HAVE WE PASSED PEAK DEMAND FOR FOSSIL FUELS?

By Jens Burchardt, Patrick Herhold, Joonas Paivärinta, and Stefan Schönberger

With the COVID-19 pandemic still in full swing, energy companies around the globe are in containment mode to cope with its considerable short-term impact. But hiding in the shadows of the current crisis is a possibility with even greater potential implications for global energy markets: the world may already have passed peak demand for fossil fuels.

A Year of Turmoil for Energy Markets

The pandemic has smashed its way through the world economy like a wrecking ball. In just a few months, it has destroyed trillions of dollars in global economic value and cost more than 300 million full-time jobs, according to the International Labor Organization. The International Monetary Fund (IMF) expects the pandemic to reduce global GDP by 3% to 6% this year, about two to four times as much as during the 2008–2009 financial crisis.

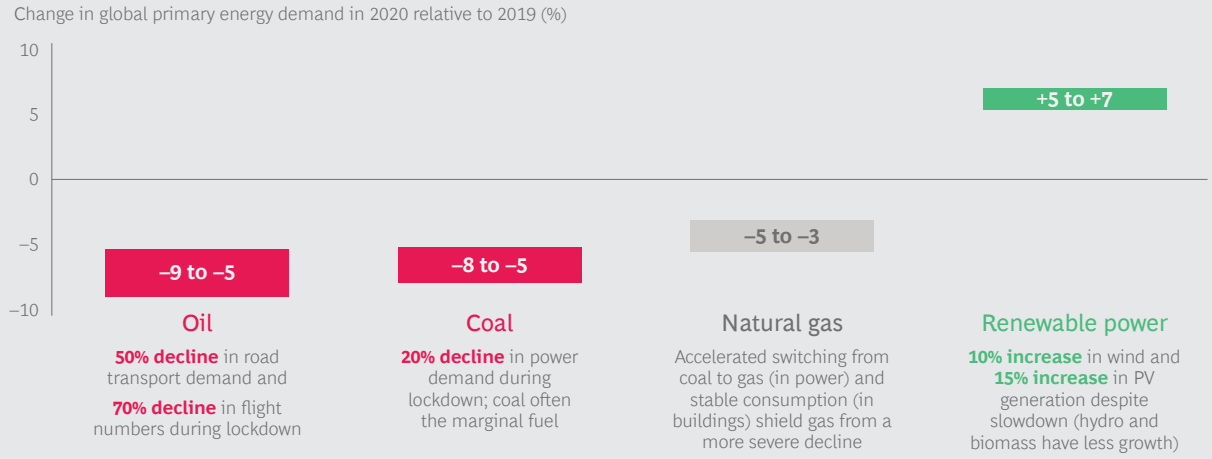
On global energy markets, sectors have felt very different effects. (See Exhibit 1.)

Demand for oil has been hit particularly hard. In March and April—as global air travel ground to a halt, global trade slowed, and government-enforced confinement measures limited public movement in many countries—oil demand temporarily dropped by more than 20%, the equivalent of 20 million barrels per day. The resulting oversupply, exacerbated by a dispute between OPEC and Russia over production quotas, sent global oil prices into freefall, even briefly turning prices in the US negative for the first time in history.

Coal demand has suffered almost as much. As weaker economic activity reduced power consumption in many countries, the load hours of coal-fired power plants deteriorated. At the same time, lower wholesale power prices have eroded margins for many plant operators in merchant markets.

Although demand for natural gas is lower, too, that reduction is more in line with the overall drop in global GDP. Demand has especially declined in the power and industry sectors, though to varying degrees de-

EXHIBIT 1 | Pandemic-Induced Recession Disproportionately Impacts Fossil Fuel Demand



Sources: International Energy Agency; International Monetary Fund; BCG analysis.
Note: Assumes a decline in GDP of 3%–6% in 2020 versus 2019. PV = photovoltaic.

pending on the region. But the dampening impact of the mild 2019–2020 winter aside, consumption in buildings will likely remain more stable.

In contrast to fossil fuels, renewable energy production continues to grow. The expansion of wind and solar has fallen below pre-crisis expectations, but the International Energy Agency (IEA) still projects that global wind and photovoltaic (PV) power generation this year will increase by more than 10% and 15%, respectively. And because renewables are a must-run source of power with near-zero marginal generation costs, this growth is further squeezing conventional operators.

This pattern has fundamental implications for future energy market dynamics. Several forces are at play. Economic recovery will drive overall energy demand, but the gradual decline in the global economy's energy intensity (for example, through gradual efficiency improvements in the asset stock) will continue.

Together with continued growth of renewable energy sources and increasing electrification in transport, this means that the recovery in demand for fossil fuels will lag behind global GDP. The pace of these different forces will determine to what extent demand recovers.

Are We Beyond Peak Fossil Fuel Demand?

As countries around the world emerge from lockdown, it remains unclear how lasting the economic damage from the pandemic will be. The IMF's baseline scenario still outlines a V-shape recovery that would see global GDP in 2021 surpass 2019 levels, but voices warning of a longer U-shape recovery are steadily increasing. Such a scenario could have a serious negative impact on energy markets. In an L-shape recovery—the IMF's worst-case scenario—the harm would be even greater. (See Exhibit 2.)

To understand the impact, we modeled the demand for fossil fuels—coal, oil, and natural gas—in the US, Europe, China, India, and the rest of the world under three different scenarios published by the IMF in April 2020. We then applied a conservative extrapolation of past energy intensity trends across all major economic sectors, and assumed growth of renewables and electrification in line with the IEA's Stated Policies Scenario (STEPS) from November 2019, adjusted to fit a likely slower expansion caused by the COVID-19 crisis. (See "How We Modeled COVID-19's Impact on Fossil Fuels.")

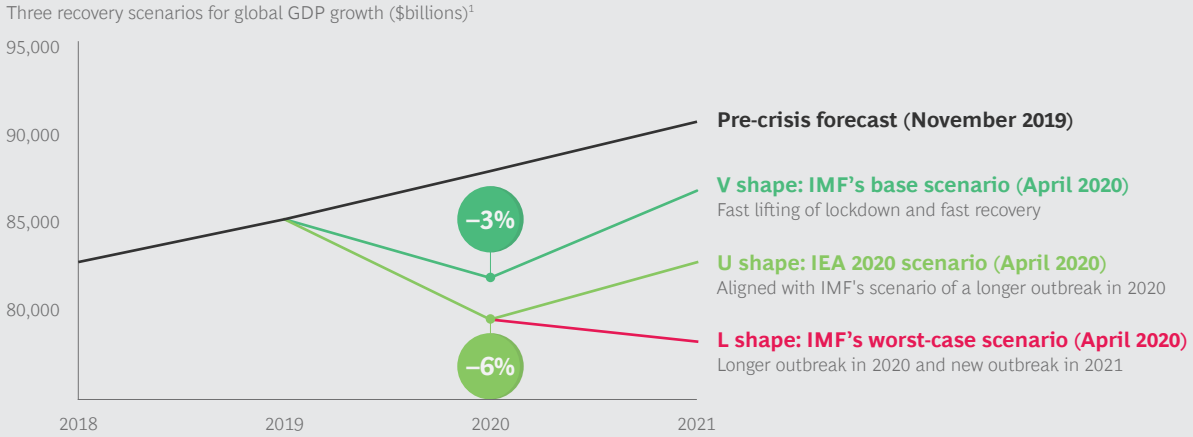
If the IMF's V-shape projection materializes, worldwide fossil fuel demand will likely recover beyond 2019 levels in 2022, only a few months after global GDP does. (See Ex-

hibit 3.) This is in line with what happened in the aftermath of past economic crises, where energy demand rebounded quickly.

But in the event of a U-shape scenario (deeper recession in 2020, GDP recovery by 2022, and a resumption of the historical growth path thereafter), the recovery will take far longer. With insufficient economic growth to offset other forces, demand for fossil fuels will not move back to 2019 levels until the second half of the decade. And if the energy transition accelerates, this may never occur. In an L-shape scenario, demand will not recover this decade.

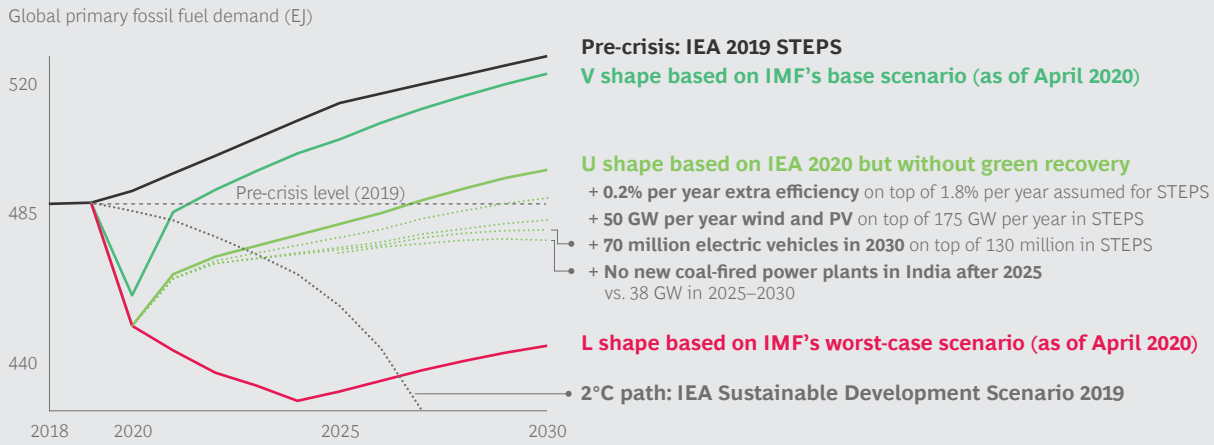
In such scenarios, not all fuels would be hit equally hard. Demand expectations for coal were already flat before the crisis. A combination of lower-than-expected power demand growth and increasing renewable capacity would make it very unlikely that coal demand could recover to pre-crisis levels. Oil demand would suffer from slower growth in transport and travel, as well as from continuing efficiency improvements in

Exhibit 2 | Global GDP Is Expected to Drop by 3% to 6% in 2020



Sources: International Monetary Fund, World Economic Outlook, November 2019 and April 2020; World Bank; BCG analysis.
Note: IEA = International Energy Agency; IMF = International Monetary Fund.
[1] Growth expressed in constant 2010 money. To obtain comparable series of constant price data, the World Bank rescales GDP to a common reference year.

Exhibit 3 | Demand for Fossil Fuels May Not Recover to 2019 Levels



Sources: International Energy Agency; International Monetary Fund; BCG analysis.
Note: EJ = exajoules; GW = gigawatt; IEA = International Energy Agency; IMF = International Monetary Fund; PV = photovoltaic; STEPS = Stated Policies Scenario.

HOW WE MODELED COVID-19'S IMPACT ON FOSSIL FUELS

We used the following scenarios, assumptions, and forecasts to model the effects of the pandemic on fossil fuel demand.

Economic Scenarios

Future GDP development per region is based on three IMF scenarios from April 2020: the Baseline (V-shape) scenario, the Longer Outbreak in 2020 (U-shape) scenario, and the Longer Outbreak in 2020 and New Outbreak in 2021 (L-shape) scenario. The pre-COVID GDP forecast is based on the IMF's October 2019 World Economic Outlook. As the April 2020 IMF scenarios are modeled only until 2024, we used GDP growth rate forecasts for 2025 to 2030 published in May 2020 by the Economist Intelligence Unit.

Overall Energy Consumption per Country and Sector

To translate different GDP scenarios into energy demand scenarios (final and primary energy consumption by country and sector), we applied a conservative best-fit extrapolation of past energy intensity trends for five economic sectors: transportation, power and heat generation, industry (including petrochemical feedstock), buildings, and other (including other energy industry) in China, the US, the EU, India, and the rest of the world.

We built our model on historical GDP data from the IMF and energy demand data from the IEA, by region and sector. It performed well in back-tests of the historical development of the energy intensity of GDP trends, even during past crises (for example, in 2000 and 2008).

We calibrated the impact of the COVID-19 crisis on demand development in 2020 in the U-shape scenario according to the IEA's April 2020 Global Energy Review, which used the IMF's Longer Outbreak in 2020 scenario as its economic reference scenario. We constructed the 2019 base-year data from available national data as of May 2020 and, where this was not available, extrapolated it from 2018 data.

Fossil Fuel Demand Within Sectors

To model fossil fuel demand in each scenario, we assumed the nonfossil technology and energy carrier development—mostly wind, photovoltaic (PV), and deployment of electric mobility—according to the IEA's Stated Policies Scenario (IEA STEPS) from November 2019, adjusting it to take into account the lower demand triggered by the COVID-19 crisis. Our sector-specific assumptions are as follows:

Transportation

- All technologies and fuels—notably, liquid fuels (fossil and bio), liquefied natural gas, and electricity—will scale with GDP-driven total transportation activity.
- Changes in the technology mix in road transportation will accord with IEA STEPS projections—for example, electric mobility will reach about 1% of energy demand by 2030.
- International bunker fuels in aviation and shipping will react proportionally to GDP development.

Power and Heat Generation

- Wind and PV deployment will slow in 2020–2021 by 50% versus IEA STEPS values and then gradually recover to IEA STEPS deployment levels (approximately 170 GW per year) by 2024.
- Hydro and nuclear development will occur through 2030 as anticipated in IEA STEPS.
- Fossil power generation from coal, gas, and oil will be marginal,

HOW WE MODELED COVID-19'S IMPACT ON FOSSIL FUELS (continued)

squeezed out of the generation mix as demand declines and renewable capacity increases. The relative shares of coal, gas, and oil will be as specified in IEA STEPS, except in the US, where, because of a strong coal-to-gas switch in 2019, coal will not rebound until 2030.

Industry (Including Petrochemical Feedstock)

- The relative share of energy carriers through 2030 will follow the path projected in IEA STEPS, albeit with lower overall demand owing to the lower GDP trajectory.

Buildings

- Absolute energy demand will continue the linear trend of the past two decades, permitting calibration against IEA STEPS.
- The relative share of energy carriers will evolve as in IEA STEPS.

Deaveraged Results

Scenario results vary significantly by region and commodity, as indicated in table below, which summarizes the deaveraged results.

Scenario Results by Region and Commodity

	2019 (EJ)	2030 scenarios (percentage change vs. 2019)															
	Actual	IEA (as of November 2019)					V shape					U shape					L shape
	World	US	EU	China	India	World	US	EU	China	India	World	US	EU	China	India	World	Total
Coal	158	–20%	–40%	0%	+60%	+2%	–20%	–50%	0%	+50%	+2%	–20%	–50%	–10%	+40%	–4%	–16%
Oil	188	–10%	–20%	+20%	+50%	+8%	–10%	–20%	+20%	+40%	+7%	–10%	–30%	+10%	+30%	+1%	–9%
Gas	138	+10%	–10%	+80%	100%	+18%	0%	–10%	+80%	+90%	+14%	0%	–10%	+70%	+80%	+9%	–1%
Total	484					+9%					+7%					–2%[1] to +2%	–9%

Maximum increase X% ← Intensity of change → Y% Maximum decrease

Sources: International Energy Agency; International Monetary Fund; BCG analysis.
Note: EJ = exajoules; IEA = International Energy Agency.
[1]Assuming accelerated energy transition, as detailed in Exhibit 3: 0.2% per year extra efficiency; 50 gigawatts per year extra wind and photovoltaic; 70 million extra electric vehicles; and no new coal-fired power plants in India after 2025.

the vehicle fleet (in aviation, earlier-than-expected fleet retirements during the pandemic may accelerate this effect). On the other hand, the much slower pace of electrification would decrease displacement pressure. Whether and to what extent oil demand recovers will depend largely on how quickly demand in the transportation sector improves, especially in China. Meanwhile, demand for gas would likely nearly resume its previous growth trajectory. Economics and government policies are driving coal-to-gas conversion in several countries' power sectors, and demand in buildings is more resilient to a weak economy.

The demand picture would differ by region, too. In developed countries, demand for most fuels was already stagnating or declining. The COVID-19 crisis has accelerated these trends. In emerging economies such as China and India, demand is more likely to recover and increase, but growth would remain below pre-crisis expectations, as indicated in "How We Modeled COVID-19's Impact on Fossil Fuels."

While it remains a scenario, our analysis suggests the possibility that demand for fossil fuels has already peaked. If the world economy does not rapidly recover from the crisis, and if efforts to curb emissions accelerate moderately, global fossil fuel demand will have peaked in 2019.

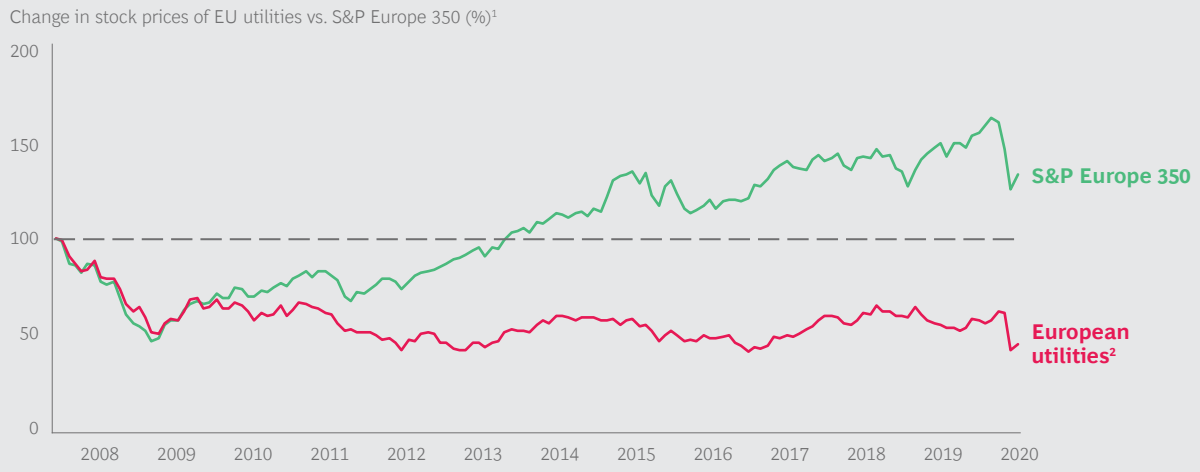
Several effects could lessen COVID-19's impact on fossil fuels. In the first place, a recession-induced erosion of investment capacity could slow efficiency gains and the expansion of renewable power, electric vehicles, and other low-carbon technologies. At the same time, historically low fossil fuel prices could create headwinds for low-carbon projects worldwide. On the other hand, renewable power costs continue to plunge, with the cost of new wind and PV projects falling below the cost of existing coal plants in some regions. In transportation, it remains unclear whether some of the recent restrictions may trigger longer-term behavioral changes in business and long-distance travel. Several countries are introducing green recovery programs that combine post-pandemic economic stimulus funding with a transformation toward lower carbon dependency. And the European Union's flagship Green Deal could significantly accelerate the deployment of low-carbon technologies—with potential spillover to countries outside the EU.

What If?

Today, many fossil-fuel-based energy players are suffering from an unprecedented demand and price shock. Yet what could happen after this shock may reverberate even louder. Industries that have been growing since the start of industrialization may suddenly stagnate or decline. Even though demand effects will vary by region and commodity (with gas demand likely continuing to grow), and even though volume and price trajectories will change very gradually, many fossil fuel players' profit margins could come under continuous pressure. And investors will be quick to price in the long-term implications of these developments.

The European utility sector offers a drastic example of what could lie ahead. As wind and solar power started to emerge in the early 2000s, the initial loss of market share by conventional generators was microscopic. Coal still burns in many European countries today and will likely continue to do so for at least another decade. But once financial markets realized the structural changes that were underway, utilities lost significant market value within just a few years. (See Exhibit 4.) By the time utilities accepted that they needed to transform their business models, their ability to fund such a transformation had severely diminished.

EXHIBIT 4 | European Utilities Lost Significant Stock Value in Just a Decade



Sources: S&P Capital IQ; BCG analysis.
[1]Indexed to November 30, 2007.
[2]Average of Centrica, EDF Energy, EnBW, Enel, EGIE, E.ON, Iberdrola, and RWE.

The growth in fossil fuels was always going to come to an end, but the COVID-19 crisis may have accelerated this by more than a decade: peak fossil fuel demand may have happened in 2019. Should this scenario prove to be true, it could fundamentally change many companies' economic position and outlook, increasing the pressure on conventional business models, intensifying the need for a low-carbon transformation, and likely accelerating industry consolidation.

Players need to react swiftly to this possibility. They should reassess their market scenarios, review existing investment programs, and evaluate the portion of their portfolio that may represent stranded reserves. In parallel, they should prepare to reduce costs to increase resilience against a longer-term environment of low-price fossil fuels, as well as accelerating efforts to transform their business portfolios and—ultimately—rewrite their equity stories.

In the fight against climate change, peak fossil demand would be no cause for complacency. Projected emissions in most scenarios remain incompatible with the Paris climate accord's 2°C—let alone 1.5°C—target. And cheap fossil fuels will create new economic challenges for businesses and governments that seek to accelerate the low-carbon transition.

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