

The Renewable Future

Utilities winners and losers as U.S. goes green.

Morningstar Equity Research

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Green Monster: Renewable Energy Takes Over U.S. Investment, Generation Mix

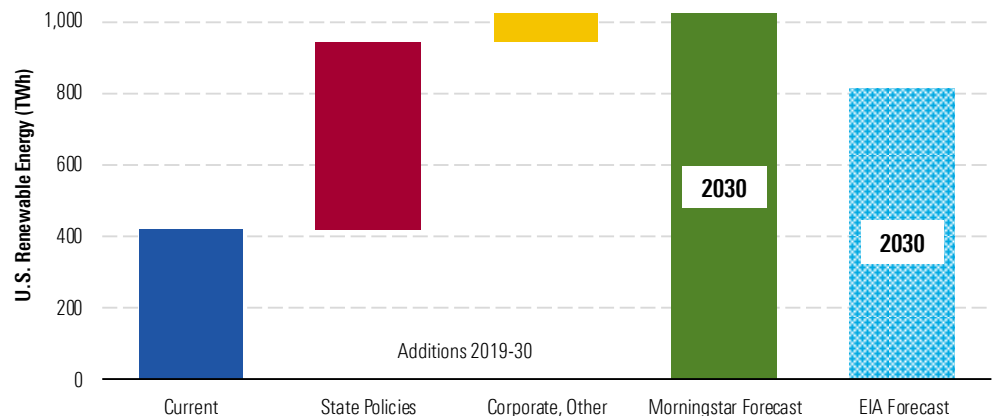
Renewable energy is still a small player in the U.S. energy ecosystem—just 10% of U.S. electricity sales and 7% of U.S. energy consumption, excluding hydropower. Oil, natural gas, nuclear, and even coal will keep us comfortable, charged, and on the go well into the next decade.

But we think renewable energy will grow up faster than consensus forecasts. U.S. renewable energy—mostly wind and solar—will climb 8% annually during the next decade, reaching 22% of total electricity generation in our forecast. Tech, consumer, and even oil and gas firms are rushing into renewable energy to establish sustainability cred, and politicians are greening up their resumes. Utilities that can harness this renewable energy growth will win big for investors; those that lack public support and struggle to execute will be left behind.

Renewable energy is also shifting the U.S. energy landscape: Natural gas is at risk. Coal and nuclear generation are reaching bottom and energy demand is stagnant, creating a zero-sum game between renewable energy and gas. Gas has a near-term advantage, but renewable energy is gaining strength. Texas, California, and New England will be early battlegrounds.

Related Research: [The Next Battle Royale: Natural Gas Vs. Renewables](#)

Morningstar: U.S. Renewable Energy Climbs 142% By 2030



Source: Morningstar, U.S. Energy Information Administration. Excludes large hydro.

Key Takeaways

1) Morningstar's 2030 U.S. Renewable Energy Forecast

We forecast that U.S. renewable energy will surpass 1,000 terawatt-hours by 2030, or 22% of U.S. electricity generation, excluding hydro (Exhibit 1a). The ramp-down in solar and wind tax credits during the next five years won't slow growth as much as others assume. State renewable energy portfolio standards and corporate purchases will fill the growth gaps. Our 8% CAGR in 2018-30 is higher than global growth rate forecasts and higher than the 5.6% forecast CAGR from the U.S. Energy Information Administration, which has a history of underestimating renewable energy growth (Exhibits 1b, 1c, and 1d).

2) Renewable Energy vs. Natural Gas

The cost gap between renewable energy and gas generation has closed (Exhibit 1e), and the technologies are fighting for new investment throughout the U.S. Renewable energy has a policy advantage and will grow faster than gas during the next decade. We think gas will continue to grow, but only at a 2% annual rate, down from 5% during the last decade. Gas' demise is beyond our forecast period, but solar and wind will knock gas off its throne in many areas of the country by 2040, based on current technologies and policies.

3) Solar Growth Underestimated

Solar is the key disrupter. Experts have consistently underestimated solar. A 2012 government-industry report suggested solar would struggle to reach 50 gigawatts and 11% of U.S. electricity demand by 2030.¹ Solar already has 40 GW operating and 37.9 GW in construction or backed with signed contracts, according to Wood Mackenzie. Module shipments are exceeding 1 GW per month.² With some 200 GW in U.S. grid operators' interconnection queues,³ solar could become the second-largest generation source behind natural gas in the next decade. Solar's load-matching profile makes it the biggest threat to natural gas, especially when paired with energy storage. In California, gas demand for power generation has fallen 30% since 2015, and the state's zero-carbon target could mean eliminating all gas use by 2045. The next big tests will be Florida and Texas, where gas generation dominates but solar has momentum.

1 United States Department of Energy. 2012. SunShot Vision Study. <https://www1.eere.energy.gov/solar/pdfs/47927.pdf>.

2 United States Energy Information Administration. October 2019. 2019 Monthly Solar Photovoltaic Module Shipments Report. https://www.eia.gov/renewable/monthly/solar_photo/pdf/renewable.pdf.

3 Lawrence Berkeley National Laboratory. 2018. Utility-Scale Solar: Empirical Trends in Project Technology, Cost, Performance, and PPA Pricing in the United States, 2018 Edition.

4) Wind Growth Overestimated

Wind growth estimates are too high. In 2009, the North American electric grid monitor forecast 256 GW of installed wind capacity by 2018, far above the 99 GW now in service.⁴ In 2015, the U.S. Department of Energy forecast that wind would hit 20% of U.S. electricity demand by 2030, well beyond what we think is possible. Wind bulls did not anticipate competing with natural gas for off-peak market share or solar for on-peak market share.

- ▶ Gas has the reliability advantage; wind has the cost advantage. This war has whacked off-peak power prices in Texas; spurred offshore wind in the land-constrained, gas-short Northeast; and led utilities to flip-flop investment between gas and wind.
- ▶ Cheap gas and reliability will vault gas generation to more than 40% U.S. market share by 2030. Cost-effective energy storage in development could boost wind and solar.
- ▶ We think offshore wind will be a financial, regulatory, and logistical albatross for early entrants. We plan to publish an offshore wind analysis in the coming months.

5) Policy Sets Floor for Renewable Energy Growth

We estimate that renewable energy will more than double by 2030 just to meet current government targets in 38 states and Washington, D.C. This represents most of our 10-year growth forecast after incorporating our state demand forecasts.⁵ We estimate that 32 states have not met their renewable portfolio standards (Exhibit 1f). New York (70% by 2030) and California (60% by 2030) represent one third of our RPS-based renewable energy growth estimate during the next decade. Michigan, New Jersey, Illinois, and Pennsylvania also require big investments. Six states and Washington, D.C. (2032) are chasing 100% RPS. We believe the renewable energy policy floor will keep rising.

6) Utilities Winners and Losers

Winners	Economic Moat	Moat Trend	Fair Value Estimate (\$)	Current Price (\$)	Uncertainty Rating	Morningstar Rating	Dividend Yield	Market Cap (\$Bil)
NextEra Energy NEE	Narrow	Stable	193.00	229.91	Low	★★	2.1%	112.4
Xcel Energy XEL	Narrow	Stable	46.00	63.49	Low	★	2.5%	33.3
First Solar FSLR	None	Stable	59.00	55.01	Very High	★★★	NA	5.8
CMS Energy CMS	Narrow	Stable	46.00	63.54	Low	★	2.4%	18.0
Edison International EIX	Narrow	Stable	68.00	69.84	Medium	★★★	3.4%	25.0
NiSource NI	Narrow	Stable	27.00	27.97	Low	★★	2.7%	10.4
Alliant Energy LNT	Narrow	Stable	44.00	52.29	Low	★★	2.6%	12.4
Losers	Economic Moat	Moat Trend	Fair Value Estimate (\$)	Current Price (\$)	Uncertainty Rating	Morningstar Rating	Dividend Yield	Market Cap (\$Bil)
NRG Energy NRG	None	Stable	33.00	39.52	High	★★	0.3%	10.0
Vistra Energy VST	None	Negative	21.50	27.00	High	★★	1.4%	13.3
Exelon EXC	Narrow	Stable	43.00	46.97	Medium	★★	3.0%	46.2

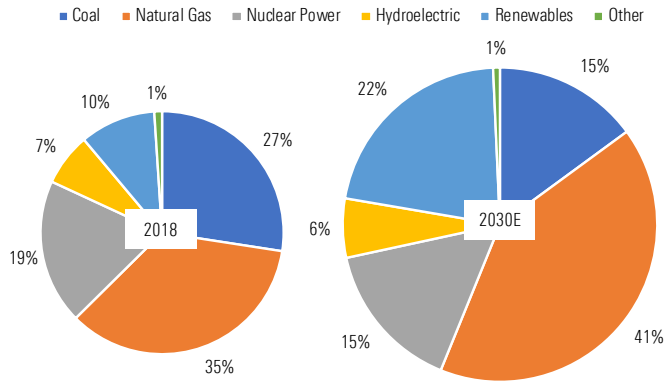
⁴ North American Electric Reliability Council. 2009. 2009 Long-Term Reliability Assessment.

<https://www.frcc.com/Reliability/Shared%20Documents/NERC%20Long-Term%20Reliability%20Assessments/LTRA2009.pdf>.

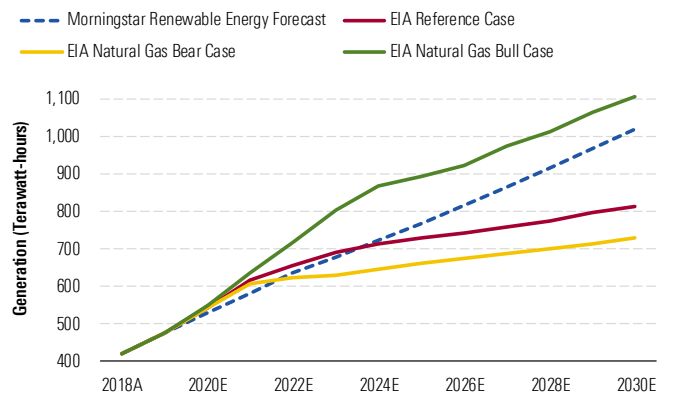
⁵ Our RPS forecast is technology-agnostic; assumes each state meets or is substantially on track to meet its headline RPS by 2030; and excludes states that have no RPS or have met their RPS. Renewable energy growth exceeding RPS or in states that have met their RPS or have no RPS is included in our overall forecast but not our RPS-based forecast. For our state demand forecasts, see [Can EVs, Pot, and Data Save Electricity Demand?](#) published November 2018.

Exhibit 1 Renewable Energy Growth Drives U.S. Power Generation Outlook and New Investment Opportunities

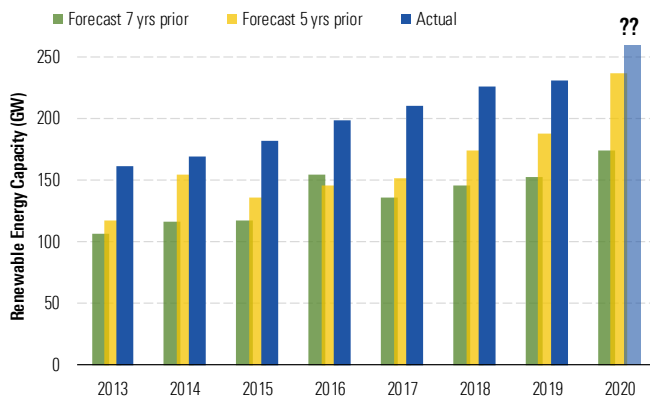
1a Morningstar: Renewable Energy Supplies 22% of U.S. Electricity Demand By 2030



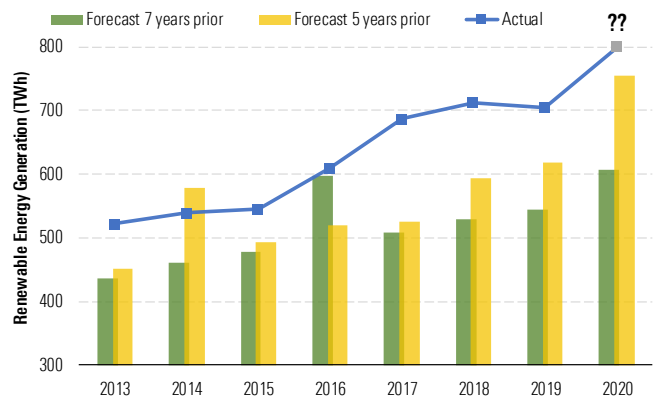
1b Morningstar: Renewable Energy Grows Faster Than EIA Reference Case



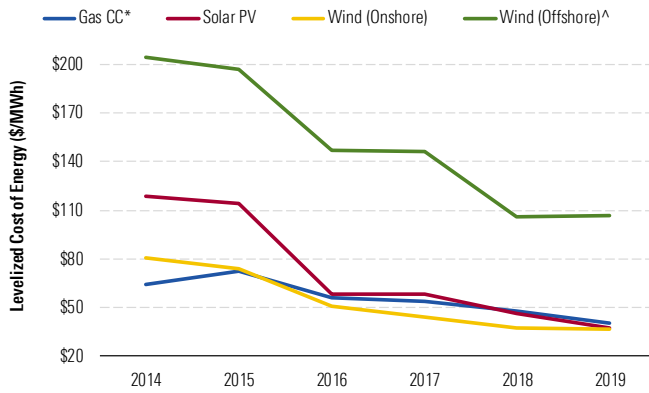
1c The EIA Consistently Underestimates Renewable Energy Capacity (GW) ...



1d ...and Generation (TWh), Especially Recently.

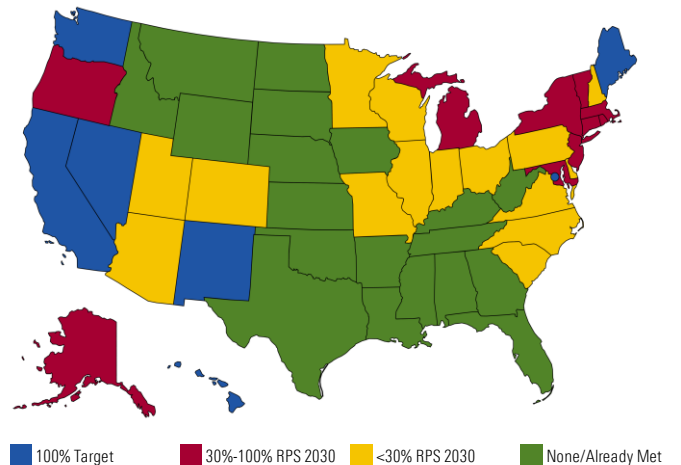


1e Wind and Solar Costs Converged With Gas Generation



Note: Total system with transmission. Capacity-weighted average 2016-19. Incorporates tax credits as in effect at the time of estimate. *Advanced Combined Cycle ^Simple average 2016, 2017

1f Many States Have Not Met Their RPS Targets



Utilities: Winners and Losers

Clear-Cut Winners

NextEra Energy, Xcel Energy, and First Solar should top any list of renewable energy winners within our coverage. This in part explains why NextEra Energy and Xcel Energy trade at substantial premiums to our fair value estimates as of mid-October. First Solar trades at a slight discount to our fair value estimate.

NextEra Energy (NEE)

Fair Value Estimate: \$193

Earnings Growth Forecast: 8%

As the largest wind power producer in the U.S., NextEra has proven itself to be a best-in-class renewable energy operator and developer. Management's continued execution on its Energy Resources development program leaves us confident that NextEra will deliver at the high end of its 11.5 GW to 18.5 GW development target in 2019 to 2022. Declining wind and solar costs position Energy Resources favorably during the next decade. NextEra's early entry into battery storage will further enhance its competitive positioning in the market. It has two first-of-its-kind wind-solar-battery projects in development, one in Oregon and one in Oklahoma.

NextEra's regulated utilities in Florida also are moving into renewable energy with state support. By 2030, the utility aims to install 10 GW of new solar capacity, of which the utility earns near immediate returns upon completion. The program would increase solar energy in Florida Power & Light's service territory to 20%, up from roughly 1% today. We forecast regulatory capital will increase 8% annually through 2023. On a consolidated basis, we forecast NextEra's annual earnings growth will reach the top end of management's 6%-8% range and annual dividend growth will average 14% through 2023.

Xcel Energy (XEL)

Fair Value Estimate: \$46

Earnings Growth Forecast: 6%

Xcel aims to be one of the industry's leading clean energy providers, with much of its \$20 billion planned investment during the next five years going to renewable energy. This investment plan gives investors a transparent runway of 6% annual earnings and dividend growth potential. However, Xcel's investment plan creates more regulatory risk than peers. It must continue to receive political, regulatory, and customer support for its clean energy investments, particularly in its largest jurisdictions, Colorado and Minnesota, where it plans to invest \$15 billion in 2019-23. Lower energy costs have helped keep customer bills mostly flat despite higher infrastructure charges. In the long run, we think Xcel's investment in renewable and clean energy could top \$1 billion per year to meet management's net-zero

carbon goal by 2050. Colorado and New Mexico are working on legislation that would require 100% carbon-free generation by 2050, supporting that long growth runway.

First Solar (FSLR)

Fair Value Estimate: \$59

Earnings Growth Forecast: 27%

First Solar is the only pure-play solar company in our coverage and is winning big contracts with key U.S. developers. North America now represents two thirds of its potential booking opportunities. But a surge in U.S. demand doesn't make First Solar a slam dunk investment. Module makers like First Solar differentiate on cost and conversion rate—modules' ability to turn sun into electricity. First Solar's thin-film technology gives it a slight advantage in both but not enough to warrant an economic moat. Maintaining margins and staying ahead of the competition will require First Solar to invest in new technology and production capacity. This is risky for investors. Strong demand for its Series 6 modules released in 2017 and its smooth production capacity expansion is a win for investors so far. Bookings in 2018 and 2019 leave First Solar effectively sold out through 2021 at current capacity. Investors must watch if First Solar can stay ahead of the technology curve and expand production enough to offset lower margins in an increasingly competitive market.

Up-and-Coming Winners

Most investor-owned utilities have yet to commit serious money to renewable energy. They own only 20% of U.S. wind projects and less of solar. The utilities below often don't make lists of renewable energy leaders, but we think they have the most renewable energy investment upside. The utilities that execute should reward investors with earnings growth and premium valuations.

CMS Energy (CMS)

Fair Value Estimate: \$46

Earnings Growth Forecast: 7%

Michigan's regulatory and political support gives CMS a transparent runway of earnings growth. CMS' electric integrated resource plan, or IRP, settlement in January 2019 and rate increases at its gas and electric businesses support our 7% annual earnings growth rate as long as regulators approve the bulk of CMS' proposed investments. The IRP supports CMS' five-year, \$11 billion investment plan, and we think that investment total will go higher as CMS invests more in renewable energy. CMS' growth focuses on electric and gas distribution and renewable energy. These projects are positives for shareholders because they align with energy policy in Michigan and are likely to gain regulatory and political support. The planned Palisades nuclear plant retirement in 2022 and Michigan's 15% renewable portfolio standard by 2021 necessitate near-term investment. We think CMS can approach 25% renewables in the coming years with regulatory support.

Edison International (EIX)

Fair Value Estimate: \$68

Earnings Growth Forecast: 6%

Despite the California policy risk overhang, Edison has growth opportunities that would make most utilities jealous. With plans for \$5 billion of annual capital investment and good regulatory support, we think Edison can average 6% annual earnings growth on a normalized basis. Most of Edison's growth investment is not directly in renewable energy but in all of the infrastructure upgrades that will be

needed to support California's quest for 100% renewable energy. Growth investments also will address California's aging core infrastructure and support for next-generation energy services, such as electric vehicles, distributed generation, and energy storage.

Regulators have approved much of Southern California Edison's \$10 billion capital investment plan in 2019-20. In September, Edison presented a plan that would continue \$5 billion of annual investment through 2023. We think state policies and initiatives give Edison a good case to gain regulatory support for its investment plan. In the near term, Edison's growth could be lumpy as regulatory delays, wildfire issues, and California energy policy changes lead to shifts in spending and cost recovery. Edison's \$2.4 billion contribution to the state wildfire insurance fund in 2019 will dilute earnings in 2019-20 before growth picks up. Dividend growth might lag earnings in the near term.

NiSource (NI)

Fair Value Estimate: \$27

Earnings Growth Forecast: 6%

Even though just one third of NiSource's earnings come from its electric business, it is at the center of the struggle between renewable energy and natural gas generation in Indiana. Indiana regulators are assessing NiSource's long-term resource plan calling for retiring 80% of its coal generation by 2023 and all of it by 2028. NiSource plans to replace this with a combination of wind, solar, and battery storage, all at lower costs than fossil-fuel options. Its seven-year, \$1.2 billion investment program at its electric utility helps support this surge in renewable energy. On Oct. 1, NiSource's Indiana electric utility, Nipsco, requested proposals for 2.3 GW of solar and energy storage and expects to sign contracts in 2020.

Companywide, NiSource plans to invest about \$30 billion in infrastructure improvements during the next 20 years, more than half of which are modernization programs for replacing steel and cast iron pipe with plastic at its natural gas distribution utilities. Special rate treatment for most of these investments helps ensure NiSource earns its allowed returns. Across its entire system, NiSource has rate trackers for roughly 75% of planned capital expenditures, providing recovery of investments in less than 12 months. As a result of the favorable regulation, NiSource has stepped up its capital expenditures to almost \$2 billion per year over the next five years, almost double its annual investment the last five years.

Alliant Energy (LNT)

Fair Value Estimate: \$44

Earnings Growth Forecast: 6%

The Upper Midwest utility is planning \$7 billion of investment during the next five years and is eyeing another \$5.7 billion beyond 2023. Much of that is going to renewable energy, and regulators are pushing in that direction. Interstate Power and Light in Iowa received approval for 1,000 megawatts of wind generation with an 11% allowed return, almost 200 basis points higher than most U.S. utilities earn. IPL has placed into service 470 MW and is on track to install the remaining 530 MW by the end of 2020. The wind generation will help offset the planned power purchase agreement retirement of the Duane Arnold Energy Center. At Wisconsin Power and Light, management has identified 200 MW of new wind projects. Alliant benefits from operating in what we consider two of the most favorable regulatory jurisdictions. To maintain earned returns near allowed returns during this period of high investment, management has reduced regulatory lag by working with regulators on unique rate structures.

Utilities at Risk

Any company that owns coal, nuclear, or gas generation outside of a cost-of-service rate framework is at risk of losing market share and earnings. Most large utilities have exited the merchant generation business during the last half-decade. Here are the three primary ones remaining:

NRG Energy

The renewable energy buildout in the eastern U.S.—especially solar—is going to shrink margins for NRG's legacy coal, nuclear, and gas generation. In the mid-Atlantic and Northeast, nuclear subsidies also hurt NRG's competitive position. In Texas, we expect wind and solar to start stealing share from NRG's legacy coal, nuclear and gas generation. Our forecast for 1.4% annual demand growth in Texas during the next decade won't be enough to offset 38% renewable energy growth on a capacity-weighted basis in the next three years, according to the most recent grid operator's report. NRG's growing retail business will help offset the weak outlook for its generation business. Retail earnings could surpass generation earnings as soon as 2020 based on recent retail acquisitions and weak energy prices. Falling renewable energy costs and more retail demand for renewable energy could boost retail margins, but we don't think it will be enough to offset the drop in generation margins.

Vistra Energy

Vistra became one of the largest fossil fuel generators in the country, with 41 GW of nuclear, coal, and natural gas generation after acquiring Dynegy in 2018. But like NRG, falling renewable energy costs in its core Texas, Northeast, and mid-Atlantic markets are a big long-term risk. One early sign: Vistra retired three coal plants in Texas in 2018 and plans to retire five coal plants in Illinois. Texas leads the U.S. in wind energy, and Illinois ranks sixth. Vistra has offset some of its wholesale energy market exposure by growing its retail energy business. Its 2019 acquisitions of Crius Energy (\$436 million) and Ambit Energy (\$475 million) will boost retail earnings to about one third of consolidated earnings. This could result in more stable cash flows and more share buybacks. Vistra is eyeing renewable energy and battery storage opportunities, but earnings from those projects are many years out.

Exelon

The largest nuclear operator has protected most of its earnings downside with state subsidies covering most of its generation. If wind and solar continue to exceed growth expectations in Illinois and New York, state subsidies might not be enough to save nuclear in the next decade. Huge sunk costs, low variable costs, and high reliability factors give nuclear an advantage. But maintenance investment is a big risk. Any large capital outlays could lead to plant shutdowns. Carbon caps would be a near-term lifeline, but it also would boost renewable energy economics. As Exelon directs more investment to its regulated distribution businesses and even renewable energy, its nuclear fleet share of earnings will continue to fall. We expect its regulated utilities to produce all the earnings growth for the foreseeable future and surpass generation earnings within the next two years.

Eastern U.S. Outlook

Eastern U.S.: Morningstar Forecast RPS-Based Growth

States with RPS	Current		2030 RPS Forecast		
	In-State Renewable Energy	% Retail Sales	New RPS Renewable Energy Need	Total RPS Renewable Energy	% Retail Sales
New York	6,625	4%	102,038	108,663	70%
New Jersey	1,920	3%	38,272	40,192	50%
Maryland	1,381	2%	31,239	32,620	50%
Michigan	7,195	7%	31,093	38,288	35%
Illinois	13,954	10%	23,404	37,358	25%
Pennsylvania	5,203	4%	23,063	28,266	18%
Virginia	3,297	3%	16,185	19,482	15%
Massachusetts	2,667	5%	19,102	21,769	40%
Connecticut	897	3%	11,990	12,887	44%
Washington, D.C.	NM	NM	10,345	10,345	85%
North Carolina	8,980	7%	9,446	18,426	12%
Maine	3,718	32%	6,201	9,919	80%
Ohio	2,452	2%	4,754	7,206	5%
Indiana	6,593	7%	4,631	11,224	10%
Delaware	97	1%	3,063	3,160	25%
Vermont	940	17%	2,760	3,700	65%
Rhode Island	446	6%	1,959	2,405	31%
New Hampshire	1,930	18%	1,086	3,016	25%
South Carolina	1,477	2%	394	1,871	2%
Wisconsin	2,728	4%	354	3,082	4%
Eastern U.S. State RPS	72,500	5%	341,379	413,879	26%
U.S. State RPS	261,268	11%	520,425	781,693	30%

Based on current policy, excluding large hydro. State RPS totals exclude states with no RPS or that have already met RPS: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Tennessee, West Virginia. All figures in TTM gigawatt-hours (GWh).

Source: Morningstar, EIA, other.

New England

The combination of aggressive RPS, a 75%-80% carbon emissions reduction goal by 2050, and constrained land poses a big challenge for the region's utilities, such as Eversource Energy, National Grid, and Avangrid. All six New England states are well behind the pace they need to reach their RPS, and politicians keep raising the bar. Not-in-my-backyard opposition is compounding problems. Eversource Energy's Northern Pass transmission line would have brought 1,090 MW of clean energy from Canada into the region, but New Hampshire effectively nixed it in 2018. Now New Hampshire is eyeing a carbon price scheme to help achieve its 25% RPS by 2025. Massachusetts has topped its solar goal with 2.5 GW installed, but it has a tough path to its 40% total RPS by 2030 just as Connecticut (48%) and Maine (80%) have tough RPS goals to reach by 2030. Grid modernization and battery storage could be long-term solutions, but for now the region is making a big bet on offshore wind.

Offshore wind: New England will set the bar for offshore wind (Exhibit 2). Estimates suggest the region could support 50 GW,⁶ potentially twice as much as New England's electricity demand.⁷ Massachusetts legislation in 2016 revived offshore wind after the lackluster debut of Rhode Island's 30 MW Block Island wind farm, the only operating U.S. facility. The 800 MW Vineyard Wind I (equal owners Avangrid and Copenhagen Infrastructure Partners) could be next if it can resolve permitting issues. A subsequent Massachusetts law signed in August requires the state to buy 3,200 MW of offshore wind by 2035. Bids are in for a second solicitation totaling up to 800 MW. Subsequent solicitations could come in 2022 and 2024. Connecticut (300 MW) and Rhode Island (400 MW) are supporting a proposed Revolution Wind project (Orsted and Eversource Energy). A new Connecticut law authorizes another 2,000 MW by 2030. The first 400 MW up to 1,200 MW could be awarded as soon as November. Maine joined the group with a 12 MW project planned.

Exhibit 2 Offshore Wind Key to New England States Meeting RPS

State	Approved/ Committed (MW)	Operating	Contracted	Current/Future RFP	State RPS
Connecticut	2,300		Revolution Wind (304 MW)	2,000 MW	44% (40% Class I)
Maine	12		Aqua Ventus (12 MW)		80% by 2030
Massachusetts	3,200		Vineyard Wind (800 MW)	2,400 MW	est. 30%
Rhode Island	430	Block Island (30 MW)	Revolution Wind (400 MW)		38.5% by 2035
New Hampshire				Government study	25%

Source: Company report, state reports, Morningstar.

Prices for the projects are rich but effectively irrelevant if the region is going to meet its obligations. Vineyard Wind priced its contracts at \$65/MWh (2017\$) in May 2018. The next round of projects will probably require higher prices since they won't qualify for the full federal wind tax credit. Rhode Island regulators approved a 20-year contract at \$98.40/MWh nominal (\$74/MWh in 2017 dollars) for its share

⁶ Krapels, E. 2019. Transmission to Scale Offshore Wind in Massachusetts and New England.

<http://www.raabassociates.org/Articles/Krapels%20Presentation%20Final%20for%20printing%209.27.19.pdf>.

⁷ Assume 60% offshore wind capacity factor. ISO New England served 123,307 GWh in 2018; 28.13 GW all-time peak load in August 2006.

of the Revolution Wind project. Connecticut hasn't disclosed its contract prices, but reports suggest they are higher than Rhode Island's. We plan to publish an offshore wind analysis in the coming months.

New York & New Jersey

New York has the most aggressive renewable energy growth plan behind California. We estimate the state will have to add 100 TWh of renewable energy during the next decade—nearly one third of all U.S. renewable energy right now—to meet its 70% Clean Energy Standard by 2030. This must happen quickly as the state closes its last two coal plants in 2020 and its largest nuclear plant, Indian Point, in 2021. New York City utility ConEd should benefit from distribution upgrades and solar investment opportunities. But the likely jump in customer bills from already-high levels will make regulators stingier about raising rates to pay for infrastructure. Reliability will be another factor.

New Jersey also has a tough 50% RPS by 2030 and offshore wind requirement as part of 2018 legislation. That means plenty of growth opportunities for the state's largest utility, Public Service Enterprise Group, which recently pledged to be net-zero carbon emissions by 2050.

Offshore wind: In mid-July, New York passed legislation that mandates 9,000 MW of offshore wind by 2035, up from 2,400 MW by 2030 in its 2015 energy plan. The new goal will cost more than \$40 billion, including transmission, based on our analysis of estimates from New York officials. The success or failure of these early projects will determine whether offshore wind is here to stay or a passing fad. The state recently awarded 1,700 MW of offshore wind contracts to Sunrise Wind (880 MW, Eversource and Orsted) and Empire Wind (816 MW, Equinor). The 130 MW South Fork project (Eversource and Orsted) also is in the works. New Jersey must reach 3,500 MW of offshore wind by 2030 and has one project in the works, Orsted's 1,100 MW Ocean Wind. We plan to publish an offshore wind analysis in the coming months.

Florida

In the Sunshine State, natural gas should beware—solar is marshalling support. Gas' surge during the last decade cut coal's share of power generation in Florida to 12% from 25%. Only 7.8 GW of coal capacity remains, and it is shrinking. Natural gas fuels 70% of state power generation, up 23% since 2014. But that could be where gas peaks. Even though Florida has no RPS—legislation in 2009 never passed and utilities have opposed subsequent efforts—solar is booming. Florida now has 2 GW of solar, and its largest utility, NextEra's FPL, has pledged 10 GW of new solar by 2030. FPL estimates that solar would represent 20% of its systemwide electricity demand, corresponding with 5% of the state's total demand. Other large utilities, such as Duke Energy's Progress and Emera's Tampa Electric, have solar growth plans that could lift Florida to near the top of the solar leaderboard in the next decade.

Carolinas

North Carolina's 4 GW solar fleet is the second largest in the country behind California, and the state is poised to challenge Florida and California as the top place for solar investment. Corporates are driving the growth. We estimate another 2 GW of corporate-contracted projects will come on line in the next few years. Google recently signed contracts for 230 MW of solar in North Carolina and South Carolina.

North Carolina's coherent solar market structure—and the state's recent moratorium on wind projects—is driving solar growth. The state's 2017 Competitive Energy Solutions law supports the regulated utilities while allowing customers to sign contracts with third-party renewable energy suppliers (see below). Duke Energy has been leading the charge, connecting 500 MW of new solar in 2018 and receiving approval for its Green Source Advantage program, which will support another 600 MW. Duke's efforts in the Carolinas and Florida led it to commit to cutting its electric generation carbon emissions in half from 2005 levels by 2030 and commit to net-zero carbon emissions by 2050. This should turn out well for investors, too, with clean energy investments helping support our 5% annual earnings growth rate estimate the next five years.

And don't count out wind, despite the policy uncertainty. North Carolina has among the best offshore wind resources of any state in the eastern U.S., according to the National Renewable Energy Lab. Avangrid has leased an Outer Banks tract that could support 2.5 GW of offshore wind, one of the largest in the country. South Carolina has good offshore wind potential, but state leaders are still smarting from the new nuclear debacle, and we expect they will be hesitant to take on another multibillion-dollar utility project such as offshore wind.

Southeast Heartland

Renewable energy is not part of the energy plans for Alabama, Arkansas, Georgia, Kentucky, Mississippi, Tennessee, and Louisiana, none of which have renewable energy requirements. Too many jobs and too much money is tied up in the region's coal-to-gas effort. However, interest is sprouting. Google has contracted some small projects in the region. Republican-led federal legislation with support from politicians in the Southeast (The American Energy First Act) would expand oil and gas drilling in states like Louisiana and ease siting regulations for onshore and offshore renewable energy. Including renewable energy in contentious legislation could boost investment in states with weak or no renewable energy interest. Check back next decade.

Mid-Atlantic

Corporates in data alley want renewable energy, and they want it freaky fast. So do politicians. Virginia's Democratic Gov. Ralph Northam signed an executive order on Sept. 17 that includes a goal of 30% renewable and nuclear energy by 2030 and 100% by 2050, surpassing the 15% by 2025 RPS goal passed in 2007. The order also calls for 3 GW of solar and onshore wind by 2022 and 2.5 GW offshore wind by 2026. Virginia has less than 500 MW of solar right now. A renewable energy industry study suggested the state would need 40 GW of wind and solar, and 20 GW of energy storage by 2050 to reach the zero-carbon goal without raising customer bills.⁸ This is aggressive in the short run, but it demonstrates how falling renewable energy costs can produce earnings growth for utilities without rate increases.

Northam's order isn't likely to become law, since Republicans control the state Legislature, but we expect it to guide policy as if it is law. This will set off a scramble among utilities and renewable energy

⁸ The Greenlink Group. 2019. Virginia's Energy Transition. <https://info.aee.net/va-energy-transition-report>.

developers, who have tussled for several years. We think Dominion Energy's large service territory and access to capital gives it an advantage as it competes for renewable energy investment opportunities. It also is well-positioned to work with corporates if it can resolve regulatory hangups.

Just two days after Northam's order, Dominion proposed three 880 MW offshore wind farms, all but locking in rights to the offshore wind requirement. If it completes all three phases by 2026, it would be the largest U.S. offshore wind project. But it won't be cheap—we estimate at least \$6 billion. Dominion's size makes it one of the few in the world that could take on a project this size. Still, we think Dominion will need broader political, regulatory, corporate, and financial support before it starts development.

Maryland also recently upped its renewable energy target to 50% by 2030, but not without political drama. Republican Gov. Larry Hogan refused to sign the legislation, arguing it didn't go far enough. He wanted 100% clean energy (including nuclear) by 2040. We expect solar to be a big winner given Maryland's land constraints and a 14.5% solar RPS carve-out. The state also has been trying to jump into offshore wind for more than six years, even offering \$1.7 billion of subsidies in 2013 legislation. But the state's first project, Orsted's 120 MW Skipjack, won't be on line until 2022 at the earliest.

Midwest

Gas won't feel a pinch from renewable energy in the Great Lakes region until later next decade, but we see it coming. Coal is falling from more than half of total generation toward one third of generation around the region. States like Michigan and Illinois have aggressive RPS.

- ▶ In Illinois, coal will be less than one third of total generation after Vistra shuts down four coal plants this year. Natural gas generation has tripled and renewable energy has doubled during the last decade to take coal's place. But fading coal, subsidized nuclear, and the state's 25% RPS by 2025-26 means renewable energy will start competing with those new gas plants. Illinois' large generation net export position will protect gas generators in the near term while renewable energy grows.
- ▶ Michigan is in a similar spot with its historically coal-heavy generation fleet shrinking. Its 35% RPS by 2025 could require 31 TWh of new renewable energy, 7% of current U.S. renewable energy generation. The 6 TWh of nuclear generation Michigan will lose when the Palisades nuclear plant closes in 2022 will give gas a respite for several years. Renewable energy is a key part of CMS Energy's \$11 billion investment plan. DTE Energy is not far behind.
- ▶ Wisconsin's utilities are investing in gas and renewable energy to replace retiring coal and nuclear. The state's first large solar farm (150 MW; 500,000 panels; 800 acres) will go near NextEra Energy's Point Beach nuclear plant, an ominous sign for a plant just down the road from the recently shuttered Kewaunee nuclear plant. Madison Gas & Electric has pledged to be carbon-free by 2050. Alliant and WEC Energy have big investment plans in gas and renewable energy.
- ▶ Ohio's gas generators and utilities are in a precarious spot. New legislation nixed the state's RPS (good for gas) but subsidizes coal and nuclear (bad for gas). Gas should keep its market share with renewable energy sidelined, but gas' middle-seat position will result in little new development. Gas could be a big loser if Ohio's large industrial customers start to favor renewable energy. Investors in the state's large utilities like American Electric Power and FirstEnergy face the most risk with renewable energy and gas

generation growth likely to lag in the state. We expect each utility to focus growth investment outside of Ohio until the state formulates a clear energy policy direction.

- ▶ Indiana is on track to meet its soft 2025 RPS and coal still has a long way to fall before gas and renewable energy clash. The state has great wind resource, but solar is making competitive inroads. New project requests in 2019 would lift solar from 354 MW as of mid-2019 to more than 3,000 MW in the next few years. See our NiSource profile.

Western U.S. Outlook

Western U.S.: Morningstar Forecast RPS-Based Growth

States with RPS	In-State Renewable Energy	% Retail Sales	2030 RPS Forecast		
			New RPS Renewable Energy Need	Total RPS Renewable Energy	% Retail Sales
California	57,146	23%	100,270	157,416	60%
Nevada	8,595	23%	13,107	21,702	50%
Oregon	7,506	16%	13,090	20,596	40%
Washington	7,150	8%	7,392	14,542	15%
Arizona	5,885	8%	7,202	13,087	15%
New Mexico	7,462	31%	6,030	13,492	50%
Minnesota	13,393	20%	4,924	18,317	26%
Colorado	11,432	20%	4,103	15,535	25%
Missouri	3,069	4%	3,973	7,042	8%
Oklahoma	27,064	43%	3,623	30,687	43%
Kansas	19,369	48%	3,545	22,914	50%
Alaska	82	1%	3,352	3,434	50%
Utah	3,555	11%	3,343	6,898	20%
Hawaii	1,204	13%	2,784	3,988	40%
North Dakota	10,791	53%	1,579	12,370	53%
South Dakota	2,792	22%	415	3,207	22%
Montana	2,273	15%	314	2,587	16%
Western U.S. State RPS	188,768	20%	179,045	367,813	36%
U.S. State RPS	261,268	7%	520,425	781,693	19%

Based on current policy, excluding large hydro. Excludes states with no RPS or that have already met RPS: Idaho, Iowa, Nebraska, Texas, Wyoming. All figures in TTM gigawatt-hours (GWh).

Source: Morningstar, EIA, other.

California

Gas is already clinging to life in California, where policy momentum favors renewable energy, especially solar. Not only is the state working toward 60% renewable energy by 2030, it's targeting 100% carbon-free energy by 2045. This would eliminate natural gas, even for heating and cooking. Berkeley, Calif., recently banned natural gas for any new homes or buildings in the city. The state's rooftop solar requirement for all new homes makes electric appliances a no-brainer. San Francisco is discussing 100% renewable energy by 2030 for all large commercial property.

California's renewable energy challenge will become more difficult in the next decade. California has been tapping neighboring states' solar and wind to keep its renewable energy lead — Arizona, Nevada, and Oregon are all energy net exporters. But California's neighbors increasingly will have to keep their solar and wind to meet their own state RPS, notably Nevada's new 50% requirement. California's in-state renewable generation is just 23% of retail sales as of mid-2019. It has tried to merge its electric grid with the Western region grid to tap more energy resources, but its attempts have failed.

Solar is the primary solution. California alone will almost double current U.S. solar generation, including small-scale, during the next decade to meet its 2030 goal. Wind won't make a dent. California's 5 GW of in-state wind capacity ranks it in the bottom half of all states as a percentage of retail sales. California's carbon-free quest also means more electric vehicles, creating an even greater need for renewable energy.

The state's three investor-owned utilities — Sempra Energy, Edison International, and PG&E — aren't likely to build or own the actual generation, but they have a big opportunity to invest in modernizing the distribution network to handle large amounts of intermittent generation, rooftop solar, and electric vehicles. Energy storage is a big investment opportunity with state policy support. Energy management services to help customers transition from gas to renewable energy are another business opportunity outside the regulated utilities. See our profile on Edison International.

We think California's renewable energy experiment is a risk for the entire renewable energy industry. The state's deregulation debacle in the late 1990s led many states to scale back or eliminate plans to deregulate. If California runs into financial or energy reliability problems, other states might temper their renewable energy enthusiasm.

Colorado

Colorado wants to play with the renewable energy big boys, and Xcel Energy is helping it grow up fast. The Colorado Energy Plan, which supports \$1 billion of investment the next few years, is the near-term hallmark of Xcel's steel-for-fuel strategy. The state is now considering legislation that would require 80% carbon reduction by 2030 and carbon-free generation by 2050. Xcel's 600 MW Rush Creek wind farm, which will be the largest in the state, represents some \$900 million of investment and increases the state's wind generation by 20%. Xcel's projects are helping develop a wind manufacturing base in the state, which should support even more wind growth.

Central Plains

No surprise, the "Wind Alley" states were first movers in wind energy and continue to be leaders. The Central Plains states, along with Wyoming and Montana, produced 40% of all U.S. wind generation during the last 12 months. Iowa, Oklahoma, Kansas, Montana, and the Dakotas have blown through their RPS. Minnesota is within striking distance of its 2020 and 2025 requirements. Transmission development in the region sets the stage for continued growth. Two transmission lines that Xcel Energy built between the Dakotas and Minnesota support development of an additional 3.6 GW of wind. And there is plenty of opportunity to grow the region's wind generation fleet. The region's grid operator, Midcontinent Independent System Operator, reported wind generation averaged only 4 GW this summer and peaked at 12.5 GW, only about 10% of the system's peak demand.

- ▶ Iowa's 8.8 GW of nameplate wind capacity at the end of 2018 is second to Texas. Oklahoma at 8.1 GW is close behind. But Iowa's concentration of wind generation is most impressive. Iowa's 7.6 kilowatt-hours of wind generation per person during the last 12 months is almost three times as much as Texas' wind generation per person. In terms of wind capacity, Iowa has 1 MW of wind capacity for every 6.4 square miles compared with 1 MW for every 10.3 square miles in Texas.
- ▶ In South Dakota, regulators have approved eight wind projects totaling 700 turbines and \$2.6 billion of investment in the last 12 months. Two more projects totaling 188 turbines and \$640 million of investment are in the final approval stages. Xcel Energy is benefiting.
- ▶ In Utah, Berkshire Hathaway's PacifiCorp subsidiary Rocky Mountain Power recently submitted a 20-year plan to add 3.5 GW of new wind and 3 GW of new solar by 2025. Across PacifiCorp's six-state territory, it plans to retire 16 of its 24 coal plants by 2030. Retiring old generation capacity and building new renewable energy capacity should produce earnings growth for Berkshire Hathaway Energy.
- ▶ Wyoming is set to be home to the largest U.S. wind farm, the 3 GW Chokecherry and Sierra Madre project on oil maven Phil Anschutz's ranch. Its 1,000 turbines will cost \$5 billion plus another \$3 billion for a 730-mile transmission line to California on line by 2025. Anschutz hopes to sell to California utilities at premium prices as the state tries to meet its 100% RPS. The project could produce 12 TWh per year, representing 5% of California's electric demand.

Southwest

A plethora of sun and wind in the Southwest U.S. makes it easy for Arizona, New Mexico, and Nevada to attract renewable energy. We estimate the three states need only about 10 TWh, or 7% of our combined 2025 demand forecast for those states, to meet their RPS. Renewable energy is sure to grow well beyond the states' RPS requirements due to corporate demand and rooftop solar now that the states have resolved policy issues. The states' high electricity demand growth gives gas plenty of near-term safety despite solar and wind penetration.

Northwest

The Northwest is blessed with good hydro and wind resources, giving most states a high share of renewable energy when including hydro. Policymakers won't disrupt that advantage, and the wind buildout—operating and planned—will be saturated in the next few years. Solar will have trouble making inroads. Thus, we don't expect a huge boom in renewable energy beyond projects already in the works. Oregon's largest electric utility, Portland General, already gets 40% of its energy from carbon-free

sources and isn't planning to add much renewable energy as part of its 2019 integrated resource plan. Energy storage, like NextEra's wind-solar-battery project in the region, would give wind and solar a second wave of growth if it proves cost-effective.

Texas

Even though Texas long ago passed its 1999 goal of 10 GW of renewable energy by 2025, we think solar growth will make it one of the most exciting markets to watch during the next decade. Texas had just 2 GW of utility-scale solar capacity as of June, representing less than 2% of the state's 125 GW total generation capacity. But we think solar will be the most disruptive generation source during the next decade based on planned projects reported to the U.S. Department of Energy and increasingly attractive economics. Wind hasn't dented the state's reputation as an oil and gas safe haven, but solar could.

Currently, wind and gas dominate the energy mix in Texas. Wind capacity has grown to 25 GW, triple the next-highest state and more than all but four countries in the world. Wind generation met 19% of average demand in 2018 and tops coal generation on windy days. But cheap gas still has the biggest market share. We think the state's few remaining coal and nuclear plants will continue to operate for the foreseeable future because of their low-cost reliability benefits. But wind, solar, and gas will battle for supremacy during the next decade.

We expect wind and solar will continue to grow their market shares in Texas, stealing share from gas generators and helping serve the state's growing electricity demand. The state's primary electric grid operator, ERCOT, reports 14 GW of wind projects and 7 GW of solar projects with signed interconnection agreements to come on line by 2021. An additional 22 GW of wind projects and 48 GW of solar projects are under study, according to an April 2019 ERCOT report. Some \$3 billion of solar and wind projects will kick off in the fourth quarter of 2019, according to Industrial Information Resources, a market intelligence firm. Developer Intersect Power recently announced it has 1 GW of Texas solar projects in late-stage development.

Texas shows that even Republicans realize renewable energy can be popular and profitable. In 2005, the state's Republican lawmakers supported \$7 billion of transmission projects, knowing the projects would encourage new wind development by linking the state's windy west with its populous east. A recent poll by the *Texas Tribune* and University of Texas indicated that 74% of the state's registered voters think politicians should be doing something about climate change. Houston, long a global fossil fuel capital, recently joined the global C40 Reinventing Cities initiative to fight climate change and is pushing urban solar, including a 70 MW facility that could begin operating by 2021. Austin, Dallas, and San Antonio have climate and sustainability plans that would cut into fossil fuel use.

Renewable Energy Already Shifting Texas Power Market

Wind has disrupted state power markets, and solar could upturn them during the next decade. Wind generation growth has taken share from coal and gas generators during low-demand periods and pushed down off-peak prices. But wind's variability during peak demand periods, especially in the

summer, has helped gas generators protect their volumes and margins. Solar could be a game-changer by stealing that valuable on-peak market share from gas generators.

Wind generation was almost 30% of the state's total generation capacity this summer but on average served only 17% of demand, or 8.8 GW, during peak demand periods. Wind fared even worse during superpeak hours, serving only between 4 GW and 12 GW on average when demand topped 70 GW. Natural gas generation on those days ranged from 30 GW to 36 GW, on average.

Greater reliance on natural gas during peak-demand periods and wind saturation during low-demand periods has created wide price spreads throughout the day. Power prices during a hotter-than-normal August this year averaged \$129/MWh with several hours that hit \$1,000/MWh. In July, which had cooler-than-normal weather and more wind generation, prices averaged just \$29/MWh.

Corporates: Filling in the RPS Gap

Big tech companies made corporate renewable energy cool, but now corporate and industrial renewable energy is going mainstream. Utilities have big opportunities to capitalize on this evolution. We expect corporate purchases will support both our state policy growth forecast and our non-RPS growth forecast.

Corporates' Choices

Corporates generally have four ways to invest in renewable energy and earn their green credentials. Utilities can benefit in all cases.

- ▶ **Distributed Generation:** Factories, warehouses, big-box stores, data farms, and other large electricity users get electrons directly from onsite solar. Upfront costs are high, but central network needs are reduced or eliminated. We incorporate distributed generation as a reduction to our electricity demand growth forecast, like energy efficiency, not in our renewable energy generation forecast. Utilities benefit from providing the capital for upfront investments or providing energy management services.
- ▶ **Power Purchase Agreements and Virtual PPA:** Corporates sign financial deals to invest in renewable energy projects outside their local regions. For example, a company in New York City signs a contract to pay a developer for a Texas wind farm. The New York company still uses electrons from the New York utility and the wind farm electrons stay in Texas, but the New York company can claim it is offsetting its energy use with renewable energy through its PPA. Utilities can be the project developer and owner with long-term contracts providing locked-in returns on investment. These can be highly accretive, low-risk growth opportunities.
- ▶ **Renewable Energy Certificates:** The U.S. Environmental Protection Agency defines an REC as a market-based instrument that represents the property rights to the environmental, social, and other nonpower attributes of renewable energy. Typically, one REC represents one MWh of electricity delivered to the grid from a renewable energy source. Net proceeds from RECs sold into regional markets go to project developers. RECs allow companies to meet their renewable energy goals without making large, long-term PPA commitments. Developers also might prefer to sell their energy, capacity, and RECs into wholesale markets rather than locking into a long-term PPA.
- ▶ **Green Tariff Programs:** Companies pay a fee that goes to the local utility to cover the costs of building renewable energy locally. Electrons from the renewable energy project flow onto the regional network but not directly to the C&I customer like distributed generation. These favor small and midsize

companies that don't have the capital to invest in a full project or distributed generation. Utilities can build renewable energy facilities on their network and earn on them without socializing the costs across all ratepayers. However, utilities must ensure the tariff is sufficient to cover the costs and returns on projects. More than 15 utilities offer green tariffs.

C&I Growth Potential

C&I renewable energy is still a sliver of the renewable energy market. C&I contracts support only 10-15 GW, 5% of total renewable energy capacity in the U.S., according to several estimates. But that will climb quickly. In the first half of 2019, Bloomberg reports that C&I customers signed 6 GW of new projects that will come on line in the next few years. The Renewable Energy Buyers Alliance says there are 60 GW of signed contracts for projects in development. This would represent a 25% increase in U.S. renewable energy capacity if all those projects come on line. On an energy basis, we estimate this represents about 180 TWh. Some of these projects and contracts will be canceled and many will be in states where the generation will count toward RPS in our forecast. The balance makes up most of the 77 TWh we forecast will come from corporates or other investors outside of RPS requirements during the next 10 years.

C&I customers account for 70% of U.S. electricity demand. The Fortune 1000 companies use about 1,200 TWh per year and will demand as much as 85 GW of renewable energy by 2030, according to a recent report from the American Wind Energy Association and Wood Mackenzie. That would double the current renewable energy generation in the U.S., excluding Texas and California. Some of this potential renewable energy development will occur outside of the U.S.

Globally, 195 companies representing nearly 200 TWh have committed to offsetting all their energy use with renewable energy as part of the RE100. Aside from the large tech and financial firms, the list includes consumer firms like Walmart, Anheuser-Busch InBev, BMW, Johnson & Johnson, Kellogg, Nike, Procter & Gamble, Sony, Visa, and Unilever. We estimate the RE100 firms are only 40% of the way to their goal based on RE100 data. If we assume the U.S. accounts for one-third of the group's energy demand, achieving the 100% renewable energy mark could represent 40 TWh of additional renewable energy in the U.S., or about 12% of current U.S. renewable energy generation.

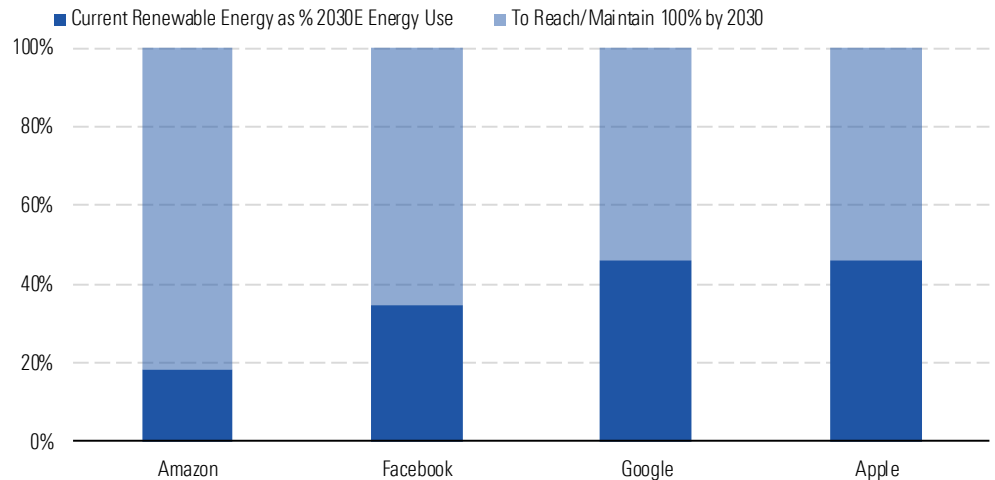
C&I interest isn't just about sustainability cred. In some cases, C&I renewable energy contracts can lower energy costs. Corporates have been signing contracts for as low as \$15/MWh for wind projects in Texas and the Plains region. Recent solar PPAs have ranged from \$19/MWh to \$42/MWh, cheaper than generation off central grids in many areas of the country. We expect a ramp-up in C&I contract activity during the next three years as they lock in wind tax credits next year and the highest solar credits by 2022.

Mega-Tech Faceoff

Facebook, Google, Amazon, and Apple are in a renewable energy race. Google and Apple say they are now matching all their energy use with renewable energy purchases. For Google, that means 5.5 TWh in 2018, or 1.5% of all U.S. renewable energy and more renewable energy than most small countries

generate. Facebook plans to be at 100% next year and Amazon is targeting 100% by 2025. If these companies' energy use keeps growing at high-single-digit rates through 2030, Amazon will have to grow its renewable energy portfolio fivefold, while Google and Apple will have to double their renewable energy purchases in the next decade (Exhibit 3).

Exhibit 3 Tech Giants Will Remain Large Renewable Energy Buyers to Keep 100% Mark



Source: Company reports, Morningstar. Assumes 8% average annual energy usage growth 2020-30.

Facebook has been the largest C&I renewable energy buyer during the last 18 months, according to several reports. It now has 4 GW in its pipeline and matched 75% of its 3.42 TWh of electricity use in 2018. If it reaches its 100% goal by the end of 2020, we estimate that Facebook will account for almost 1% of U.S. renewable energy generation. And with its energy use growing at a 35% average annual rate since 2014, Facebook will remain one of the largest renewable energy buyers in the world.

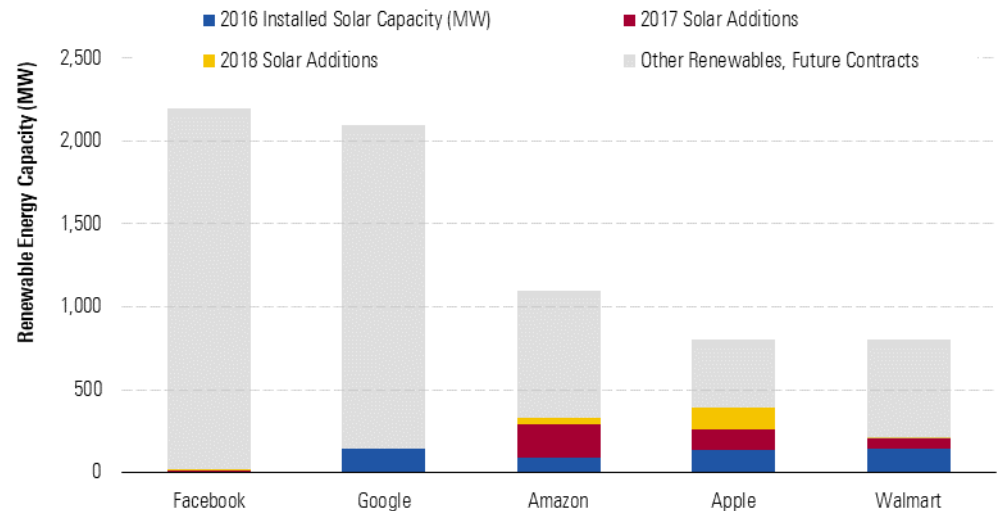
This year, Facebook has booked a 350 MW solar deal in Virginia and North Carolina; a 397 MW solar deal in Texas; and a 200 MW Texas wind deal. Facebook's recent renewable energy buying spree gives it the largest book of installed or contracted renewable energy, nearly all of it set to be developed during the next few years. It has the least installed renewable energy capacity of its giant tech peers since most of its contracts are for projects not yet developed.

Google had a substantial lead in contracted renewable energy before Facebook's spending spree and is a little further along in its developed projects. Google's largest-ever \$2 billion, 1,600 MW package of deals in the U.S., Chile, and Europe announced in mid-September could vault it ahead of Facebook again. Google now reports it has 5,500 MW of installed or contracted renewable energy capacity.

On the same day as Google made its announcement in September, Amazon pledged to double its renewable energy share to 80% by 2024, produce no carbon emissions by 2040, and meet Paris climate agreement targets 10 years early. That might not be enough to top Google and Facebook in the near term, but it should keep Amazon in the top three.

Apple was the earliest renewable energy leader, giving it the largest book of completed solar projects through 2018 but fewer projects in the development phase (Exhibit 4).

Exhibit 4 Tech Giants Lead the Rush to Renewable Energy, Especially Solar



As of year-end 2018. Source: Solar Energy Industries Association, Wood Mackenzie. 2016-18 capacity represents 70% of all commercial solar capacity installed in U.S. (7 GW, 35,000 projects, 43 states).

Solar is the hottest place for corporate purchases right now. In Google's recent megadeal, all of its U.S. contracts were solar: 75 MW in South Carolina and 490 MW in Texas. Facebook's solar deals in 2019 could knock Apple out of its spot as the leading C&I solar owner based on installed capacity, just one year after Apple passed Amazon.

Oil and Gas Firms Jumping In

Oil and gas firms are becoming big players in the U.S. market—and they have ambitious investment plans. The industry spends just 1.3% of its capital expenditures on alternative energy worldwide, according to estimates from environmental disclosure group CDP Worldwide,⁹ but we expect that to grow. Capital spending doesn't tell the whole story, because many oil and gas firms have long-term PPAs that support renewable energy projects. Renewable energy offers many benefits for the industry. First, it offsets some of the companies' direct fossil fuel exposure to improve their environmental profile. Second, renewable energy contracts offer an income stream that have high cash flow and are not sensitive to commodity prices. Third, renewable energy can help energy firms lower electricity costs for their other operations.

⁹ Fletcher, L. 2019. Beyond the cycle: What's on the horizon for oil and gas majors? <https://www.cdp.net/en/articles/investor/beyond-the-cycle-whats-on-the-horizon-for-oil-and-gas-majors>.

Shell recently discussed tripling its global renewable energy capacity by 2025 with \$1 billion or more of annual investment. We expect a sizable amount of that investment will go to the U.S. In particular, Shell's Mayflower Wind (with EDP Renewables) is competing for up to 800 MW in Massachusetts and another 400 MW-1,200 MW in Connecticut. Equinor is also eyeing U.S. offshore wind opportunities. Its Empire Wind project in New York could grow to 1.5 GW, an investment that could top \$5 billion. Exxon, which was one of the first energy companies to invest in solar in the 1970s, recently signed a 12-year West Texas solar contract with Orsted in part to power its exploration and production operations in the region. BP is also active in U.S. renewable energy development.

Utilities to Watch

Utilities can benefit from C&I renewable energy growth in two ways. First, they can build and contract projects outside regulated rate structures, giving them a new source of earnings growth. Utilities' low cost of capital and project development expertise give them a competitive advantage. Second, more renewable energy on the electric grid requires utilities to make new transmission and distribution investments, which grow earnings.

Duke Energy

Long known for its large fossil fuel generation fleet, Duke is remaking its image in part through C&I PPAs and green tariffs, helping support its 4%-6% earnings growth outlook and goal to have net-zero carbon emissions by 2050. In North Carolina, Duke's Green Source Advantage program arose from the state's 2017 Competitive Energy Solutions Law. The program allows large C&I customers to sign third-party deals for up to 5 MW; the military can sign up to 100 MW; and the state university system can sign up to 250 MW. If the program reaches its 600 MW cap, it could represent as much as 2 TWh of renewable energy, a 22% jump from current in-state renewable energy. Google and Cisco participated in a pilot program. Although Duke loses the revenue from the third-party contracts, the green tariff payment Duke receives effectively makes the program earnings-neutral for the utility.

The North Carolina program is a growth opportunity for its nonregulated business, Duke's commercial renewables business, which should have a cost advantage over other third parties. Outside of North Carolina, Duke recently signed up AT&T and Ball to support a 350 MW expansion of its Frontier wind farm in Oklahoma. Duke has 3 GW of contracted solar and wind projects nationwide as of mid-2019 and 1.35 GW in its pipeline. Although commercial renewables contribute only 6% of projected 2019 earnings, we think Duke can earn better returns on these projects than some of its traditional regulated utility assets.

Dominion Energy

As one of the largest U.S. utilities, with operations in 18 states, Dominion supplies at least some energy to most large U.S. corporations. Dominion's home state, Virginia, hosts 70% of the world's Internet traffic daily. On a systemwide basis, Dominion has pledged to reduce its generation fleet carbon emissions by 80% by 2050, which will require substantial support from C&I customers. Its recent proposal to build North America's largest offshore wind farm will likely attract—and require—support from C&I customers.

Virginia has been a battleground for C&I renewable energy. Virginia law allows third parties to sign 100% renewable energy contracts with C&I customers, but Dominion has challenged the program to avoid losing customer revenue. C&I customers such as eBay, Salesforce, Adobe, Walmart, Costco, Target, and others have fought Dominion to increase its share of renewable energy or offer a 100% renewable energy option. Virginia regulators have pushed Dominion to add renewable energy but also pushed back on C&I customers that want to leave Dominion. Regulators are considering Dominion's proposed 100% renewable energy option with a decision possible by year-end. Still, Dominion has partnered with Facebook, Amazon, Microsoft, and the U.S. Navy to support nearly 1 GW of solar projects in the state, and we expect that to grow.

Portland General

Oregon's well-established renewable energy choice policy gives Portland General a big head start. It has offered its Green Future program for 20 years and almost one fourth of its business and residential customers participate. PGE's participation rate has been higher than any other U.S. utility's renewable energy program for 10 consecutive years, according to rankings from the U.S. Department of Energy's National Renewable Energy Laboratory. The utility recently launched the Green Future Impact program, which helps large C&I customers source 100% of their energy from solar and wind. PGE reports that it sold 160 MW of capacity in the program during the first three minutes of the program going live. Customers include Adobe, Comcast, Daimler, and several local healthcare and education firms. If demand remains strong, we expect regulators will expand the 300 MW program, which is earnings-neutral and doesn't affect customer rates but helps utilities meet their renewable energy targets.

Edison International

Edison is carving out a niche in energy management through Edison Energy, which it launched in early 2016. The division seeks to manage corporates' energy profile, including distributed generation and energy efficiency programs, outside the regulated utility framework. We don't expect it to be a material earnings contributor for several more years, but its asset-light business strategy could produce high returns on capital. Corporate energy management services will be a critical need in Edison's home state, California, if the state is going to meet its carbon-free goal. Edison's brand name and industry experience through the utility should be a competitive advantage. ■■

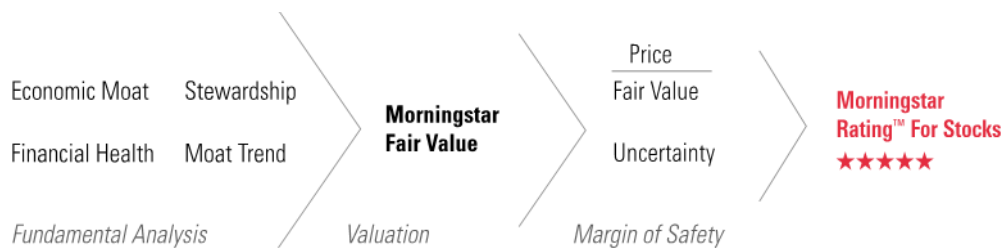
Research Methodology for Valuing Companies

Overview

At the heart of our valuation system is a detailed projection of a company's future cash flows, resulting from our analysts' research. Analysts create custom industry and company assumptions to feed income statement, balance sheet, and capital investment assumptions into our globally standardized, proprietary discounted cash flow, or DCF, modeling templates. We use scenario analysis, in-depth competitive advantage analysis, and a variety of other analytical tools to augment this process. Moreover, we think analyzing valuation through discounted cash flows presents a better lens for viewing cyclical companies, high-growth firms, businesses with finite lives (for example, mines), or companies expected to generate negative earnings over the next few years. That said, we don't dismiss multiples altogether but rather use them as supporting cross-checks for our DCF-based fair value estimates. We also acknowledge that DCF models offer their own challenges (including a potential proliferation of estimated inputs and the possibility that the method may miss short-term market-price movements), but we believe these negatives are mitigated by deep analysis and our long-term approach.

Morningstar's equity research group ("we," "our") believes that a company's intrinsic worth results from the future cash flows it can generate. The Morningstar Rating for stocks identifies stocks trading at a discount or premium to their intrinsic worth—or fair value estimate, in Morningstar terminology. Five-star stocks sell for the biggest risk-adjusted discount to their fair values, whereas 1-star stocks trade at premiums to their intrinsic worth.

Morningstar Research Methodology



Source: Morningstar.

Four key components drive the Morningstar rating: 1) our assessment of the firm's economic moat, 2) our estimate of the stock's fair value, 3) our uncertainty around that fair value estimate and 4) the current market price. This process ultimately culminates in our single-point star rating.

Economic Moat

The concept of an economic moat plays a vital role not only in our qualitative assessment of a firm's long-term investment potential, but also in the actual calculation of our fair value estimates. An economic moat is a structural feature that allows a firm to sustain excess profits over a long period of time. We define economic profits as returns on invested capital (or ROIC) over and above our estimate of a firm's cost of capital, or weighted average cost of capital (or WACC). Without a moat, profits are more susceptible to competition. We have identified five sources of economic moats: intangible assets, switching costs, network effect, cost advantage, and efficient scale.

Companies with a narrow moat are those we believe are more likely than not to achieve normalized excess returns for at least the next 10 years. Wide-moat companies are those in which we have very high confidence that excess returns will remain for 10 years, with excess returns more likely than not to remain for at least 20 years. The longer a firm generates economic profits, the higher its intrinsic value. We believe low-quality, no-moat companies will see their normalized returns gravitate toward the firm's cost of capital more quickly than companies with moats.

To assess the sustainability of excess profits, analysts perform ongoing assessments of the moat trend. A firm's moat trend is positive in cases where we think its sources of competitive advantage are growing stronger; stable where we don't anticipate changes to competitive advantages over the next several years; or negative when we see signs of deterioration.

Estimated Fair Value

Combining our analysts' financial forecasts with the firm's economic moat helps us assess how long returns on invested capital are likely to exceed the firm's cost of capital. Returns of firms with a wide economic moat rating are assumed to fade to the perpetuity

period over a longer period of time than the returns of narrow-moat firms, and both will fade slower than no-moat firms, increasing our estimate of their intrinsic value.

Our model is divided into three distinct stages:

Stage I: Explicit Forecast

In this stage, which can last five to 10 years, analysts make full financial statement forecasts, including items such as revenue, profit margins, tax rates, changes in working-capital accounts, and capital spending. Based on these projections, we calculate earnings before interest, after taxes, or EBI, and the net new investment, or NNI, to derive our annual free cash flow forecast.

Stage II: Fade

The second stage of our model is the period it will take the company's return on new invested capital—the return on capital of the next dollar invested, or RONIC—to decline (or rise) to its cost of capital. During the Stage II period, we use a formula to approximate cash flows in lieu of explicitly modeling the income statement, balance sheet, and cash flow statement as we do in Stage I. The length of the second stage depends on the strength of the company's economic moat. We forecast this period to last anywhere from one year (for companies with no economic moat) to 10–15 years or more (for wide-moat companies). During this period, cash flows are forecast using four assumptions: an average growth rate for EBI over the period, a normalized investment rate, average return on new invested capital (RONIC), and the number of years until perpetuity, when excess returns cease. The investment rate and return on new invested capital decline until a perpetuity value is calculated. In the case of firms that do not earn their cost of capital, we assume marginal ROICs rise to the firm's cost of capital (usually attributable to less reinvestment), and we may truncate the second stage.

Stage III: Perpetuity

Once a company's marginal ROIC hits its cost of capital, we calculate a continuing value, using a standard perpetuity formula. At perpetuity, we assume that any growth or decline or investment in the business neither creates nor destroys value and that any new investment provides a return in line with estimated WACC.

Because a dollar earned today is worth more than a dollar earned tomorrow, we discount our projections of cash flows in stages I, II, and III to arrive at a total present value of expected future cash flows. Because we are modeling free cash flow to the firm—representing cash available to provide a return to all capital providers—we discount future cash flows using the WACC, which is a weighted average of the costs of equity, debt, and preferred stock (and any other funding sources), using expected future proportionate long-term market-value weights.

Uncertainty Around That Fair Value Estimate

Morningstar's Uncertainty Rating captures a range of likely potential intrinsic values for a company and uses it to assign the margin of safety required before investing, which in turn explicitly drives our stock star rating system. The Uncertainty Rating represents the analysts' ability to bound the estimated value of the shares in a company around the Fair Value Estimate, based on the characteristics of the business underlying the stock, including operating and financial leverage, sales sensitivity to the overall economy, product concentration, pricing power, and other company-specific factors.

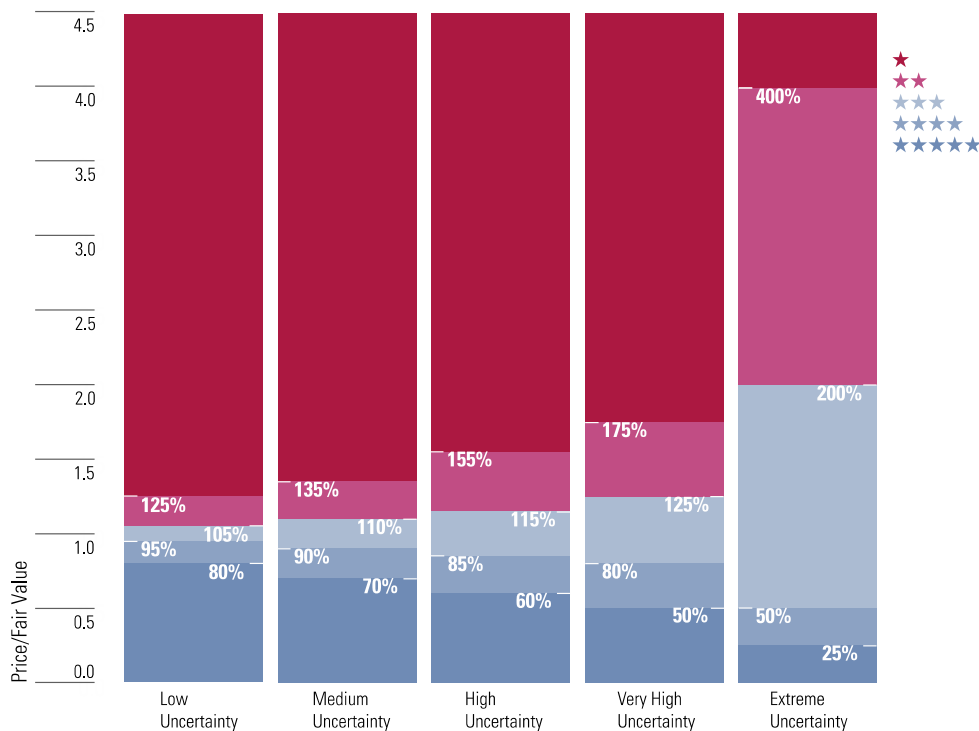
Analysts consider at least two scenarios in addition to their base case: a bull case and a bear case. Assumptions are chosen such that the analyst believes there is a 25% probability that the company will perform better than the bull case, and a 25% probability that the company will perform worse than the bear case. The distance between the bull and bear cases is an important indicator of the uncertainty underlying the fair value estimate.

Our recommended margin of safety widens as our uncertainty of the estimated value of the equity increases. The more uncertain we are about the estimated value of the equity, the greater the discount we require relative to our estimate of the value of the firm before we would recommend the purchase of the shares. In addition, the uncertainty rating provides guidance in portfolio construction based on risk tolerance.

Our uncertainty ratings for our qualitative analysis are low, medium, high, very high, and extreme.

- ▶ Low—margin of safety for 5-star rating is a 20% discount and for 1-star rating is 25% premium.
- ▶ Medium—margin of safety for 5-star rating is a 30% discount and for 1-star rating is 35% premium.
- ▶ High—margin of safety for 5-star rating is a 40% discount and for 1-star rating is 55% premium.
- ▶ Very High—margin of safety for 5-star rating is a 50% discount and for 1-star rating is 75% premium.
- ▶ Extreme—margin of safety for 5-star rating is a 75% discount and for 1-star rating is 300% premium.

Morningstar Equity Research Star Rating Methodology



Market Price

The market prices used in this analysis and noted in the report come from exchange on which the stock is listed which we believe is a reliable source.

For more details about our methodology, please go to <https://shareholders.morningstar.com>.

Morningstar Star Rating for Stocks

Once we determine the fair value estimate of a stock, we compare it with the stock's current market price on a daily basis, and the star rating is automatically re-calculated at the market close on every day the market on which the stock is listed is open. Our analysts keep close tabs on the companies they follow, and, based on thorough and ongoing analysis, raise or lower their fair value estimates as warranted.

Please note, there is no predefined distribution of stars. That is, the percentage of stocks that earn 5 stars can fluctuate daily, so the star ratings, in the aggregate, can serve as a gauge of the broader market's valuation. When there are many 5-star stocks, the stock market as a whole is more undervalued, in our opinion, than when very few companies garner our highest rating.

We expect that if our base-case assumptions are true the market price will converge on our fair value estimate over time, generally within three years (although it is impossible to predict the exact time frame in which market prices may adjust).

Our star ratings are guideposts to a broad audience and individuals must consider their own specific investment goals, risk tolerance, tax situation, time horizon, income needs, and complete investment portfolio, among other factors.

The Morningstar Star Ratings for stocks are defined below:

★★★★★ We believe appreciation beyond a fair risk-adjusted return is highly likely over a multiyear time frame. Scenario analysis developed by our analysts indicates that the current market price represents an excessively pessimistic outlook, limiting downside risk and maximizing upside potential.

★★★★ We believe appreciation beyond a fair risk-adjusted return is likely.

★★★ Indicates our belief that investors are likely to receive a fair risk-adjusted return (approximately cost of equity).

★★ We believe investors are likely to receive a less than fair risk-adjusted return.

★ Indicates a high probability of undesirable risk-adjusted returns from the current market price over a multiyear time frame, based on our analysis. Scenario analysis by our analysts indicates that the market is pricing in an excessively optimistic outlook, limiting upside potential and leaving the investor exposed to Capital loss.

Risk Warning

Please note that investments in securities are subject to market and other risks and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not be sustained in future and is no indication of future performance. A security investment return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost. A security's current investment performance may be lower or higher than the investment performance noted within the report. Morningstar's Uncertainty Rating serves as a useful data point with respect to sensitivity analysis of the assumptions used in our determining a fair value price.

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