



bp Energy Outlook – 2023

Insights from the Accelerated, Net Zero and New Momentum scenarios – Global

The war in Ukraine accelerates the decarbonization of the energy system as electrification increases, renewables grow faster and low-carbon hydrogen demand boosts

1. Final energy demand peaks in all three scenarios as gains in energy efficiency accelerate
2. Electricity and low carbon hydrogen demand grow strongly in all scenarios. Electricity is the largest energy source in 2050
3. Fossil fuel consumption decreases in all scenarios by 2050, except for natural gas in **New Momentum**

35% to 64%

share of renewables in primary energy in 2050

3% to 13%

share of coal in primary energy in 2050

1.8x to 2.3x

growth in electricity generation to 2050

-28% to -95%

net change in CO_{2e} emissions by 2050

- ▶ The world's economy grows at a rate of 2.4% a year in 2019-2050, down from 2.6% in the previous outlook, reflecting the impacts of the Russia-Ukraine war.
 - ▶ Oil demand declines in all scenarios, as its use in transport is displaced by lower-carbon alternatives. Global oil demand falls from 98 Mb/d in 2019 to between 21 and 73 Mb/d in 2050.
 - ▶ Coal demand strongly declines in all scenarios, with its share in primary energy falling from 25% in 2019 to between 3% and 13% in 2050.
 - ▶ In contrast, global natural gas demand in **New Momentum** is around 20% above 2019 levels driven by growing use from emerging markets, especially in power generation. However, natural gas demand is 40% lower than 2019 levels in **Accelerated** and 55% lower in **Net Zero**.
 - ▶ Low-carbon hydrogen demand increases to nearly 300 Mt in **Accelerated** and over 450 Mt in **Net Zero**, reflecting its growing use in sectors which are difficult or costly to electrify.
 - ▶ Modern bioenergy demand grows in all scenarios, from 24 EJ in 2019 to around 50 EJ in **New Momentum** and 65 EJ in **Accelerated** and **Net Zero** by 2050.
 - ▶ Carbon emissions fall by around 30% in **New Momentum**, 75% in **Accelerated** and 95% in **Net Zero** relative to 2019 levels.
- ▶ Final energy demand peaks in the 2020s in **Accelerated** and **Net Zero** reflecting significant gains in energy efficiency. In contrast, it continues to grow until around 2040 in **New Momentum**, driven by increasing consumption in emerging markets.
 - ▶ Renewables expand rapidly over the outlook, with their share in primary energy increasing from 12% in 2019 to 35-64% by 2050.
 - ▶ Electricity more than doubles by 2050 in **Accelerated** and **Net Zero** and grows by 86% in **New Momentum**.



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	Level in 2050				2019	Shares in 2050 (%)			Change 2019-2050 (% p.a.)		
	2019	Accelerated	Net Zero	New Momentum		Accelerated	Net Zero	New Momentum	Accelerated	Net Zero	New Momentum
Primary energy consumption by fuel (EJ)											
Total	627	666	630	733	100	100	100	100	0.2	0	0.5
Oil†	193	78	39	140	31	12	6.1	19	-2.9	-5.0	-1.0
Natural gas	140	87	60	166	22	13	9.5	23	-1.5	-2.7	0.5
Coal	158	23	17	96	25	3.5	2.6	13	-6.0	-7.0	-1.6
Nuclear	25	40	47	28	4.0	5.9	7.5	3.9	1.5	2.1	0.4
Hydro	38	61	65	48	6.0	9.1	10	6.5	1.6	1.8	0.8
Renewables (incl. biofuels)	74	377	403	256	12	57	64	35	5.4	5.6	4.1
Primary energy consumption (native units)											
Oil† (Mb/d)	98	42	21	73							
Natural gas (Bcm)	3,900	2,422	1,658	4,616							
Total final consumption by sector (EJ)											
Total	477	398	335	513	100	100	100	100	-0.6	-1.1	0.2
Transport	119	100	90	114	25	25	27	22	-0.6	-0.9	-0.1
Feedstocks	38	36	27	45	7.9	9.0	8.1	8.7	-0.2	-1.0	0.6
Buildings	132	110	90	151	28	28	27	29	-0.6	-1.2	0.4
Industry	188	153	128	203	39	38	38	40	-0.7	-1.3	0.2
Generation											
Electricity (TWh)	27,143	56,990	61,410	50,015					2.4	2.7	2.0
Hydrogen (Mt)	66	301	460	165					5.0	6.4	3.0
Production											
Oil† (Mb/d)	98	42	21	73					-2.7	-4.8	-0.9
Natural gas (Bcm)	3,976	2,422	1,658	4,616					-1.6	-2.8	0.5
Coal (EJ)	168	27	15	92					-5.7	-7.4	-1.9
Emissions											
Carbon emissions (Gt of CO ₂ e) ^{††}	40	9.1	2.0	29					-4.7	-9.1	-1.1
CCUS (Mt of CO ₂)	0	4,063	6,068	1,132							

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 CO₂ emissions from energy use, industrial processes, natural gas flaring, and methane emissions from energy production.