

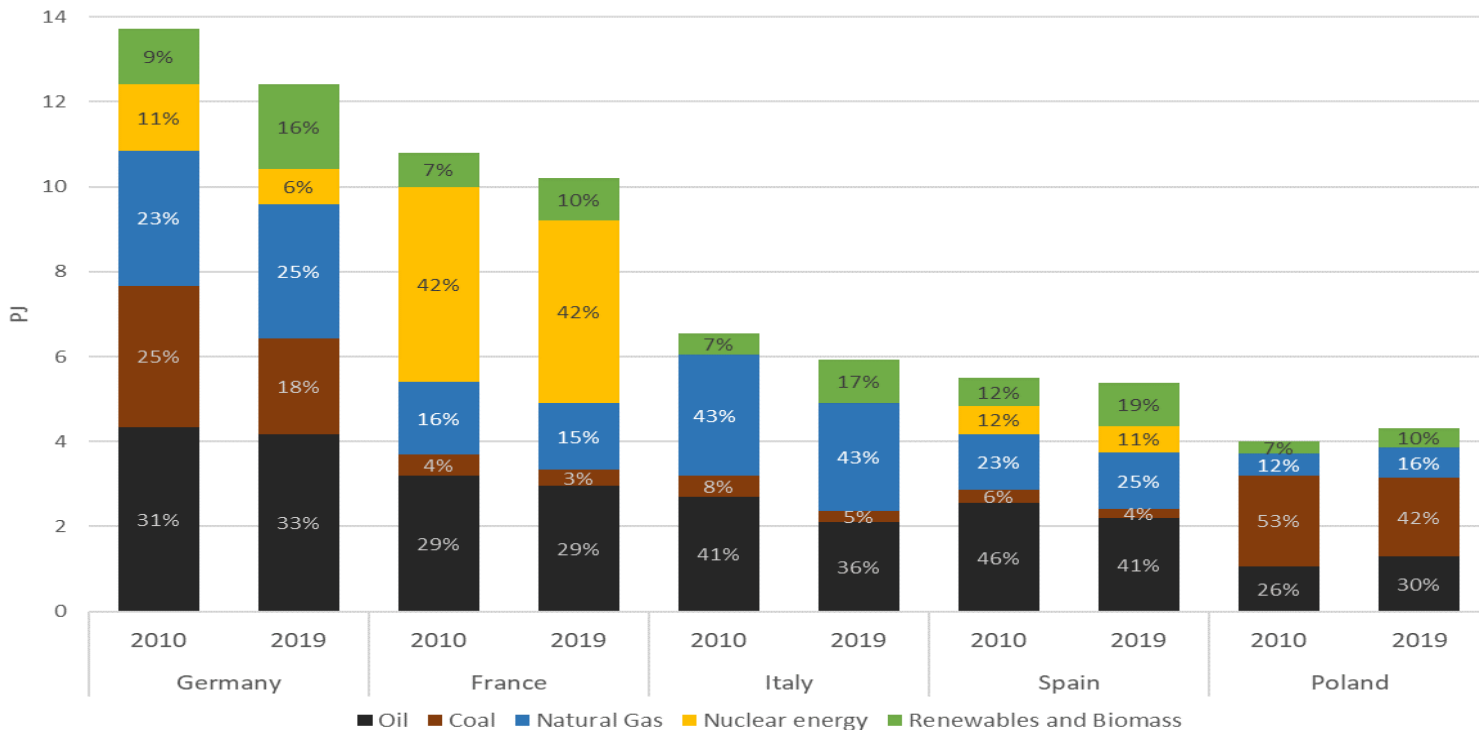
## Future of hydrogen in the context of severe turbulences in Europe's plan for an accelerated energy transition



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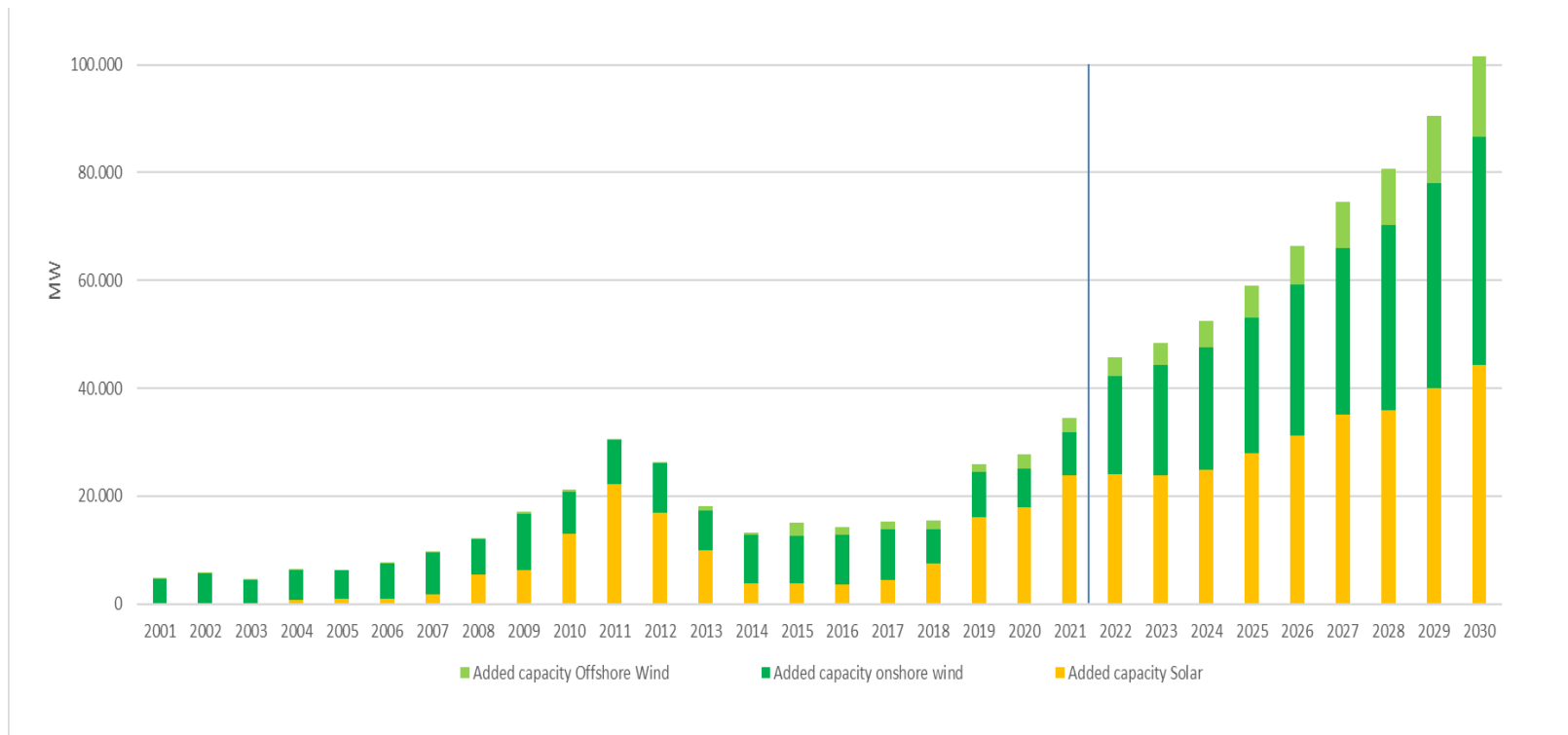
# Europe's energy mix far from decarbonized as only limited progress has been achieved in the past decade

Total primary energy demand by source in 2010 and 2019 (Petajoule)



# Europe must ramp up renewable in a war-type mobilization effort, but can it succeed and what will be left for hydrogen?

Yearly added capacity in the period 2001-2021 in the EU and projection of new added capacity to reach 40% of RES in final energy consumption by 2030



# Differences in how European countries approach hydrogen

## Main elements of hydrogen strategies in a selection of European economies

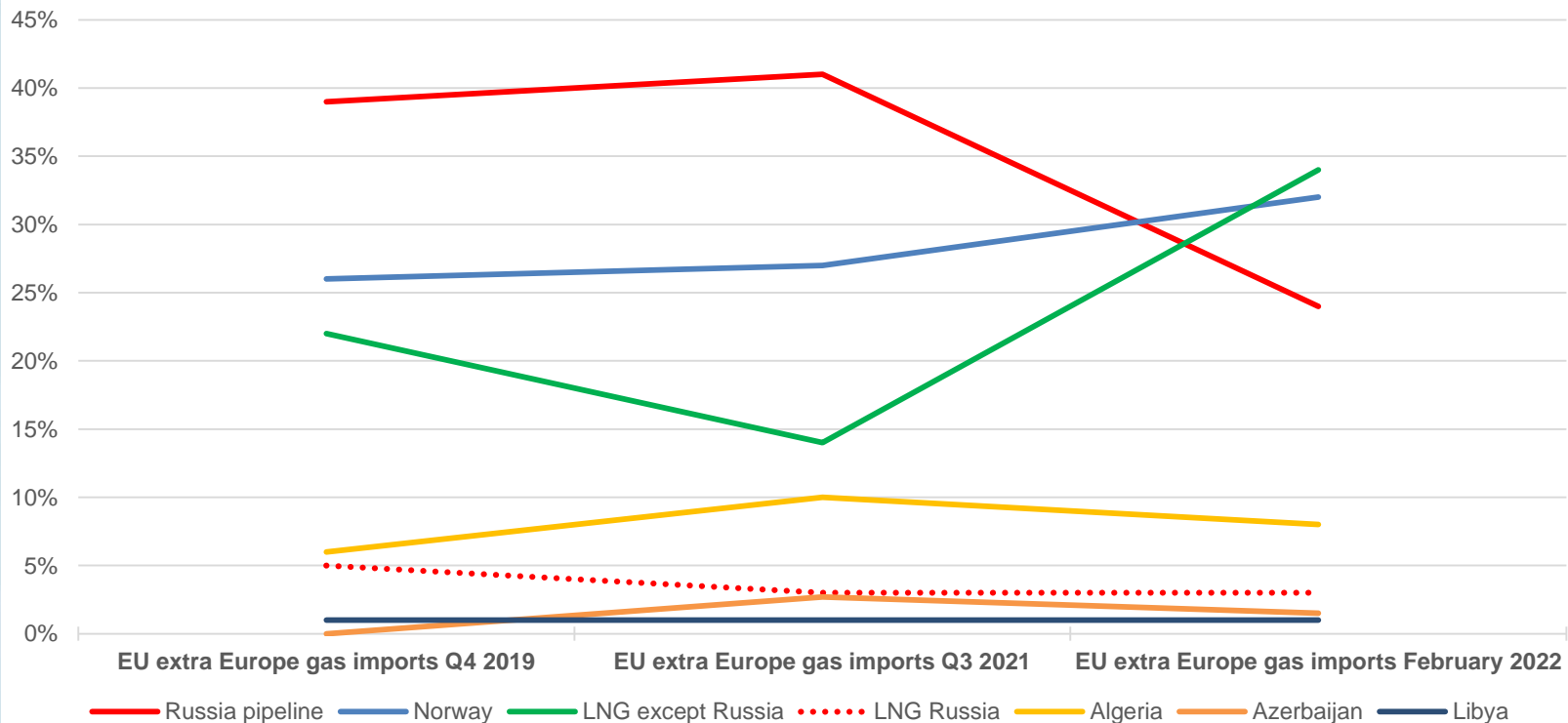
	France	Germany (or Netherlands)	Spain	Swiss
<b>Role in the future energy mix</b>	Limited	Strong	Medium	Medium
<b>Organisation of value chains</b>	Local systems, small clusters, production at consumption sites	Large infrastructures around hubs, large industrial clusters around ports/pipelines	First local grapes around industries, then clusters, then connections linking up the country	Road transport, filling stations, grapes around stations
<b>Origins of H2</b>	All colours, including from nuclear	Mainly Green, Blue tolerated	Green or blue	Green, notably hydro
<b>Imports</b>	No	Imports are a priority, 2/3 to be imported	Exports	Likely to be necessary as domestic electricity generation not enough
<b>Uses</b>	Industry, transport	Almost all possible, except passenger car transport, road transport not a priority	Industry, transport	Transport, notably trucks (Hyundai), buses, industry, grid services
<b>Role of gas infrastructure</b>	Limited	Large integration	Large integration	To be determined
<b>Domestic industrial H2 equipment manufacturing</b>	Strong manufacturing ambition, state financing backing for supply side infrastructure	Strong manufacturing ambition, strong state financing backing for supply and demand	Little manufacturing ambition, medium financing backing	Local small electrolyser design & manufacturing, fuel cells; favorable taxation

## Muli sector and multi level, mutually reinforcing energy, industrial and soon to come, social crises

- War in Ukraine/Europe
- Oil & gas price crises, looming supply crisis
- Electricity market crisis
- Systemic inflation, not temporary and limited: Stagflation?
- Gas intensive industries crisis, looming social crises
- Automotive industries in crisis
- Supply chains & logistics crisis: efficiency versus resilience
- GHG emissions crisis
- Green Deal & global climate governance crises
- Agricultural/fertilizer and food crises?
- Sanitary crisis
- Trust crisis: companies, policies, élites
- Looming metals & minerals price & supply crises

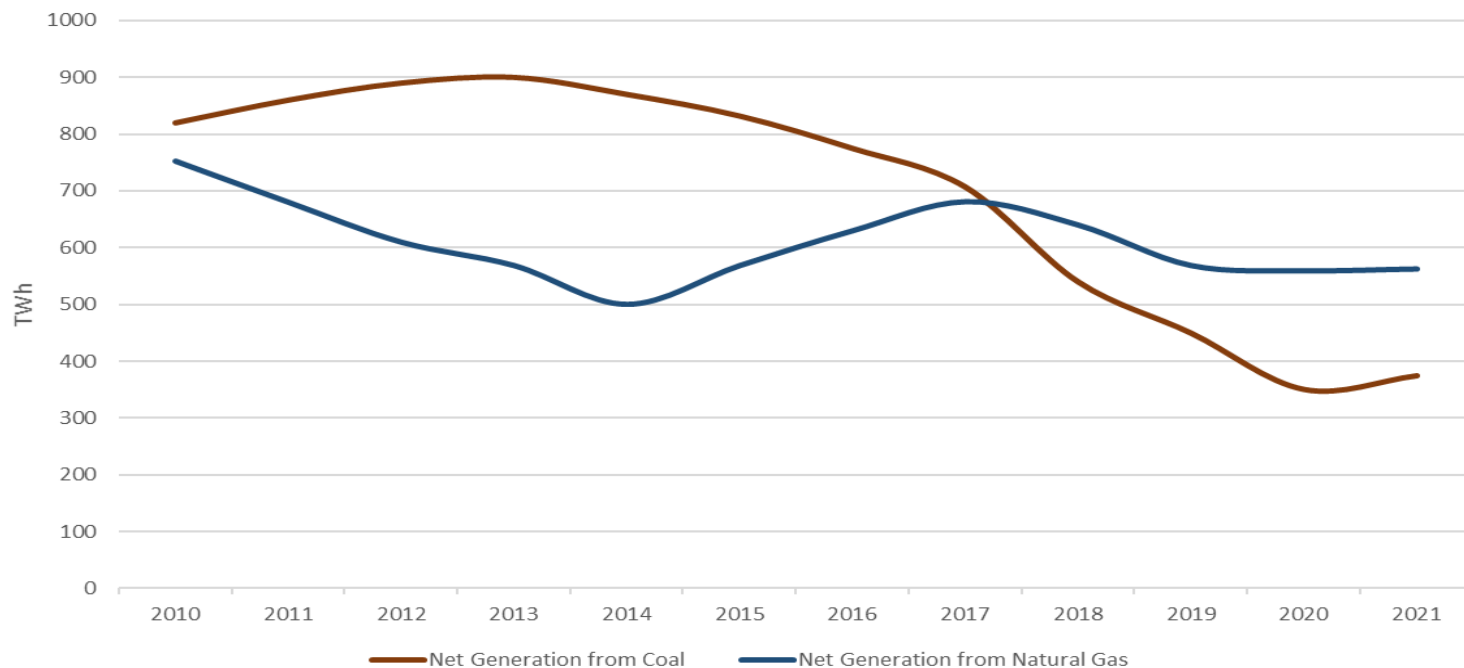
# Russia limits supplies to Europe, LNG comes in... for now: preparing for a future with limited, falling or no Russian gas

EU gas imports by source, share of total imports (in%), Q4 2019, Q3 2021, 02/2022



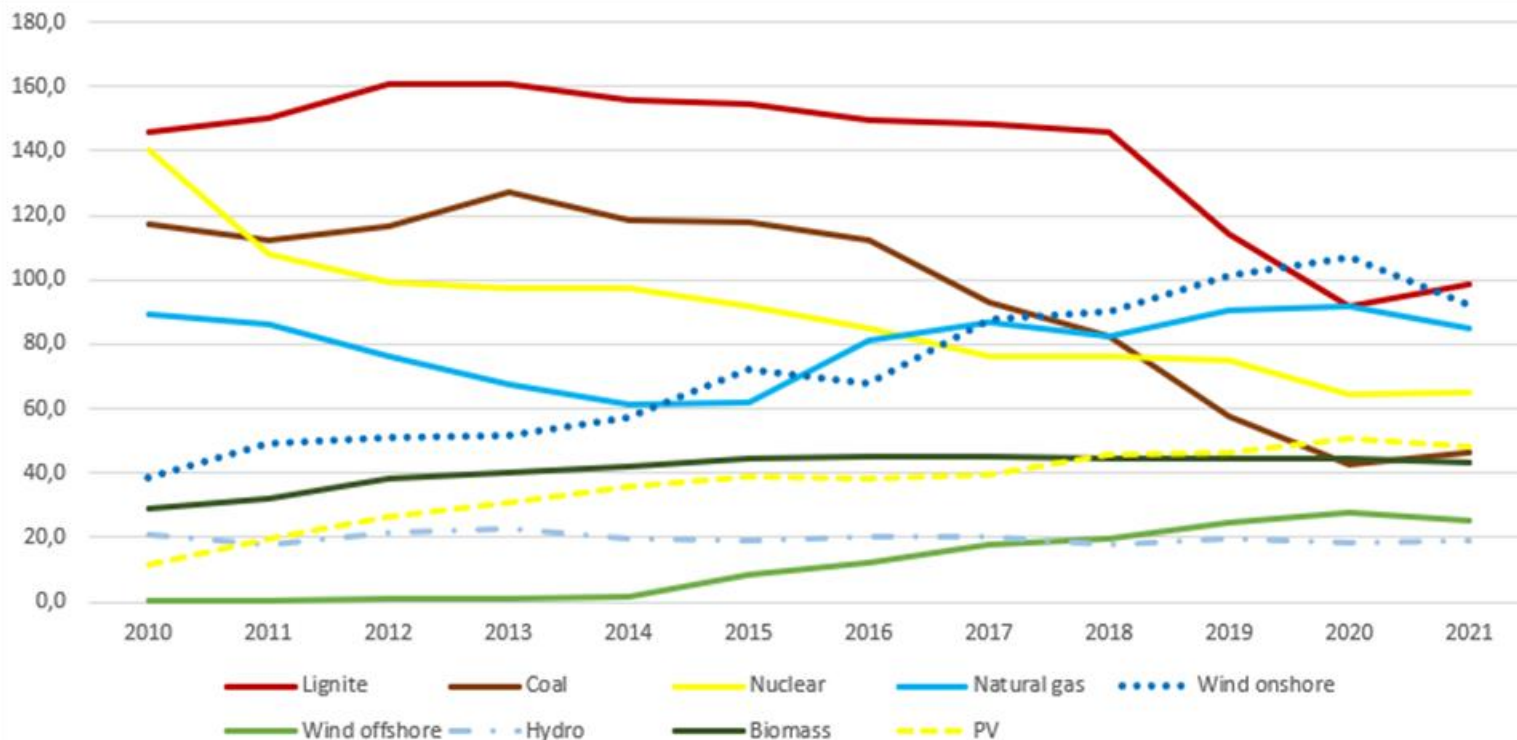
# Role of gas in EU power generation no more in decline and still very strong, was expected to strengthen further

Total EU electricity generation from coal and natural gas in TWh (2000-2021)



# Flexible gas more than a back up for renewables and replacement of coal, nuclear in Germany: backbone of the (broken) system...

Electricity generation in Germany in TWh (2010-2021)





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