

# A Matter of Opinion

Credit Rating Agency Evolution on Climate Change Risk  
and Fossil Fuel Financial Viability

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## Key Findings

**Major credit rating agencies have entered a new phase of more stringent credit standards regarding climate change.**

**Community and climate voices have become new participants that are shaping the market generally and credit agencies in particular.**

**The market is likely to continue to reward low-carbon, fossil-free investments.**

**Climate change has become its own risk category for credit rating agencies because of regulatory, legal, economic, financial, political and social concerns.**



## Executive Summary

Credit rating agencies (Moody's Investors Service, Standard and Poor's, and Fitch Ratings) have moved almost 180 degrees in their perspective on fossil fuels during the last 20 years. A consensus has emerged. At one time, the agencies considered fossil fuels to be "credit positive." Now, individually and in the aggregate, the three major credit rating agencies are issuing clear, specific warnings about the financial risks of fossil fuels. The opinions and approaches are varied and nuanced but clear: Coal is credit negative, and oil and gas companies confront substantial financial risks that are dampening credit ratings. Moody's, for example, has moved its position on coal from credit positive to credit negative, and it perceives oil and gas—also once deemed credit positive—as facing a quagmire of risks.

This paper charts credit rating agency changes on climate-related risks and roots the change in the eroding fortunes of fossil fuel companies and their investors. The erosion of the coal, oil and gas sectors' energy and financial leadership roles maps the declining significance of fossil fuels to the economic growth calculus that has served the world for decades. On the equities side, the industry has gone from a market-dominating 28% of the stock market in the 1980s to a stunning 2% of market in October 2020, more than a year before Putin invaded Ukraine. On the business side, fossil fuels face competition across the entire range of end users in electricity generation, transportation and petrochemicals. The trends are clear, and day-to-day market disruptions are unlikely to change the basic economic trajectory away from fossil fuels.

This report also identifies a new actor on the scene—"community and climate voices." At first dismissed, these scientific, technological, environmental, community and business voices have established "facts on the ground" through persistent, well-documented, skilled, and organized activities that are increasingly finding articulation and legitimacy in institutional positions taken by energy and financial stakeholders.

Not all the community and climate voices have climate change as their priority. Some are defending communities beset by toxic pollution; others have created innovative tools to improve efficiency; and still others are seeing the move away from fossil fuels as creating business opportunities in a sustainable future. Taken together, these voices have formed an alternative, still-evolving view of a sustainable economy and are mustering the tools necessary to challenge the quasi-monopolistic power arrangements that have supported fossil fuel use for decades.

The current storyline starts in the 1960s, charting 40 years of coal, oil and gas growth fueling the global economy with rising quarterly revenues and market share, and providing a significant contribution to the world's sovereign wealth, pension and institutional funds. The credit term for this positioning is "credit positive." In the early 2000s, the United States embarked on a plan to expand coal use. Fueled by a flood of cheap coal and the promise of new technologies, it moved forward with a market-driven plan for 151 new coal plants. That plan and others designed to launch a new golden era of coal backfired amidst a string of market setbacks and growing public concerns.

Today, coal plants are credit negative, and oil and gas investments are a flashing yellow light, tilting toward red. The interaction of market forces and organized community and climate voices completely undermined coal's growth plans in the United States. Though some coal plant operators in the United States and more so worldwide can navigate the increasing financial and environmental risks, coal's position adds negatives to company risk profiles. Oil and gas—a more powerful and significant factor in any economic calculus—is also losing its competitive position, market valuation, demand, and popular support. There is still short-term money to be made in fossil fuels, but steady growth and blue-chip performance is a thing of the past.

The result: The finance sector's oversight watchdogs, the credit rating agencies, have all moved to the arena of comprehensive credit analysis, acknowledging the impact of climate change on traditional risk areas—regulatory, legal, economic, financial, political, and social. The issue has grown to such magnitude that climate has become its own risk category.

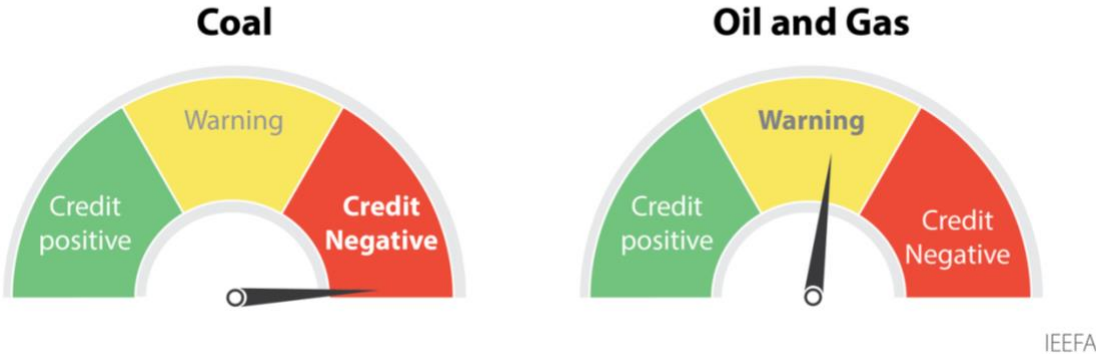
The new, tightened standards are rooted in the financial fundamentals of credit—the ability and willingness of companies and issuers to pay back obligations. The erosion of demand for fossil fuels reduces revenues, new energy opportunities driven by cost-saving technologies are replacing fossil fuels, and the energy transition—the ability to achieve a substantial reduction of fossil fuels in the aggregate—is a story in the making. Taken as a whole, climate change is a financial risk. Financial risks require financial actions to manage or eliminate them.

The next steps for the market, credit rating agencies, and community and climate voices will be critically important. The market is likely to continue to reward low-carbon, fossil-free investments. It is also likely to begin to punish fossil fuel investments. Even periodic price spikes—although temporarily beneficial to fossil fuel producers—are now seen through a lens of volatility, inflation, societal disruption and a drag on global economic growth. Credit rating agencies will need to refine these new standards as they apply them. This will allow them to stay ahead of the curve. They play an important role in deciding whether fossil fuel companies that have made climate promises are keeping them. And community and climate voices have a far more complex task as their mission inevitably changes from marshalling the facts and bringing worldwide attention to climate change to now selecting among options that are difficult, contradictory and may have uncertain outcomes.

Credit ratings serve a very specific function in the investment decision-making process. They are not meant to be an investment recommendation just as they are not a judge of policy options. They are a broad analytical tool that assesses the ability of an enterprise to pay back debt. This paper makes clear that climate change is altering the credit landscape, including the role the credit rating agencies are playing in the process of formulating public policy.

Figure ES-1: Fossil Fuel Credit Indicator Dashboard 2023

An IEEFA analysis of credit rating agency evaluations of the coal and oil and gas sectors finds both are no longer credit-positive.



This report focuses on institutional change. It charts the evolution of credit rating agency commentary on the risks of climate change impacts from 2000 to the present. It also describes how the evolving commentaries and risk assessments by the credit agencies reflect the continuous erosion of the creditworthiness of coal, oil, and gas companies.

This paper treats climate change as a financial risk requiring financial actions. Those actions by investors and management can be offensive (launching new investment directions) or defensive (restricting or eliminating reliance upon fossil fuels as a value proposition). Short- and long-term corporate programs by fossil fuel producers and value chain manufacturers and distributors to address climate change, once mere promises in corporate press releases, are now requiring the deployment of financial resources, as well as the assessment of profit and loss that comes with it.

This paper does not address the relationship between climate risk and environmental, social and governance (ESG) issues. IEEFA has done that elsewhere.<sup>1</sup>

## Background

This report is about climate change, credit risk and the financial viability of fossil fuels. Credit risk analysis is changing due to climate change risk and the institutional reaction to it. The change in direction has deep implications since it is also linked to the faltering economic position of the coal, oil and gas sectors.

At the heart of the climate change issue, from a financial perspective, is the physical damage done by repeated, extreme weather events taking place over an extended duration with increasing

<sup>1</sup> IEEFA. [Campaign to undermine ESG principles is about power—not good investment policy](#). September 28, 2022. IEEFA. [Two Economies collide: Competition, conflict and the financial case for fossil fuel divestment](#). October 13, 2022.

intensity.<sup>2</sup> In response, countries are engaging in disaster recovery and rebuilding, as well as providing support for public and private new business lines and other mitigation activities to decrease the production of greenhouse gas (GHG) emissions.<sup>3</sup> Questions of how those actions are integrated into the new business models of the companies and countries involved and the structure of profit, including the ability to honor long-term financial obligations, are at the heart of the credit challenge for both the public and private sector. These questions of governance, corporate strategy and portfolio assessment are typically discussed under the rubric of transition risk—how companies are changing to move away from fossil fuel dominance in the economy.

These two analytically distinct risk categories—physical and transition risk—are integrated in this paper. Physical risk grows if transition risks remain unabated and vice versa.

With or without climate change, the energy sector needs a new business model. The contemporary model is based on the premise that the economy is largely industrial and needs large amounts of energy to grow. The premise that economic growth and fossil fuel growth are synonymous is changing—the two are decoupling.

Economic growth will continue. However, it will be fueled by a far less energy-intensive business model. ExxonMobil publishes an annual Global Energy Outlook that contains an Energy Intensity Index. That report shows that Energy Intensity (thousand British Thermal Units, or “Btus,” of energy per dollar of gross domestic product) was 8.5 in 2000 and is expected to be 3.7 in 2050. GDP is expected to grow by 100% during this same period.<sup>4</sup>

The economy is expected to continue to grow without a commensurate increase in the rate of growth in the traditional energy sector. This macroeconomic projection explains and supports a major premise of this paper: The energy sector has been in a state of decline, continues to decline and is likely to stay on that path.

- In 1980, the energy sector had 28% of the stock market. Today it has 3.9% of the stock market. In October 2020 the sector hit 2%.
- In eight of the 10 years before the Ukraine invasion, the sector lagged the stock market. In five of those years, it placed last in the stock market.
- In 2023, after a strong financial performance due to the 2022 invasion, the industry placed last in the stock market again for most of the year. In 2023, the energy sector finished next to last.

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<sup>2</sup> The periodic reports of the [Intergovernmental Panel on Climate Change](#) have mapped the trajectory of physical events and climate science since the 1990s.

<sup>3</sup> Under the Paris Agreement, the United Nations Conference on Climate Change hosts regular meetings to discuss the status of global efforts in cooperation to find climate solutions.

<sup>4</sup> ExxonMobil. [Global Energy Outlook 2023](#). Last visited December 23, 2023.



- Coal entered this century as the leading source of electricity, commanding 50% of the electricity market in many years. In 2023, it failed to command 20% in any given month.<sup>5</sup>
- The oil and gas sector faces strong competition in most of its major end-product markets. By 2040, ExxonMobil CEO Darren Woods anticipates that there will be no new automobiles using gasoline.
- Natural gas growth is expected to slow through 2050.<sup>6</sup>
- Plastics use is expected to grow, but recycling will put a damper on industry growth projections.

There are many short-term drivers that will cause oil and gas prices to rise and fall, and stock prices to change accordingly. Wars, inflation, recession, trade disputes and political upheavals are unlikely to reverse the more fundamental trend of new lower-cost (and lower-carbon) technologies as determinants of economic growth. It remains to be seen how these changes, spurred on by scientific findings on climate change and increasing admonitions about it, will be integrated into business models and balance sheets. The corporate revenue story that will accompany these changes forms the basis for much of the credit analysis. The broader political and societal changes taking place along with the financial story complete the picture.

If the credit raters carry their weight in the coming decades, financial markets should experience fewer jolts and the larger society will be better served. The credit raters are not the only financial mechanism to look to during the energy transition, but they do contain one of the most transparent and objective tools for all to keep track of the storyline.

## What Is a Credit Rating?

A credit rating is an opinion about the ability and willingness of debt issuers to meet repayment obligations. The rating serves the market because it is an independent view, usually provided in the form of credit opinion that includes a letter grade, short-term outlook (A-, stable) and a qualitative assessment that elevates prominent risk factors related to the operating environment.<sup>7</sup>

Credit ratings and the discourse around credit ratings create a common language for understanding the market, but are more analytically focused than standard accounting data. For the purposes of this report, we rely on the credit ratings and methodologies of Moody's, Fitch, and Standard and Poor's.

The scope of credit rating can cover an issuer—usually a company, governmental entity, or special purpose vehicle. Credit ratings apply to both public and private issuers. They all have separate rating classifications and methodologies. The ratings usually focus on the revenues available to pay back

<sup>5</sup> World Coal. [IEEFA: Coal use at U.S. power plants continues to decline](#). November 9, 2023.

<sup>6</sup> IEA. [After peak in mature markets, global gas demand is set for slower growth in coming years](#). October 10, 2023.

<sup>7</sup> Standard and Poor's Global. [Introduction to Credit Ratings](#). Last visited December 7, 2023. Also see: Moody's Investor Services. [What is a Credit Rating](#). Last visited December 7, 2023. Also see Fitch Ratings. [Here is What Ratings Mean and what they don't](#). Last visited December 7, 2023.



obligations. The business climate of the issuer is critical. The credit review usually integrates data that covers both financial and non-financial factors. The operating environment usually includes an analysis of:

1. Economic, financial, legal, geopolitical, technological, scientific, and societal indicators.
2. Governance issues; and
3. The competitive position of the issuer in the various markets where products are made, distributed and sold.

The analysis is informed by an understanding of the business cycles that affect an issuer's financial performance. The issuer analysis reviews the financial fundamentals, including revenues, expenses, capex, and liquidity, as well as specific factors influencing the issuer's operating environment.

Credit ratings also cover an issuance, usually a bond or instrument that entails raising capital for a specific project or set of projects, such as a power plant, petrochemical plant, or pipeline. In such instances, the analysis focuses on the operating environment of the facility, revenue and expense projections, debt service capability, regulatory environment, and political considerations, as well as relevant macroeconomic and business cycle factors.

Credit rating agencies often report on significant issues affecting the market or shaping public debate with market implications. This is often done as part of a formal credit opinion. This report, for example, cites Standard and Poor's use of a credit opinion on the Formosa company to comment more broadly on the political forces in opposition to petrochemical hubs. Moody's also has produced commentaries separate from the credit opinion. For example, they have covered the growing inequality in the United States and the potential for market destabilization as a result.<sup>8</sup>

## What a Credit Rating Is Not

Credit ratings are NOT investment recommendations. Creditworthiness is one aspect of the all-things-considered judgment that goes into making an investment recommendation or decision. It is considered one component of the diligence of an investment decision, often used as a sensitivity test that complements the independent diligence that is expected of an investor. Beyond the credit rating, investors consider potential investments in relation to the overall portfolio, investment strategy and the comparative valuation of securities usually facilitated by issuer audits, annual reports, and other special investor studies.

Credit ratings also are not guarantees of future performance. Although the methodologies are thorough and constantly evaluated, the economy produces an abundance of unknowns.

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<sup>8</sup> Moody's Investor Services. Government of the United States: Rising US income inequality presents long-term challenges to fiscal strength and political risk. September 27, 2019. See also Moody's Investor Service. U.S. racial wealth and income inequality raises sovereign-related social risks. July 14, 2020. (Proprietary).

It is important to understand this distinction as many companies that are facing worrisome credit assessments continue to generate cash, dividends and fund new projects. The importance of the credit rating is that it is assessing the company's operating environment.

## Who Uses the Credit Rating?

The customers for credit ratings are investors, market intermediaries, issuers and business and financial institutions.

- Investors, institutions and individuals use the credit analysis as a supplement to their own diligence. Some institutional investors utilize the credit rating as a threshold. For example, a portfolio may not invest in a company with a speculative rating, below BBB-. Central banks use the credit rating to establish collateral requirements and to assess transactions.
- Intermediaries like investment bankers use the credit rating as part of the market information provided to potential buyers of securities. The rating is a quick way of summarizing a vast amount of information. Issuers use the rating as an independent verification of their representations to the market. The rating is also used by the financial planners for an issuer responsible for making assumptions about the all-important interest rate environment—the higher the credit rating, the lower the interest rate.
- Business and financial institutions use credit ratings to help assess counterparty risk in their operations. Will an issuer be negatively affected if its principal customers falter, e.g., will Chevron be affected if Ford and other automobile companies stop producing cars that run on gasoline?

Credit ratings change. They are driven by big picture macroeconomic considerations such as GDP trajectories, interest rates, demographics, inflation, and technological disruptions. When short-term changes trigger new assessments that are noteworthy but do not warrant letter grade changes, rating agencies use the “Positive,” “Negative,” “Stable,” or “Developing” qualifiers.

## Climate Change and Credit Ratings: A New Player Enters the Scene

The methodology of the credit rater is designed to handle the specific factors facing an industry or issuer. Credit rating agencies have developed a host of methodologies to cover most market sectors. Moody's, for example, has nine market segment classifications representing roughly 350 methodologies. Constructing overarching standards related to climate change that are based on a consistent set of principles applicable to this complicated system has taken time.

Climate change is creating significant challenges for credit raters.<sup>9</sup> The credit raters are being criticized for missing the climate issue, just as they missed the mortgage meltdown. Blunt assessments that no issuer has ever been denied market access due to climate change are fair. The credit rater plays a market watchdog function. In this role, it has been slow to act—in large measure due to the lack of solid, quantifiable data (on emissions, technology investments, estimated revenue and profit) at the industry and company level. The formal financial presentations of companies and other issuers have not made provisions for carbon-related issues because there has been no demand for it over the decades. There is now, and the attempt at comprehensive treatment by credit raters in their methodologies is still in its infancy. That is slow, given that the Intergovernmental Panel on Climate Change (IPCC) has been issuing studies and warnings for more than 30 years.

On the other hand, credit raters have addressed climate change as a risk factor for many years. For example, climate change is a factor in Moody's treatment of coal and its evolving position, as outlined in this paper. Under the current credit paradigm, climate change is a factor that touches most risk areas—economic, financial, political, regulatory, and societal. As the issue has become more urgent, the methods of credit analysis have changed. This report looks at how the credit rating agencies are changing and how climate risk is being integrated into risk assessments.

Understanding the slow pace of change is key to grasping its significance. Credit raters proceed cautiously, often relying on an understated vocabulary. As noted above, credit ratings are also often misunderstood. Given these qualifications, this paper shows that climate change poses alarming risks. When a credit agency moves coal power plants from credit-positive (a status they enjoyed for decades) to credit-negative for electricity producers, the level and intensity of the warning is tantamount to a five-alarm fire.

Credit rating agencies are now putting in place comprehensive standards assessing the steps that companies or issuers are taking to address the climate issue. Climate change is a global phenomenon with implications for all regions and all sectors of the economy. Some sectors—such as the coal, oil, and gas industries—are heavily exposed from a financial perspective. Other companies that are consumers of raw, intermediate or end-use fossil fuel products also play a role. The evolving standards of the credit raters are being extended to every sector of the economy reflecting the singular importance of fossil fuels to the world economy. Also new to the credit rating environment is the appearance on the scene of community and climate voices. We define community and climate voices as the amalgam of organizations and individuals devoting time and resources to the process of elevating the issue of and solutions for climate change. They are becoming increasingly important and offering a vision of a realigning economy and society.

Community and climate voices may be seen from the outside as one entity. However, we see these voices as an amalgam of interests that make up the climate movement, and many groups that are invested in climate change issues see them as fundamentally related to other, primary interests. For

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<sup>9</sup> Moody's, for example, has established a complex set of climate and ESG ratings for more than 4,000 companies. The mechanism allows the credit agency to assign ratings along a continuum of energy transition responsiveness from Challenged to Highly Negative. See: Moody's Investor Service. Cross Section Global, Data Report. September 2022. (Proprietary)

example, a community organization that does not want another toxic chemical plant in their neighborhood opposes it; stopping that project eliminates new greenhouse gas emissions. Or, a company might see the benefit in investing in a new business line that serves the wind or solar industry. The development and success of the effort employs people, pays taxes and builds a community.<sup>10</sup> It also helps to replace coal, oil and gas in the nation's electricity system. All these interests will find common cause with those involved with climate change.

Other communities come to the issue in a far more profound way. For example, natural resources have played an integral role in the ways that tribal nations have fought for years to maintain their rights, identity, and culture. So too, communities of color who have lived with the burden of unequal distribution of the costs and benefits of economic development confront climate change as one more example of the isolation caused by racial and economic injustice.

Community and climate voices do not have a commercial interest in the credit ratings process. Because of their independence and objectivity, credit raters can be useful sources of validation. At the same time, their objectivity and independence does not always yield a position or result that serves the interests of climate change stakeholders. In this sense, the credit raters are used to inform and sometimes validate how climate change and solutions are articulated. The standards used by the credit agencies represent a codification of the rules of the road for economic actors. How those rules are deduced is critically important to understand how the credit ratings are arrived at and what can change them.

When we assume that climate change touches all the basic risk areas—legal, economic, financial, political, regulatory, and societal—then how the credit rater looks at each risk factor is important. For example, this report takes note of the fact that Moody's sees negative credit implications for issuers when community and climate voices successfully use regulatory processes to cancel or shut down a greenhouse gas emitter. Because there is now a pattern of regulatory decisions of this nature, the credit rater cannot provide a positive rating for such projects during their development phase because of regulatory uncertainty. The regulatory uncertainty at the credit rating level flows from the size, resilience, and knock-on effect of individual campaigns where the climate issue is a driving factor. From a strict credit perspective, cash is invested by a company for development and construction costs. The money will not be paid back if regulators substantially amend or cancel the project. The details are important.

This report examines how community and climate voices can affect credit standards and opinions. The rating agencies are engaged in a constant process of information gathering, verification, codification, implementation, and evaluation. At each step of the process, "facts on the ground" can add weight to a perspective on the issue, an issuer, or an issuance. Details become facts, facts become trends, trends become perspectives, and perspective becomes policy. As a result, all three of the credit raters have developed new standards to thoroughly analyze climate change and to set

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<sup>10</sup> IEEFA. [Wind projects improve county bond ratings in Ohio](#). August 2019.

the stage for a significant realignment of the concept of creditworthiness during the energy transition.

Credit raters once saw the coal, oil and gas industries and component companies as credit positive. Coal plants consistently registered strong, consistent cash margins, policy support from regulators and legislatures, and generally positive operating environments. These factors were all integral to a growing economy. Over time, significant new market, regulatory and political risks emerged, challenging coal's market share and profitability calculations. Credit raters gradually changed their orientation, noting the risks and ultimately seeing that the coal decline, for example, was permanent. Credit raters have also sketched out a path on oil and gas along a somewhat similar storyline—once quite positive and a mainstay of economic growth. Over the last decade, however, there has been an erosion in the market position and outlook of the oil and gas industry, driven in part by organized opposition. The next chapter of the story is uncertain, but the oil and gas industry in particular faces a hard road ahead. They are being pressed by market and policy forces to change at a time when their traditional business model is troubled.

The nuances involved with credit ratings are frustrating to many. For example, this paper has identified a trend among the credit raters that is increasing their warnings about fossil fuels. These warnings do not mean that the creditworthiness of the companies is subpar, some companies do fit that category. The negative factors associated with coal and oil and gas can be managed by many companies and they still remain profitable – the association with fossil fuels however adds a negative weight to the credit profile. How they weight is explained and more importantly how each company addresses the operational problems associated with it matter.

On the following page, Table 1 provides a timeline of developments that represent significant actions of credit rating agencies, as well as pressures on them. The table also provides a reference for each development to the discussion of the topic in this report.

**Table 1: Timeline of Critical Developments in the Evolution of Credit Rating Agency Analysis of Climate Impacts on Credit Risk**

| Year             | Event   | Page of Report |
|------------------|---|----------------|
| <b>1969-2000</b> | <b>Coal demand grows from 176 to 985 million tons per year</b>  | <b>15</b>      |
| 2001             | Big coal boost during Bush/Cheney admin; CCS budget; 1,900 new power plants proposed                      | 15             |
| 2001             | National Energy Technology Laboratory publishes list of 151 proposed coal plants                          | 15             |
| <b>2004-2007</b> | <b>Moody's credit positive for coal plants and utilities</b>  | <b>15</b>      |
| 2005             | Sierra Club advances strategy to challenge 150 plants   | 15             |
| 2007             | United States breaks 1 billion ton per year coal consumption for electricity generation                   | 15             |
| 2008             | Schlissel Technical Consulting report "Don't Get Burned" financial risks for coal plant challenges        | 18             |
| 2009-2010        | Coal plants cancelled, finance - Public Service Commission - Alliant in Marshalltown, Iowa                | 19             |
| 2008             | Bush/Cheney second thoughts on coal, cancels Future Gen; rural utility coal moratorium                    | 20             |
| 2008             | Moody's 2008 coal outlook raises environmental/climate concerns; mentions activists                       | 21             |
| 2009             | Public power authorities lose coal plant fights, ex: Meigs County; environmentalists cited                | 21             |
| 2008-2009        | Natural gas prices collapse   | 21             |
| <b>2009</b>      | <b>Moody's coal outlook: natural gas challenges coal market share</b>                                     | <b>22</b>      |
| <b>2009</b>      | <b>Moody's cites federal carbon risk issues</b>   | <b>22</b>      |
| 2009             | At end of year, Sierra Club highlights 97 coal plant cancellations  | 23             |
| 2009             | Obama takes office; coal industry pursues new strategy to upgrade existing coal plants                    | 24             |
| 2010             | Waxman-Markey climate bill defeated in Congress   | 22             |
| 2011             | As You Sow publishes critique of financials on upgrading plants; dozens of reports scuttle the idea       | 24             |
| 2010-2015        | Coal demand drops from 1 billion to 800 million tons  | 25             |
| 2012             | Daniel Yergin, <i>The Quest</i> : Cites anti-coal movement as factor in canceling new coal plants         | 25             |
| <b>2016</b>      | <b>Moody's: Coal in permanent decline; natural gas and renewables advance at its expense</b>              | <b>26</b>      |
| 2018             | U.S. Chamber: abuse of environmental laws, cancels 15 projects, ban in NY; cites activism                 | 28             |
| 2019             | IEEFA responds: discusses financial reasons for cancellation, defends activism as part of process         | 29             |
| <b>2020</b>      | <b>Moody's: oil gas infrastructure cancellation trend, raises risks need to see commercial operations</b> | <b>29</b>      |
| <b>2020-2030</b> | <b>Moody's extends detailed, economy-wide analysis by industry, including banking</b>                     | <b>31</b>      |
| 2020             | Standard and Poor's publishes global petrochemical hub warning  | 31             |
| 2023             | Fitch: two-year sectoral analysis and proposed guidelines; 20% of companies face downgrade                | 36             |

## I. The Credit Risk Trajectory of Coal: Consistent, Steady Rise Before the Decline Begins

The post-World War II economy unleashed a period of industrial economic growth that was supported by an increased reliance on fossil fuels. This macroeconomic reality created an environment where public policy supported coal, oil and gas as a protected class that enabled growth. It gave a tremendous boost to the coal industry, particularly in the United States, China and India. This growth trajectory can be found in the many industry and company analyses produced by the credit raters.

### A. Coal's Strength: Almost 40 Years of Growth

The production of coal for electricity generation grew rapidly in the United States between 1960 and 2000, from 176.7 million tons per year to 985 million tons per year.<sup>11</sup> Coal production expanded geographically from a southern and mid-Atlantic phenomenon to one that saw a reinvigoration of Midwestern mines and an expansion of coal mining in Wyoming, Texas, Colorado, and Montana.

Coal was the most plentiful and affordable source of energy at the turn of the century. Based on this fact,<sup>12</sup> then-Vice President Dick Cheney called in April 2001 for the creation of 1,300 to 1,900 new power plants. Cheney said coal would be a major source of electricity for the nation for years, proclaiming, "To try and sell ourselves otherwise is to deny reality." The new coal plants would have to be cleaner, according to the vice president; his proposals were accompanied by various pollution control mechanisms.<sup>13</sup> An energy plan released in May 2001 called for the new plant additions and assumed that half of the nation's electricity would be provided by coal plants through 2020.<sup>14</sup>

Between 2000 and 2005, coal use for electricity plateaued at historically high levels of more than 1 billion tons per year.<sup>15</sup> In its 2007 Coal Outlook, Moody's projected a future of robust growth for coal in the United States. The outlook identified 30,000 megawatts (MW) of new coal plant generation to be added to the nation's grid by 2010 (an increase of 120 million tons of new demand for coal from the nation's mines) and assumed the upward trend would exceed the 30,000 MW over time.<sup>16</sup> In May 2007, the National Energy Technology Laboratory (NETL) published a projection of new coal capacity based on its identification of 151 proposed and new plants producing 90 gigawatts with a

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<sup>11</sup> For deeper background on the development of the major coal regions in the United States, particularly the Powder River Basin, see: IEEFA. [The Great Giveaway](#). June 2012 ("Great Giveaway"). Also see: Energy Information Administration. [Coal Consumption by Sector, 1950-2022](#), Table 6.2, Monthly Energy Review, January 2024. Last visited November 30, 2023. ("Coal Consumption") [Monthly Energy Review - January 2024](#)

<sup>12</sup> C-Span.org, Energy Policy, Comments by Vice President Richard Cheney at the Annual Meeting of the Associated Press, Toronto Canada, April 30, 2001.

<sup>13</sup> This included enthusiastic support for carbon capture and sequestration technology.

<sup>14</sup> The President's Energy Policy, released in May 2001, included more funding for clean coal research and a directive to streamline regulatory oversight on coal plants. It did not call for a specific number of new coal plants, but projected construction of 1,300 to 1,900 plants over the next 20 years. The plan assumed coal-fired generation would continue to provide more than 50% of the nation's electricity.

<sup>15</sup> [Coal Consumption](#).

<sup>16</sup> Moody's Investor Service. US Coal Industry Outlook – 2007. Industry Outlook. December 2006 (PBC # 100985) (Proprietary).



projected value of \$145 billion.<sup>17</sup> By October 2007, there would be 71,000 MW of permitted, planned and announced plants.

By 2008, Moody's anticipated solid, long-term market fundamentals for the U.S. coal sector. Coal continued to be the primary fuel for electricity generation despite increased regulatory and environmental hurdles that slowed the development of new coal-fired power plants. Robust demand for coal from the power sector was assumed as long as the prices of alternative fuels such as natural gas, oil, and uranium remained high. With a significant number of coal-fired generators set to come online in 2009 and beyond, demand for coal was expected to rise steadily into the next decade.<sup>18</sup> Based on its review of the mix of fuel choices for power generation, Moody's highlighted the continued viability of coal in the integrated resource planning (IRP) processes of many utilities.<sup>19</sup>

This general view was reflected in several of Moody's individual company assessments that highlighted constructive relations between utilities and state public service commissions.<sup>20</sup> In a 2005 review of Edison International, Moody's saw the company's Midwest and Pennsylvania coal assets as positioned positively.<sup>21</sup> Major electricity producers that were heavily dependent on coal, such as Duke,<sup>22</sup> AEP, Xcel,<sup>23</sup> and Southern,<sup>24</sup> all received positive, stable outlook assessments from 2004-07. The four companies accounted for more than 20% of all coal used for electricity purposes in the United States.<sup>25</sup>

## B. Campaign to Stop the 150 Coal Plants

There was little reason to think of the coal industry as a credit risk in 2007. The White House had endorsed a massive round of new investments in coal plants. The proliferation of new coal plant proposals, however, was met by a new plan launched by the Sierra Club to challenge every new coal plant proposal being advanced—all 150 projects.<sup>26</sup>

Coal has been a point of contention with the U.S. environmental movement. Campaigns over the years to enforce coal ash regulations, promote new air pollution control technologies, and stop

<sup>17</sup> NETL. [Tracking New Coal-Fired Power Plants: Coal's resurgence in electric power generation](#). May 1, 2007, slide 6.

<sup>18</sup> Moody's Investor Service. US Coal Industry Outlook – 2008. Industry Outlook. October 2007 (PBC # 105372) (Proprietary).

<sup>19</sup> Moody's Investor Service. U.S. Electric Utility. January 2008 (PBC# 107004) (Proprietary).

<sup>20</sup> Moody's Investor Service. US Electric Utilities. December 2006 (PBC # 101304) (Proprietary).

<sup>21</sup> Moody's Investor Service. Edison International. Analysis. December 2005 (PBC # 95825) (Proprietary).

<sup>22</sup> Moody's Investor Service. Moody's Assigns Baa2 Issuer Rating to Duke Energy Corporation. April 6, 2006 (PR #111597) (Proprietary).

<sup>23</sup> Moody's Investor Service. Moody's Assigns Baa1 rating to Public Service Company of Colorado. June 25, 2004 (Proprietary).

<sup>24</sup> Moody's Investor Service. Southern Company: The Liquidity Risk Assessment. October 31, 2006 (Proprietary).

<sup>25</sup> Doyle Trading Associates. 2007 Coal Handbook. December 2008.

<sup>26</sup> The Sierra Club organizational model was rooted in its voluntary membership base in each state. While local chapters were critical to increasing membership involvement, the national office provided direction, resources and staffing. Most of the campaigns focused on environmental permitting and the use of legal compliance as critical leverage. The cases, which sometimes also included energy regulation through state utility boards served several purposes: 1) Ensured heightened regulatory attention to the underlying environmental issues related to pollution and climate change; 2) Often caused delays in the project development timelines of companies which caused costs to rise (particularly important as prices were rising); 3) Increased public awareness of the issues; and 4) With the addition of utility regulatory oversight interventions, the issue of electricity rates became a significant topic. Utility regulation broadened stakeholder interest to include consumers and businesses (agricultural, industrial, commercial, manufacturing and retail).

mountaintop removal coal mining entered another phase in the early 2000s. The initiative was catalyzed by a plan to build 150 new coal power plants. The opposition flowed from a two-fold concern: Traditional environmental problems with air pollution, coal ash and mountaintop removal coal mining were now linked to the rising worry over climate change and coal plant contributions to greenhouse gas emissions. Sierra Club organizers, lawyers and allies mounted several successful initial efforts relying on their volunteer members and local organizations.<sup>27</sup>

Although these efforts were supported by substantial market factors, each coal fight required a specific mobilization of existing local and statewide organizations working on the coal plant issue. For example, in Marshalltown, Iowa, an early coal plant fight circa 2006 consisted of a loose coalition of environmentalists, community groups, health professionals, agricultural interests, consumers (including the state consumer advocate, part of the state attorney general's office) and prominent climate activists. The governor's economic development strategy for the state was also predicated on an increase in wind manufacturing that would increase investment in the state and the jobs created by this new industry. Although organized labor initially supported the coal plant, outreach efforts proved successful and their opposition disappeared.

Similarly, opposition to the Pee Dee coal plant supported by a public authority, Santee Cooper<sup>28</sup> in South Carolina, consisted of a group of environmentalists, historic preservationists and land trust advocates. A dispute over the plant also broke out between commercial and industrial interests over how rate increases were to be applied in the wake of rising construction prices for the new plant. As that problem intensified, the board of Santee Cooper and the governor's positions changed, and the project was canceled.<sup>29</sup>

The coalitions were different in every state. In some instances, the effort was not organized by climate interests at all. Every plant had its own story and local coalitions and interests that formed. The "coal plant issue" was addressed based upon longstanding political alliances, public service commission policies, economic trends, community history and informal and formal power arrangements. The nature and quality of local leadership that emerged reflected these factors. Most often, climate change was not the overriding motivation for opposition.

In the mid-2000s, something else happened.

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<sup>27</sup> Captimes.com. [Cooling Coal: Sierra Club lawyer here successfully fights power plant pollution](#). December 2007.

<sup>28</sup> [Santee Cooper](#) is South Carolina's water and power utility.

<sup>29</sup> Inside Climate News. [In Quiet End to a Coal Battle, Utility Puts Canceled Plant Parts Up for Sale](#). April 5, 2011. One side note: The analytical frame of financial risk was also taking hold within the environmental movement. In the postmortem to the Santee Cooper plant dispute, the Southern Alliance for Clean Energy (SACE) is quoted in Inside Climate News discussing the financial risks of the PeeDee plant and how those risks will also inform Santee Cooper's next plan, which was to support an objectionable nuclear power plant. Environmentalists were being quoted in newspapers and other outlets discussing the business side of the equation and doing so in a manner that demonstrated a level of sophistication that ultimately proved superior to the many financial analysts who proposed and supported coal plants that were not financially viable.

Financial warnings about the future of coal—and the financial viability of the proposed coal plants—started to come from the climate and environmental movement.<sup>30</sup> During 2007-08, warnings emerged about the decline of the coal industry. A landmark report by David Schlissel identified 20 coal plants that had already been canceled and many more delayed.<sup>31,32</sup>

Environmental and climate considerations had created clouds over the coal industry and White House expansion plan, but exposure of the new financial trends made it rain on coal's parade.

The new plank to the environmentalist platform hit on several financial points.

- Rising construction costs caused by massive GDP growth in China drove the costs of worldwide industrial production higher;
- Renewed pressure to enforce air, water and land pollution was a response to the industry's mountaintop removal and coal ash disposal practices, which had economic roots reflecting the increased legacy costs of coal extraction;
- New climate change policies being debated at the federal level changed the opinion of economic decision-makers;<sup>33</sup> and
- The failure of the coal industry to demonstrate the success of carbon capture and sequestration (CCS) undermined the coal industry's new technology thesis. CCS, a technology initially developed to provide CO<sub>2</sub> for use in boosting oil and gas extraction, was offered as an air pollution control technology and climate solution.<sup>34</sup> A technological fix thesis had proven successful before, when the industry was allowed to reopen the Illinois Basin coalfields in the 1990s using new air pollution controls.<sup>35</sup> CCS involves more complex and costly technology, however, and its record of operations over the years has not met expectations.<sup>36</sup>

Rising and volatile coal prices were also added to the risk mix. Given a boost by strong demand, coal prices had risen steadily from 2000. As natural gas prices hovered around \$8 million metric British thermal units (MMBtu), the expectation was for continued strong robust pricing.<sup>37</sup> Coal prices added

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<sup>30</sup> A retrospective in 2015 captured the economic logic behind the campaign to stop the coal plants. Politico.com. [Inside the War on Coal](#). May 2015. Also see: IEEFA. [The Whac-a-Mole Strategy Works \(and Is Helping Shape the New Energy Economy\)](#). June 2015.

<sup>31</sup> David Schlissel, Synapse. [Don't Get Burned](#). 2008.

<sup>32</sup> Reuters. [Alliant Partners for Iowa Coal plant, debate seen](#). November 28, 2007.

<sup>33</sup> Merrill Jones Barradale. [The logic of carbon risk](#). USAEE Working Paper No. 09-037. December 30, 2009, revised May 26, 2014.

<sup>34</sup> White House. [President Bush discusses global climate change](#). June 11, 2001.

<sup>35</sup> Reuters.com. [Coal makes a comeback in Illinois Basin in United States](#). May 11, 2012.

<sup>36</sup> IEEFA publications on [Carbon Capture and Sequestration](#)

<sup>37</sup> This view was so pronounced that Kravis, Kohlberg, and Roberts (KKR) underwrote the purchase of a portfolio of coal plants in Texas under the corporate name Energy Futures Holding. KKR supported a valuation of \$40 billion based on an assumption that ever-rising gas prices would allow the coal plants to run full out. At the time, Moody's valued the plants at roughly \$10 billion. The decline of the natural gas prices in 2009 drove the plan into bankruptcy in 2014. Even before the gas price crash in 2008-09, the investment was losing value. The initial valuation, flaws, subsequent impairments, and revaluations through 2013 are detailed in a 2013 report. See: Tom Sanzillo. [The Case to Retire Big Brown, Monticello and Martin Lake Coal Plants: Three Financially Mismanaged, Unprofitable, Outmoded and Worthless Coal Plants in North Texas](#). October 2013. For discussion of bankruptcy, see: Energy Futures Holding Company. [Energy Futures Holding Company, et.al.](#) April 2014.

to the cumulative risk factors facing the industry as the price of electricity was facing upward pressures from construction, future regulations and volatile fuel costs.

The issues associated with coal presented a cumulative set of risks that made the financial calculation for new coal plants too risky. Although 150 plants were on the drawing board, they all became questionable. The cancellations came from both companies and regulators.

The underlying financial risks confronting coal plant proponents were often made clear at the state level by public service commissions. Market forces were making it too risky to build coal plants. In Marshalltown, Iowa, for example, Interstate Power and Light (a subsidiary of Alliant Inc.) proposed a new coal plant. The regulatory proceeding exposed a trend: Rapidly rising construction prices. The Iowa regulator decided to approve the plant—but with a caveat. Interstate Power and Light would have to agree to bear all future construction cost increases. The company demurred and cancelled the proposed plant.<sup>38</sup>

The analysis and early warnings surfaced in other ways, as well.

The Bush administration, which had supported the 150 new coal plants and a few new, big-picture coal initiatives (such as Future Gen, a major carbon capture and sequestration project),<sup>39</sup> came to have second thoughts during its second term.<sup>40</sup>

Another way the second thoughts became apparent was a major decision by the U.S. Department of Agriculture's Rural Utility Service (RUS) to cancel federal support for coal plants. The matter received little attention at the time. RUS had been the lead agency for coal plant financing at the federal level. RUS had been the economic development arm of the nation's electric cooperatives since the New Deal.<sup>41</sup> The cooperatives helped people understand the benefits of electricity to the nation's rural areas. Many southern and western communities received funding for new power generation that included hydropower and nuclear plants, but the mainstay was coal plants. Most of the coal in the western United States was owned publicly, so the decision was made in the 1970s to flood the markets with cheap coal.<sup>42</sup> Initially, it seemed only natural that the federal agency would breathe life into the idea of 150 new coal plants.

By early 2008, however, RUS administrators had seen the writing on the wall. In response to the proposed Highwood Generation coal plant in Montana, the RUS made it clear the agency would not only disapprove the Montana project but also suspend any consideration for additional new coal

<sup>38</sup> Milwaukee Journal Sentinel. [Alliant cancels Iowa Plant](#). March 5, 2009.

<sup>39</sup> Cen.acs.org. [Getting to 'Clean Coal'](#). February 23, 2004.

<sup>40</sup> New York Times. Up In [Smoke: President Bush's Big Environmental Broken Promise](#). February 13, 2008.

<sup>41</sup> In 2008, RUS financings had amounted to a portfolio of \$50 billion in outstanding loan balances. RUS electric cooperatives were pulling in \$25 billion in electricity sales. See: USDA. [2008 Statistical Report: Rural Electric Borrowers](#). December 2009.

<sup>42</sup> [The Great Giveaway](#)

plants.<sup>43</sup> Rising prices had caused coal plant construction costs to accelerate, and any new system was likely to be more expensive. The *Washington Post* exposed the fundamental financial problem:

The RUS administrator, James M. Andrew, said in the letter that it “is not funding loans for new base load generators until the Agency and the Office of Management and Budget can develop a subsidy rate to reflect the risks associated with the construction of new base load generation plants.

“An RUS spokesman would not say when the OMB closed the lending window for baseload plants; the agency gave no hint of the policy change until its letter to Southern Montana Electric on February 19.”<sup>44</sup>

The cumulative impact of rising construction prices, an uncertain regulatory environment and lagging customer interest made it impossible for the federal government to arrive at a loan rate—an interest rate that reflected the underlying risks. RUS administrators said they expected these conditions, and its coal plant moratorium, to extend indefinitely.

The implications of this action were considerable. RUS was responsible for expanding the supply of electricity to rural areas. Started during the New Deal, the funding vehicle was a stand-in for the market when the market would not function.<sup>45</sup> The inability of the federal agency to derive an interest rate for what was already considered a speculative area of investment was a strong statement that coal plants were not financially viable.<sup>46</sup> It was not a question of coal plant viability at the individual level like those under consideration before state regulators; it was that coal plants that were already heavily subsidized as a class were no longer viable.

The Bush administration also pulled the plug on Future Gen in 2009.<sup>47</sup> The project would gain a second life, but only to be cancelled again in 2015 due to cost, technological considerations, and—perhaps most revealing—a loss of private sector sponsors.<sup>48</sup> Other technological coal innovations at the Edwardsport (Indiana) and Kemper (Mississippi) projects experienced problems.<sup>49,50</sup>

As these financial issues became a factor in the decision-making of federal officials, public service commissions and some companies, the message also became an important tool for campaigners. Market forces were empowering climate voices.

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<sup>43</sup> Groundworkcenter.org. [Client Memo](#). May 7, 2008.

<sup>44</sup> The Washington Post. [Government suspends lending for coal plants: Risks cited to economy, environment](#). March 13, 2008. See also: Great Falls Tribune. [Rural Utilities explains funding pullout](#). March 4, 2008. Also see: Great Falls Tribune. [Coal-fired power plant projects feel heat from rising costs, environmental concerns](#). March 13, 2008.

<sup>45</sup> Jesse Jones. *Fifty Billion Dollars*. New York: Macmillan. 1951. For a discussion of the role of electricity in the development of the nation's economic and political history see: Robert Caro, *The Path to Power*, New York: Alfred Knopf, 1982.

<sup>46</sup> A February 2008 letter from Henry Waxman, Chair of House Oversight to James Andrew, Director of Rural Development, Utilities Program (February 14, 2008) spelled out those risks. Also see: Tom Sanzillo. [Memo from Tom Sanzillo, TR Rose to Sandy Buchanan, Director Ohio Citizen Action](#). 2008.

<sup>47</sup> New York Times. [Energy Dept. Said to Err on Coal Math](#). March 11, 2009.

<sup>48</sup> Reuters. [AEP, Southern pull out of FutureGen project](#). June 25, 2009.

<sup>49</sup> IEEFA.org. [Edwardsport](#).

<sup>50</sup> IEEFA.org. [Kemper Power Plant, a Debacle That Should Never Have Been](#). November 20, 2014.

At the same time, community organizations were successfully challenging new coal plants proposed by public power authorities. American Municipal Power of Ohio (AMP Ohio) had proposed a 960 MW coal plant in Meigs County, Ohio slated for opening in 2012-2013. The proposal was put before AMP Ohio's 92 community members for consideration in 2008. Several communities signed on. However, as the planning process moved forward, construction prices continued to increase. After a contentious series of hearings, AMP Ohio announced that the plan would be cancelled.<sup>51</sup>

AMP Ohio's press statement at the time pointed out in Meigs County what many more companies would come to realize, and some would acknowledge:

“Contrary to what the activist groups who have opposed this project will assert, this conversion is not the result of their opposition efforts, our position in upcoming permit appeals, or load loss by our members (as the project is designed to reduce existing market exposure rather than to address growth),” said Gerkan (CEO of AMP Ohio). “This project compared favorably to the market until the most recent target price in November.”<sup>52</sup>

The Meigs County project was canceled, but the Prairie State plant—another 1600 MW coal plant proposed originally by Peabody Energy and AMP Ohio—as one of the few coal plants built at this time.<sup>53</sup> Two hundred and seventy-seven participating communities from eight Midwest and eastern states were locked in place with long-term contracts that were enforced to the letter. Although several communities were severely affected financially, only one was able to terminate their agreement.<sup>54</sup> On the other hand, AMP-Ohio never built another coal plant.<sup>55</sup>

## C. Credit Rating Agencies Begin to See Storm Clouds for Expansion of Coal Plants and Mining

As prices in the natural gas sector began to drop precipitously between mid-2008 and 2009,<sup>56</sup> and as the mortgage meltdown affected the economy, Moody's confidence in the future of coal began to waver.<sup>57</sup>

“The outlook for the U.S. coal industry is stable, due largely to strong contracted thermal coal positions that offset the challenges posed by the scale and scope of the current financial crisis. Larger companies with greater operational and financial flexibility and sound liquidity will be better poised to navigate these uncertain times and maintain their ratings.

<sup>51</sup> AMP Ohio. [Press Release](#). November 2009.

<sup>52</sup> *Ibid.*

<sup>53</sup> Wikipedia. [Prairie State Energy Campus](#). (last visited February 16, 2024).

<sup>54</sup> St. Louis Post-Dispatch. [Marceline Cuts ties to Prairie State Energy Campus](#). August 21, 2013.

<sup>55</sup> Courierjournal.com. [Bad bet traps Paducah in coal-fired nightmare](#). February 13, 2015.

<sup>56</sup> Macrotrends. [Natural Gas Prices Historical](#). Accessed November 25, 2023.

<sup>57</sup> Moody's Global Corporate Finance – U.S. Coal. U.S. Coal Industry Outlook: Six-Month Update United States. Industry Outlook. April 2009 (PBC # 116778) (Proprietary).



“When natural gas prices are low, a significant amount of generation can switch, so if natural gas prices remain below \$4 per MMBtu, we expect continued downward pressure on coal. Considering the current favorable gas prices, EIA projects the electric power sector’s natural gas consumption to rise by 0.4% in 2009.”

Moody’s outlook was also becoming increasingly informed by a changing regulatory outlook. The potential of new carbon regulations on top of the potential for long-term lower natural gas prices strongly suggested coal prices would decline. Still, despite these signals, Moody’s did not project a fundamental impact on the economics of new coal plants.<sup>58</sup>

The proposed Waxman-Markey climate bill in Washington, D.C., was a major debate. Environmental organizations offered full support and invested heavily in its passage. The fossil fuel lobby had characterized the bill as the death knell for fossil fuels,<sup>59</sup> and Congress’s failure to pass the legislation was seen as a devastating blow to the climate movement.<sup>60</sup>

Yet the loss of this fight in Washington did not stop the energy market forces already unleashed. Instead, the industry’s legislative victory was followed by a decade-long decline in the financial fortunes of the coal, oil, and gas sectors. After 2010, not only did the coal industry continue to falter but the oil and gas industry’s profitability also continued its long-term decline.

The fossil fuel industry in 2009-10 was on a relative upswing—down from its 1980s levels when it commanded 28% of the S&P 500 but up from its 6% market share showing in 2000. By 2010, the industry made up 12% to 14% of the stock market. During the decade from 2010 to 2020, however, the oil and gas sector lost substantial market share, hitting a low of 2% of the S & P 500-stock index in October 2020.<sup>61</sup> The underlying financial deterioration of the energy sector cannot be understated as a major factor in the changes taking place at the credit rating agencies.

What was missed in the post-mortem over Waxman-Markey? As the debate heated up in Congress, the big Washington groups poured more and more resources into lobbying at the federal level. Grassroots groups, written off by the “official version of events,”<sup>62</sup> used the national tumult to great effect at the state level—as evidence of regulatory uncertainty. The contentious debate and potential for a new regulatory scheme was a major plank in the risk analysis used to question the new coal plants.<sup>63</sup>

<sup>58</sup> Moody’s Investor services. Carbon Risks Becoming More Imminent for U.S. Electric Utility Sector. Sector Comment. March 2009 (PBC # 115175).

<sup>59</sup> API.org. [Reject Waxman Markey](#). May 14, 2009. Also see: Wall Street Journal. [Chamber of Commerce Details Opposition to Waxman Markey Bill](#). May 14, 2009. Regarding coal industry opposition, also see: The Hill. [Dems pressure coal execs to drop opposition to climate legislation](#). April 14, 2020.

<sup>60</sup> Foreign Policy. [Who Killed the Climate Bill](#). July 23, 2010.

<sup>61</sup> Sibilis, Standard and Poor’s 500 Index: Sector Weightings, Historical (Proprietary).

<sup>62</sup> See, for example, Theda Skocpol’s argument that grassroots groups were essentially written off during the climate legislation debate as unwilling to deal with business. Washington Post. [Why has climate legislation failed? An interview with Theda Skocpol](#). January 16, 2013.

<sup>63</sup> See: [Don’t Get Burned](#).



The Washington debate, far from the failure portrayed by many, itself was a financial risk picked up by public service commissioners, federal coal plant financiers, utilities and financial analysts who were saying “no” to coal plants. The numerous reports and filings that supported the defeat of individual coal plant proposals regularly cited the Washington debate over legislation as a material factor supporting the thesis that coal plants had a problematic future.<sup>64</sup>

The larger Washington, D.C., community not only failed to grasp the market dynamics occurring at the time, but also failed to grasp the actual political benefit of the Washington insider debate. Similarly, few observers at the time grasped both the market significance and the political undercurrents.<sup>65</sup> The early coal plant campaigners hit the coal industry at precisely the right time and were able to take full advantage of larger economic forces that were undermining the market position of coal, oil and gas.<sup>66</sup>

Market forces empowered the community climate vision.

## D. Coal Plant Cancellations Accelerate, Plans to Retrofit Existing Plants Are Challenged

By the end of 2009, the Sierra Club noted that 97 planned new coal plants had been cancelled.<sup>67</sup> As the coal industry began to absorb the fact that coal expansion would not be achieved by a significant new build strategy, they began to focus on a different strategy.

The industry decided to promote upgrading existing coal plants. The theory: Since capacity factors were relatively low for existing plants, upgrading them could be a source for continued growth in coal sales. This would maintain coal’s market share, and expand a rationale for new mining projects. The new coal plants were not necessary for the coal industry to sustain a growth strategy. Also, the upgrades would mean improving the emissions technology of existing plants, which project sponsors hoped would be attractive to the Obama administration that had taken office in January 2009, given its concern for clean air.

Many of the problems the industry had faced with new-build economics, however, would surface to scuttle the existing upgrades campaign. Historically, such new expenses had simply been added to the rate base of a utility and the costs passed along to consumers. The risk for the coal buildout strategy: Low natural gas prices were a longer-term phenomenon that would keep pressure on coal prices to remain low.

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<sup>64</sup> For a listing of IEEFA Reports that contributed coal plant campaigns and provided supportive research on coal plants generally, see: Appendix I.

<sup>65</sup> Mother Jones. [How a Grassroots Rebellion Won the Nation’s Biggest Climate Victory](#). April 2012.

<sup>66</sup> *Ibid.*

<sup>67</sup> Reuters. [U.S. coal power plants scuttled, Sierra Club cheers](#). May 1, 2009.

A report that summarized the conditions facing coal plant operators as they pursued the upgrade plan elaborated on the earlier list of risks. Published by As You Sow, a California-based nonprofit organization, the risks included:

- Competition from low natural gas prices exerting downward pressure on power prices;
- Capital expenditures for environmental compliance and uncertainty about the cost implications of pending and anticipated environmental mandates;
- Persistently high construction costs;
- Coal price volatility, rising costs for mining, and shifting markets placing upward pressure on coal prices;
- Improved profitability and policy preferences for solar, wind, and energy efficiency investments; and
- The slow pace of development of viable commercial scale CCS for coal plants.<sup>68</sup>

Given these conditions, it was unlikely the upgrade strategy would work.

This financial realization was supported not only by the As You Sow report's financial modeling, but also by at least a dozen industry papers reflecting the same basic conclusions.<sup>69</sup> And "facts on the ground" were growing in support of the fundamental flaws in the coal industry's new analysis.

Between 2010 and 2015, the electricity sector's demand for coal dropped from 1 billion tons per year to 800,000 tons per year. Natural gas began to cut into coal's market share, and new builds were favoring natural gas and renewable energy as the broader impact of natural gas was reshaping the market.<sup>70</sup> The overall decline was punctuated by Moody's with reports that the plan to bolster slumping profits with a surge of exports was also unlikely to succeed.<sup>71</sup>

A key industry source acknowledged one other factor beyond the traditional risk profile. Daniel Yergin, an author and investment advisor on fossil fuels, concluded the emergence of a movement in

<sup>68</sup> As You Sow. [White Paper: Financial Risks of Investments in Coal](#) 2011.

<sup>69</sup> Metin Celebi, et al., Brattle Group. Potential Coal Plant Retirements Under Emerging Environmental Regulations. December 8, 2010; Deutsche Bank Climate Change Advisors. Natural Gas and Renewables: A Secure Low Carbon Future Energy Plan for the United States. November 2010; Bernstein Research. U.S. Utilities Coal-Fired Generation Is Squeezed in the Vice of EPA Regulation: Who Wins and Who Loses? October 2010; Bernstein Research, Black Days Ahead for Coal: EPA Air Emissions Regulation & the Outlook for Coal Fired Generation. September 22, 2010; MJ Bradley and Analysis Group. Ensuring A Clean, Modern Electric Generation Fleet while maintaining electric Reliability. August 2010; Jonathan Fahey, Forbes. "Why Small Coal-Fired Plants Are Going Away." July 19, 2010; Bernstein Research. U.S. Utilities: A Visit to Washington Finds Utility Lobbyists and Environmentalists Agreeing on the Grim Outlook for Coal. March 9, 2010; Congressional Research Service. Displacing Coal with Generation from Existing Natural Gas-Fired Power plants. January 19, 2010. See also: North American Electric Reliability Corporation (NERC). 2010 Special Reliability Scenario Assessment: Resource Adequacy and Impact of Potential U.S. Environmental Regulations. October 2010; Bank of America Merrill Lynch. Power and Gas Leaders Conference, New York. September 29, 2010; ICF International. Clean Air Regulations: Impacts of EPA Proposed Rules. September 16, 2010.

<sup>70</sup> Edison Electric Institute. [2015 Financial Review](#). 2016, p. 50. Also see: Moody's Investor Service, No end in sight for low natural gas prices, power landscape to be changed permanently, April 2012 (PBC # 242686)

<sup>71</sup> Moody's Investor Services, Growing Export opportunities for U.S. coal industry, but costs and geography impose limits, September 2012 (PBC # 145433).

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opposition to coal had taken hold in the United States and Europe. Picking up on Moody's 2008 observation about environmental activism, Yergin went further:

“Between 1975 and 1990 the output of coal-generated electricity literally doubled in the United States. In those years, government policies restricted alternatives and coal became the reliable buildable generation source ... Policies also promoted coal as a secure energy source and one not subject to political disruption ... In 2011 about 25 coal-fired plants were under construction in the United States. But political and regulatory opposition to coal on grounds of global warming has mounted to a level that makes it difficult to launch new conventional coal plants. Permits for coal projects already under construction are being challenged, and several new coal power projects have been canceled or delayed in the United States—even after entering advanced stages of development. Some environmental groups have made opposition to build new coals plants a top priority.”<sup>72</sup>

Yergin's book, *The Quest*, was one of the first industry sources to acknowledge that the community climate voices constituted a material risk for coal companies. As implied, the source of the risk was global warming, and the nature of the risk was both regulatory and political. The regulatory and political risks translated into an outcome that could no longer be addressed by a checklist of corrective actions from a regulator. The regulators were arriving at conclusions that projects had to be canceled outright. The carbon budget was finite.

Yergin also implied that the new responses from regulatory and governmental bodies heightened the potential for significant investment losses. Managerial decisions to move forward based on early regulatory approvals could be reversed by political or regulatory decisions made further down the development pipeline, and after considerable outlays on predevelopment and even early-stage construction dollars.

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<sup>72</sup> Daniel Yergin. *The Quest*. New York: The Penguin Press. 2012, p. 400. Yergin cites the Sierra Club Stop the Coal Rush Website. A 2014 paper by IEEFA and Oil Change international, [Material Risks](#), advanced the concept further, extending it beyond coal to oil and gas.

## II. Permanent Decline of Coal, Beginning Recognition of Decline in the Oil and Gas Sector

By 2016, it was apparent to Moody's that coal was in a permanent state of decline and the coal upgrade plan was a failure.<sup>73</sup> The credit rating agency's models were now projecting coal's share of the electricity market would drop to 30% of the electricity market, down from the 50% share it had held for decades.<sup>74</sup> The agency anticipated natural gas would take up most of the lost coal market share as long as prices remained around \$2 to \$4 MMBtu. This analysis found its way increasingly into individual corporate credit opinions, such as this Moody's opinion:

"In the broader universe of municipal-owned and G&T cooperative-owned coal plants, most plants are older and less efficient. With higher operating costs, they are less competitive on a cost basis compared with the market and vulnerable to being replaced by low-cost natural gas and renewable resources. As shown in Exhibit 2, 72.3% of these plants, or about 65.0 GW, have an operating cost exceeding \$30/MWh (which includes actual fuel and variable operating costs plus an assumed \$50/kW-year for fixed operations and maintenance, and major maintenance capital expenditures). Considering how inexpensive renewable and natural gas fired generation have become, we consider \$30/MWh in operating costs to be a threshold above which coal plants are vulnerable to be displaced by a combination of natural gas and renewables. We refer to such plants as being "at risk". This term does not imply that Moody's expects the coal plant to be shut down in the near term, especially since public power and G&T coop utilities are able to set their own rates to recover all costs. It simply reflects a greater likelihood of shutdown before the plant's useful economic life as utilities seek to minimize costs."<sup>75</sup>

From 2016-18, Moody's considered the closure of coal plants and the decrease of company portfolios' carbon exposure as "credit positive."<sup>76</sup> The economics were not working due to the

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<sup>73</sup> Moody's Investor Service. Shift in Electric Generation Mix Favors Natural Gas, Renewables at Expense of Coal: Special Comment. June 5, 2016 (PBC #141980) (Proprietary).

<sup>74</sup> *Ibid.*

<sup>75</sup> Moody's Investor Services. Efficient coal plants are still competitive, but nationwide fleet remains under pressure. Issuer-In-Depth. April 5, 2018 (PBC # 1110886) (Proprietary).

<sup>76</sup> Moody's Investor Services. Great River Energy Plans to Retire Stanton Station Coal Plant, a Credit Positive. July 21, 2016 (PBC#191227) (Proprietary). ("Stanton Stations")

Also see: Moody's Investor Services. Vistra's Coal Plant Closures Are Credit Positive for Generators. Sector Comment. October 18, 2017 (PBC # 1097037) (Proprietary). Moody's perspective was not confined to the United States, see: Moody's Investor Services, Closing British Coal Plants is Credit Positive for Generators, but Credit Negative for Ports, September 2015, PBC 184144 (Proprietary).

Moody's Investor Services. JEA's Plan to Decommission Coal-Fired Power Plant is Credit Positive. Issuer Comment. March 27, 2017 (PBC # 195083) (Proprietary).

Moody's Investor Service. Xcel Energy Inc.: Update to credit analysis following negative outlook. Credit Opinion. October 23, 2018 (PBC # 1146009) (Proprietary).

decrease in natural gas prices,<sup>77</sup> but now Moody's had also added the growth of renewable energy to its credit opinions. Moody's credit opinion on the Stanton coal plant in North Dakota, for example, found:

1. The coal plant was uneconomic given the declining price of natural gas;
2. Closure of the coal plant would yield net savings;
3. The cost savings would allow for a rate reduction;
4. The plant closure would reduce emission for a cooperative that was heavily weighted with coal; and
5. The cooperative's plan for renewable energy would lock in emissions reduction and cost savings.<sup>78</sup>

The fracking boom led to a surplus of natural gas reserves. Between mid-2008 and August 2009, the price of natural gas crashed. The result devastated the balance sheets of exploration and production companies.<sup>79</sup> The number of new natural gas plants increased substantially in the post-2008 environment. Natural gas was being called the "new coal."<sup>80</sup>

But Moody's recognized a new risk factor in 2017: Lower natural gas prices were now being challenged by even lower renewable energy prices.<sup>81</sup> The potential for lost market share by natural gas was now fully reflecting the reshaped electricity market. A new entrant to the market would have to demonstrate the ability to vie for position as a lower-cost competitor.

It was also becoming clear that renewable energy's competitive strength was enhanced because it was anti-inflationary and did not carry the volatility of fossil fuels.

The introduction of natural gas as a cost-competitive alternative to coal had the paradoxical effect of swapping one fossil fuel for another. It also reshaped the market, undermining any possibility of a coal resurgence. The industry was quick to suggest that natural gas was a transition fuel that was necessary because renewable energy was not yet equipped to become the dominant electricity source. This discussion continues.

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<sup>77</sup> Despite this general conclusion, Moody's also provided credit opinions that were positive for some coal plants. The Wisconsin Energy Group's Elm Road Generating Station continued to receive favorable credit opinions because the parent company was standing behind a long-term lease arrangement. See: Moody's Investor Service, Elm Road Generating Station, Super Critical, July 2017 (PBC# 1082117) (Proprietary). The plant continues to run in 2023 and carries a solid credit rating even as the company is reducing its coal fleet to zero by 2030.

<sup>78</sup> Stanton Station (Proprietary).

<sup>79</sup> The New York Times. [Natural gas prices plummet to a seven-year low](#). August 21, 2009.

<sup>80</sup> S&P Global. [Overpowered: Why a US gas-building spree continues despite electricity glut](#). December 2019.

<sup>81</sup> Moody's Investor Services. Policy and regulatory credit risks emerge for global regulated utilities amidst decarbonization efforts. November 3, 2017 (PBC#1082285) (Proprietary).

### III. Industry Fights Back—But Market Forces Persist

The U.S. Chamber of Commerce issued a lengthy report in 2018.<sup>82</sup> The report identified 15 different instances in which fossil fuel power plants, pipelines, transmission lines and export facilities were stopped or delayed due to regulatory interventions. The chamber concluded the collective lesson learned was that environmental regulatory processes in the United States were being abused:

“In recent years, anti-energy groups have rallied around a singular theme: “Keep it in the Ground.” Environmental activists argue that many of our most reliable energy sources—coal, natural gas, and oil—should not be accessed at all, and instead be left deep underground. In support of this agenda, they are actively fighting against as many energy infrastructure and development projects as they can—pipelines and transportation networks, power plants and transmission lines, export facilities, and much more.

This campaign has significant costs: Power plants that are cancelled mean fewer job opportunities for blue collar workers and potential challenges for electric reliability. Pipelines that aren’t built mean higher energy prices, as residents in the Northeast have discovered during frigid winters. Delaying or altogether blocking energy infrastructure means foregone tax revenue that would pay for public services, schools, emergency response, and roads.

While these efforts have been reported on over the years, their aggregate economic impact has never been calculated, until now.”

The chamber characterized the campaigns in opposition to fossil fuel projects:

“Furthermore, it aims to do so through any means necessary, employing a broad range of tactics (public relations, litigation, permitting and regulatory processes, divestment pressure, civil disobedience, and “direct action” campaigns) to block a broad range of projects (leasing, production, transport, use, manufacturing and refining, exports, etc.), regardless of the actual merits of any safety or environmental concerns associated with those projects.”

IEEFA responded to the chamber’s report with an analysis of the market forces that were making continued expansion of fossil fuel extraction and use untenable. The report also underscored how changing environmental and climate considerations had altered the decision-making calculus of regulators. IEEFA’s report, in summary, stated:

“IEEFA finds that the Chamber’s analysis fails to grasp the changing nature of political and economic risk for fossil fuel projects in the U.S. It does not recognize how the growth of low-priced renewable energy is influencing energy markets and lacks a fundamental understanding of how local communities may find it in their best interests to reject industry

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<sup>82</sup> U.S. Chamber of Commerce. [New analysis demonstrates massive costs of ‘Keep It in the Ground’ anti-energy movement.](#) December 18, 2018.

plans. Finally, we find that even if the Chamber succeeded in its goal of eviscerating environmental protections, it would not be able to overcome the market forces that threaten the profitability of the fossil fuel sector in general, and many fossil fuel projects in particular.”

The broader analysis showed that the removal of regulation that was protective of the public health and safety harmed the public health and safety. The removal of the regulations would not turn around the financial forces of fossil fuel companies. Those were occurring due to market forces.

## A. A Credit Rating Agency Declares Uncertainty in Oil and Gas Infrastructure Projects

Moody’s updated its thinking on the impact of environmental regulation on the viability of fossil fuel infrastructure in September 2020.<sup>83</sup> The credit agency identified eight instances where regulatory oversight, legal challenges or cost increases resulted in the delay or cancellation of major oil and gas pipelines and extraction projects. The nine projects included:

1. Penn East Pipeline<sup>84</sup>
2. Frontier Oil Sands Project<sup>85</sup>
3. Keystone XL<sup>86</sup>
4. Dakota Access Pipeline (DAPL)<sup>87</sup>
5. Constitution Project (Williams Companies)<sup>88</sup>
6. Northeast Supply Enhancement Project (NESE)<sup>89</sup>
7. Atlantic Coast Pipeline<sup>90</sup>
8. Mountain Valley Pipeline<sup>91</sup>

Unlike the chamber, Moody’s examined the underlying financial and regulatory issues at stake in these projects, which included not only environmental impact assessments but also challenges to

<sup>83</sup> Moody’s Investor Service. Shifting environmental agendas raise long-term credit risk for natural gas investments. September 30, 2020 (PBC\_1303073) (Proprietary). A few months later the company issued: Moody’s Investor Service, Revised classification of environmental considerations reflects evolving standards, PBC: 1255308, December 2020. (Proprietary)

<sup>84</sup> IEEFA. [IEEFA U.S. Another big pipeline project bites dust and FERC should take notice](#). September 2021.

<sup>85</sup> IEEFA. [Teck Resources’ Frontier Oil Sands project shows reckless disregard for financials](#). January 2021.

<sup>86</sup> IEEFA. [Investors Should Steer Clear of the Keystone Pipeline](#). January 2017.

<sup>87</sup> IEEFA. [Dakota Access Pipeline Driven by ‘High-Risk Financing’ in Overbuilt Region; Little-Known Economic Weaknesses in Controversial Project](#). November 15, 2016.

<sup>88</sup> IEEFA. [Energy Department says local governments can ban new gas hookups](#). February 2022.

<sup>89</sup> IEEFA. [Proposed NESE gas pipeline may stick New York ratepayers with one billion-dollar+ cost](#). April 2020.

<sup>90</sup> IEEFA. [The vanishing need for the Atlantic Coast Pipeline](#). January 2019.

<sup>91</sup> IEEFA. [Two Pipeline Expansion Projects in Appalachia Indicate a Rush Toward Overbuilding](#). April 2016.



assertions of energy market need and concerns about cost impacts on ratepayers. Moody's concluded the decisions, in the aggregate, revealed an overbuilding problem by the industry.

What the U.S. Chamber of Commerce saw as an abuse of regulatory law and process, Moody's saw as protecting investors and complying with the law to protect public health and safety.

The bottom-line credit assessment: Investors could no longer count on announcements by companies of a new pipeline or oil sands project as sufficient evidence that a project was financially sound. Moody's determined that credit standards needed to be tightened. The credit agency declared it could not consider assets credit-positive until the project was not only announced, but also built and operational for a period.

More than \$200 billion is spent annually on oil and gas pipeline construction in the United States.<sup>92</sup> The price of credit is the only indicator the United States has to determine if a project is needed or not needed.<sup>93</sup> As RUS had found with regard to coal plants, Moody's determined the oil and gas markets were in such a state of flux that it could not confidently price the risk.

## B. Moody's Current Status of Oil and Gas Credit Assessments Climate Change

While most of the credit analysis on climate change prior to the middle 2000s was rooted in coal, credit agency reporting on international agreements, shareholder activism and rising attention to climate issues were gaining traction.<sup>94</sup> Since 2018, Moody's analyses of the impact of climate change issues on the oil and gas sector have accelerated. For the most part, the credit rating agency is mapping a broader view of climate change. The analysis, by and large, provides a review of how each individual sector is addressing the mix of risk and opportunity created by the energy transition. Moody's is looking economy-wide.<sup>95</sup> It has issued reports on the quality of company transition readiness plans in the automotive, passenger airlines, utilities and oil and gas industries.<sup>96,97,98</sup>

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<sup>92</sup> Oil & Gas Journal. [Land pipeline construction costs hit record \\$10.7 million/mile](#). October 2, 2023.

<sup>93</sup> This is noted in IEEFA's commentaries on regulations governing the siting of pipelines. See: IEEFA. [Two Pipeline Expansion Projects in Appalachia Indicate a Rush Toward Overbuilding](#). April 2016.

<sup>94</sup> Moody's Investor Services. 2007 Gas and Oil Outlook – Canadian presentation. October 2007 (PBC #105061) (Proprietary).

<sup>95</sup> Moody's Investor Service, Net Zero Assessment, Assessment Framework, November 2023.

<sup>96</sup> Moody's Investor Services. Substantial variation exists in automakers carbon transition risk profiles. November 2021 (Proprietary).

<sup>97</sup> Moody's Investor Services. Global: Fuel efficiency, policy exposure and fleet renewal differentiate carbon transition risk. June 2019 (Proprietary).

<sup>98</sup> Moody's Investor Service, Utilities improve positions for rapid transitions, other high risk sectors have not, November 2023, (PBC # 1340072) (Proprietary).

In 2020, Moody's issued its strongest risk warnings for the oil and gas exploration and production sector.<sup>99</sup> The credit rating agency also issued strong warnings in 2021 for the integrated oil and gas producer's sector.<sup>100</sup>

Moody's new paradigm for assessing climate change is based on an analytical exercise that connects company ambitions (stated climate goals) with the likelihood of successful implementation in the context of the greenhouse gas governance structures in place within a company. The model gauged the level of ambition based on company promises to curtail emissions consistent with scientifically based temperature targets. Implementation related issues were judged according to the clarity of plans, likelihood of technological innovations to reduce emissions and build new businesses and revenue streams. A company's greenhouse governance commitments were based on what a company's strategy is with regard to new businesses and revenue streams. A company's greenhouse gas governance commitment is assessed based on a plan's credibility, company track record and investment levels.

Moody's has also acknowledged the singular importance of the banking sector as it works with the energy industry on climate change issues.<sup>101</sup> The credit rating agency has noted progress made by the world's large lending institutions. Its sample of banking plans on climate change mitigation represents banks with a total of \$55 trillion in assets under management. Moody's recognizes the need for banks to provide greater transparency at board and committee levels on questions of how climate monitoring data is integrated into business strategies, risk appetites and budgetary allocations. The credit rating agency is looking for greater specification on how banks lend by region, office and category of emissions. Finally, the credit rating agency is encouraging banks to assess the financial performance effects of their own climate actions, particularly the likely effects on revenue (plus and minus) of new business strategies.

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<sup>99</sup> Moody's Investor Services. Global: Independent E & P companies not well positioned for rising carbon transition risks. September 20, 2021 (Proprietary).

<sup>100</sup> Moody's Investor Services. Carbon transition assessments show material exposure for all companies. Integrated Oil and Gas – Global. September 21, 2021 (Proprietary).

<sup>101</sup> Moody's investor Service. Enhanced climate change reporting will support risk management. Banking. October 11, 2023. (PBC\_1380100) (Proprietary).

## IV. Standard and Poor's, Climate Change and Petrochemicals

Standard and Poor's, like Moody's, offers an ongoing set of monitoring tools for climate change.<sup>102</sup> This report's treatment of Standard and Poor's is not based on a new analytical framework like that offered by Moody's and Fitch. It analyzes one specific credit opinion related to petrochemicals that the agency published. The Standard and Poor's approach on this issue is more far-reaching and sets it apart from its peers.<sup>103</sup>

Formosa Plastics Group (FPG) is a Taiwanese conglomerate with a diverse set of interests in biotechnology, petrochemicals, and electronics. Its headquarters is in Taipei, Taiwan. The company produces a host of base chemicals, including ethylene, chlorine, propylene, and caustic soda. It also produces intermediate chemicals such as ethylene dichloride, monoethylene glycol, terephthalic acid and vinyl chloride, as well as polymers, including polyvinyl chloride and high-, low-, and low-linear density polyethylene (HDPE, LDPE and LLDPE) as well as polypropylene (PP).

FPG is a holding company for Formosa Plastics Corporation (FPC), Formosa Chemicals and Fiber, Formosa Petrochemicals and NanYa Plastics. The four companies are traded on the Taiwan stock exchange (1301.TW). The companies are financially strong with a long history of meeting dividend targets. They are rated A3 by Moody's Investor Service and were downgraded in 2020 by SP Taiwan Rating Service to AA-.<sup>104</sup> The company has production bases in Taiwan, the United States, China, Vietnam, the Philippines, and Indonesia. FPG and its four Formosa companies, which are highly integrated, had annual revenues of \$8.4 billion in 2022.

During 2019, the company's revenues of \$6.8 billion were comprised proportionally as follows:

- Plastics (34%)
- Polyolefin (21%)
- Polypropylene (18%)
- Tairylan (15%)

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<sup>102</sup> Standard and Poor's has established and maintained a robust monitoring program on climate change. In 2023 the company withdrew its quantitative rating system on ESG. This step has not changed the company's active monitoring efforts on climate change. Company ESG assessments, including the issue of climate change remains a part of its credit analysis. The company is stepping up its analytical capabilities and promises new tools going forward. See: S&P Global. [The Evolution of Climate Risk Assessment](#) (Video). September 2023.

<sup>103</sup> For example, where Standard and Poor's observed considerable risk on the Louisiana project, Moody's did not even mention it and generally saw the company's U.S. expansion plans favorably. See: Moody's Investor Service, Formosa Plastics Corporation, September 17, 2020. (Proprietary)

<sup>104</sup> Moody's Investor Services. Formosa Plastics Corporation. Credit Opinion. Update. September 17, 2020 (Proprietary). Also see Taiwan Rating Service. [Media Release: Ratings On Formosa Plastics Group Core Units Lowered To 'twAA-' On Growing Operating Headwinds; Outlook Stable](#). October 16, 2020, p. 2.

- Chemistry (10%)
- Others (2%)

Formosa has had business operations in the United States since the 1980s. In 2020, the hub of its corporate activity became Port Comfort, Texas, where it had maintained a presence since the early 1990s.<sup>105</sup> The company's industrial activity in Port Comfort today consists of a recently expanded cracker and petrochemical complex.<sup>106</sup> The complex includes a 1.5 Million metric tons per year (Mmta/y) ethane cracker integrated with HDPE, LLDPE, and Ethylene Glycol (EG) capacity, and the company plans to add propylene (Propane Dehydrogenation -PDH) and PP capacity. Formosa also has operated a plant since 1993 in Baton Rouge, La., which can produce polyvinyl chloride and ethylene dichloride. Formosa currently controls 6% of North America's ethane cracker capacity.

In April 2018, then-Louisiana Gov. John Bel Edwards and the Formosa Group announced that Formosa Group LA LLC, a subsidiary of Formosa Plastics Group, was planning to build a new petrochemical manufacturing complex in St. James Parish.<sup>107</sup> The multibillion-dollar complex would include two ethane crackers and processing capacity for HDPE, LLDPE, PP, EG and propane dehydrogenation (PDH) production.

The Formosa project would shift the company's enterprise-wide ethylene feedstock balance from a naphtha-based, Asia-centric operational mix to one that would be more evenly balanced by ethane-based North American investments. Currently, the global ethylene market is dominated by 67% naphtha and 16% ethane.<sup>108</sup> By 2025, the use of ethane as a feedstock is expected to rise to 23% globally.<sup>109</sup>

Formosa has faced an increasingly difficult investment environment at home in the northeast Asian region. Company management has acknowledged that Taiwan government officials regard the petrochemical industry and Formosa with disdain, particularly over environmental concerns, and it is not practical to attempt to build another facility in Taiwan. The Vietnamese government fined the company for environmental violations at its steel facility, and local groups continue the monitoring campaign. Formosa also faces ongoing demonstrations from citizen opposition in Taiwan over the environmental performance of the Formosa Plastic Corporation Naphtha Cracker No. 6.<sup>110,111</sup> Local

<sup>105</sup> Formosa Plastics. [Our Operations](#). Last visited November 26, 2023.

<sup>106</sup> The Port Comfort complex has capacity to handle naphtha, ethane, propane, and butanol feedstock. It can produce polyethylene, polypropylene, ethylene glycol, ethylene oxide, ethylene dichloride, vinyl chloride and polyvinyl chloride.

<sup>107</sup> Louisiana Economic Development. [Formosa Selects St. James Parish for \\$9.4 Billion Chemical Manufacturing Complex](#). April 2018.

<sup>108</sup> GEP. [Ethylene Market Outlook Considering the Impact of Covid-19](#). October 2020. Liquefied Petroleum Gas and others comprise the balance.

<sup>109</sup> *Ibid.*

<sup>110</sup> Business and Human Rights Resource Center. [Groups march in Taiwan to protest air pollution: ask local govt. to stop issuing permits to a Formosa Plastics naphtha cracking plant](#). June 13, 2017.

<sup>111</sup> China Perspectives. [Resisting Naphtha Crackers: A historical survey of environmental politics in Taiwan](#). Open Editions Journal. September 1, 2014.

activists in Taiwan have urged the company to drop the project in Louisiana.<sup>112</sup> Also, the recent trade tensions between the United States and China have had a negative impact on Formosa's China operations.<sup>113</sup>

Since the Louisiana announcement, community opposition has been multi-faceted and persistent. The community successfully sued the company and achieved an unprecedented ruling from then-Louisiana District Judge Trudy White, who remanded the case back to the agency because the air permit process for the project ran afoul of discrimination statutes.<sup>114</sup> Recently, a Louisiana appeals court reinstated the permit. The U.S. Army Corps of Engineers also was persuaded by new evidence that it should require a full environmental impact statement for the project.<sup>115</sup>

Standard and Poor's assessed the Louisiana project and found it deficient for several interrelated reasons.<sup>116</sup>

First, the large project would be developed in stages, requiring the company to tie up cash for several years, and it had already been delayed due to permitting and community opposition. Also, the market for petrochemical products is changing. Although the project benefits from low-cost natural gas, feedstock end product needs are evolving. The project design would typically serve producers of single-use plastic bottles, bags, straws, and packaging, but these markets are relatively overcrowded and likely to remain so until 2030. Standard and Poor's was skeptical of the prospects of tying up significant amounts of cash for the project. The credit agency estimated that Formosa would do better if it sought to produce durable plastics for products supporting the energy transition, such as plastics for electric vehicles.<sup>117</sup>

Second, in 2020 it was reported that the cost to build the petrochemical complex had risen from \$9.4 to \$12 billion.<sup>118</sup> This issue was fresh in the minds of Louisiana business leaders. Sasol, a South African company, had recently built a petrochemical complex, but rising costs and poor management resulted in a corporate scandal and shareholder litigation.<sup>119</sup> The increased construction cost estimate for the Formosa complex raised the specter of diminishing competitiveness and declining profitability of the facility.

Third, petrochemical hubs like the one proposed for Louisiana are being strongly opposed by communities. The opposition is not limited to Louisiana. It is global, and the level of opposition will likely increase. This international element of risk materialized for the Louisiana project when the

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<sup>112</sup> Earthworks. [Opponents of Formosa Plastics' Louisiana Plant Petition Shareholders to Drop Project at Taiwan Annual Meeting](#). June 10, 2020. Also see: The World. [From Louisiana to Taiwan, environmental activists stand up to a major plastics company](#). July 2020.

<sup>113</sup> Nikkei Asian. [Trade War traps Taiwan between two superpowers](#). December 5, 2018.

<sup>114</sup> The New York Times. [In 'Cancer Alley,' Judge Blocks Huge Petrochemical Plant](#). September 15, 2022.

<sup>115</sup> Reuters. [U.S. Army orders environmental review of Louisiana plastics project](#). August 18, 2021.

<sup>116</sup> Standard and Poor's. [Ratings On Formosa Plastics Corp. And Three Associated Companies Affirmed At 'BBB+' On Low Debt Leverage: Outlook Stable](#). October 2021.

<sup>117</sup> *Ibid.*

<sup>118</sup> The Advocate. [Major Formosa Plastics plan in St. James may cost 12 billion rating agency estimates](#). December 15, 2020.

<sup>119</sup> IEEFA. [Formosa's Louisiana project: Wrong products, wrong time](#). March 23, 2021.

Taiwan News published an editorial reporting on the racial conflict in Louisiana involving the proposed petrochemical hub.

On a broader level, Standard and Poor's suggested that Formosa's pursuit of the project could lead to a downgrade of the company's credit rating.

A downgrade of Formosa's credit rating not only would affect the company but also would undermine the perceived strength of low natural gas prices as a silver bullet. Low natural gas prices had created a cost advantage that was promising for developers relying on the fossil fuel as feedstock, but—given the series of other risk factors now converging—the low-cost advantage might not prove to be enough in the broader investment calculation.

Oil and gas producers have identified petrochemicals as a way to future profits in a carbon-constrained world.<sup>120</sup> Some analysts had acknowledged the tepid profits of the sector over the prior decade's weak fracking profits and oil sands write-offs. In addition, the Russia-Saudi dispute reminded everyone that the oil and gas sector was alarmingly volatile. *The Wall Street Journal* produced an important piece in 2017 that suggested the relative profit decline would all but ensure that future capex growth would be pointed toward the petrochemical sector.<sup>121</sup> The article highlighted the risk involved, given that profits from the petrochemical industry historically have been dwarfed by traditional oil and gas exploration, production, and refinery investments.

## V. Fitch's Growing Contribution to the Climate Change Debate

Although Fitch Ratings has been developing its climate risk analysis for several years, it published its first climate vulnerability assessment on utilities in October 2020. The company, having deepened its climate assessment, identified oil, gas and chemical companies as industries with heightened risk.<sup>122</sup> Since then, the company has developed a more comprehensive Climate Vulnerability Scoring (CVS) system.

The CVS analytical tool is designed to provide consistent application of climate criteria to credit ratings.<sup>123</sup> The company bases its scoring system on a collaboration with the United Nations Principles for Responsible Investors (UNPRI) and the Inevitable Policy Response Forecast Policy Scenario (IPR).<sup>124</sup> The approach is built around a set of scenario assumptions for sectors and companies targeted to the issue of financial materiality directly related to an individual company's creditworthiness.

<sup>120</sup> CNBC. [Every new passenger car sold in the world will be electric by 2040, says Exxon Mobil CEO Darren Woods](#). June 25, 2022.

<sup>121</sup> Wall Street Journal. [Big Oil is Betting on plastics. It may be a risky bet](#). May 2017.

<sup>122</sup> Fitch Ratings. [Oil and Gas and chemicals face heightened energy transition risks](#). April 25, 2022.

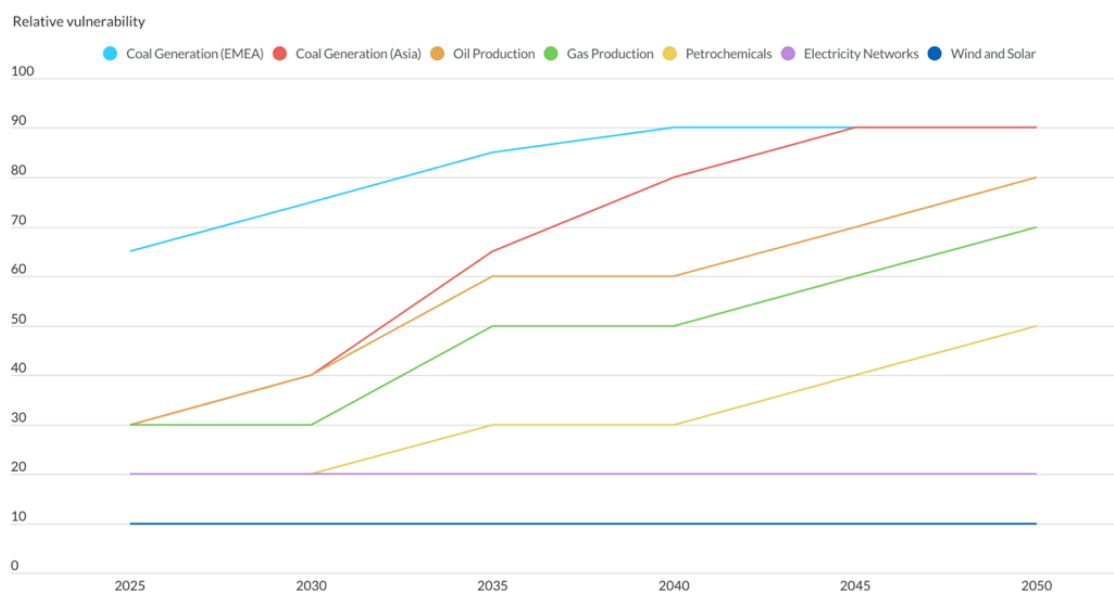
<sup>123</sup> Fitch Ratings. [Climate Vulnerability in Corporate Ratings](#). February 2023. ("CVS Proposal")

<sup>124</sup> Unipri.org. [Inevitable Policy Response: Forecast Policy Scenario Macroeconomic Results](#). Last visited November 26, 2023.

The sector analyses address changing market structures, demand for goods and services, capital and operating finances, and business models that affect creditworthiness. The index begins in 2025 and goes out to 2050, rating companies from 10 (low risk) to 90 (high risk). Numerical scoring is assigned as though corrective actions were not taken from the snapshot point of the analysis.

The index is based on both quantitative and qualitative metrics. Quantitatively, Fitch analysts focus on carbon pricing, coal phaseout, clean power, zero emissions, low-carbon buildings, clean industrial policy, deforestation and agriculture. The qualitative assessments are rooted in climate policy, technological development and costs, social and political concerns, industrial competitiveness, trade exposure and energy security issues.

### Fitch: Select Sector Climate Vulnerability Signals



Source: Fitch, [CVS Proposal](#).

On the quantitative level, the credit agency focuses on revenue weighted analyses as the starting point. It assumes current revenue weights are a critical metric for judging companies, and it is the place to start when projecting the potential of new sustainability initiatives.

Fitch employs three critical insights to arrive at its scoring:<sup>125</sup>

- 2035 is a pivotal year for analytical findings and conclusions. By 2035, Fitch expects three real-world assumptions to be operative. Coal has been phased out in most developed economies, new fossil fuel vehicles are being phased out and oil demand is in decline.
- Fitch has not factored into its analysis the Ukraine effects, since they see it as short-term, and its scoring tool is long-term. Fitch acknowledges the asset lives of some coal plants have

<sup>125</sup> [CVS Proposal](#).



been extended, the price of oil, gas and electricity are up, and the general prospects for more renewables have improved.

- The long-term view leads Fitch to conclude current trade tensions, disruption in energy commodity markets and uncompetitive technological innovations will not likely be detrimental to the low-carbon transition and will not undermine the fundamental assumption that low-carbon technologies will proceed based on falling costs.

Fitch applied the index to its current listing of 315 issuers and found that by 2035, 20% of the companies that are now carrying an investment-grade rating will be downgraded. By 2050, the number rises to 30%.<sup>126</sup>

Not surprisingly, more than half of the companies that Fitch scored with a 45 rating (at risk of imminent credit action) in 2035 are oil and gas companies, including producers, pipeline and midstream companies.<sup>127</sup>

Although there is little debate that a reduction in the letter grade of a company's bond rating negatively affects its stock price,<sup>128</sup> a variety of methods are used to project how much of a stock price drop is likely.<sup>129</sup>

Fitch's current view is that a significant percentage of companies, particularly oil and gas companies, will face downgrades—perhaps even downgrades that take the company from an investable grade to a speculative grade. Fitch's view is based on an increasingly information-rich environment as companies and industry efforts improve disclosures and metrics. The implication of Fitch's analysis is that the companies facing downgrades may not be worth their current market capitalization.<sup>130</sup> The character and quality of the risks facing the oil and gas sector raise serious questions about current market value expressions.<sup>131</sup>

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<sup>126</sup> *Ibid.*

<sup>127</sup> Fitch Ratings. [Over half of corporates facing climate related downgrades by 2035 are investment grade](#). October 24, 2023.

<sup>128</sup> Science. [Credit rating downgrades and stock price crash risk: International evidence](#). July 2023.

<sup>129</sup> The market capitalization of the Energy Sector is currently \$3.7 trillion. One half of that is \$1.85 trillion that is facing potential downgrades. The overall market today is valued at \$68 billion. The potential downgrades cover 2.7% of the stock market for just the energy sector.

<sup>130</sup> The current market capitalization of the Energy Sector of the S&P 500 is \$3.76 trillion. See: Fidelity. [Fidelity Research](#). Last visited November 25, 2023.

<sup>131</sup> While Fitch's work is a major step forward, some criticisms are emerging. For example, Fitch seems to be viewing carbon capture and sequestration as part of a positive climate solutions program. This component, a widely supported technological plank in the corporate solutions platform, is questionable. See: The Energy Mix. [Coal, Gas Face Deepening Financial Risk in Fitch Climate Vulnerability Ratings](#). May 1, 2022. Also see: The Toronto Star. ['The oil and gas industry is facing a moment of truth': Carbon capture won't work, says International Energy Agency](#). November 23, 2023.

## Conclusion

Credit rating agencies were roundly criticized for their failure to sound the alarm about the mortgage meltdown. While they have been slow to act on climate change, they have responded. They have responded not only to the science and technology but also to a new climate stakeholder speaking loudly and persistently for the safety of the planet itself. The voices are coming from parties with varied interests. Perhaps the loudest and most persistent voice has been that of the market itself. Markets have empowered the community and climate voices identified in this report.

1. The credit rating agencies have increased their credit monitoring tools on the energy sector and climate change. They have broadened their scope to the wider economy. Some have moved faster than others, although all have made meaningful contributions to the discussion of the quality and type of risks created by climate change.
2. Much of the risk articulation has come from the communities faced with the problems created by climate change. Business groups and credit agencies have cited the impact of community and climate voices on investment decisions.
3. The conditions created by climate change and the risk articulation have also given legitimacy to changes in the character and quality of how credit agencies assess risk.
4. Despite these changes in methodology, the fundamental question remains the same. Can an asset or enterprise generate sufficient revenue to carry the debt load it creates?
5. These factors—financial fundamentals and newly identified risks—have increased the financial challenges faced by the fossil fuel industry. The once-powerful and attractive energy industry is offering an unattractive investment choice in the bond market.

The credit agencies, individually and collectively, are at a pivotal point in the treatment of the climate issue. They are moving from credit-positive ratings of fossil fuel companies to a drilling down on company climate plans. This includes more frequent and rigorous monitoring reports as well as clear, explicit warnings. This paper charts an evolving trajectory of how credit rating agencies have changed their view. The logic of credit rating agencies thus far should lead in the future to an industry-wide finding of imminent default. This is unlikely to occur, but as this paper shows, there are numerous gradations on the trajectory. The view on fossil fuels has shifted almost 180 degrees. The path is not straight but the outlook, tilting toward negative and full of red flag warnings, is clear.

1. From 2005-07, the industry considered coal power plants and coal mining “credit positive.” This condition fostered an ambitious plan to expand coal-fired power generation.
2. From 2008-10, natural gas prices collapsed, and credit agencies began to identify regulatory risk for coal, particularly new laws and tightening regulation from Washington.
3. During 2008-10, credit rating agencies began to recognize the growth of renewable power generation and its potential incursion on both coal and natural gas.

4. In 2010, the Waxman-Markey bill failed (accompanied by successful energy sector opposition). The coal, oil and gas industry argued Waxman-Markey was an existential threat to the industry. The bill's failure, however, offered no cure for the industry. The coal industry's market share continued to fall and financial risk factors combined with regulatory and political factors to undermine the growth of oil and gas. The decade started with the energy sector at 11.5% of the stock market.<sup>132</sup> At the end of 2020, the industry accounted for 2.28% of the market.<sup>133</sup>
5. By 2016, credit rating agencies found coal plants to be credit negative.
6. Between 2008 and 2012, credit rating agencies began to identify opposition to coal plants as part of a broader challenge to fossil fuels generally.
7. By 2018, individual businesses and trade associations identified the risks posed by organized opponents.
8. By 2020, credit rating agencies were recognizing the troubled outlook for oil and gas infrastructure. Moody's reaction was material. The simple announcement of a new fossil fuel asset was no longer the standard measure for a credit-positive assessment. Now, fossil fuel assets would have to demonstrate a period of commercial operation before the credit-positive moniker would be attached.
9. By 2021 Standard and Poor's had issued a warning that petrochemical hubs were questionable investments. The company warned Formosa Plastics of a potential downgrade and globalized its assessment to all petrochemical complexes.
10. By 2023, Fitch had issued a proposed criteria for reviewing climate change and concluded that if the standards were operational today, 20% of covered companies could face downgrades.

Given the normal trajectory of the credit rating process, the difficult rating questions ahead could result in some dire credit actions. It is clear though that climate change has altered how risk is assessed. The expectation established most clearly by Fitch is that without substantial change for the energy sector the markets can expect increasingly dire warnings, negative outlooks and perhaps letter downgrades. It is unlikely that an entire industry would be downgraded.

The fossil fuel industry—coal, oil and gas—face a cumulative set of risks. The companies individually and the industry collectively face:

- Strong competition
- Poor business plans to address climate change
- Dubious technological solutions

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<sup>132</sup> Sibilis, Sector Weightings, (Proprietary).

<sup>133</sup> In October 2020, the sector declined to 2.01%.

- A weak financial rationale
- Geopolitical divisions
- Demands for more public dollars and regulatory support

Despite this cumulative risk outlook, for the foreseeable future the credit agencies are likely to focus on the nuts-and-bolts operations of individual issuers and their projects. The credit rating agencies through their credit opinions and methodological changes must address the issue of what should be done with an industry that is in a state of long-term decline. Most of the agencies have developed tools that they think will be useful in assessing individual company and industry prospects. Those tools will likely be refined as they are applied. The fossil fuel and banking sectors will be the key critical sectors since they have more exposure. All sectors of the economy have a role to play.

Community and climate voices have a daunting responsibility. Major areas of progress—articulating the issue and the need for change, validating corporate, governmental and societal actions, codifying those actions into programs supported by oversight infrastructure and allocations of public and private capital—have been made. The companies have made promises in the form of sustainability plans and other declarations. Now, they must deliver on those promises. How that is achieved is becoming an increasingly complex question. In these areas, much has been achieved but much remains, and the choices are not at all clear.

The next steps for responsible climate voices are to evaluate the changes being implemented by international, national, state, local, and corporate actors. The studies, audits and evaluations should lead to a new cycle of issue articulation to validate new action areas and realign financial allocations based on a continuous evaluation of the problem and conditions faced. One operative principle for climate voices can be found in the credit rating agency deliberations—the credit rating agencies, for example, have standards for accepting new business arrangements and new technologies. Before granting creditworthy status, credit raters want to see more than announcements. They want to see results—investments made, commercial operation commenced, and stable revenues that support the technology and the enterprises involved.

The institutional progress of the credit rating agencies demonstrated in this paper is too slow. Institutional progress is an inherently slow process—too slow, given what we know scientifically and what is being seen in community after community. And too slow in issuing guidance that is supportive of energy transition strategies. Sterner warnings about climate risk and negative credit opinions are increasingly in order.

In one sense the credit rating agencies are like the rest of the world on climate change—slow to act. The new tools and guidance they are offering create the potential for the rating agencies to get ahead of the problem. Another clear message has emerged. If the voices keep speaking, change occurs.

## Appendix I: IEEFA Coal Plant Reports, Testimony and Analytical Observations

Many of the documents listed below were used as part of campaigns, administrative, legislative or judicial proceedings. Some were produced as part of IEEFA's general monitoring and data gathering activities. Some of the reports and testimony that predate IEEFA are difficult to locate. We have used local press or advocacy accounts.

Although most were part of campaigns, not all the coal plants listed below were part of the kind of campaigns discussed in this paper.

1. (Prior to IEEFA's formation, Schlissel and Sanzillo filed testimony in the case against Interstate Power and Light) Opposition to Marshalltown Iowa coal plant,<sup>134</sup> October 2007.
2. Big Stone II coal plant: David Schlissel, [Testimony before the South Dakota Public Utilities Commission](#), May 2006. [Testimony](#) in case included research on current state of carbon capture and sequestration.
3. East Kentucky Power Cooperative, [The Right Decision for Changing Times](#), April 2009.
4. Plant Washington, [Power4Georgia's Plant Washington: Too High a Price for Consumers](#), July 2011
5. Michigan, [Wolverine Power Plant](#), 2009.
6. Prairie State, [The Truth About Prairie State](#), 2012.
7. Old Dominion, [The Financial Risks of Old Dominion](#), Virginia, April 2009.
8. [Karn Weadock Coal Plant](#), April 2010.
9. Energy Futures Holding, [The Financial Case to Retire Big Brown, Monticello and Martin Lake Coal Plants](#), March 2011.
10. Huntley Generating Station, [Coal Plants Weak Financial Outlook](#), January 2014.
11. Schlissel (Synapse), [Assessment of Santee Cooper Integrated Resource Plan, Santee Cooper Pee Dee Plant](#), South Carolina, April 2011. (Missing Background Bond Briefings)
12. Brayton Point, [Dark Days Ahead for Brayton Point](#), (Massachusetts) March 2013.
13. Edwardsport, [Indiana Gasification Project](#), May 2007.
14. Hempstead Coal Plant, Arkansas, July 2007.
15. [Little Gypsy Unit 3](#), Louisiana, August 2017.
16. Wise County Coal Plant, Virginia, November 2007.
17. Appalachian Power Gasification Project, West Virginia, November 2007.
18. [Meigs County](#), Ohio, [December 2007](#).
19. Nelson Dewey Coal Plant, Wisconsin, August 2008.
20. [Columbia 1 and 2 Coal Plant, Wisconsin](#), October 2009. Coal emissions upgrades
21. [Edgewater Unit 5](#), Coal plant emissions controls, December 2009.
22. Kemper, Mississippi, December 2009.
23. Taylorville, Illinois IGCC power plant, April 2010.
24. [Wygen III coal plant](#), South Dakota, April 2010.
25. Portland General Electric Integrated Resource Plan, Oregon, August 2010.
26. Emissions Plans in Colorado, September 2010.
27. [Four Corners Unit 4 and 5](#), Arizona, May 2011.

<sup>134</sup> Plains Justice. [Marshalltown Coal Plant Under Fire: National Experts Testify in Opposition](#). October 31, 2007.

28. [LaCygne Generating Station Units 1 and 2](#), Kansas, June 2011.
29. [Navajo Power Generating Station, Arizona](#), 2015.
30. Tristate Coal Plants
31. Colorado Electric Resource Plan, June 2012. (Opposition to Coal Plants)
32. [San Juan Generating Station](#), New Mexico, 2020.
33. [Pacific Corp Corporate reversal on coal](#), December 2018.
34. Colstrip, [Bleak future for Colstrip 1 and 2](#), Montana, June 2015.
35. [Project Tundra](#), North Dakota September 2020.
36. [Petra Nova Mothballing](#), Texas, August 2020.
37. [Utah Coal Ports](#), November 2017.
38. [Oaklandon](#), Texas, September 2018.
39. [Capping campaign in Texas on over a dozen coal plant closures](#), Texas, September 2016.
40. [Coal fired power plants in decline throughout northeast](#), October 2019.
41. [McIntosh Unit 3](#), Florida, October 2015.
42. [Pleasants West Virginia](#), September 2022.
43. [Prairie State tentacles in Missouri](#), March 2015.
44. [Prairie State Tentacles](#), Cleveland Ohio, 2022.
45. [Prairie State Tentacles, Galion, Ohio, 2013.](#)
46. [Prairie State Tentacles](#), Danville, Virginia.
47. [Prairie State Tentacles Bowling Green.](#)
48. [Prairie State tentacles Paducah.](#)
49. [Longview, West Virginia](#), April 2020.
50. Homer City, [Homer City coal plant](#), Pennsylvania, June 2016.
51. Financial Risks of Building and Operating ODEC's Proposed Cypress Creek Power Station, April 2009.
52. [Holcomb Power Plant](#), Kansas, [CCS mentioned.](#)

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

## About the Author

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Tom Sanzillo, director of financial analysis for IEEFA, is the author of numerous studies on the oil, gas, petrochemical and coal sectors in the U.S. and internationally, including company and credit analyses, facility development, oil and gas reserves, stock and commodity market analysis and public and private financial structures. Sanzillo has experience in public policy and has testified as an expert witness, taught energy industry finance and is quoted frequently in the media. He has 17 years of experience with the City and the State of New York in senior financial and policy management positions. As the first deputy comptroller for the State of New York, Sanzillo oversaw the finances of 1,300 units of local government, the annual management of 44,000 government contracts, and over \$200 billion in state and local municipal bond programs as well as a \$156 billion global pension fund.

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