Carbon Pricing and Its Potential Credit Impact

As atmospheric concentrations of carbon dioxide (CO_2) continue to rise, climate change is projected to accelerate, pressuring regulators and government agencies to find cost-effective solutions to reduce emissions. In the U.S., fossil fuel combustion is the largest source of greenhouse gas (GHG) emissions and the primary source of CO_2. The transportation sector is the largest emitter of energy-related CO_2 emissions in the country, followed by the electric power and industrial sectors. For many economists and policymakers, the best way to shift away from fossil fuels and reduce emissions is to put a price on carbon. In this report, Kroll Bond Rating Agency (KBRA) compares two carbon pricing policy options: a carbon tax and cap-and-trade program, as well as discusses potential credit implications for project finance transportation, electricity generation, and midstream industries.

Carbon Pricing

Economists have long suggested that assigning a price to CO_2 emissions could be a cost-effective way to curb those emissions. With the increasing push by governments around the world to slow down the effects of climate change, the idea of applying a pricing mechanism to CO2 emissions is spreading. According to the Commodity Futures Trading Commission, setting a price on carbon in the U.S. is the most critical step to managing climate risk.[1] The aim of carbon pricing, whether in the form of a carbon tax or a cap-and-trade system, is to put a price on carbon emissions so that the costs of climate change and the costs of transitioning to a low-carbon footprint are reflected in everyday production and consumption choices. A carbon pricing system would force producers to internalize the externalities (i.e., the climate change effects) of their production decisions, while consumers would feel that impact in their consumption decisions.

Carbon pricing aims to reduce the amount of carbon released into the atmosphere by explicitly making it more expensive to create carbon emissions. As the cost of emitting carbon becomes more expensive, producers and consumers would be incentivized to seek alternatives such as developing new technology that reduces the overall carbon emissions in their existing processes, or reduce their overall consumption and production levels. Overall, carbon pricing policies can help achieve emissions reduction goals under international commitments such as the Paris Agreement. According to the High-Level Commission on Carbon Prices, an effective carbon pricing scheme should price carbon between $40-$80 per metric ton (or tonne) of CO_2 (tCO_2) by 2020 and $50-$100/tCO_2 by 2030 to reduce carbon emissions in line with the targets of the Paris Agreement.[2] However, median global carbon prices are currently about $15/$tCO_2$.[3]

There are two primary market-based policies that set a price on CO_2 emissions: a carbon tax and a cap-and-trade program. If well designed, either approach can be a cost-effective way to reduce carbon emissions, in line with climate and energy transition goals. Further, depending on the exact pricing scheme in place, both policies could even generate additional government revenue that can help spur technological innovation, increase capital flow to more affordable and cleaner energy sources, and offset the impact of increasing energy costs to consumers. This may become a key point, especially if governments are keen to prevent a consumer backlash similar to that seen in France with the *gilet jaunes* movement.

Carbon Tax

A carbon tax is a fixed fee imposed on the carbon content of goods and services produced and consumed. In effect, a carbon tax seeks to reduce CO_2 emissions by increasing the price and thereby reducing the demand for products that are among the key contributors to overall carbon emissions. Setting the price per tonne on carbon effectively prices the externality of the emission and allows the market to internalize the cost to determine emission levels. Pricing carbon provides incentives for carbon-intensive industries, products, and fossil fuel-based energy generators to find cleaner alternatives or invest in carbon reduction technologies. Further, a carbon tax's impact can be broadly applied to numerous sectors of the economy as it is not limited to producers. It can also be easily applied across the manufacturing and services value chain, from intermediaries such as airlines, agriculture, and industrial goods industries to end consumers such as electricity and transportation fuel users.

The effect of a carbon tax on taxpayers largely depends on how the tax's corresponding revenue is spent. As the effect of a carbon tax is most likely regressive in nature, it may be politically easier to enact carbon tax legislation if the taxation regime contemplates addressing the tax's equity implications by returning the corresponding revenues to

[1] Managing Climate Risk in the U.S. Financial System
[2] Report of the High-Level Commission on Carbon Prices
[3] The world urgently needs to expand its use of carbon prices

consumers through tax cuts or energy rebates. According to a study led by Columbia University's SIPA Center on Global Energy Policy (CGEP), if the revenues from carbon taxes are used to provide equal per-household rebates, the policy can revert a carbon taxation regime to be progressive in nature.[4]

Carbon taxes have been implemented worldwide, but British Columbia, Canada, was the first to introduce a revenue-neutral carbon tax in North America in 2008.[5] The tax applies to the use and purchase of fossil fuels at a rate of CAD10 per tonne and has increased gradually to the current level of CAD40 per tonne. Most of the funds collected are returned to taxpayers in the form of tax credits.

While there is no carbon tax at the U.S. federal or state level, the city of Boulder, Colorado, was the first to implement a tax levied on electricity consumption to reduce GHG emissions in 2007.[6] The tax generates approximately $1.8 million annually and is used to fund climate mitigation programs and rebates to residents and businesses.

Cap-and-Trade

Under a carbon cap-and-trade program, the government limits pollution by imposing a ceiling on certain industries' carbon emissions. Governments then distribute emissions permits consistent with the cap, typically through a combination of paid auctions or free allocations to existing market players in those industries. Companies and producers that can bring their emissions levels below their emissions permits can sell the remainder to other market participants who may choose to exceed their emissions cap by the allowance amount purchased. By capping the initial number of allowances, a cap-and-trade system effectively places a ceiling on the total carbon emissions level and allows market participants, through the changing tradable price for emissions allowances, to choose the best course of action to meet their production and emissions targets. In a sense, market participants are offered the choice to reduce their production levels, find more efficient ways to produce, or pay for the right to continue their emissions, assuming tradable credits are available. The cap is usually reduced over time, forcing a decrease in the amount of emissions allowances and thereby increasing its price. Under a cap-and-trade system, the cost of the allowance may be volatile, but it is expected that under the scheme, the price of emissions should, theoretically, begin to decrease over time as the industry finds cost-effective ways to meet the mandated, albeit reduced allowance targets, at even lower costs.

The U.S. Acid Rain Program (ARP) in the early 1990s was the first cap-and-trade scheme in the country and was implemented to reduce sulfur dioxide (SO_2) emissions. Although it effectively reduced acid rain and SO_2 emissions, it is still uncertain if this success can be replicated with a national carbon cap-and-trade program since the scope would be substantially larger than that in place for the nation's coal-fired power generators under the ARP. Technological solutions to reduce SO_2 emissions were already in place under the ARP, with several miners already producing low-sulfur coal and SO_2 scrubbers were readily available to the coal-fired power plants. Nevertheless, some local and regional schemes are operating in the country with promising results. For example, 11 states in the Northeast are part of the Regional Greenhouse Gas Initiative (RGGI) and participate in a cap-and-trade scheme to reduce carbon emissions from the power sector.[7] Similarly, California is using this strategy as a complement to other measures to effectively reduce GHG emissions. Both programs' revenues are invested in energy efficiency solutions.[8]

There are multiple carbon markets globally, but the European Union Emissions Trading System (EU ETS) is the world's largest carbon market that functions under a cap-and-trade system.[9] The pilot phase (2005-07) focused solely on carbon emissions from power generators and energy-intensive industries, but the coverage of sectors and GHGs has been expanded throughout the years. For example, nitrous oxide emissions and the aviation sector were included in phase 2 (2008-2012). The system started phase 4 this year (2021-2030), and participation in the EU ETS is mandatory for certain sectors such as commercial aviation, power and heat generation, and energy-intensive industry sectors. The EU ETS has been an efficient tool, having led to reduced combined sector-wide GHG emissions by about 35% since 2005.

Comparison of Carbon Tax and Cap-and-Trade Scheme

From an economic standpoint, both a carbon tax and a cap-and-trade scheme can be functionally equivalent in cutting carbon emissions if properly designed. However, the programs differ in the certainty they provide. Cap-and-trade sets a maximum emissions level, allowing the market to determine the price for those allowable emissions. This affects the price volatility of the underlying goods in the economy in line with the price volatility in the tradable allowances. With such cost uncertainty, it could undermine capital investment and dwarf the efforts to develop cleaner technologies. In contrast, a carbon tax sets the price on carbon emissions, allowing the market to determine emissions levels. While this

[4] The Energy, Economic, and Emissions Impacts of a Federal US Carbon Tax
[5] Revenue-Neutral Carbon Tax | Canada
[6] Boulder's Climate Action Plan
[7] The Regional Greenhouse Gas Initiative
[8] Cap-and-Trade Program
[9] EU Emissions Trading System

provides predictability to the price per tonne of CO_2 (and to the underlying goods), it comes at the cost of uncertainty in the level of continued carbon emissions.
In terms of feasibility, a carbon tax is easier to implement and administer. In contrast, cap-and-trade is more complex to design and requires additional layers of regulation. Additionally, a carbon allowance auction or emissions trading program must be operational, which increases compliance and oversight costs. Cap-and-trade programs are most successful when there are a limited number of market players, for instance, when trying to control emissions from coal-fired power plants, as was the case under the ARP or the RGGI that covers the power sector only. It can be challenging to implement when the aim is to broaden the scope of the various industries to fall under compliance of the carbon emissions regime.

The success of any program depends on its design, with determining the right carbon price as crucial—a too high price could have unintended consequences on the economy, while one that is too low may discourage carbon reductions, with market participants continuing to consume carbon-intensive goods and services. Political considerations can also have significant effects on the design and implementation of carbon pricing. Australia's carbon tax, for example, was repealed in 2014 after two years in operation, following the election of a new government. Although the carbon tax did achieve a reduction in the country's emissions, the incoming prime minister delivered on his election campaign promise to revoke the tax.

Both carbon-offsetting programs have a useful role to play and, if designed correctly, may have similar outcomes. However, according to CGEP, due to the sectors' responsiveness to a carbon price, a carbon tax is expected to achieve the most emission reductions in the electric power sector and the least in the transportation sector.[10] Similarly, economists recommend this program to target emissions from large-scale emitters, such as large industrial plants, due to the cap-and-trade scheme's complexity.[11] That said, although carbon pricing is necessary to tackle climate change, the response is not sufficient on its own. Complementary policies such as energy efficiency requirements, regulating GHGs other than CO_2, and investing in infrastructure improvements, are all policies that will be needed to slow, if not reverse, the impact of a changing climate.

U.S. Carbon Pricing Debate

A carbon price mechanism has been the subject of serious debate in the U.S. There is no federal carbon pollution pricing system to reduce CO_2 emissions, and efforts to pass legislation have been unsuccessful. However, Secretary of the Treasury, Janet Yellen, has been outspoken in support of carbon pricing as a tool to combat climate change.[12] Similarly, public interest is rapidly increasing, shown by the number of carbon pricing bills introduced in the last Congress, the most since the 111th Congress was in session from January 2009 to 2011.[13]

The Biden administration has signed several executive orders and set ambitious goals toward a path to a net-zero economy. As part of one of his first executive orders, Biden recently updated the previous administration's estimate and set a social cost of carbon at $51 per tonne, a move that will have consequential effects since it will be used as an input in cost-benefit analyses to examine the potential impacts of new regulations and could inform a future carbon price.[14]

Credit Impact on Electricity Generation, Transportation, and Midstream Industries

Given the uncertainties around the eventual implementation of carbon pricing on the electricity generation, transportation, and midstream industries, it is still too soon to gauge the full effect of carbon pricing on the credit risk of U.S. issuers. KBRA believes it can be a credit positive when issuers demonstrate awareness of, and planning for, potential regulatory actions including carbon pricing that may impact their credit quality. As discussed in our previous ESG-themed report, KBRA's ESG Management framework focuses on the ability of companies' management teams or the transaction sponsor to identify, plan for, and mitigate the ongoing risks that carbon pricing may present, as well as benefit from any opportunities. In the case of how carbon pricing may impact a particular issuer, we will evaluate the specific industry and the management team's strategy under different carbon pricing scenarios, as well as how it may impact their business.

Electricity Generation

Carbon pricing is expected to directly impact the electricity generation industry since natural gas-fired plants set spot prices in most U.S. electric systems. A MWh of electricity produced by a coal-fired plant generates about a metric ton of CO_2 emissions, while a natural gas-fired plant generates on average 0.41 metric tonnes of carbon. A cap-and-trade program would likely benefit efficient gas and renewable energy generators, allowing them to sell their allowances and benefit from a higher spot market price that increases the overall cost of operations of inefficient and higher carbon producers. Depending on the actual carbon allowance, the impact on market prices is uncertain but would likely result in an overall increase in electricity prices for end users.

[10] Energy and Environmental Implications of a Carbon Tax in the United States
[11] Pricing Carbon: A Carbon Tax or Cap-And-Trade?
[12] Finance Committee Questions for the Record. Hearing on the Nomination of Dr. Janet Yellen
[13] Carbon Pricing Bill Tracker
[14] Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990

In a scenario of a $51/tCO$_2$ carbon tax—much higher than the cost of carbon in Europe, at about $27/tCO$_2$—the additional cost per MWh produced would be $51/tonne for coal and $21/tonne for natural gas. Natural gas generation usually sets the price in most U.S. energy markets, meaning a carbon tax would likely result in higher electricity prices of about $21/MWh. All producers who generate carbon emissions that are lower than 0.41 tonnes/MWh would benefit by charging a higher price than needed to produce energy, taking into account the respective carbon tax. Carbon taxes would also benefit renewable generators that sell in the merchant market as they would pay little to no taxes and benefit from an overall increase in electricity prices. The impact of higher pricing would likely be passed on to end users (industrial, commercial, and residential), which would make a carbon tax palatable only if revenues collected are used to offset some of these increased costs. The advantage of both programs is the market signal (higher electricity prices) would incentivize users to reduce overall energy consumption.

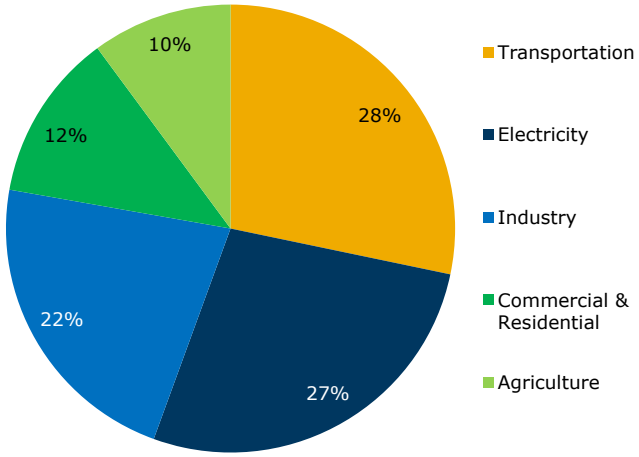
KBRA would expect rating deterioration in merchant thermal producers with aging plants that generate higher-than-average carbon emissions, as they are the most at risk of being displaced by other technologies. Renewable generators with exposure to merchant markets are expected to increase their revenue generation potential due to higher market prices, and could have their ratings upgraded.

KBRA believes there is a high likelihood that a U.S. carbon price mechanism will be enacted and implemented over the next five years. In the last few years, we have started to see many market consultants incorporate a pricing scenario where electricity rates increase due to carbon pricing. However, the carbon tax, allowance under a cap-and-trade regime, and the specifics of the program will determine the overall credit impact on energy generators. Issuers with management teams that prepare for a potential carbon price in the near term are better positioned to reduce the overall impact of carbon pricing.

Transportation

The transportation sector is responsible for the largest share of U.S. GHG emissions. Carbon pricing could accelerate the shift to electric vehicles and increase the cost of transportation modes with fewer fuel alternatives, such as air travel.

Figure 1: Total U.S. Greenhouse Gas Emissions by Sector (2018)



Source: U.S. Environmental Protection Agency

A high carbon price could impact customer behavior and may impact the credit profile of toll roads and airport terminals as users reduce their travel demand and/or change behavior to reduce the added cost (carpooling or increased use of public transportation), resulting in lower revenue generation. Alternatively, a carbon tax could trigger a major shift toward alternative fuel-powered vehicles. Transportation companies' management teams that support the energy transition will likely have a competitive advantage over their peers who are behind the curve. For example, road operators that invest in charging stations could see higher volumes compared to networks without the necessary electric vehicle infrastructure.

Midstream

One of the major contributors to CO_2 emissions is the burning of fossil fuels that primarily power our electricity supply and modes of transportation. As the industry largely responsible for the processing, storage, and transportation of fossil fuels— from their site of production to their site of consumption—the midstream industry is partly accountable for CO_2 emissions along the entire life cycle. While the midstream industry is responsible for some direct carbon emissions, most of its influence is manifested as enablers of the process that facilitates the downstream consumption of fossil fuels.

As such, KBRA anticipates that in the presence of a carbon pricing regime, such pricing effects would predominantly fall either on the upstream producers of fossil fuels (the exploration and production industry) or on the downstream consumers of fossil fuels (transportation, refinery, and power generating industry). KBRA would not expect major pricing and costs shifts in the overall operations of midstream market participants as most of the carbon pricing effects can be passed on to the ultimate consumers.

That said, in the presence of consumers' responses to carbon pricing on the fossil fuels that pass through the midstream industry, KBRA expects that the sector may experience demand dislocation as consumers shift their consumption toward other less impacted sources. For example, should consumers meaningfully accelerate their shift toward alternative forms of cleaner electricity supply such as photovoltaic and wind-based generation, and away from fossil fuel supplies such as natural gas-fired generation, then the demand shift away from fossil fuels may affect the overall competitive structure of the midstream industry. In such scenarios whereby upstream participants are forced to reduce their production of, or downstream participants are forced to reduce their demand for, fossil fuels, then the midstream market participants will compete for ever decreasing throughput volumes, which may undermine the current pricing power that the industry enjoys.

However, in the near term, should natural gas production benefit in the face of carbon pricing at the expense of coal production, it is possible that some participants in the midstream industry may be winners, given their role in procuring and delivering natural gas to the electricity generation industry, which has seen natural gas replacing coal as a primary feedstock of electricity production. Further, under the assumption that overall GHG reduction may require additional solutions alongside carbon pricing such as remediation efforts around capturing and storing CO_2, midstream assets may yet play a critical role in the long term. However, KBRA anticipates that the overall effect of carbon pricing on the midstream sector remains unclear and will depend on the intensity and pace of energy transition plans. For these reasons, KBRA believes the near-term impact of climate risk on midstream companies' credit ratings is somewhat more complex and cannot be reduced to a simple ESG score. Issuers with strategies based on different scenarios of carbon pricing and overall climate regulation will likely better insulate or protect their revenue generation streams from new government regulation.

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