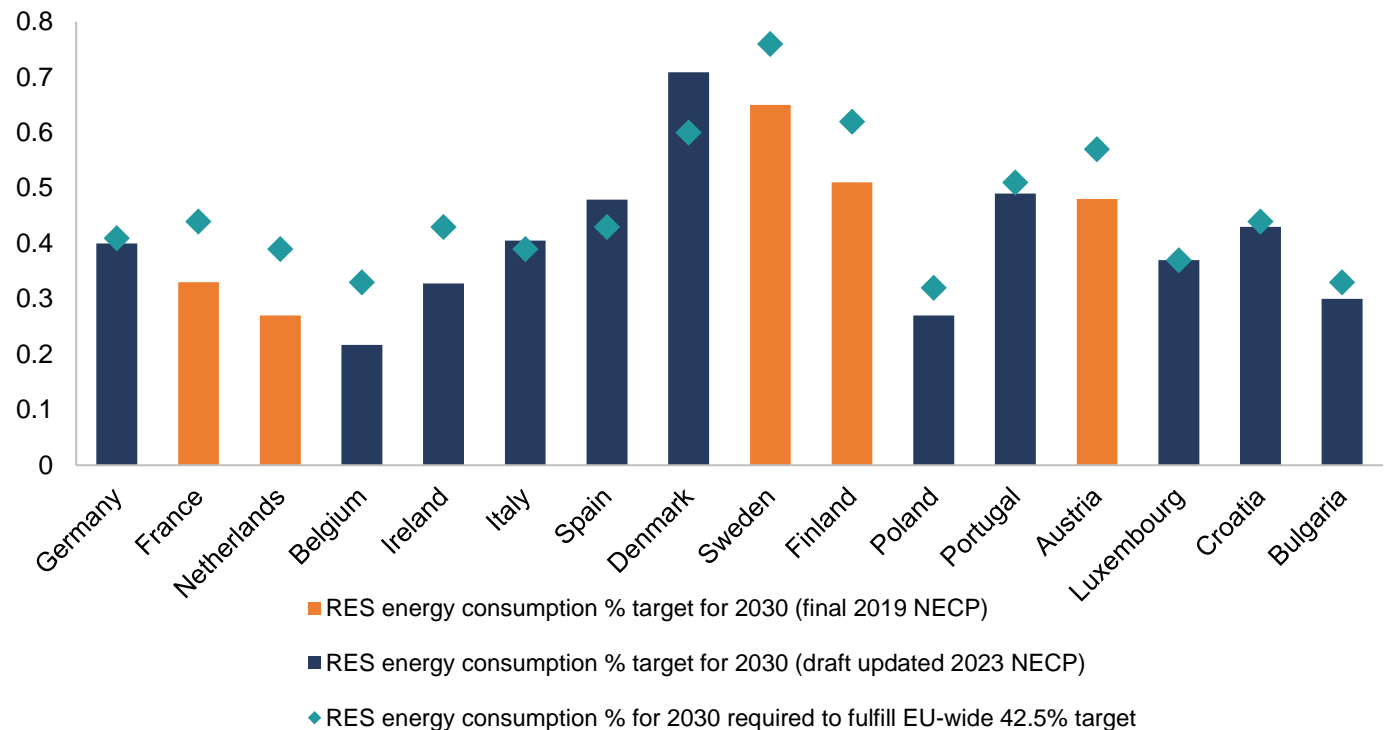
Summary of the EC assessment of RES penetration targets from draft 2023 NECPs

All shown countries (except FR, NL, FI, SE & AT, in orange) either updated their renewable energy consumption targets for 2030 in the draft 2023 NECPs or submitted their updated targets to the European Commission (EC)

Zoom on France:

- The French NECP, **fails to detail its renewable energy objective for 2030** and refers instead to a **'decarbonised' energy target**, which is in contradiction with the provisions of the EU RED III.
- Draft PPE 3 - subsequently published - provides detailed information of future RES targets per technology

Overall renewable energy share required⁽³⁾ to fulfil the Renewable Energy Directive III's target of 42.5% by 2030 vs. targets laid down in national NECP



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The next PPE is in preparation phase, that will update RES devt. objectives from PPE19 and take stock of energy regulation & policy shifts in France

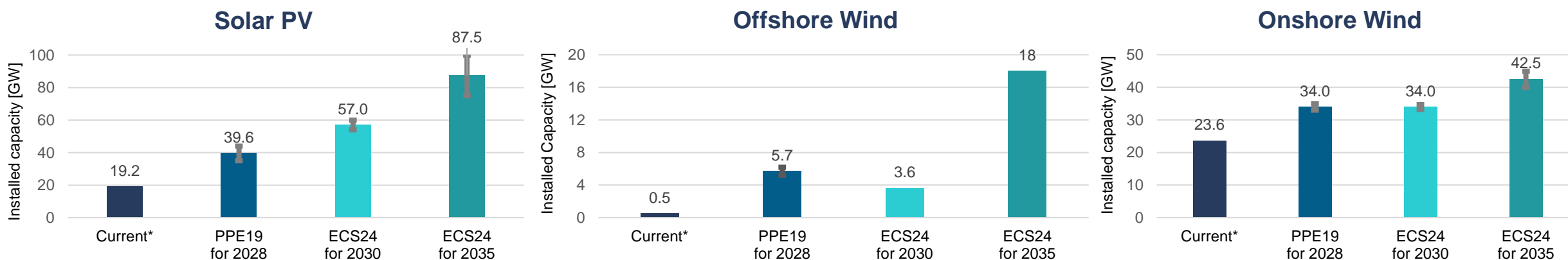
Apr 2020	PPE 2019	<ul style="list-style-type: none"> ▪ Sets detailed objectives in terms of RES deployment by 2030: incl. 40% RES share in electricity production ▪ Defines concrete policies and a detailed auction calendar per technology for RES, including Offshore wind tenders. ▪ Nuclear share in electricity generation should be reduced to 50% by 2035 (incl. closure of Fessenheim).
Feb 2022	Belfort Declaration <i>not legally binding, but politically binding</i>	<ul style="list-style-type: none"> ▪ Revival of nuclear: Reduction in nuclear share of PPE2019 cancelled and 25GW new nuclear to be built by 2050. ▪ Strong increase in ambition in solar and in Offshore wind. Limited ambition on onshore wind. ▪ Increase of ambition in energy efficiency and demand reduction
Mar 2023	RES Acceleration Law	<ul style="list-style-type: none"> ▪ Modifies legislation to accelerate deployment of RES ▪ Created the concept of “acceleration zones for RES” ▪ Includes provisions on simplification of administrative procedures, use of unused surfaces
Oct 2023	Energy-Climate Strategy <i>not legally binding, but basis for the new PPE</i>	<ul style="list-style-type: none"> ▪ Maintain onshore wind development at recent level to reach PPE2019 targets by 2030 (33-35 GW). ▪ Strong increase in ambition in solar for 2030 compared to PPE2019, achieving 54-60 GW. ▪ Offshore Wind is expected to scale up and achieve 18 GW by 2035, following a macro-auction of 10 GW by 2025/26. ▪ Inclusion of revival of nuclear in the strategy, with 6 EPR2 confirmed and 8 more optional to follow.
Present	Final NECP 2024	<ul style="list-style-type: none"> ▪ Public consultation to be conducted in Q2 2024 on PPE 2024 and SNBC 2024. ▪ Final NECP 2024 to be submitted to EC by June 2024, but likely not before Q4 2024. This should be in line with PPE 2024 and SNBC 2024.

The next PPE should come into force by end of 2024; the Energy & Climate Strategy shows increased ambition in terms of RES and nuclear deployment

Key objectives related to electricity supply

- **Maintain onshore wind development at recent level** to reach PPE2019 targets by 2030 (33-35 GW).
- **Strong increase in ambition in solar** for 2030 compared to PPE2019, achieving 54-60 GW.
- **Offshore Wind is expected to scale up and achieve 18 GW by 2035**, following a macro-auction of 10 GW by 2025/26.
- **Inclusion of revival of nuclear in the strategy**, with 6 EPR2 confirmed and 8 more optional to follow.
- **Deploying batteries** possibly combined with RES generation to ensure security of supply alongside existing thermal capacity, STEP, DR and interconnections

Main updates in terms of RES targets between the PPE 2019 and the Energy & Climate strategy from Jan 2024, in GW of installed capacity^{[1][2][3]}

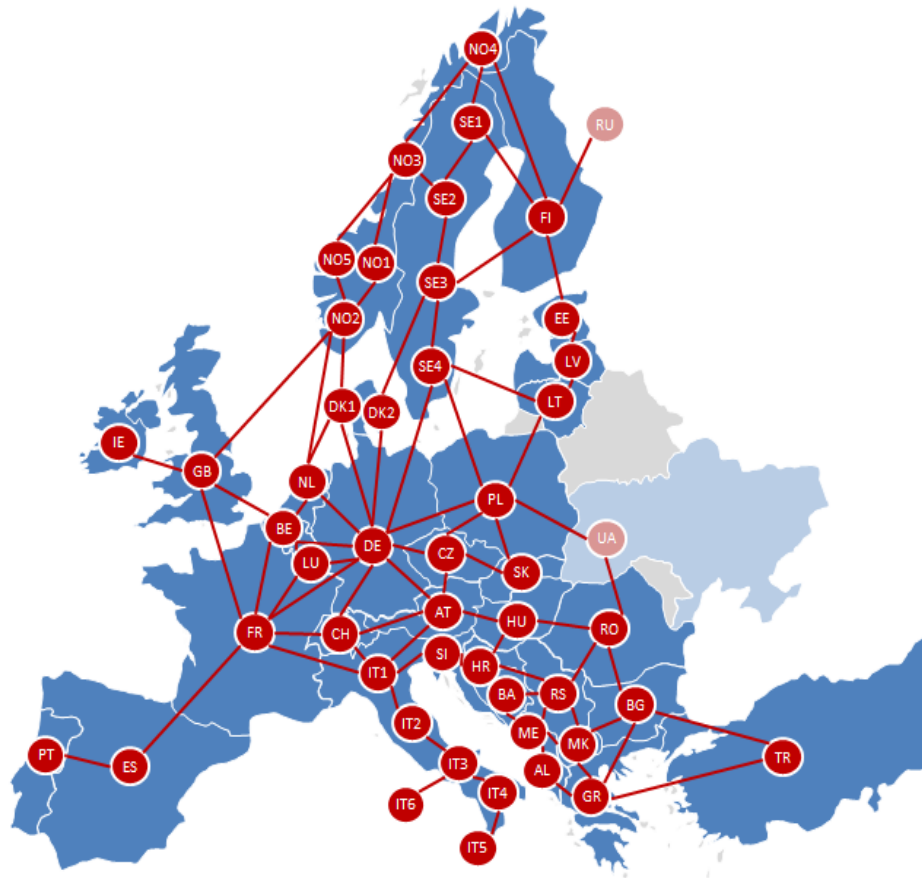


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CL European power market model covers the power markets of EU27+ with fine granularity

Geographic scope of the model

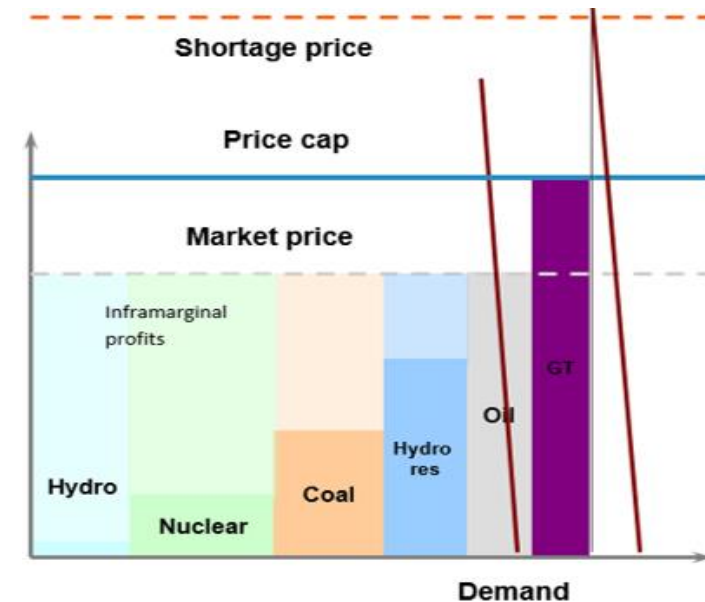


- CL Energy's power market model covers the **EU-27 countries as well as the UK, Switzerland, Norway, the Balkans and Turkey.**
 - Countries beyond this geographic scope are modelled at an aggregate level.
 - The model is run on a commercial modelling platform Plexos® using data and assumptions constructed by CL Energy for demand, supply, commodity price and interconnection.
- CL Energy's power market model constructs **supply in each price zone based on individual plants and simulates the market with hourly resolution**
 - European power plants database containing technical parameters of all thermal European plants
 - Zonal prices are found as the marginal value of energy accounting for generators' bidding strategies.
 - Model takes into account cross-border transmission and interconnectors and unit-commitment plant constraints.
- CL Energy's power market model uses **ENTSOE Pan-European Climate Database (PECD)** for hourly time series for wind and solar production, hydro inflows and demand pattern.

CL pan EU power market model relies on a dispatch optimisation software that emulates the functioning of power markets

- **Long term capacity scenarios can be derived from two distinct approaches:**
 - **Dynamic long-term optimisation** : Based on cost reduction assumptions, the capacity mix is optimized to minimise the cost of the system while meeting a number of constraints such as security of supply or CO2 emission reduction target.
 - **Long term capacity scenarios based on energy policies and regulation:** Capacity projections are based on national and European energy policies and regulation which would structure the evolution of the capacity mix (coal closure policies, nuclear policies, renewable policies, ...)
- Our modelling approach combines both long-term capacity scenarios based on energy policies and regulation and dynamic long-term optimisation through :
 - **NECP renewable development** until 2030
 - **Coal and nuclear phase-down plan** through 2050
 - **European emission reduction** to net zero by 2050
 - National **power system reliability** through minimum margin

- **Model constructs supply hourly in each price zone based on individual plants unit commitment constraints:**
 - European power plants database containing technical parameters of all thermal European plants
 - Zonal prices are found as the marginal value of energy accounting for generators' bidding strategies
 - Model takes into account cross-border transmission and interconnectors



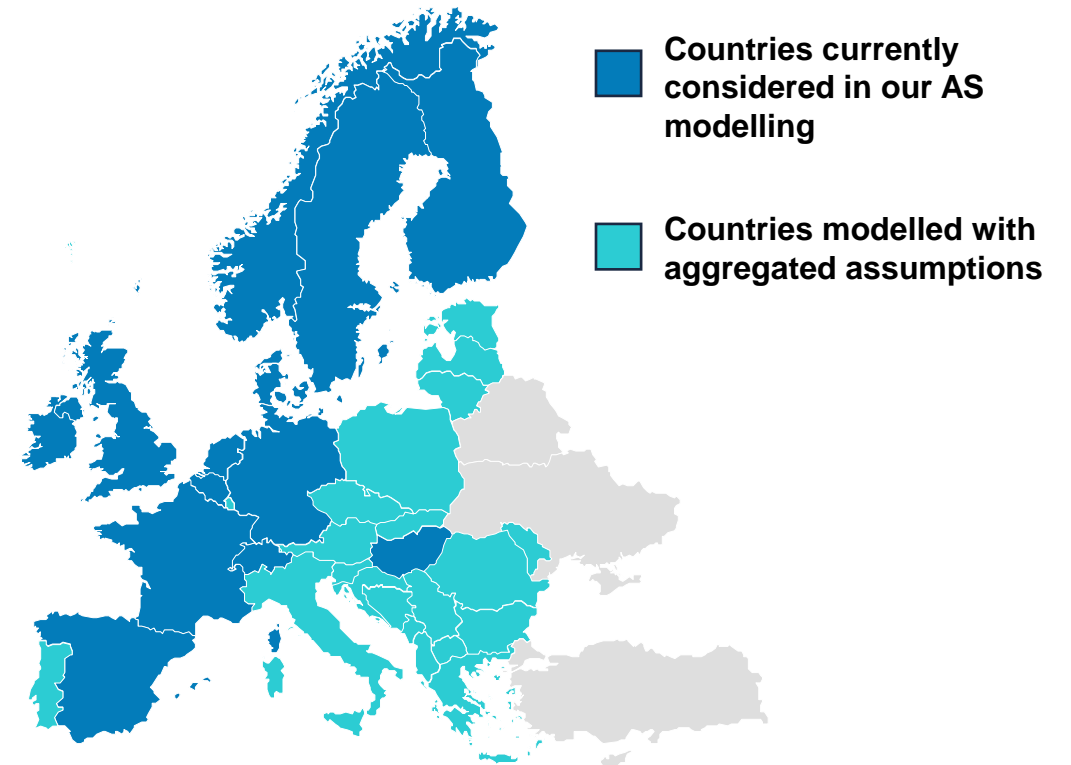
CL Ancillary Services market model cover EU balancing platforms (TERRE, MARI and PICASSO) and reservation

Frequency products considered in our AS modelling*

FCR - Frequency Containment reserve	Capacity reservation**
aFRR - Automatic Frequency Restoration Reserve	Capacity reservation and energy activation
mFRR - Manual Frequency Restoration Reserve	Capacity reservation and energy activation
RR – Replacement reserve ***	Capacity reservation and energy activation

* For FCR, there is no market auction for the activation.
** Replacement reserve is not procured in all EU countries.
*** The names of the reserves differ in the UK and in Ireland. Some countries can also procure additional AS products (such as FRR in Sweden)

Geographic scope of our AS modelling*



* For the activation part, all countries participating to the European platform (PICASSO, MARI...) are considered in our modelling

The French power demand is expected to increase materially, to support long-term decarbonisation objectives of other sectors

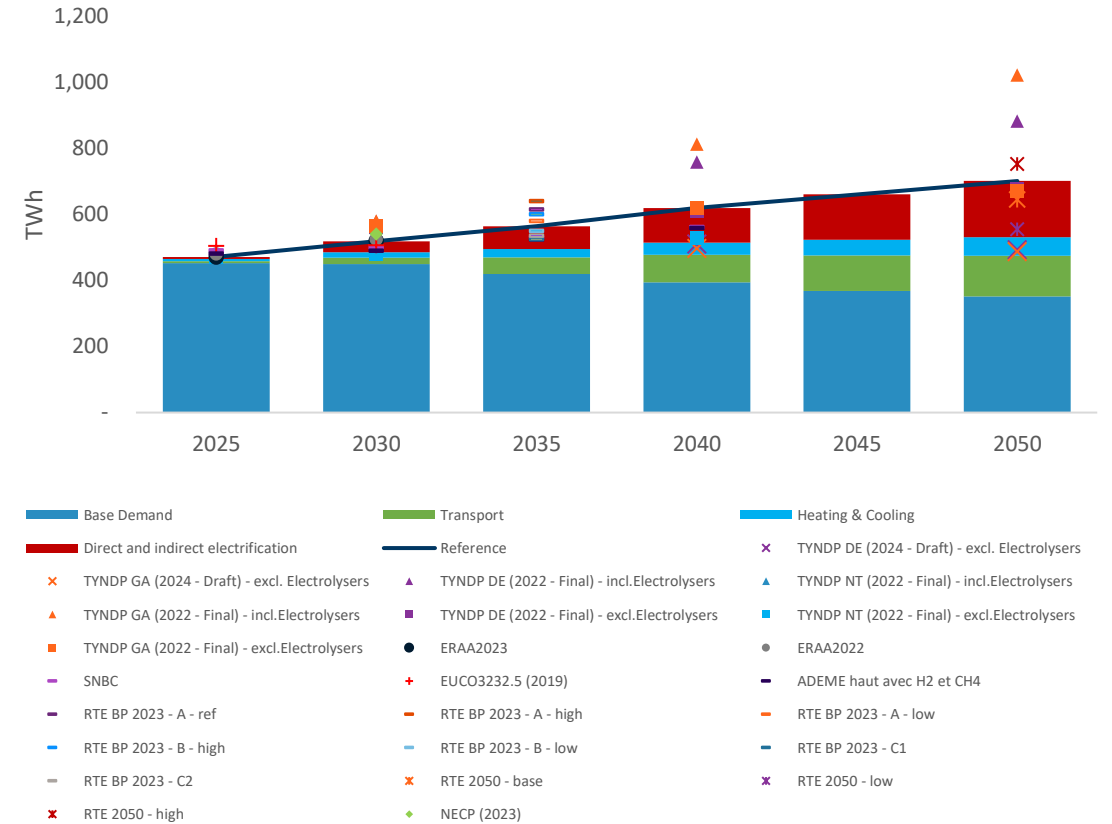
The French power demand is expected to increase materially to support long-term decarbonisation objectives of other sectors

Overall, the French electricity demand is expected to reach +700TWh by 2050 with the electrification of transport, the replacement of electric heating by more efficient HP and with the direct and indirect electrification of the industry.

- The electrification of transport is expected to add around 100TWh of electricity demand by 2050
- While replacing direct electric heating, HP is expected to add around 60TWh of electricity demand by 2050
- Direct and indirect electrification in the industry is expected to add around 170TWh of electricity demand by 2050

Compared to other European countries which are expected to double or more their electricity demand, the French electricity demand is expected to less than double given its current high electrification rate.

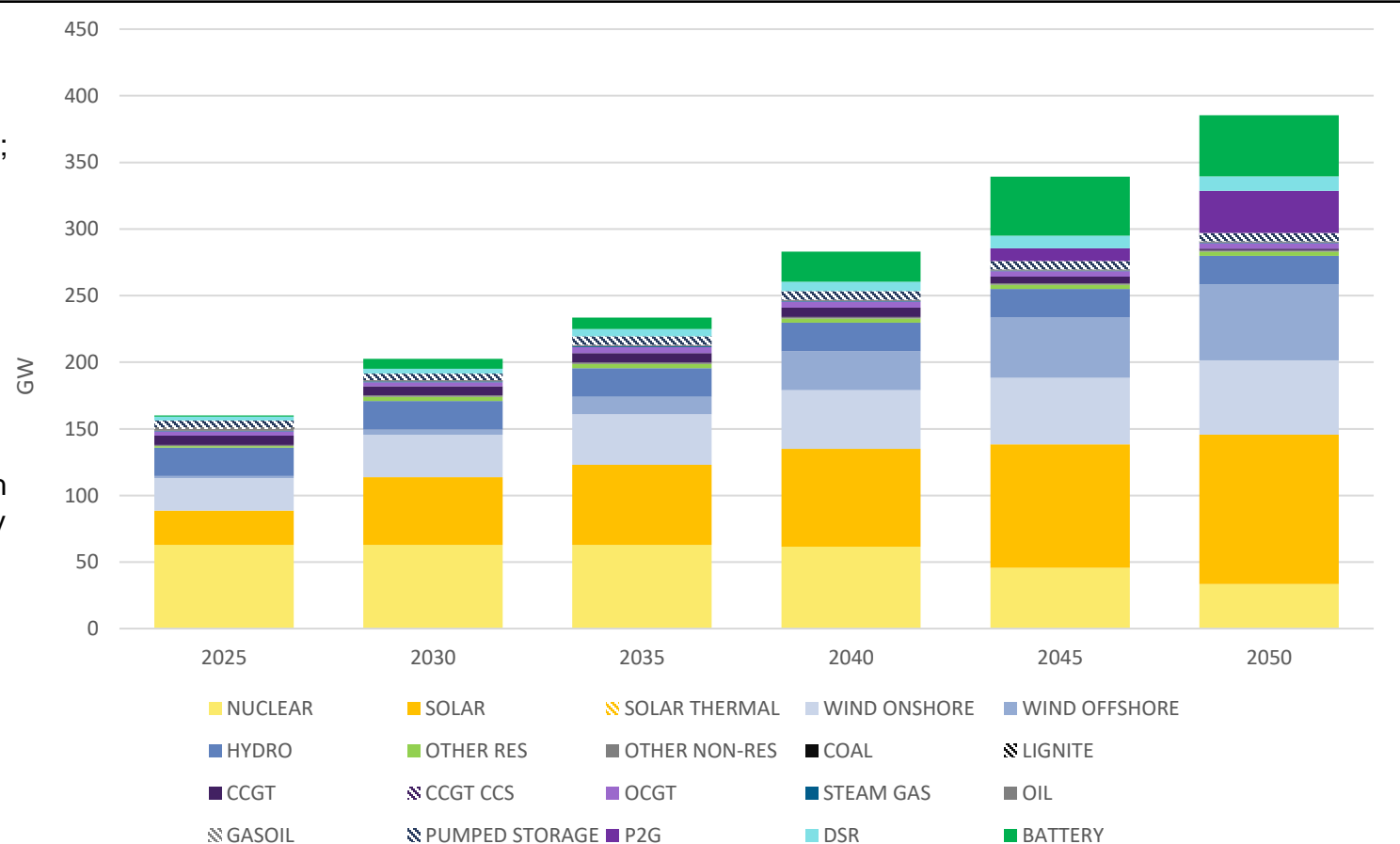
Electricity demand in decarbonisation scenario



In line with the expected increase in power demand, installed capacity is expected to more than double by 2050 in France

- The French capacity mix is **expected to change significantly over the forecast horizon** with the following key changes:
 1. **lower prominence of nuclear** in the capacity mix;
 2. **higher shares of variable RES** in the production mix (solar, onshore wind and offshore wind);
 3. **higher flexible capacity on both the demand and supply side** in the form of batteries and P2G to ensure system security and stability with the increasing penetration of renewables.
- In 2030, **solar capacity reaches c.50 GW and onshore wind capacity reaches c.32 GW** in line with recent announcements on French renewable capacity development objectives.
- In the **long term, solar capacity reaches c.112 GW** by 2050, onshore wind capacity reaches c.56 GW by 2050 and offshore wind capacity c.57 GW by 2050, ensuring the energy balance of the French electricity system.

Installed capacity – decarbonisation scenario

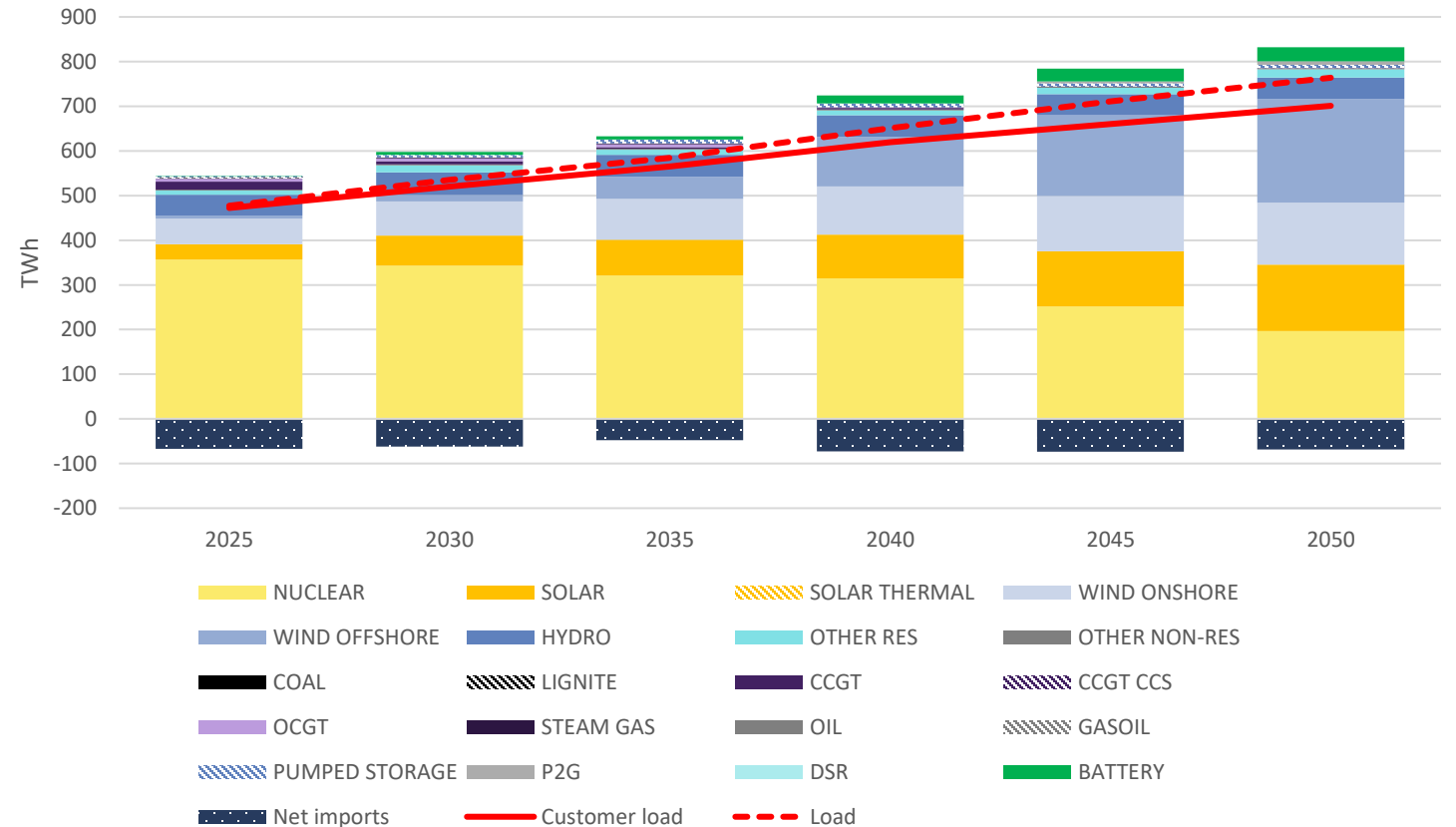


Sources: CL analysis

GENERATION MIRRORS INSTALLED CAPACITY WITH A SIGNIFICANT INCREASE IN RENEWABLE PRODUCTION ACROSS THE FORECAST HORIZON

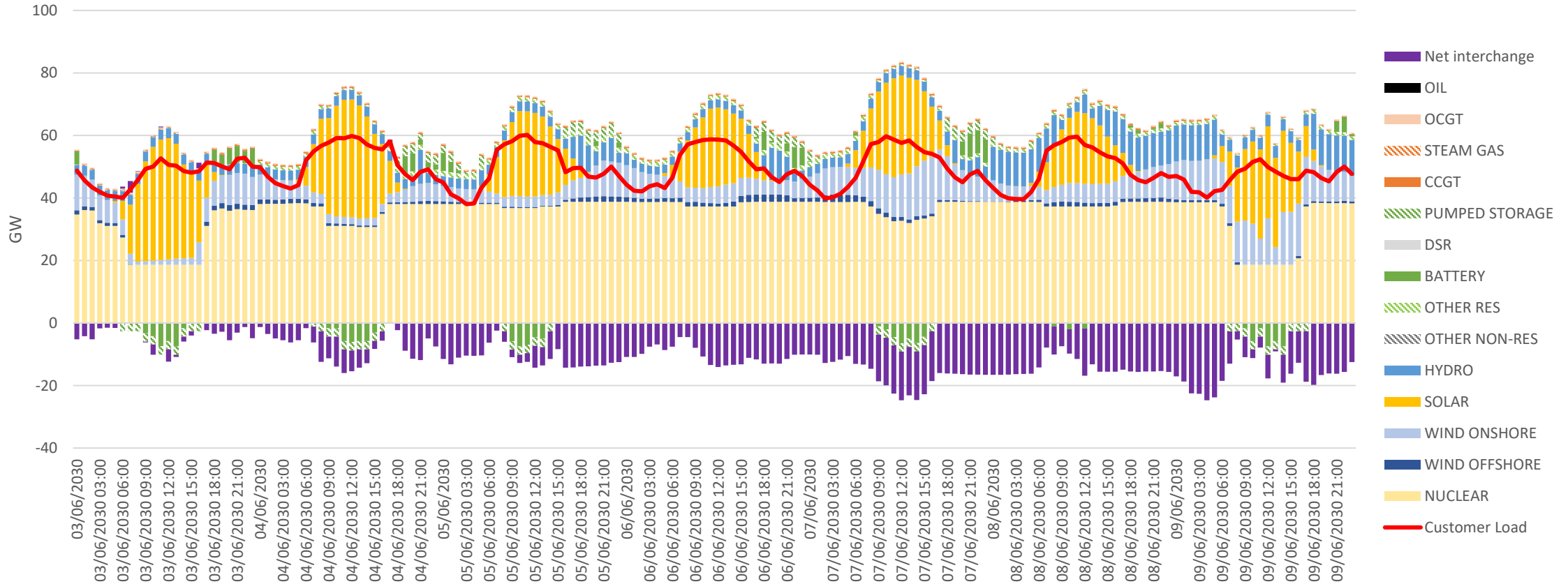
- In line with the evolution of the capacity mix and the assumption of a balanced energy system, the French power market generation sees two main trends across the forecast horizon:
 - A reduction in nuclear generation: from c.355 TWh in 2025 to c.197 TWh by 2050.
 - An increase in solar and wind generation: from c.91 TWh in 2025 to c.520 TWh by 2050 for onshore wind, offshore wind and solar. By 2050, solar and wind account for over 60% of power generation.

Generation in the decarbonisation scenario



The French nuclear fleet is expected to operate flexibly, providing both seasonal flexibility and shorter-term downward flexibility

Projected hourly generation mix for selected days for the year 2030 in decarbonisation scenario



Sources: CL analysis

The French power price is expected to rebalance in line with commodity markets by 2030, and to increase in the long-term as demand and CO2 price rise

- Designed to reflect the expected evolution of power demand, commodities and associated power mix, this scenario is based on a European dispatch model optimisation reflecting current policy objectives towards decarbonisation by 2050.

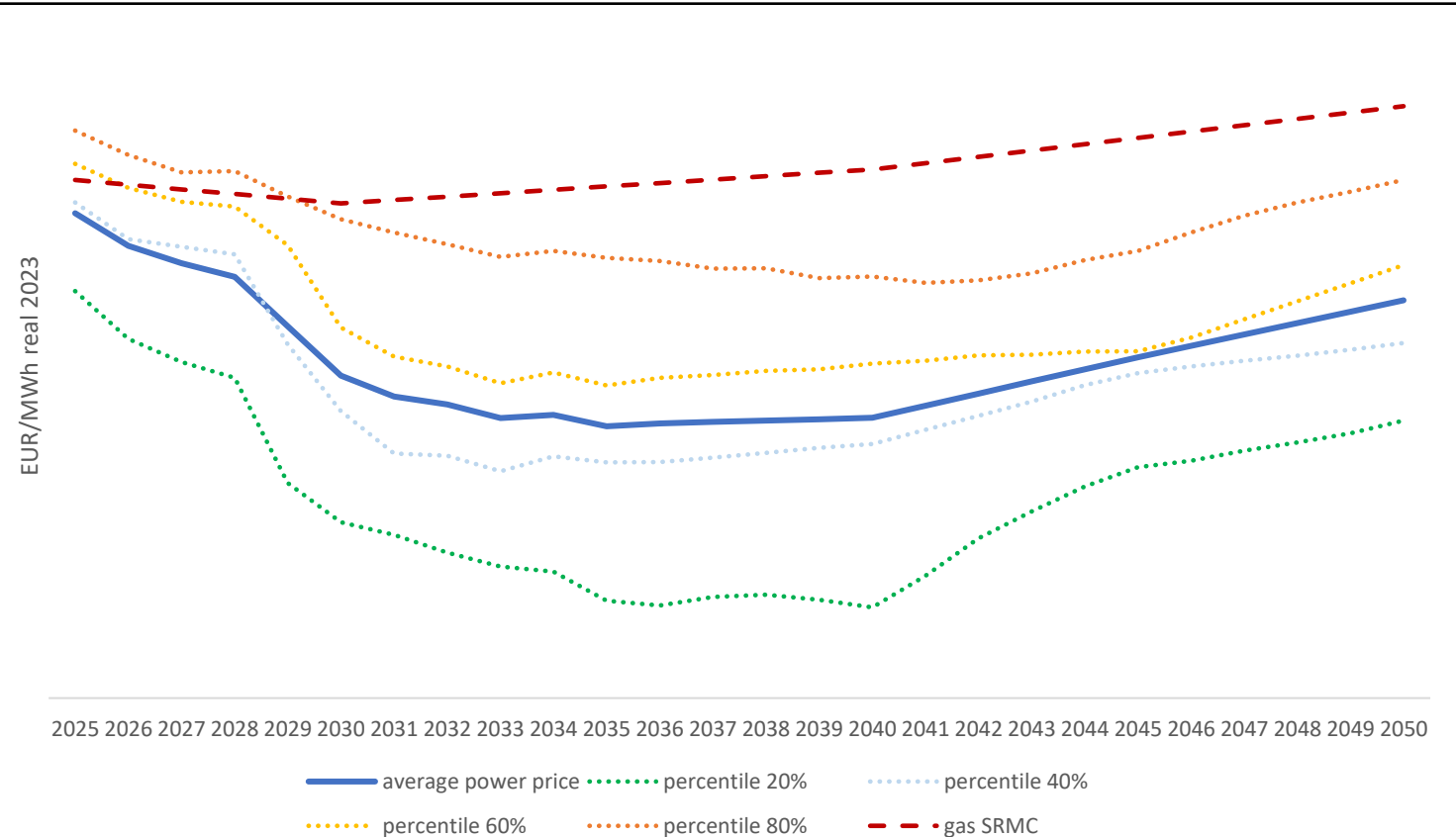
Short-medium term outlook

- Power prices are expected to decrease over the medium term, primarily due to the rebalancing of gas markets, and the growing penetration of renewables in the EU mix.

Long-term outlook

- In the long-term, power prices increase due to the strong increase in power demand, the increase in CO2 prices to decarbonise the economy and the flexible needs of the system.

French power price projection – Decarbonisation scenario



Locations

Europe

Berlin
Brussels
Copenhagen
Düsseldorf
Helsinki
London
Madrid
Milan
Paris

North America

Boston
Chicago
Houston
Los Angeles
Miami
New York
Oakland
Washington, DC

Latin America

Buenos Aires
Santiago

Asia Pacific

Beijing
Singapore

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