REFERENCE DATA SERIES No. 1
2020 Edition

Energy, Electricity and Nuclear Power Estimates for the Period up to 2050

IAEA
International Atomic Energy Agency

ENERGY, ELECTRICITY AND NUCLEAR POWER ESTIMATES FOR THE PERIOD UP TO 2050

REFERENCE DATA SERIES No. 1

ENERGY, ELECTRICITY AND NUCLEAR POWER ESTIMATES FOR THE PERIOD UP TO 2050

2020 Edition

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2020

ENERGY, ELECTRICITY AND
NUCLEAR POWER ESTIMATES
FOR THE PERIOD UP TO 2050
IAEA-RDS-1/40
ISBN 978-92-0-118120-6
ISSN 1011-2642
Printed by the IAEA in Austria
September 2020
Cover photo credit:
China National Nuclear Corporation / 2018

CONTENTS

Introduction

Reference Data Series No. 1 (RDS-1) is an annual publication — currently in its 40th edition — containing estimates of energy, electricity and nuclear power trends up to the year 2050.

The publication is organized into world and regional subsections and starts with a summary of the status of nuclear power in IAEA Member States as of the end of 2019 based on the latest statistical data collected by the IAEA's Power Reactor Information System. It then presents global and regional projections for energy and electricity up to 2050 derived from two international studies: the International Energy Agency's World Energy Outlook 2019 [1] and the United States Energy Information Administration's International Energy Outlook 2019 [2]. The energy and electricity data for 2019 are estimated, as the latest information available from the United Nations Department of Economic and Social Affairs [3] and International Energy Agency is for 2017. Population data originate from World Population Prospects 2019 [4], published by the Population Division of the United Nations Department of Economic and Social Affairs.

Global and regional nuclear power projections are presented as low and high cases, encompassing the uncertainties inherent in projecting trends. The projections are based on a critical review of (i) the global and regional energy, electricity and nuclear power projections made by other international organizations, (ii) national projections supplied by individual countries for a recent OECD Nuclear Energy Agency study [5] and (iii) estimates of the expert group participating in an annual IAEA consultancy meeting.

The nuclear electrical generating capacity estimates are derived using a country by country 'bottom-up' approach. In deriving these estimates, the group of experts considers all operating reactors, possible licence renewals, planned shutdowns and plausible construction projects foreseen for the next several decades. The experts build the estimates project by project by assessing the plausibility of each, considering a high and low case. The estimates consist of both available capacity

(currently supplying electricity to the grid) and installed nominal capacity (available, but not currently supplying electricity to the grid).

The assumptions of the low case are that current market, technology and resource trends continue and there are few additional changes in laws, policies and regulations affecting nuclear power. This case was explicitly designed to produce a 'conservative but plausible' set of projections. Additionally, the low case does not assume that targets for nuclear power in a particular country will necessarily be achieved. The high case projections are more ambitious but are still plausible and technically feasible. Country policies toward climate change are also considered in the high case. In both cases the same outlook of economic and electricity demand growth based on current expectations is assumed.

The low and high estimates reflect contrasting, but not extreme, underlying assumptions about the different driving factors that have an impact on nuclear power deployment. These factors, and the ways they might evolve, vary from country to country. The estimates presented provide a plausible range of nuclear capacity growth by region and worldwide. They are not intended to be predictive nor to reflect the whole range of possible futures from the lowest to the highest feasible.

By 2050 global final energy consumption is projected to increase by about 30% and electricity production is expected to double. Worldwide, fossil fuels remain the dominant energy source for electricity production at about 63% in 2019, their share having changed little since 1980. Today, nuclear contributes about 10% of global electricity production.

Currently, about two thirds of nuclear power reactors have been in operation for over 30 years, highlighting the need for significant new nuclear capacity to offset retirements in the long term. Uncertainty remains regarding the replacement of the large number of reactors scheduled to be retired around 2030 and beyond, particularly in Northern America and Europe. However, ageing management programmes and long term operation are being implemented for an increasing number of reactors.

Climate change mitigation is a potential driver for maintaining and expanding the use of nuclear power. According to the International Energy Agency [6], the use of nuclear power has avoided more than 60 gigatonnes of CO_2 emissions over the past 50 years. Commitments made under the Paris Agreement and other initiatives could support nuclear power development, provided the necessary energy policies and market designs are established to facilitate investments in dispatchable, low carbon technologies.

This year marks the 40th edition of RDS-1. Since RDS-1 was first published, the IAEA projections have been continually refined to reflect an evolving global energy context. Most global development of nuclear power took place in the 1970s and 1980s, with optimism about nuclear power expansion reflected in the IAEA's initial projections published in early editions of RDS-1. Over the past decade, nuclear power development has remained within the range of projections described in prior editions of RDS-1.

Compared with the previous year's global projections, the 2020 projections are largely unchanged, although revisions were made at the regional level. Relative to a global nuclear electrical generating capacity of 392 gigawatts (electrical) (GW(e)) in 2019, the low case projections indicate a decrease of about 7%, to 363 GW(e), by 2050. In the high case, an increase of about 82%, to 715 GW(e), is expected by 2050.

It is important to consider the changes in nuclear electrical generating capacity in each region within the context of region specific factors. The low price of natural gas and the impact of subsidized variable renewable energy sources on electricity prices, which do not account for the overall costs to the electricity system, are expected to continue to affect nuclear growth prospects. Ongoing financial uncertainty and stagnant electricity demand in some regions will continue to present challenges for capital intensive projects such as nuclear power. Heightened safety requirements, challenges in deploying advanced technologies and other factors have increased construction times and costs, contributing to delays. However, in some regions

nuclear power plants have been built on time and on budget. The expert group assumed that the aforementioned challenges will continue to affect nuclear development plans.

It is too soon to fully assess the energy impacts of the coronavirus disease (COVID-19) pandemic, but the reduction in global electricity demand is the largest observed in almost a century. Some countries with nuclear power programmes experienced 10–20% reductions in electricity demand under full lockdown. Nuclear power and renewables were impacted the least by the situation; in contrast, fossil fuels faced drastic reductions in demand and production in close succession. The longer term implications of the COVID-19 crisis for electricity generation are unknown, but nuclear power continued to support electricity security and has been one of the most resilient electricity sources during the crisis.

The low case projections suggest that the share of nuclear electricity production in total electricity could decline to about 6% by 2050. Along with the current pace of nuclear power development, this shows that urgent actions are needed to maintain the existing role of nuclear power in the energy mix. Significant, concerted action is also needed for nuclear power to reach a share of 11% in electricity production by 2050, as seen in the high case projections. The involvement of a broad range of actors including policymakers, the nuclear industry and international organizations, along with active engagement with the public, is necessary.

The underlying fundamentals of population and electricity consumption growth in the developing world, as well as climate change and air quality concerns, security of energy supply and price volatility of other fuels, continue to point to nuclear generating capacity potentially playing an important role in the energy mix in the longer run, provided concerted actions are taken.

Geographical Regions

The nuclear electrical generating capacity projections presented in RDS-1 are grouped according to the geographical

regions used by the Statistics Division of the United Nations Secretariat [7]. The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the IAEA concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Notes

The estimates for nuclear electricity production in 2019 are from the 2020 edition of the IAEA publication Nuclear Power Reactors in the World [8]. The estimates for energy and electricity are made by the IAEA Secretariat based on different international and national data sources available as of July 2020.

In accordance with International Recommendations for Energy Statistics [9], the estimates for the breakdown of historical electricity production by energy source are expressed in gross figures. Gross electricity production is the total electrical energy produced by all generating units and installations measured at the output terminals of the generators. Current data on nuclear electrical production and future estimates of nuclear and total electrical production are expressed in net values, as the data are adapted from the RDS-2 publication.

Owing to rounding, numbers presented throughout this publication may not add up precisely to the totals provided, and percentages may not precisely reflect the absolute figures.

Total final energy consumption refers to all fuel and energy delivered to users for their energy use.

Nuclear electrical generating capacity estimates consider the scheduled retirement of older units at the end of their lifetime.

The global and regional nuclear electrical production data and the nuclear electrical generating capacity data cannot be used to calculate average annual capacity factors for nuclear power plants, as the nuclear electrical generating capacity data are year-end capacity.

World

7 713

million people

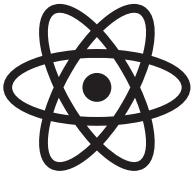
Energy Overview 2019

18.8%

of final energy consumed was electricity

25 602TW·h

of electricity produced



10.4%

of electricity produced by nuclear

Nuclear Power Development in 2019

- At the end of 2019, 443 nuclear power reactors were operational, with a total net installed power capacity of 392 GW(e).
- In addition, 54 reactors with a total capacity of 57 GW(e) were under construction.
- Six new nuclear power reactors with a total capacity of 5 174 MW(e) were connected to the grid, and 13 reactors with a total capacity of 10 196 MW(e) were retired. Construction began on 5 new reactors that are expected to add a total capacity of 6 021 MW(e).
- Compared with 2018, total electricity production from all energy sources increased by 1.3% and electricity production from nuclear power reactors increased about 4%, reaching 2 657 TW·h.
- Nuclear power accounted for 10.4% of total electricity production in 2019, an increase of 0.2 percentage points from the previous year and the first increase since 2015.

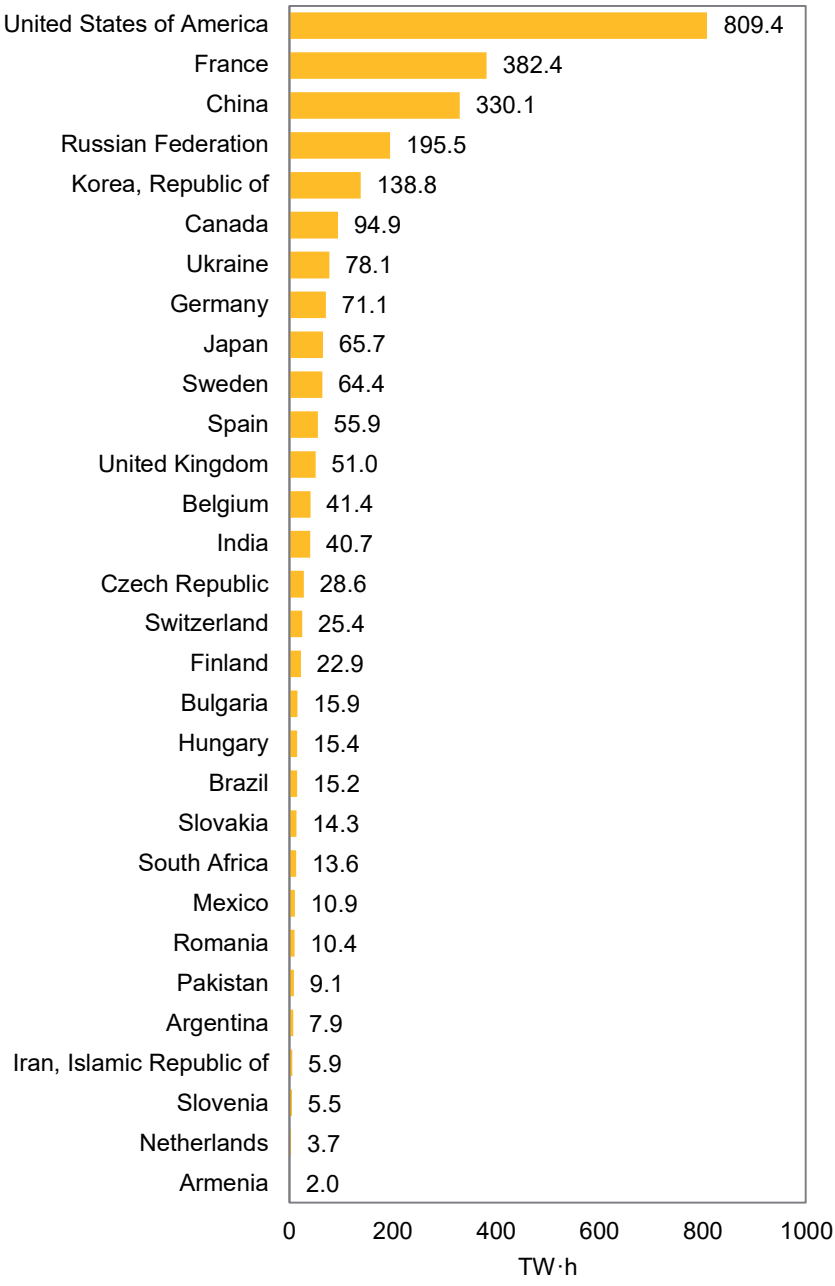
TABLE 1. NUCLEAR POWER REACTORS IN THE WORLD (end of 2019)

Country	Operational		Under Construction		Nuclear Electricity Production in 2019	
	Number of units	Net capacity (MW(e))	Number of units	Net capacity (MW(e))	TW·h	% of total
World Total[a]	**443**	**392 098**	**54**	**57 441**	**2 657.2**	**10.4**
Argentina	3	1 641	1	25	7.9	5.8
Armenia	1	375			2.0	27.3
Bangladesh			2	2 160		
Belarus			2	2 220		
Belgium	7	5 930			41.4	46.2
Brazil	2	1 884	1	1 340	15.2	2.5
Bulgaria	2	2 006			15.9	40.5
Canada	19	13 554			94.9	15.1
China	48	45 518	11	10 564	330.1	4.7
Czech Republic	6	3 932			28.6	35.7
Finland	4	2 794	1	1 600	22.9	34.7
France	58	63 130	1	1 630	382.4	70.0
Germany	6	8 113			71.1	12.2
Hungary	4	1 902			15.4	48.8
India	22	6 255	7	4 824	40.7	2.7
Iran, Islamic Republic of	1	915	1	974	5.9	1.9

Japan	33	31 679	2	2 653	65.7	6.7
Korea, Republic of	24	23 172	4	5 360	138.8	25.0
Mexico	2	1 552			10.9	3.3
Netherlands	1	482			3.7	3.2
Pakistan	5	1 318	2	2 028	9.1	6.4
Romania	2	1 300			10.4	18.8
Russian Federation	38	28 437	4	4 525	195.5	18.6
Slovakia	4	1 814	2	880	14.3	51.9
Slovenia	1	688			5.5	37.2
South Africa	2	1 860			13.6	5.7
Spain	7	7 121			55.9	21.2
Sweden	7	7 740			64.4	42.0
Switzerland	4	2 960			25.4	38.1
Turkey			1	1 114		
Ukraine	15	13 107	2	2 070	78.1	55.4
United Arab Emirates			4	5 380		
United Kingdom	15	8 923	2	3 260	51.0	16.5
United States of America	96	98 152	2	2 234	809.4	19.3

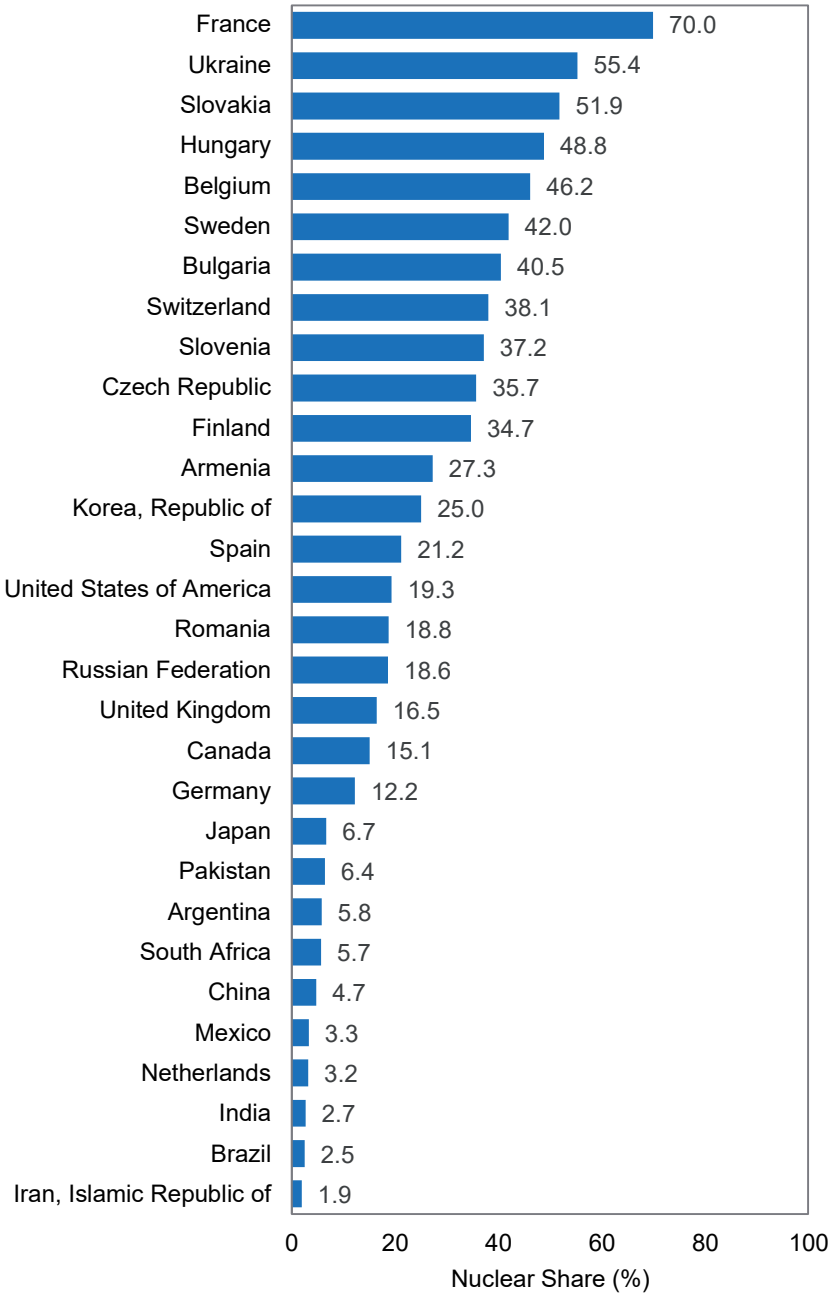
[a] Includes the following data from Taiwan, China: 4 units in operation with a total capacity of 3844 MW(e), 2 units under construction with a total capacity of 2600 MW(e), and 31.1 TW·h of nuclear electricity generation, representing 12.0% of the total electricity produced.

FIGURE 1. WORLD NUCLEAR ELECTRICITY PRODUCTION IN 2019



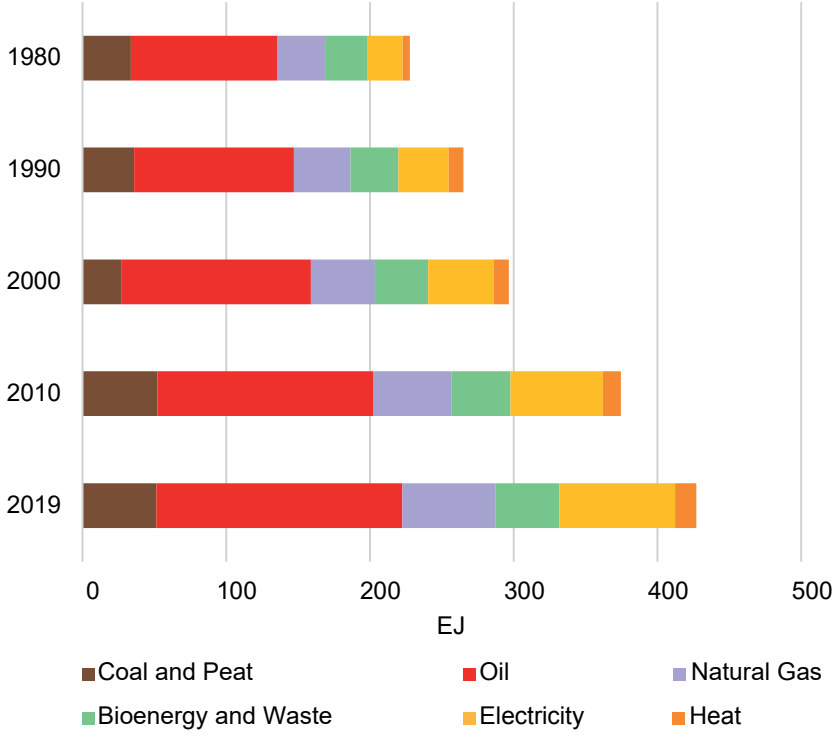
Note: The nuclear electricity production in Taiwan, China, was 31.1 TW·h.

FIGURE 2. SHARE OF NUCLEAR IN TOTAL ELECTRICITY PRODUCTION IN THE WORLD IN 2019



Note: The share of nuclear in the total electricity production of Taiwan, China, was 12.0%.

FIGURE 3. WORLD FINAL ENERGY CONSUMPTION BY ENERGY SOURCE



Final Energy Consumption

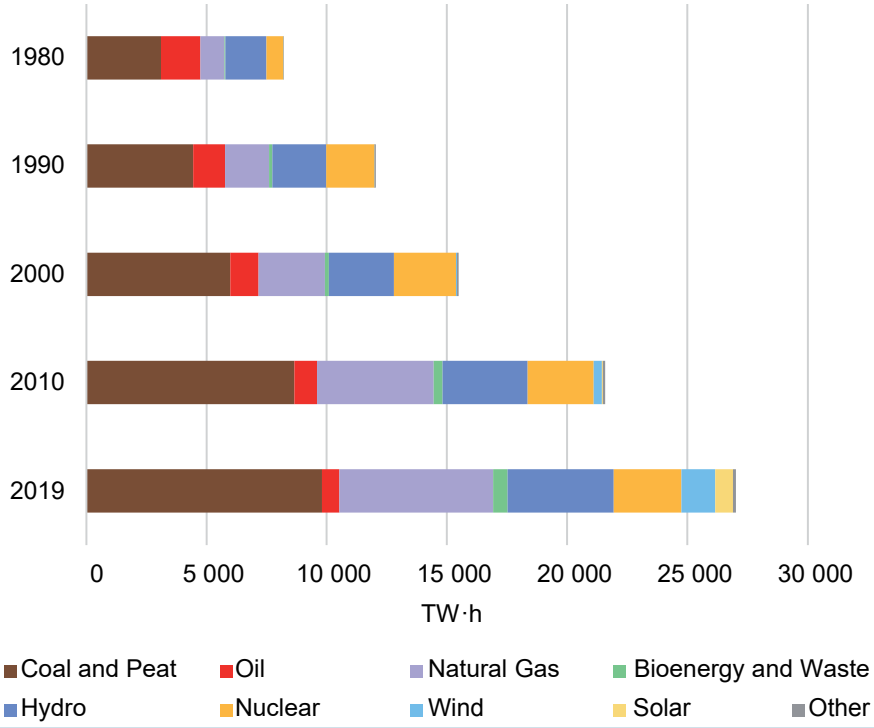
Since 1980, fossil fuels have continued to dominate final energy consumption, although there has been a gradual reduction in their combined share from 74% in 1980 to 67% in 2019.

The share of coal declined slightly from 1980 to 2000 but has since increased. Natural gas has maintained a consistent share of about 15%. The share of oil has declined slightly since 1980, stabilizing at about 40% since 2010.

The share of electricity has undergone the most significant change since 1980, increasing by 8 percentage points, with consumption growing at an average annual rate of about 3%.

Looking to the future, electricity consumption is expected to increase faster than final energy consumption, thus it is anticipated that the share of electricity will continue to grow.

FIGURE 4. WORLD TOTAL ELECTRICITY PRODUCTION BY ENERGY SOURCE



Electricity Production

With a share of more than 60%, fossil fuels — particularly coal — have remained dominant sources of electricity production since 1980, despite increases in the combined share of nuclear and renewables over the years.

The share of natural gas has increased more than 10 percentage points since 1980. The share of coal remained around 40% until 2010 but has since gradually decreased by a few percentage points. Of all fossil fuels, the share of oil has experienced the most significant change, decreasing from about 20% in 1980 to below 3% in 2019.

Hydro remains the largest contributor of low carbon electricity, accounting for 16%, although its share has decreased by about 4 percentage points since 1980. In recent years, the share of solar and wind has undergone a rapid increase, rising from less than 1% in 1980 to 8% in 2019.

The share of nuclear grew rapidly from 1980 to 1990, almost doubling, but has declined since 2000.

Energy and Electricity Projections

- Final energy consumption is expected to increase by about 15% from 2019 levels by 2030 and by about 39% by 2050, at an average annual rate of approximately 1%.
- Electricity consumption is expected to grow at a faster rate of about 2% per year. Electricity consumption is expected to almost double by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 8 percentage points from its 2019 share.

FIGURE 5. WORLD FINAL CONSUMPTION OF ENERGY AND ELECTRICITY

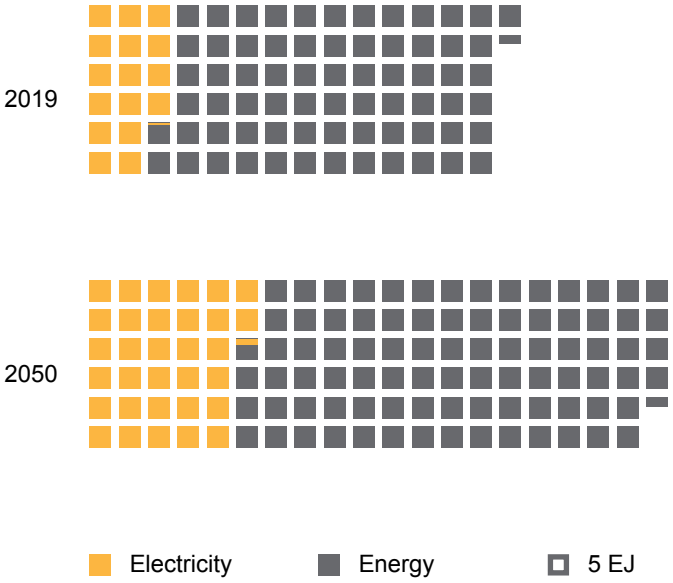


TABLE 2. WORLD FINAL CONSUMPTION OF ENERGY AND ELECTRICITY, EJ

Final Consumption	2019	2030	2040	2050
Energy	427.1	491.4	544.3	592.3
Electricity	80.4	109.0	135.8	161.4
Electricity as % of Energy	*18.8%*	*22.2%*	*24.9%*	*27.2%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase by about 45% by 2030 and to more than double by 2050.
- In the high case, nuclear electrical generating capacity is projected to increase by about 20% by 2030 and by about 80% by 2050 compared with 2019 capacity.
- In the low case, nuclear electrical generating capacity is projected to gradually decline by about 10% until 2040 and then rebound, resulting in only a 7% reduction by 2050.
- In both the low and the high case, the share of nuclear in total electrical generating capacity is expected to decrease by 2050. A reduction of 3 percentage points is expected in the low case a reduction of less than 1 percentage point is expected in the high case.

FIGURE 6. WORLD NUCLEAR ELECTRICAL GENERATING CAPACITY

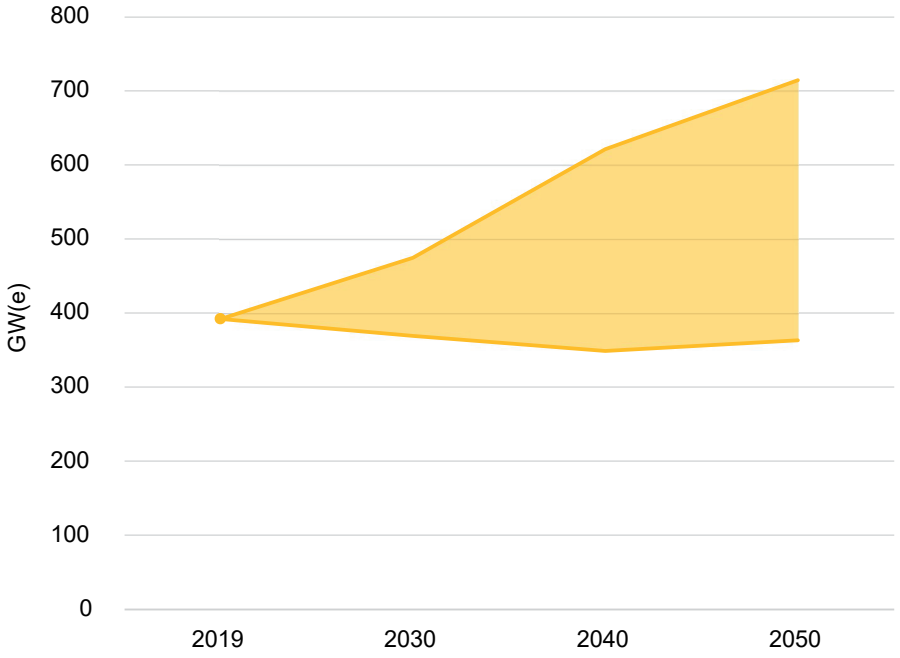


TABLE 3. WORLD TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY, GW(e)

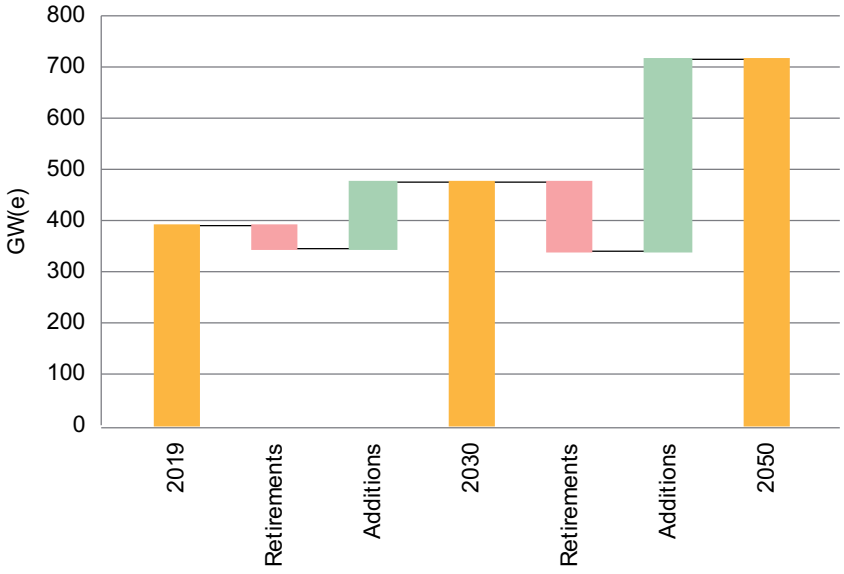
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	7 410	10 722	10 722	13 272	13 272	15 978	15 978
Nuclear	392	369	475	349	622	363	715
Nuclear as % of Electrical Capacity	*5.3%*	*3.4%*	*4.4%*	*2.6%*	*4.7%*	*2.3%*	*4.5%*

Reactor Retirements and Additions

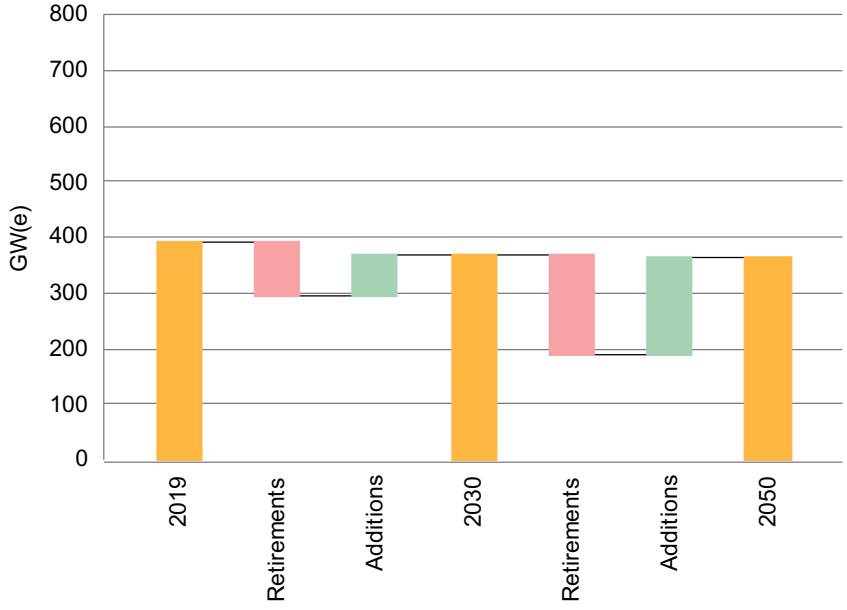
- Two out of every three nuclear power reactors have been in operation for more than 30 years and are scheduled for retirement in the foreseeable future.
- In the high case, it is assumed that the operating life of several nuclear power reactors scheduled for retirement will be extended such that only about 12% of the 2019 nuclear electrical generating capacity is retired by 2030. This is expected to result in net capacity additions (newly installed less retired) of about 80 GW(e) by 2030 and more than 200 GW(e) over the subsequent 20 years.
- In the low case, it is assumed that about one third of existing nuclear power reactors will be retired by 2030, while new reactors will add almost 80 GW(e) of capacity. Between 2030 and 2050 it is expected that capacity additions of new reactors will almost match retirements.

FIGURE 7. WORLD NUCLEAR CAPACITY: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is expected to increase by about 35% by 2030 and to more than double by 2050 compared with 2019 production level.
- In the high case, nuclear electricity production is expected to increase almost 40% from 2019 levels by 2030 and eventually more than double by 2050. The share of nuclear in total electricity production is expected to increase by about 1 percentage point.
- In the low case, nuclear electricity production is expected to increase by about 8% from 2019 levels by 2030, rising to 10% by 2050. The share of nuclear in total electricity production is expected to decline by almost 50%.

FIGURE 8. WORLD NUCLEAR ELECTRICITY PRODUCTION

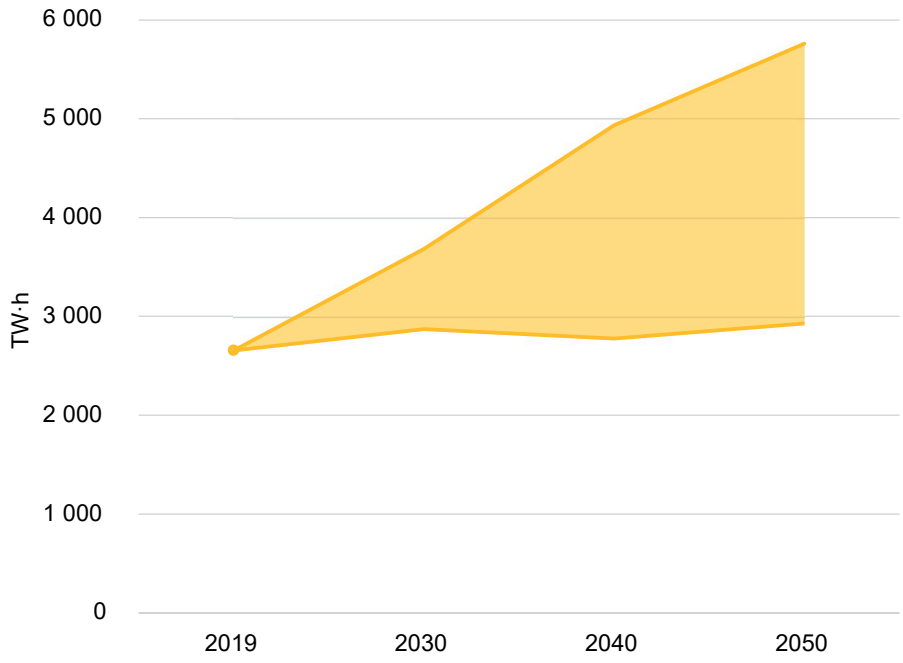


TABLE 4. WORLD TOTAL AND NUCLEAR ELECTRICAL PRODUCTION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	25 602	34 922	34 922	43 372	43 372	51 633	51 633
Nuclear	2 657	2 872	3 682	2 774	4 933	2 929	5 762
Nuclear as % of Electricity Production	*10.4%*	*8.2%*	*10.5%*	*6.4%*	*11.4%*	*5.7%*	*11.2%*

TABLE 5. WORLD NUCLEAR ELECTRICAL GENERATING CAPACITY, GW(e)

Region	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
World Total	**392.1**	**369**	**475**	**349**	**622**	**363**	**715**
Northern America	111.7	91	109	64	107	40	109
Latin America and the Caribbean	5.1	6	6	8	15	10	21
Northern, Western and Southern Europe	107.9	76	92	51	90	43	70
Eastern Europe	52.5	54	64	54	89	57	95
Africa	1.9	2	4	3	11	6	15
Western Asia	0.4	8	9	11	19	14	24
Southern Asia	8.5	18	26	31	47	46	75
Central and Eastern Asia	104.2	114	164	126	242	144	297
South-eastern Asia				1	3	3	8
Oceania							2

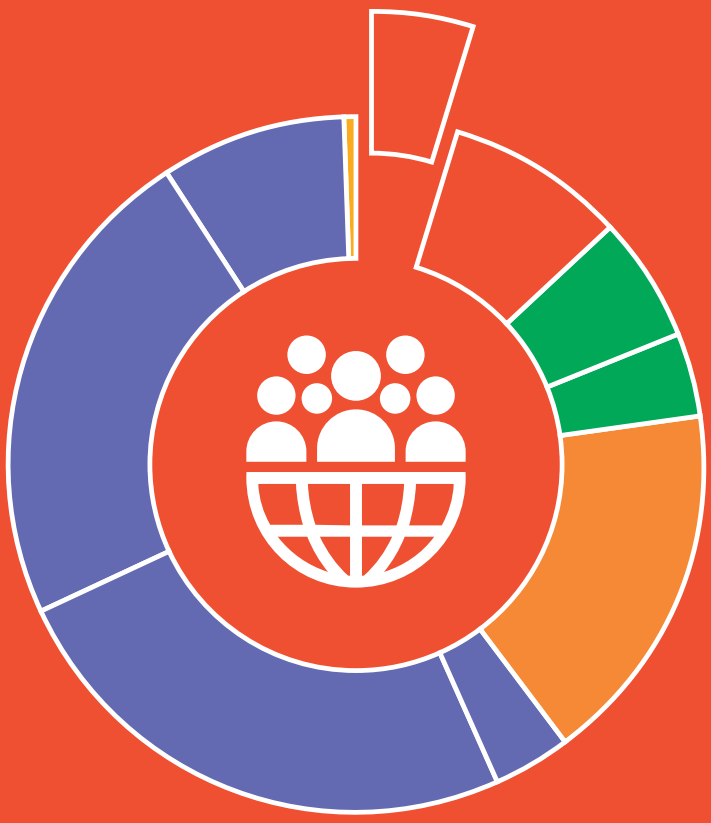
TABLE 6. WORLD NUCLEAR ELECTRICITY PRODUCTION, TW·h

Region	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
World Total	**2 657.3**	**2 872**	**3 682**	**2 774**	**4 933**	**2 929**	**5 762**
Northern America	904.2	721	863	509	854	325	877
Latin America and the Caribbean	34.0	46	49	62	119	80	170
Northern, Western and Southern Europe	723.8	601	724	408	718	348	562
Eastern Europe	358.2	428	504	434	711	459	764
Africa	13.6	14	32	27	83	52	119
Western Asia	2.0	59	71	85	146	111	190
Southern Asia	55.7	145	209	252	375	372	606
Central and Eastern Asia	565.8	859	1 231	990	1 904	1 158	2 393
South-eastern Asia				8	23	24	64
Oceania							16

Northern America

367

million people



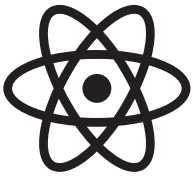
Energy Overview 2019

20.8%

of final energy consumed was electricity

4 813TW·h

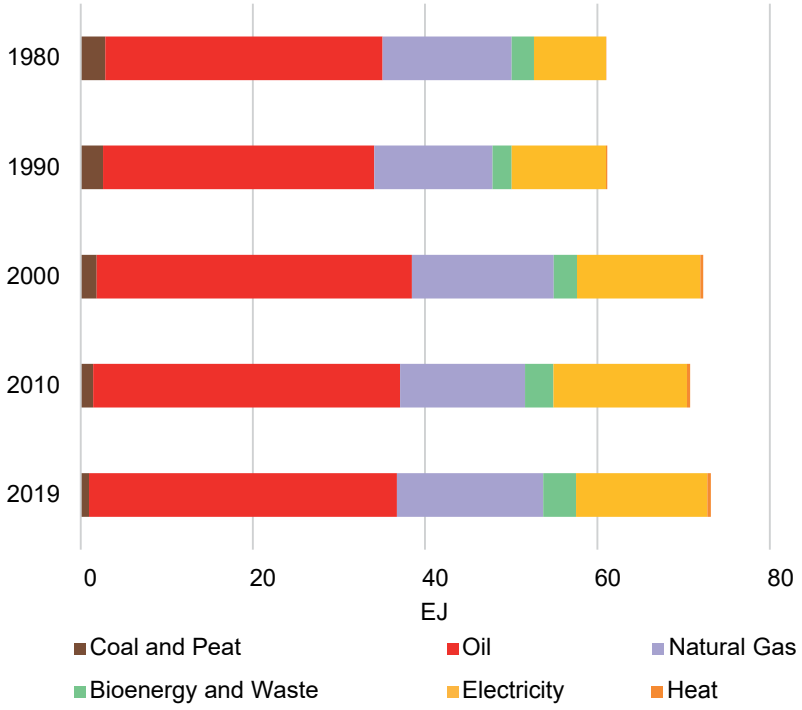
of electricity produced



18.8%

of electricity produced by nuclear

FIGURE 9. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE NORTHERN AMERICA REGION



Final Energy Consumption

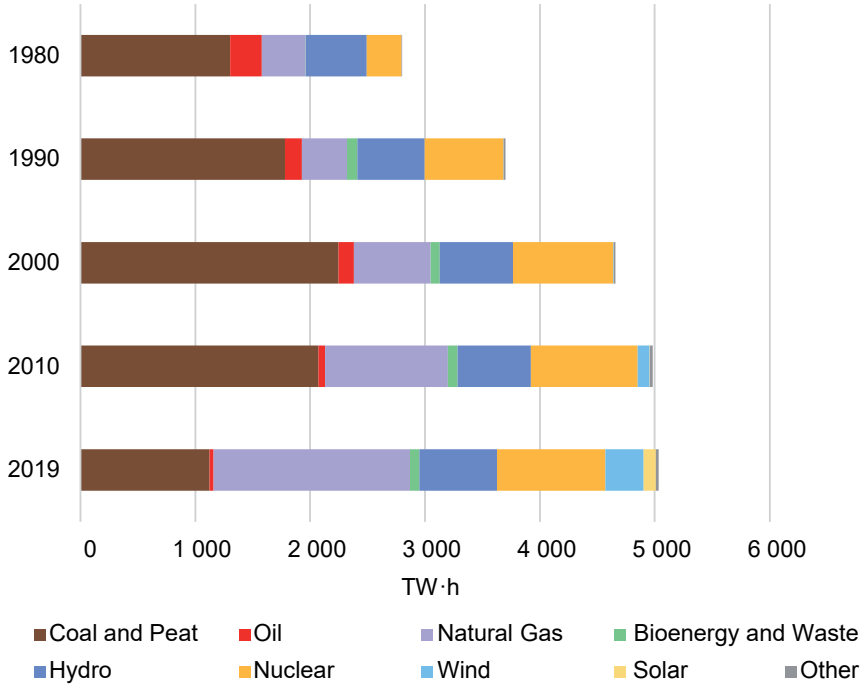
Since 1980 the share of fossil fuels in final energy consumption has remained above 70%, with a slight reduction from 82% in 1980 to 73% in 2019.

Of all fossil fuels, oil has the largest share, having remained at about 50% since 1980.

With a share of 23%, natural gas is the second largest energy source in 2019. Its share has remained relatively stable since 1980.

From 1980 to 2010, the share of electricity gradually increased by 8 percentage points. Its share in 2019 was about one fifth of final energy consumption.

FIGURE 10. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE NORTHERN AMERICA REGION



Electricity Production

Fossil fuels contributed more than half of the electricity produced in 2019.

The share of coal has decreased by more than half since 1980, whereas the share of natural gas has more than doubled. The share of oil has decreased from 10% in 1980 to around 1%, where it remains.

Nuclear is the largest low carbon energy source. Its share nearly doubled from 1980 to 1990 and has remained stable at almost 20% since 1990.

The share of hydro has decreased by 6 percentage points over the past 39 years.

The share of wind has increased since 2000, stabilizing at about 2%.

Energy and Electricity Projections

- Final energy consumption is expected to remain almost constant up to 2050. A slight increase of about 1% is expected by 2030, followed by a slight decrease over the next 20 years.
- Electricity consumption is expected to continue to grow. By 2030 it is projected to increase by nearly 10% from 2019 levels, reaching an increase of almost 25% by 2050.
- The share of electricity in final consumption of energy is expected to gradually increase by about 5 percentage points by 2050.

FIGURE 11. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE NORTHERN AMERICA REGION

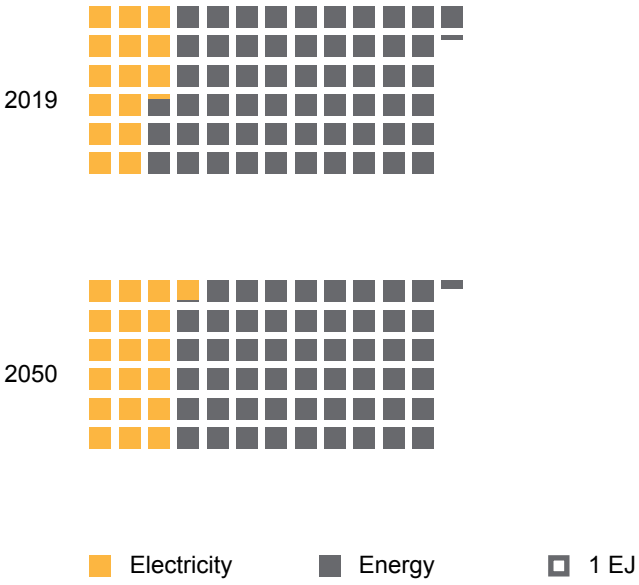


TABLE 7. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE NORTHERN AMERICA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	73.2	74.2	73.1	72.4
Electricity	15.2	16.6	17.6	18.9
Electricity as % of Energy	*20.8%*	*22.4%*	*24.1%*	*26.1%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is projected to increase by almost 15% by 2030 and 23% by 2050.
- Significant changes in nuclear electrical generating capacity are projected over the next three decades for the low case, whereas the high case is expected to remain relatively stable.
- In the high case, nuclear electrical generating capacity is projected to remain roughly constant, with a slight decrease of about 3–4% by 2050. The share of nuclear in total electrical capacity is expected to decrease by 1 percentage point by 2030 and by almost 2 percentage points by 2050.
- In the low case, nuclear electrical generating capacity is projected to decrease by 20% from current capacity by 2030 and to be around one third of current capacity by 2050. The share of nuclear in total electrical capacity is projected to decrease by about 2 percentage points by 2030 and almost 6 percentage points by 2050.

FIGURE 12. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE NORTHERN AMERICA REGION

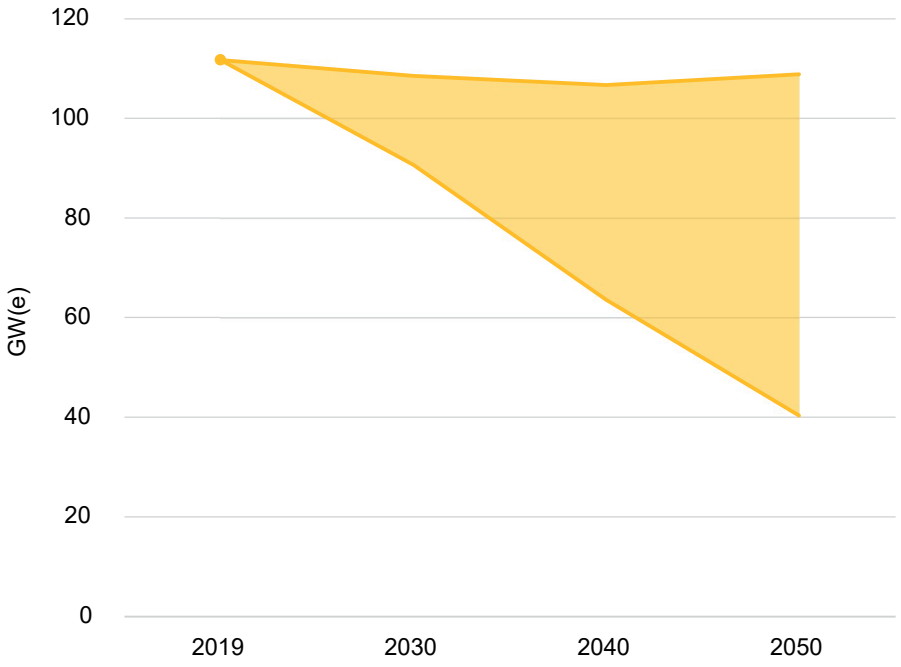


TABLE 8. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE NORTHERN AMERICA REGION, GW(e)

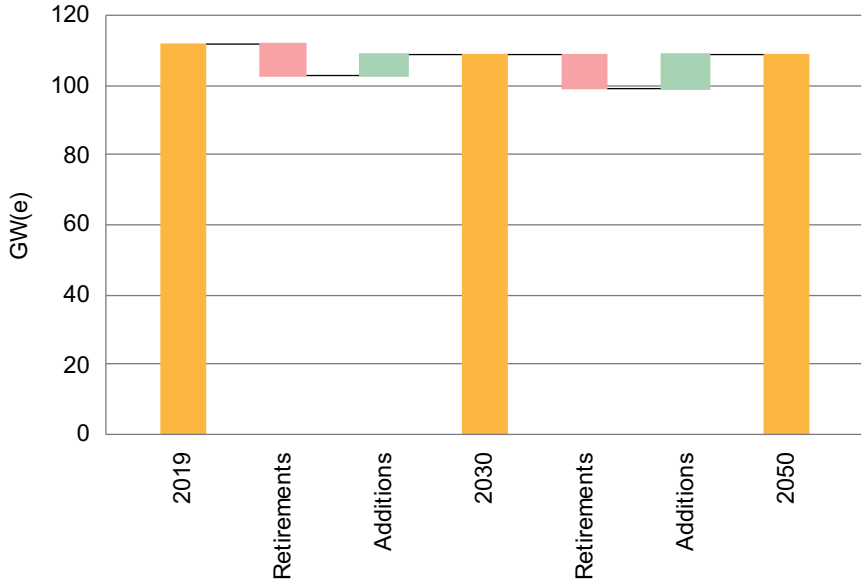
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 343	1 537	1 537	1 591	1 591	1 649	1 649
Nuclear	112	91	109	64	107	40	109
Nuclear as % of Electrical Capacity	*8.3%*	*5.9%*	*7.1%*	*4.0%*	*6.7%*	*2.4%*	*6.6%*

Reactor Retirements and Additions

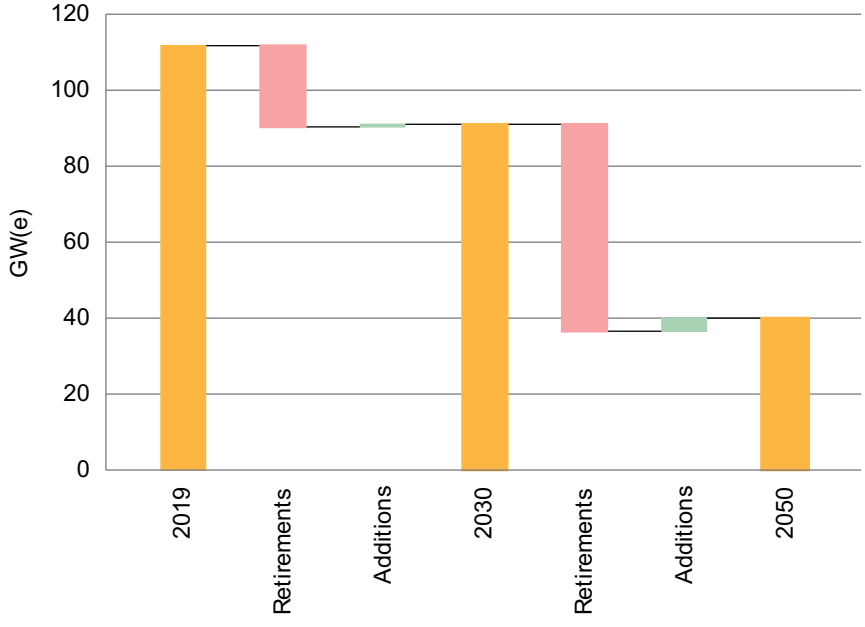
- Even in the high case a reduction of 3 GW(e) is expected by 2030. Between 2030 and 2050 it is expected that capacity additions of new reactors will almost match retirements.
- In the low case, it is assumed that about 20% of nuclear power reactors will be retired by 2030, with reactor additions of only about 0.5 GW(e) of capacity. Between 2030 and 2050 it is expected that significantly more capacity will be retired than is added, resulting in a net reduction in capacity of about 50 GW(e).

FIGURE 13. NUCLEAR CAPACITY IN THE NORTHERN AMERICA REGION: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is projected to increase about 8% by 2030 and is expected to be about 20% higher than 2019 production levels by 2050.
- In the high case, nuclear electricity production is projected to decrease by about 5% from 2019 levels by 2030 but only decline by a total of 3% by 2050. The share of nuclear in total electricity production is also expected to decrease, but less than in the low case, with a reduction of about 2 percentage points by 2030 and almost 4 percentage points by 2050.
- In the low case, nuclear electricity production is projected to decrease by 20% from 2019 levels by 2030 and by almost two third by 2050. The share of nuclear in total electricity production is expected to decrease by almost 5 percentage points by 2030 and about 13 percentage points by 2050.

FIGURE 14. NUCLEAR ELECTRICITY PRODUCTION IN THE NORTHERN AMERICA REGION

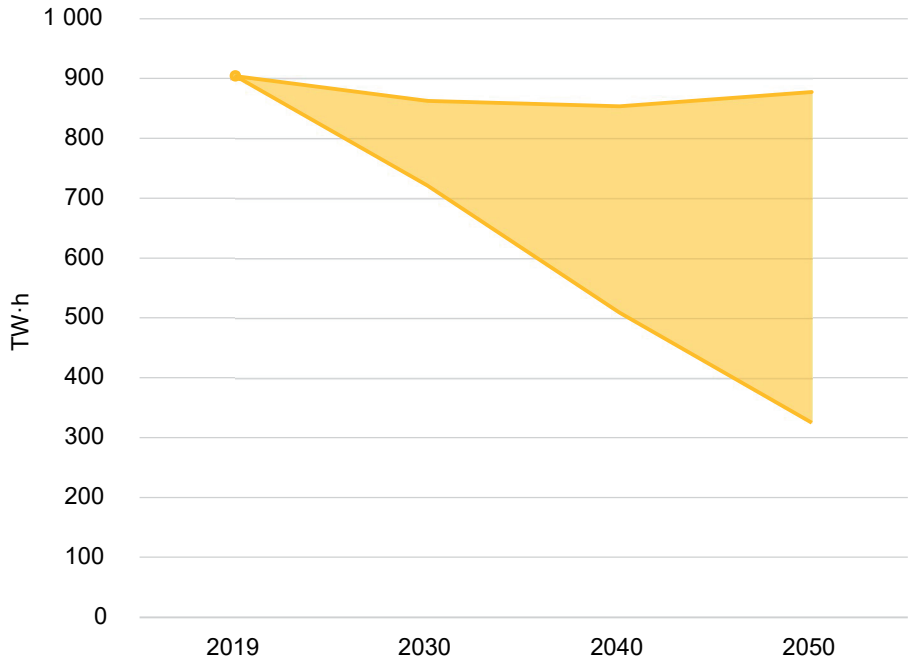


TABLE 9. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE NORTHERN AMERICA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	4 813	5 178	5 178	5 452	5 452	5 817	5 817
Nuclear	904	721	863	509	854	325	877
Nuclear as % of Electricity Production	*18.8%*	*13.9%*	*16.7%*	*9.3%*	*15.7%*	*5.6%*	*15.1%*

Latin America and the Caribbean

648

million people

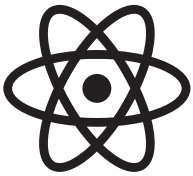
Energy Overview 2019

18.8%

of final energy consumed was electricity

1 596TW·h

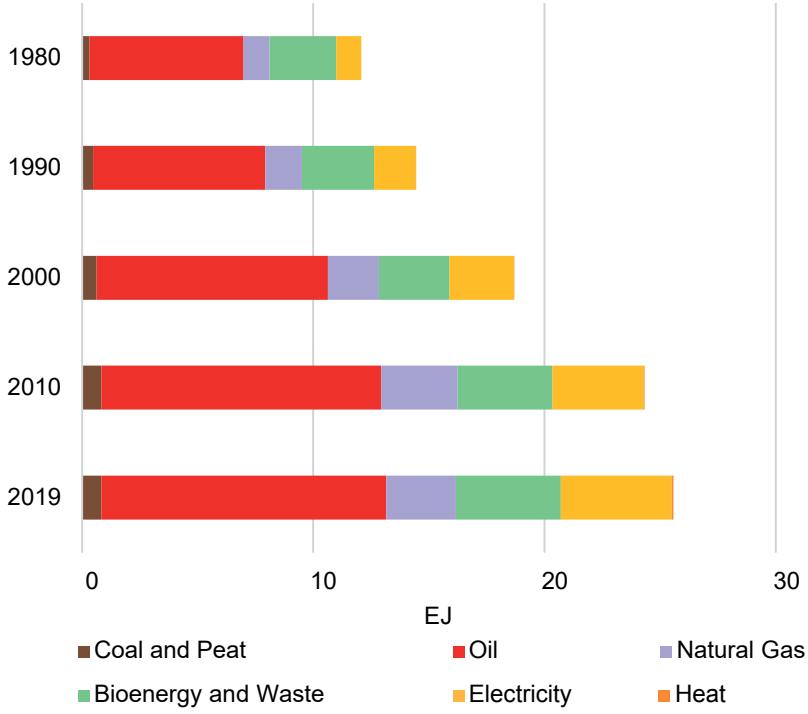
of electricity produced



2.1%

of electricity produced by nuclear

FIGURE 15. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE LATIN AMERICA AND THE CARIBBEAN REGION



Final Energy Consumption

From 1980 to 2000 the share of fossil fuels in final energy consumption increased slightly, but since 2000 it has gradually decreased. The combined share of fossil fuels in 2019 was about 60%.

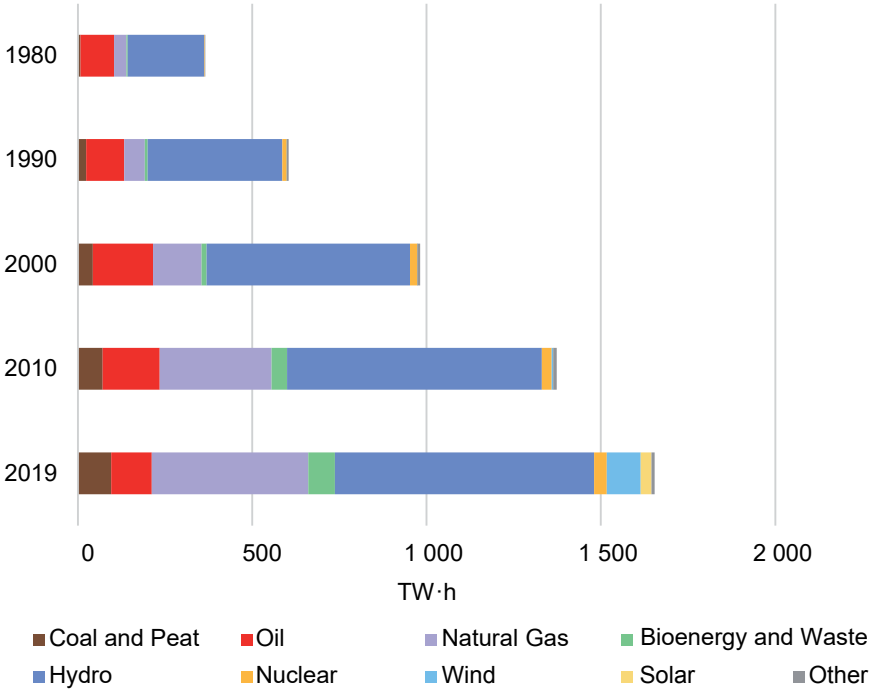
Oil accounted for almost 50% of final energy consumption in 2019, although its share has decreased by about 7 percentage points since 1980.

The share of natural gas has risen by a few percentage points over the past 39 years.

The share of coal has remained small at about 3%.

The share of electricity has undergone the most significant change, more than doubling since 1980.

FIGURE 16. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE LATIN AMERICA AND THE CARIBBEAN REGION



Electricity Production

Since 1980 hydro has been the largest source of electricity; its production increased throughout this period, although its share has decreased by about 15 percentage points. From 2000 onwards, other renewables started contributing significantly to electricity production. In 2019 the combined share of other renewables was almost 13%.

Of all fossil fuels, natural gas accounted for the largest share of electricity production in 2019, having displaced oil as the largest source after 2000. The share of natural gas has undergone an almost threefold increase over the past 39 years. The share of coal has almost tripled since 1980, whereas the share of oil has steadily decreased by almost 20 percentage points.

Nuclear's share has increased almost fourfold since 1980, although its overall share has remained relatively small and was just over 2% in 2019.

Energy and Electricity Projections

- Final consumption of energy is expected to increase by about 25% from 2019 levels by 2030 and by about 60% by 2050, at an average annual rate of about 1.6%.
- Electricity consumption is expected to grow at a faster rate of about 3% per year, doubling over the next 30 years.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 10 percentage points from its 2019 share.

FIGURE 17. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE LATIN AMERICA AND THE CARIBBEAN REGION

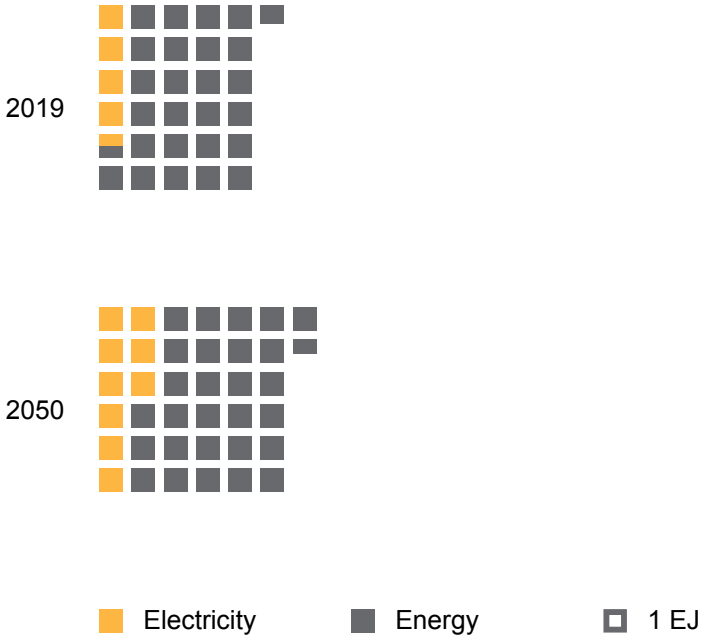


TABLE 10. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE LATIN AMERICA AND THE CARIBBEAN REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	25.6	32.2	37.4	42.1
Electricity	4.8	7.2	9.4	11.7
Electricity as % of Energy	*18.8%*	*22.4%*	*25.1%*	*27.8%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is projected to increase by about 30% by 2030 and to more than double by 2050.
- In the high case, nuclear electrical generating capacity is projected to increase fourfold by 2050, with its share in total electrical capacity growing by 1 percentage point.
- In the low case, nuclear electrical generating capacity is projected to double over the next 30 years, although its share in total electrical capacity is expected to remain constant.

FIGURE 18. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE LATIN AMERICA AND THE CARIBBEAN REGION

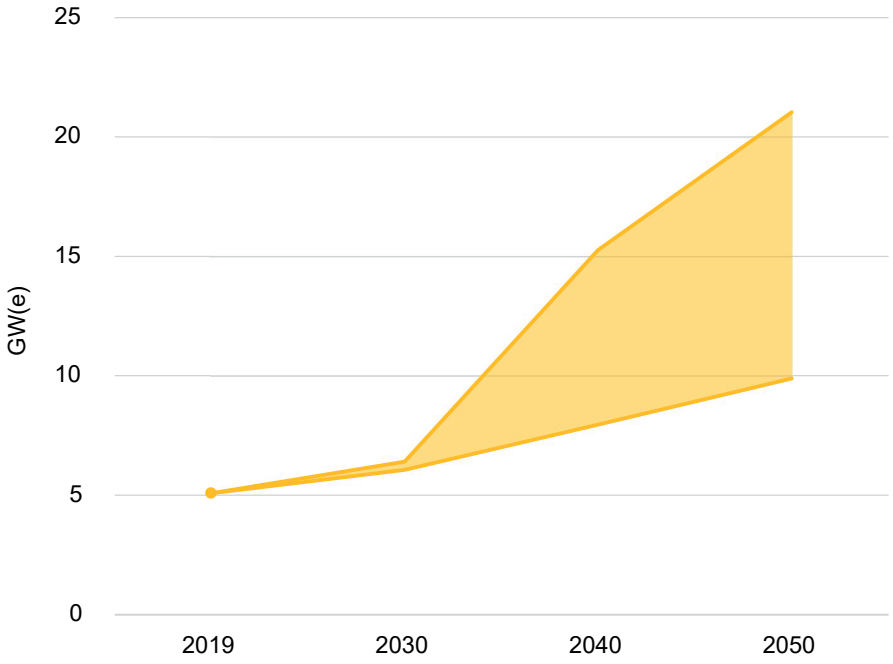


TABLE 11. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE LATIN AMERICA AND THE CARIBBEAN REGION, GW(e)

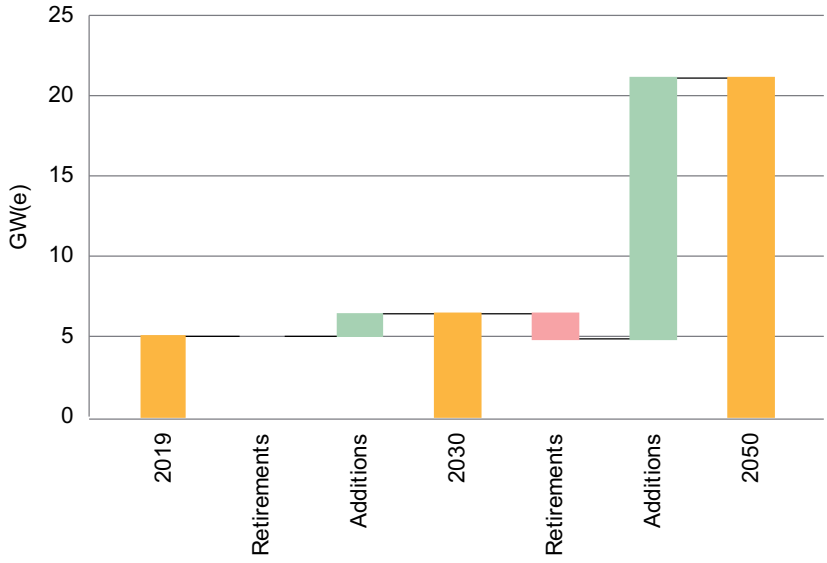
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	456	603	603	811	811	1 010	1 010
Nuclear	5.1	6	6	8	15	10	21
Nuclear as % of Electrical Capacity	*1.1%*	*1.0%*	*1.0%*	*1.0%*	*1.8%*	*1.0%*	*2.1%*

Reactor Retirements and Additions

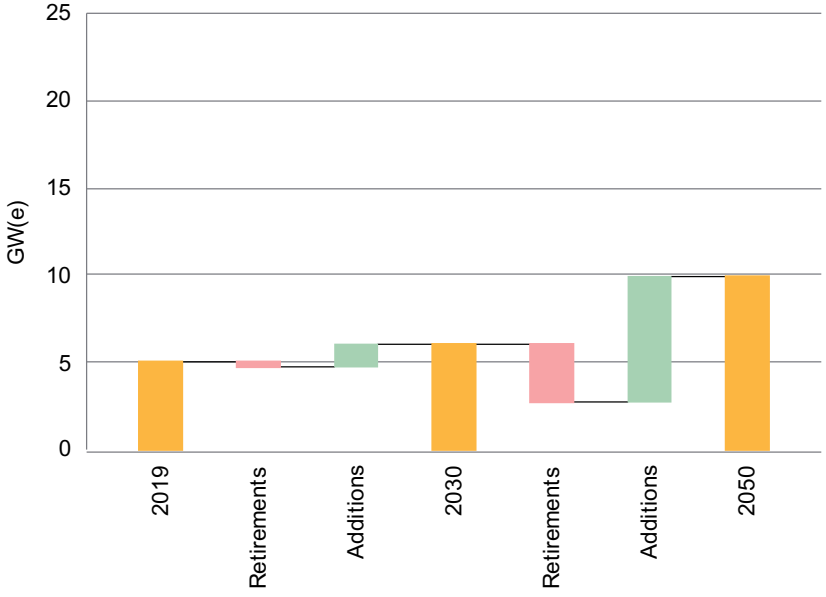
- In the high case, no reactor retirements are expected by 2030 and it is assumed that just over 1 GW(e) of capacity will be added. Between 2030 and 2050 it is expected that there will be a significant number of additions with only a few retirements, resulting in a net increase in capacity of almost 15 GW(e).
- In the low case, it is assumed that there will be a net increase in capacity of about 1 GW(e) by 2030, as only one reactor is expected to be retired. Between 2030 and 2050 it is expected that there will be more capacity added than retired, resulting in a net increase in capacity of almost 4 GW(e).

FIGURE 19. NUCLEAR CAPACITY IN THE LATIN AMERICA AND THE CARIBBEAN REGION: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is projected to rise significantly by 2030 with an increase of about 50% from 2019 levels. It is expected to more than double by 2050.
- In the high case, nuclear electricity production is projected to rise just over 40% by 2030 and more than triple over the next 20 years. The share of nuclear in total electricity production is expected to gradually increase, doubling by 2050.
- In the low case, nuclear electricity production is projected to increase by about 35% by 2030 and almost double over the subsequent 20 years. The share of nuclear in total electricity production is expected to remain at its 2019 level.

FIGURE 20. NUCLEAR ELECTRICITY PRODUCTION IN THE LATIN AMERICA AND THE CARIBBEAN REGION

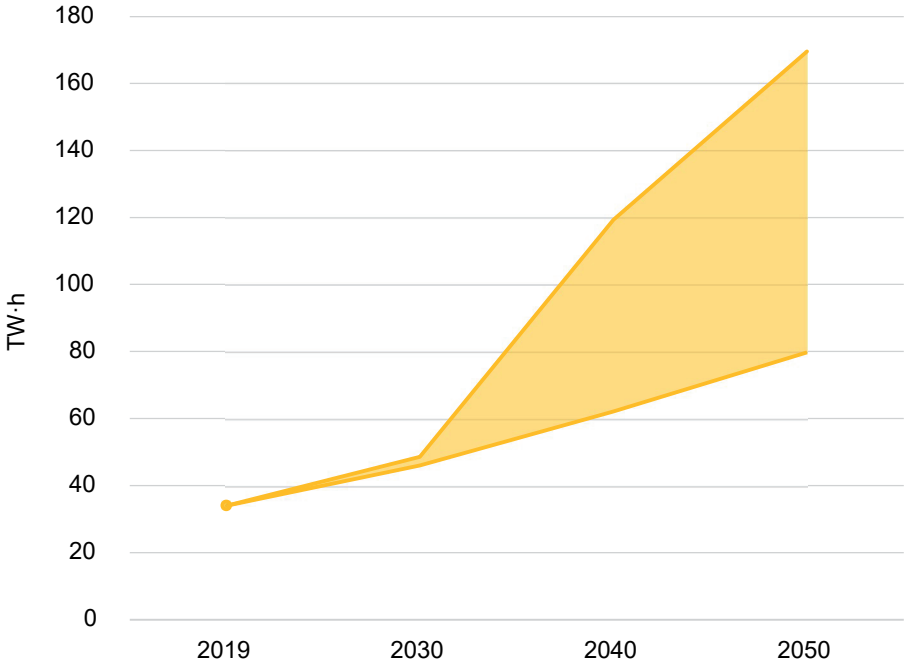


TABLE 12. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE LATIN AMERICA AND THE CARIBBEAN REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 596	2 396	2 396	3 107	3 107	3 837	3 837
Nuclear	34	46	49	62	119	80	170
Nuclear as % of Electricity Production	*2.1%*	*1.9%*	*2.0%*	*2.0%*	*3.8%*	*2.1%*	*4.4%*

Northern, Western and Southern Europe

454

million people

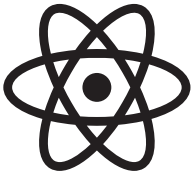
Energy Overview 2019

21.9%

of final energy consumed was electricity

2 989TW·h

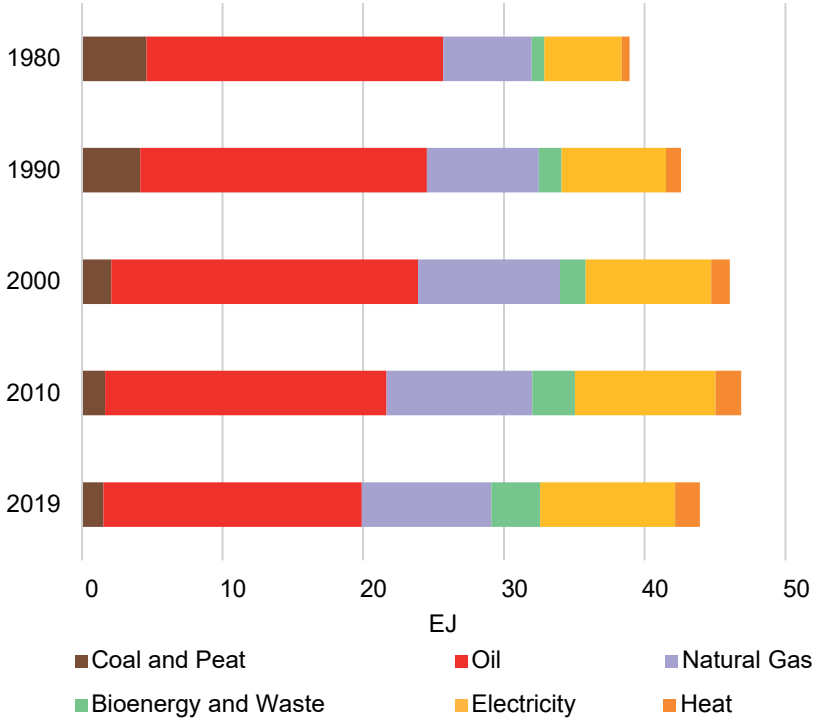
of electricity produced



24.2%

of electricity produced by nuclear

FIGURE 21. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE



Final Energy Consumption

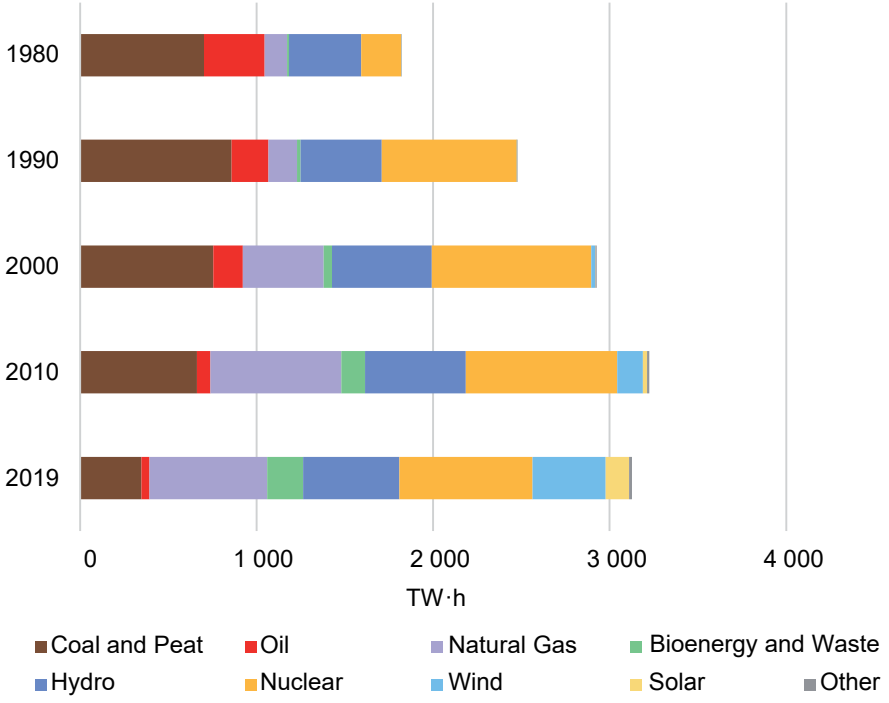
Since 1980 fossil fuels have continued to dominate final energy consumption, although there has been a gradual reduction in their combined share, which fell about 16 percentage points to about 66% in 2019.

Of all fossil fuels, oil has the largest share, although it has been declining over the past 39 years. In 2019 the share of oil remained significant at about 42%.

The share of natural gas has increased by about 5 percentage points since 1980. It accounted for one fifth of the final energy consumed in 2019. On the other hand, the share of coal has decreased by about 8 percentage points over the past 39 years but its share has remained at about 3.5% since 2010.

In 2019, the share of electricity in final energy consumption was more than 20%, an increase of almost 8 percentage points since 1980.

FIGURE 22. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE



Electricity Production

In the past 39 years, the combined share of fossil fuels in electricity production has effectively decreased by half. About one third of electricity was produced by fossil fuels in 2019, with natural gas being the largest contributor at about 21%. The share of natural gas has effectively tripled since 1980, whereas oil has declined from almost 20% in 1980 to 1.5% in 2019. Since 1980, the share of coal in electricity production has fallen from almost 40% to about 11%.

Nuclear is the largest contributor of low carbon electricity production. Its share more than doubled from 1980 to 1990 and then decreased by about 7 percentage points from 2000 to 2019 to a share of about 24%.

Over the past 39 years the share of hydro has decreased slightly by about 5 percentage points. In 2019 it was around 17%. Wind and solar did not contribute significantly to electricity production in 1980. These energy sources have since increased substantially to a combined share of 17.5% in 2019.

Energy and Electricity Projections

- Until 2030 final energy consumption is expected to remain constant, but by 2050 a decrease of about 9% is expected, at an average annual rate of approximately 0.3%.
- Electricity consumption is projected to increase by about 10% by 2050, at an average annual rate of approximately 0.3%.
- The share of electricity in final energy consumption is expected to increase by almost 5 percentage points.

FIGURE 23. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE

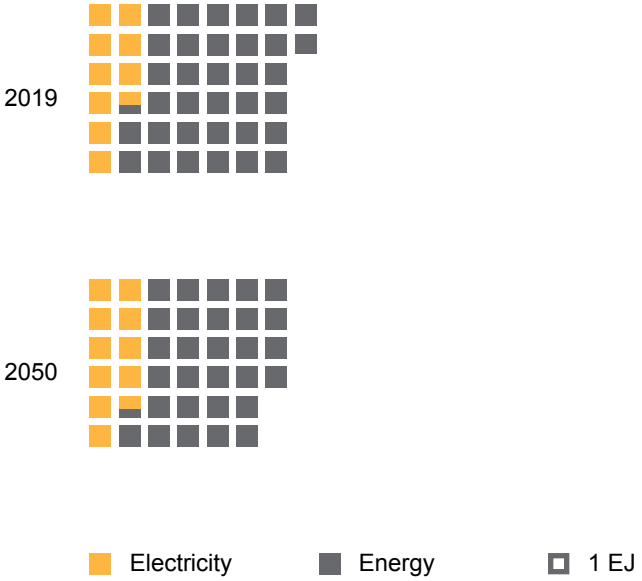


TABLE 13. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE, EJ

Final Consumption	2019	2030	2040	2050
Energy	43.9	43.8	41.7	40.0
Electricity	9.6	10.3	10.4	10.6
Electricity as % of Energy	*21.9%*	*23.5%*	*24.9%*	*26.5%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is projected to increase almost 20% by 2030 and by almost one third by 2050 compared with 2019 capacity.
- In the high case, nuclear electrical generating capacity is projected to decrease by 2050, but to a lesser extent than in the low case, with a reduction of about one third from 2019 capacity. The share of nuclear in total electrical capacity is expected to decrease about 50%.
- In the low case, nuclear electrical generating capacity is projected to decrease by 60% by 2050. The share of nuclear in total electrical capacity is expected to decline by more than 7 percentage points.

FIGURE 24. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE

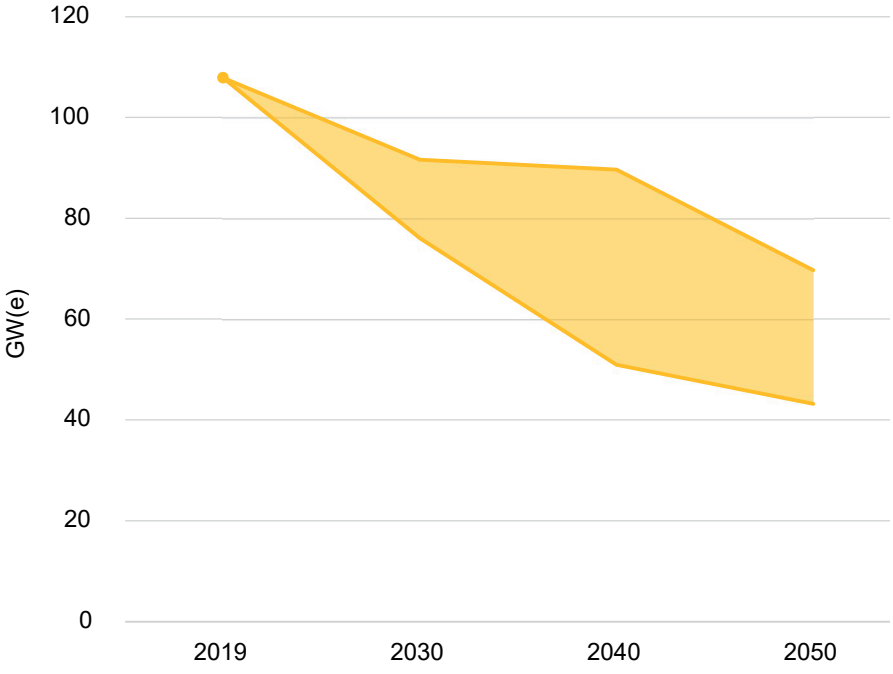


TABLE 14. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE, GW(e)

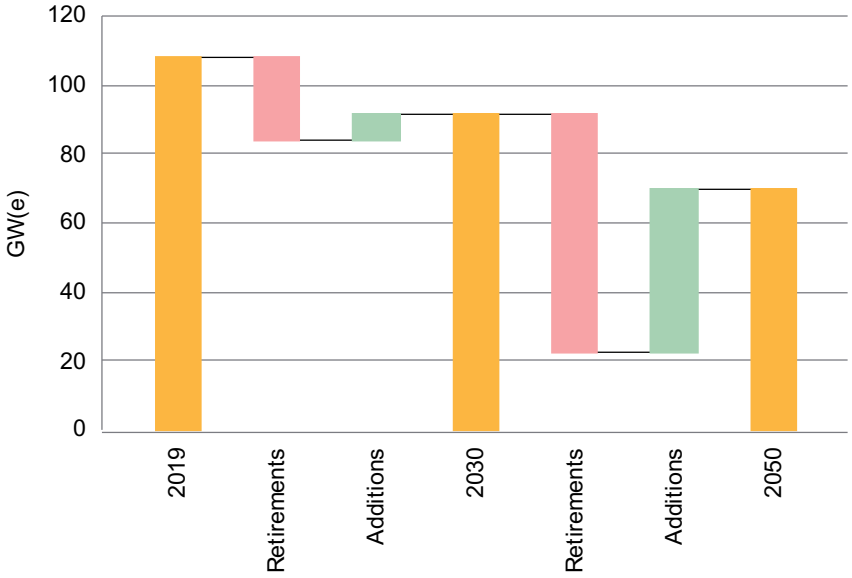
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 010	1 204	1 204	1 271	1 271	1 327	1 327
Nuclear	108	76	92	51	90	43	70
Nuclear as % of Electrical Capacity	*10.7%*	*6.3%*	*7.6%*	*4.0%*	*7.1%*	*3.2%*	*5.3%*

Reactor Retirements and Additions

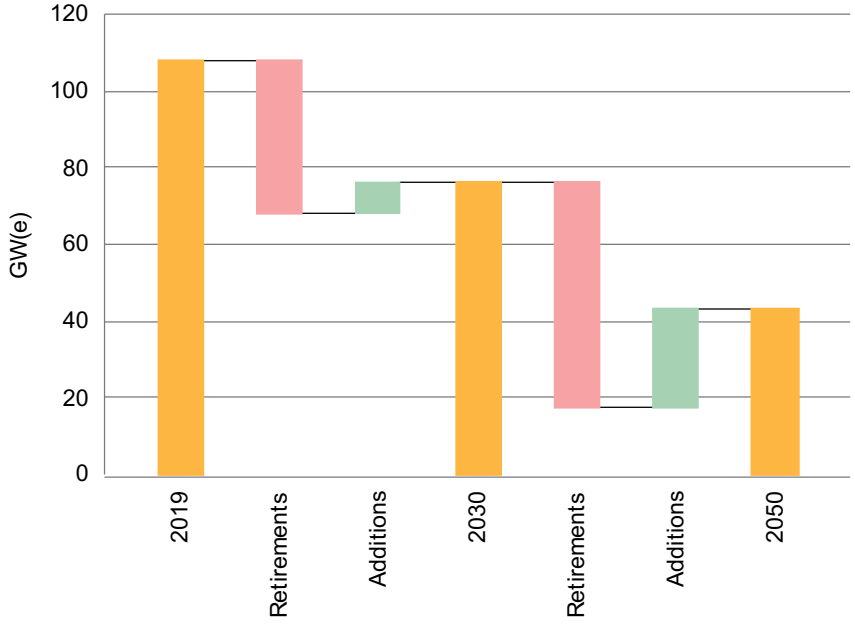
- In the high case, it is assumed that there will be a net decrease in capacity by 2030, but fewer retirements are expected than in the low case. Capacity is expected to decrease by about 16 GW(e). From 2030 until 2050 further net reductions of about 22 GW(e) are expected.
- In the low case, it is assumed that there will be a net decrease in capacity of almost 32 GW(e) by 2030 owing to more retirements than additions of capacity in this period. Between 2030 and 2050 a further reduction of 33 GW(e) is expected.

FIGURE 25. NUCLEAR CAPACITY IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is projected to increase by about 6% by 2030 and 8% by 2050, compared with 2019 production levels.
- In the high case, nuclear electricity production is projected to remain stable until 2030. However, it is projected to decrease by about one fifth by 2050. The share of nuclear in total electricity production is expected decline by almost 7 percentage points by 2050.
- In the low case, nuclear electricity production is projected to decrease by about 17% by 2030. By 2050 it is expected to decrease by about 50%. The share of nuclear in total electricity production is expected to decline by more than 50% by 2050.

FIGURE 26. NUCLEAR ELECTRICITY PRODUCTION IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE

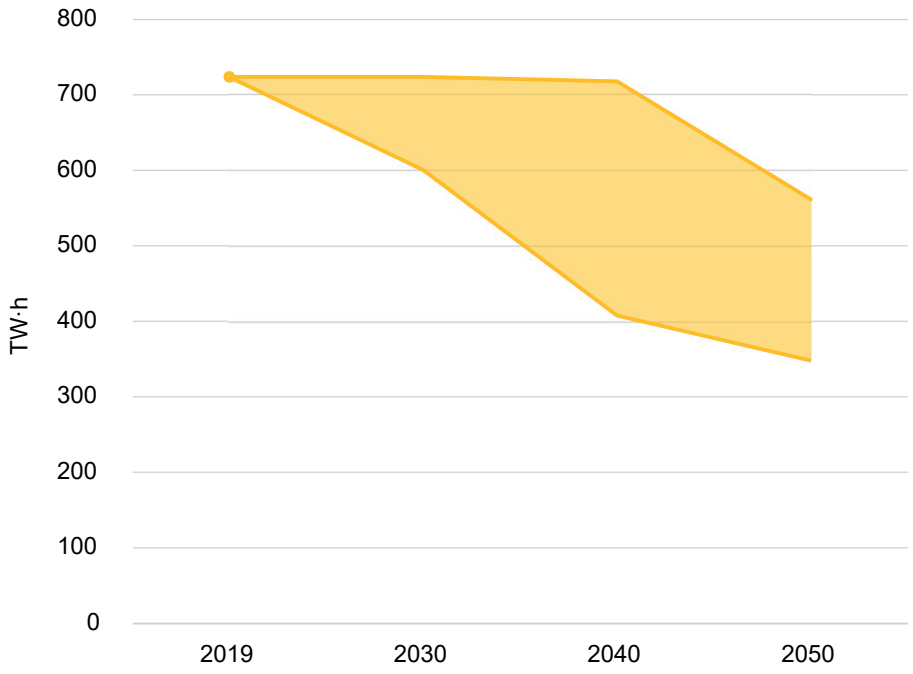


TABLE 15. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE COMBINED REGIONS OF NORTHERN, WESTERN AND SOUTHERN EUROPE, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	2 989	3 162	3 162	3 181	3 181	3 224	3 224
Nuclear	724	601	724	408	718	348	562
Nuclear as % of Electricity Production	*24.2%*	*19.0%*	*22.9%*	*12.8%*	*22.6%*	*10.8%*	*17.4%*

Eastern Europe

293

million people

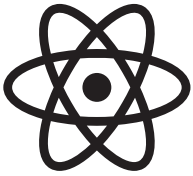
Energy Overview 2019

14.6%

of final energy consumed was electricity

1 622TW·h

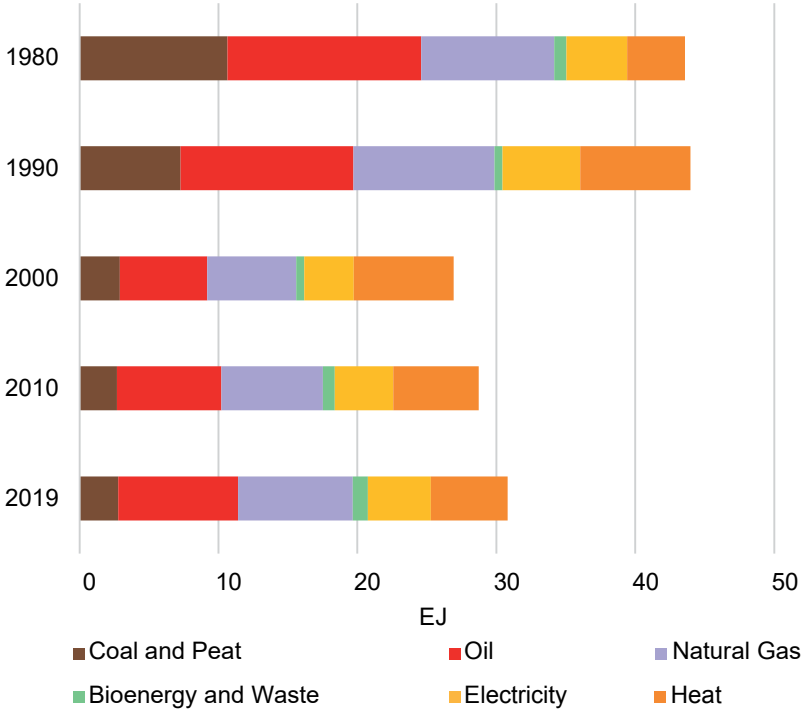
of electricity produced



22.1%

of electricity produced by nuclear

FIGURE 27. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE EASTERN EUROPE REGION



Final Energy Consumption

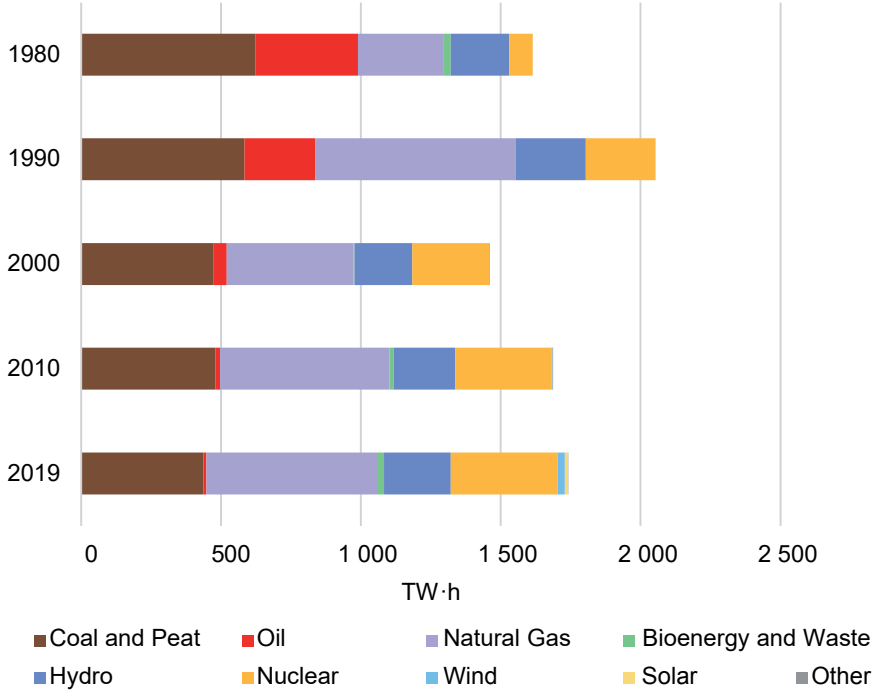
Since 1980 fossil fuels have had the largest share in final energy consumption. Between 1980 and 2000 the combined share of fossil fuels declined by around 20 percentage points. However, from 2000 onwards there has been a gradual increase to about 64% in 2019.

Oil has the largest share of all fossil fuels, although it has declined by about 4 percentage points over the past 39 years. Conversely, the share of natural gas has increased by almost 5 percentage points since 1980. The share of coal has also declined and in 2019 was almost two thirds of its 1980 share.

The share of electricity has increased gradually by about 5 percentage points over the years.

With almost a doubling of its share since 1980, heat has seen the most significant change of all energy sources.

FIGURE 28. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE EASTERN EUROPE REGION



Electricity Production

Although the combined share of fossil fuels has declined about 20 percentage points since 1980, they remain the dominant sources of electricity production with a share of about 60% in 2019.

Over the years natural gas has almost doubled its share. In 2019 more than one third of the electricity produced was from natural gas. The share of oil has dropped significantly from almost 23% in 1980 to less than 1% in 2019. Coal contributed about a quarter of electricity production in 2019, down from 40% in 1980.

The share of nuclear has quadrupled since 1980, and nuclear accounted for just over one fifth of the electricity produced in 2019.

The share of hydro has remained relatively stable throughout the years at about 12–14%. The combined share of solar and wind remained small at about 2% in 2019, although in 1980 they did not contribute to electricity production at all.

Energy and Electricity Projections

- Final consumption of energy is expected to increase by about 11% by 2030 and by just over 20% by 2050 compared with 2019 consumption, an average annual rate of approximately 0.6%.
- Electricity consumption is expected to grow at a faster rate of about 2% per year. Electricity consumption is expected to double by 2050.
- The share of electricity in final consumption of energy is expected to increase by almost 10 percentage points by 2050.

FIGURE 29. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE EASTERN EUROPE REGION

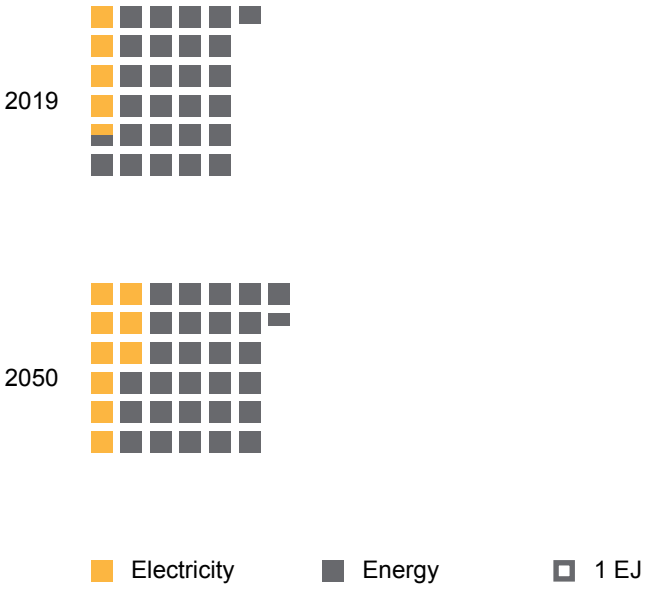


TABLE 16. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE EASTERN EUROPE REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	30.8	34.2	36.1	37.6
Electricity	4.5	6.3	7.7	9.0
Electricity as % of Energy	*14.6%*	*18.4%*	*21.3%*	*23.9%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is projected to increase by about 25% by 2030 and 75% by 2050 compared with 2019 capacity.
- In the high case, nuclear electrical generating capacity is projected to increase just over 80% by 2050. However, its share in total electrical capacity will remain almost constant with an expected increase of only about 0.5 percentage points.
- In the low case, nuclear electrical generating capacity is projected to remain relatively stable over the next 30 years, with only about a 10% increase expected by 2050. The share of nuclear in total electrical capacity is expected to decrease by about 4 percentage points.

FIGURE 30. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE EASTERN EUROPE REGION

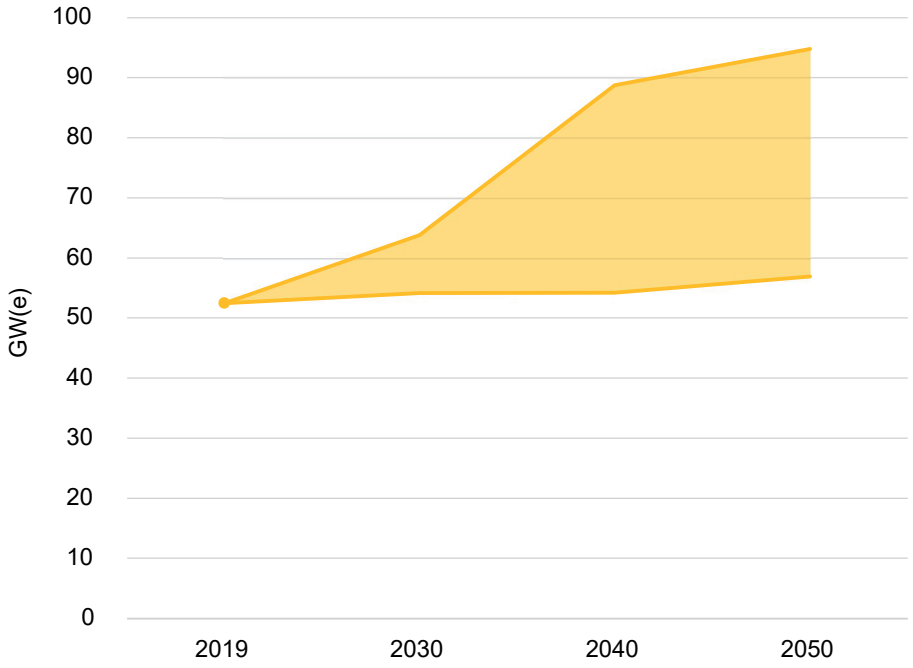


TABLE 17. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE EASTERN EUROPE REGION, GW(e)

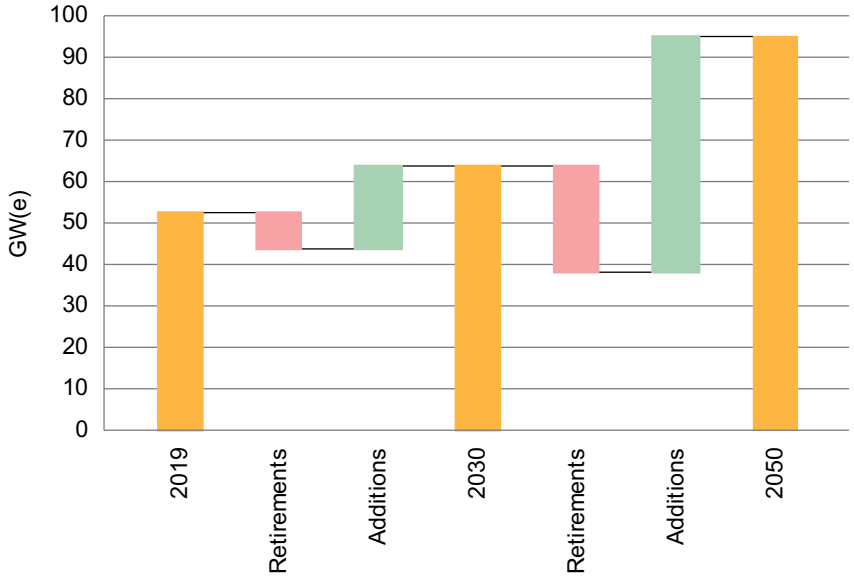
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	459	579	579	699	699	800	800
Nuclear	52	54	64	54	89	57	95
Nuclear as % of Electrical Capacity	*11.3%*	*9.3%*	*11.1%*	*7.7%*	*12.7%*	*7.1%*	*11.9%*

Reactor Retirements and Additions

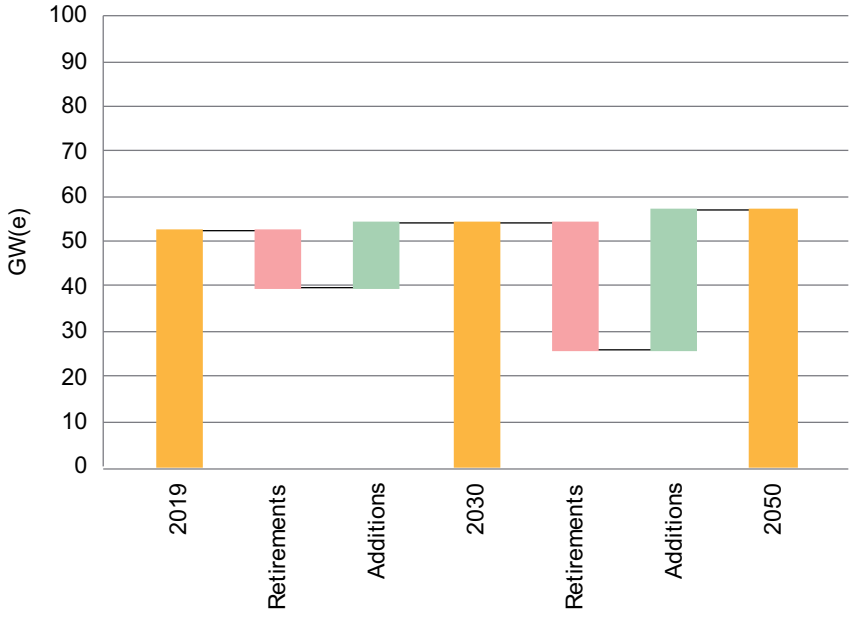
- In the high case, it is assumed that more than twice as much capacity will be added than retired by 2030, resulting in a net increase in capacity of more than 10 GW(e). Similarly, between 2030 and 2050 more than twice as much capacity is expected to be added than retired, resulting in a net increase in capacity of more than 30 GW(e).
- In the low case, it is assumed that there will be almost the same number of units retired as added by 2030, with a net increase in capacity of only 1.6 GW(e). Between 2030 and 2050 slightly more reactors are expected to be added than retired, resulting in a net increase in capacity of almost 3 GW(e).

FIGURE 31. NUCLEAR CAPACITY IN THE EASTERN EUROPE REGION: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is projected to increase by more than one third by 2030 and by about 85% by 2050 compared with 2019 production.
- In the high case, nuclear electricity production is projected to rise just over 40% by 2030 compared with 2019 levels and more than double by 2050. The share of nuclear in total electricity production is expected to increase by about 3 percentage points.
- In the low case, nuclear electricity production is projected to increase by 20% by 2030 compared with 2019 levels, and an increase of almost 30% is expected by 2050. The share of nuclear in total electricity production is expected to decline about 7 percentage points by 2050.

FIGURE 32. NUCLEAR ELECTRICITY PRODUCTION IN THE EASTERN EUROPE REGION

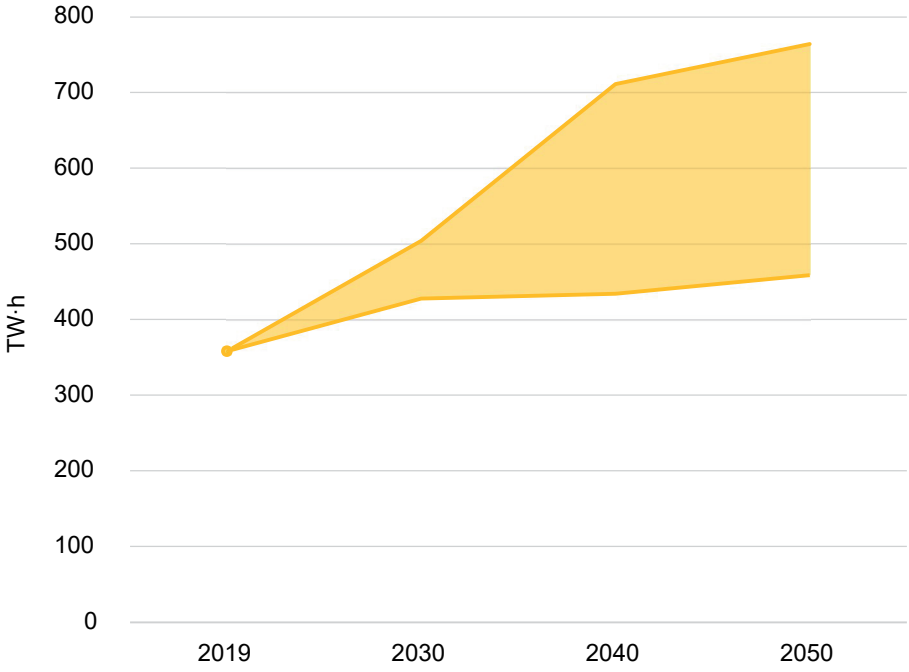


TABLE 18. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE EASTERN EUROPE REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 622	2 182	2 182	2 622	2 622	3 017	3 017
Nuclear	358	428	504	434	711	459	764
Nuclear as % of Electricity Production	*22.1%*	*19.6%*	*23.1%*	*16.6%*	*27.1%*	*15.2%*	*25.3%*

Africa

1 308

million people

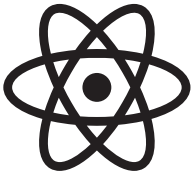
Energy Overview 2019

10.0%

of final energy consumed was electricity

841 TW·h

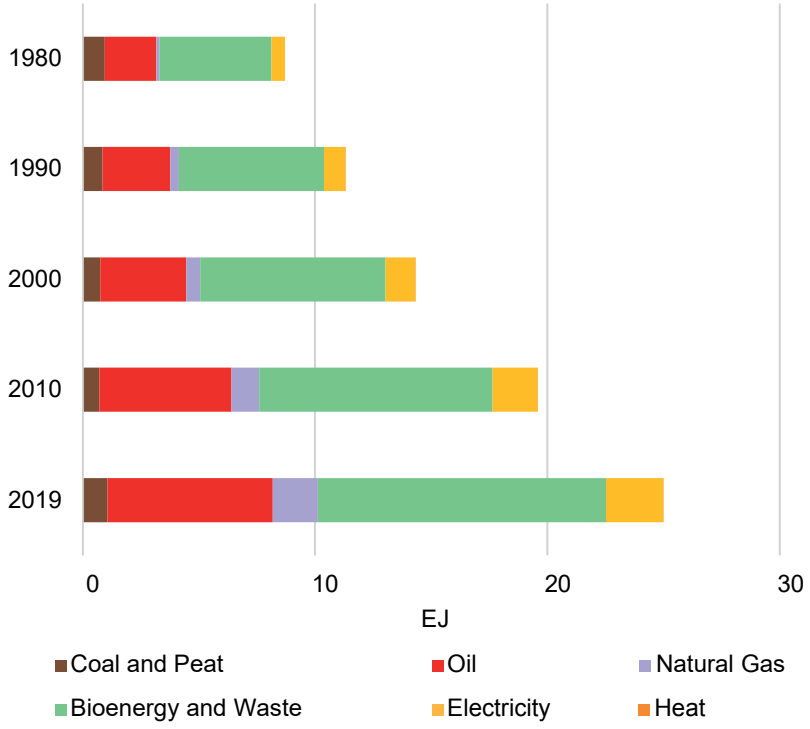
of electricity produced



1.7%

of electricity produced by nuclear

FIGURE 33. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE AFRICA REGION



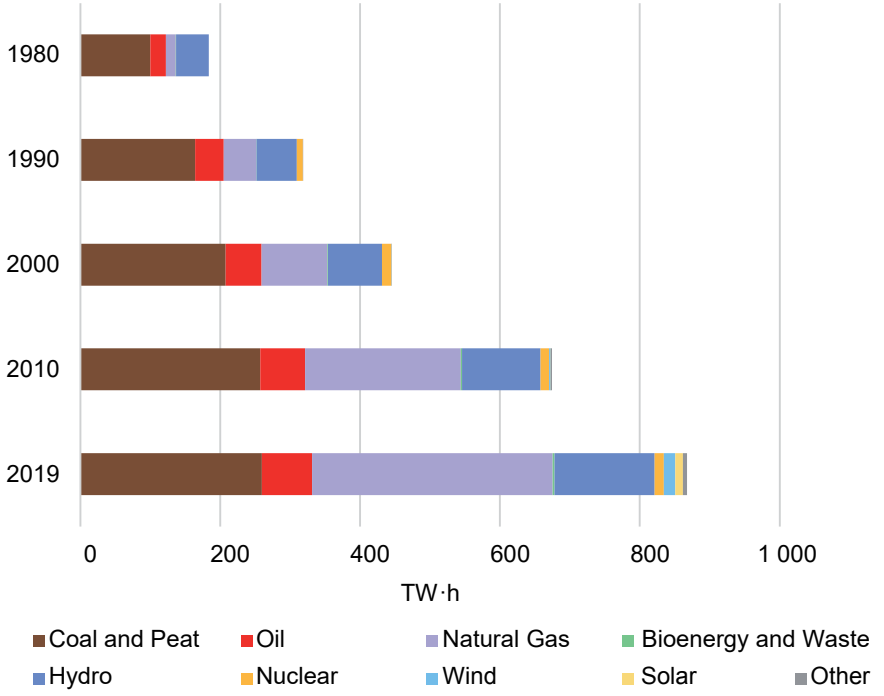
Final Energy Consumption

The share of bioenergy and waste in final energy consumption has been the largest over the past 40 years at around 50%.

The combined share of fossil fuels has been relatively stable since 1980 at about 40%. The share of natural gas has increased by about 6 percentage points over the past 39 years, and that of oil has increased at about 3 percentage points. The share of coal has gradually decreased by about 7 percentage points.

With a share of almost 10% in 2019, the share of electricity has increased a few percentage points since 1980.

FIGURE 34. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE AFRICA REGION



Electricity Production

From 1980 until 2010 the combined share of fossil fuels in electricity production gradually increased by about 6 percentage points. From 2010 to 2019 their combined share decreased by 3 percentage points but was still almost 80% of electricity production in 2019.

Since 1980, natural gas has steadily increased its share by about 30 percentage points, whereas the share of coal has declined almost 50%. The share of oil has decreased by about 4 percentage points.

The share of nuclear was around 2–3% from 1990 to 2010 and 1.5% in 2019.

Hydro was the largest contributor of low carbon energy, accounting for almost 17% of electricity production in 2019, although its share has decreased by about 10 percentage points over the past 39 years. The share of wind and solar has increased slightly since 2000, rising from less than 1% to about 3% in 2019.

Energy and Electricity Projections

- Final energy consumption is expected to increase 25% from 2019 levels by 2030 and to almost double by 2050, at an average annual rate of approximately 2%.
- Electricity consumption will grow much faster, at an average annual rate of approximately 5%, and is expected to increase more than fourfold from 2019 levels by 2050.
- Over the next 30 years the share of electricity in final energy consumption is expected to more than double from its 2019 share.

FIGURE 35. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE AFRICA REGION

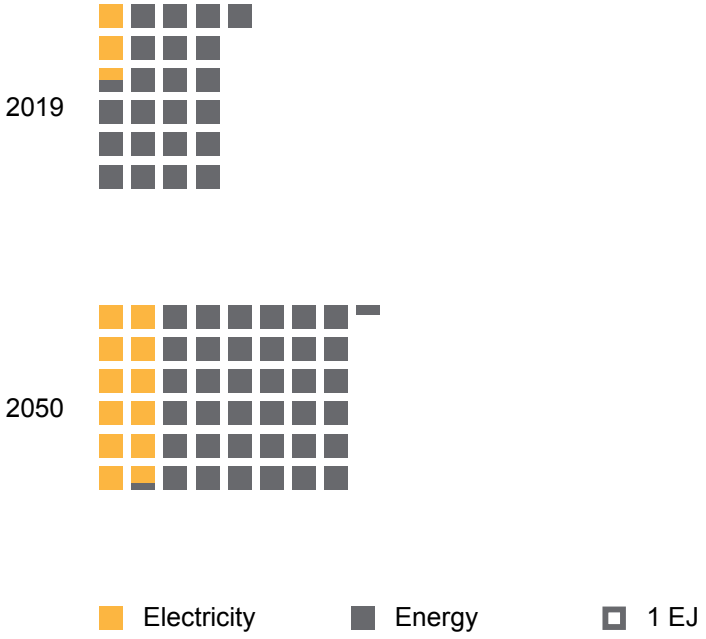


TABLE 19. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE AFRICA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	25.0	31.3	38.7	48.4
Electricity	2.5	4.5	7.5	11.7
Electricity as % of Energy	*10.0%*	*14.4%*	*19.4%*	*24.2%*

Per Capita Energy and Electricity

- Only about 25% of the electricity produced in Africa is consumed by the residential sector.
- Electricity consumption on a per capita basis is expected to triple by 2050 from 0.6 MW·h per person in 2019 to 1.5 MW·h per person. This would be enough electricity to power one high efficiency modern (circa 2020) washing machine or one small high efficiency (induction) electric stove for 30 minutes per day.
- In 2010 the global average electricity consumption for households with electricity was about 3.5 MW·h, more than 20 times that for the residential sector in Africa in 2019.

FIGURE 36. PER CAPITA ELECTRICITY PRODUCTION IN THE AFRICA REGION

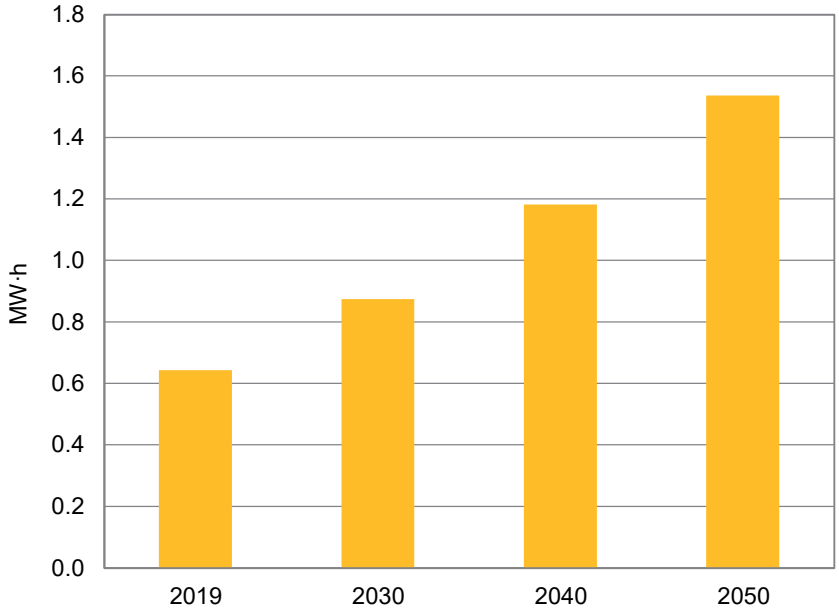
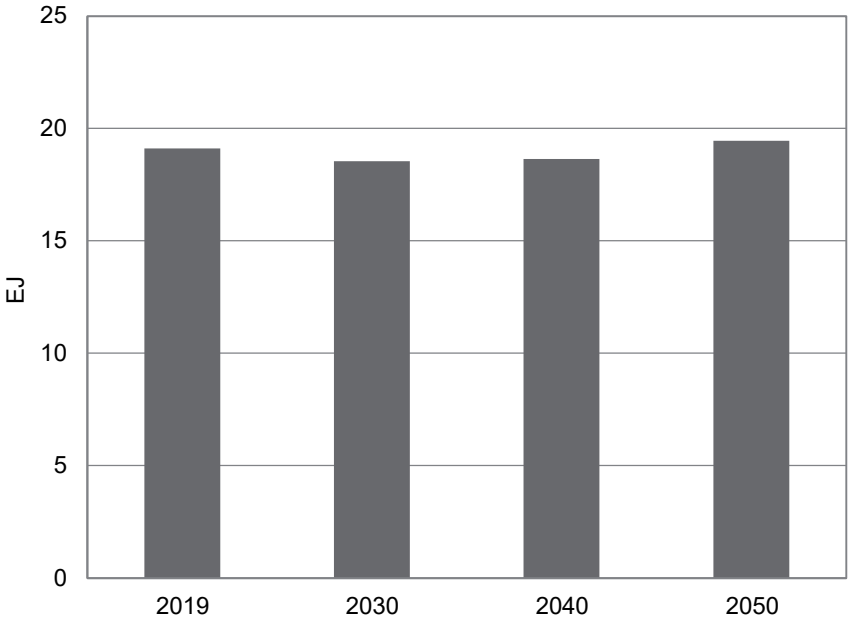


FIGURE 37. PER CAPITA FINAL ENERGY CONSUMPTION IN THE AFRICA REGION



Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase by 87% by 2030 and to undergo a fivefold increase by 2050.
- In the high case, nuclear electrical generating capacity is projected to more than double by 2030 and to undergo an almost sevenfold increase by 2050 compared with 2019 capacity.
- In the low case, by 2030 nuclear electrical generating capacity is projected to remain almost constant and by 2050 it is expected to triple compared with 2019 levels.

FIGURE 38. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE AFRICA REGION

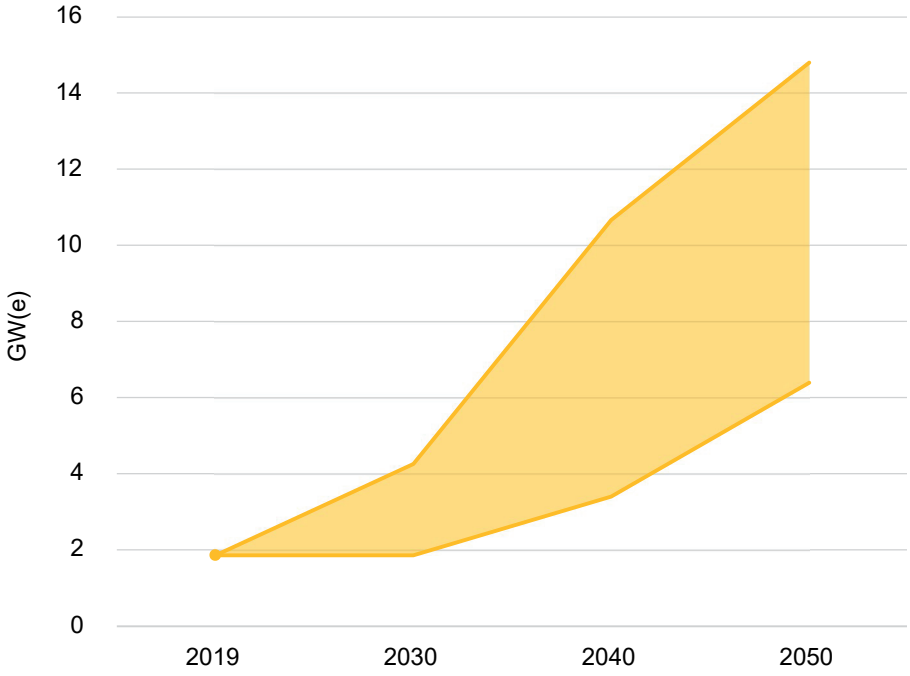


TABLE 20. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE AFRICA REGION, GW(e)

Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	230	430	430	715	715	1 155	1 155
Nuclear	1.9	2	4	3	11	6	15
Nuclear as % of Electrical Capacity	*0.8%*	*0.4%*	*0.9%*	*0.4%*	*1.5%*	*0.5%*	*1.3%*

Electricity and Nuclear Production Projections

- Total electricity production is projected to increase by 75% by 2030 and to increase almost fivefold by 2050.
- In the high case, nuclear electricity production is expected to more than double from 2019 levels by 2030 and to increase more than eightfold by 2050. The share of nuclear in total electricity production is expected to almost double.
- In the low case, nuclear electricity production is expected to remain almost the same by 2030 and almost quadruple by 2050. The share of nuclear in total electricity production is expected to decline slightly by 2030, increasing again thereafter and returning to almost the same level as in 2019 by 2050.

FIGURE 39. ELECTRICITY PRODUCTION BY NUCLEAR POWER IN THE AFRICA REGION

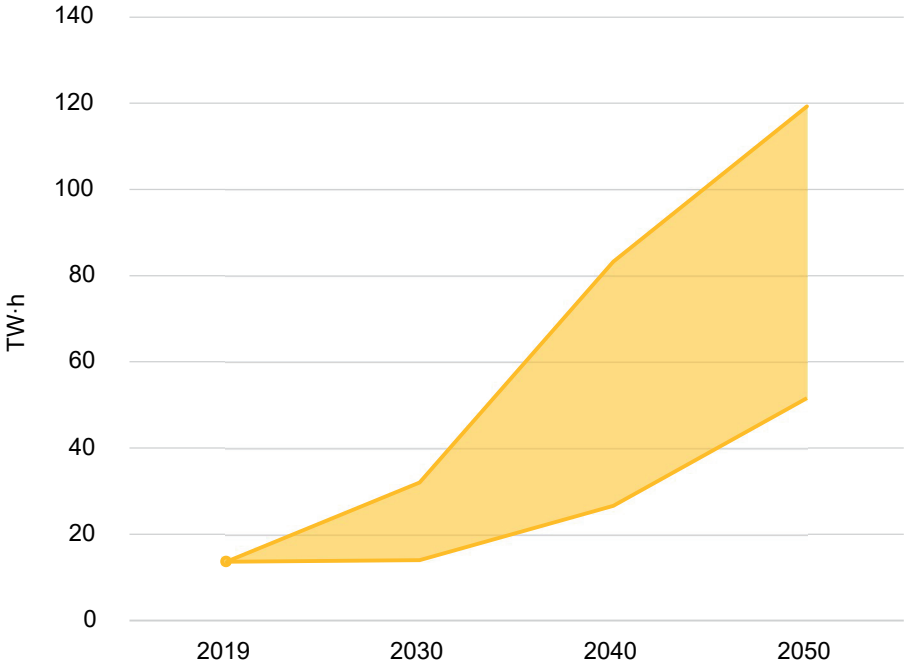


TABLE 21. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE AFRICA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	841	1 475	1 475	2 455	2 455	3 825	3 825
Nuclear	14	14	32	27	83	52	119
Nuclear as % of Electricity Production	*1.7%*	*0.9%*	*2.2%*	*1.1%*	*3.4%*	*1.4%*	*3.1%*

Western Asia

275

million people

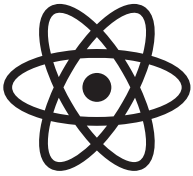
Energy Overview 2019

19.7%

of final energy consumed was electricity

1 257 TW·h

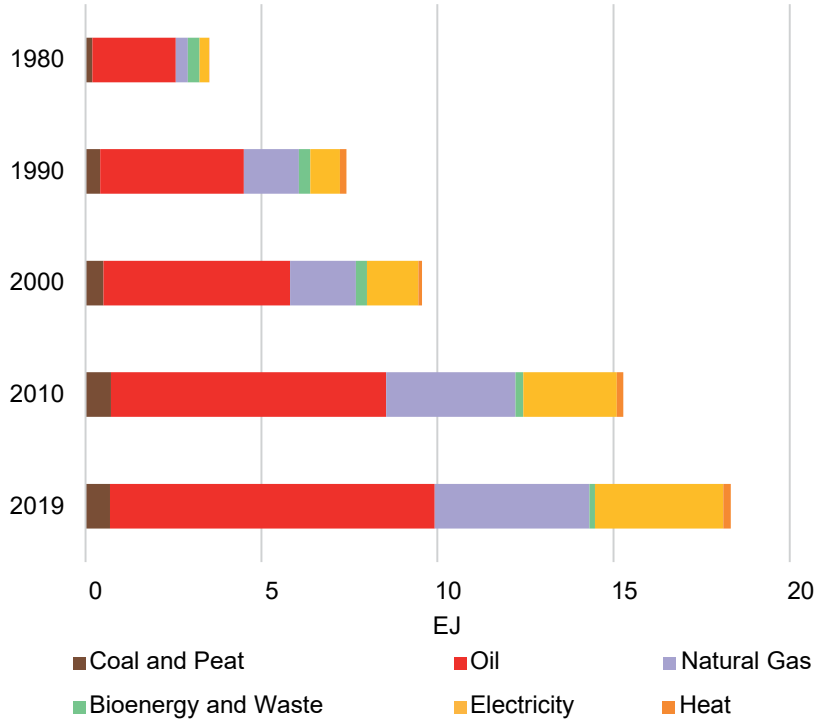
of electricity produced



0.2%

of electricity produced by nuclear

FIGURE 40. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE WESTERN ASIA REGION



Final Energy Consumption

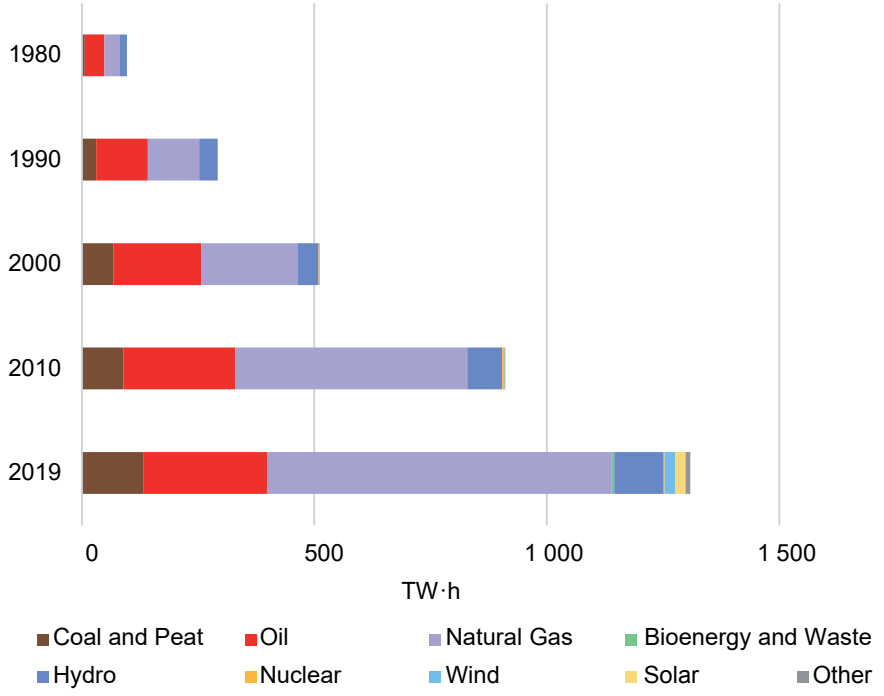
Fossil fuels have continued to dominate final energy consumption, with a stable share of about 80% since 1980.

At about 50% in 2019, oil had the largest share in final energy of all fossil fuels despite a 17 percentage point reduction since 1980. The share of natural gas has increased steadily since 1980 and was the second largest at almost a quarter of final energy consumption in 2019. The share of coal was about 4% in 2019, remaining relatively small and reflecting a decrease of a few percentage points since 1980.

At about 20% in 2019, the share of electricity in final energy consumption has more than doubled since 1980.

The share of bioenergy and waste in final energy consumption has declined gradually over the years, decreasing from about 9% in 1980 to less than 1% in 2019.

FIGURE 41. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE WESTERN ASIA REGION



Electricity Production

With a share of almost 90%, fossil fuels — particularly natural gas — have remained dominant sources of electricity production since 1980.

Hydro remains the largest contributor of low carbon electricity, accounting for about 8%, although its share has declined by about half since 1980.

The share of nuclear in electricity production remains small at less than 1%.

In recent years, solar and wind have begun generating electricity, and in 2019 their combined share was about 3%.

Energy and Electricity Projections

- Final energy consumption is expected to increase from 2019 levels by about 15% by 2030 and about 40% by 2050, at an average annual rate of approximately 1%.
- Electricity consumption is expected to grow at a faster rate of about 2% per year. Electricity consumption is expected to double by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 8 percentage points from its 2019 share.

FIGURE 42. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE WESTERN ASIA REGION

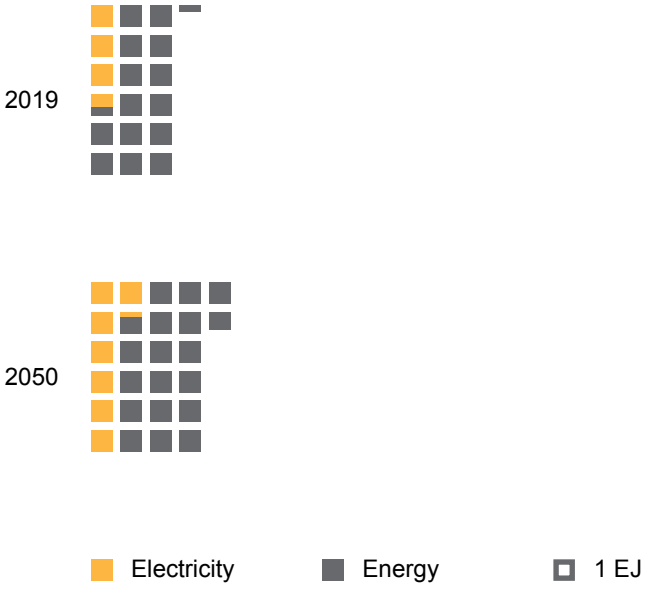


TABLE 22. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE WESTERN ASIA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	18.3	21.1	23.4	25.8
Electricity	3.6	5.2	6.3	7.2
Electricity as % of Energy	*19.7%*	*24.6%*	*26.9%*	*27.9%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase by about 16% by 2030 and about 65% by 2050.
- In the high case, nuclear electrical generating capacity is projected to undergo an almost 24-fold increase by 2030 and about a 63-fold increase by 2050 compared with 2019 capacity.
- In the low case, nuclear electrical generating capacity is projected to undergo a more than 20-fold increase by 2030 and an almost 40-fold increase by 2050 compared with 2019 capacity.
- Owing to the small share of nuclear in total electrical generating capacity, by 2050 it is expected that the share will increase significantly in both the high and low case — at about 4 and 2 percentage points, respectively.

FIGURE 43. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE WESTERN ASIA REGION

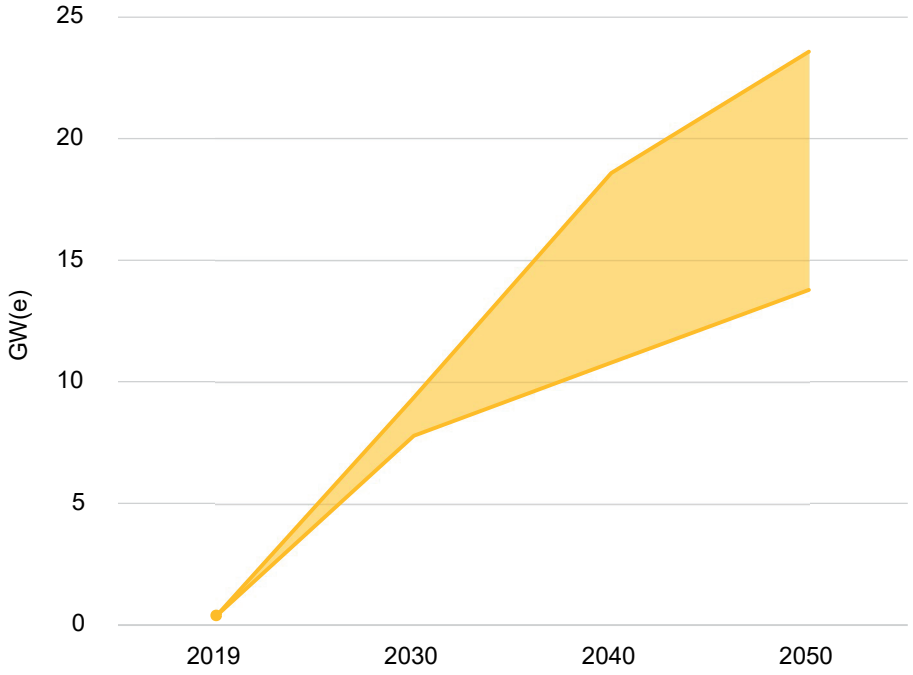


TABLE 23. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE WESTERN ASIA REGION, GW(e)

Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	354	410	410	496	496	583	583
Nuclear	0.4	8	9	11	19	14	24
Nuclear as % of Electrical Capacity	*0.1%*	*2.0%*	*2.2%*	*2.2%*	*3.8%*	*2.4%*	*4.1%*

Electricity and Nuclear Production Projections

- Total electricity production is projected to increase by about 35% by 2030 and by more than 80% by 2050.
- In the high case, nuclear electricity production is expected to undergo an almost 35-fold increase from 2019 levels by 2030 and a more than 90-fold increase by 2050. The share of nuclear in total electricity production is expected to increase by about 8 percentage points.
- In the low case, nuclear electricity production is expected to undergo an almost 30-fold increase from 2019 levels by 2030, rising to more than a 50-fold increase by 2050. The share of nuclear in total electricity production is expected to increase by almost 5 percentage points.

FIGURE 44. NUCLEAR ELECTRICITY PRODUCTION IN THE WESTERN ASIA REGION

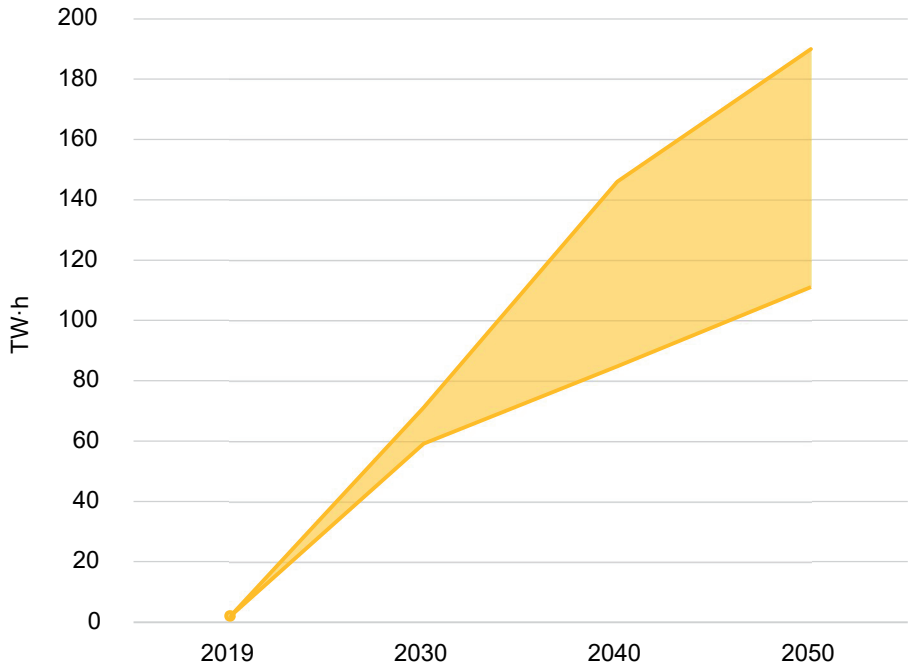


TABLE 24. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE WESTERN ASIA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 257	1 698	1 698	2 066	2 066	2 338	2 338
Nuclear	2	59	71	85	146	111	190
Nuclear as % of Electricity Production	*0.2%*	*3.5%*	*4.2%*	*4.1%*	*7.1%*	*4.7%*	*8.1%*

Southern Asia

1 918

million people

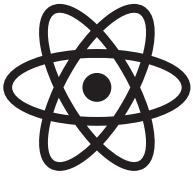
Energy Overview 2019

14.8%

of final energy consumed was electricity

2 071 TW·h

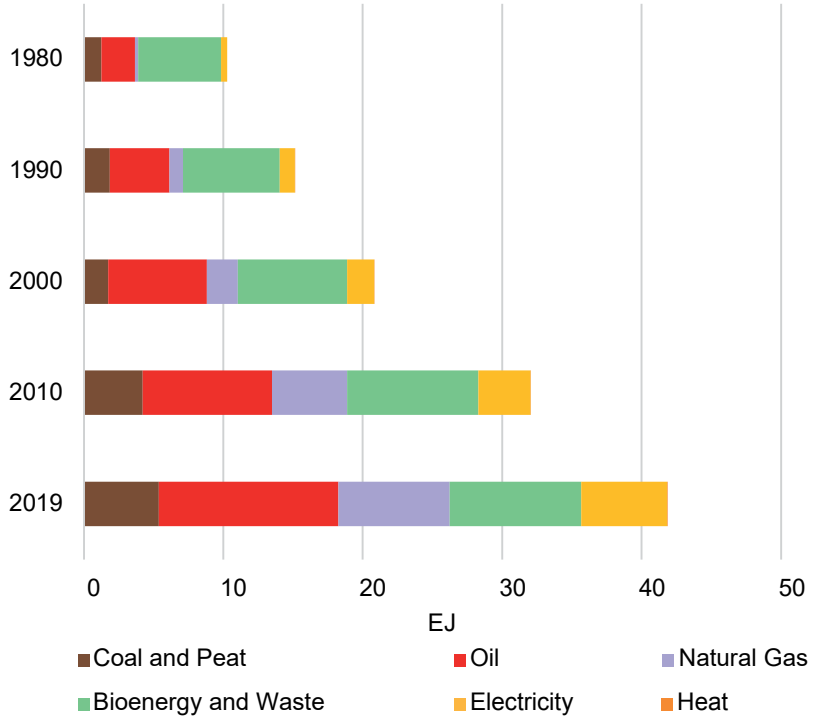
of electricity produced



2.7%

of electricity produced by nuclear

FIGURE 45. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE SOUTHERN ASIA REGION



Final Energy Consumption

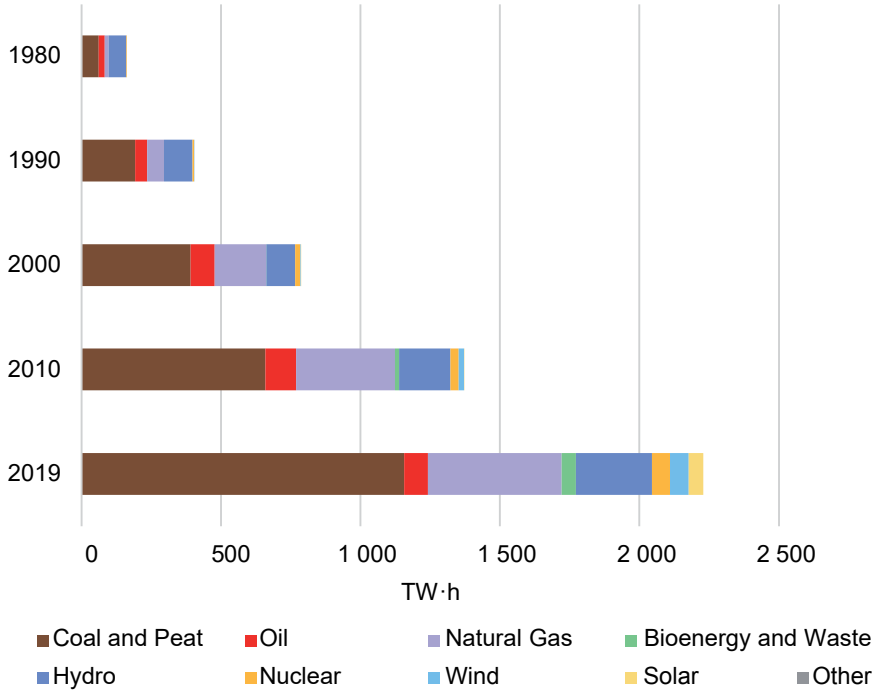
Since 1980 the share of fossil fuels in final energy consumption has been increasing steadily from a share of approximately 40% in 1980 to more than 60% in 2019.

The share of natural gas has increased from less than 3% in 1980 to about 20% in 2019. Oil has also been gradually increasing, with a share of almost one third in final energy consumption in 2019, an increase of about 7 percentage points since 1980. Coal has remained relatively stable with a share of about 12–13%.

In 2019 the share of electricity was about 15%, almost tripling since 1980.

The share of bioenergy and waste has declined by more than half since 1980 reaching about 23% in 2019.

FIGURE 46. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE SOUTHERN ASIA REGION



Electricity Production

From 1980 to 2000, fossil fuels increased their share in electricity production from about 60% to more than 80%. Their share has since declined to about 77% in 2019.

Coal is the largest source of electricity with a share of more than 50%, an increase of about 14 percentage points since 1980. The share of natural gas has more than doubled since 1980, accounting for about a fifth of the electricity produced in 2019. The share of oil has decreased 9 percentage points since 1980 to about 4% of the region's electricity in 2019.

Hydro remains the largest contributor of low carbon electricity, accounting for 12%, although its share has decreased by about 27 percentage points since 1980. In recent years, the share of solar and wind has undergone a rapid increase, rising from less than 1% in 2000 to about 5% in 2019.

The share of nuclear was about 3% in 2019, a rise of about 1 percentage point since 1980.

Energy and Electricity Projections

- Final energy consumption is expected to increase by about 60% from 2019 levels by 2030 and to more than double by 2050, at an average annual rate of approximately 3%.
- Electricity consumption is expected to grow at a faster rate of almost 5% per year. Electricity consumption is expected to quadruple by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 9 percentage points from its 2019 share.

FIGURE 47. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE SOUTHERN ASIA REGION

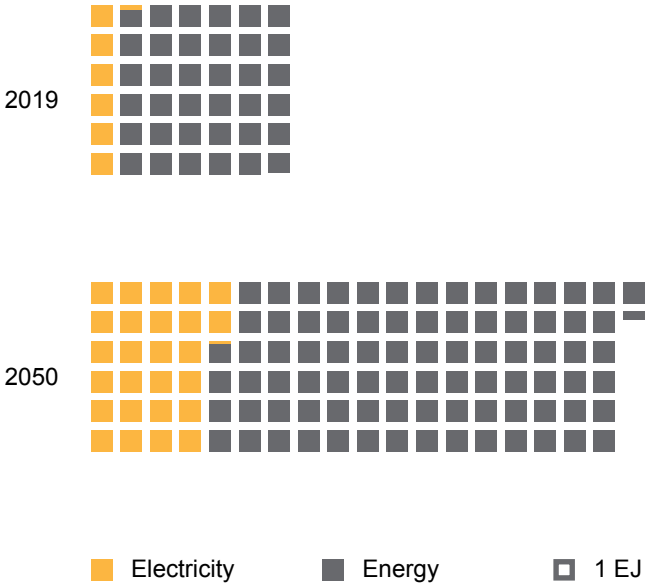


TABLE 25. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE SOUTHERN ASIA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	41.9	67.2	89.1	109.4
Electricity	6.2	12.1	19.2	26.1
Electricity as % of Energy	*14.8%*	*18.0%*	*21.5%*	*23.9%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to more than double by 2030 and to increase fivefold by 2050.
- In the high case, nuclear electrical generating capacity is projected to triple by 2030 and to undergo an eightfold increase by 2050 compared with 2019 capacity. The share of nuclear in total electrical generating capacity is expected to increase by about 1 percentage point by 2050.
- In the low case, nuclear electrical generating capacity is projected to double by 2030 and undergo a fivefold increase by 2050. The share of nuclear in total electrical generating capacity is expected to remain almost the same as the 2019 level.

FIGURE 48. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE SOUTHERN ASIA REGION

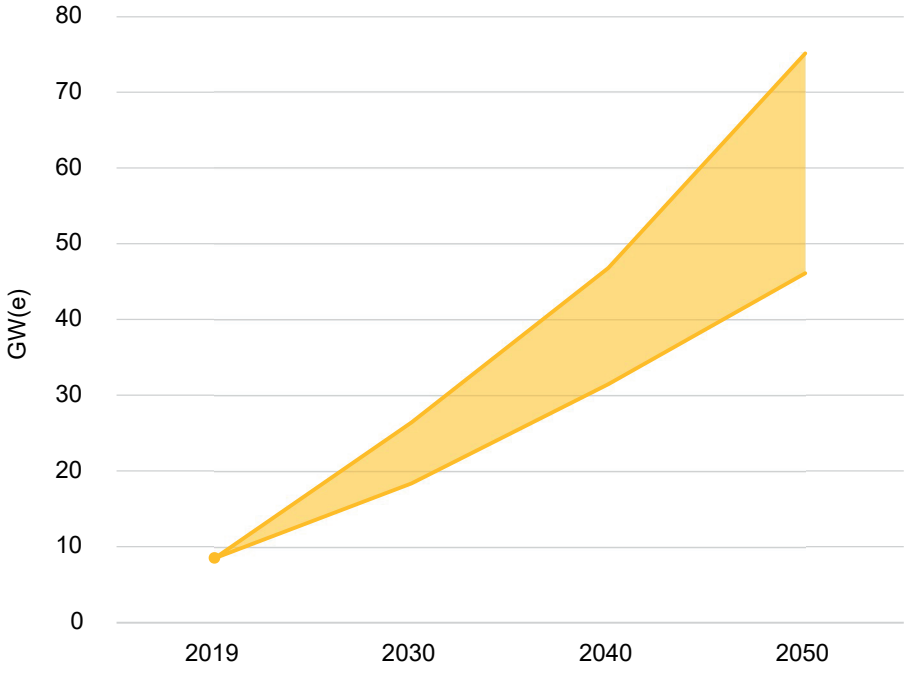


TABLE 26. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE SOUTHERN ASIA REGION, GW(e)

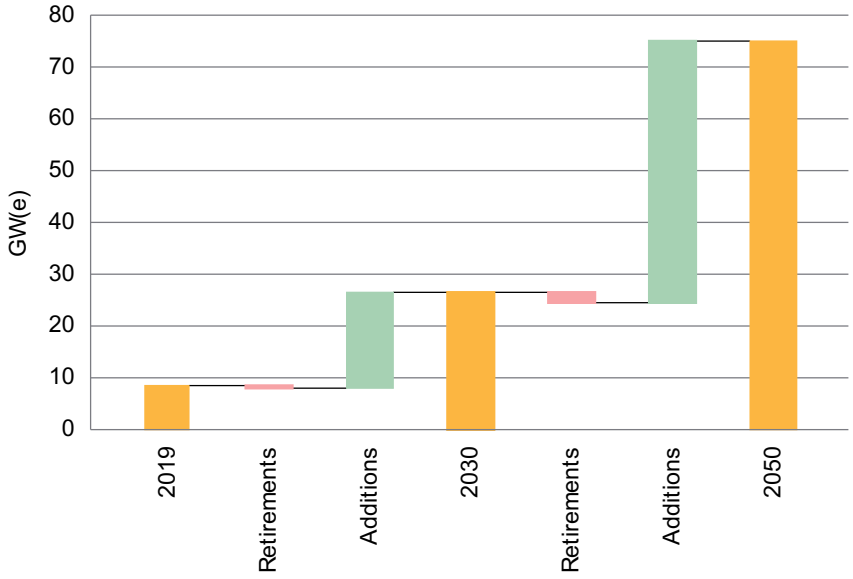
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	550	1 282	1 282	1 996	1 996	2 840	2 840
Nuclear	9	18	26	31	47	46	75
Nuclear as % of Electrical Capacity	*1.5%*	*1.4%*	*2.0%*	*1.6%*	*2.4%*	*1.6%*	*2.6%*

Reactor Retirements and Additions

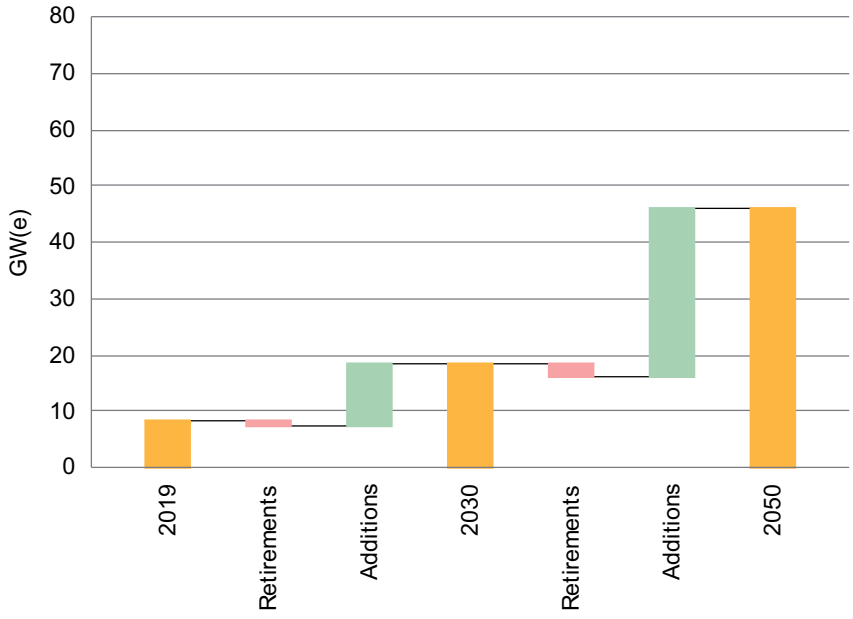
- In the high case, it is assumed that only about 11% of the 2019 nuclear electrical generating capacity will be retired by 2030 and that 20% of the 2019 nuclear electrical generating capacity will be retired by 2050. This is expected to result in increases in net capacity additions of about 18 GW(e) by 2030 and almost 50 GW(e) over the 20 years that follow.
- In the low case, it is assumed there will be about 10 GW(e) of net capacity added by 2030. Between 2030 and 2050 it is expected that new reactors will add about 30 GW(e) of capacity and only a few GW(e) of capacity will be retired.

FIGURE 49. NUCLEAR CAPACITY IN THE SOUTHERN ASIA REGION: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electrical production is projected to almost double by 2030 and to increase more than fourfold by 2050 compared with 2019 production.
- In the high case, nuclear electricity production is expected to almost quadruple from 2019 levels by 2030 and to undergo an about 11-fold increase by 2050. The share of nuclear in total electricity production is expected to increase by about 4 percentage points.
- In the low case, nuclear electricity production is expected to increase 2.5 times from 2019 levels by 2030, rising to an almost sevenfold increase by 2050. The share of nuclear in total electricity production is expected increase by 1.5 percentage points.

FIGURE 50. NUCLEAR ELECTRICITY PRODUCTION IN THE SOUTHERN ASIA REGION

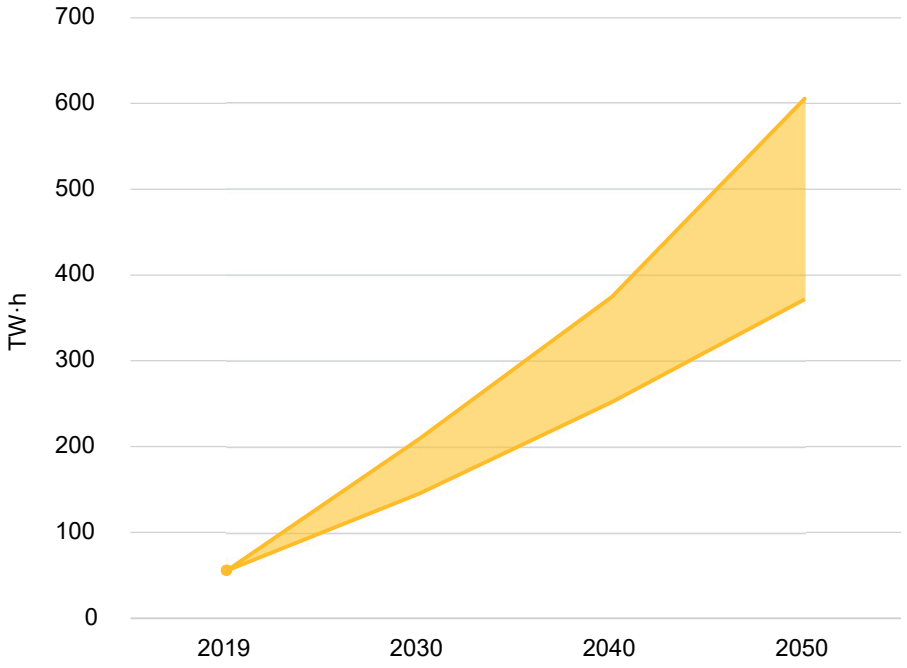


TABLE 27. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE SOUTHERN ASIA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	2 071	4 058	4 058	6 407	6 407	8 844	8 844
Nuclear	56	145	209	252	375	372	606
Nuclear as % of Electricity Production	*2.7%*	*3.6%*	*5.2%*	*3.9%*	*5.9%*	*4.2%*	*6.9%*

Central and Eastern Asia

1 745

million people

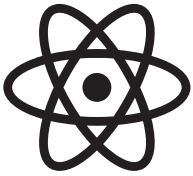
Energy Overview 2019

23.8%

of final energy consumed was electricity

9 024 TW·h

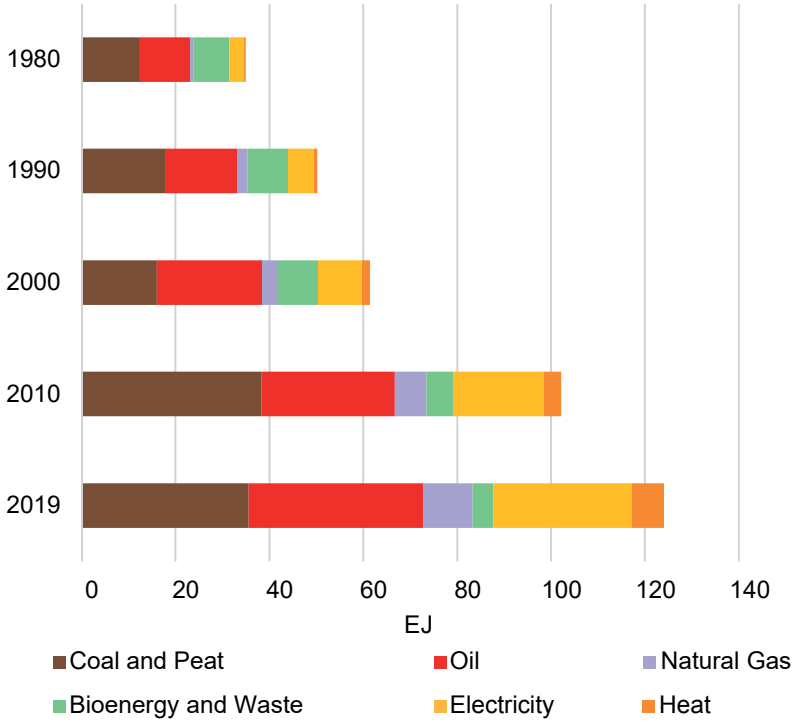
of electricity produced



6.3%

of electricity produced by nuclear

FIGURE 51. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA



Final Energy Consumption

Since 1980 fossil fuels have continued to dominate final energy consumption with a combined share that has remained around 70%.

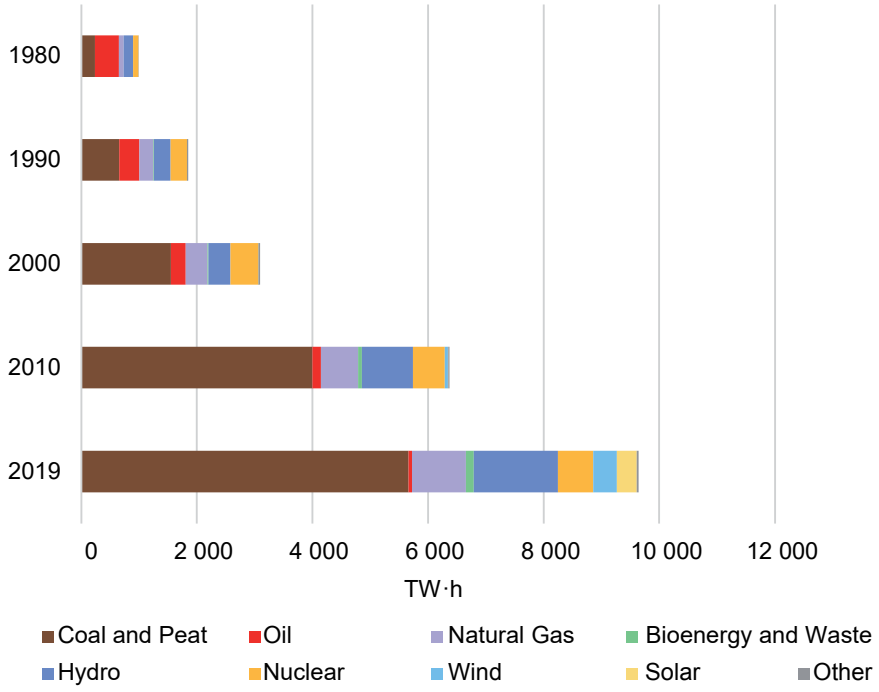
The share of natural gas has increased fourfold since 1980, whereas oil has maintained a relatively consistent share of about 30%. The share of coal was almost 30% in 2019.

The share of electricity has more than doubled since 1980, accounting for almost a quarter of final energy consumption in 2019.

The share of bioenergy and waste in final energy consumption has decreased by about 18 percentage points since 1980.

The share of heat has increased from less than 1% in 1980 to almost 6% by 2019.

FIGURE 52. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA



Electricity Production

With a share of about 70%, fossil fuels — particularly coal — have remained dominant sources of electricity production since 1980.

The share of coal has increased more than 35 percentage points since 1980. The share of natural gas increased from 1980 to 1990, and then declined to about 10%. Of all fossil fuels, the share of oil has experienced the most significant change, decreasing from about 42% in 1980 to below 1% in 2019.

Hydro was the largest contributor of low carbon electricity, accounting for 15% in 2019. Its share has remained relatively stable over the past 39 years. In recent years, the share of solar and wind has increased rapidly, rising from less than 1% in 2010 to about 8% in 2019.

The share of nuclear increased between 1980 and 2000 but has since declined, falling to about 6% in 2019.

Energy and Electricity Projections

- Final energy consumption is expected to increase by about 10% from 2019 levels by 2030 and by about 20% by 2050, at an average annual rate of approximately 0.65%.
- Electricity consumption is expected to grow at a faster rate of about 2% per year. Electricity consumption is expected to almost double by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 12 percentage points from its 2019 share.

FIGURE 53. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA

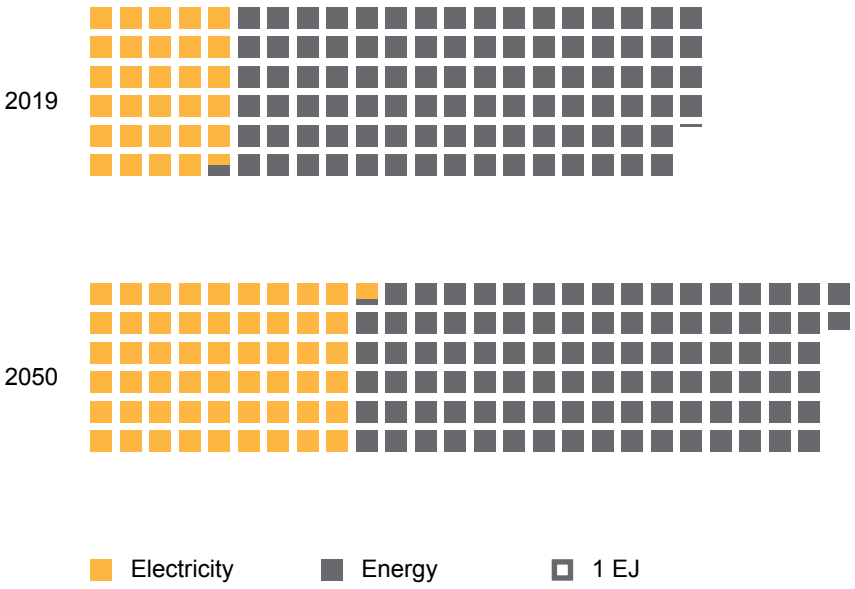


TABLE 28. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA, EJ

Final Consumption	2019	2030	2040	2050
Energy	124.1	136.7	147.6	151.8
Electricity	29.5	40.1	48.4	54.7
Electricity as % of Energy	*23.8%*	*29.3%*	*32.8%*	*36.0%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase by about 55% by 2030 and to more than double by 2050.
- In the high case, nuclear electrical generating capacity is projected to increase by about 60% by 2030 and to almost triple by 2050 compared with 2019 capacity. The share of nuclear in total electrical generating capacity is expected to increase by about 1.3 percentage points by 2050.
- In the low case, nuclear electrical generating capacity is projected to increase by about 10% by 2030 and about 40% by 2050 compared with 2019 capacity. The share of nuclear in total electrical generating capacity is expected to decrease by about 1.4 percentage points by 2050.

FIGURE 54. NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA

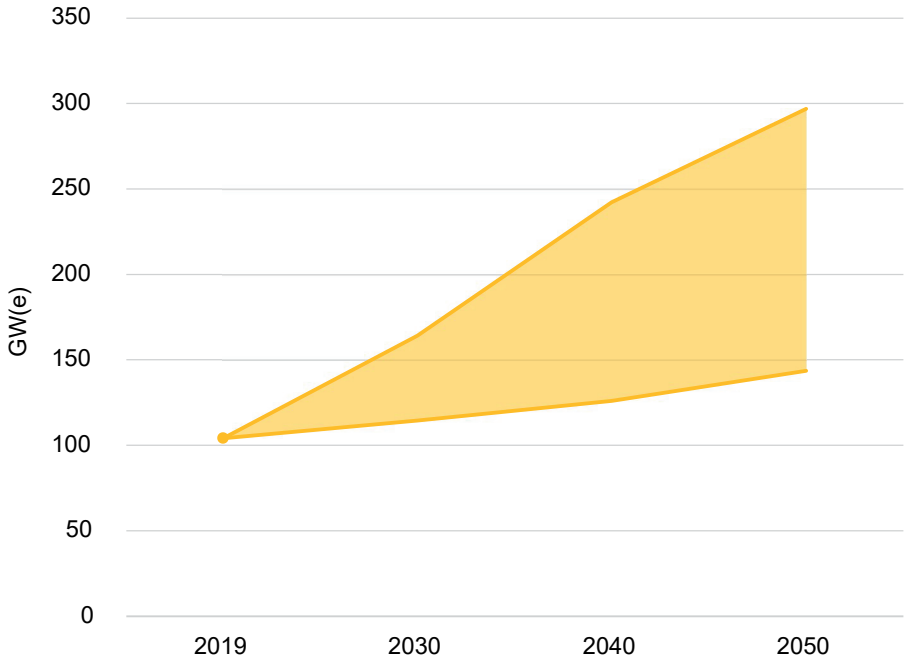


TABLE 29. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA,GW(e)

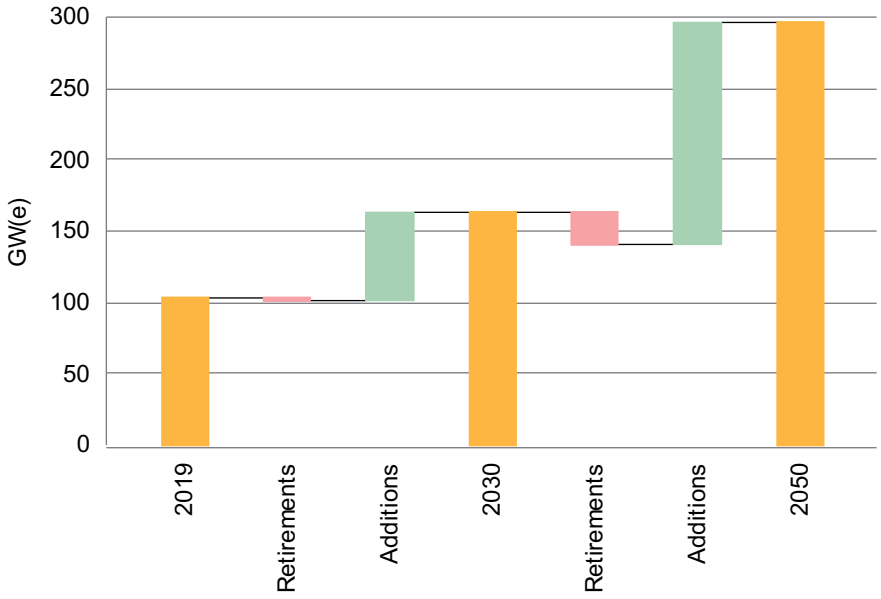
Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	2 654	4 128	4 128	4 936	4 936	5 664	5 664
Nuclear	104	114	164	126	242	144	297
Nuclear as % of Electrical Capacity	*3.9%*	*2.8%*	*4.0%*	*2.6%*	*4.9%*	*2.5%*	*5.2%*

Reactor Retirements and Additions

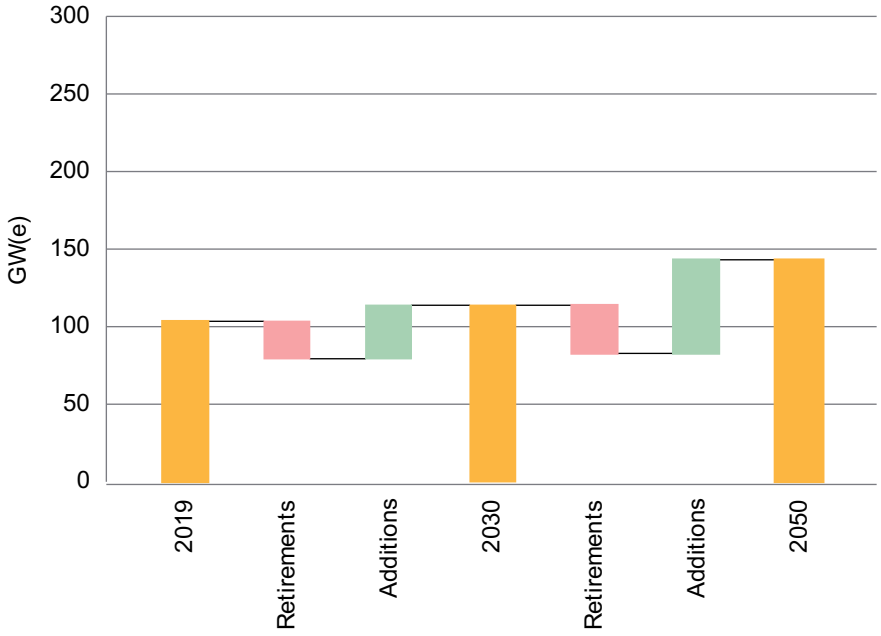
- In the high case, it is assumed that about 3.5% of the 2019 nuclear electrical generating capacity will be retired by 2030 and 20% will be retired by 2050. This is expected to result in net capacity additions of about 60 GW(e) by 2030 and about 133 GW(e) over the subsequent 20 years.
- In the low case, it is assumed that about 20% of the 2019 nuclear electrical generating capacity will be retired by 2030, while new reactors will add about 30% capacity. Between 2030 and 2050 net capacity additions of about 30 GW(e) are expected.

FIGURE 55. NUCLEAR CAPACITY IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA: ACTUAL, RETIREMENTS AND ADDITIONS

HIGH CASE



LOW CASE



Electricity and Nuclear Production Projections

- Total electricity production is projected to almost double by 2050.
- In the high case, nuclear electricity production is expected to more than double from 2019 levels by 2030 and to undergo a fourfold increase by 2050. The share of nuclear in total electricity production is expected to increase by almost 8 percentage points.
- In the low case, nuclear electricity production is expected to increase by about 50% from 2019 levels by 2030 and to double by 2050. The share of nuclear in total electricity production is expected increase by about 0.5 percentage points.

FIGURE 56. NUCLEAR ELECTRICITY PRODUCTION IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA

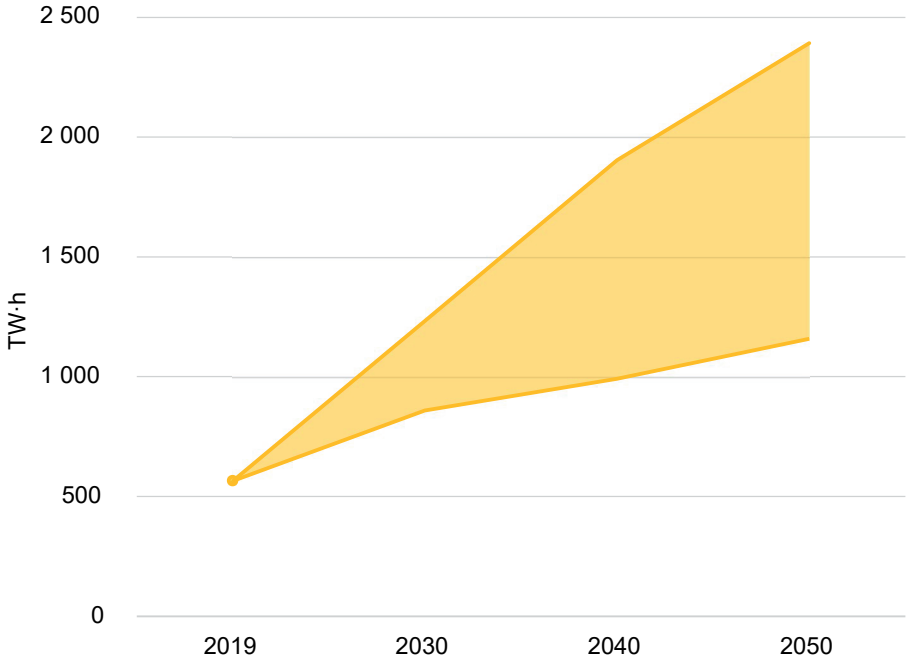


TABLE 30. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE COMBINED REGIONS OF CENTRAL AND EASTERN ASIA, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	9 024	12 736	12 736	15 287	15 287	17 193	17 193
Nuclear	566	859	1231	990	1904	1158	2 393
Nuclear as % of Electricity Production	*6.3%*	*6.7%*	*9.7%*	*6.5%*	*12.5%*	*6.7%*	*13.9%*

South-eastern Asia

662

million people

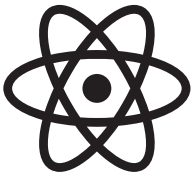
Energy Overview 2019

15.6%

of final energy consumed was electricity

1 088 TW·h

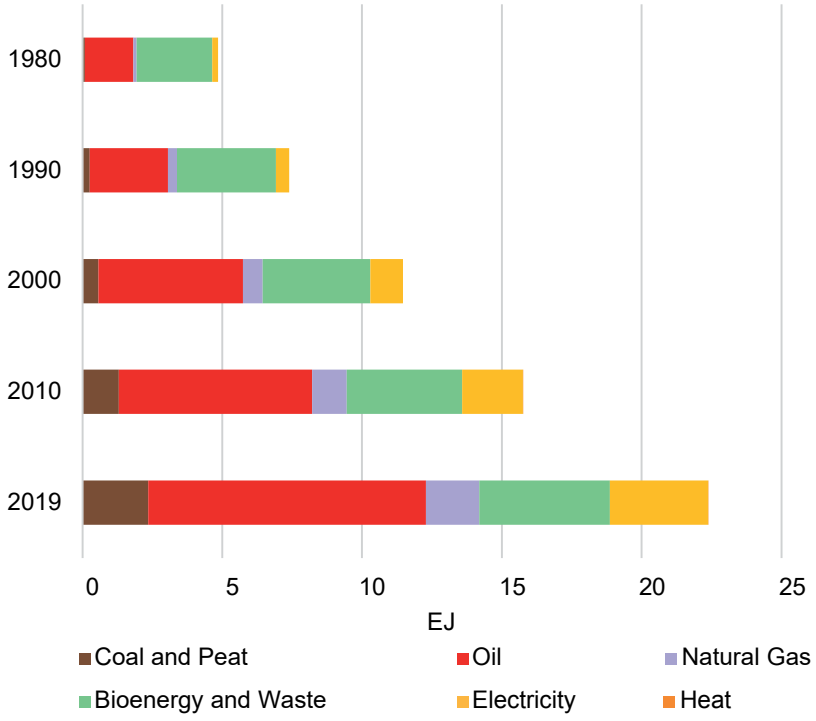
of electricity produced



0%

of electricity produced by nuclear

FIGURE 57. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE SOUTH-EASTERN ASIA REGION



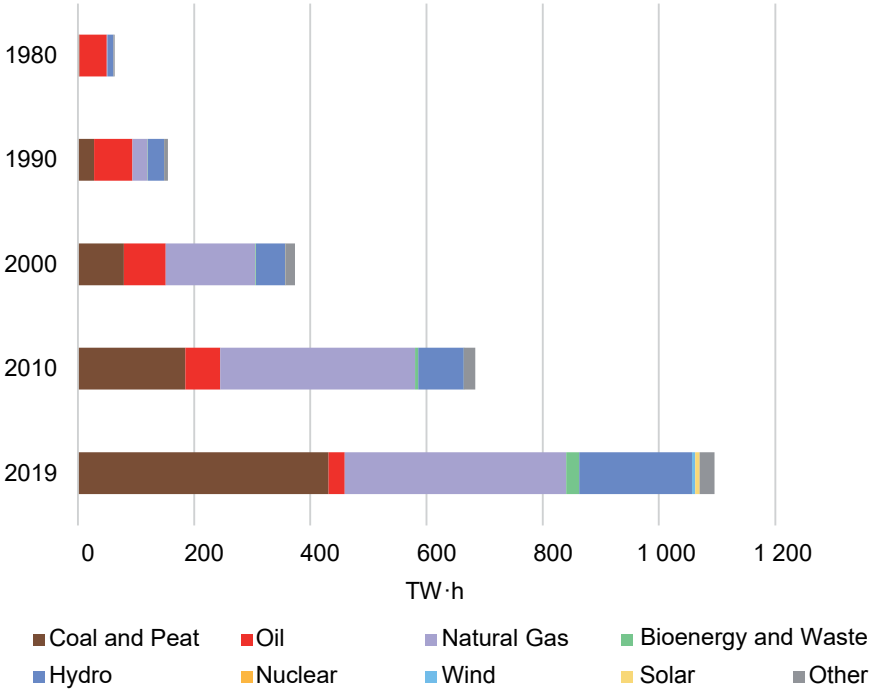
Final Energy Consumption

From 1980 to 1990, bioenergy and waste had the largest share in final energy consumption.

Since 2000, fossil fuels have dominated final energy consumption, with oil having the largest share at about 45%. The share of coal has gradually increased over the past 39 years, reaching almost 11% in 2019, an increase of almost 9 percentage points. The share of natural gas has quadrupled since 1980, reaching almost 9% in 2019.

At almost 16% in 2019, electricity's share has increased almost fourfold since 1980.

FIGURE 58. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE SOUTH-EASTERN ASIA REGION



Electricity Production

With a share of about 80% over the past 40 years, fossil fuels have remained dominant sources of electricity production.

The share of coal has increased 35 percentage points since 1980 and was almost 40% in 2019, whereas oil's share has declined by some 70 percentage points to about 3% in 2019. The share of natural gas has increased about 34 percentage points since 1980.

Hydro remains the largest contributor of low carbon electricity, accounting for almost 18% in 2019. The share of other sources increased by about 1 percentage point between 1980 and 2000, but has since fallen, reaching about 2% in 2019. Solar and wind has recently begun contributing to electricity generation, contributing a little below 1% in 2019.

Energy and Electricity Projections

- Final energy consumption is expected to increase by about 20% from 2019 levels by 2030 and by almost 70% by 2050, at an average annual rate of approximately 1.7%.
- Electricity consumption is expected to grow at a faster rate of 3.7% per year. Electricity consumption is expected to almost triple by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 12 percentage points from its 2019 share.

FIGURE 59. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE SOUTH-EASTERN ASIA REGION

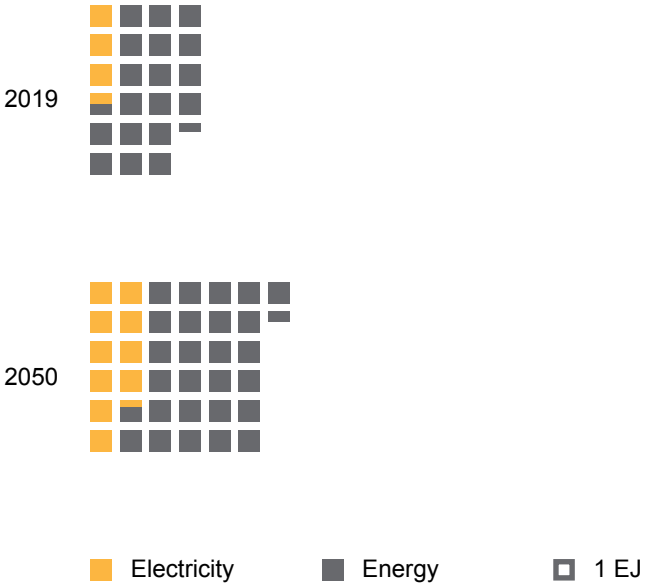


TABLE 31. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE SOUTH-EASTERN ASIA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	22.4	27.1	32.1	37.5
Electricity	3.5	5.7	8.0	10.3
Electricity as % of Energy	*15.6%*	*21.0%*	*24.9%*	*27.5%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase by about 60% by 2030 and to triple by 2050.
- Total electricity production is projected to increase by about 55% by 2030 compared with 2019 production levels and to almost triple by 2050.
- In the high case, nuclear reactors are projected to be operational by 2040 and by 2050 nuclear electrical generating capacity is expected to more than double compared with 2040 capacity. The share of nuclear in total electricity production is expected to reach 2.1%.
- In the low case, nuclear reactors are also projected to be operational by 2040 and by 2050 nuclear electrical generating capacity is expected to triple compared with 2040 capacity. The share of nuclear in total electricity production is expected to reach about 0.8%.

TABLE 32. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE SOUTH-EASTERN ASIA REGION, GW(e)

Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	266	430	430	615	615	791	791
Nuclear	0	0	0	1	3	3	8
Nuclear as % of Electrical Capacity	*0.0%*	*0.0%*	*0.0%*	*0.2%*	*0.5%*	*0.4%*	*1.0%*

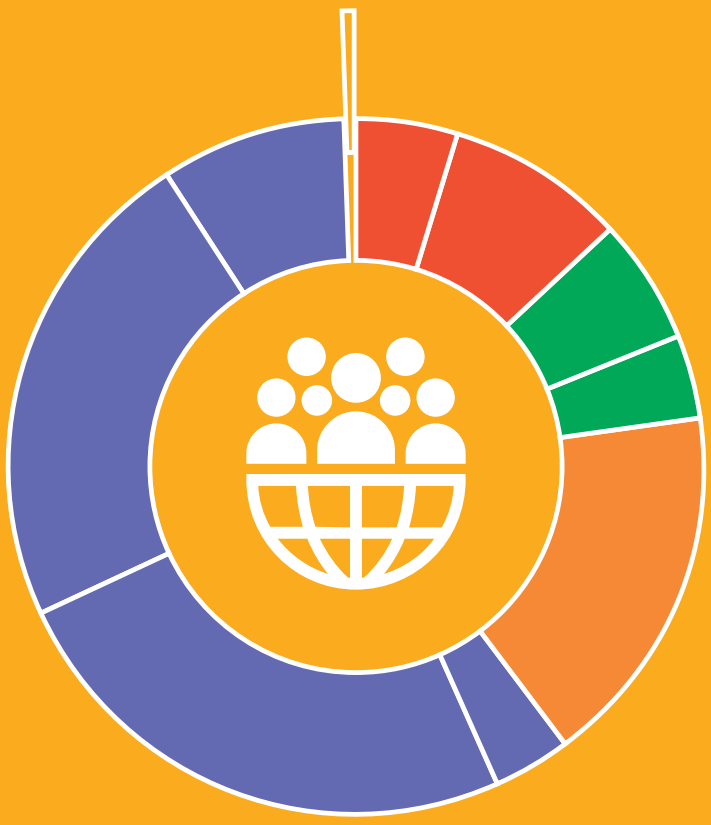
TABLE 33. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE SOUTH-EASTERN ASIA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	1 088	1 691	1 691	2 388	2 388	3 085	3 085
Nuclear	0	0	0	8	23	24	64
Nuclear as % of Electricity Production	*0.0%*	*0.0%*	*0.0%*	*0.3%*	*1.0%*	*0.8%*	*2.1%*

Oceania

42

million people



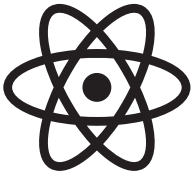
Energy Overview 2019

22.2%

of final energy consumed was electricity

300TW·h

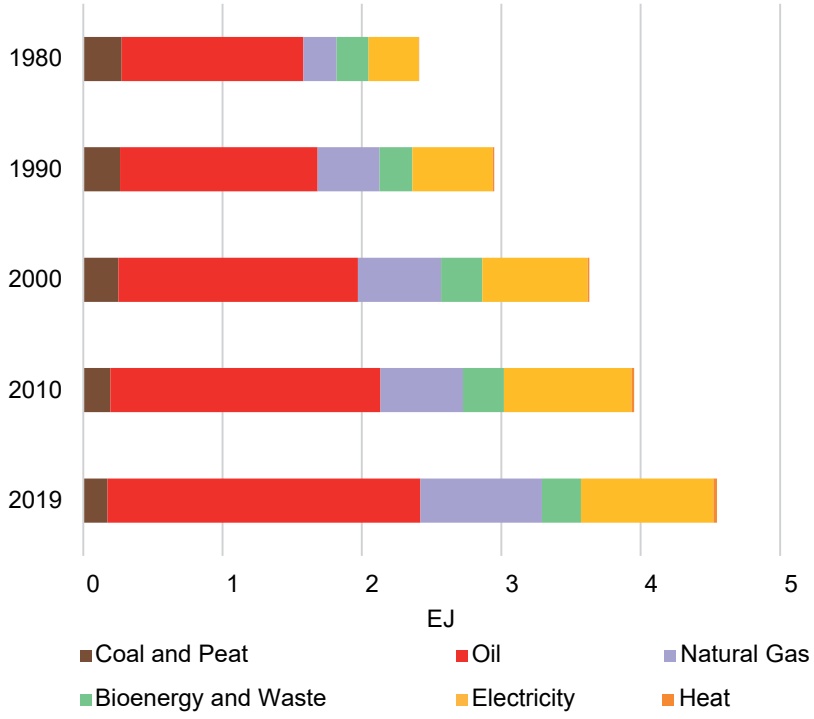
of electricity produced



0%

of electricity produced by nuclear

FIGURE 60. FINAL ENERGY CONSUMPTION BY ENERGY SOURCE IN THE OCEANIA REGION



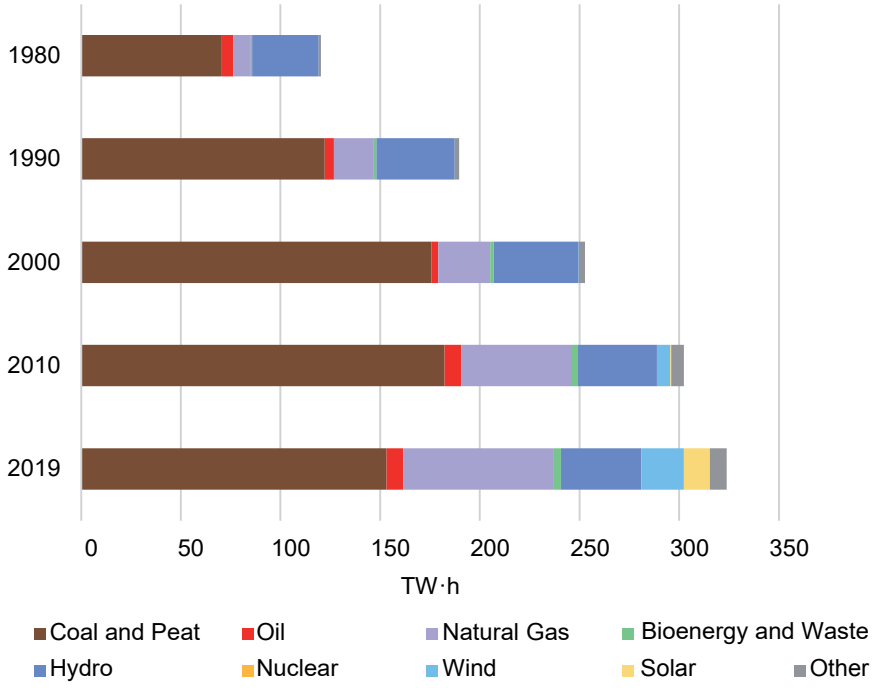
Final Energy Consumption

Since 1980 fossil fuels have continued to dominate final energy consumption, although there was a gradual reduction in their combined share from 76% in 1980 to 69% in 2010. Between 2010 and 2019 their combined share increased by 3 percentage points.

Oil has the largest share of all the fossil fuels, remaining at about 50% since 1980. The share of natural gas has doubled over the past 39 years, whereas coal's share has declined by almost 8 percentage points during that time.

The share of electricity is about one fifth of final energy consumption, an increase of 6 percentage points since 1980.

FIGURE 61. ELECTRICITY PRODUCTION BY ENERGY SOURCE IN THE OCEANIA REGION



Electricity Production

With a share of more than 70%, fossil fuels — particularly coal — have remained dominant sources of electricity production over the past 39 years. From 1980 to 2010 their share increased some 10 percentage points and then declined by 8 percentage points by 2019.

The share of natural gas has more than tripled since 1980, whereas oil's share has fallen by half. The share of coal increased from almost 60% in 1980, peaking at almost 70% by 2000 and then falling to about 50% by 2019.

The share of hydro has declined by more than half since 1980, reaching about 12% in 2019. The combined share of solar and wind has increased from 0.1% in 2000 to almost 11% in 2019.

Energy and Electricity Projections

- Final energy consumption is expected to increase by almost 10% from 2019 levels by 2030 and by almost 20% by 2050, at an average annual rate of approximately 0.5%.
- Electricity consumption is expected to grow at a faster rate of about 1% per year. Electricity consumption is expected to increase 40% by 2050.
- By 2050 the share of electricity in final energy consumption is expected to increase by about 4 percentage points from its 2019 share.

FIGURE 62. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE OCEANIA REGION

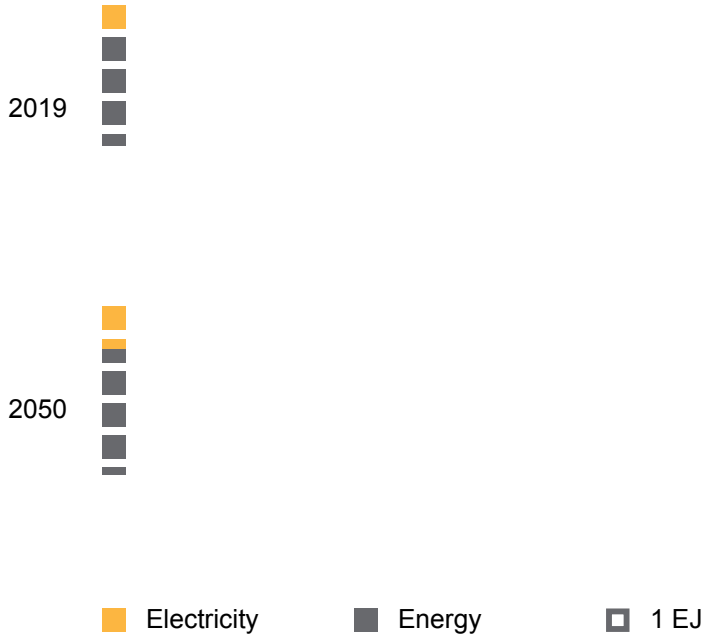


TABLE 34. FINAL CONSUMPTION OF ENERGY AND ELECTRICITY IN THE OCEANIA REGION, EJ

Final Consumption	2019	2030	2040	2050
Energy	4.5	4.9	5.1	5.3
Electricity	1.0	1.1	1.2	1.4
Electricity as % of Energy	*22.2%*	*22.4%*	*23.5%*	*26.4%*

Nuclear Electrical Generating Capacity Projections

- Total electrical generating capacity is expected to increase from 2019 levels by about 35% by 2030 and by increase 80% by 2050.
- Total electricity production is projected to increase by about 15% by 2030 and by about 50% by 2050 compared with 2019 production levels.
- In the high case, nuclear power is projected to generate electricity by the middle of the century. The share of nuclear in total electrical generating capacity is expected to reach about 1%.
- In the low case, nuclear power is not projected to be introduced into the electricity generation system.

TABLE 35. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY IN THE OCEANIA REGION, GW(e)

Electrical Capacity	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	89	120	120	142	142	159	159
Nuclear	0	0	0	0	0	0	2
Nuclear as % of Electrical Capacity	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*1.3%*

TABLE 36. TOTAL AND NUCLEAR ELECTRICAL PRODUCTION IN THE OCEANIA REGION, TW·h

Electricity Production	2019	2030		2040		2050	
		Low	High	Low	High	Low	High
Total	300	346	346	408	408	453	453
Nuclear	0	0	0	0	0	0	16
Nuclear as % of Electricity Production	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*3.5%*

REFERENCES

[1] INTERNATIONAL ENERGY AGENCY, World Energy Outlook 2019, OECD Publishing, Paris (2019).

[2] UNITED STATES ENERGY INFORMATION ADMINISTRATION, International Energy Outlook 2019 with Projections to 2050, U.S. Department of Energy, Washington, DC (2019).

[3] UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, 2017 Energy Balances, United Nations, New York (2020).

[4] UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, World Population Prospects 2019, United Nations, New York (2019).

[5] OECD NUCLEAR ENERGY AGENCY, INTERNATIONAL ATOMIC ENERGY AGENCY, Uranium 2018: Resources, Production and Demand, OECD Publishing, Paris (2019).

[6] INTERNATIONAL ENERGY AGENCY, Nuclear Power in a Clean Energy System, OECD Publishing, Paris (2019).

[7] UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, Standard Country or Area Codes for Statistical Use, Series M, No. 49, United Nations, New York, https://unstats.un.org/unsd/methodology/m49/

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Power Reactors in the World, Reference Data Series No. 2, IAEA, Vienna (2020).

[9] UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, International Recommendations for Energy Statistics (IRES), Series M No. 93, United Nations, New York (2018).

IAEA
International Atomic Energy Agency

No. 26

ORDERING LOCALLY

IAEA priced publications may be purchased from the sources listed below or from major local booksellers.

Orders for unpriced publications should be made directly to the IAEA. The contact details are given at the end of this list.

NORTH AMERICA

Bernan / Rowman & Littlefield
15250 NBN Way, Blue Ridge Summit, PA 17214, USA
Telephone: +1 800 462 6420 • Fax: +1 800 338 4550
Email: orders@rowman.com • Web site: www.rowman.com/bernan

REST OF WORLD

Please contact your preferred local supplier, or our lead distributor:

Eurospan Group
Gray's Inn House
127 Clerkenwell Road
London EC1R 5DB
United Kingdom

Trade orders and enquiries:
Telephone: +44 (0)176 760 4972 • Fax: +44 (0)176 760 1640
Email: eurospan@turpin-distribution.com

Individual orders:
www.eurospanbookstore.com/iaea

For further information:
Telephone: +44 (0)207 240 0856 • Fax: +44 (0)207 379 0609
Email: info@eurospangroup.com • Web site: www.eurospangroup.com

Orders for both priced and unpriced publications may be addressed directly to:

Marketing and Sales Unit
International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Telephone: +43 1 2600 22529 or 22530 • Fax: +43 1 26007 22529
Email: sales.publications@iaea.org • Web site: www.iaea.org/publications

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA

20-02746E