

SECTOR IN-DEPTH

2 December 2020



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Electric Utilities and Power Generators – US

Carbon transition risk for power generation varies widely by issuer

- » **Most generation owners are moderately positioned for the transition to a low-carbon economy.** Our carbon transition assessments (CTAs) of 51 US electric utilities and power generators that own generation assets show a wide range of positioning for the transition to a low-carbon economy. The median generation CTA score was CT-7, indicating moderate positioning for the carbon transition. [NextEra Energy Partners LP](#) (Ba1 stable) and [Covanta Holding Corporation](#) (Ba3 stable) received scores indicating advanced positioning because they do not use fossil fuels. Significant exposure to coal-fired generation leaves [Ameren Corporation](#) (Baa1 stable), [DTE Energy Company](#) (Baa2 stable) and [NRG Energy Inc.](#) (Ba1 positive) poorly positioned.
- » **Overall CTA scores benefit from reduced carbon exposure of non-generation businesses.** The 51 issuers with generation assets were part of a broader cohort of 71 issuers in the power sector whose non-generation activities were also scored for transition risk. For our entire 71-issuer cohort, the median overall CTA score was CT-5, indicating strong positioning. Because most non-generation operations are less carbon-intensive than power generation, this mitigates transition risk for most issuers.
- » **Component A - Current business profile: fossil-fuel plants result in exposure to expected phase out.** NextEra Energy Partners and Covanta received the strongest scores for fossil-fuel supply weighting because they do not own any fossil generation. Fourteen issuers operate their fossil plants at high utilization rates, indicating more efficient operations that are better positioned to survive.
- » **Component B - Policy, market and technology risk: exposure varies by location and capacity mix.** NextEra Energy Partners, [Avangrid Inc.](#) (Baa1 negative), [PG&E Corporation](#) (Ba2 stable) and [Consolidated Edison Inc.](#) (ConEd, Baa2 stable) are best positioned in terms of policy risk because of their reliance on renewable energy sources. Issuers scoring poorly for technology cost risk have fossil or nuclear capacity in areas where the cost of solar or onshore wind power is lower.
- » **Component C - Medium-term response activities: broad range of positioning in terms of expected fossil-fuel supply mix.** About 40% of the issuers are poorly positioned because of their expected reliance on fossil fuels through 2025.
- » **Component D - Long-term resilience: significant realignment needed for some issuers under a rapid carbon transition.** About 30% of issuers are poorly positioned because a significant portion of their generation mix is coal that is at risk of retirement.

Most generation owners are moderately positioned for the transition to a low-carbon economy

Our carbon transition assessments (CTAs) for US electric utilities and power generators show a wide range of positioning for the sector's transition to a low-carbon economy. The 71 issuers we have scored in this report (see page 15) span a wide range of regulated and unregulated issuers involved in the generation and/or transmission of electric power. Of those issuers, 51 own generation assets that were scored under our [CTA framework for power generation](#). The generation CTA scores for these issuers ranged from CT-1 to CT-9 on our 10-point CTA scale, where CT-1 shows the most advanced positioning and CT-10 the poorest. The median generation CTA score was CT-7, indicating moderate positioning for the carbon transition. This range of scoring reflects that the energy transition is already occurring. The new US Administration taking office in 2021 is expected to accelerate this trend.

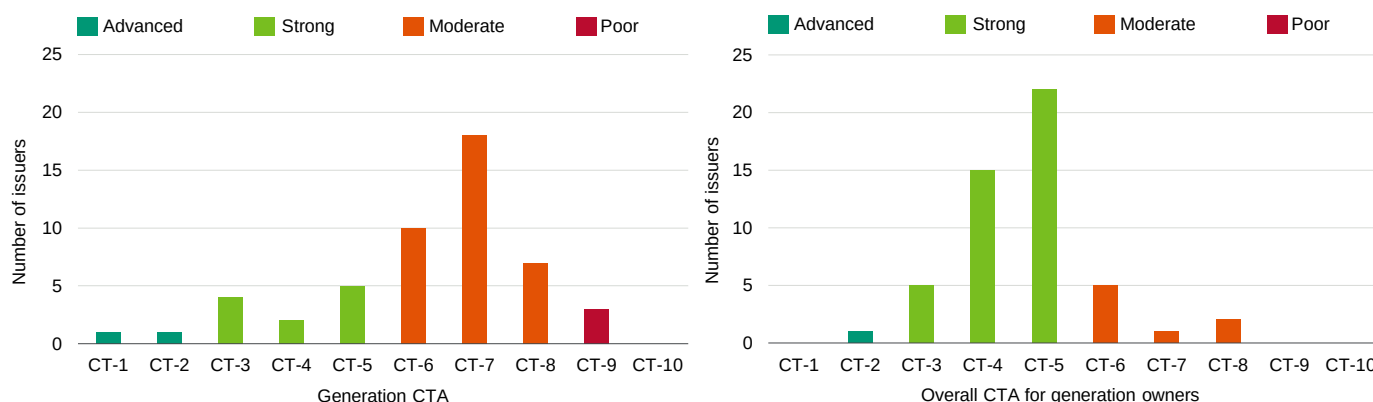
NextEra Energy Partners and Covanta were the only issuers to receive generation CTA scores that indicated advanced positioning for the carbon transition, buoyed by generation assets that are fueled by renewable sources (NextEra Energy Partners) or municipal waste (Covanta). Similarly, most of the generation assets owned by Avangrid and ConEd consist of wind and solar farms in their unregulated power segments, which improve their CTA positioning compared to their core distribution utility asset profile. At the other end of the spectrum, significant exposure to coal-fired generation contributed to CT-9 scores for Ameren, DTE and NRG, indicating poor positioning.

We also calculated separate scores for non-generation activities because most of the issuers in our cohort have a combination of generation, distribution, transmission and other related operations, all of which have varying levels of exposure to carbon transition risk. Most non-generation operations have lower levels of exposure to transition risk than power generation, as transmission and distribution is neutral to the type of power generated. As a result, the generation owners' final overall CTA scores, which reflect the aggregate transition risk of both their generation and non-generation operations, were generally stronger than their generation-only CTA scores (see Exhibit 1). The median overall CTA score for the 51 generation owners in our cohort was CT-5, indicating strong positioning for the carbon transition.

Exhibit 1

Generation owners' overall CTA scores were generally stronger than their generation-only CTA scores

Distribution of carbon transition assessment scores for the 51 generation owners in our cohort



Source: Moody's Investors Service

Most of the generation owners saw a one- to two-notch improvement in their overall CTA score, while issuers whose operations are most heavily weighted toward transmission and distribution or networks businesses, like [American Electric Power Company](#) (Baa2 stable), [FirstEnergy Corp.](#) (Ba1 negative), Ameren and [PPL Corporation](#) (Baa2 stable) had differentials of four to five notches.

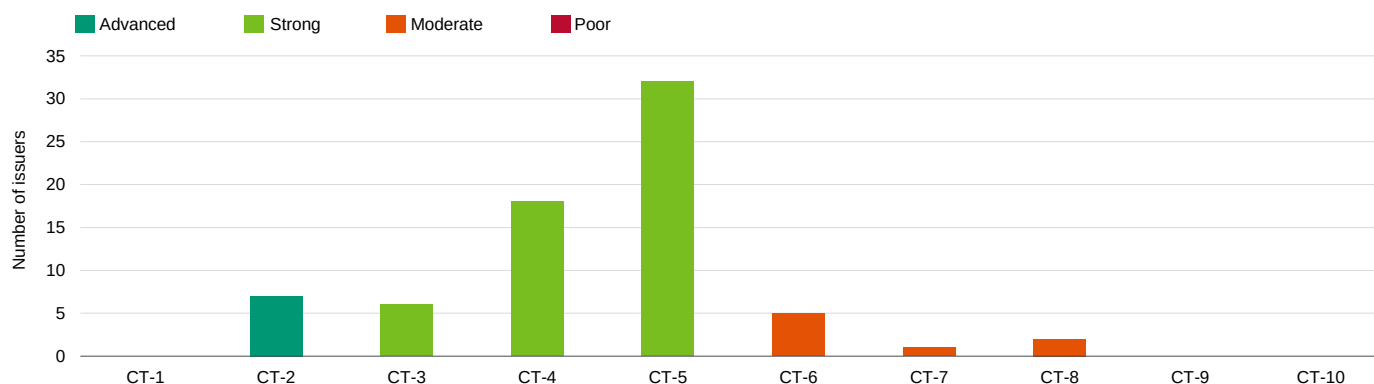
This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the ratings tab on the issuer/entity page on www.moody's.com for the most updated credit rating action information and rating history.

For our entire 71-issuer cohort, which includes issuers that do not own generation assets, the median overall CTA score was also CT-5, indicating strong positioning for the carbon transition (see Exhibit 2). The cohort was primarily comprised of regulated electric and gas utilities and regulated electric networks. Regulated issuers received overall CTA scores indicating advanced to strong positioning, except for DTE, which scored CT-6 in the moderate category. Unregulated issuers' scores had a broader range across advanced, strong and moderate positioning (CT-1 to CT-8).

Exhibit 2

Median overall CTA score of our entire cohort was CT-5

Distribution of overall carbon transition assessment scores for all 71 electric utilities and power generators in our cohort



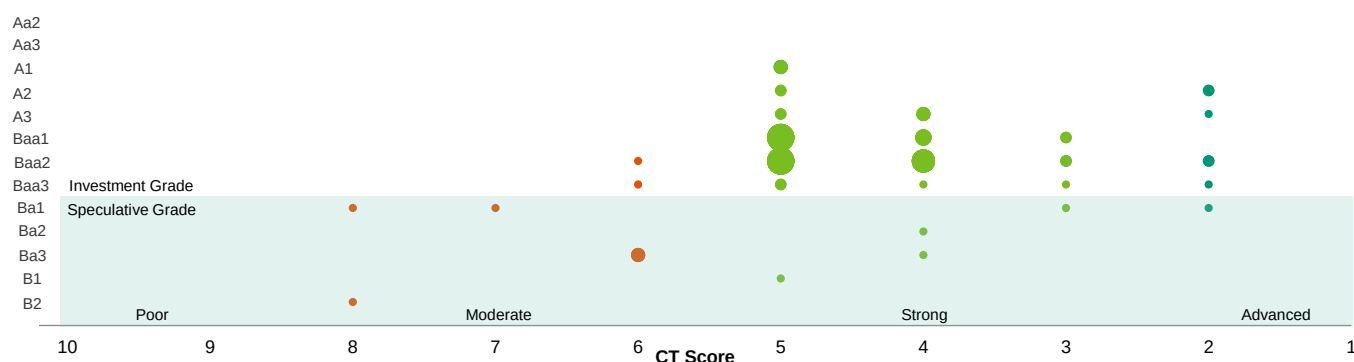
Source: Moody's Investors Service

All issuers that received advanced overall CTA scores have investment-grade ratings, except for NextEra Energy Partners, while all issuers within the moderate band have speculative-grade ratings, except for DTE and [Energy Harbor Corp.](#) (Baa3 negative), as shown in Exhibit 3. However, there is no linear relationship between CTA scores and credit ratings because carbon transition risk is just one of many considerations that inform our credit analysis and the weight we place on transition risk will vary by issuer. Companies may improve their creditworthiness if they address carbon transition when it presents a material risk.

Exhibit 3

Most investment-grade issuers in this peer group have strong or advanced positioning for carbon transition

Long-term credit ratings and CTA scores for 71 electric and/or gas utilities and power generators



Source: Moody's Investors Service

This is the third in a series of reports in which we score rated issuers on the basis of their exposure to carbon transition risk (see ["Refining and marketing – Global: Location and complexity limit severity of carbon transition risk for most refiners"](#) and ["Automotive manufacturing – Global: Substantial variation exists in automakers' carbon transition risk profiles"](#)). We are calculating the scores through the use of our [carbon transition assessment \(CTA\) framework for electric utilities and power generators](#). We intend to publish CTA scores for utilities and power companies from other regions as well, along with CTA scores of other high risk sectors.

Our report focuses on the ultimate parent companies of US electric utilities and the US operating subsidiaries of foreign parent companies that are rated under Moody's methodologies for [regulated electric and gas utilities](#), [regulated electric and gas networks](#) and [unregulated utilities and power companies](#). Although not included in this report, the CTA framework also applies to companies rated under our methodologies for [US public power electric utilities](#), [US electric generation and transmission cooperatives](#) and [US municipal joint action agencies](#). The framework does not apply to companies rated under our [power generation projects methodology](#).

How we calculate CTA scores for power generation

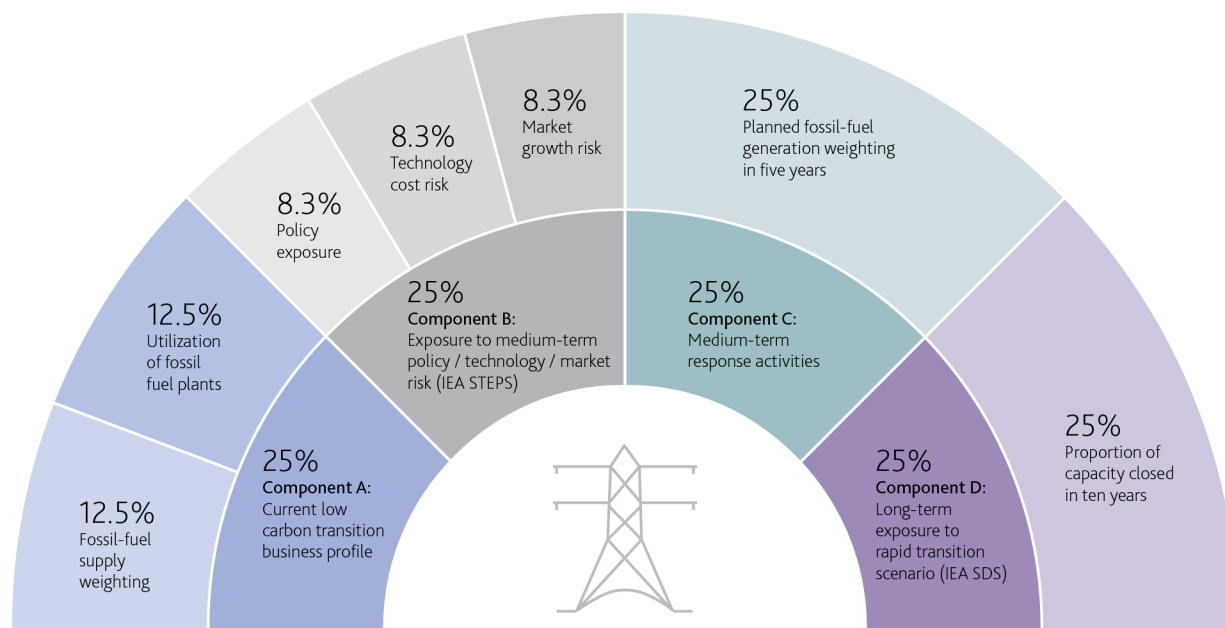
Four, equally weighted components underpin our CTA scores for power generation, as illustrated in Exhibit 4. Component A considers the current business profile of the issuer; Components B and C look at the medium-term risks and opportunities by assessing exposure to technology, market and policy risks and the corporate response to these risks; and Component D considers a company's long-term resilience to a low-carbon transition by looking out over a 10-year horizon.

Our CTA framework for power generation is based on our general CTA framework for non-financial companies (see "[Non-financial companies – Global: Framework to assess carbon transition risk for corporate sectors](#),"), with subcomponents tailored to the power sector.

Exhibit 4

Factors we consider when assessing carbon transition risk for issuers that own generation assets

Components and weightings of our carbon transition assessment framework for power generation



Source: Moody's Investors Service

Our CTA scores are grouped into four categories advanced (dark green), strong (light green), moderate (orange) and poor (red), on a 10-point scale, where the lower the number, the stronger the positioning. Electric utilities and power generators assigned the highest scores, CT-1 and CT-2, exhibit advanced positioning for the carbon transition. They typically have a business model that benefits, rather than faces risks, from the transition to a low-carbon economy. Electric utilities and power generators assigned scores from CT-3 through CT-8 have increasingly greater degrees of exposure to carbon transition risks and are categorized as strong or moderate. Electric utilities and power generators assigned the lowest scores, CT-9 and CT-10, exhibit poor positioning and typically have business models that are fundamentally threatened over the long term by the carbon transition (see Exhibit 5).

Exhibit 5

Summary of our carbon transition assessment (CTA) score categories and descriptions

ADVANCED		1	1.00 – 1.30	Issuers exhibit "advanced" positioning for the carbon transition. They typically have a business model that benefits from the transition to a low carbon economy.
		2	1.31 – 1.60	
STRONG		3	1.61 – 1.90	Issuers exhibit "strong" positioning for the carbon transition. They either have a business model that is not expected to be materially affected by the carbon transition, or have strategies and plans in place that substantially mitigate their carbon transition exposure.
		4	1.91 – 2.20	
		5	2.21 – 2.50	
MODERATE		6	2.51 – 2.80	Issuers exhibit "moderate" positioning for the carbon transition. They have material exposure to carbon transition risks and their relative positioning within this category is determined by variations in their degree of exposure to carbon risks, medium term management actions and long-term resilience.
		7	2.81 – 3.10	
		8	3.11 – 3.40	
POOR		9	3.41 – 3.70	Issuers exhibit "poor" positioning for the carbon transition. They typically have business models that are fundamentally inconsistent, over the long-term, with the transition to low carbon economy.
		10	3.71 – 4.00	

Source: Moody's Investors Service

Generation CTA scores by component**Component A - Current low-carbon transition business profile: fossil-fuel plants result in exposure to expected phase out.**

The first component of our CTA framework for generation examines a company's current business profile as it pertains to the low-carbon transition. Subcomponents specific to power generation include the proportion of fossil-fuel supply and the utilization rates of coal and combined-cycle gas turbine (CCGT) plants.

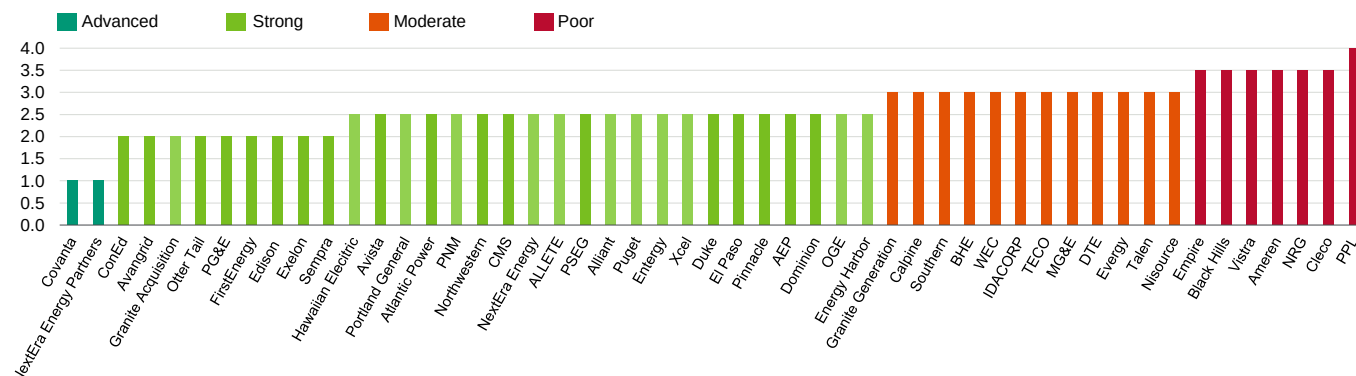
Fossil-fuel supply weighting: Power plants running on fossil fuels still account for the majority of US electricity generation, although the fuel mix has changed over the last decade as coal-fired generation declines. According to the US Energy Information Administration (EIA), 546 coal-fired power units, representing 102 GW of generating capacity were retired in the US between 2010 and 2019. While utilities are rapidly moving away from coal, their generation mix is still heavily comprised of fossil fuels, especially natural gas. The EIA reported that the total electricity generation from fossil fuels decreased from 69% in 2010 to 62.6% in 2019. But during the same period, coal's share of total generation fell to 23.4% from 44.5%, while natural gas-fired plants rose to 38.4% of generation from 23.3%. (see "[Electric utilities and power producers – US: Power companies on pace to reduce CO2 emissions](#)").

Issuers like NextEra Energy Partners that generated all of their power from non-fossil-fuel sources during the prior year received a score of 1.0 for advanced positioning (on a scale of 1.0 to 4.0) in this subcomponent (see Exhibit 6). For issuers with fossil-fuel generation, we calculated their score by multiplying the percentage of electricity sales from coal, oil and natural gas by 100, 75 and 50, respectively and scoring this weighted outcome. To receive a strong or advanced score the weighted fossil fuel mix must be below 40 points.

Exhibit 6

The range of power generation mix reflects the shifting fuel mix in the US

Our scoring of CTA subcomponent assessing fossil-fuel supply weighting



Source: Moody's Investors Service

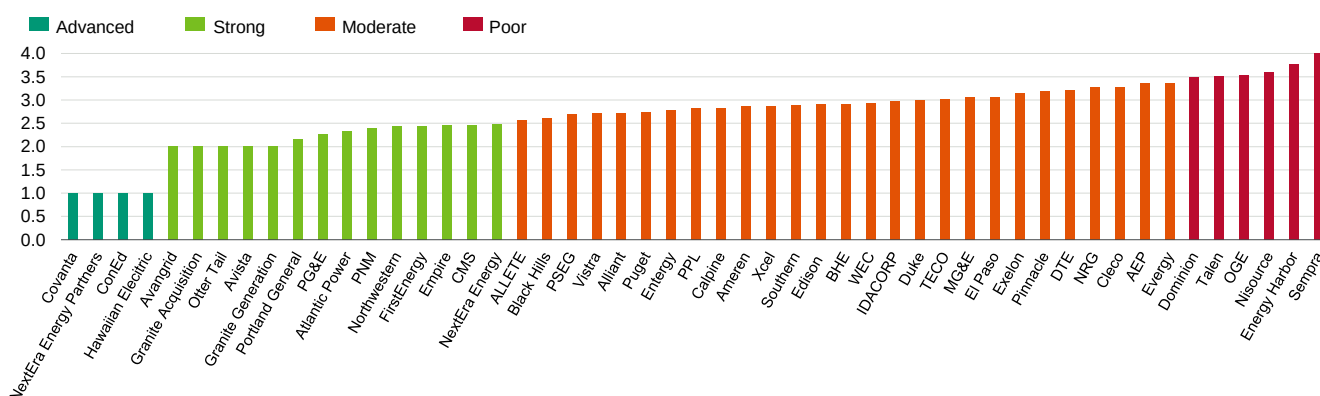
Utilization of fossil-fuel plants: The second subcomponent of Component A assessed the 2019 utilization rate, or capacity factor, of coal and CCGT plants, which were designed to run baseload generation to cover high fixed costs. Low utilization may be an indicator that these plants are a candidate for closure, accelerating asset write-downs, which would be credit negative for the issuer. According to the EIA, the US coal plant capacity factor declined from 64.2% in 2009 to 47.5% in 2019, while the capacity factor of CCGT plants increased from 43.9% to 57.3%, mainly due to low natural gas prices.

In this subcomponent, issuers that do not have any coal or CCGT plants received a score of 1.0 for advanced positioning. A plant would score strongly if the annual capacity factor is above 60% for a coal plant and 50% for a CCGT plant. In 2019, the average utilization of coal and CCGT plants among our scored issuers was 43% and 50%, respectively. Therefore, less than half of the issuers scored strongly for utilization (see Exhibit 7). The high penetration of renewable energy in California explains the low utilization ratio of the two combined cycle natural gas plants of [Semptra Energy's](#) (Baa2 stable) utility subsidiary [San Diego Gas & Electric Company](#) (Baa1 positive). However, the recent rolling blackouts in the California power market have highlighted the value of these facilities from a systems' reliability perspective.

Exhibit 7

Most issuers exhibited a moderate positioning for coal and CCGT utilization

Our scoring of CTA subcomponent assessing 2019 utilization rate of coal and combined cycle gas turbine (CCGT) plants



Source: Moody's Investors Service

Component B - Medium-term exposure to policy/technology/market risk (IEA STEPS): exposure to policy, technology and market growth risks varies by location

Policy exposure: The first subcomponent of Component B assesses the policy exposure of a power plant based on location, regulatory market framework and type of fuel. In the US, we measured policy risk at the state level because regulatory authority rests primarily

with individual states. Our policy exposure score is composed by the sum of these four elements scores: (1) renewables target; (2) coal support; (3) capacity mechanism and; (4) carbon pricing.

We categorize the US states as being regulated or unregulated based on the regulatory status of the power market. Every coal-fired power plant located in a regulated state received a score for the policy elements of renewables target and coal support, while a coal plant located in an unregulated state also received scores for the policy elements of capacity mechanism and carbon pricing. Other fossil fuel plants received a score for renewables target if located in a regulated state; if located in an unregulated state, they also received a score for capacity mechanism. The sum of a fossil fuel plant policy risk score on these four elements cannot be below 2.0 to ensure the appropriate positioning of fossil fuel plants compared to other technologies.

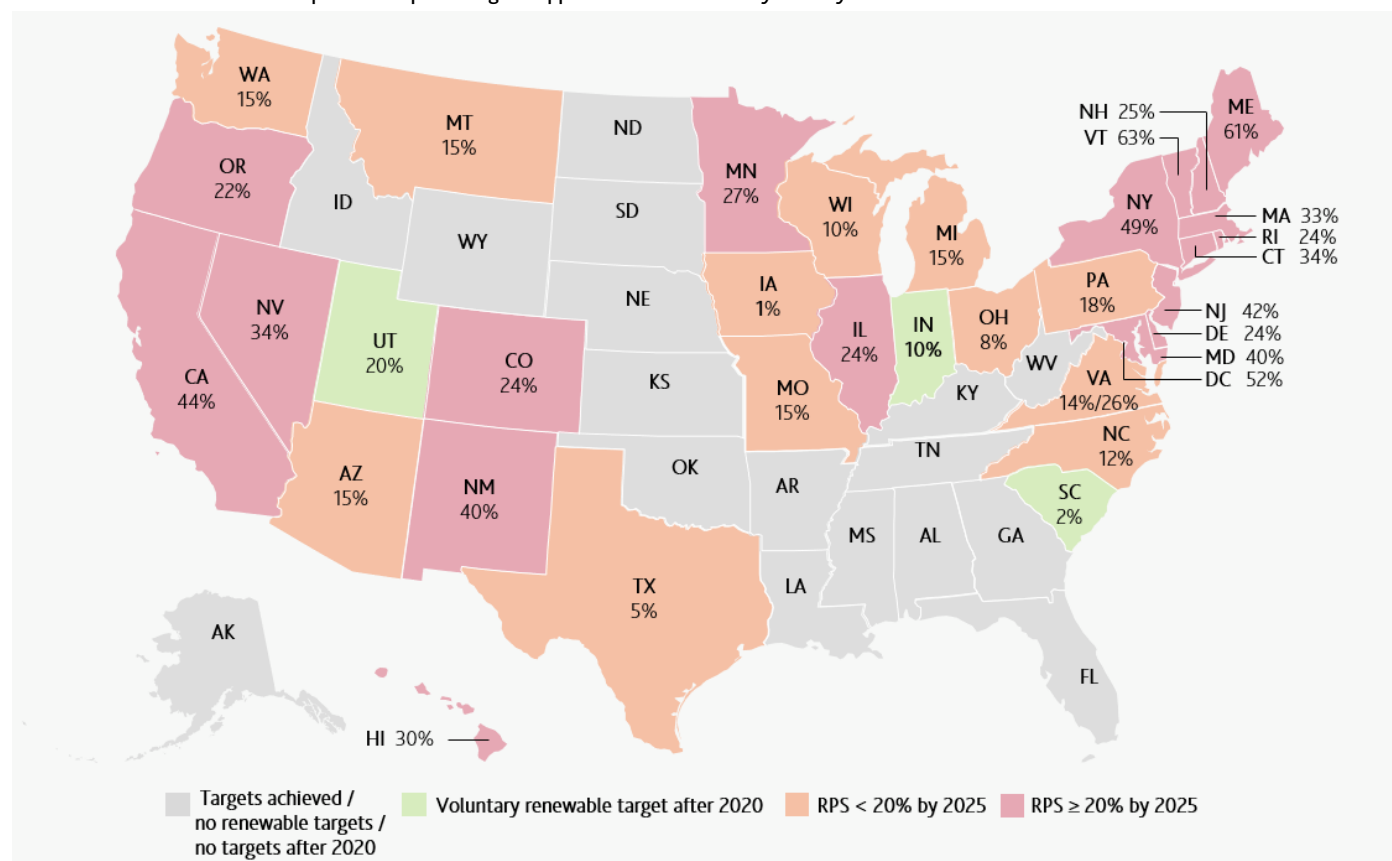
Renewables will receive a score of 1.0 for policy regardless of where the plant is located. As a low-carbon technology, nuclear plants will receive a score of 2.0 for policy risk because they are not exposed to emissions reduction policies. But nuclear plants will not benefit from decarbonization policies to the same degree as renewable energy sources.

In the US, most states adopted a renewable portfolio standard (RPS) requiring a minimum level of the electricity consumption to be generated by renewable resources, increasing the policy risk of fossil-fuel plants located in these states. We used the pro rata 2025 RPS target to score fossil fuel plants, as indicated in Exhibit 8. Fossil-fuel plants did not score well in renewables target portion of the policy exposure score if they are located in states with renewable portfolio standards that require renewable energy sources to account for more than 20% of electricity sales by 2025.

Exhibit 8

Most states have adopted renewable portfolio standards and goals

US state mandates for renewable power as a percentage of applicable retail electricity sales by 2025



Renewable Portfolio Standards (RPS) resource eligibility varies considerably from state to state.

Sources: Berkeley Lab, National Conference of State Legislatures and Moody's Investors Service

We assigned a coal support score of -1 for coal plants located in states of Kentucky, West Virginia and Wyoming because these states have significant coal production activities.

We assigned a score of 0 for fossil-fuel plants located in states with capacity mechanisms, except for plants located in the state of Illinois, because MISO, the independent system operator serving the region, was considered to have a weak capacity mechanism compared to other capacity markets in the US. Fossil-fuel plants located in Illinois received a score of 0.5 for capacity mechanism.

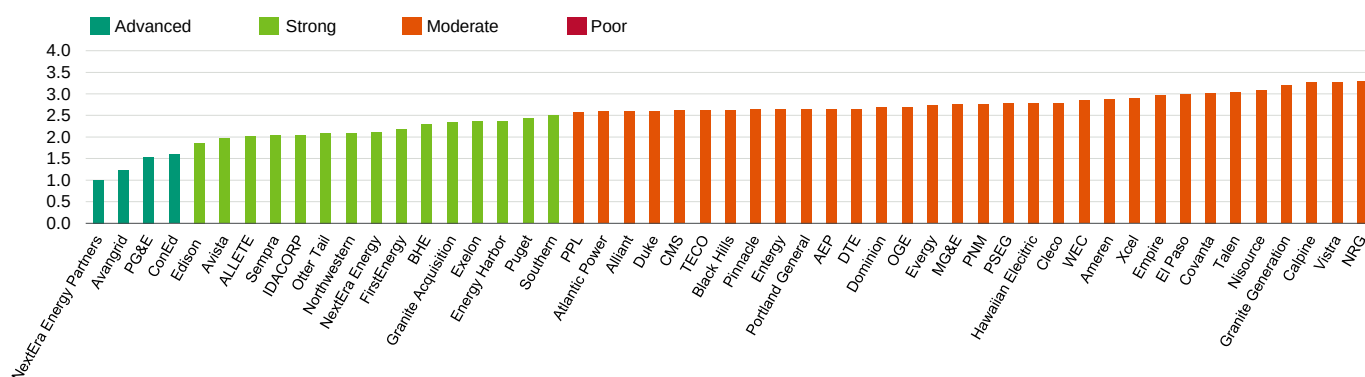
Coal-fired plants located in states participating in the Regional Greenhouse Gas Initiative (RGGI) and/or an emissions cap and trade scheme were assigned a score of 0.5 for carbon pricing element because the average CO₂/ton price in 2019 was below our threshold of €20/ton.

After we scored each fossil-fuel plant under the applicable elements of the policy exposure subcomponent, we combined the scores according to the sector scoring framework.

NextEra Energy Partners, Avangrid, PG&E and Consolidated Edison received a score below 1.6 for advanced positioning because they already derive a significant portion of their generation mix from renewables. As shown in Exhibit 9, most issuers were scored moderate positioning for policy risk. Of these issuers, NRG, [Vistra Energy Corp.](#) (Ba1 positive) and [Calpine Corporation](#) (Ba3 stable) received the weakest scores because they have a significant portion of their fossil-fuel generation capacity is located in unregulated states with ambitious renewables targets and weaker or no capacity mechanisms. Diversification of generation capacity and the location of these assets prevented any issuers from being scored for poor positioning.

Exhibit 9

Scores vary based on whether states have renewables target, coal support, capacity mechanism or carbon pricing
Our scoring of CTA subcomponent assessing policy risk exposure



Source: Moody's Investors Service

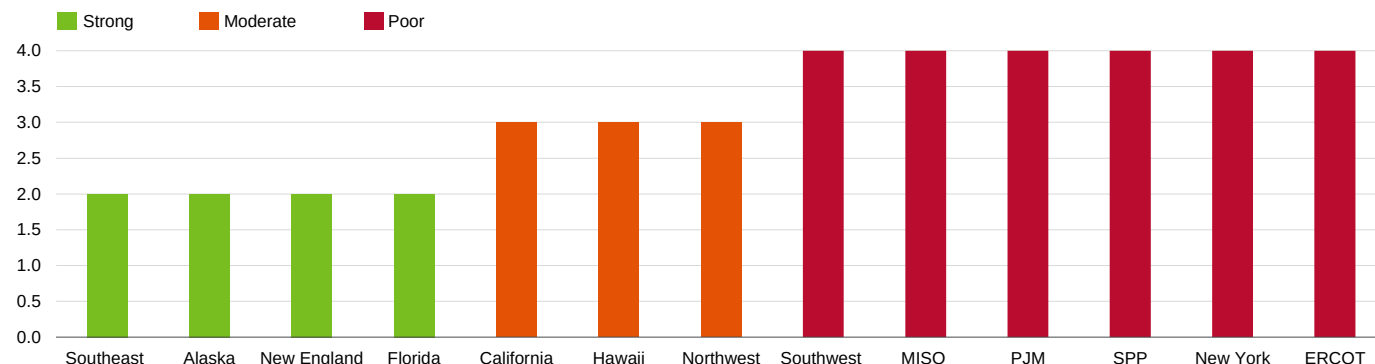
Technology cost risk: This subcomponent scores the existence of lower renewable technology costs in the region where a nonrenewable plant is located relative to other parts of the country. We ranked markets using the cheapest levelized cost of energy (LCOE) for either solar or onshore wind. Recognizing the different ways LCOEs are calculated, for the US we sourced all the LCOEs from Bloomberg New Energy Finance to produce a relative ranking and score them consistently. We recognize the limitations of LCOEs in terms of assumptions, which is why we are using them to score only relative exposure, rather than to calculate actual costs for comparison with existing plants.

Issuers that scored poorly in this subcomponent have fossil-fuel or nuclear capacity within the power regions of Southwest Power Pool, [Midcontinent Independent System Operator Inc.](#) (MISO, A1 stable), [PJM Interconnection LLC](#) (Aa2 stable), New York and [Electric Reliability Council of Texas Inc.](#) (ERCOT, Aa3 stable), where the cost of onshore wind or solar power is low and highly competitive compared to other power regions in the US.

Exhibit 10

Regions with lower renewable costs present greater risk to fossil-fuel and nuclear plants

Score of relative cost of renewables in US regions on a scale of 1 to 4



Sources: Bloomberg New Energy Finance and Moody's Investors Service

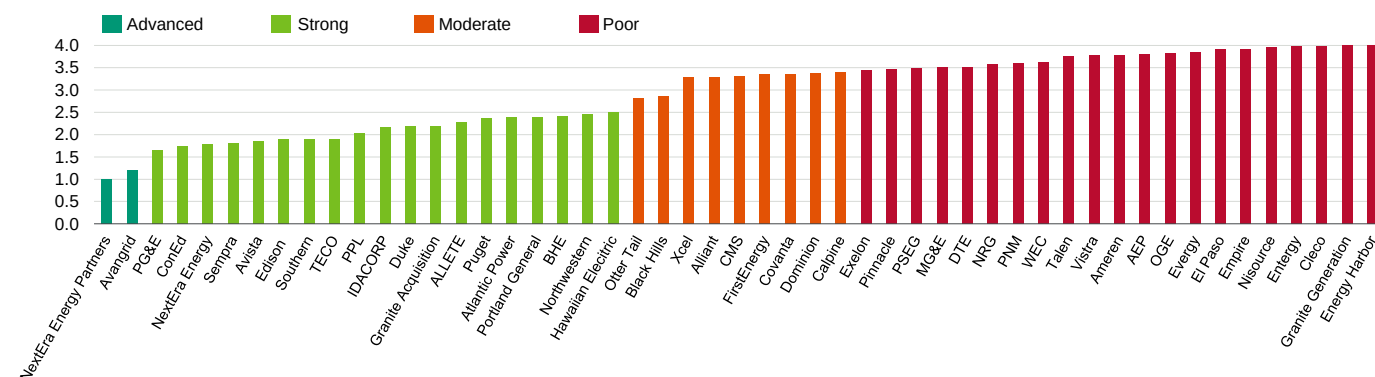
Only renewables plants received the score of 1.0 for advanced positioning. Plants using other fuel types, including nuclear, were scored between 2.0 and 4.0. The higher the cost of renewables technology in the region, the lower the risk for the fossil-fuel plant.

This subcomponent shows a wide range of technology cost risks for issuers in the US. As shown in Exhibit 11, NextEra Energy Partners and Avangrid received scores indicating advanced positioning because they have the highest proportion of renewables generation capacity among the issuers in our cohort, from renewables sources. [NiSource Inc.](#) (Baa2 stable), [Entergy Corporation](#) (Baa2 stable), [Cleco Corporate Holdings LLC](#) (Baa3 stable), [Granite Generation LLC](#) (Ba3 stable) and Energy Harbor scored poorly because of the location of their fossil-fuel and nuclear capacity and proportion of each issuer's generation capacity.

Exhibit 11

Poorly scoring issuers have fossil-fuel or nuclear capacity in regions where onshore wind or solar cost is relatively low

Our scoring of CTA subcomponent assessing technology cost risk



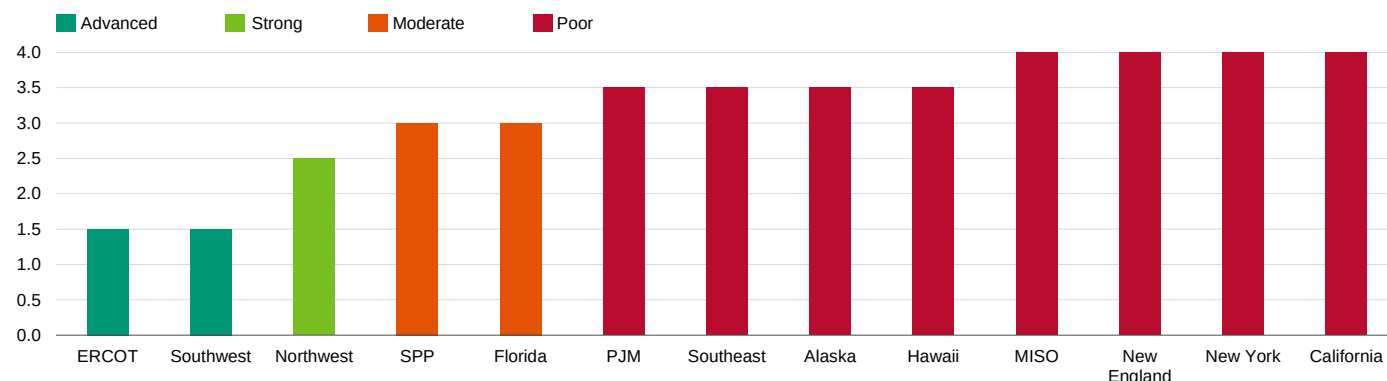
Source: Moody's Investors Service

Market growth risk: This subcomponent score is based on the growth in electricity demand that the North American Electric Reliability Corporation (NERC) forecasts for each of its regions (and subregions, where applicable) for the period 2019-25. The lower the expected growth in electricity demand, the worse the score. Power plants located in markets where NERC expects electricity demand to remain stable or decline are more exposed to energy transition risks because renewable energy will likely displace fossil fuels.

Exhibit 12

Regions where power demand is not increasing are more exposed to transition risk

Score of expected growth in net energy load for the period 2019-25 by region on a scale of 1 to 4



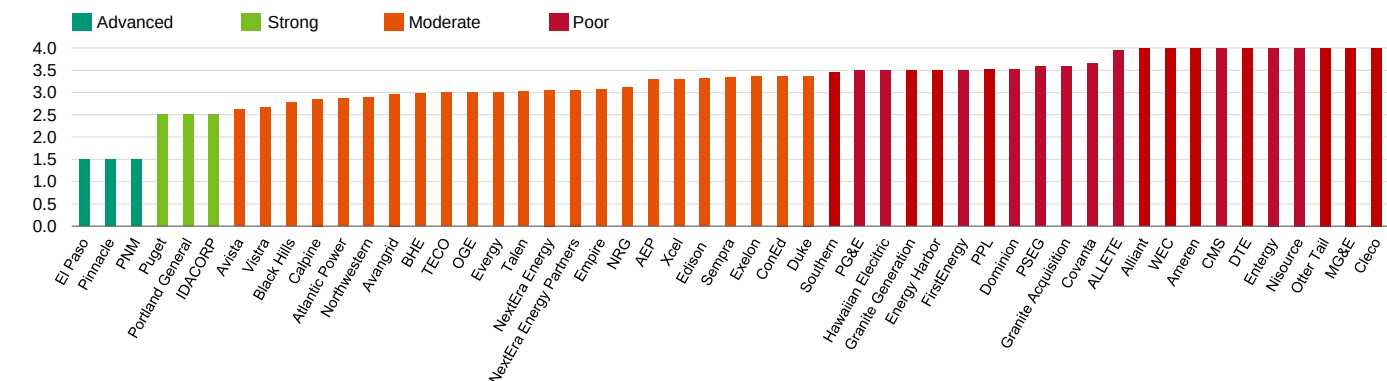
Sources: North American Electric Reliability Corporation and Moody's Investors Service

Most issuers received scores indicating moderate or poor positioning for market growth risk, because the electricity consumption is expected to remain flat or decline in most parts of the country through 2025. Issuers with power plants located in MISO, New England, New York and California scored poorly in this subcomponent. Conversely, issuer with power plants located in ERCOT, Southwest and Northwest scored advanced or strong positioning, as shown in Exhibit 13. [El Paso Electric Company](#) (Baa2 stable), [Pinnacle West Capital Corporation](#) (A3 negative) and [PNM Resources Inc.](#) (Baa3 stable) scored advanced positioning because the majority of their capacity is located in the Southwest where demand for power is growing due to increases in economic and residential development.

Exhibit 13

Most issuers have moderate or poor positioning

Our scoring of CTA subcomponent assessing market growth risk



Source: Moody's Investors Service

Component C - Assessing medium-term response activities: broad range of positioning in terms of expected fossil-fuel supply mix

Electric utilities and power generators that are already building renewable capacity and divesting fossil-fuel plants will be better positioned for the low-carbon transition because they do not have to invest as much to align with decarbonisation policies.

Fossil-fuel supply mix in 2025: To assess the medium-term response of issuers, we use just one subcomponent that estimates their fossil-fuel supply mix in 2025, including expected changes to fossil-fuel generating capacity, as well as planned additions of fossil capacity and generation, assuming the total electricity supply in 2025 is the same as 2019 and all retired fossil-fuel capacity and respective generation is replaced by renewables. We did not include specific planned renewable power projects due to the lack of reliable data and the limited visibility of future developments. We scored issuers by dividing its estimated 2025 generation from fossil fuels in MWh by the total electricity sold by the issuer in 2019.

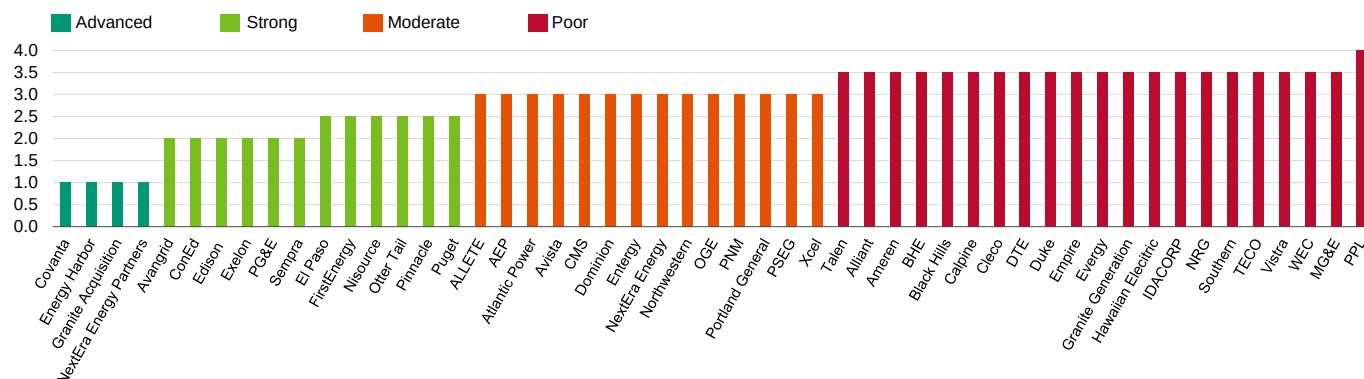
The scoring ranges are tighter than those for the subcomponents of Component A to reflect a more restricted range of future outcomes for fossil-fuel plants. The fossil-fuel supply weighted by respective carbon contents must be below 20 points on a 100-points scale to score strong positioning.

As shown in Exhibit 14, this component reveals a wide degree of variance among the issuers. Covanta, Energy Harbor, [Granite Acquisition](#) (B1 stable) and NextEra Energy Partners received scores indicating advanced positioning because their projected fossil fuel supply mix in 2025 is comprised entirely of non-fossil-fuel sources.

Exhibit 14

Wide range of positioning among issuers

Our scoring of CTA subcomponent assessing planned fossil-fuel supply mix in 2025



Source: Moody's Investors Service

Component D - Assessing long-term exposure to rapid transition scenario: significant realignment needed for some issuers

The final component of our CTA framework – long-term exposure to a rapid carbon transition scenario scores the estimated amount of coal-fired capacity retired under the IEA's Sustainable Development Scenario (SDS) until 2030. Under this scenario, global electricity supply moves rapidly toward renewables and other low-carbon sources and coal-fired installed capacity in the US falls by 56%, from 245 GW in 2020 to 108 GW in 2030.

Assuming no growth in electricity consumption, we expect a reduction in US coal-fired generation to around 10% of total power generated in 2030 from 27.5% in 2019. To assess how issuers owning generation assets will fare in this scenario, we consider the proportion of each issuer's generation capacity that will close in 10 years.

Proportion of capacity closed in 10 years (2030): To calculate the score for this subcomponent, we assumed the retirement of all coal plants that either have an announced retirement date by 2030, are located in a state that requires the phaseout of coal generation by 2030 or are owned by an issuer located in a state that requires the phaseout of coal generation by 2030. Then we ranked older coal plants to be retired by age until we reach the cumulative retired capacity determined under IEA SDS. In the US, we assumed that all coal plants which are older than 47 years in 2020 will be retired by 2030.

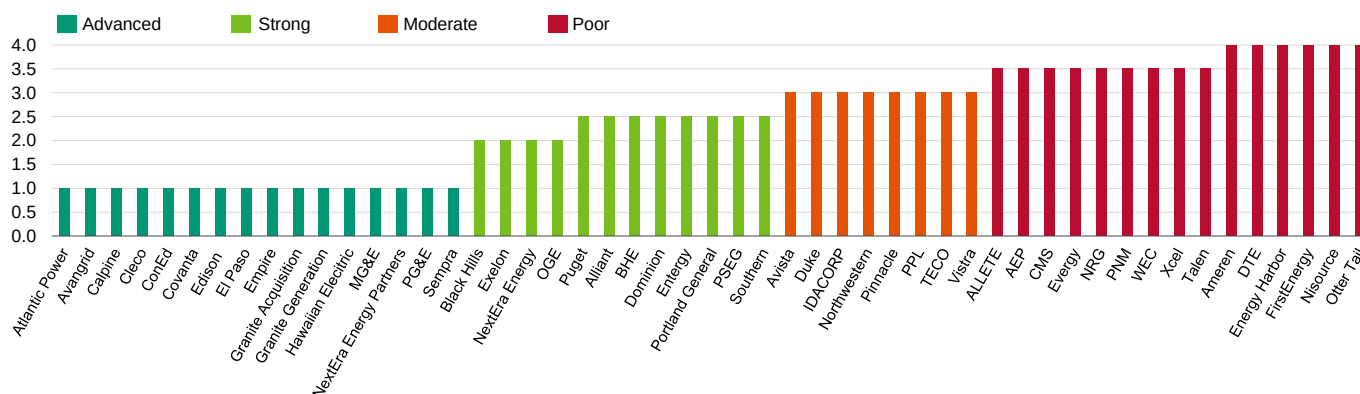
More than half of the issuers in our cohort scored 2.5 and below for strong and advanced positioning, indicating they have a portfolio of power plants that would be well-positioned under the IEA SDS. Issuers that scored advanced positioning either have no coal capacity or their coal was not retired under our assumptions explained above. As shown in Exhibit 15, Ameren, DTE, Energy Harbor, FirstEnergy, NiSource and [Otter Tail Corporation](#) (Baa2 stable) scored 4.0 in this component because they would have to retire more than 30% of their current generation capacity under our assumptions.

NiSource scored poorly because it plans to retire all of their coal-fired generation by 2028, which represents 72% of their current generation capacity. [Otter Tail Power Company](#) (A3 stable), Otter Tail Corporation's principal utility subsidiary, generated 46% of its energy needs from coal in 2019. A significant portion of its coal generation will be retired by 2021 and replaced with renewable and gas-fired generation. As issuers retire coal capacity, their CTA scores will improve accordingly to reflect greater alignment with a low carbon energy transition.

Ameren generates more than 60% of its power from coal and has no immediate plans for diversification. But the US Department of Justice's litigation against the company for alleged violations of the Clean Air Act's New Source Review provisions increases the risk that Ameren may have to accelerate the closure of its coal-fired Rush Island Energy Center or spend significant capital for emissions-control upgrades.

Exhibit 15

More than half of utilities and power companies would be well-positioned for an accelerated transition to a low-carbon economy
Our scoring of CTA subcomponent assessing proportion of capacity closed in 10 years



Source: Moody's Investors Service

Overall CTA scores benefit from reduced carbon exposure of non-generation businesses

Twenty of the 71 issuers in our cohort do not own generation assets and most that do also have distribution, transmission or other related operations. For non-generation activities, we assigned a separate CTA score ranging from 1.0 for low-carbon activities to 4.0 for high-carbon activities, as shown in Exhibit 16. We then weighted each score based on the segment's proportion of the issuer's EBITDA or revenue when EBITDA was not available.

Exhibit 16

CTA scores for non-generation activities of power companies

Specific Business	CTA Score
Other low carbon activities	1.0
Electric transmission / distribution / networks	1.6
Gas transmission / distribution / networks	2.5
Retail	2.5
Other uncategorized*	2.5
Other high carbon activities	4.0

*Other uncategorized refers to business segments where the nature of the business is unclear.

Source: Moody's Investors Service

To calculate each issuer's final, overall CTA score, we combined the CTA scores for their generation and non-generation operations, weighting them based on their proportion of the issuer's EBITDA. NextEra Energy Partners was the only issuer to receive both generation CTA and overall CTA scores indicating advanced positioning. While Covanta received generation CTA scores indicating advanced positioning, they received slightly lower overall CTA scores, indicating strong positioning because of the proportion of EBITDA from their waste businesses, which received a score of 2.5 for carbon transition risk. By contrast, the overall CTA scores of Ameren and PPL each improved by five notches from their generation CTA scores because they derive a significant proportion of their EBITDA from businesses with lower transition risk, predominantly electric transmission and distribution.

Non-generation issuers scoring the best were those focused on electric transmission and distribution, such as [American Transmission Company LLC](#) (A2 stable), [Central Hudson Gas & Electric Corporation](#) (A3 negative), [Duquesne Light Holdings Inc.](#) (Baa3 stable), [Electric Transmission Texas LLC](#) (Baa2 stable), [Transource Energy LLC](#) (A2 stable) and [ITC Holdings Corp.](#) (Baa2 stable).

Appendix

Exhibit 17

Carbon transition assessment (CTA) scores for the power generation operations of the 51 issuers in our cohort that own generation assets

Issuer	LT Rating	Generation CTA	Component A: Current Profile				Component B: Medium-term exposure to technology /market/policy risk			Component C: Medium-term response activities		Component D: Long-term exposure to rapid transition scenario	
			Score	Fossil-fuel supply weighting	Utilization of fossil fuel plants	Component A	Policy exposure	Technology cost risk	Market growth risk	Planned fossil-fuel generation weighting in 5 years	Component C	Proportion of capacity closed in 10 years	Component D
				Score	Score								
NextEra Energy Partners, LP	Ba1	CT-1	1.17	1.00	1.00	1.00	1.00	1.00	3.06	1.69	1.00	1.00	1.00
Covanta Holding Corporation	Ba3	CT-2	1.58	1.00	1.00	1.00	3.02	3.36	3.65	3.35	1.00	1.00	1.00
Consolidated Edison, Inc.	Baa2	CT-3	1.68	2.00	1.00	1.50	1.60	1.75	3.37	2.24	2.00	2.00	1.00
Granite Acquisition, Inc.	B1	CT-3	1.68	2.00	2.00	2.00	2.35	2.19	3.58	2.71	1.00	1.00	1.00
Avangrid, Inc.	Baa1	CT-3	1.70	2.00	2.00	2.00	1.23	1.19	2.97	1.79	2.00	2.00	1.00
PG&E Corporation	Ba2	CT-3	1.84	2.00	2.26	2.13	1.54	1.65	3.50	2.23	2.00	2.00	1.00
Edison International	Baa3	CT-4	1.95	2.00	2.92	2.46	1.86	1.88	3.31	2.35	2.00	2.00	1.00
Sempra Energy	Baa2	CT-4	2.10	2.00	4.00	3.00	2.05	1.81	3.34	2.40	2.00	2.00	1.00
Atlantic Power Corporation	Ba3	CT-5	2.26	2.50	2.34	2.42	2.59	2.40	2.86	2.61	3.00	3.00	1.00
El Paso Electric Company	Baa2	CT-5	2.27	2.50	3.06	2.78	3.00	3.91	1.50	2.81	2.50	2.50	1.00
Hawaiian Electric Company, Inc.	Baa2	CT-5	2.29	2.50	1.00	1.75	2.79	2.49	3.50	2.93	3.50	3.50	1.00
Exelon Corporation	Baa2	CT-5	2.41	2.00	3.14	2.57	2.36	3.45	3.36	3.05	2.00	2.00	2.00
NextEra Energy, Inc.	Baa1	CT-5	2.45	2.50	2.48	2.49	2.12	1.79	3.06	2.32	3.00	3.00	2.00
Puget Energy, Inc.	Baa3	CT-6	2.51	2.50	2.74	2.62	2.43	2.36	2.50	2.43	2.50	2.50	2.50
Portland General Electric Company	A3	CT-6	2.59	2.50	2.17	2.33	2.65	2.40	2.50	2.52	3.00	3.00	2.50
Avista Corp.	Baa2	CT-6	2.60	2.50	2.00	2.25	1.97	1.86	2.61	2.15	3.00	3.00	3.00
Granite Generation, LLC	Ba3	CT-6	2.64	3.00	2.00	2.50	3.20	4.00	3.50	3.57	3.50	3.50	1.00
Calpine Corporation	Ba3	CT-6	2.65	3.00	2.82	2.91	3.27	3.39	2.86	3.17	3.50	3.50	1.00
Empire District Electric Company (The)	Baa1	CT-6	2.70	3.50	2.46	2.98	2.98	3.92	3.07	3.33	3.50	3.50	1.00
Pinnacle West Capital Corporation	A3	CT-6	2.72	2.50	3.19	2.85	2.64	3.46	1.50	2.54	2.50	2.50	3.00
Northwestern Corporation	Baa2	CT-6	2.74	2.50	2.43	2.47	2.10	2.45	2.89	2.48	3.00	3.00	3.00
Madison Gas and Electric Company	A1	CT-6	2.74	3.00	3.06	3.03	2.75	3.50	4.00	3.42	3.50	3.50	1.00
OGE Energy Corp.	Baa1	CT-6	2.80	2.50	3.53	3.02	2.69	3.82	3.00	3.17	3.00	3.00	2.00
Black Hills Corporation	Baa2	CT-7	2.83	3.50	2.60	3.05	2.63	2.87	2.77	2.76	3.50	3.50	2.00
Public Service Enterprise Group Incorporated	Baa1	CT-7	2.84	2.50	2.70	2.60	2.77	3.48	3.58	3.28	3.00	3.00	2.50
Energy Harbor Corp.	Baa3	CT-7	2.86	2.50	3.78	3.14	2.36	4.00	3.50	3.29	1.00	1.00	4.00
Cleco Corporate Holdings LLC	Baa3	CT-7	2.87	3.50	3.27	3.39	2.79	3.99	4.00	3.60	3.50	3.50	1.00
Otter Tail Corporation	Baa2	CT-7	2.87	2.00	2.00	2.00	2.09	2.82	4.00	2.97	2.50	2.50	4.00
Berkshire Hathaway Energy Company	A3	CT-7	2.88	3.00	2.92	2.96	2.30	2.40	2.98	2.56	3.50	3.50	2.50
PNM Resources, Inc.	Baa3	CT-7	2.89	2.50	2.39	2.44	2.76	3.61	1.50	2.62	3.00	3.00	3.50
Southern Company (The)	Baa2	CT-7	2.89	3.00	2.88	2.94	2.50	1.88	3.45	2.61	3.50	3.50	2.50
Dominion Energy, Inc.	Baa2	CT-7	2.92	2.50	3.48	2.99	2.69	3.37	3.52	3.19	3.00	3.00	2.50
Entergy Corporation	Baa2	CT-7	2.92	2.50	2.79	2.64	2.65	3.98	4.00	3.54	3.00	3.00	2.50
FirstEnergy Corp.	Ba1	CT-7	2.93	2.00	2.44	2.22	2.18	3.36	3.50	3.01	2.50	2.50	4.00
IDACORP, Inc.	Baa1	CT-7	2.93	3.00	2.98	2.99	2.05	2.17	2.50	2.24	3.50	3.50	3.00
ALLETE, Inc.	Baa1	CT-7	2.95	2.50	2.57	2.53	2.02	2.28	3.94	2.75	3.00	3.00	3.50
Alliant Energy Corporation	Baa2	CT-7	2.98	2.50	2.73	2.61	2.61	3.29	3.98	3.29	3.50	3.50	2.50
Duke Energy Corporation	Baa1	CT-7	2.99	2.50	3.01	2.75	2.61	2.18	3.37	2.72	3.50	3.50	3.00
TECO Energy, Inc.	Baa2	CT-7	3.00	3.00	3.02	3.01	2.61	1.90	3.00	2.50	3.50	3.50	3.00
CMS Energy Corporation	Baa1	CT-7	3.07	2.50	2.47	2.48	2.61	3.30	3.99	3.30	3.00	3.00	3.50
Xcel Energy Inc.	Baa1	CT-7	3.09	2.50	2.88	2.69	2.90	3.29	3.29	3.16	3.00	3.00	3.50
American Electric Power Company, Inc.	Baa2	CT-8	3.17	2.50	3.35	2.93	2.65	3.80	3.29	3.25	3.00	3.00	3.50
Vistra Energy Corp.	Ba1	CT-8	3.21	3.50	2.72	3.11	3.27	3.77	2.66	3.23	3.50	3.50	3.00
PPL Corporation	Baa2	CT-8	3.28	4.00	2.82	3.41	2.58	2.02	3.51	2.71	4.00	4.00	3.00
Evers, Inc.	Baa2	CT-8	3.34	3.00	3.37	3.18	2.73	3.84	3.00	3.19	3.50	3.50	3.50
WEC Energy Group, Inc.	Baa1	CT-8	3.36	3.00	2.92	2.96	2.85	3.63	3.99	3.49	3.50	3.50	3.50
NiSource Inc.	Baa2	CT-8	3.37	3.00	3.60	3.30	3.08	3.97	4.00	3.68	2.50	2.50	4.00
Talen Energy Supply, LLC	B2	CT-8	3.38	3.00	3.51	3.25	3.04	3.76	3.03	3.28	3.50	3.50	3.50
NRG Energy, Inc.	Ba1	CT-9	3.43	3.50	3.27	3.39	3.30	3.58	3.11	3.33	3.50	3.50	3.50
DTE Energy Company	Baa2	CT-9	3.50	3.00	3.20	3.10	2.66	3.52	3.99	3.39	3.50	3.50	4.00
Ameren Corporation	Baa1	CT-9	3.56	3.50	2.87	3.18	2.89	3.78	3.99	3.55	3.50	3.50	4.00

Score legend

■ Advanced
 ■ Strong
 ■ Moderate
 ■ Poor

Component/subcomponent scores are based on a four-point scale. The overall score, which is the sum of the four, equally weighted component scores, is then mapped to the 10-point CTA scale. The four categories of positioning (advanced, strong, moderate, poor), which are defined in Exhibit 5, are color-coded and are applied in the scoring of each subcomponent, component and overall CTA score.

Source: Moody's Investors Service

Exhibit 18

Carbon transition assessment (CTA) scores for the 71 issuers in our cohort

Issuer	LT Rating	Overall CTA score	Score	Generation CTA score	Score
NextEra Energy Partners, LP	Ba1	CT-2	1.50	CT-1	1.17
American Transmission Company LLC	A2	CT-2	1.60	-	-
Central Hudson Gas & Electric Corporation	A3	CT-2	1.60	-	-
Duquesne Light Holdings, Inc.	Baa3	CT-2	1.60	-	-
Electric Transmission Texas, LLC	Baa2	CT-2	1.60	-	-
Transource Energy, LLC	A2	CT-2	1.60	-	-
ITC Holdings Corp.	Baa2	CT-2	1.60	-	-
FirstEnergy Corp.	Ba1	CT-3	1.68	CT-7	2.93
PPL Corporation	Baa2	CT-3	1.70	CT-8	3.28
Eversource Energy	Baa1	CT-3	1.73	-	-
Avangrid, Inc.	Baa1	CT-3	1.78	CT-3	1.70
Edison International	Baa3	CT-3	1.78	CT-4	1.95
Consolidated Edison, Inc.	Baa2	CT-3	1.82	CT-3	1.68
El Paso Electric Company	Baa2	CT-4	1.94	CT-5	2.27
Hawaiian Electric Company, Inc.	Baa2	CT-4	1.95	CT-5	2.29
CenterPoint Energy, Inc.	Baa2	CT-4	1.98	-	-
PG&E Corporation	Ba2	CT-4	2.01	CT-3	1.84
Public Service Enterprise Group Incorporated	Baa1	CT-4	2.02	CT-7	2.84
Exelon Corporation	Baa2	CT-4	2.05	CT-5	2.41
UNS Electric, Inc.	A3	CT-4	2.05	-	-
Puget Energy, Inc.	Baa3	CT-4	2.06	CT-6	2.51
Sempra Energy	Baa2	CT-4	2.06	CT-4	2.10
American Electric Power Company, Inc.	Baa2	CT-4	2.08	CT-8	3.17
NextEra Energy, Inc.	Baa1	CT-4	2.08	CT-5	2.45
Covanta Holding Corporation	Ba3	CT-4	2.09	CT-2	1.59
Unitil Corporation	Baa2	CT-4	2.09	-	-
Avista Corp.	Baa2	CT-4	2.10	CT-6	2.60
Portland General Electric Company	A3	CT-4	2.10	CT-6	2.59
Pinnacle West Capital Corporation	A3	CT-4	2.16	CT-6	2.72
Ameren Corporation	Baa1	CT-4	2.18	CT-9	3.56
OGE Energy Corp.	Baa1	CT-4	2.20	CT-6	2.80
Berkshire Hathaway Energy Company	A3	CT-5	2.21	CT-7	2.88
Northwestern Corporation	Baa2	CT-5	2.23	CT-6	2.74
Granite Acquisition, Inc.	B1	CT-5	2.25	CT-3	1.68
PNM Resources, Inc.	Baa3	CT-5	2.25	CT-7	2.89
Empire District Electric Company (The)	Baa1	CT-5	2.26	CT-6	2.70
IDACORP, Inc.	Baa1	CT-5	2.27	CT-7	2.93
Alliant Energy Corporation	Baa2	CT-5	2.31	CT-7	2.98
Madison Gas and Electric Company	A1	CT-5	2.31	CT-6	2.74
Otter Tail Corporation	Baa2	CT-5	2.32	CT-7	2.87
Southern Company (The)	Baa2	CT-5	2.33	CT-7	2.89
Duke Energy Corporation	Baa1	CT-5	2.34	CT-7	2.99
TECO Energy, Inc.	Baa2	CT-5	2.35	CT-7	3.00
Cleco Corporate Holdings LLC	Baa3	CT-5	2.37	CT-7	2.87
Xcel Energy Inc.	Baa1	CT-5	2.37	CT-7	3.09
Dominion Energy, Inc.	Baa2	CT-5	2.38	CT-7	2.92
Entergy Corporation	Baa2	CT-5	2.38	CT-7	2.92
WEC Energy Group, Inc.	Baa1	CT-5	2.39	CT-8	3.36
CMS Energy Corporation	Baa1	CT-5	2.41	CT-7	3.07
UGI Utilities, Inc.	A2	CT-5	2.45	-	-
Black Hills Corporation	Baa2	CT-5	2.47	CT-7	2.83
Eversgy, Inc.	Baa2	CT-5	2.47	CT-8	3.34

Issuer	LT Rating	Overall CTA score	Score	Generation CTA score	Score
ALLETE, Inc.	Baa1	CT-5	2.48	CT-7	2.95
NiSource Inc.	Baa2	CT-5	2.49	CT-8	3.37
Atmos Energy Corporation	A1	CT-5	2.50	-	-
New Jersey Natural Gas Company	A1	CT-5	2.50	-	-
Northwest Natural Gas Company	Baa1	CT-5	2.50	-	-
ONE Gas, Inc.	A2	CT-5	2.50	-	-
SEMCO Energy, Inc.	Baa1	CT-5	2.50	-	-
South Jersey Gas Company	A3	CT-5	2.50	-	-
Southwest Gas Holdings, Inc.	Baa1	CT-5	2.50	-	-
Spire Inc.	Baa2	CT-5	2.50	-	-
WGL Holdings, Inc.	Baa1	CT-5	2.50	-	-
DTE Energy Company	Baa2	CT-6	2.53	CT-9	3.50
Atlantic Power Corporation	Ba3	CT-6	2.55	CT-5	2.26
Calpine Corporation	Ba3	CT-6	2.63	CT-6	2.65
Granite Generation, LLC	Ba3	CT-6	2.64	CT-6	2.64
Energy Harbor Corp.	Baa3	CT-6	2.80	CT-7	2.86
NRG Energy, Inc.	Ba1	CT-7	3.08	CT-9	3.43
Vistra Energy Corp.	Ba1	CT-8	3.13	CT-8	3.21
Talen Energy Supply, LLC	B2	CT-8	3.38	CT-8	3.38

Score legend

■ Advanced
 ■ Strong
 ■ Moderate
 ■ Poor

The four categories of positioning (advanced, strong, moderate, poor), which are defined in Exhibit 4, are color-coded and are applied in the scoring of the overall and generation CTA scores.

Source: Moody's Investors Service

Moody's related publications

Assessment Frameworks and scoring reports

- » [Electric Utilities and Power Generators – Global Carbon transition assessment framework for electric utilities and power](#), 3 November 2020
- » [Refining and marketing – Global: Location and complexity limit severity of carbon transition risk for most refiners](#), 21 September 2020
- » [Refining and Marketing – Global: Carbon transition assessment framework for refining and marketing companies](#), 10 July 2020
- » [Automotive manufacturing – Global: Substantial variation exists in automakers' carbon transition risk profiles](#), 4 November 2019
- » [Automotive manufacturing – Global: Carbon transition assessment framework for auto manufacturers](#), 24 September 2019
- » [Non-financial companies – Global Framework to assess carbon transition risk for corporate sectors](#), 24 September 2019

Sector In-Depth

- » [Power Generation – US: State policies drive long-term US renewable energy demand](#), 22 September 2020
- » [Electric Utilities and Power Companies – US: Nuclear operators face growing climate risk but resiliency investments mitigate impact](#), 18 August 2020
- » [ESG – Global: Climate scenarios vital to assess credit impact of carbon transition, physical risks](#), 10 March 2020
- » [Regulated electric and gas utilities – US: Grid hardening, regulatory support key to credit quality as climate hazards worsen](#), 2 March 2020
- » [Regulated electric utilities – US: Intensifying climate hazards to heighten focus on infrastructure investments](#), 16 January 2020
- » [Cross-Sector – Europe: EU decarbonisation strategy accelerating energy transition](#), 19 November 2019
- » [Electric utilities and power producers – US: Power companies on pace to reduce CO2 emissions](#), 26 September 2019
- » [Power generation – US: Nuclear zero emission credits reduce carbon transition risk but change market dynamics](#), 27 June 2019
- » [Power generation – US: FAQ on the economics of renewable energy, battery storage and fossil-fuel power plants](#), 12 June 2019
- » [Cross-Sector - Global Frequently asked investor questions about environmental, social and governance issues](#), 5 March 2019
- » [Environmental Risks – Global: Heat map: 11 sectors with \\$2.2 trillion debt have elevated environmental risk exposure](#), 25 September 2018

Cross-Sector Rating Methodology

- » [General Principles for Assessing Environmental, Social and Governance Risks: Proposed Methodology Update](#), 23 September 2020
- » [General Principles for Assessing Environmental, Social and Governance Risks](#), 9 January 2019

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