Bulgaria

Bulgaria's targets are from the Integrated National Energy and Climate Plan 2021-2030 (NECP). This does not feature any concrete targets but are based on models.

Targets

Bulgaria's emission targets are not impressive, with the NECP stating that the national target for reduction of greenhouse gas emissions from 2005-levels for the non-Emission Trading System (ETS) sector by 2030 is 10%.[1]

Bulgaria has several goals for renewable energy. First and foremost, by 2030, 34.96% of Bulgaria's gross final energy consumption should come from renewables.[2] By 2050, this will be increased to 85.5% according to the WAM-scenario.[3] This further breaks down into 49.34% for electricity, 44.01% for heating and cooling, and 29.93% for transportation.[4] Electricity generating capacity by renewable sources is expected to increase by 7.160 GW from 2022 to 2030. This is divided into 5.050 GW of photovoltaic, 1.280 GW of onshore wind farms, and 0.5 GW of offshore wind.[5] However, these are expectations based on the WAM-scenario, not actual targets. The wind farms are onshore only, but the Government of Bulgaria has recently proposed an offshore wind bill, for developing the Black Sea. However, this bill faces opposition.[6]

Table 1: Renewable energy capacity projections for electricity production (GW) [WAM][7]

	Total WAM	PV	Offshore	Onshore
2025	7.13	3.75	0	0.71
2030	12.31	6.78	0.5	1.99
2035	17.12	9.88	1.71	2.72
2040	22.02	12.58	1.87	4.09
2045	24.55	13.21	2.69	4.09
2050	26.84	13.66	2.90	5.45

[1] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 25.
[2] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 24.
[3] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 69.
[4] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 71.
[5] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 75. Here, it should be noted, the machine translation of the text is exceptionally poor. The text says that: 'The first 2 030 MW offshore plants are expected to be operational in 500.' I first assumed that the translation had not been able to properly translate 2050, however, after consulting the chart below, which only has information in Bulgarian, I was able to discover that in reality the expectation was for 500 MW of offshore wind by 2030.
[6] Buljan, 'Bulgarian Offshore Wind Bill Passes First Parliament Reading, Faces Strong Opposition'.
[7] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 75.

Nuclear will continue to be an important energy source in Bulgaria with the government contemplating building approximately 2 GW of nuclear power, coming into commission somewhere between 2035 and 2040.[8] According to WEM projections, nuclear power output will increase from 49 374 GWh in 2022 to 99 900 GWh in 2040.[9] Table 2 contains more information on nuclear energy.

Table 2: Nuclear energy [WEM]

	Nuclear Energy Electricity Production (GWh)[10]	Nuclear Energy Capacity (GW)[11]	Primary Energy Production Nuclear (GWh)[12]
2025	16.5	2	49374
2030	16.5	2	49374
2035	26.6	3.27	99900
2040	36.7	4.53	99900
2050			75213

Energy demand projections

Table 3: Energy consumption (Mtoe & GWh) [WAM][13]

	PEC (Mtoe)	**FEC (Mtoe)**	**Transportation (GWh)**	**Services (GWh)**	**Households (GWh)**	**Industry (GWh)**
2025	15.39	9.36	42211	15346	22092	29243
2030	13.19	8.82	39521	14685	19892	28447
2035	13.44	7.90	34591	13828	16831	26611
2040	13.88	7.05	29171	12411	15631	24740
2045	14.77	6.74	26291	11993	16016	24068
2050	13.52	6.54	23258	12286	16647	23898
Target	13.71	8.85				

Bulgaria expects the both the primary and final energy consumption to decrease by 2030. The numbers can be seen in Table 3. Bulgaria also has estimates of electricity consumption, however this is only available in the old NECP. Here, total electricity

[8] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 87.
[9] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 290.
[10] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 290–91.
[11] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 313.
[12] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 87.
[13] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 88-89.

consumption will increase from 31.76 TWh in 2020 to 35.358 TWh in 2030.[14] The projections are broken down into sectors in Table 4 below.

Table 4: (OLD) Increase in domestic electricity consumption (GWh)[15]

	2020	**2025**	**2030**
Transport	422 GWh	533 GWh	953 GWh
Energy sector	1 351 GWh	1 313 GWh	1 155 GWh
Sectoral services	8 432 GWh	9 289 GWh	9 345 GWh
Industry	10 229 GWh	10 455 GWh	11 147 GWh
Households	11 326 GWh	12 077 GWh	12 758 GWh
Total	31 760 GWh	33 667 GWh	35 358 GWh

Heating and cooling

The heating and cooling sector will have a renewable share of 44.01% in 2030. This will include a large scale build out of heat pumps, renewable fuels of non-biological origin (RFNBO), solar, and other geothermal and biological energy sources. A short breakdown is found in Table 5.

Table 5: heating and cooling by energy sources (ktoe) [WAM?][16]

	Heat pumps	RFNBO	Solar
2025	217	0	40
2030	299	0	53
2035	307	7	64
2040	297	66	67
2045	248	132	67
2050	202	213	66

Transportation

Bulgaria aims to increase the share of renewable energy in transportation to 29.93% by 2030 and then 83.70% by 2050.[17] While the plan aims to limit high emission transport, there are no specific objectives for EVs and charging capacity. There is however an expectation that the transport sector will become slightly more dependent on renewable energy. This is shown in Table 6.

[14] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 87.
[15] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 87.
[16] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 76.
[17] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 76.

Table 6: Renewable fuels in the transport sector (ktoe) [WAM?][18]

	Total renewable	Electricity	RFNBO
2025	218	23	0
2030	431	146	23
2035	689	299	89
2040	924	470	206
2045	1136	592	351
2050	1376	688	579

Hydrogen and batteries

Bulgaria aims to develop electricity storage capacity with 180 MW of batteries and 200 MW of an undecided but appropriate technology.[19] The updated NECP projects that Bulgaria will greatly increase green hydrogen production (See Table 7). This will mainly occur through Power-to-X (PtX) technology. Batteries are also a part of the transition strategy of Bulgaria; the numbers also displayed in Table 8.

Table 8: Energy storage and conversion GW [WAM][20]

	Hydrogen	Batteries
2025	0	0.18
2030	0.05	1.28
2035	0.99	1.28
2040	1.62	1.28
2045	1.83	1.28
2050	3.09	1.28

[18] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 77.
[19] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 150.
[20] Ministry of Energy and Ministry of Environment and Water, 'National Energy and Climate Plan Bulgaria', 338–39.

Old information

Table 2: Energy production (GWh) [WEM][21]

Primary Energy Production WEM (GWh)				
GWh	Nuclear	Wind	Solar +[A]	Total
2020	46731	1451	1664	140400
2025	46731	1564	2944	142836
2030	46731	1901	5141	130040
2035	69197	1901	5153	128602
2040	91662	3608	5333	131838
Net Electricity Production WEM (GWh)				
2020	14926	1451	1402	43949
2025	14926	1564	2653	45981
2030	14926	1901	4841	47732
2035	22676	1901	4841	49922
2040	30426	3608	4841	50957
Net Installed Capacity WEM (GW)[22]				
2020	1.9	0.7	1.0	12.4
2025	1.9	0.7	1.9	12.8
2030	1.9	0.9	3.3	13.9
2035	2.9	0.9	3.3	14.0
2040	3.9	1.5	3.3	15.6

A: for net electricity production it is solar only, this is not the case for primary energy production.

Difference WEM and WAM

In 2030, the difference between the 'With Existing Measures,' WEM, and 'With Additional Measures,' WAM, scenarios are shown in Table 7 below. It is surprising that Solar production capacity is estimated to be lower in the WAM-scenario than in the WEM-scenario.

Table 7: Difference between WEM and WAM scenarios in 2030 (GWh)[23]

	WEM 2030	**WAM 2030**
Hydro	4 619 GWh	4 619 GWh
Wind	1 901 GWh	2 049 GWh
Solar	4 841 GWh	4 652 GWh
Biomass	1 377 GWh	1 640 GWh
Total	12 739 GWh	12 961 GWh

[21] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 211–12.
[22] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 224.
[23] Ministry of Energy and Ministry of Environment and Water, 'Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030', 233.