

# Dünya Enerji Görünümüne Bakış

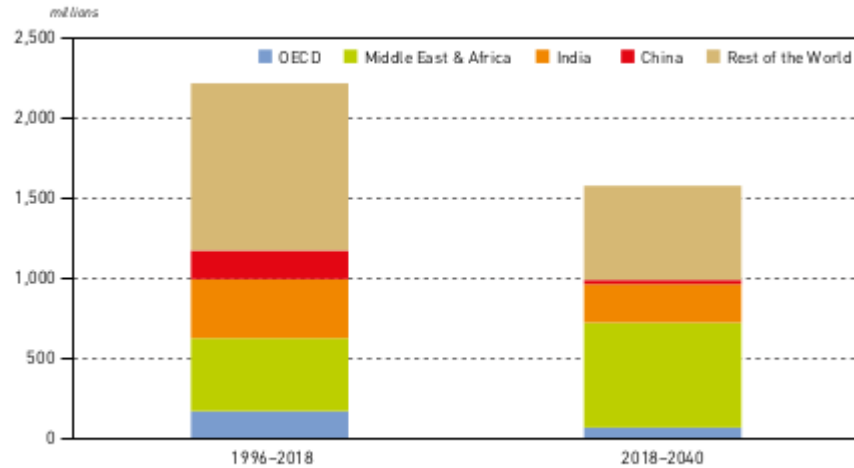
Barış Sanlı  
3 Mart 2020 - İTÜ

# Kaynaklar

- OPEC WOO-World Oil Outlook 2019 (ücretsiz)
- IEA WEO 2019 – World Energy Outlook
- Shell LNG Outlook 2020
- BNEF New Energy Outlook

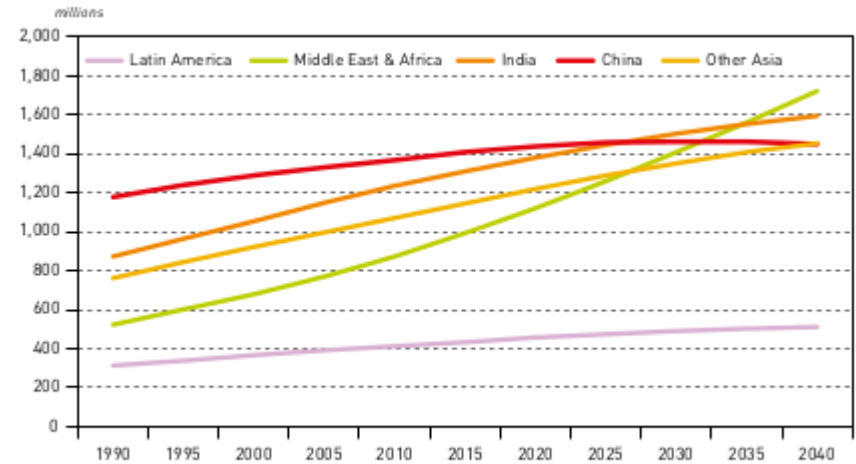
# Nüfus

World population growth, 1996–2018 versus 2018–2040



Source: United Nations, OPEC.

Population trends in selected regions and countries, 1990–2040



Source: UN, OPEC.

# Çalışan nüfus

## Working population (age 15–64) by region

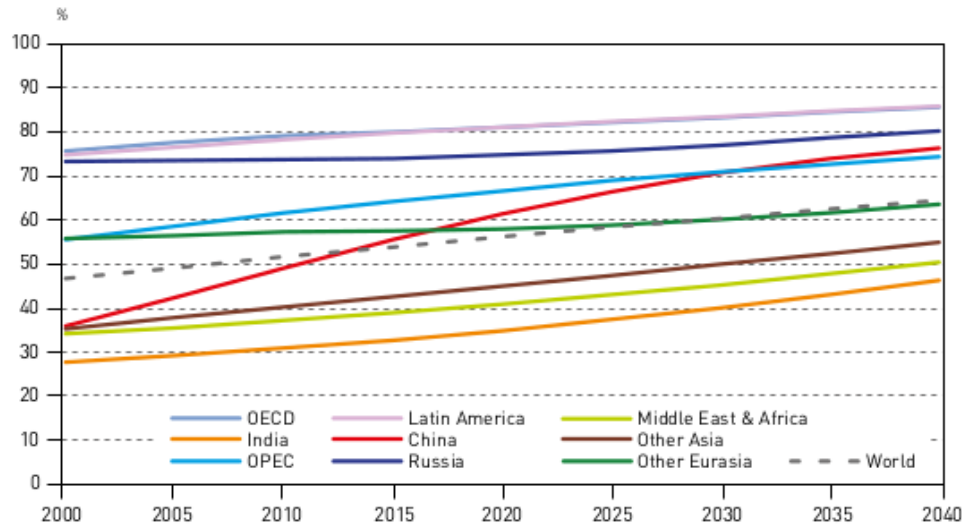
millions

	2018	2020	2025	2030	2035	2040	2018–2040
OECD Americas	340	344	352	358	366	373	33
OECD Europe	372	372	368	362	355	348	-24
OECD Asia Oceania	137	136	133	130	126	120	-17
<b>OECD</b>	<b>850</b>	<b>852</b>	<b>854</b>	<b>850</b>	<b>847</b>	<b>842</b>	<b>-8</b>
Latin America	303	309	321	329	335	338	35
Middle East & Africa	610	645	740	844	954	1,069	458
India	899	925	983	1,029	1,068	1,098	198
China	1,007	1,002	996	974	928	882	-125
Other Asia	780	801	849	891	926	955	175
OPEC	304	317	352	391	429	467	163
Russia	97	95	91	89	89	87	-10
Other Eurasia	131	130	130	131	132	132	1
<b>Non-OECD</b>	<b>4,133</b>	<b>4,225</b>	<b>4,462</b>	<b>4,678</b>	<b>4,862</b>	<b>5,028</b>	<b>895</b>
<b>World</b>	<b>4,983</b>	<b>5,078</b>	<b>5,315</b>	<b>5,528</b>	<b>5,709</b>	<b>5,870</b>	<b>887</b>

Source: World Bank, OPEC.

# Kentleşme

Urbanization rate for selected regions, 2000–2040



Source: UN, OPEC.

Net migration by region

% of regional population

	2018	2020	2025	2030	2035	2040
OECD Americas	0.8	1.0	1.0	2.2	3.6	5.0
OECD Europe	-0.4	-0.5	0.4	0.9	1.6	2.4
OECD Asia Oceania	0.0	0.1	0.6	1.2	2.0	2.8
<b>OECD</b>	<b>0.1</b>	<b>0.2</b>	<b>0.7</b>	<b>1.5</b>	<b>2.5</b>	<b>3.6</b>
Latin America	0.4	0.2	-0.4	-0.7	-0.9	-1.1
Middle East & Africa	1.2	1.2	0.0	-0.1	-0.3	-0.4
India	0.1	0.2	-0.2	-0.3	-0.5	-0.7
China	-0.9	-1.0	-0.1	-0.3	-0.4	-0.6
Other Asia	-0.5	-0.6	-0.3	-0.7	-1.1	-1.5
OPEC	0.8	0.9	0.3	0.4	0.3	0.2
Russia	-1.2	-1.5	0.3	0.7	1.2	1.7
Other Eurasia	-0.2	-0.2	-0.3	-0.5	-0.8	-1.1
<b>Non-OECD</b>	<b>-0.2</b>	<b>0.0</b>	<b>-0.1</b>	<b>-0.3</b>	<b>-0.5</b>	<b>-0.7</b>

Source: UN, OPEC.

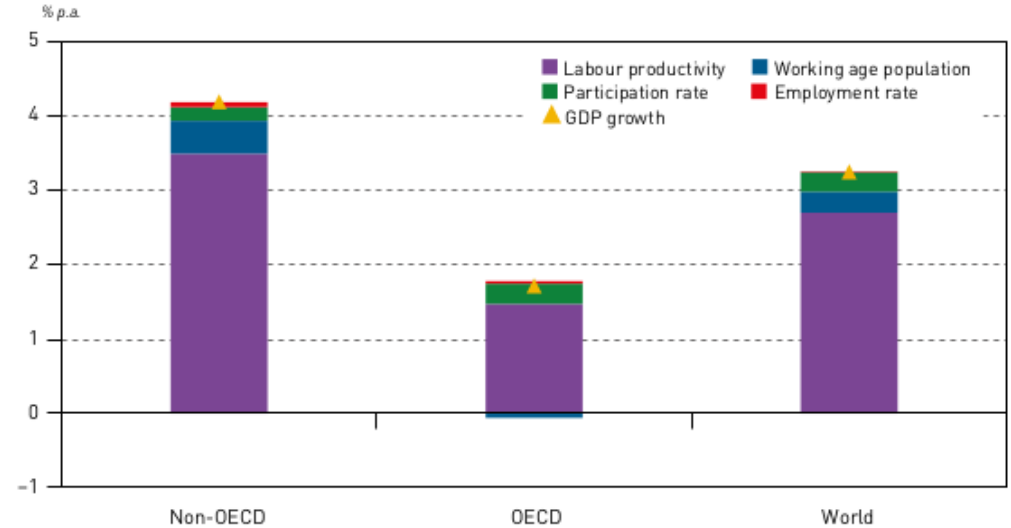
# Ekonomik Büyüme

Medium-term annual real GDP growth rate

% p.a.

	2018	2019	2020	2021	2022	2023	2024	Average 2018-2024
OECD Americas	2.7	2.4	1.9	1.8	1.8	1.9	2.0	2.1
OECD Europe	2.1	1.2	1.4	1.5	1.6	1.6	1.7	1.6
OECD Asia Oceania	1.6	1.2	1.2	1.4	1.4	1.5	1.5	1.4
<b>OECD</b>	<b>2.3</b>	<b>1.7</b>	<b>1.6</b>	<b>1.6</b>	<b>1.7</b>	<b>1.7</b>	<b>1.8</b>	<b>1.8</b>
Latin America	1.3	1.3	2.0	2.4	2.4	2.5	2.5	2.0
Middle East & Africa	3.1	2.9	2.9	3.1	3.2	3.2	3.3	3.1
India	7.4	6.8	7.0	7.0	6.8	6.7	6.6	6.9
China	6.6	6.2	6.0	5.8	5.7	5.6	5.5	5.9
Other Asia	4.6	4.3	4.1	4.2	4.1	4.2	4.2	4.2
OPEC	0.0	0.4	1.0	2.0	2.4	2.6	2.6	1.6
Russia	2.3	1.4	1.4	1.5	1.6	1.7	1.7	1.7
Other Eurasia	3.7	3.3	3.0	2.9	2.9	2.8	2.7	3.1
<b>Non-OECD</b>	<b>4.6</b>	<b>4.3</b>	<b>4.4</b>	<b>4.5</b>	<b>4.5</b>	<b>4.6</b>	<b>4.5</b>	<b>4.5</b>
<b>World</b>	<b>3.6</b>	<b>3.2</b>	<b>3.2</b>	<b>3.3</b>	<b>3.3</b>	<b>3.4</b>	<b>3.4</b>	<b>3.3</b>

Long-term GDP growth rates by component, 2018-2040



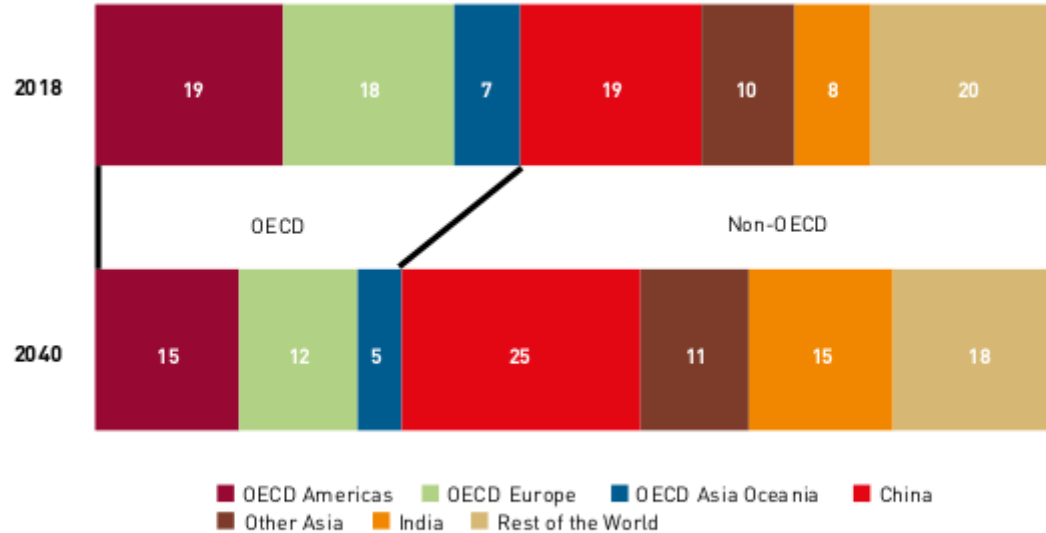
Source: OPEC.

Source: OPEC.

# OECD'nin ekonomideki payı

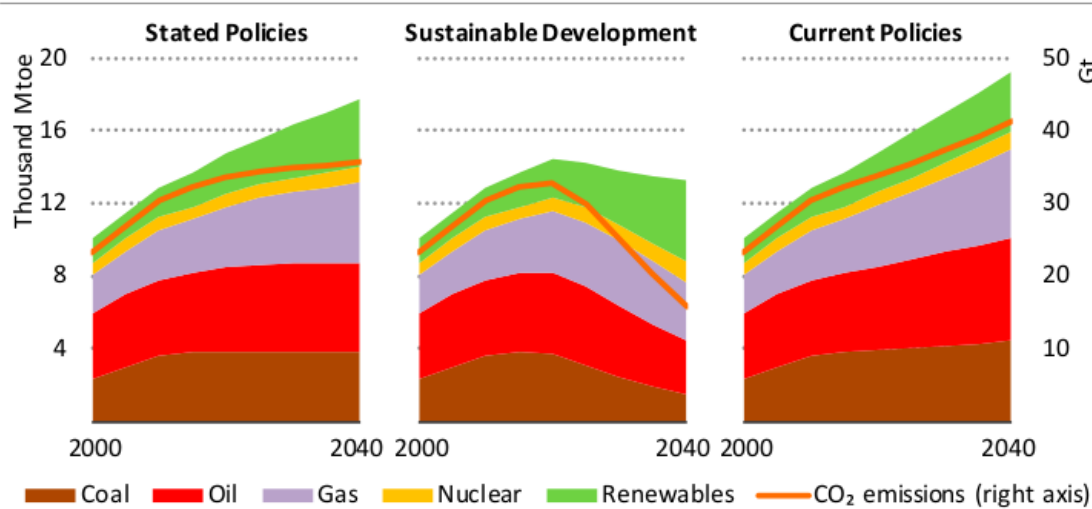
Distribution of the global economy, 2018 and 2040

%



Source: OPEC.

# Dünya Enerji Talebi - IEA



*Existing policies and announced targets slow growth in global emissions to 2040, but they are not strong enough to force a peak in an expanding energy system*

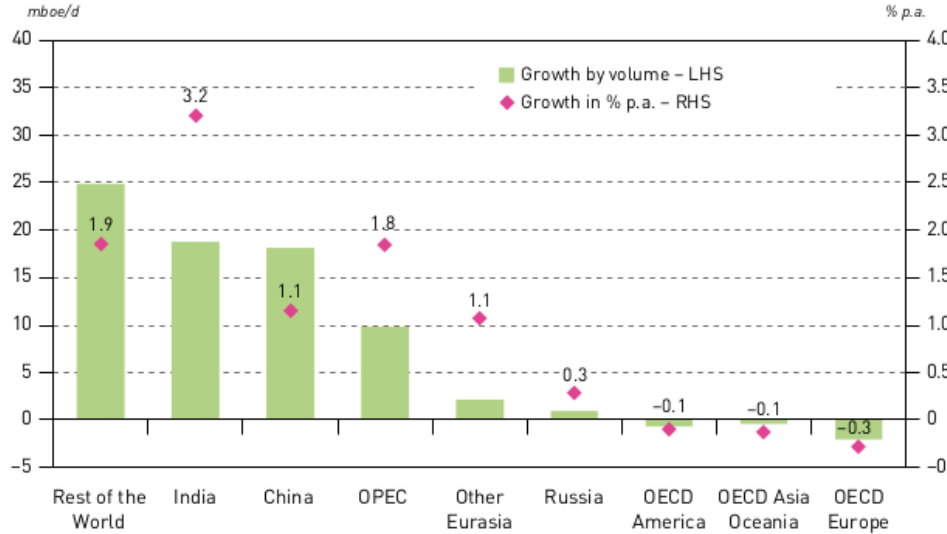
	2000	2018	Stated Policies		Sustainable Development		Current Policies	
			2030	2040	2030	2040	2030	2040
Coal	2 317	3 821	3 848	3 779	2 430	1 470	4 154	4 479
Oil	3 665	4 501	4 872	4 921	3 995	3 041	5 174	5 626
Natural gas	2 083	3 273	3 889	4 445	3 513	3 162	4 070	4 847
Nuclear	675	709	801	906	895	1 149	811	937
Renewables	659	1 391	2 287	3 127	2 776	4 381	2 138	2 741
Hydro	225	361	452	524	489	596	445	509
Modern bioenergy	374	737	1 058	1 282	1 179	1 554	1 013	1 190
Other	60	293	777	1 320	1 109	2 231	681	1 042
Solid biomass	638	620	613	546	140	75	613	546
<b>Total</b>	<b>10 037</b>	<b>14 314</b>	<b>16 311</b>	<b>17 723</b>	<b>13 750</b>	<b>13 279</b>	<b>16 960</b>	<b>19 177</b>
<i>Fossil fuel share</i>	<i>80%</i>	<i>81%</i>	<i>77%</i>	<i>74%</i>	<i>72%</i>	<i>58%</i>	<i>79%</i>	<i>78%</i>
<b>CO<sub>2</sub> emissions (Gt)</b>	<b>23.1</b>	<b>33.2</b>	<b>34.9</b>	<b>35.6</b>	<b>25.2</b>	<b>15.8</b>	<b>37.4</b>	<b>41.3</b>

Notes: Mtoe = million tonnes of oil equivalent; Gt = gigatonnes. Other includes wind, solar PV, geothermal, concentrating solar power and marine. Solid biomass includes its traditional use in three-stone fires and in improved cookstoves.



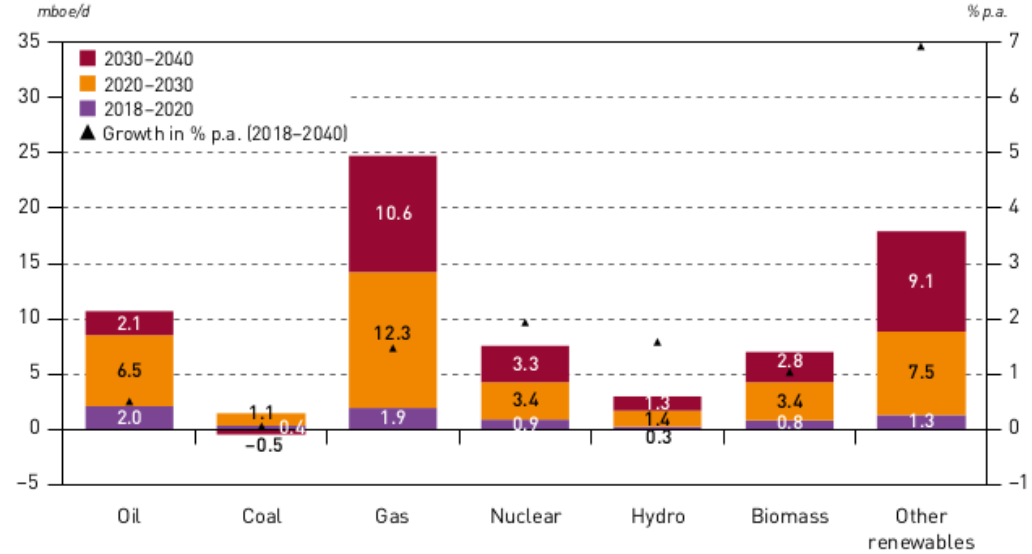
# Birincil enerji - OPEC

Growth in primary energy demand by region, 2018–2040



Source: OPEC.

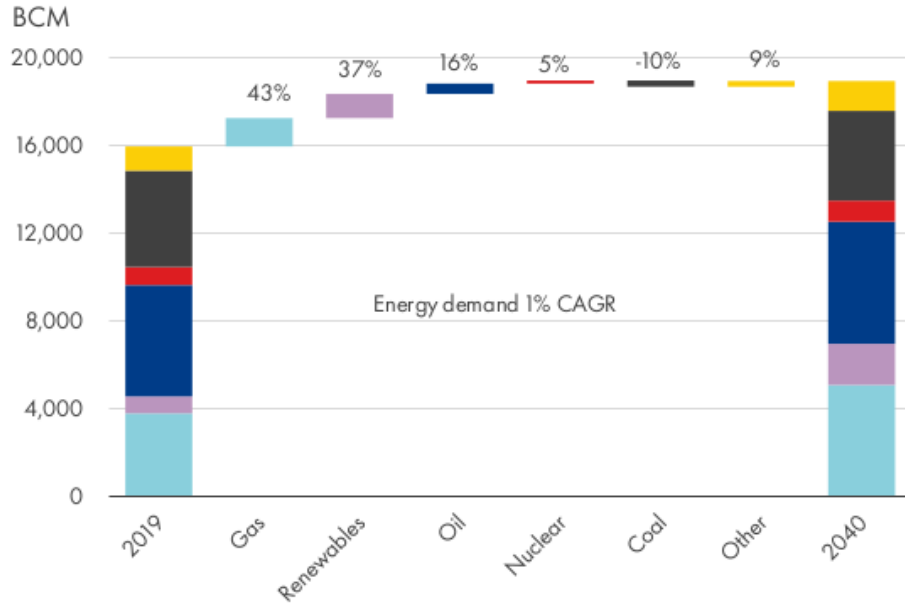
Growth in primary energy demand by fuel type, 2018–2040



Source: OPEC.

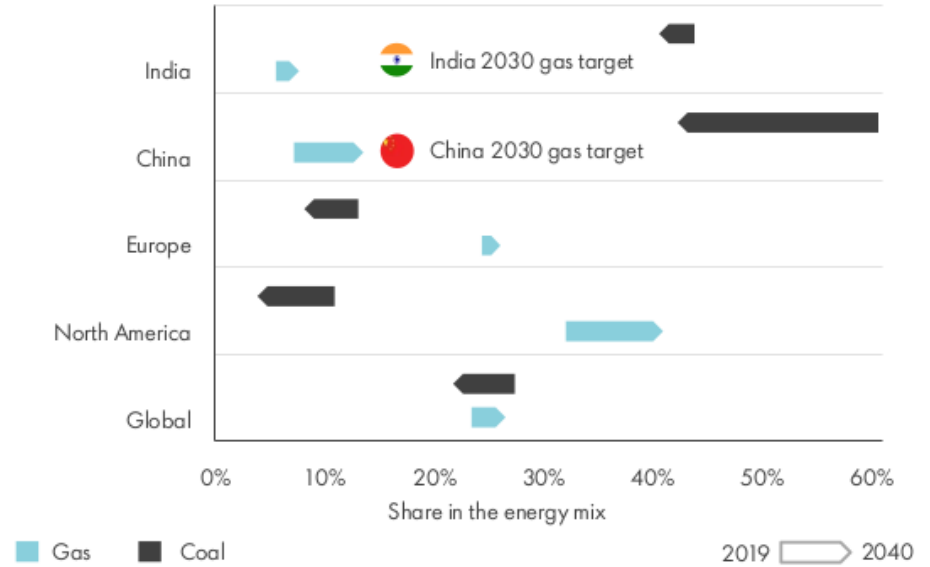
# Dünya Enerji Talebi - Shell

## Global energy demand growth by fuel type



Source: Shell interpretation of Wood Mackenzie H1 2019 data CAGR - Compound annual growth rate

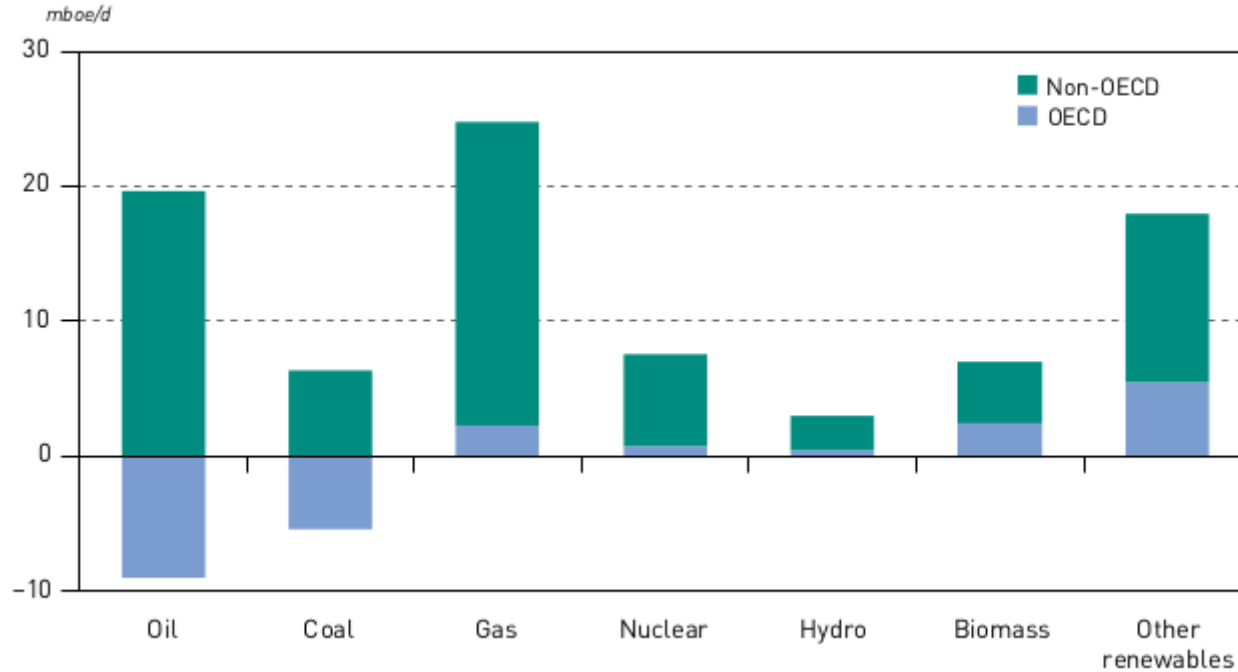
## Gas and coal share in the energy mix 2019-2040



Source: Shell interpretation of Wood Mackenzie H1 2019 data

# Kaynakların değişimi - OPEC

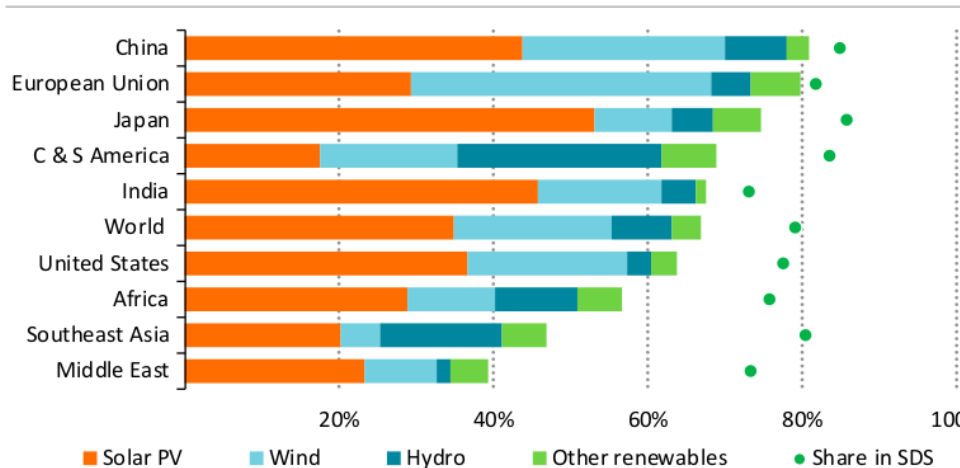
Growth in energy demand by fuel type and region, 2018–2040



Source: OPEC.

# Yenilenebilirin Değişimi - IEA

**Figure 1.2** ▶ Share of renewables in total capacity additions by region and scenario, 2019-2040



*Renewable sources dominate the increase in global power generation capacity in the Stated Policies Scenario, with solar PV taking the lead*

Notes: C&S America = Central and South America; SDS = Sustainable Development Scenario. Other renewables includes geothermal, concentrating solar power, bioenergy and marine.

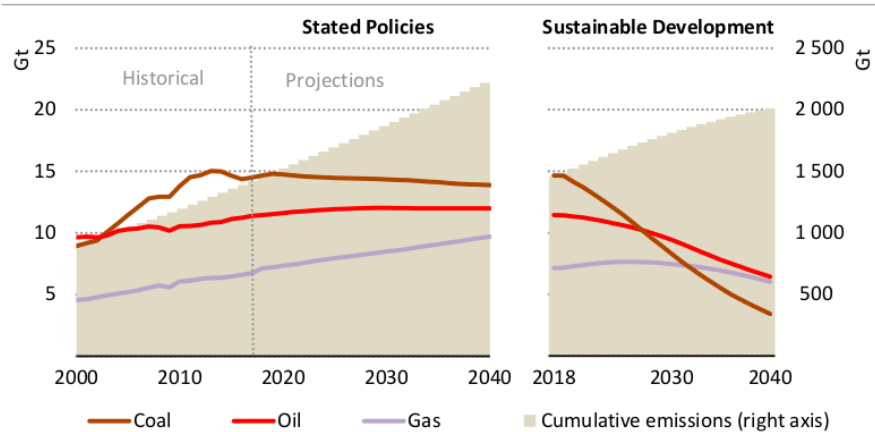
**Table 1.4** ▶ World electricity generation by fuel, technology and scenario (TWh)

	2000	2018	Stated Policies		Sustainable Development		Change 2018-2040	
			2030	2040	2030	2040	STEPS	SDS
Coal	5 995	10 123	10 408	10 431	5 504	2 428	307	-7 695
Oil	1 207	808	622	490	355	197	-319	-611
Natural gas	2 760	6 118	7 529	8 899	7 043	5 584	2 781	-534
Nuclear	2 591	2 718	3 073	3 475	3 435	4 409	757	1 691
Hydro	2 613	4 203	5 255	6 098	5 685	6 934	1 895	2 731
Wind and solar PV	32	1 857	5 879	9 931	7 965	15 503	8 073	13 645
Other renewables	217	739	1 344	2 020	1 785	3 628	1 281	2 889
<b>Total generation</b>	<b>15 436</b>	<b>26 603</b>	<b>34 140</b>	<b>41 373</b>	<b>31 800</b>	<b>38 713</b>	<b>14 770</b>	<b>12 110</b>
<i>Electricity demand</i>	<i>13 152</i>	<i>23 031</i>	<i>29 939</i>	<i>36 453</i>	<i>28 090</i>	<i>34 562</i>	<i>13 422</i>	<i>11 531</i>

Notes: TWh = terawatt-hours. STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario. Total generation includes other sources. Electricity demand equals total generation minus own use (for generation) and transmission and distribution losses.

# Hidrokarbonlar – Emisyon&ithalat

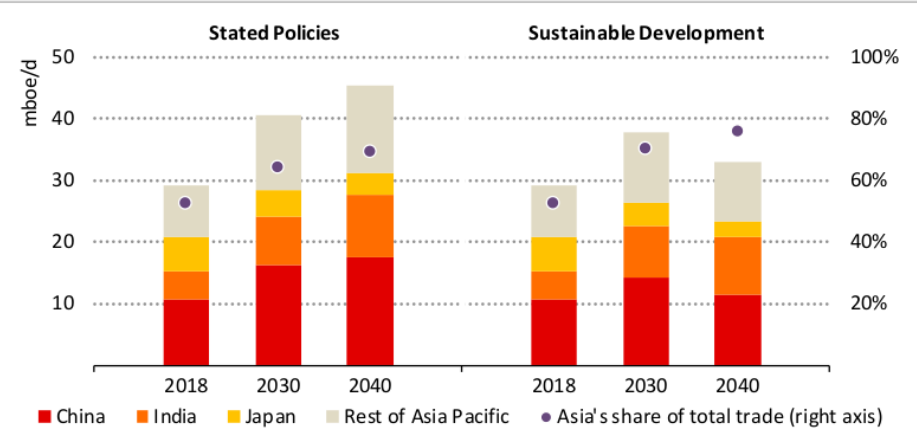
**Figure 1.6** ▶ Cumulative energy-related CO<sub>2</sub> emissions (since 1890) and annual emissions by fuel and scenario



Existing and announced policies do not produce a peak in global CO<sub>2</sub> emissions by 2040.  
The Sustainable Development Scenario is on course for net-zero emissions in 2070.

Note: Gt = gigatonnes.

**Figure 1.7** ▶ Net oil and gas imports to Asia by scenario



Some 70% of global net oil and gas imports flow to Asia by 2040 in both scenarios

Note: mboe/d = million barrels of oil equivalent per day.

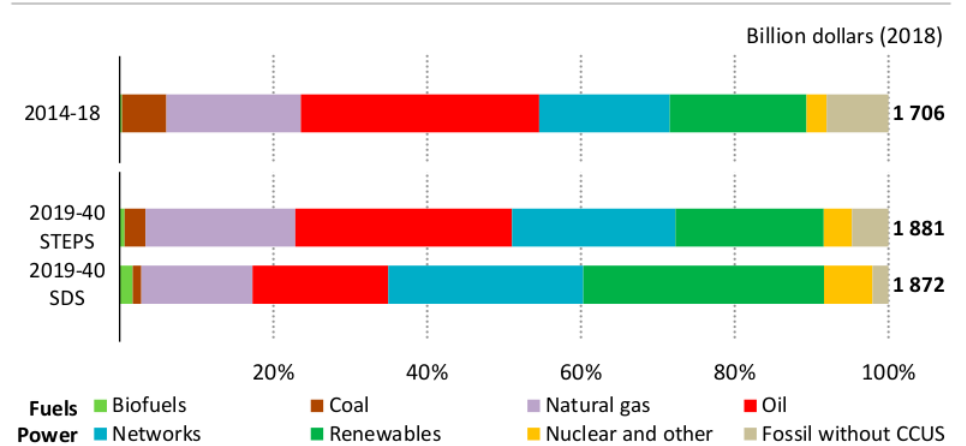
# Dünyada küresel yatırımlar

**Table 1.7 ▶ Global average annual energy investment by type and scenario (\$2018 billion)**

	2014-18	Stated Policies		Sustainable Development		Change 2031-40 vs. 2014-18	
		2019-30	2031-40	2019-30	2031-40	STEPS	SDS
Fossil fuels without CCUS	1 063	1 017	1 063	749	555	0	-508
Renewables	308	356	398	548	703	89	395
Electricity networks	291	354	455	345	631	164	340
Nuclear and other	44	64	74	99	141	29	97
<b>Fuels and power</b>	<b>1 706</b>	<b>1 792</b>	<b>1 989</b>	<b>1 741</b>	<b>2 030</b>	<b>282</b>	<b>323</b>
<i>Fuels</i>	55%	52%	50%	42%	28%	-5%	-27%
<i>Power</i>	45%	48%	50%	58%	72%	5%	27%
Energy efficiency	238	445	635	625	916	397	678
Renewables and other	127	220	308	332	950	181	824
<b>End-use</b>	<b>365</b>	<b>665</b>	<b>943</b>	<b>957</b>	<b>1 866</b>	<b>578</b>	<b>1 501</b>
<b>Total</b>	<b>2 071</b>	<b>2 457</b>	<b>2 931</b>	<b>2 697</b>	<b>3 896</b>	<b>860</b>	<b>1 825</b>
		2019-40		2019-40			
Cumulative total		58 795		71 329			
Average annual total		2 673		3 242			

Notes: STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario. Other fuels and power includes battery storage and power plants equipped with CCUS. Other end-use includes CCUS in industry sector, and electric vehicles and EV slow chargers.

**Figure 1.8 ▶ Global average annual energy supply investment by type and scenario**

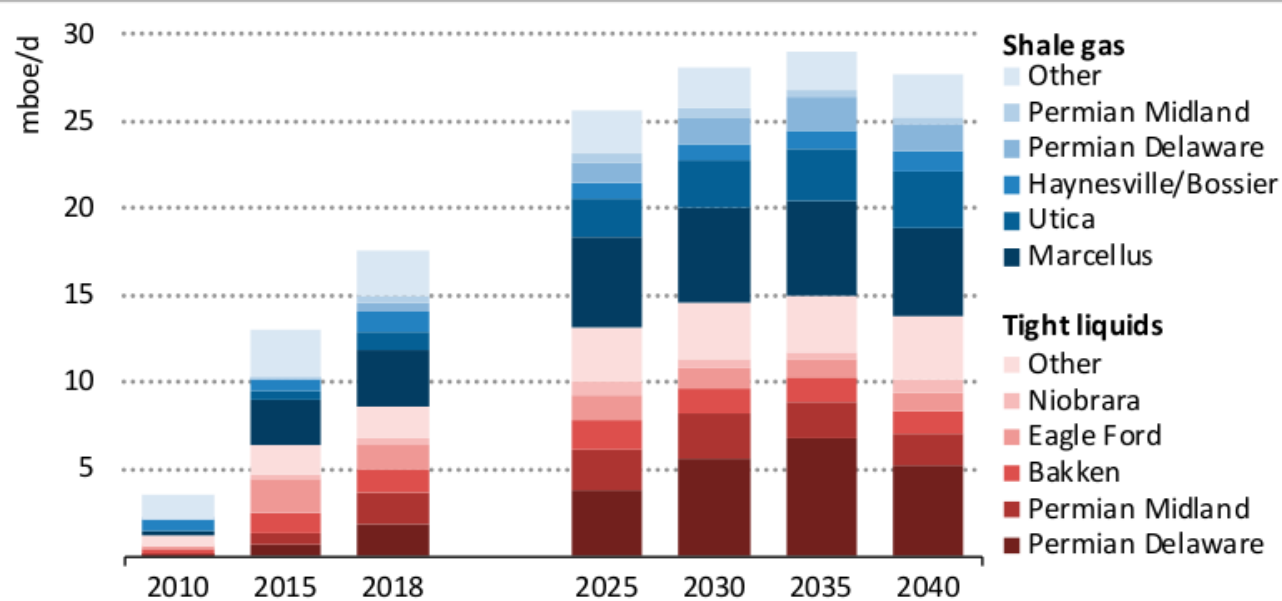


*Investment in fuels and power needs rise in both scenarios; a major capital reallocation from fuels to power would be needed to meet sustainability goals*

Notes: STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario. Nuclear and other includes nuclear, battery storage and power plants equipped with CCUS.

# ABD Petrol ve Gaz üretimi

**Figure 1.15** ▶ Tight oil and shale gas output in the United States, 2010-2018, and in the Stated Policies Scenario



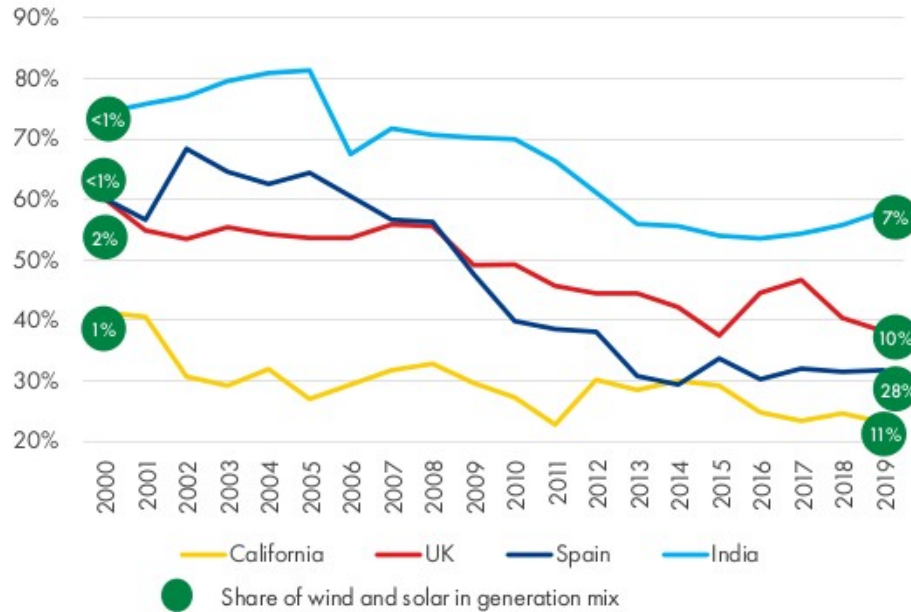
*United States shale production alone (oil and gas) is projected to exceed the entire oil and gas output of Russia before 2025*

Note: mboe/d = million barrels of oil equivalent per day.

# Değişen elektrik üretim portföyü

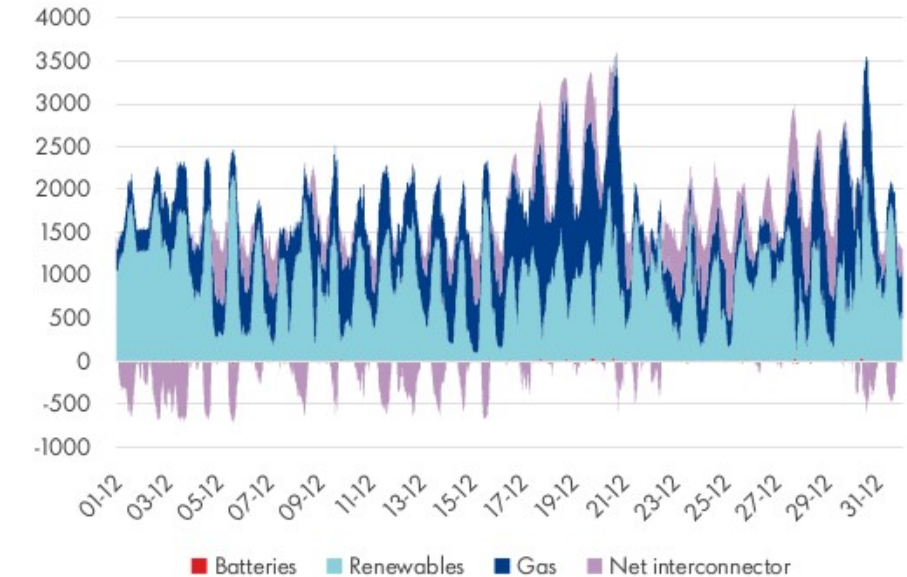
## Average thermal load factors

Thermal load factors



## South Australia electricity supply December 2019

MW

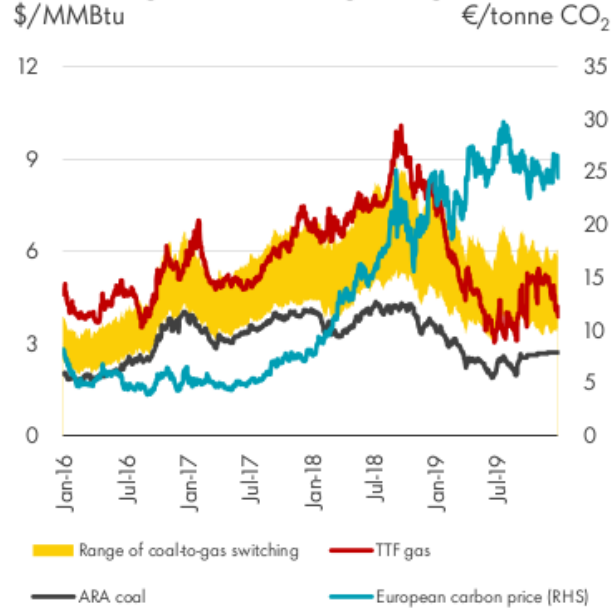


Source: Shell interpretation of Wood Mackenzie H1, national data and OpenNEM 2019 data

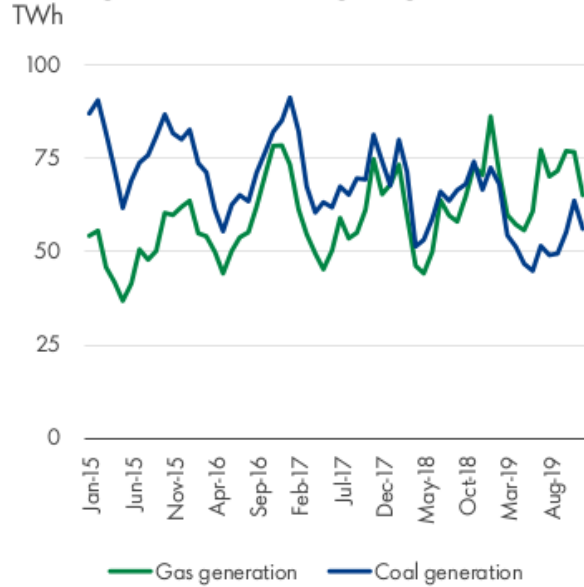


# Kömür – Gaz rekabeti

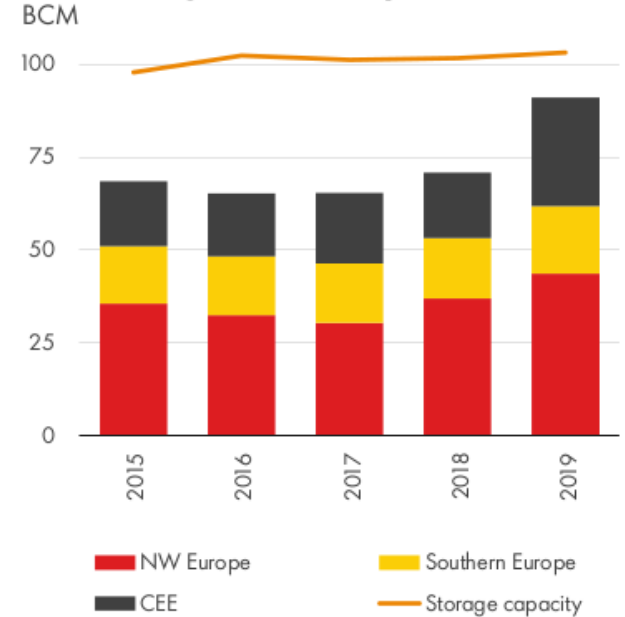
## Coal-to-gas switching range



## Coal generation vs gas generation



## Year-end gas inventory

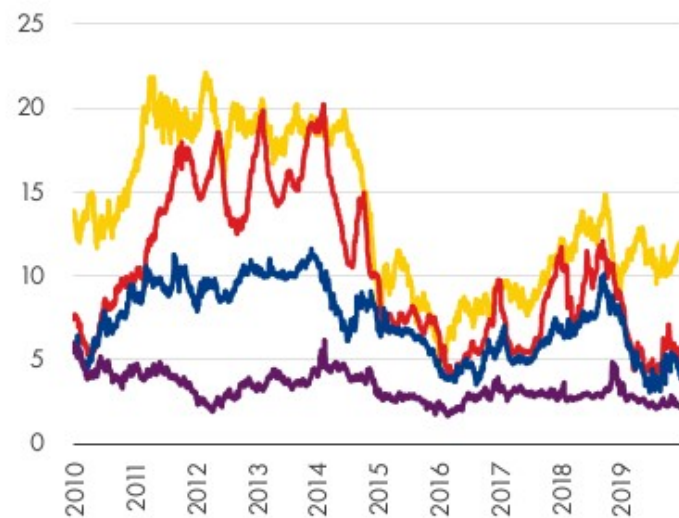


Source: Shell interpretation of IHS Markit, Wood Mackenzie and Gas Infrastructure Europe (Aggregated Gas Storage Inventory) 2019 data

# LNG

## Global gas prices

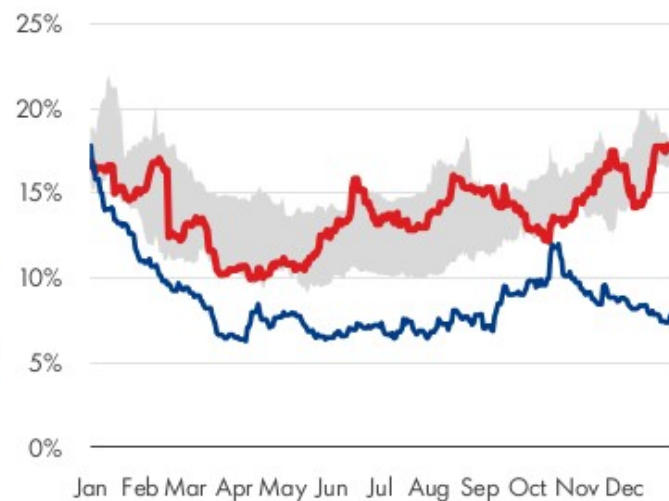
\$/MMBtu



— Dated Brent — JKM — TTF — Henry Hub

## Asia spot price

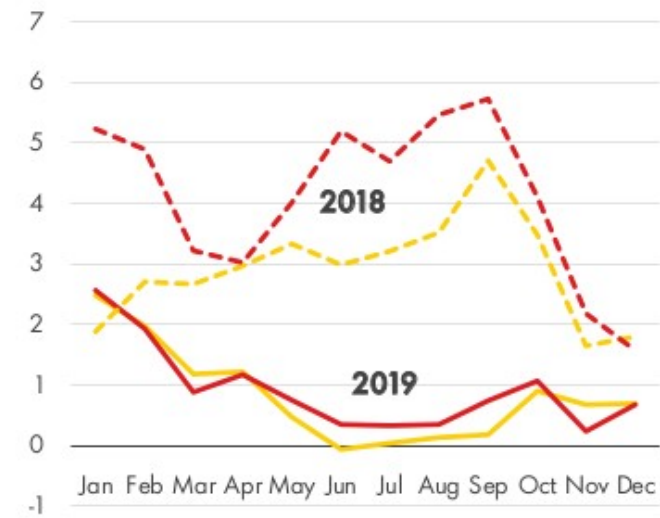
JKM as % of Brent



— Range 2013-2018 — 2018 — 2019

## US LNG export margins\*

\$/MMBtu



— TTF netback — JKM netback

Source: Shell interpretation of ICE, CME, S&P Global Platts 2019 data

\*Excludes liquefaction fee; netback calculated as: JKM and TTF minus regasification and transportation cost minus 115% Henry Hub

Coronavirüs sonrası

# Koronavirüs'ün enerji tarafına etkileri



Enerji  
Politikaları  
Araştırma  
Merkezi

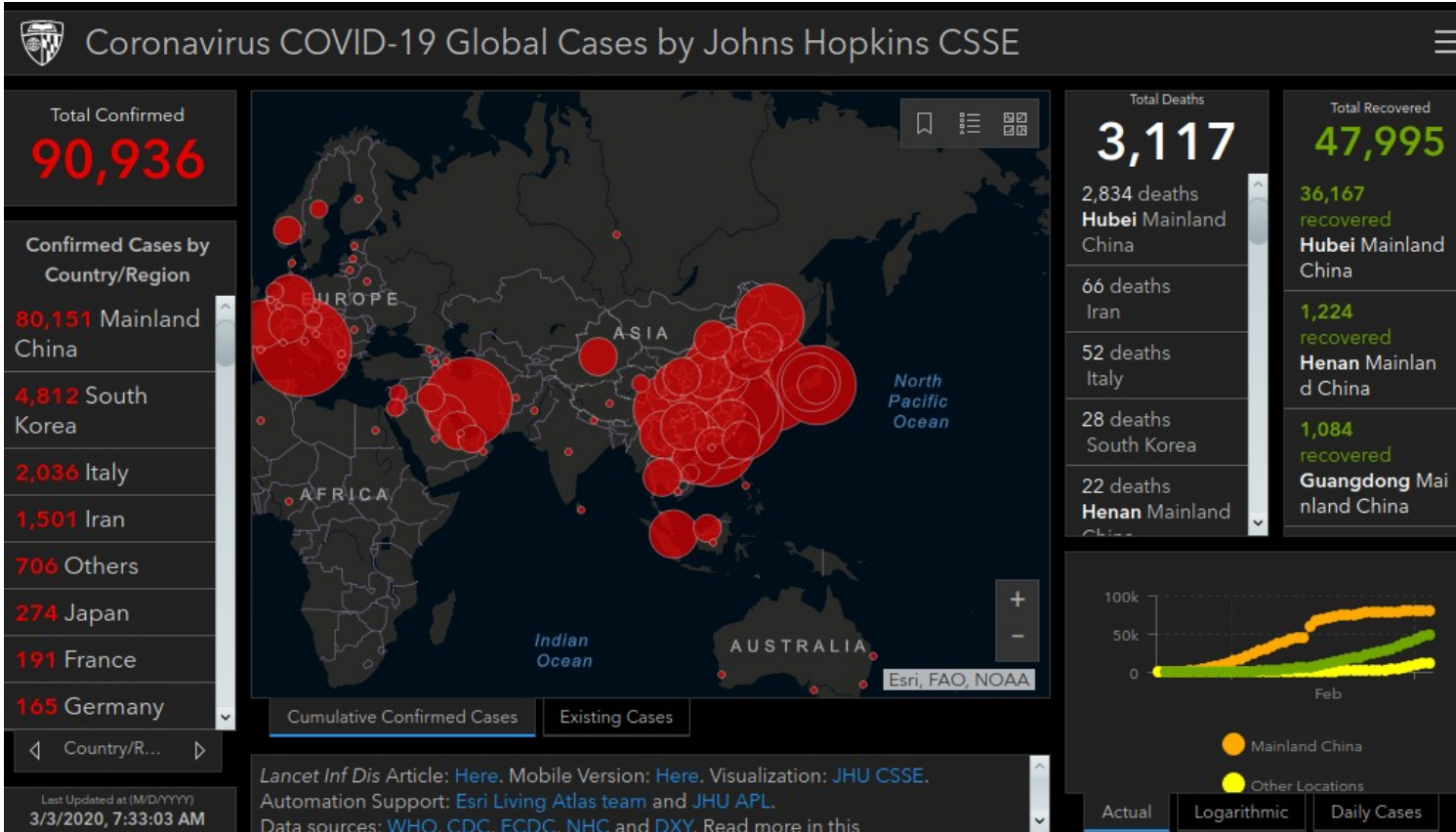
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Enerji Talebini Öldüren Bir  
Virüs: Koronavirüs'ün Etkileri

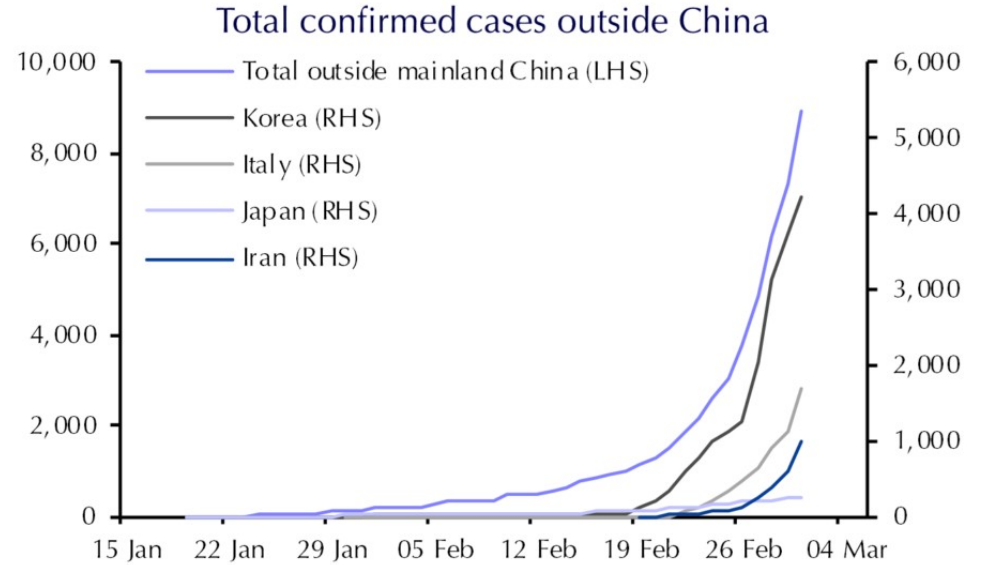
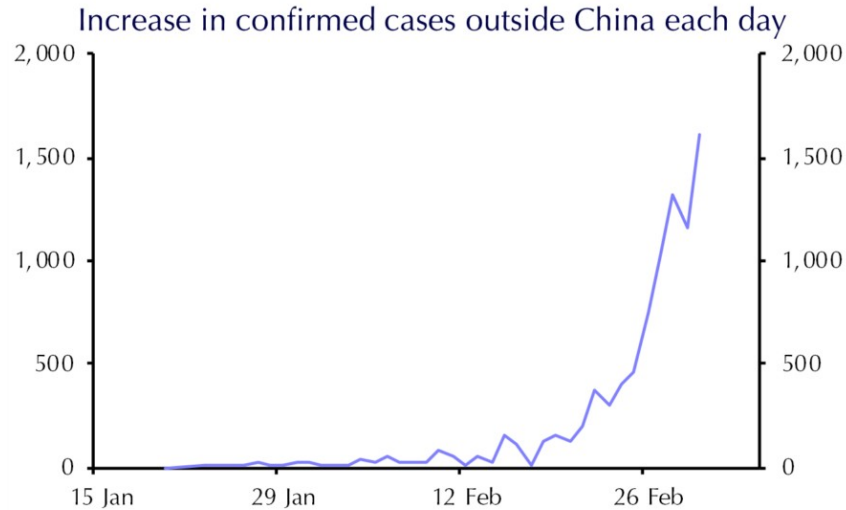
Barış Sanlı & Gökberk Bilgin

Şubat 2020

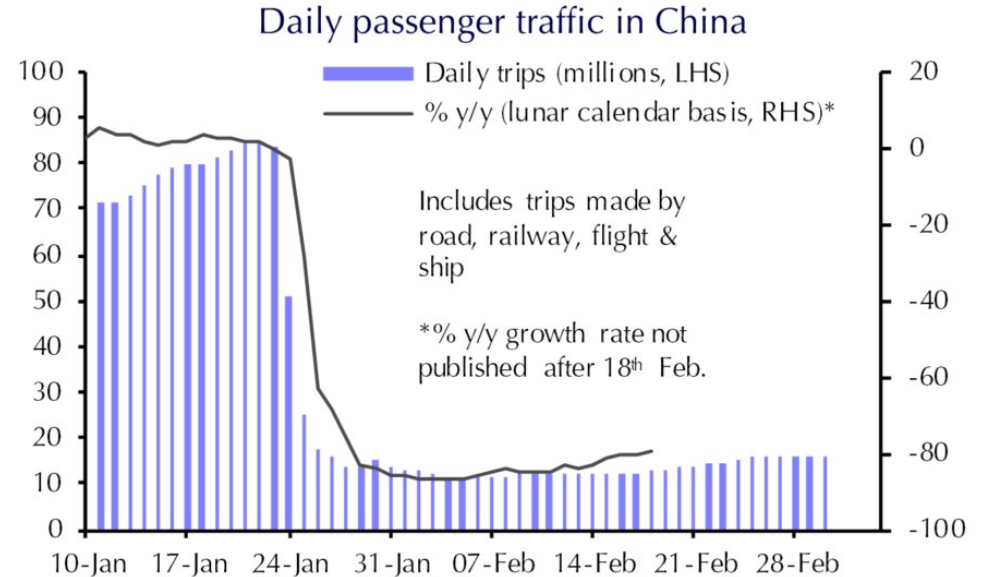
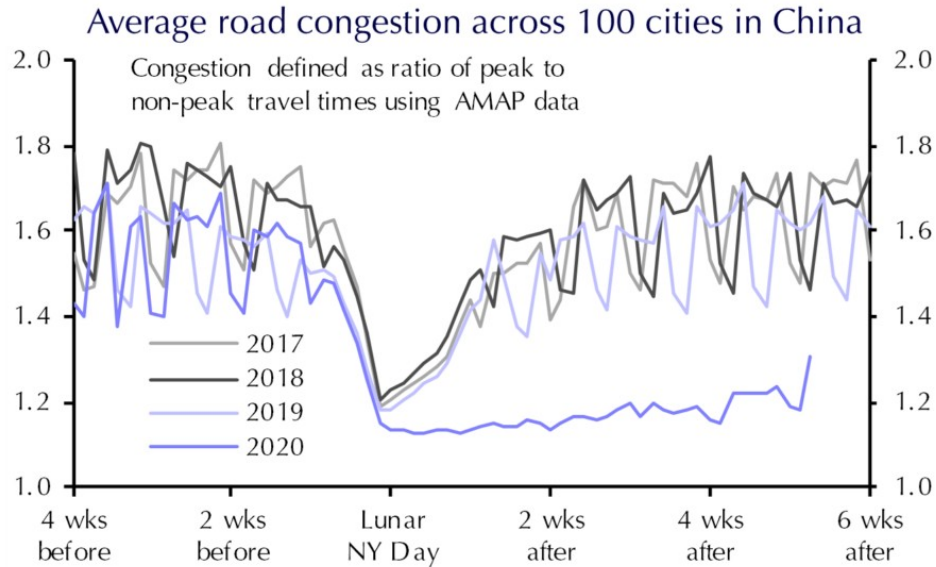
# Coronavirus – 3 Mart



# Çin dışı yayılma

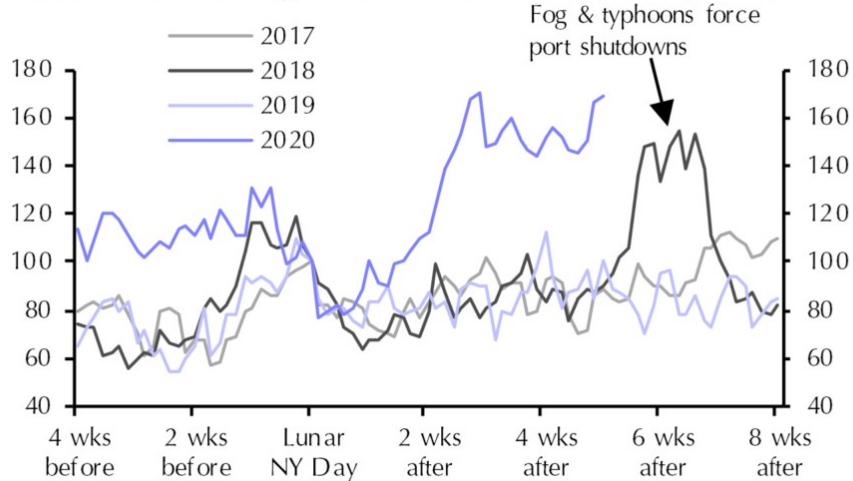


# Ulaştırma Talebi

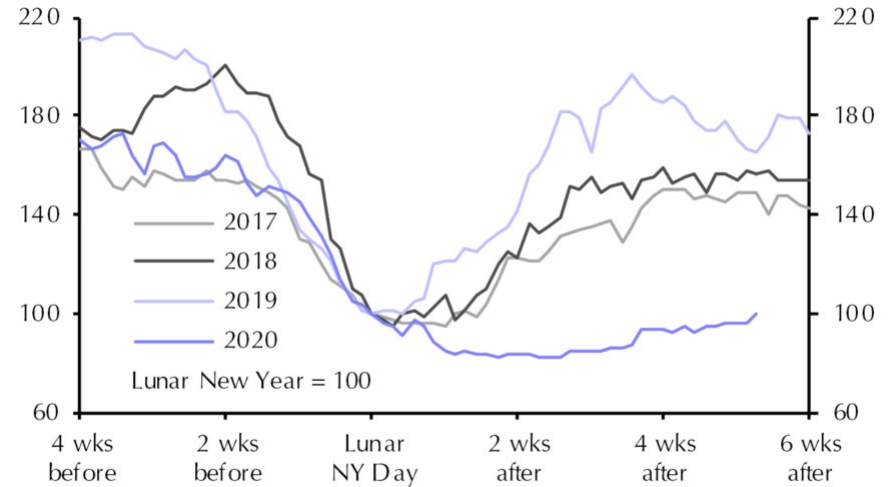


# Bekleyen konteynır ve kömür tüketimi

Containers waiting to be offloaded at Chinese ports (TEU)



Coal consumption at power plants in China



Sources: Refinitiv, Capital Economics

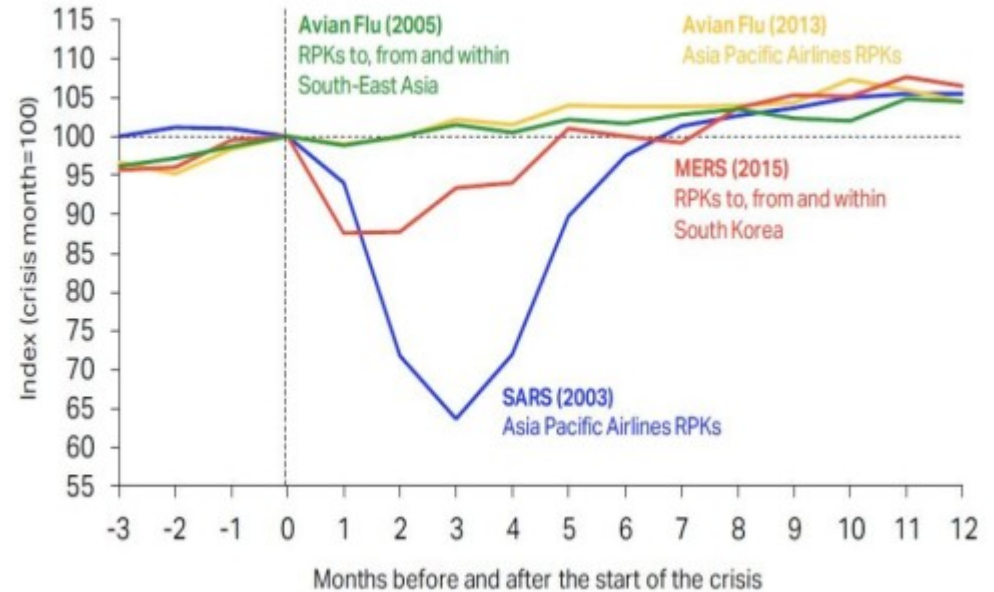
Sources: Wind, Capital Economics



# Değişen dengeler

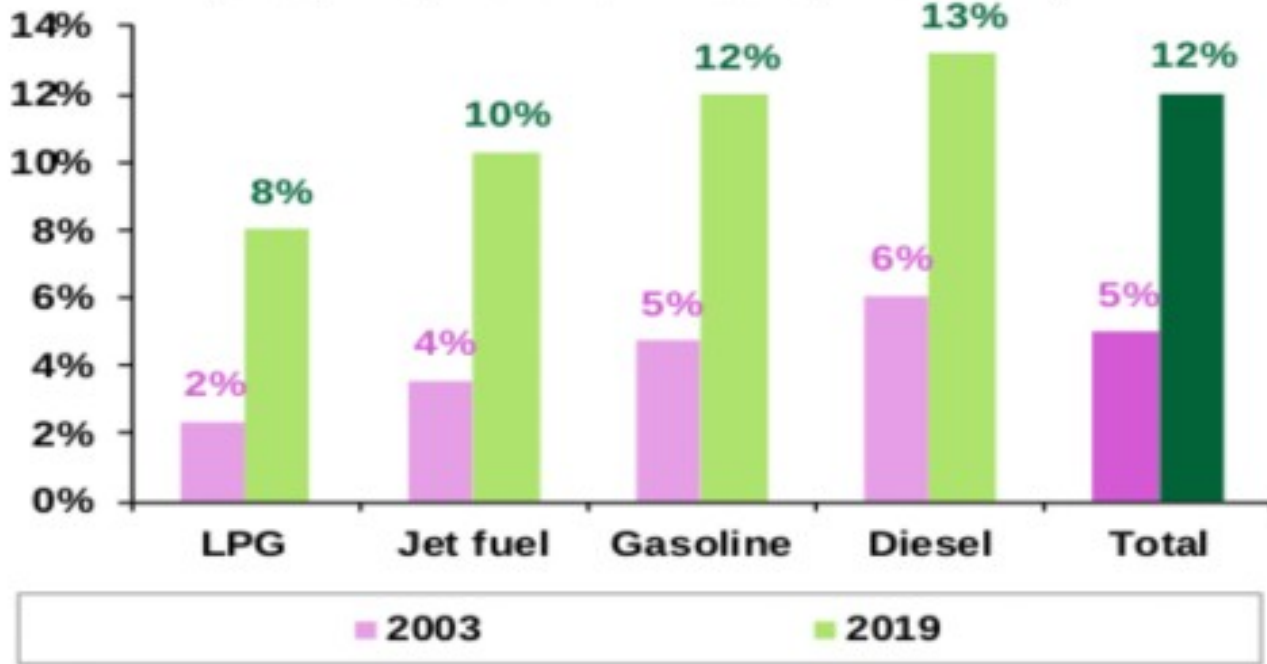
- SARS 2002-2003
- Çin'in dünya ekonomisindeki yeri
- Havacılık&ulaştırma
- Kömür tüketimi
- Doğalgaz talebi

Şekil 4: Geçmiş Salgınların Havacılık Üzerindeki Etkileri



# Ulaştırma yakıtlarında Çin

Şekil 7: Çin'in Ulaşım Yakıt Talebinin Küresel Ulaşım Talebindeki Payı



Kaynak: OPEC [25]

# Öngörüler

- Çin ve Dünyanın Kalanı
- Ebola'nın yayılması 10-12 haftada (peak)durduruldu
- Petrol ve LNG fiyat düşüşü → OPEC kesinti
- Senenin kalanı → artan talep mi, yavaş gelen talep mi?
- Küresel ekonomik büyümeye etkisi

**Teşekkürler**

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