bp Energy Outlook – 2024

Insights from the EU

Europe's energy system decarbonizes rapidly, with carbon emissions falling 75% in **Current Trajectory** and turning slightly negative in **Net Zero**

1. Primary energy declines sharply in 2022-50 in both scenarios, between 27% and 48%
2. Despite the decline in primary energy, renewables and hydropower increase in both scenarios
3. The electrification of the energy system accelerates, with the share of electricity in final demand reaching between 44% and 53% in 2050, from 21% in 2022

27% to 48%
decline in primary energy in 2022-50

64% to 70%
growth in power generation in 2022-50

56% to 72%
share of renewables in primary energy in 2050

0 to 0.7
Gt of CO_2e level of carbon emissions by 2050

- Total final consumption declines between 24% and 43% in 2022-50.
- However, this decline hides material changes in energy demand from transport, industry, and buildings. Electricity, hydrogen, bioenergy and synthetic fuels grow in all scenarios. The combined share of these fuels on total final demand increases from 30% in 2022 to 65-85% in 2050.
- Even with a decrease in overall energy consumption, electricity generation is projected to grow significantly, between 64% and 70%. This strong growth is partly driven by the production of green hydrogen, which itself accounts for 14-27% of the total increase in electricity generation.
- Electrification increases in all final use sectors. The share of electricity over total consumption of energy in industry grows from 31% in 2022 to 46% and 53% in 2050 in **Current Trajectory** and **Net Zero**, respectively. Within buildings, this share grows from 34% in 2022 to 53% and 63% in 2050. Within transport, the penetration of electricity is 1% in 2022 but it reaches 41% in **Current Trajectory** and 51% in **Net Zero.**
- Fossil fuel consumption declines strongly in both scenarios. In **Net Zero**, these fuels decline between 82% and 96%. In **Current Trajectory** natural gas is slightly more resilient and declines only 44%, while coal and oil decrease by 82% and 73%, respectively. In this scenario, 18% of natural gas is consumed in combination with a carbon capture and storage technology.
- The EU decarbonizes at a rapid speed. The current level of emissions is similar to that of 1968. In **Current Trajectory** emissions decline by 75%, reducing to 0.7 Gt of CO_2e. In **Net Zero** carbon emissions are completely removed from the energy system. In both scenarios, the power sector is fully decarbonized by 2050.

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		Level in 2050			Shares in 2050 (%)		Change 2022-2050 (% p.a.)	
	2022	Current Trajectory	Net Zero	**2022**	Current Trajectory	Net Zero	Current Trajectory	Net Zero
Primary energy consumption by energy type (EJ)								
Total	**55**	**40**	**28**	**100%**	**100%**	**100%**	**-1.1%**	**-2.3%**
Oil†	22	6.0	1.9	41%	15%	6.8%	-4.6%	-8.4%
Natural gas	12	6.9	2.2	23%	17%	7.9%	-2.1%	-5.9%
Coal	7.8	1.4	0.3	14%	3.5%	1.1%	-6.0%	-11%
Nuclear	2.2	1.9	2.1	4.0%	4.8%	7.5%	-0.4%	-0.1%
Hydro	1.0	1.2	1.3	1.8%	3.1%	4.6%	0.8%	1.0%
Renewables (incl. biofuels)	9.1	23	20	17%	56%	72%	3.3%	2.9%
Primary energy consumption (native units)								
Oil† (Mb/d)	11	2.9	1.0					
Natural gas (Bcm)	345	192	62					
Total final consumption by sector (EJ)								
Total	**49**	**37**	**28**	**100%**	**100%**	**100%**	**-1.0%**	**-2.0%**
Transport	15	10.0	8.6	31%	27%	31%	-1.5%	-2.0%
Feedstocks	3.7	2.6	1.7	7.6%	7.0%	6.2%	-1.3%	-2.7%
Buildings	15	12	8.4	30%	32%	30%	-0.8%	-2.0%
Industry	15	13	8.9	32%	34%	32%	-0.7%	-1.9%
Generation								
Power (TWh)	2,796	4,762	4,599				1.9%	1.6%
Hydrogen (Mt)	5.5	11	17				2.2%	3.8%
Production								
Oil† (Mb/d)	0.3	0.1	0.1				-4.4%	-6.5%
Natural gas (Bcm)	41	16	2.3				-3.4%	-9.7%
Coal (EJ)	4.1	1.0	0				-4.9%	-15%
Emissions								
Carbon emissions†† (Gt of CO_2e)	2.9	0.7	0				-4.8%	
CCUS (Mt of CO_2)	0	-109	-247					

EJ = exajoules

† Oil supply includes crude oil, shale oil, oil sands, natural gas liquids, liquid fuels derived from coal and gas, and refinery gains, but excludes biofuels. Oil demand includes consumption of all liquid hydrocarbons but excludes biofuels. ††Carbon emissions include CO_2 emissions from energy use, industrial processes, natural gas flaring, and methane emissions from energy production.