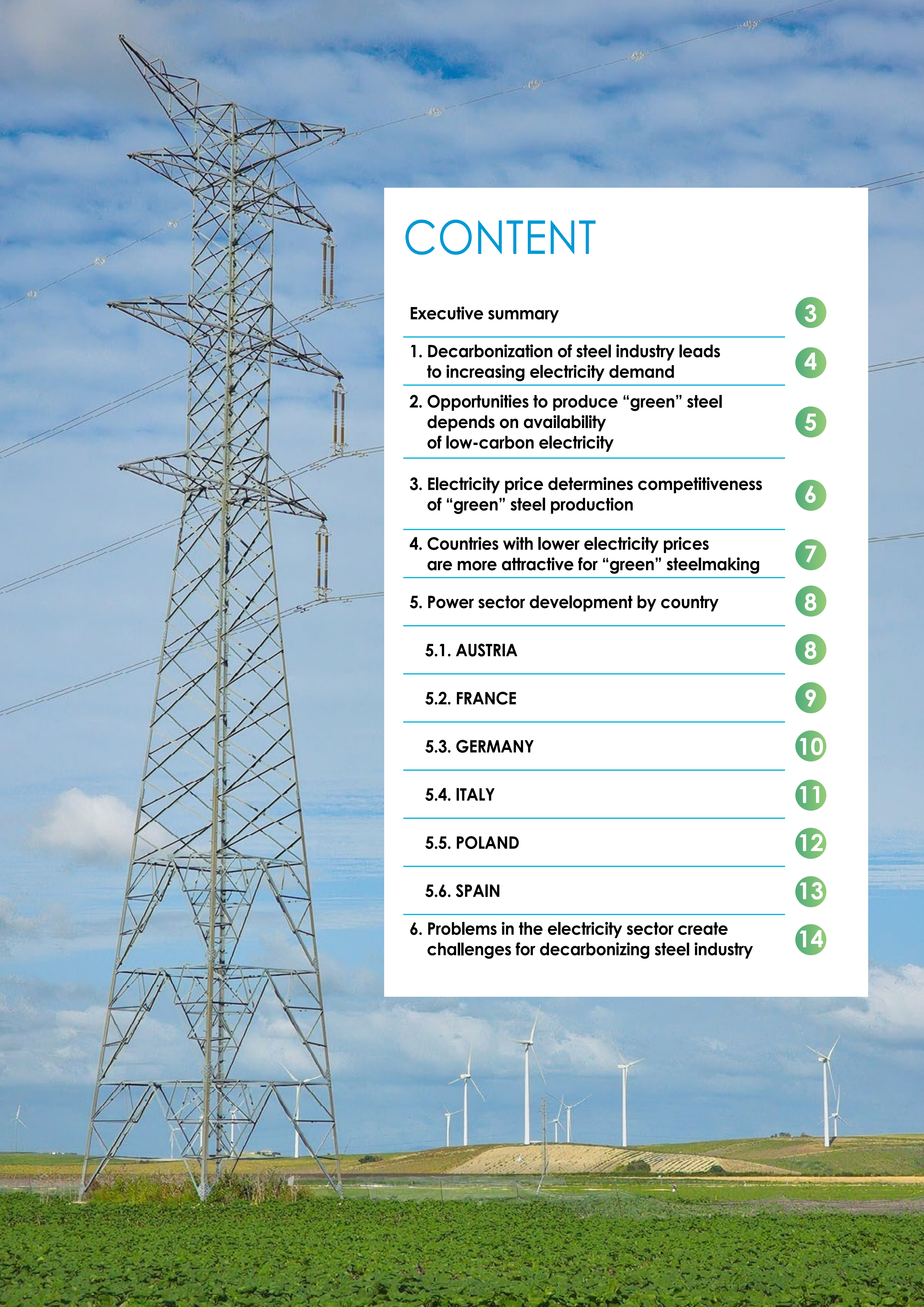
EU ELECTRICITY MARKET:

challenges for green transition IN STEEL INDUSTRY

June 2025



CONTENT

EXECUTIVE SUMMARY

The decarbonization of the European steel industry is driving a sharp increase in electricity demand. As fossil-fuel-based production methods are phased out, electrification – particularly through hydrogen-based processes – has become the central pathway to achieving climate goals. According to Eurofer estimates, electricity consumption in the steel sector will soar by 2.2 times by 2030 and over fivefold by 2050, reaching 400 TWh per year, with 230 TWh allocated for hydrogen production.

The ability to produce “green” steel depends on the availability of low-carbon electricity, sourced from renewables and nuclear power. Countries with substantial clean energy generation, such as France, Spain, and Sweden, are better positioned to support large-scale green steel production. Conversely, nations that rely heavily on fossil fuels, such as Italy and Poland, face significant challenges in transitioning to low-carbon power, exposing them to rising electricity costs due to EU ETS carbon pricing.

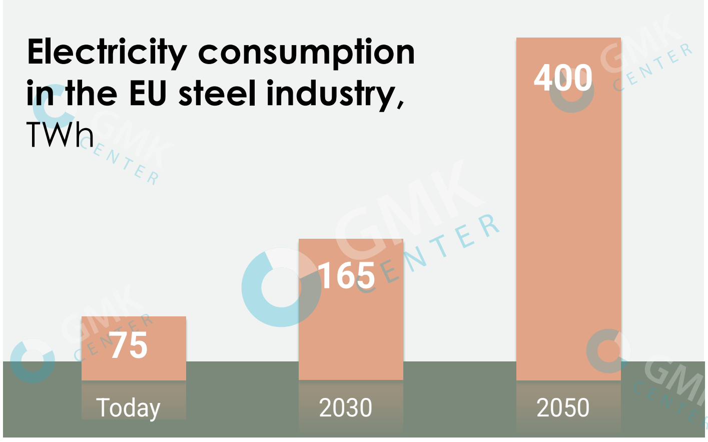
Electricity prices play a decisive role in determining the competitiveness of green steel. Hydrogen-based steelmaking is highly sensitive to electricity costs, with production expenses increasing sharply as prices rise. If electricity price reaches $100/MWh, the share of electricity in overall production costs could surpass 40%, threatening the viability of decarbonization projects and steel output within the EU.

The EU electricity market remains fragmented, with wide price disparities between regions. Countries with lower electricity prices, such as Spain and France, offer more attractive conditions for “green” steel investments. Meanwhile, high prices in Italy, Greece, Bulgaria, and Romania create barriers to industrial decarbonization. Cross-border grid expansion could reduce price discrepancies, but such measures may erode competitive advantages for countries with low-cost electricity.

Challenges in the power sector pose risks to steel decarbonization. A potential shortage of low-carbon electricity may prevent steelmakers from meeting climate targets. Moreover, extreme volatility in electricity prices, which saw record swings in recent years, disrupts operational stability, complicating long-term investment planning. As concerns mount, EU policymakers have initiated discussions on economic policy interventions to reduce electricity costs without destructing the incentives for power sector development. The outcome of these debates will shape the future of European steelmaking and its ability to transition toward climate neutrality.

1. Decarbonization of steel industry leads to increasing electricity demand

Electricity consumption in the EU steel industry, TWh



Data source: Eurofer.

27%
of electricity demand in the EU steel industry
is met by generation based on residual BF-BOF gases

Steelmaking processes require high temperature heating which is now achieved using fossil fuels. Electricity is an alternative option. In fact, decarbonization of steel industry means electrification of its production processes.

According to Eurofer's estimates, decarbonization of the European steel industry will increase its electricity consumption by 2.2 times by 2030. Almost 55% of electricity will be used for hydrogen production. By 2050 electricity consumption of the European steel industry will grow more than 5 times, reaching 400 TWh per year, 230 TWh of them will be used for hydrogen production.

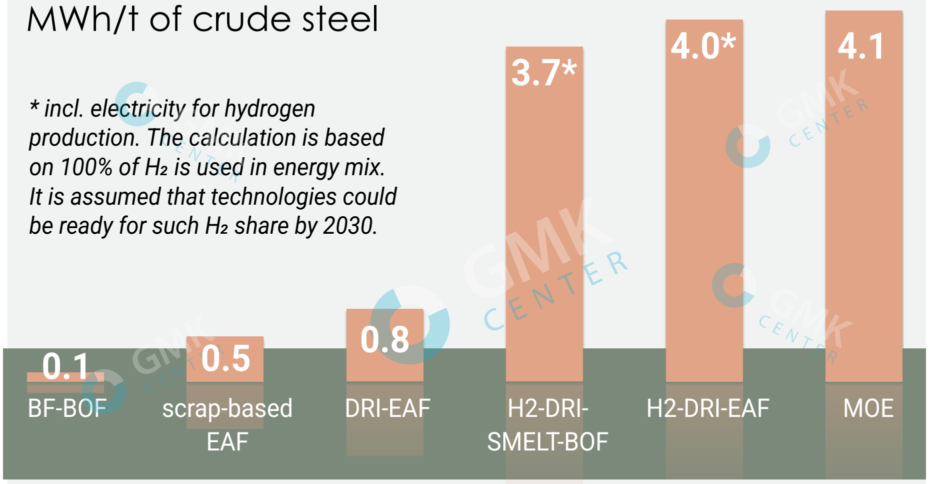
Other estimates also confirm a significant increase in electricity demand from the steel industry. In particular, German Steel Association calculated that in case of a conversion of 14 million tons of primary steel production to the direct reduction process demand for grid electricity will double by 2030 reaching 24 TWh. Additionally, 48 TWh will be required for hydrogen electrolysis.

Hydrogen Europe assessed that the conversion of all EU BF-BOF plants (103 million tons of hot metal per year) to hydrogen-DRI processes will require up to 370 TWh of additional renewable electricity.

There are two main reasons for increasing electricity demand in the steel industry. First of all, major technologies leading to decrease in carbon emissions require more electricity. The average electricity intensity in scrap-based EAF steelmaking is 5 times higher than at BF-BOF plants. DRI-EAF steelmaking would increase electricity demand by 8 times compared to BF-BOF. Electricity consumption of hydrogen-based direct reduction-smelter route (H2-DRI-SMELT-BOF) and hydrogen-based direct reduction – electric arc furnace route (H2-DRI-EAF) would be 37-40 times higher than in BF-BOF processes. Electricity consumption of molten oxide electrolysis (MOE) is 41 times higher than BF-BOF.

According to Eurofer's estimates, now European steel plants meet around 27% of electricity demand (20 TWh) by own generation working on residual gases from BF-BOF processes. German Steel Association assessed that German steel plants satisfy 52% of electricity needs via self-generated power. Future phase-out of BF-BOF$_s$ due to decarbonization will deprive steel plants of their own electricity generation, so they will become more dependent on external electricity sources. It is an additional reason for increasing demand for grid-supplied electricity, which emphasizes the importance of power sector development for decarbonization of steel industry.

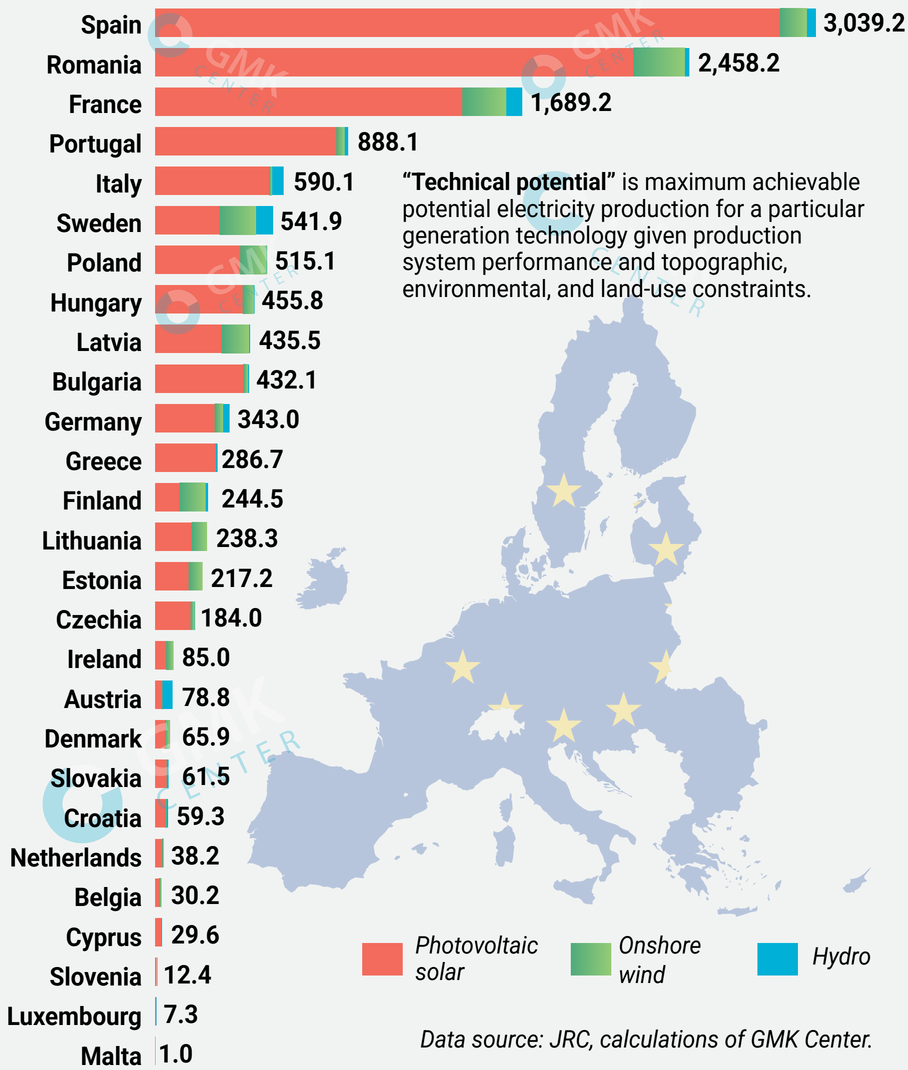
Electricity consumption per technology route, MWh/t of crude steel



Data source: Agora Industries, calculations of GMK Center.

2. Opportunities to produce “green” steel depends on availability of low-carbon electricity

Technical potential of renewables generation, TWh



Data source: JRC, calculations of GMK Center.

Nuclear development plans

Country	Nuclear capacities expansion, GW	Term
Bulgaria	2.5	2040
Czechia	2.5	2040
Hungary	2.4	2040
Romania	1.9	2040
Sweden	2.5	2035
Netherlands	2.0-3.3	2035
Poland	3.0	2033

“Green” steel production requires low-carbon electricity to ensure minimal Scope 2 emissions. Such electricity could be generated by renewable or nuclear power plants. Countries which will be able to develop big low carbon electricity generating capacities will be the best places for “green” steel production.

EU countries have different natural conditions, which define technical potential for renewable generation. For example, TOP countries by renewables generation potential are Spain (3039 TWh), Romania (2458 TWh), France (1689 TWh), Portugal (888 TWh), Italy (590 TWh).

Accordingly, these countries have the biggest plans to install renewables capacities. For example, according to National Energy and Climate Plan, Spain intends to install 56.5 GW of solar capacities and 31.0 GW of wind capacities (Ember’s calculation). In fact, the development of renewables generation is more connected with solar as it has the biggest unrealized potential: in 2024 EU solar energy generation was only 2.5% from technical potential. Onshore wind and hydro potentials were used by 29.4% and 93.7% accordingly.

EU taxonomy recognizes nuclear energy as low carbon since CO_2 emissions from nuclear power plants over their life-cycle comparable to those from renewable energy sources. Amid the energy crisis and the instability of renewable generation, European countries are reconsidering their attitude towards nuclear power plants. Bulgaria, Czechia, Hungary, Romania, Sweden, Netherlands, Poland have specified plans to increase nuclear capacities.

Denmark wants to reconsider nuclear ban focusing on small modular reactors. In May 2025 Belgium cancelled plans to phase out nuclear energy. The Italian government wants to finalize nuclear power revival plan by 2027 after a near 40-year ban. Croatia is going to study potential locations for new nuclear capacity. Germany closed its last nuclear reactor in April 2023, but now new German government wants to return to developing nuclear generation.

3. Electricity price determines competitiveness of "green" steel production

Since "green" steelmaking technologies require more electricity to produce steel, productions costs are becoming more sensitive to changes in electricity prices.

According to our calculations, increasing electricity prices from $20/MWh to $100/MWh leads to increasing electricity share in production costs from 2% to 11% in case of direct reduction with natural gas and CCS.

In the case of hydrogen-based DRI-EAF route electricity share can increase from 11% to 38%. Hydrogen-based direct reduction smelter route could face with very similar increase.

Hydrogen-based production routes are more sensitive to changes in electricity prices as production of "green" hydrogen is electricity intensive. Electricity price also determines the price of "green" hydrogen.

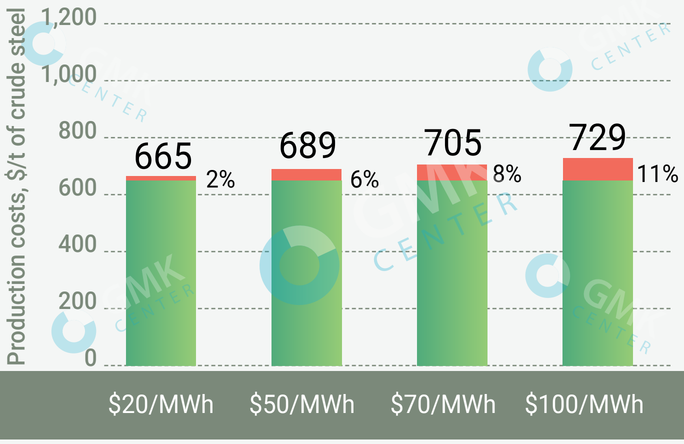
Electrolysis processes like molten oxide electrolysis or alkaline electrolysis, which are expected to be ready for commercial use by 2050, will be more dependent on electricity prices than hydrogen-based technologies.

According to our calculations, if the electricity price reaches $100/MWh, electricity share in molten oxide electrolysis production costs could reach 50%.

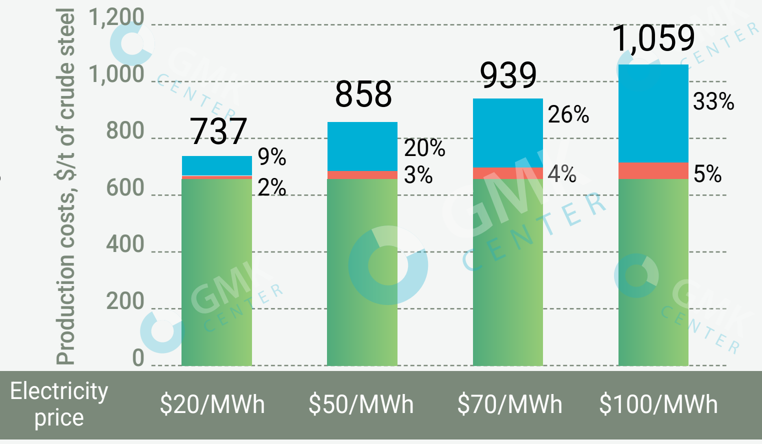
Production costs depending on electricity price

2030

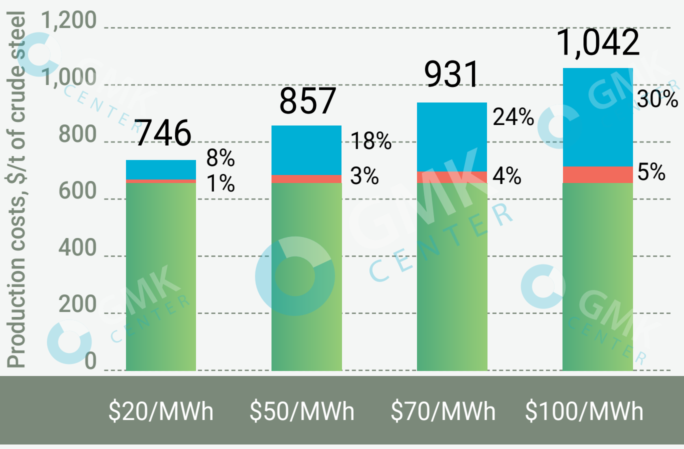
Direct reduction with natural gas and CCS (NG-DRI-EAF-CCS)



Hydrogen-based direct reduction – electric arc furnace route (H2-DRI-EAF)

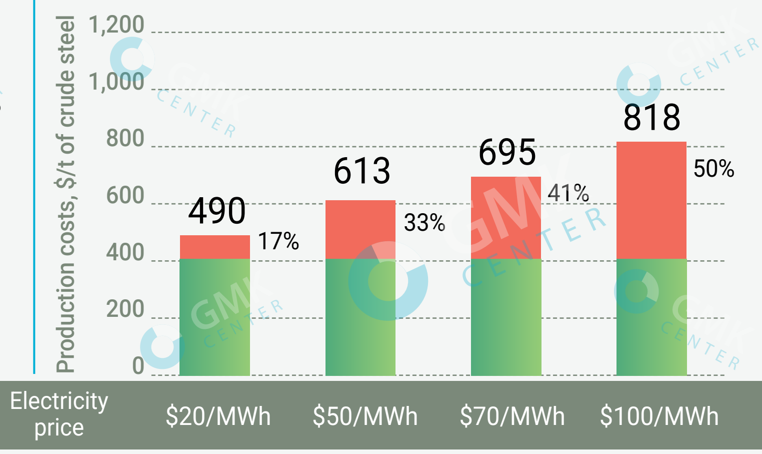


Hydrogen-based direct reduction-smelter route (H2-DRI-SMELT-BOF)



2050

Molten oxide electrolysis (MOE)



Electricity for hydrogen production · *Electricity for plant operation* · *Other costs*

Data source: Agora Industries, calculations of GMK Center.

4. Countries with lower electricity prices are more attractive for "green" steelmaking

The EU electricity market is fragmented. Even within one country there may be several bidding zones with different prices, as for example in Sweden and Italy.

The highest electricity prices are observed in Romania, Bulgaria, Greece, Italy, Ireland (more than €100/MWh). The lowest electricity prices are in Spain, Portugal, France, Sweden, Finland, Norway.

There are many reasons for price differences, including volume of generating capacities, their structure, cross-border transmission capacities.

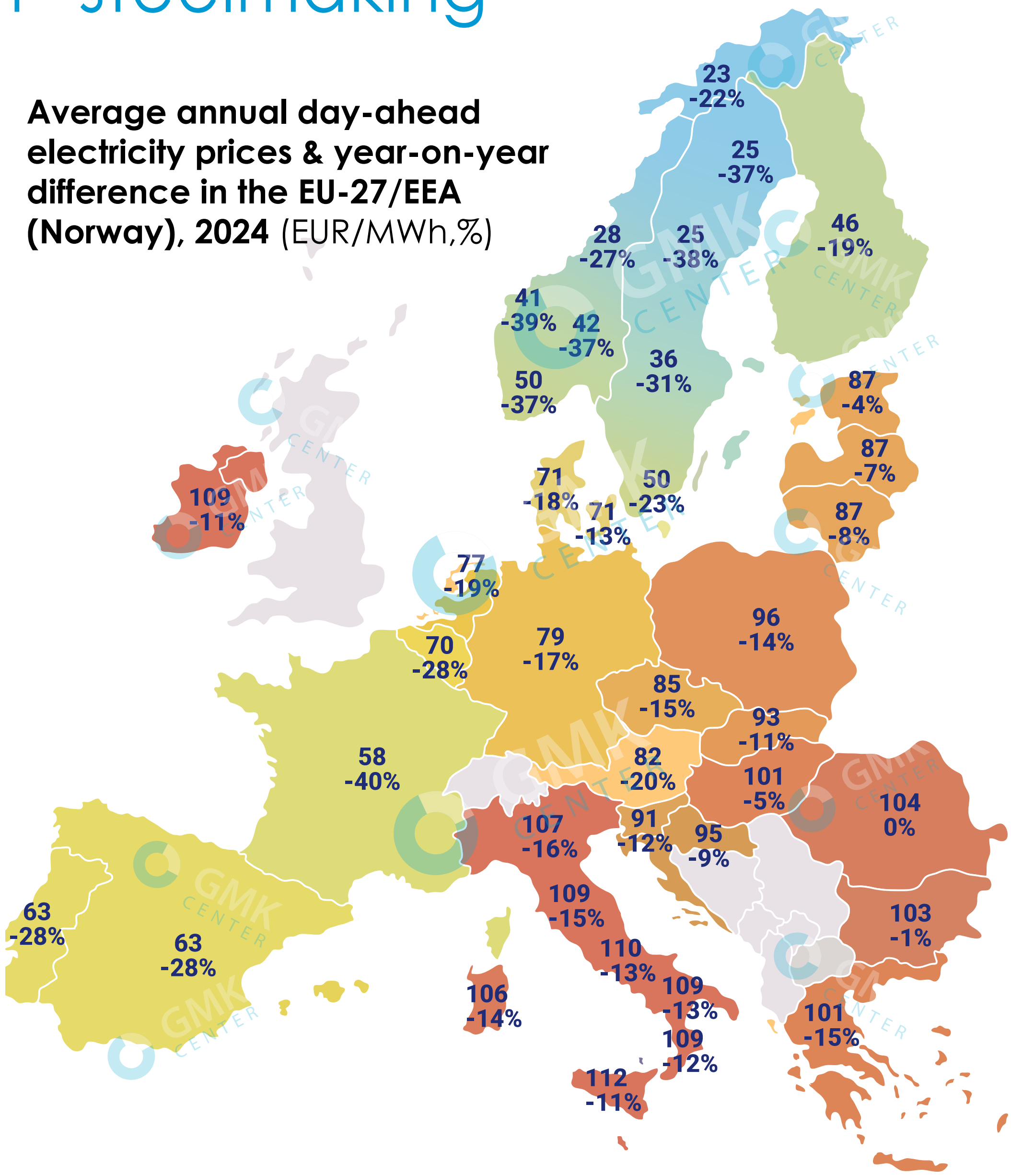
Spain and Portugal have low electricity prices due to large renewable capacities, France – due to nuclear generation, Sweden – due to hydropower. Electricity generation in Italy and Poland are largely based on fossil fuels, which results in high electricity prices considering carbon costs in the EU ETS.

Insufficient connections between Bulgaria, Romania, Greece, and the rest of the EU create major obstacles for free flow of electricity. As a result, Southeastern Europe has bigger electricity prices than West Europe. Expansion of cross-border transmission capacities is considered to be the way to achieve decreasing electricity prices. However, as a result, countries with low electricity prices will lose their competitive advantages as electricity prices in their domestic markets will rise. So, in practice, countries may not want to expand their grid interconnections.

Italy is considering decoupling gas-based electricity prices from renewables. Now all electricity is paid at the rate of the last and usually most expensive source needed to meet demand (often gas-based plants). As a result, suppliers of renewable electricity get prices which are much higher than their production costs. Decoupling could reduce weighted average price as renewable and fossil fuel electricity will be traded separately.

We don't expect that the EU electricity market will have the single electricity price. So, EU countries with high electricity prices will have to find their solutions to decrease them. Low electricity prices will be the main competitive advantage for development of local "green" steel industry.

Average annual day-ahead electricity prices & year-on-year difference in the EU-27/EEA (Norway), 2024 (EUR/MWh,%)



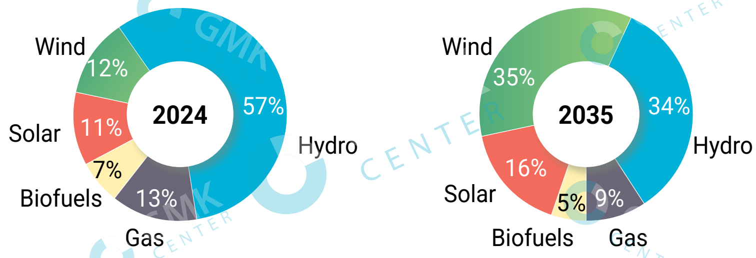
Data source: ACER.

5. Power sector development by country

5.1. AUSTRIA

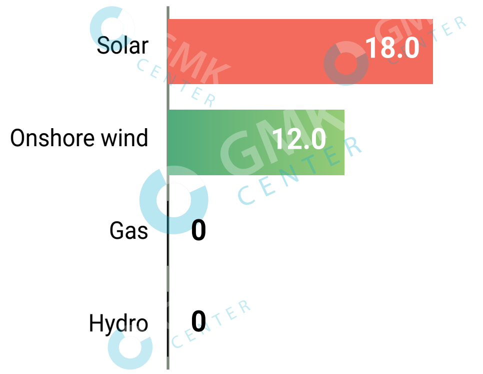
	2024	2035
Electricity demand, TWh	59	81-89
Net import share	-8.3%	-7.6%
Installed power capacities, GW	29	56-62
Low carbon electricity share	86%	91%
Green hydrogen capacities, MW	13	1,500
Battery storage capacities, MWh	950	4,100
Carbon intensity, g/kWh	107	66-73
Average electricity prices, day-ahead, €/MWh	**82**	**60-70**
Steel output, mln t	7.1	7.5-8.0

Power generation balance



Austria currently boasts one of the lowest carbon footprints in the EU, thanks to its extensive reliance on hydropower. Looking ahead, the country is scaling up its solar and wind capacity to meet growing demand for clean energy. So, policies are prioritizing incentives for new solar and wind installations, but don`t provide significant support for commercial-scale generating capacities. This strategy reinforces Austria's position as a net electricity exporter and strengthens its appeal for energy-intensive industries like iron & steel, where low electricity prices provide a competitive edge.

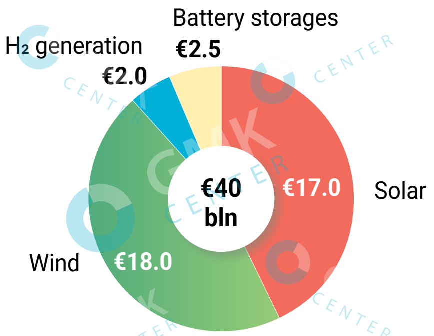
Power generation capacities developments 2025-2035, GW



Key instruments for the power sector developments:

- **Feed-in-Tariffs:** fixed tariffs for 15-20 years or market premium mechanism for commercial-scale projects (difference between market price and a predefined strike price).
- **Accelerated depreciation:** 60% in the first 4 years.
- **Klimafonds:** grants up to 30% of CAPEX for rooftop systems, €500,000 grants for feasibility studies for wind and hydro, €200/kWh grant for storages.
- **Investitionsprämie:** tax refund of 20% CAPEX, max. €1 mln.
- **Soft loans:** AWS Grüne Energie (0.5-1.5%, max. €50 mln), Kommunalkredit Green Finance (1-2%), EIB.
- **Regional programs:** Vienna offers grants for small-scale PV installations (up to €200,000 per project), Lower Austria grants up to €50,000 for PV, up to €200,000 for turbines replacement.
- **EU Funds:** European Regional Development Fund, LIFE Programme, IPCEI Hydrogen (€0.5 bln for Austria).
- **H2 Austria Initiative:** €70 mln for 2021-2025, grants covering up to 45% of CAPEX, max. €5 mln per project.

CAPEX needs 2025-2035, € bln



Case-studies

€4 mln
0.75% loan for 10MWh battery storage from Energie AG Ökoenergie-Fonds for Voestalpine, €2 mln grant received

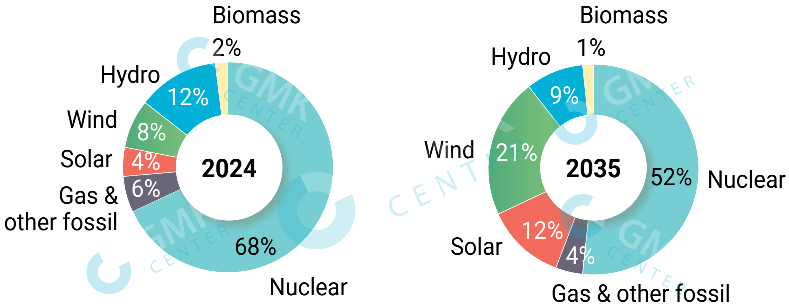
€25 mln
1.2% loan from Kommunalkredit Green Finance received by IG Windkraft for replacing 9MW old wind turbines with 18MW

€5 mln
grant received by Verbund within H2Future initiative for 3MW electrolyzer project in Linz, €15 mln loan provided by EIB with 0.8% rate

5.2. FRANCE

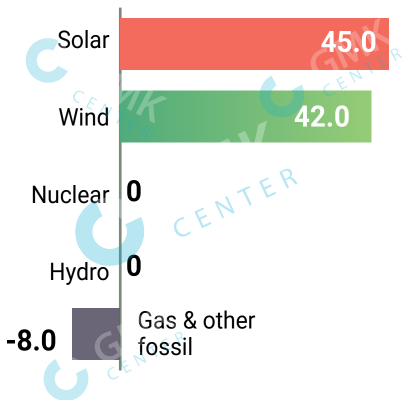
	2024	2035
Electricity demand, TWh	430	500-550
Net import share	-16.0%	-9.3%
Installed power capacities, GW	149	220-240
Low carbon electricity share	94%	96%
Green hydrogen capacities, MW	35	10,000
Battery storage capacities, MWh	1,500	8,100
Carbon intensity, g/kWh	21	23-26
Average electricity prices, day-ahead, €/MWh	**58**	**50-58**
Steel output, mln t	10.8	12.5-13.5

Power generation balance



France is leading the way in the green energy transition, leveraging its robust nuclear power infrastructure to deliver some of the lowest carbon emissions and most affordable electricity prices in Europe, while also capitalizing on opportunities for energy exports. By 2035, the country aims to solidify its position as an energy powerhouse by maintaining its nuclear capabilities and expanding renewable energy sources to meet rising demand. Additionally, France provides substantial funding opportunities for major projects, including hydrogen production.

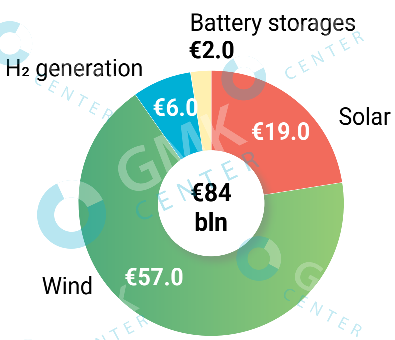
Power generation capacities developments 2025-2035, GW



Key instruments for the power sector developments:

- **Feed-in Tariffs (FiT) and Feed-in Premiums (FiP):** FiTs for small-scale and offshore projects, FiP tenders for large-scale projects.
- **Bonus depreciation:** additional 40% deduction on top of the standard depreciation in the 1st year for solar and wind equipment.
- **BPI France (Public Investment Bank) soft loans and guarantees:** 10-20 years loans with 1-3% interest rates, max. €50mln.
- **EIB soft loans:** 1-2% interest rates for up to 25 years for large-scale projects.
- **Banque des Territoires soft loans:** 1-3% loans for local projects, max. €20 mln.
- **ADEME grants:** 50% of costs for heat projects, up to €5 mln for waste-to-energy, up to €20 mln for innovation projects, up to €20 mln for hydrogen projects.
- **France 2030 Investment Plan:** €9 bln for energy transition, incl. €4 bln for hydrogen projects.
- **NRRP:** €7 bln for renewables and hydrogen projects.

CAPEX needs 2025-2035, € bln



Case-studies

€500 mln received Horizeo Solar Project in grants from ADEME for the development of 1 GW solar farm, battery storage and electrolyzer

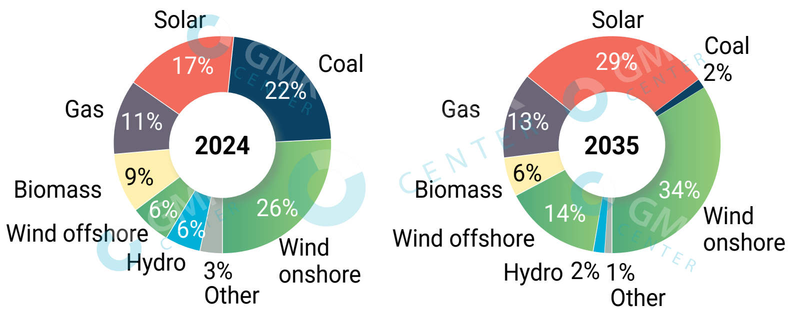
€200 mln 1.0-1.5% loan for 600 MW Dunkirk offshore wind farm from Banque des Territoires and BPI France, total project`s debt funding – €1.4 bln (70%)

€700 mln 1-2% loan from EIB for 1.5 GW electrolyzers within H2V Normandy Hydrogen Project, funding structure also included €300 mln of state grants

5.3. GERMANY

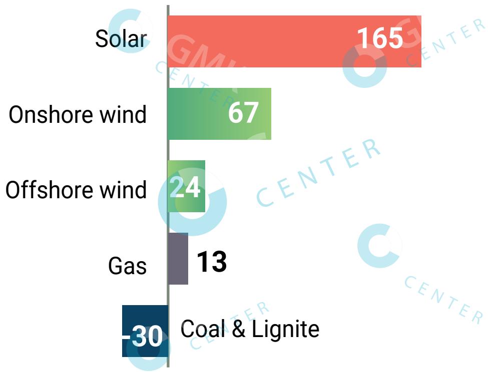
	2024	2035
Electricity demand, TWh	465	590-650
Net import share	5.9%	-3.4%
Installed power capacities, GW	251	470-510
Low carbon electricity share	55%	80%
Green hydrogen capacities, MW	35	18,000
Battery storage capacities, MWh	7,500	40,000
Carbon intensity, g/kWh	321	122-136
Average electricity prices, day-ahead, €/MWh	**80**	**55-65**
Steel output, mln t	37.2	39.0-40.0

Power generation balance



As the EU's largest economy, Germany has navigated the complexities of its green energy transition by effectively replacing decommissioned nuclear and coal power with renewables. To address the challenges posed by its high reliance on renewables, the country has established ambitious goals for hydrogen production and battery storage development. To meet these targets, Germany is driving large-scale projects through soft loans from institutions like KfW and the European Investment Bank, alongside other EU funding mechanisms, while also encouraging smaller initiatives through regional support programs.

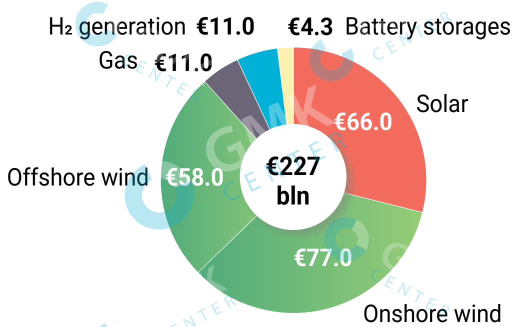
Power generation capacities developments 2025-2035, GW



Key instruments for the power sector developments:

- **Feed-in Tariffs (FiT):** auctions for large-scale projects.
- **Accelerated depreciation:** 20% in the 1st year for solar installations.
- **KfW grants and loans**:
  - program 270 (large-scale wind, solar, biomass projects): up to 100% of project costs, 1.0-2.5%, up to 20 years;
  - program 295 (energy storages paired with RES): grant 30% (max. €30 mln), other 70% - loan at 1.0-2.0%;
  - program 268 (large-scale offshore wind projects): 25 years loans at 2.0-3.0% max. €500 mln;
  - program 353: (electrolysis plants): 1% loans.
- **IPCEI Hy2Tech:** €8 bln in grants for hydrogen projects.
- **NRRP:** €12 bln in grants, covering up to 30-40% of CAPEX.
- **Regional programs:** North Rhine-Westphalia grants 30% of costs for small-scale PV projects.
- **EU funds:** ERDF, Innovation Fund, Just Transition Fund, etc.

CAPEX needs 2025-2035, € bln



Case-studies

€45 mln

soft loan received BayWa r.e. for 150 MW Alttrebbin Solar Farm from KfW at 1.5%, covered 50% of total project costs

€150 mln

grant received by BASF within IPCEI H2Tech program for 30 MW Ludwigshafen Green Hydrogen Plant, covered 30% of project costs

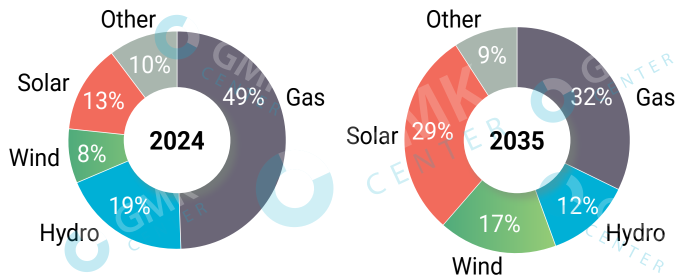
€81/MWh

feed-in tariff for 242 MW Gode Wind 3 offshore wind farm

5.4. ITALY

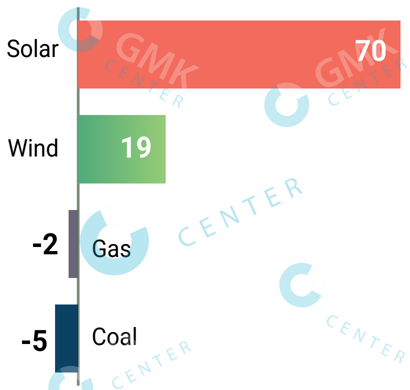
	2024	2035
Electricity demand, TWh	465	600-650
Net import share	16.1%	8.1%
Installed power capacities, GW	121	200-220
Low carbon electricity share	48%	68%
Green hydrogen capacities, MW	35	7,000
Battery storage capacities, MWh	3,880	12,900
Carbon intensity, g/kWh	310	170-190
Average electricity prices, day-ahead, €/MWh	**108**	**76-86**
Steel output, mln t	20.0	20.0-21.0

Power generation balance



Italy, heavily dependent on natural gas for electricity generation, must add roughly 90 GW of renewable capacity by 2035, a monumental effort requiring €75 bln. To meet this goal, the government is leaning primarily on private capital, offering revenue guarantees via fixed tariffs and covering up to 40% of project costs through EU-funded subsidies. Regional initiatives, particularly in the sun-rich South, further bolster progress. Yet even if Italy hits its 2035 targets, gas could still account for 32% of its power mix, leaving it with some of the EU's highest carbon emissions and electricity prices, a lingering challenge in the transition.

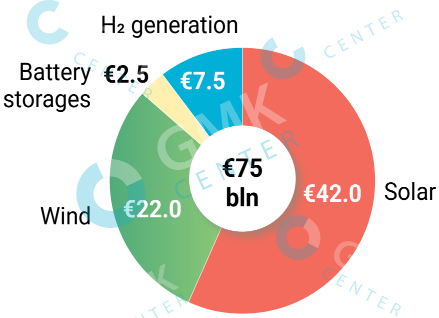
Power generation capacities developments 2025-2035, GW



Key instruments for the power sector developments:

- **Feed-in Tariffs:** fixxed tariffs for 20 years or market premium mechanism for commercial-scale projects (difference between market price and a predefined strike price).
- **Accelerated depreciation:** 50% in the 1st year.
- **PNRR Fund (EU Recovery Fund, REPowerEU):** €5 bln for RES, €3.6 bln for H2, €1.1 bln for storages till 2026. Provide blended finance:
  - grants for solar/wind projects max. €20 mln, hydrogen – €50 mln, storages – €10 mln;
  - soft loans: 20-years loans with 0.5-1.5% interest rate.
- **Regioan programs (ERDF funded):**
  - Southern Italy: grants of up to 60% of equipment costs;
  - North/Central Italy: grants of up to 40-50% of costs.
- **European Agricultural Fund (EAFRD):** €1.0 bln for agrivoltaics and biogas projects in Italy.
- **IPCEI Hy2Tech:** €1.0 bln for Italy.

CAPEX needs 2025-2035, € bln



Case-studies

€100 mln
IPCEI Hy2Use grant received by Tenaris for 100 MW electrolyzers installations in Taranto within Green Steel Transition project

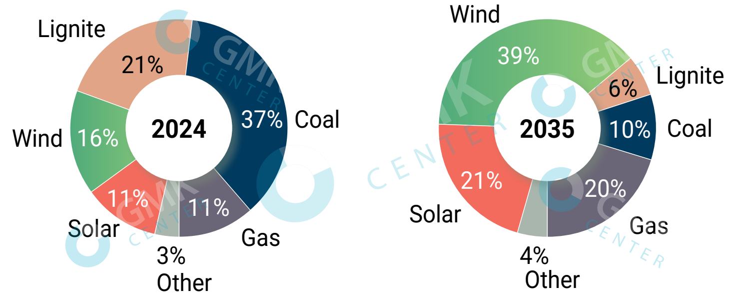
€25 mln
grant received by Enel Green Power from PNRR for 84 MW Tago Solar Park, covered 40% of total project CAPEX

40%
of €160 mln CAPEX of Porto Marghera Green Hydrogen project financed from state funds (PNRR, Innovation Fund, Veneto Transition 4.0 Fund)

5.5. POLAND

	2024	2035
Electricity demand, TWh	164	190-210
Net import share	1.1 %	2.2%
Installed power capacities, GW	60	92-102
Low carbon electricity share	30%	64%
Green hydrogen capacities, MW	10	3,000
Battery storage capacities, MWh	479	4,000
Carbon intensity, g/kWh	653	250-280
Average electricity prices, day-ahead, €/MWh	**96**	**100-115**
Steel output, mln t	7.1	6.2-6.8

Power generation balance

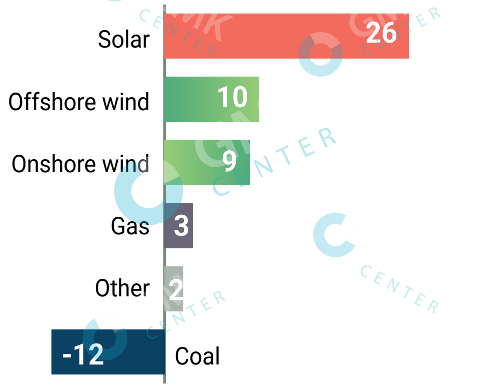


Poland plans to cut coal reliance by 2035, adding over 45 GW of RES and launching 1.6 GW of nuclear capacity (post-2035). This shift creates major financing opportunities for large-scale projects, requiring €79 billion (up to 1% of GDP annually) by 2035. Yet, Poland's electricity carbon intensity and prices will stay among the EU's highest, hindering decarbonization and harming steel industry development.

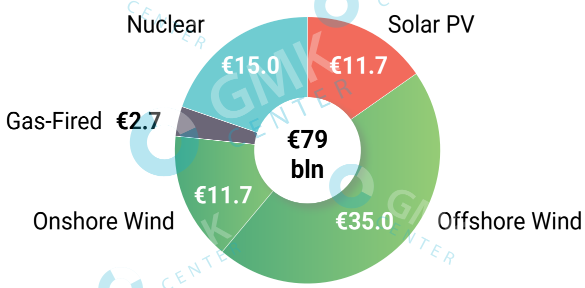
Key instruments for the power sector developments:

- **Contract for difference (CfD):** price guarantees for RES and hydrogen, kind of feed-in-tariffs.
- **Nuclear Program:** €20 bln state-backed financing for construction of 6 GW nuclear capacities by 2043.
- **EU Funds:** Innovation Fund (€1.2 bln for Poland); Modernization Fund (€2.5 bln); Recovery and Resilience Facility (€12 bln for RES); European Regional Development Fund (€5-6 bln for RES); Just Transition Fund (€3.5 bln for Poland).
- **National Funds:** National Fund for Environmental Protection (NFOŚiGW) – guarantees up to 80% of bank loans, grants up to 40% of CAPEX; National Recovery Plan – €12 bln for energy transition.
- **Low-interest loans:** up to 2% interest rates for RES projects from Polish Development Bank, €5 bln for energy infrastructure projects in Poland from EIB.
- **Energy storage subsidy program:** €1.0 bln subsidy scheme for 5 GW battery storages projects, sourced from EU Funds.

Power generation capacities developments 2025-2035, GW



CAPEX needs 2025-2035, € bln



Case-studies

4%

fixed interest rate for PLN 9.7 million 12-year loan of Polish Development Bank for biogas plant in Lubelskie project, covered 80% of CAPEX

€250 mln

EU Innovation Fund grant for 100 MW electolyser project in Gdansk (Orlen), another €150 mln loan provided by Polish Development Bank

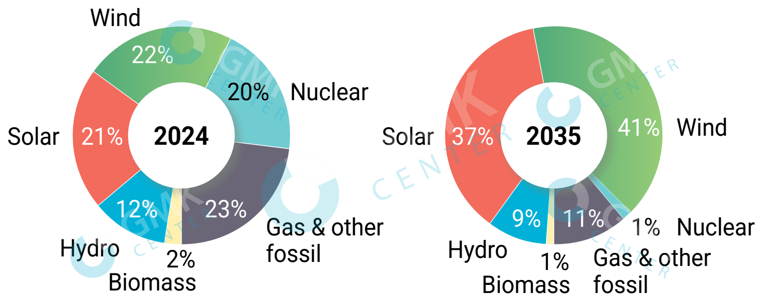
2 GW

of solar capacities added by 300,000 rooftop installations in 2023-2024 within NFOŚiGW program, granted up to 50% of CAPEX

5.6. SPAIN

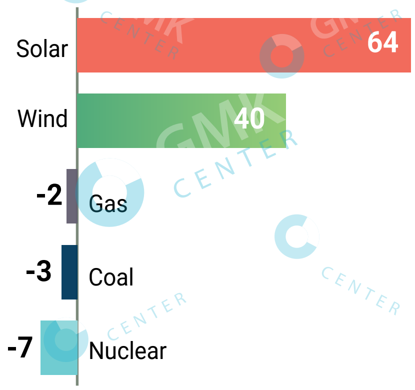
	2024	2035
Electricity demand, TWh	232	315-345
Net import share	-3.7%	-0.6%
Installed power capacities, GW	117	196-216
Low carbon electricity share	77%	89%
Green hydrogen capacities, MW	50	20,000
Battery storage capacities, MWh	4,900	24,000
Carbon intensity, g/kWh	145	75-85
Average electricity prices, day-ahead, €/MWh	**63**	**50-58**
Steel output, mln t	11.8	13.0-13.5

Power generation balance



Spain already generates 77% of its electricity from low-carbon sources, but with plans to phase out nuclear power by 2035, the country faces the challenge of adding over 100 GW of new solar and wind capacity. Fortunately, Spain's exceptional renewable potential positions it to maintain some of Europe's lowest electricity prices by 2035, strengthening its industrial competitiveness. This advantage, combined with ambitious green hydrogen plans (12 GW of electrolyzer capacity by 2030), is expected to attract energy-intensive industries, cementing Spain's role as a clean energy leader and a hub for green H_2 production.

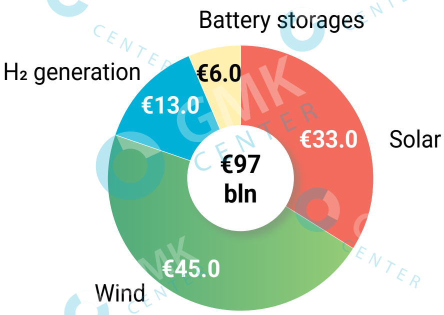
Power generation capacities developments 2025-2035, GW



Key instruments for the power sector developments:

- **Contract for difference (REER):** auctions.
- **Accelerated depreciation:** 5-10 years for solar vs 10-20 years of standard period, 5-8 years for wind turbines.
- **PNRR:** €3.1 bln grants for solar/wind capacities in 2021-2026, €1.0 bln for battery storages.
- **ERDF:** €1.5 bln grants for renewables and hydrogen projects.
- **H2 PERTE program (funded from PNRR):** €1.55 bln grants for electrolyzers and infrastructure.
- **PRTR (funded by NextGenerationEU and ERDF):** €6.9 bln grants for renewables and hydrogen projects.
- **ICO + IDEA soft loans:** Euribor +0.5%-1.5% for 12-15 years, covering 80-100% of CAPEX.
- **EIB soft loans:** 1-3% interest rates up to 20 years.
- **Regional programs:** Basque Country: grants of up to 30-50% costs for rooftop solar; Andalusia: grants of up to 40-50% costs for agrovoltaics projects.

CAPEX needs 2025-2035, € bln



Case-studies

€400 mln
soft loan provided by EIB to Iberdrola for solar projects in Spain (760 MW) in 2023

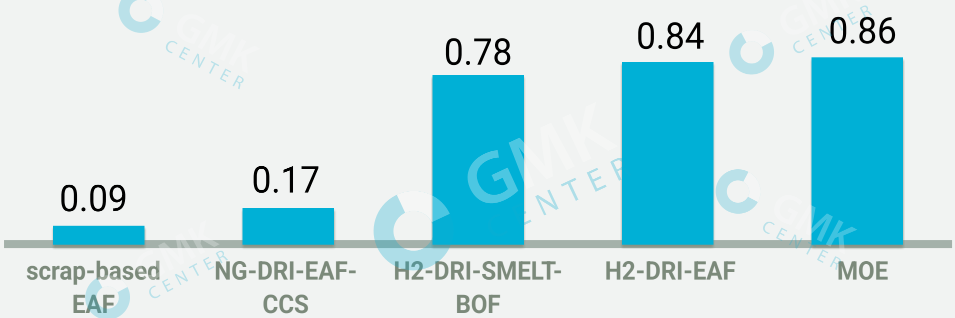
€16.3 bln
budget of PERTE ERHA, public-private partnership for renewables and hydrogen projects development involved Iberdrola, Endesa, Acciona

€422 mln
H2 PERTE funding received by Cepsa for Andalusian Green Hydrogen Valley (2 GW electrolyzers till 2030)

6. Problems in the electricity sector create challenges for decarbonizing steel industry

a) potential lack of low-carbon electricity will not allow steelmaking companies to meet decarbonization targets

Scope 2 per production route based on current GHG intensity of electricity generation in the EU, t CO_2 per t of crude steel

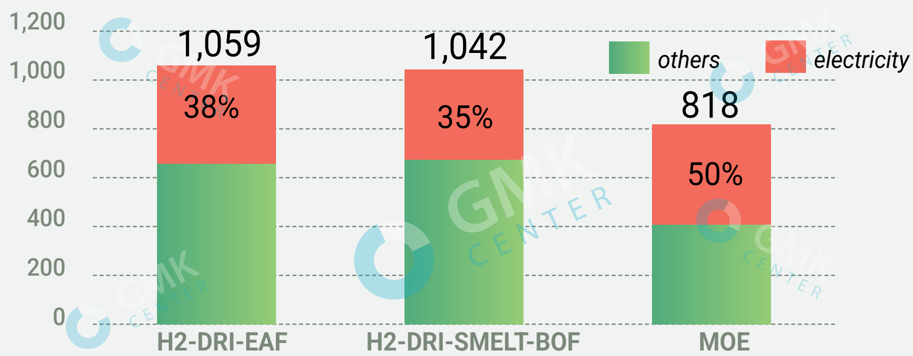


Data source: Agora Industries, European Environment Agency, calculations of GMK Center

Considering zero Scope 2, carbon intensity (Scope 1 + 2) of NG-DRI-EAF-CCS should be 0.20 t CO_2/t of crude steel, H2-DRI-SMELT-BOF – 0.04, H2-DRI-EAF – 0.01, MOE (molten oxide electrolysis) – 0.00. With current carbon intensity of electricity generation these levels are not achievable. If the electricity sector fails to reduce CO_2 emissions, then steel companies also will not be able to decrease the carbon intensity of their production.

b) high electricity prices decrease competitiveness of "green" steelmaking

Production costs if electricity price = $100/MWh



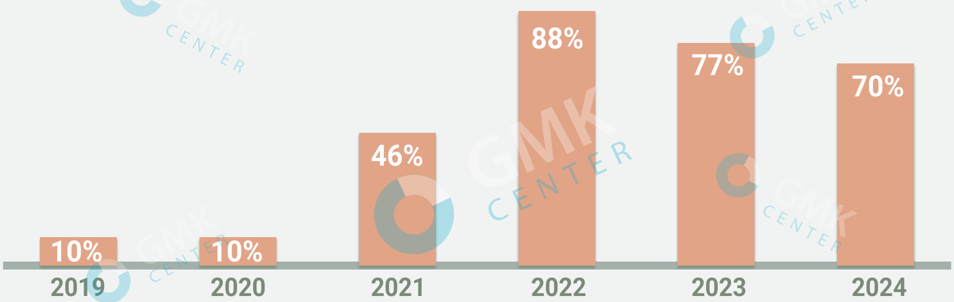
Data source: Agora Industries, calculations of GMK Center.

Increasing electricity prices lead to rising production costs. If electricity price is $100/MWh, electricity share in production costs could exceed 40%.

Steel producers are unlikely to accelerate decarbonization efforts if doing so puts their competitiveness at risk. This creates uncertainty around the future of European steelmaking

c) high electricity price volatility poses a risk to the continuity of steel production processes

Annual percentage of days when price variation per day was greater than 50 EUR/MWh, EU-27+Norway



Data source: ACER.

The growing share of renewables in the energy mix is driving increased price volatility. Since wind and solar power are inherently unpredictable, renewable generation levels can swing sharply, leading to significant price fluctuations. Spikes in electricity costs present a challenge for steel producers, potentially undermining their competitiveness.

EVERYTHING ABOUT STEEL: GMK CENTER MEDIA, THINK TANK, RESEARCH

MEDIA

Free data source about iron&steel:

- up-to-date market analytics
- corporate news
- full picture of global iron&steel industry
- interviews and opinions of market leaders
- steel and raw material prices

THINK TANK

Think tank:

- fundamental studies on key challenges for iron&steel industry
- new ideas for decision making, public and expert discussion
- support of the dialogue between steel market stakeholders

RESEARCH AGENCY

Market studies:

- global steel markets coverage
- scrap market
- DRI/HBI and DR-grade feed
- CBAM/ETS/carbon prices impact
- macroeconomic modelling
- prices forecast

OUR EXPERTISE

- Market studies and global trends
- Impact analysis, analysis of regulatory documents
- Modelling and business valuation
- Global trade issues
- Concept of reforms and policy papers
- Decarbonization and green energy transition issues
- Sustainability, ESG activities and reporting

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