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POWER SECTOR OUTLOOK

Addition by Subtraction: Recent Trends Reinforce Longer-Term Shift to Clean Energy

By Teri Viswanath

Lead Economist, Power, Energy and Water

Key Points:

- Government intervention, key behavioral shifts, and the related economic fallout suggest that response to COVID-19 could have a lingering effect on energy demand.
- From a U.S. power perspective, the contraction in weather-normalized electricity demand has been dramatic. The load erosion actually began in 2019, meaning the industry has lost the equivalent of a decade of growth since 2018.
- Even under the most aggressive recovery scenario, electricity demand would only return to pre-pandemic levels by 2024. A more conservative pace obviously means a longer recovery.
- The longer the road to recovery, the more likely the industry will confront outsized structural accommodation. Specifically, in order to rebalance the market, we expect 100,000 megawatts (MWs) or more of low-utilization coal and high-operating cost nuclear capacity will shutter by mid-decade.
- Counterbalancing these retirements will be the accelerated development of renewable generation. Indeed, planned clean energy projects currently outnumber coal capacity retirements by nearly 2-to-1.



Introduction

Many consequences of the COVID-19 pandemic for the U.S. power industry have been extreme – from demand destruction to more intense supply-side competition. This report takes a medium-term outlook for the U.S. power industry and considers which of the recent developments will persist, influencing the market through 2023 and beyond.

The most remarkable outcome of the pandemic has been the intense contraction in demand. Despite the historically warm summer heat, it appears that the industry will shed -2.6% of load in 2020 compared to 2019. When combined with the -2.7% losses of the previous year – resulting from a slower economy and the trade dispute with China – the industry will have lost the equivalent of a decade of growth. It is the totality of this loss and the timing of recovery that weighs most heavily on our updated guidance. In our opinion, even under a best-case scenario, accelerated recovery still means that industry is years away from revisiting the 2018 pre-pandemic load levels.

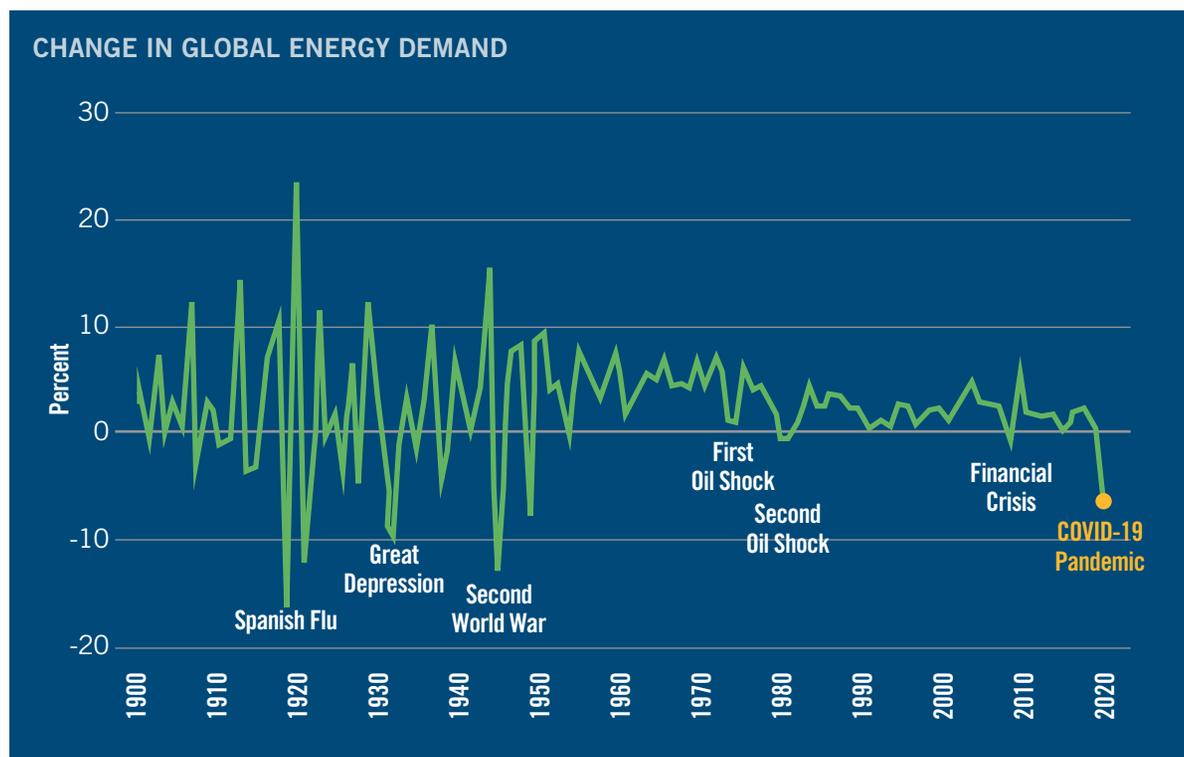
For starters, the highest annual growth rate achieved in the U.S. over the past two decades was 2.85%, or roughly the equivalent of this year's

loss. Pulling off a similar level of growth requires accomplishing an outsized economic recovery, especially considering that the previous 'high water-mark' was achieved in 2000, at the tail-end of a boom period in the U.S. economy. The past decade has witnessed a more anemic showing for weather-normalized electricity load, with growth slogging along at a glacially slow pace of 0.23% each year. A slackening economy is certainly to blame but so too are the efficiency offsets and the long downturn in energy-intensive industry. Consequently, even if we adopt an optimistic outlook for recovery such as the U.S. Energy Information Administration's (EIA) High Economic Growth case rate of 1.24% for 2021-25 – demand would only return to pre-pandemic levels by 2024. A more conservative pace would obviously further delay full recovery.

How will the industry respond? Likely by accelerating the early retirement of low-utilization coal and high-operating cost nuclear capacity – the magnitude of which will be amplified by planned clean energy deployment.

IEA Warns of Slowest Decade of Energy Demand Growth Since 1930s

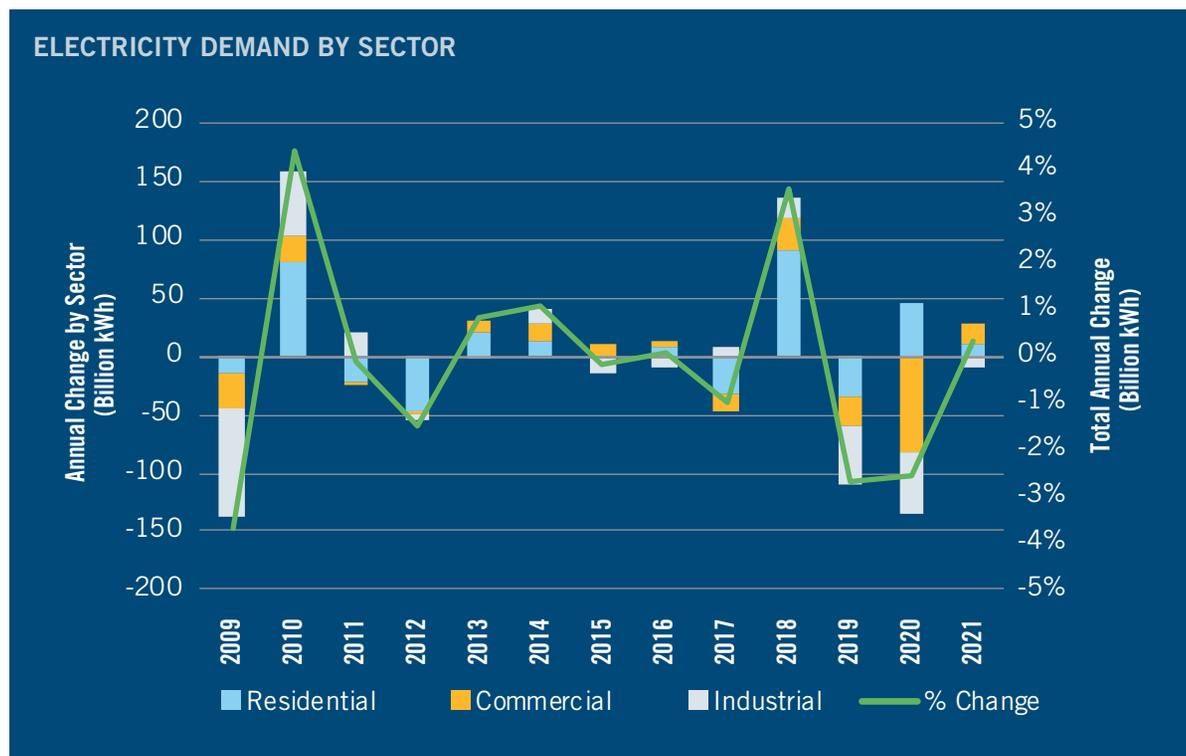
Government intervention – such as ordering business closures, reallocating industrial capacity, and committing to infrastructure – has impacted energy use. This intervention, along with key behavioral shifts and the related economic fallout, suggest that response to COVID-19 could have a lingering effect on demand. Earlier this spring, the International Energy Agency (IEA) noted that countries in full lockdown experienced an average 25% decline in energy demand per week, while countries in partial lockdown averaged an 18% decline. Yet, even as restrictions have loosened, energy demand has remained significantly below pre-pandemic levels, with most countries over the summer reporting electricity demand 10% below the 2019 levels. Full year guidance for global demand suggests a 6% contraction this year, representing the largest decline in 70 years in percentage terms. If realized, global energy demand losses this year would be more than seven times larger than the impact of the 2008 financial crisis.



Source: IEA

U.S. Electricity Demand was Already Falling Before the COVID-19 Pandemic

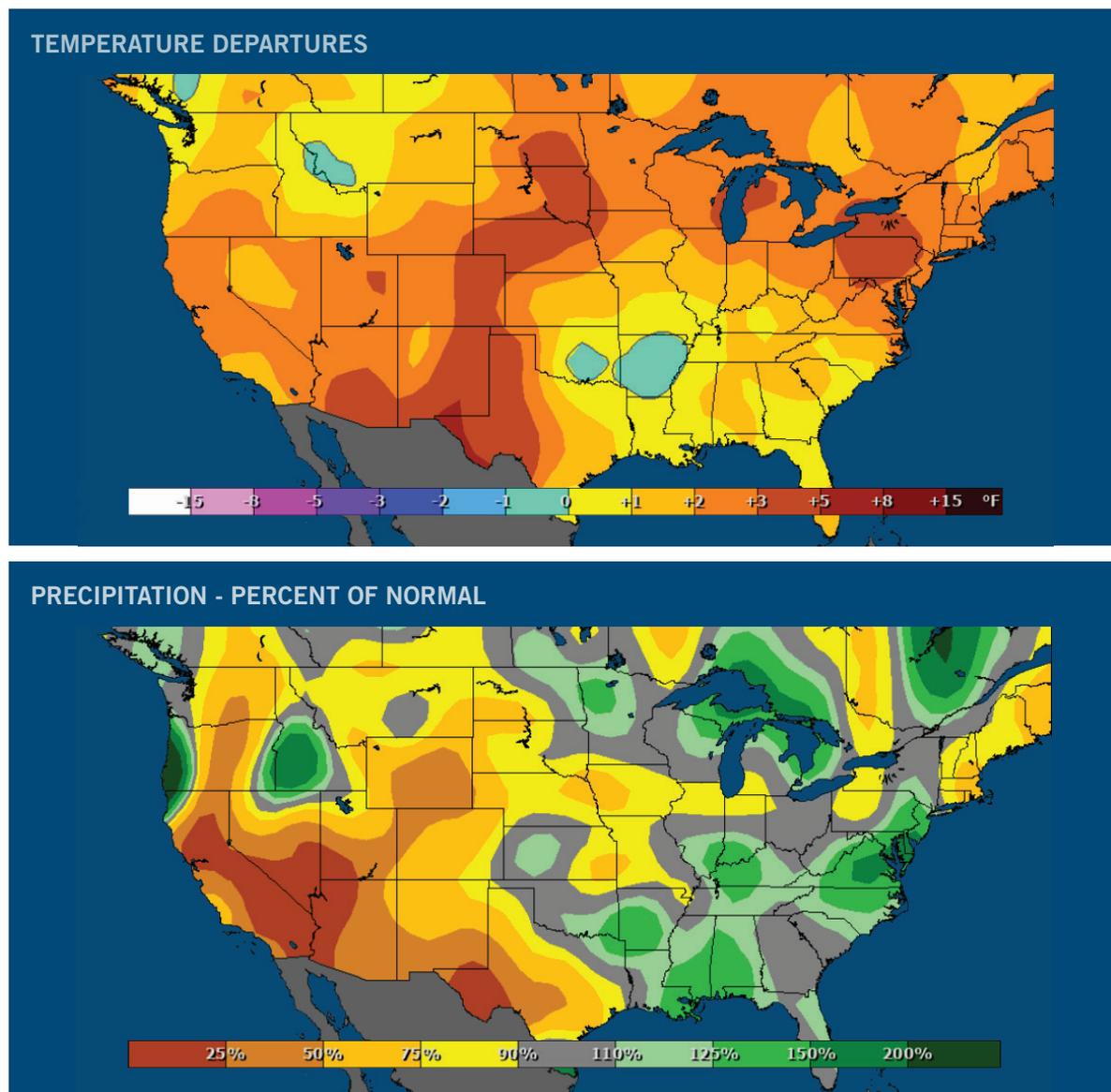
EIA's recently released *Short-Term Energy Outlook* sees total consumption of electricity in the U.S. declining by 2.6% in 2020. These losses follow a 2.7% drop in 2019 and represent the second time in the past decade when economic and weather headwinds culminated in back-to-back declines in total electricity demand. The agency expects the industry to begin to turn a corner in 2021. Yet, should weaker influences prevail, a contraction next year would be the first time in history the industry has recorded losses three years in a row. It is important to note that the normal state of electricity demand is growth, with population and economic expansion fueling increases in consumption. That said, the trade dispute with China (which featured centrally into the load losses last year) and behavioral shifts that might stall recovery pose significant headwinds to near-term growth.



Source: EIA

Summer Heat Likely Masked Underlying Demand Weakness

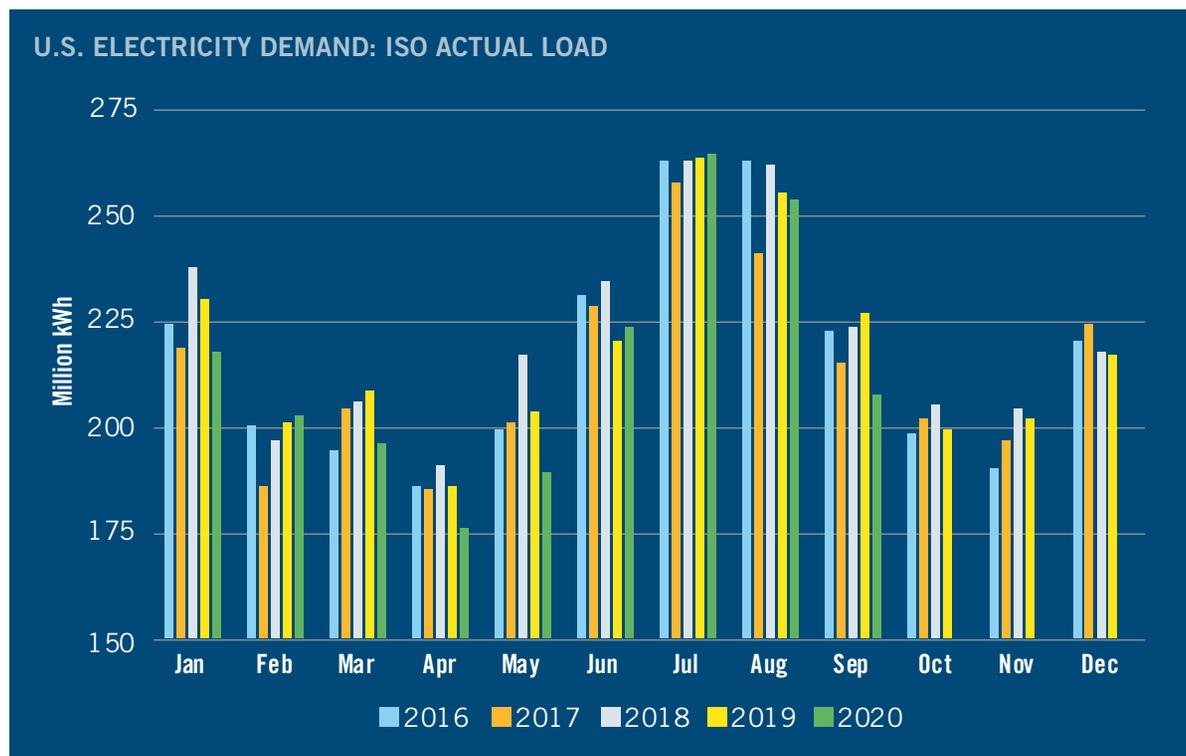
Summer-time load recovery was largely the result of very warm conditions. Just how warm? According to NOAA, the meteorological summer – June through August's end – was a standout, ranking the third hottest in 126 years in terms of the population-weighted cooling degree days (PWCDDs) and among the top one-third driest of all summers recorded. An interesting behavioral development provided an additional boost to demand. The gradual lift in state-wide restrictions generally enabled business to resume while still keeping a vast number of people working from home – a sort of best case scenario for electricity producers. Under normal conditions, some amount of residential space cooling/heating demand would likely shift over to the commercial side of the ledger. Indeed, as more employees return to offices, they are consuming less electricity at home. Normalization between sectors will ultimately occur, limiting some opportunities for demand recovery.



Source: Maxar Technologies

Recent Signs of Recovery Appear Short-lived, Demand Shows Signs of Slackening

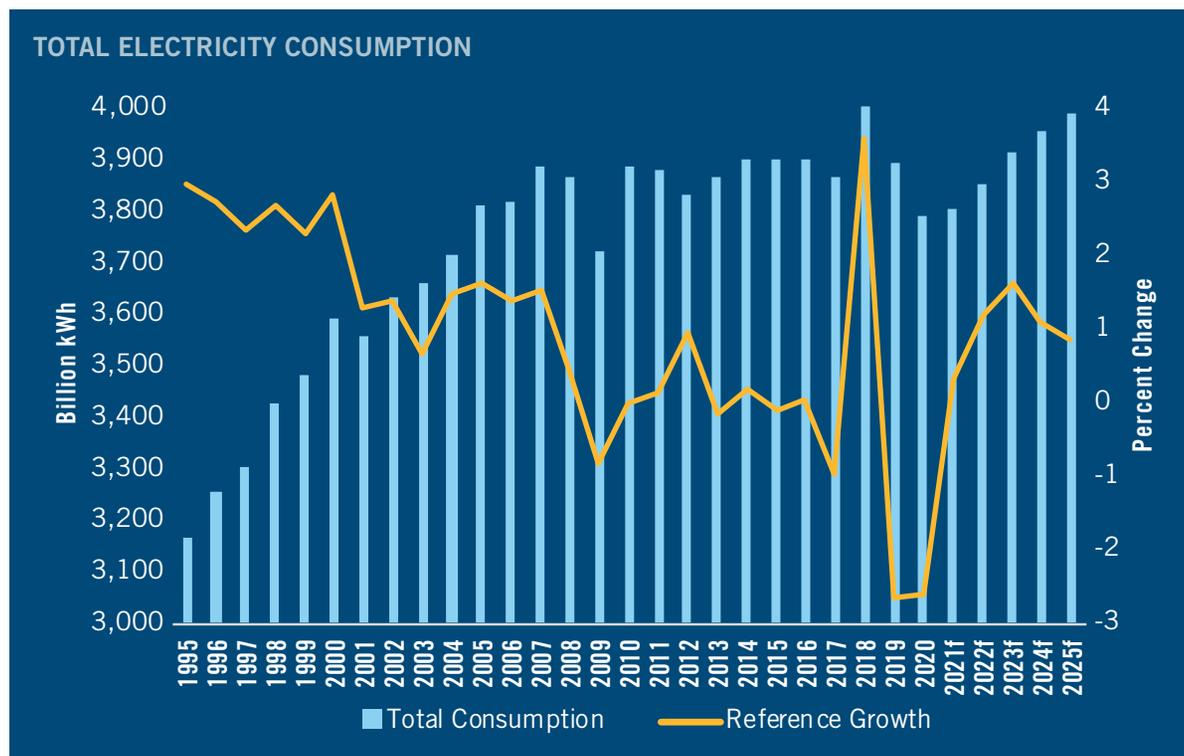
To understand how the warm weather over the summer influenced demand, we assessed the year-to-date actual load data reported by U.S. independent system operators through September. We found demand was in near perfect alignment with year-ago levels through the summer but recently began to soften with more moderate weather. Under normal circumstances, with such oppressive heat, the industry should have added 2% to 2.5% growth over the season. Instead, the system operator data suggests load was roughly flat, registering an anemic 0.4% uptick in demand compared to last summer. What does this development signify for the balance of 2020? The September data shows that summer-time air conditioning demand masked the underlying weakness caused by the pandemic. In our view, the load data will continue to lag year-ago levels.



Source: EIA and CoBank estimates

This Year's 2.6% Decline in Consumption Might be Recovered by 2024

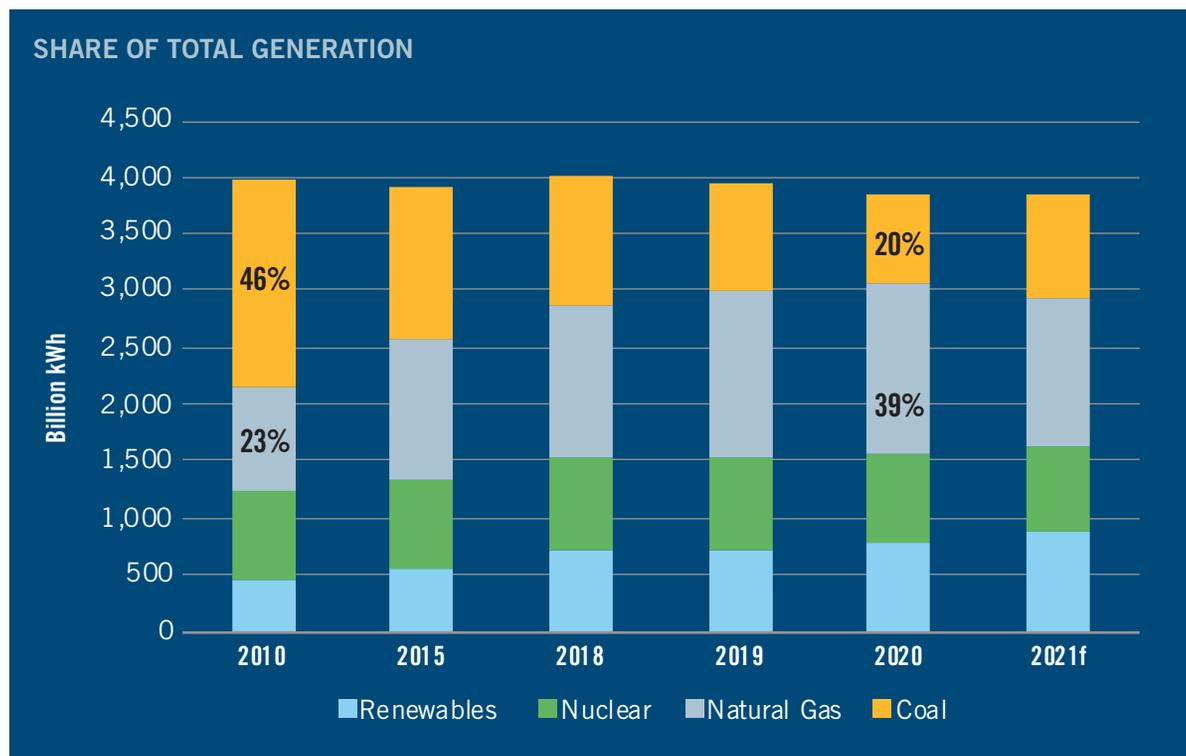
The load erosion actually began in 2019, meaning that the industry has lost the equivalent of a decade of growth since 2018. It is this loss, and the timing of recovery, that weighs most heavily on our updated guidance. In our opinion, even under a best-case scenario, accelerated recovery still means that we are years away from revisiting pre-pandemic load levels. Over the past 25 years, the highest annual electricity load growth rate the U.S. recorded was 2.85% in 2000, at the tail end of a U.S. boom. More recently, weather-normalized electricity load has grown at a glacially slow rate of 0.23%. While slackening economic activity is partially to blame, efficiency offsets and the long downturn in industrial demand also played a role. Consequently, even if we adopt EIA's High Economic Growth case rate of 1.24% for 2021-25, demand would only return to pre-pandemic levels by 2024.



Source: EIA and CoBank estimates

COVID-19 Accelerated Energy Transition in the Dispatch Stack

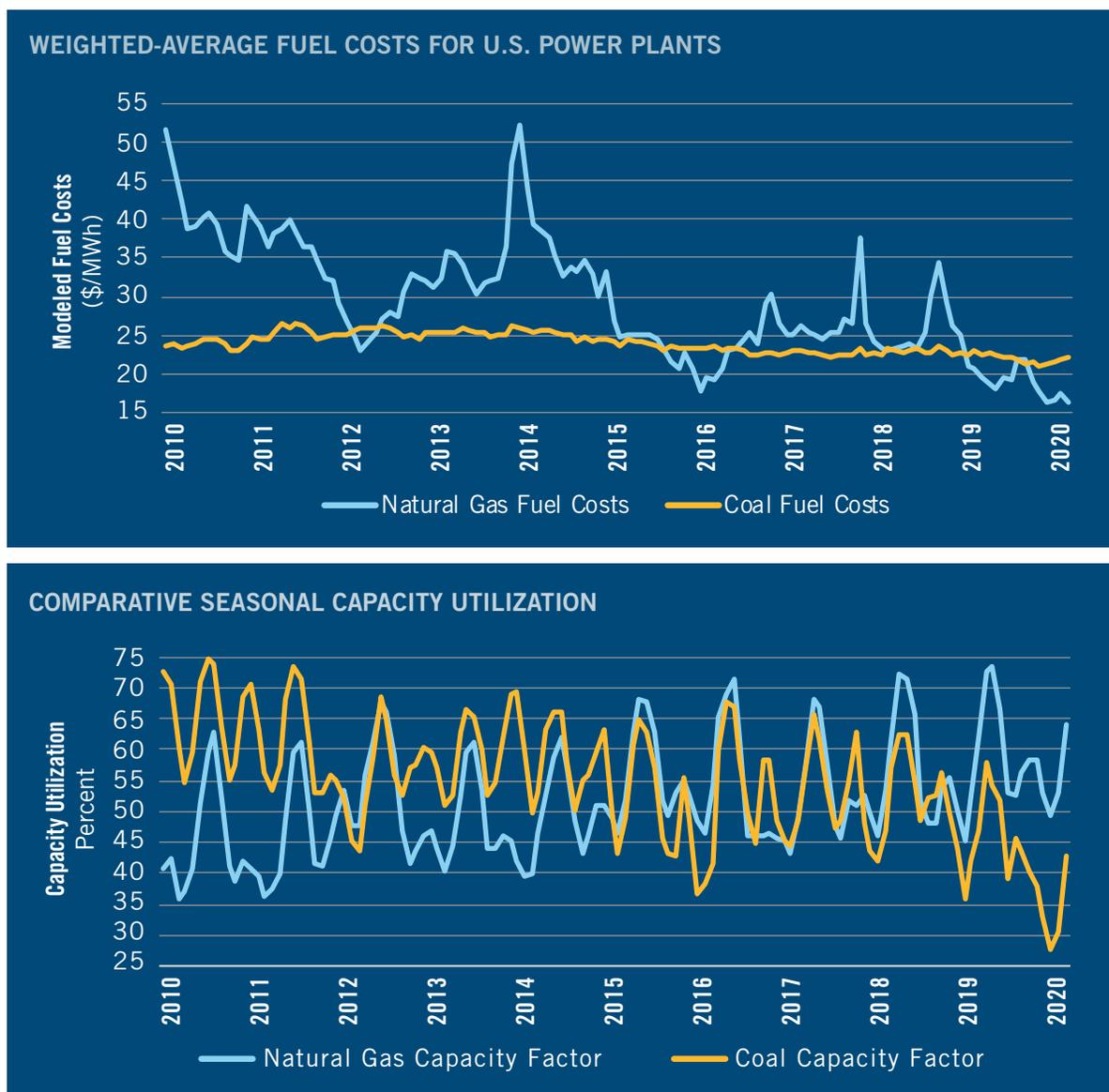
The year-to-date generation losses have largely been shouldered by U.S. coal-fired power plants. According to EIA, this segment of supply will fall a record -21% this year – contributing roughly the same amount of electricity generation as renewable resources and less than half the contribution of natural gas-fired power plants. While the market share for coal generation has been in a general downtrend since 2010, the pandemic has intensified fuel competition, thereby accelerating this development – possibly fast-forwarding what would have otherwise been a decade-long cycle of energy transition in the U.S. dispatch stack.



Source: EIA and CoBank estimates

Demand Contraction has Fueled More Intense Coal-to-Gas Switching

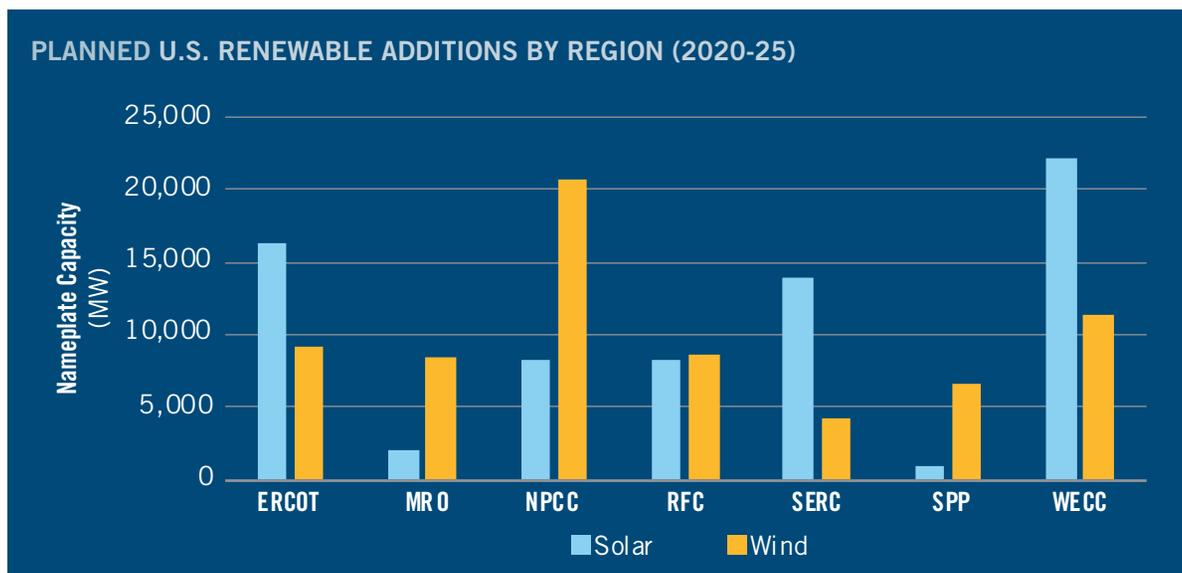
As displayed in the upper chart, the first half the past decade saw natural gas fuel costs dip below coal only infrequently. As a result, coal maintained its role as the dominant fuel source for U.S. generation. However, over the past five years, that dominance has waned with break-through shale technology ushering in a very long cycle of extraordinarily low natural gas prices. Beginning in 2015, natural gas-fired power plants have satisfied an increasing amount of electricity demand for longer periods of the day. The collapse in energy demand this year has resulted in surplus gas supply, amplifying this trend. With natural gas prices falling to their lowest level in 25 years, coal generation has been dramatically priced out of the electricity market in 2020. The lower chart clearly shows how this fuel competition has fundamentally altered plant utilization, with natural gas affirmatively taking on the role as the dominant source of U.S. generation.



Source: EIA and Hitachi ABB Power Grids

Renewable Investment Surges, Despite the Continued Contraction in Electricity Demand

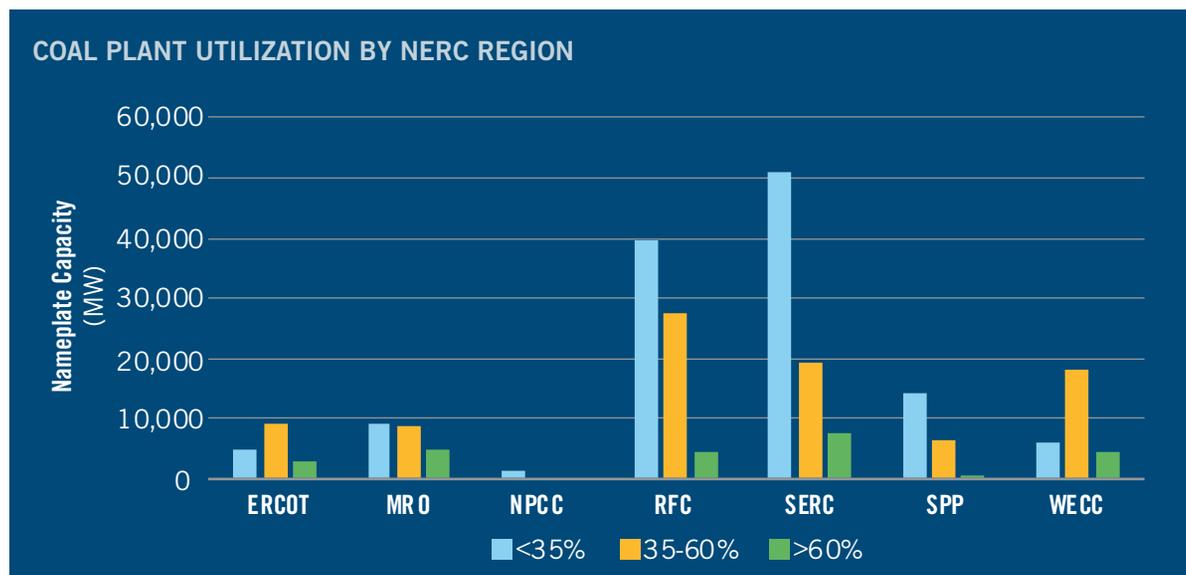
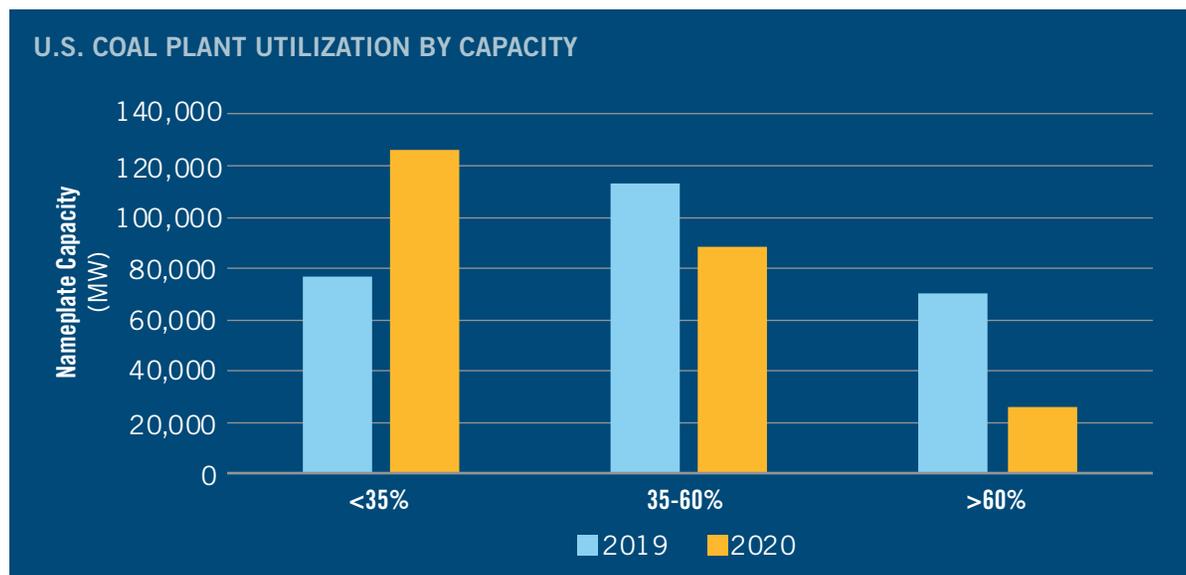
Investor pressure and the pandemic are having a profound effect on the future U.S. electricity resource slate. Certainly, parallels that can be drawn between the current COVID-19 pandemic and the existential threat of climate change. Even prior to COVID-19, a groundswell of structural change was narrowing the field for future fossil fuel use. Yet, the pandemic's economic fallout has helped catalyze a structural shift in fossil fuel use, accelerating the investment shift away from potentially stranded resources to a more pronounced wave of renewable development. Already, the pace of clean energy deployment has accelerated in 2020, with industry poised to add 20,000 MWs of new utility-scale renewable generation by year-end. This pace of resource development is roughly double what was achieved in the prior decade – providing greater certainty that 2020 is not an aberration but rather the beginning of the further greening in the U.S. power sector.



Source: EIA and Hitachi ABB Power Grids

Underutilization of Coal Plants will Accelerate Early Retirements

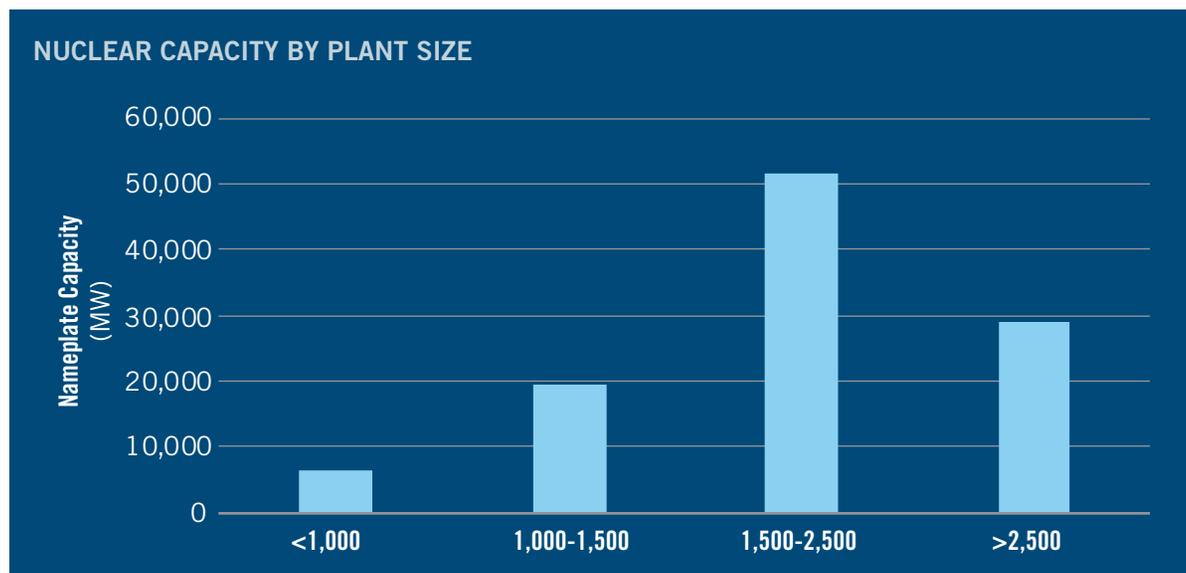
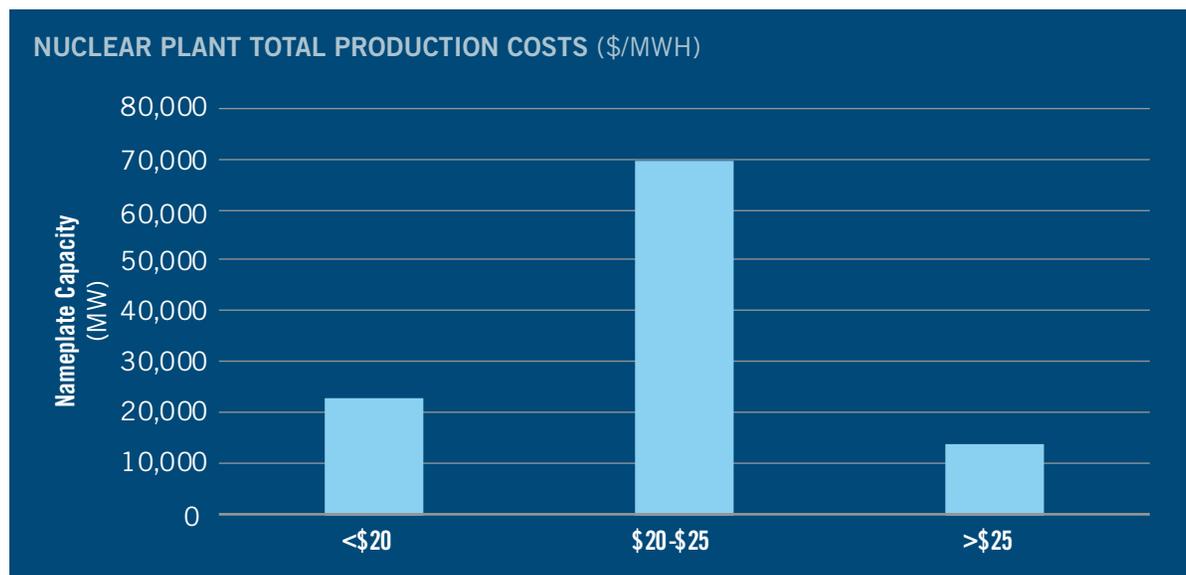
The reason why coal generation composed the dominant source of U.S. generation for much of the last century leading up until the past five years is that these plants could be operated economically to serve load for nearly every hour of the day. Then in about 2014, low gas prices and the increased adoption of renewable generation (or zero marginal cost resources) have upended the traditional economics of running coal plants round-the-clock. As a consequence, coal units are now being cycled or operated on a seasonal basis. This year's contraction in energy demand and the resulting drop in natural gas prices has only accentuated this trend. In the top graphic, 70,000 MWs of the 222,000 MWs of installed coal resources (or about one-third) had a capacity utilization factor in excess of 60% in 2019. Now, only 26,000 MWs or 12% of the fleet operates at such high frequency.



Source: EIA

Smaller, Less-Efficient Nuclear Plants are Also at Risk for Early Retirement

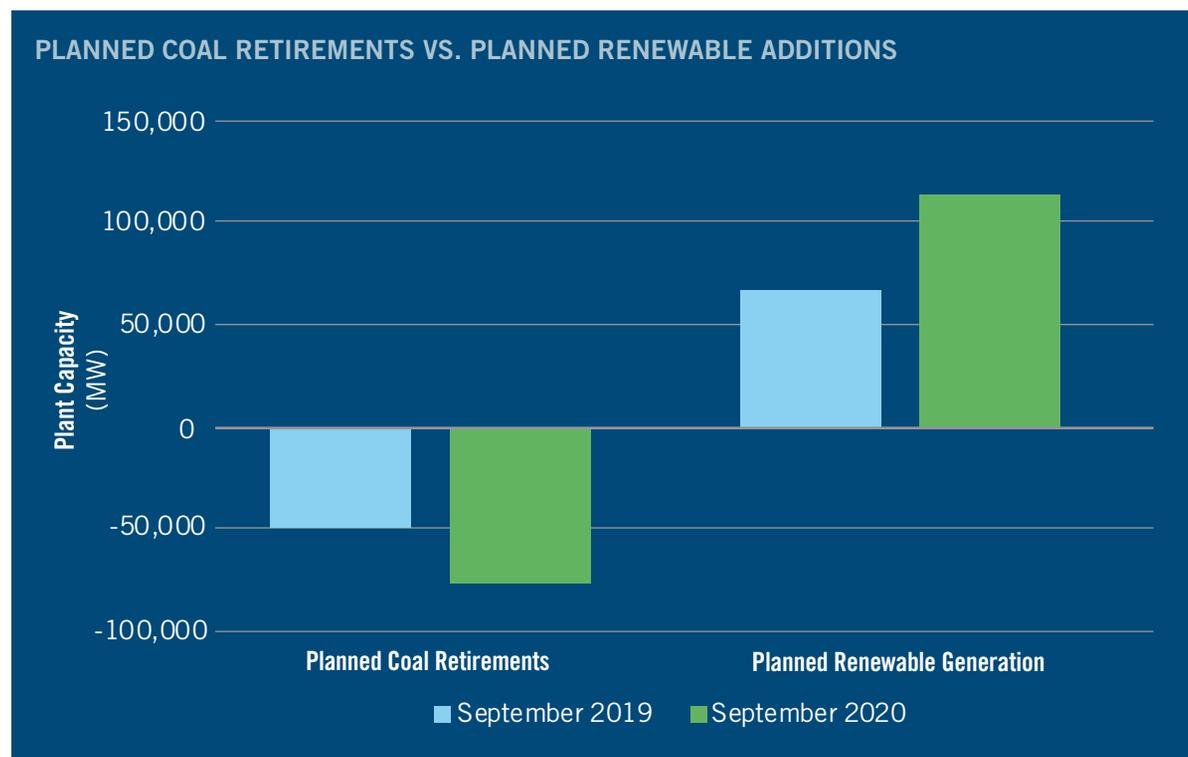
The same factors – declining revenues resulting from depressed load and low-cost natural gas – will similarly influence accelerated nuclear retirements. In the prior decade, states' policies extended a life-line for this segment. However, recent scandals have cast a gloom, possibly limiting the will-power of states to bail out higher-cost generation assets. Consequently, units operating in competitive markets will have limited opportunities to run this equipment 'out-of-merit' or have prices in excess of the competitive market. Based on our analysis, the smaller, single-reactor nuclear plants with high operating costs are particularly at risk. All told, this represents about 20,000 MWs of the current 98,000 MWs of operating capacity, or more than four-fold the 4,600 MWs of announced retirements by 2025.



Source: EIA

Twice as Many Coal Planned Retirements Coming in Half the Expected Time

To measure how COVID-19 and the prospects for accelerated energy transition are impacting investment, we look at EIA's assessment of planned coal retirements. Last year the agency anticipated that 48,500 MWs of coal plant capacity would retire over the span of the next decade. Now, however, they see 76,200 MWs will decommission with the bulk of the capacity shutting by 2025. This is almost twice as many retirements in half the expected time. During the same period, the agency's updated guidance for planned renewable generation additions has soared by 72%, rising from 67,800 MWs last year to 114,500 MWs now. Taken together, this newly-acknowledged "changing of the guard" is leading the shift away from the use of fossil fuels toward renewables and other forms of low-carbon energy.



Source: EIA

Summary

Many consequences arising from the COVID-19 pandemic for the U.S. power industry have been extreme – from demand destruction to more intense supply-side competition. When the dust settles on 2020, it appears that the industry will shed 2.6% of load compared to 2019. When added to the 2.7% 2019 demand losses, the industry has shed roughly a decade of growth.

Electricity suppliers can survive the impact of COVID-19, but the funding to fill the gap will ultimately have to come from somewhere. Securitization, rather than cost recovery, might be the best option for shoring up near-term

liquidity needs. Yet asset rationalization ultimately must occur. We believe that weak demand and a second wave of renewable development could drive >100,000 MWs of coal and nuclear power plant shutdowns by mid-decade. Indeed, coal and nuclear plant retirement might be further amplified by greater acceleration in clean energy deployment. The industry has never truly experienced energy transition. Yet, rising environmental concerns are setting the stage for new “climate math” where thermal displacement will open a wider door for renewable integration.