

Greater Houston Port Bureau

Port Bureau News

February 2022



**Fad or Future: An Introduction
to How Cryptocurrencies
Revolutionize Money and
Rearchitect Trust Systems**

Also in this Issue: Captain's Corner | Port Watch | Port Bureau Updates |
EIA: Corporate Goal Case, Annual Energy Outlook 2021 Issues in Focus |
TERP SPRY Grant Program | Commerce Club |

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About the Cover

Several trillion dollars of pandemic stimuli programs across the world have reignited an interest in cryptocurrencies. Fear of inflation and money printing have given Bitcoin new wings. Large corporations have announced plans to either hold cryptocurrency assets in treasury or accept them as a form of payment. Major financial institutions are expanding digital asset investment. *Fad or Future? Read more on page 6.*



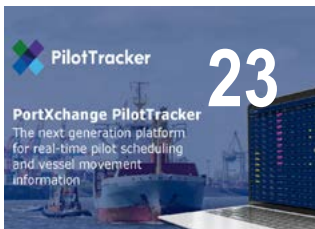
The U.S. Energy Information Administration released a paper in early February comparing the Reference case in their Annual Energy Outlook 2021 to a Corporate Goal case that models announced utility plans in addition to current laws and regulations as of October 2020. Read more on page 16.

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Captain's Corner

Time to Go Texan



When I learned I was to be transferred from Panama to Houston in 2006, I shared the news with my boss, Alberto Aleman, the CEO of the Panama Canal. I expected him to talk about the port of Houston or the ports of Texas and the connection to the Canal, but his excitement focused on the Houston Livestock Show and Rodeo.

He knew and loved the Rodeo, and told me all about the Livestock Show, bull riding, calf scramble, and, of course, the concerts. (He forgot to mention the fried everything.) He filled the entire meeting with Rodeo details; the Canal was not mentioned. With some surprise, I later shared with Annette – the Rodeo must be a big deal in Houston!

After the move, I, too, soon came to appreciate how special the Rodeo is to the community, and I am glad to welcome it back after its two-year break. Though its key mission is to promote agriculture, it brings the community together in uniquely fun ways to produce an event that benefits Houston and helps young people. According to the Houston Livestock Show & Rodeo website, more than \$550 million have been committed to young people in Texas since its inception in 1932.

The Rodeo's deep and historic ties to the community are built on thousands of volunteers, donors, and attendees - everyone is involved or knows someone who is. They are on a committee or participate in the trail ride or march in the parade. From the barbeque cook-off to students raising livestock, its influence is everywhere. The enthusiasm and stories are endless.

Natives or long-time residents are always happy to tell me who've they've seen over the years, and each has a favorite. If they have been here long enough, it might be someone like Elvis (his appearance out of the tunnel in the Astrodome in the back of a Cadillac convertible sent the star-struck crowd over the top) or Glen Campbell (people went wild over his performance of his 1969 hit Galveston).

The Rodeo shares some of the same milestone moments led by some of the same business innovators as the port of Houston. When the Houston Chamber of Commerce wanted to build an exhibition hall (the Sam Houston Coliseum – home to the Rodeo from 1938 to 1966) to promote its emerging status as the big hub for oil and cattle, leaders asked none other than Jesse Jones, who led the funding push for the Houston Ship Channel, to help see that funding plans did not get lost in bureaucratic

shuffle in Washington D.C. It was, after all, smack in the middle of the Great Depression.

At the 1935 Chamber banquet, the excited Chamber president, Gus Wortham, read a telegram from Jesse Jones to its 1500 hundred attendees that federal funding had been approved for an exhibition hall “without equal”, at no cost to the taxpayer. It was a fine moment for a group that had such a big vision for the town that built the port that built the city. Gus Wortham was known as a leader that mobilized Houstonians to work for the “general welfare of the city”.

The Rodeo is also a remarkable planning and logistics achievement. Think of what it takes to move livestock, equipment, food, people, and a genuine trail ride INTO NRG Stadium inside the country's fourth largest city! It is a spectacular accomplishment that is the result of unparalleled cooperation and community involvement. In some ways, it mirrors having the country's number one port in a city that is 50 miles inland.

The Rodeo has a more direct connection to the port – commerce. Along with being the Energy Capital, the port of Houston is the fourth-largest exporting port for cereal grains and cotton in the U.S. The Rodeo's mission benefits the farmers and ranchers whose agriculture products make it to our port for export.

Other cities play host to pretty impressive events. They do great things, but it's usually a one-off, like the Super Bowl or maybe the World's Fair. With the exception of imposed pandemic limitations – and even then supporters rallied to help the hard-working students show their livestock – Houston has completed the demanding logistics every year for 90 years. It's a tribute to its visionary founders and the people that can be counted on generation after generation for involvement, volunteerism, and support for a project that benefits so many – the same spirit that is found so broadly in the maritime community.

I once looked forward to the circus coming once a year to my hometown. As a kid, I didn't imagine the logistics required to move a circus nor could I have imagined a Rodeo experience like Houston's. Sport, carnival, music, contests, and a once-a-year craving for fried everything on a stick! Go Texan Day just can't come fast enough.

A handwritten signature in blue ink that reads "Bill".

CAPT Bill Diehl
USCG (Ret.), P.E.
GHPB President



Port Watch

Second to None



In one of the most widely-covered races in Olympic history, Adolph Hitler could not have been more proud of his German oarsman. The Führer's rowing teams had already earned five consecutive gold medals on the Langer See – the 1936 Olympic rowing venue in Grunau. Joseph Goebbels – Hitler's propaganda minister – had assured "His Führer" that German victories in the Berlin Olympics would demonstrate to the world the superiority of the Aryan race. It was a promise that was bearing much fruit as the final and most prestigious rowing event was unfolding before a world audience.

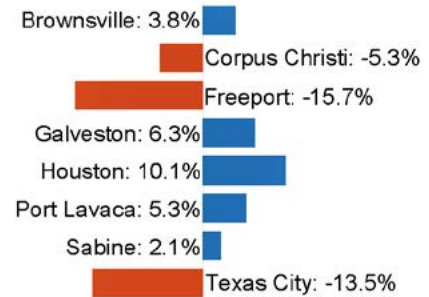
Inexplicably, despite the fact that the University of Washington's Varsity Eight had set a world record in their qualifying heat, they were positioned in the worst and most exposed lane. Yet, the German oarsman, who posted the slowest time of the six finalists, was positioned in the most sheltered lane and closest to the starting official – a complete reversal of the practice of placing the top-seed team in the most favorable position. Consequently, between the roar of the crowd and white caps that covered the waters of the outermost lanes, the *Husky Clipper's* crew was handicapped by a late start. Worse yet, wind-whipped waves forced the coxswain – Bobby

Moch - to attack the course at an angle to avoid being set into the adjacent lane. It was a no-win situation engineered by a host that would seek victory at any cost.

As Hitler smugly watched his professionally-trained crew lead the charge to the finish line, his biggest concern was whether his ally's entry – the Italians – would outspurt the Germans in the last few hundred meters. From all appearances, after battling over 1000 meters of choppy conditions, the Americans were too exhausted to make up lost ground. Yet, Bobby knew his teammates better than they may have known themselves. The *Husky* crew had overcome the elements to pull into third place with 350 meters to go. Unfortunately, they still trailed the Germans and Italians by a boat length. Moch could see the excruciating pain in the eyes of his oarsmen but, now that his boat had entered sheltered waters, they had a chance. He pushed the stroke rate to 40, thence 42, then still higher to 44, all the while exhorting them at the top of his lungs that only 20 strokes remained until the finish line. It was the race of their life. They were calling upon reserves that none of them knew existed. In the span of less than a second, Germany, Italy and the United States crossed the finish line. Goebbels and Hitler were convinced Germany was victorious. The University of Washington athletes had no idea who won. Finally, the official results were announced for all the world to hear – the *Husky Clipper* had finished first. Hitler and his retinue departed in disgust.

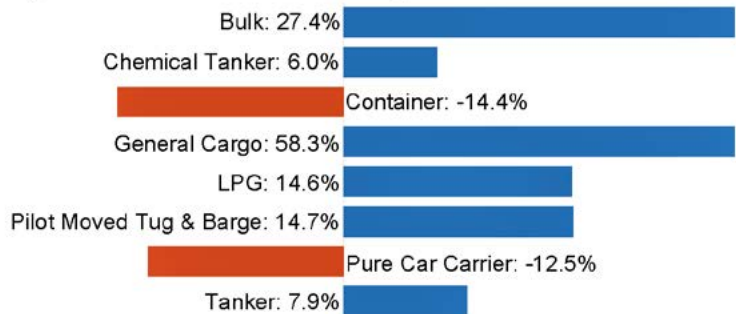
The port of Houston retained its number one ranking as the nation's port that

Deepdraft Vessel Arrivals by Port January 2022 Year-to-Date Percent Change



Source: Greater Houston Port Bureau Marine Exchange of Texas

Houston Deepdraft Arrivals by Type January 2022 Year-to-Date Percent Change



Source: Greater Houston Port Bureau Marine Exchange of Texas

handled the greatest volume of tonnage despite stiff competition from the Port of South Louisiana. This welcome news was followed by the state logging 2.7% more arrivals in the first month of 2022 versus 2021's first month. Undoubtedly, welcome news to a pandemic-fatigued economy. Likewise, the momentum in the brownwater arena continued unabated as January's Houston Ship Channel tow count began the year 10% higher than the prior one and exceeded December's robust figures by 4/10th of one percent.

There were a few Lone Star ports that began '22 behind that of '21. Texas City saw the greatest decline at over 13% following a monthly drop of nearly 15%. Freeport's run of triple-digit counts came to a close with 16% fewer arrivals in January 2022 compared to that of January 2021. Corpus Christi welcomed 10% fewer vessels from December to January resulting in a softer opening to 2022 vis-à-vis 2021's first month to the tune of 5%. In the case of Freeport and Corpus Christi, a less active January was inevitable given the extremely active final months of 2021.

On the plus side of the port ledger, Brownsville kicked off 2022 4% higher than its 2021 start. Closer to home, Galveston may have endured a 12% monthly decline; however, it outpaced last year's opening month by over 6% with the cruise season gaining additional steam. In the border port of Sabine, there was also a double-digit fall in arrivals (i.e., 10%). Nevertheless, there was a 2% uptick year-over-year primarily due to robust LNG, offshore tow and oil tanker movements.

Houston finished the first 31 days of 2022 just two shy of the enviable monthly 700-vessel arrival mark. The impact of that result is a 10% improvement over the inaugural month of 2021 and a 3.4% improvement over December's arrivals. Every category of vessel - save containers and car carriers - boasted solid gains against January 2021. Bulk carriers exceeded its previous January by over 27% and the prior month by 16%. General cargo vessels claimed the highest percentage improvement - January-over-January - at 58% and outpaced December by 16%; and LPG arrivals lagged the last month by a mere 4% but kicked off 2022 over 14% higher than that of 2021. Even tankers - a category that suffered much from the precipitous decline in crude during the height of the COVID crisis - began the first month of the year 8% ahead of 2021's start.

Granted, as evidenced by the first quarter of 2020, a strong start does not necessarily augur a year of plenty. Nonetheless, after nearly two years of economic headwinds driven by quarantines and shutdowns, the desire to live unshackled from fear is reawakening

America's quest to remain as the world's dominant economy.

The *Husky Varsity Eight* crew team's gold medal finish in Germany may have been its greatest victory but it was not their last. The following summer the team travelled from Seattle to Poughkeepsie to compete in their final national championship. After setting a new course record and outdistancing their nearest competitor by four boat lengths, the legendary Jim Ten Eyck - who rowed his first race a few days after the Battle of Gettysburg - offered his opinion on the men who powered the *Husky Clipper* to yet another championship, "It's the greatest eight I ever saw, and I never expect to see another like it." Simply put, they were second to none!



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Fad or Future: An Introduction to How Cryptocurrencies Revolutionize Money and Rearchitect Trust Systems



Several trillion dollars of pandemic stimuli programs across the world have reignited an interest in cryptocurrencies, which we had not seen since 2017. Fear of inflation and money printing have given Bitcoin new wings, because of its limited supply and known annual monetary supply. Some large corporations have announced plans to either hold cryptocurrency assets in treasury or accept them as a form of payment. Major financial institutions are expanding digital asset investment options to customers, and hardly a day goes by without major outlets reporting on some significant news within the crypto world. Twelve years after Bitcoin's genesis block, mainstream investors are starting to focus on the currency and application infrastructure created by cryptocurrencies.

This recent market fascination is undeniable, but for many a fundamental question remains: why? Why should we care about cryptocurrencies, blockchain, decentralized exchanges, NFTs [non-fungible tokens], or any other new flavor of the week? Does any of this actually matter, or is it just another fad, holding mainstream attention just until we move on to the next big thing? Some public figures, over the past several years, have easily brushed off cryptocurrency as a Ponzi scheme, a tool for illicit activities, or a short-term fascination that will be irrelevant in a few years' time.

This mindset is understandable but short-sighted. Blockchain technology enables exchange of value over the internet, reduces the need for counterparty trust, automates contractual arrangements, and beyond. No matter what segment of the economy you work and live in, these technologies will have a profound impact on how the world, as you know it, operates. Cryptocurrencies and the blockchain technology that underpins them are here to stay. Understanding the ways that this technology has already transformed our environment, and the ways that it will continue to evolve, will be critical to success in the business world of tomorrow. Annual funding of blockchain projects is in the billions of dollars and the attraction of best-in-class talent means that the space is actually moving at a faster speed. The longer one waits to come up to speed and understand this new world, the harder the learning process will be.

Bitcoin as a Breakthrough Invention, Enabled by Existing Technologies and Unique Historical Circumstances

To understand how cryptocurrency took its first steps in the world, we must look back to 2008. The global economy was in shambles, in the midst of one of the worst financial collapses of all time. Governments across the world were in the process handing out massive corporate bailouts to financial institutions, and trust in central authorities was at a low point. These circumstances and perceptions of economic inequality eventually spurred on movements like "Occupy Wall Street," which illustrates distrust in centralized institutions. Bitcoin was born in its own unique historical context: a time when people were searching for alternatives to mainstream financial and transactional systems.

Like any other major breakthrough inventions in our civilization, for Bitcoin to be launched, there had to be a combination of mature and readily available technologies. For electronic money, the key enabling ingredients were: (a) the prevalence of P2P (peer-to-peer) networks, (b) the widespread use of open-source code, (c) advanced cryptography and reliable hash functions and (d) abundant and inexpensive computing power and data storage.

In 2008, a white paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" was published by Satoshi Nakamoto (an unknown, pseudonymous individual). This paper was the first to describe blockchain technology, and it outlined in detail how Bitcoin would function. Nakamoto's goal for Bitcoin was a system for securely facilitating financial transactions between parties without involving any central intermediary. With Bitcoin there would be no need to put trust in those large financial institutions that had failed the public during the financial crisis.

Think of Bitcoin as a form of money maintained by a co-operative of players that do not know each other, using the internet to run the shared network ledger required to keep track of the money's credits and debits. No one can shut it down so long as a group of computers anywhere in the world can connect to the internet and run the Bitcoin software.




Because of Bitcoin, the first break-through invention, however, is our ability to uniquely own digital assets, to be able to transfer them and to do so with the certainty that there is no double spending. The transactions enabled by bitcoin-like applications are registered in permanent and immutable records for all to see. Transactions can occur rapidly, in a verifiable way, with no need for trustworthy intermediaries.

The second innovation that Bitcoin delivers is the ability to re-architect trust systems in society without the use of a central authority or third parties. In business, for instance, trust is a necessary ingredient for any economic activity. If you believe that your counterparty is unlikely to fulfill their obligations under an agreement, you will probably avoid engaging with them in the first place. Blockchain helps businesses operationalize trust in infinite new ways, particularly in the fast pace of today's digital age. Blockchain is already being utilized to streamline business and civic practices in the world of banking, supply chain, sustainability, healthcare, voting, and much more—and development is continuing at an intense pace.

Bitcoin represented the first major steps towards a truly electronic cash system. Another cornerstone of the Bitcoin system is a limitation on supply – there will only ever be a maximum of 21 million Bitcoins in circulation, and supply is growing towards that final cap at a known rate. This design consideration was likely intended to address concern over inflation, a common fear in 2008 and today, due to the significant amount of central bank stimulus capital making its way into the economy.

For any type of money or currency to work effectively, it has traditionally needed to serve three main functions. It has needed to be a store of value, a unit of account, and a medium of exchange. Bitcoin has managed to serve some of these functions in different degrees over time. However, until there is much broader adoption it cannot function particularly well as a medium of exchange (i.e., you cannot use it to buy most goods or services). Beyond concerns over acceptance, Bitcoin’s value has long been subject to significant volatility which further undermines its use as a medium of exchange.

Programmable Money, Decentralized Applications and the Multiple Generations of Cryptocurrencies

The Three Generations of Crypto		
Innovation	Uses	Advantages
Gen 1: Bitcoin  First cryptocurrency; gives birth to blockchain as a platform Supply controlled by algorithm based on validation of ongoing transactions	MEDIUM OF EXCHANGE STORE OF VALUE UNIT OF ACCOUNT	Fully digital money supply with traceable ledger and strong encryption Opened the door for other cryptocurrencies by proving the concept
Gen 2: Ethereum  Vitalik Buterin introduced the programmability of cryptocurrency Ushered in the use of Smart Contracts First Turing Complete language for crypto	DECENTRALIZED APPS TOKENS PROGRAMMABLE MONEY	A blockchain based software platform offers transparency, reliability, and decentralization Can run applications and store open-source code
Gen 3: Stablecoins  A cryptocurrency that is pegged to an existing fiat currency, a commodity, another cryptocurrency, or not collateralized at all	Stable currency with greater reliability for options like credit markets, derivatives, store of wealth	Far less volatile than unbacked cryptocurrencies in value

Even though cryptocurrency technology has lived a relatively short life, it has already gone through several major development cycles. We can think of Bitcoin as the flagship of a first generation of cryptocurrencies intended to facilitate exchanges of units of value: the money of the internet.

The second generation focuses on a different paradigm: programmable money. By design, and for security reasons, Bitcoin has limited programming built into it. Ethereum, is the flagship for the second generation, which adds full programmability to the formula that Bitcoin innovated. The functionality included on Ethereum makes it “Turing Complete” (given enough time, memory, and instructions, it could solve any computational problem), and lead many to refer to it as a platform instead of just a cryptocurrency. With Ethereum, users can write and automate self-executing smart contracts, issue new tokens, and run decentralized applications or organizations. There are thousands of applications currently running on Ethereum, spanning the industries of advertising, finance, gaming, art, and beyond.

When used for financial and monetary purposes, Ethereum is programmable money, capable of self-executing under known conditions, any time or day of the year, without the intervention of a central authority. In fact, we can think of these platforms as infrastructure or highways for the future traffic of value on the internet.




Alongside Ethereum we have seen a fleet of competing platforms emerge. Some are full-fledged blockchains that solve or advance on the Ethereum paradigm with novel solutions. In recent times, they are known as “Layer one blockchains,” although for a while they were referred to as “Ethereum killers.” Several key cryptocurrencies that fall within this group include Cardano, Avalanche, Algorand, Polkadot, and Solana.

One growing critique of Bitcoin, Ethereum, and earlier generation cryptocurrencies is that they require a significant amount of energy to run their networks. This can result in more expensive transaction costs, public perceptions of energy waste, and limitations on scalability. While we will not delve into the technical details here, newer cryptocurrencies are switching to a system called “Proof-of-Stake” instead of “Proof-of-Work” to solve these issues. Some also intend to add interoperability between blockchains, better scaling solutions for more transactions, and various other

features that will be important in unlocking other new use cases. In an ever-growing market, the “killer” name tag did not make sense for these other highways. In fact, as these platforms are adopted to run more decentralized applications, there is no zero sum necessarily.

A third generation solution has been addressing the high volatility of digital assets. The promised land of programmable money is not compatible with wild swings in value. What is the use of an economic contract that can be self-executed if the value of the conditions can oscillate 20-30% in a few hours? For that reason, we have seen the emergence of the so called “stablecoins,” which are actually tokens issued in one of the existing “layer one blockchains.” These stablecoins are

pegged to a fiat currency, a commodity, assets, or basket of assets. Some are even pegged to over collateralized holdings of other cryptocurrencies. The convenience of “stablecoins” is that they deliver on operational programmable digital money. In fact, one could argue that while we await for central bank issued digital

Token Rank					
Top Token by Holder Growth		Top Token by Active Address		Top Token by Transfer Volume	
Token	Holder	Token	Active Addresses	Token	Transfer Volume
 MINT	4.70K + Ethereum 3.07% ↑	 BUSD	151.54K + \$- Binance BSC 70.50% ↑	 WETH	19.43B + Ethereum 293.55% ↑
 NUTS	4.20K + \$- Binance BSC 2.85% ↑	 USDT	90.37K + \$- Binance BSC 13.16% ↑	 USDC	9.57B + Ethereum 238.31% ↑
 DAO	14.36K + Ethereum 2.37% ↑	 USDT	47.53K + Ethereum 19.24% ↑	 USDT	8.67B + Ethereum 159.60% ↑
 USDC	128.84K + \$- Binance BSC 1.94% ↑	 CAKE	42.01K + \$- Binance BSC 10.72% ↑	 BUSD	5.76B + \$- Binance BSC 325.31% ↑
 ATOM	16.50K + \$- Binance BSC 1.83% ↑	 USDC	24.28K + Ethereum 37.76% ↑	 DAI	3.15B + Ethereum 817.21% ↑

currencies, stablecoins are the digital fiat currencies of today. These stablecoins often provide a safe harbor for those trading in volatile cryptocurrency markets, and they can also facilitate an easier onramp into the world of crypto from the world of traditional finance.

Another generation of crypto is referred to as privacy coins. Although Bitcoin is frequently touted as an anonymous way to transact value, the nature of its public ledger system means that a user's identity can often be tracked down if the searcher is persistent enough. A newer batch of cryptocurrencies including Dash, Monero, and Zcash have set their sights on true transactional anonymity through a variety of technological advances. While these privacy coins are advancing the cause of a decentralized, trustless, and completely anonymous system, they do often run afoul of many regulatory regimes in the world.

Current Technological Adoption and Looking Forward

In the lifecycle of any major technological shifts, there is usually a long period of development, improvement, and consumer adoption before anything becomes a generally accepted part of everyday life. This pattern can be seen in solutions like Google's search engine (now the backbone of global web-surfing activities) or Amazon's ubiquitous consumer shopping platform. Cryptocurrency and blockchain markets are still very much in the process of designing and implementing the best technologies, but they are also moving quickly into the realm of mainstream adoption..

Recently the total market capitalization of cryptocurrencies reached briefly the \$3 trillion mark, and there has been more than \$100 billion locked into decentralized finance applications. Beyond even these public value markers, large companies like IBM, Amazon, Bank of America, and more are already utilizing some permutation of blockchain technology in their daily business activities. This adoption is far too significant to ignore and demonstrates that cryptocurrency and blockchain technologies are rapidly becoming an integral part of the global economy.

Many believe that we are currently in the investment phase of blockchain and crypto system development. As widespread adoption continues to grow and more value makes its way into the blockchain and crypto ecosystem, more businesses and individuals will be able to gain utility from these systems. Eventually we expect the market, that has been characterized by speculation and wild volatility, to transform into a more stable framework of infrastructure that the new global economy will be based on.

Epilogue for the Shipping Industry

What if blockchain technology could solve problems in industries where players should not or prefer not to trust each other? What if blockchain technology could synthesize the stacks of paperwork that some industries still use while maintaining an incorruptible and immutable record of every step of the process?

Through a joint venture, Maersk and IBM became one of the first players in this space, applying blockchain technology to solve supply chain inefficiencies and trust problems. Global trade is executed using vast amounts of documentation and little transparency. When the process is analyzed, it could seem that the technology dates back to the pre-container era. The industry does not only rely on a large number of players, but on physical documents, papers, and stamps which are error-prone manual processes.



The joint venture's creation to solve these problems with blockchain technology was named TradeLens. TradeLens is a blockchain-based platform which is made available to every stakeholder in the shipping ecosystem including freight forwarders, ports, shippers, custom authorities, and shipping lines. This digitization of the supply chain contains all the major data and information needed to track and trace a shipment. Stakeholders in the platform are also able to submit, validate, and approve documents across organizational boundaries. Similar to Bitcoin and other cryptocurrencies, one of the biggest challenges is adoption. If the whole ecosystem does not adopt the technological platform, the value proposition loses relevance. In contrast to Bitcoin, TradeLens uses a permissioned configuration, where certain stakeholders have access only to the information that they need for security and privacy purposes. For example, competing carriers are not able to access each other's pricing and forwarders do not have access to each other's cargo information.

There are several other benefits that this technology will bring about in the industry, including cutting the cost of maritime fraud. Blockchain's operational benefits, could eliminate the physical documentation portion of the process, which is estimated to be as high as 20% of the overall cost of the physical transportation. It is clear that even though adoption of a technology in an industry of this size is a very difficult task, it is an effort that will pay for years to come.



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Port Bureau Updates

ExxonMobil, SABIC Start Operations at Gulf Coast Manufacturing Facility



ExxonMobil and SABIC have announced the successful startup of Gulf Coast Growth Ventures world-scale manufacturing facility in San Patricio County, Texas.

The new facility will produce materials used in packaging, agricultural film, construction materials, clothing, and automotive coolants. The operation includes a 1.8 million metric ton per year ethane steam cracker, two polyethylene units capable of producing up to 1.3 million metric tons per year, and a monoethylene glycol unit with a capacity of 1.1 million metric tons per year.

“We built this state-of-the-art chemical plant ahead of schedule and below budget, by leveraging our global projects expertise in execution planning and delivery, while keeping everyone safe and healthy,” said Karen McKee, president of ExxonMobil Chemical Company. “This is a remarkable achievement that positions us well to help meet growing global demand for performance products while providing meaningful investment in the U.S. Gulf Coast.”

“This is a very proud moment for the parent companies,” said Abdulrahman Al-Fageeh, SABIC’s executive vice president of Petrochemicals. “It was with a great deal of dedication that our teams were able to safely start up each element of the plant before the close of 2021. As we begin this next chapter for GCGV, we look forward to continuing our role as a good neighbor in the Coastal Bend.”

Construction began in the third quarter of 2019, creating an estimated 6,000 high-paying construction jobs, and the manufacturing plant now directly employs more than 600 people. ExxonMobil and SABIC have partnered together for 40 years on petrochemical projects. Gulf Coast Growth Ventures represents their first joint venture in the Americas. SABIC is the operating partner for two long-standing joint ventures with ExxonMobil in the Kingdom of Saudi Arabia, Kemya in Jubail and Yanpet in Yanbu. Ownership interests in Gulf Coast Growth Ventures is evenly divided with 50 percent to ExxonMobil and 50 percent to SABIC. ExxonMobil is the site operator.

ABS Grants ‘Approval in Principle’ to Innovative WTIV Integrated Feeder Barge



Photo courtesy of Friede and Goldman/ABS

American Bureau of Shipping (“ABS”) has granted Approval in Principle (“AIP”) to a coordinated design for a wind turbine installation vessel (“WTIV”) in conjunction with the innovative *BargeRack* feeder barge system by Friede and Goldman (“F&G”).

The design enables the Jones Act-compliant barge in a lifting system that F&G says reduces motion and increases the window of operational time. The design was reviewed in accordance with the ABS 2017 Guidance Notes on Review and Approval of Novel Concepts.

“To achieve the scale of U.S. offshore wind market by 2030, the industry will be reliant on the delivery of the variety of vessels that will be needed to install and maintain the turbines, while navigating various port constraints. ABS has been at the forefront of supporting this process, facilitating a succession of vessel developments that will prove critical to the future of this industry. This design from F&G is the latest where we are proud to be able to assist with our extensive knowledge of U.S. regulations and our deep involvement with the entire offshore wind supply chain here in the U.S.,” said Greg Lennon, ABS vice president, Global Offshore Wind.

“F&G has developed a superior feeder vessel solution. Typical feeder solutions are inherently risky due to feeder vessel motions with the impact on equipment transfer. We’ve solved this problem by completely eliminating the feeder vessel motion, as well as reducing the feeder vessel cost by an order of magnitude compared to other feeder vessels,” said Robert Clague, vice president of engineering at F&G.

Development of the *BargeRack* WTIV is the latest vessel designed specifically for U.S. offshore wind operations to be supported by ABS. A subsea rock installation vessel is to be built to ABS Class and *Charybdis*, the first Jones Act-compliant WTIV, is also now under construction to ABS Class. The first U.S.-flagged Jones Act offshore wind farm service operation vessel (“SOV”) ever ordered will be built to ABS Class. These vessels will join the first ABS-classed crew transfer vessel (“CTV”) in the U.S., *Windserv* *Odyssey*. ABS has also issued AIPs for a series of wind support vessels from various designers.

AET Takes Delivery of First of Three DP2 Shuttle Tankers Series for Shell Charter



Photo courtesy AET

AET, a leading owner and operator of maritime transportation assets and specialized services, took delivery of *Eagle Campos*, the first of three Suezmax Dynamic Positioning (“DP2”) Shuttle Tankers purpose built for long-term charter to Brazil Shipping I Limited, a wholly owned

indirect subsidiary of Shell.

AET’s commitment to moving energy in an increasingly responsible and eco-friendly way led to the agreement with Shell in December 2019 to operate three Suezmax DP2 shuttle tankers in the international and Brazilian Basin on a long-term charter, with *Eagle Campos* being the first in this series. She was delivered to AET on Jan. 5, 2022, and will commence her operations in Brazil joining *Eagle Pilar* which AET already operates there for Shell.

Eagle Campos’ two sister vessels are currently under construction at the Hyundai Heavy Industries (“HHI”) in Ulsan, South Korea and due to be delivered later this year. AET and Eaglestar site teams have been working closely together with the HHI team to ensure all health and safety precautions were in place to safeguard the construction and delivery of the vessels during the ongoing pandemic.

“The delivery of *Eagle Campos* is another milestone in our growing partnership with Shell globally including in Brazil,” said Capt. Amit Pal, global director, DPST. “Constructing, fulfilling the stringent tests and delivering *Eagle Campos* safely during an ongoing pandemic is a huge achievement and evidence to the persevered dedication of all parties involved. My sincere thanks to everyone from Shell, Hyundai Heavy Industries, DNV, Eaglestar and AET for this remarkable collaboration and safe execution. This accomplishment showcases the unity across the industry to deliver innovative solutions which contribute to a brighter future and create a sustainable global trade network.

For AET, this latest vessel delivery further fortifies their position as a leading owner and operator of 12 highly specialized DP shuttle tankers globally, with eight vessels currently operating in the Brazilian Basin (including *Eagle Campos*). Witnessing the fruition of our agreement with Shell signifies the commitment from both parties to high-quality, safe and responsible operations.”

In collaboration with HHI, DNV and Eaglestar, the 153,000 DWT DP2 vessel has been built to Shell’s technical requirements for DP2 shuttle tankers in Brazil and will operate to the highest operational and environmental standards, including full compliance with IMO NOx Tier 3 and SOx emission requirements. *Eagle Campos* is classed with DNV and equipped with electrical-driven Variable Frequency Drive (“VFD”) cargo pumps and high-power thrusters for enhanced fuel efficiency and fully capable of operating in weather conditions expected for their class. The eco-efficient vessel is also fitted with energy-saving devices such as the Hi Pre-Swirl Duct and Rudder Bulb for improved propulsion efficiency and is already EEDI Phase 2 compliant before the regulations come into effect.

2022 Commerce Club

Join us for our March 10, 2022 Commerce Club

Brigadier General Christopher G. Beck

Commander and Division Engineer of the Southwestern Division (SWD), U.S. Army Corps of Engineers



The Greater Houston Port Bureau will hold our March 10th Commerce Club luncheon with guest speaker Brigadier General Christopher G. Beck. As the SWD Commander and Division Engineer, Beck oversees hundreds of water resources development and military design and construction projects that bring value to our communities, our nation and our warfighters.

Network with 180+ professionals from maritime, transportation, energy companies, and organizations in the port region. We hope you'll join us!

Location

Houston Marriott South at Hobby Airport

9100 Gulf Freeway
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11:15 AM - 1:00 PM

Information and RSVP

txgulf.org/events
P (713) 678-4300



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GAC Bunker Fuels' Greenhouse Gas Emissions Calculations Verified by Bureau Veritas



GAC Bunker Fuels' Greenhouse Gas ("GHG") emissions calculations have been verified by Bureau Veritas UK Limited, the world leader in audit and certification services, crossing a new milestone in its goal to be net carbon zero by 2030.

Carbon emissions are classified into categories or "scopes". GAC Bunker Fuels is assured for indirect emissions from electricity and air-conditioning under Scope 2, and other indirect emissions that occur along the value chain, particularly associated to business travel and the use of sold products under Scope 3 were verified. The bunker company does not have Scope 1 direct emissions from owned or controlled sources.

"Knowing what our emissions are today marks an important step towards emissions reduction and offsetting with the aim of achieving zero oil-based bunker sales and net carbon zero by 1 January 2030," said Kelly Rump, GAC Bunker Fuels' head of sustainability.

Martyn McMahon, GAC Bunker Fuels' global commercial manager, adds: "The market is in transition. Suppliers require a guaranteed demand to fund their projects, and customers must know what supplier projects are underway to plan their future procurement."

Kinder Morgan Announces Southern California Renewable Diesel Hub Project



Kinder Morgan, Inc. ("KMI") announced the receipt of the necessary

commercial commitments to move forward with the permitting and construction of a renewable diesel hub in Southern California. The Southern California renewable diesel hub will enable customers to aggregate renewable diesel batches (R99) in the Los Angeles area and move them on SFPP, L.P.'s pipeline system to the high demand markets in Colton (inland Empire) and Mission Valley (San Diego), California, creating up to 20,000 barrels per day ("bpd") of blended diesel throughput capacity at its truck racks with the ability to expand in the future. This Southern California renewable diesel hub, and the Northern California renewable diesel hub, collectively represent an investment by KMI of over \$50 million in the distribution of renewable fuels in California, just over half of which was contemplated in the 2022 budget.

"We are pleased to be constructing these hub projects to expand our renewable diesel handling capabilities," said KMI's president of Products Pipelines Dax Sanders. "As refineries are converting to renewable diesel, we believe this is an attractive opportunity to pivot to the energy fuels of the future in a manner that is consistent with our corporate goals and return criteria."

Upon completion, the Southern California hub will be the first of its kind in the United States to transport batches of renewable diesel by pipeline with no resulting loss of product to transmix – designed to enable customers to avoid the loss of California renewable tax credits, including the Low Carbon Fuel Standard ("LCFS") credits.

Houston Pilots

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Congratulations to the Rice Business Executive Professional Development Scholarships Winners!

The Greater Houston Port Bureau awarded three scholarships to our membership for professional leadership development at Rice Business Executive Education's new Business Innovation program May 10-12, 2022. Each scholarship is valued at \$3,650 and includes full tuition, class materials, and daily breakfast, lunch, and refreshments.

The winners were:



Dave Morgan
Cooper/Ports
America



Blake Vaughn
Magellan Midstream
Partners



Nathaniel Hough
Campbell Transportation
Co.

Innovation has become a mandate to ensure competitive advantage and profitability in today's complex business environment. The Corporate Innovation program equips participants with a comprehensive framework to successfully manage innovation at all levels. The highly interactive learning environment combines scientifically proven approaches to innovation with actionable

tools to accelerate the application of corporate innovation practices for participants and their respective organizations. The program is led by Dr. Jing Zhou, the Mary Gibbs Jones Professor of Management at the Jones Graduate School of Business at Rice University.

Nationally and globally, the Rice Business' MBA program is recognized for excellence by major media and has risen over the last decade, listing it in the nation's most distinguished business schools.

The Greater Houston Port Bureau would like to thank the Rice Business Executive Education, Rice University for their generous underwriting of these three scholarships.

For more information and details about Rice Business Executive Education programs contact Zoran Perunovic at Zoran.Perunovic@rice.edu.



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Niels Aalund Retires; Robert Hawn Promoted to Vice-President of Maritime Affairs at WGMA



Photo: Robert Hawn, vice president and Niels Aalund.

Niels Aalund, officer and senior vice-president of the West Gulf Maritime Association (“WGMA”), retired on January 31. Aalund advocated on behalf of member companies (stevedores, steamship agents, vessel owners, and industry stakeholders) with local, state, and federal agencies. From organizations such as the Washington, D.C.-

based National Maritime Association to the commercial sector, Aalund provided leadership for a variety of maritime related positions. Aalund plans to provide consulting services in the U.S. and international maritime industry.

Aalund previously served as the international president of the Propeller Club as well as 11 regional and/or national committees and boards, including the Houston Ship Channel Security District, Lone Star Harbor Safety Committee, Area Maritime Security Council, and South East Texas Waterways Advisory Committee.

Robert Hawn was promoted to vice president of Maritime Affairs at WGMA. He has been director of maritime affairs for the past seven years. Hawn previously held positions at Inchcape Shipping Services, RioMar Agencies, Inc., Southern Steamship Agency, and Biehl.

Energy Transfer Expands Its Alternative Energy Group



Energy Transfer LP (“ET”) announced it has expanded its Alternative Energy Group with the hiring of energy industry veteran Dilanka Seimon. Seimon, who most recently led BHP’s global energy sales and procurement team, joined Energy Transfer earlier this month as vice president, Alternative Energy. Seimon will be responsible for developing alternative energy and carbon capture projects for Energy Transfer along with various ESG initiatives including the development of carbon offset programs that are accretive to the Partnership’s operations.

Seimon spent eight years with BHP most recently as vice president global sales & marketing, oil, gas, power & carbon. Prior to BHP, he held positions with Southwest Energy, Wells Fargo Commodities and Sequent Energy Management. He received a Bachelor of Science degree in Economics and Finance in 2003 from Georgia College & State University.

“Adding Dilanka’s significant experience in the energy industry and his insights into renewable energy opportunities will help us continue to develop our alternative energy and ESG platforms,” said Tom Mason, head of the Alternative Energy Group. “We are very pleased to add Dilanka to our team.”

Stolt Tank Containers Appoints Hans Augusteijn as President



Stolt-Nielsen Limited announced the appointment of Hans Augusteijn as president, Stolt Tank Containers (“STC”). Augusteijn succeeds Michael W. Kramer, who will assume the role of executive vice president, Marketing and Business Development at Stolt-Nielsen Limited.

Niels G. Stolt-Nielsen, CEO of Stolt-Nielsen Limited, commented: “The expertise in strategy and business transformation that Hans Augusteijn brings to the role, together with his passion for shipping and logistics, will help us to extend our leading position in the tank container industry.”

“After 22 years as president of Stolt Tank Containers, Mike will be joining me at Stolt-Nielsen Corporate as executive vice president, Marketing and Business Development, a role in which his in-depth knowledge and experience of the logistics business will be invaluable. I would like to thank Mike for the outstanding job he has done as the leader of Stolt Tank Containers, and for his loyalty and dedication to the company.”

Augusteijn spent 17 years at Maersk in various leadership roles related to container shipping and logistics before joining Stolt Tankers as director of strategy in 2019. In his current role, he has been instrumental in developing and implementing Stolt Tankers’ overall strategy.

Ed Daniels Appointed Strategy, Sustainability and Corporate Relations Director



Shell plc (“Shell”) announced the appointment of Ed Daniels to the newly created role of Strategy, Sustainability and Corporate Relations Director. In his new role, Ed will become a member of Shell’s Executive Committee and will have accountability for the company’s existing Strategy, Sustainability and Corporate Relations organizations.

“Now is the right moment to bring these three strategic capabilities together in one Executive Committee directorate,” said Shell Chief Executive, Ben van Beurden. “As we accelerate towards our goal of becoming a net zero emissions business, we are putting greater emphasis on how we engage with all stakeholders on the many complex issues and opportunities related to the energy transition. With more than 30 years’ broad, relevant industry and leadership experience, Ed is perfectly placed to lead this work, and to bring additional strategic insights and perspectives to the Executive Committee.”

Daniels joined Shell in 1988 and has held roles in Shell’s Upstream, Integrated Gas, Downstream and Projects & Technology businesses. He previously served as Shell’s UK Country Chair, and in his most recent role as Executive Vice President Strategy, Portfolio & Sustainability, he led the development of the company’s ‘Powering Progress’ strategy to drive the decarbonization of the energy system and achieve net zero emissions by 2050.

DHS, FBI, NSA and International Partners Issue Advisory on Ransomware Trends from 2021



The Cybersecurity and Infrastructure Security Agency ("CISA"), along with the Federal Bureau of Investigation ("FBI"), National Security Agency ("NSA"), Australian Cyber Security Centre ("ACSC"), and the United Kingdom's National Cyber Security Centre ("NCSC-UK") issued a joint Cybersecurity Advisory outlining the growing international threat posed by ransomware over the past year.

The advisory titled "2021 Trends Show Increased Globalized Threat of Ransomware" outlines top trends seen across three nations including:

- Cybercriminals are increasingly gaining access to networks via phishing, stolen Remote Desktop Protocols ("RDP") credentials or brute force, and exploiting software vulnerabilities.
- The market for ransomware became increasingly "professional" and there has been an increase in cybercriminal services-for-hire.
- More and more, ransomware groups are sharing victim information with each other, including access to victims' networks.
- Cybercriminal are diversifying their approaches extorting money.
- Ransomware groups are having an increasing impact thanks to approaches targeting the cloud, managed service providers, industrial processes and the software supply chain.
- Ransomware groups are increasingly targeting organizations on holidays and weekends.

Read the full advisory at: <https://www.cisa.gov/news/2022/02/09/cisa-fbi-nsa-and-international-partners-issue-advisory-ransomware-trends-2021>

FMC Invites Comments on Benefits of New Demurrage and Detention Rule



An Advanced Notice of Proposed Rulemaking approved Feb. 4 by the Federal Maritime Commission asks the public if a new rule governing demurrage and detention billing practices would benefit the trade and should apply to marine terminal operators and non-vessel operating common carriers in addition to vessel-operating common carriers.

Specifically, the Commission is considering the merits of establishing regulations mandating certain minimum information be included in bills issued for demurrage and detention charges and prescribing the maximum period in which an invoice can be sent. Additionally, the Commission is seeking industry views on whether it should regulate the demurrage and detention billing practices of common carriers and marine terminal operators. The ANPRM broadly defines the terms "demurrage and detention" to include any charges assessed by common carriers and marine terminal operators related to the use of marine terminal space or shipping containers, regardless of the labels given to those charges.

The Commission is requesting comments on learning what information is necessary to identify a shipment, and whether bills for demurrage and detention should include information on how the charges are calculated and what circumstances justify stopping the clock on charges. Finally, the Commission is soliciting guidance on how to ensure a bill is being issued to the correct party and whether an explanation of the source and reason for the charge should be required. Read full story at: <https://www.fmc.gov/commission-invites-comments-on-benefits-of-new-demurrage-detention-rule/>

TERP Accepting Applications for Seaport and Rail Yard Areas Emissions Reduction Program



The Texas Commission on Environmental Quality ("TCEQ") is currently accepting applications for the Seaport and Rail Yard Areas Emissions Reduction ("SPRY") Program. An estimated \$20 million in grant funding is available to replace or repower drayage trucks and cargo or container handling equipment at eligible seaports and Class I rail yards in Texas. The vehicles and equipment should still be in routine use and in good operating condition.

SPRY grants will be awarded on a first-come, first-served basis. Applicants must have:

- owned or leased the vehicle or equipment for the previous two years;
- operated the vehicle or equipment at one or more of the designated seaports or Class I rail yards for a minimum of 200 days per year; and
- on road vehicles must have been continuously registered for the previous two years.

Eligible applicants may receive up to the maximum amount listed on the SPRY website or 80% of the eligible costs, whichever is less. Vehicles and equipment that are eligible to be replaced or repowered under SPRY include:

- heavy-duty vehicles with gross vehicle weight ratings ("GVWR") over 26,000 pounds;
- yard trucks or terminal tractors; or
- other cargo handling equipment

Detailed eligibility requirements and instructions for how to apply for a SPRY grant can be found at: <https://www.tceq.texas.gov/airquality/terp/spry>. Applications will be accepted until November 22, 2022 or until enough applications have been received to award all available funding, whichever comes first. In 2020, sufficient applications to award all available funding were submitted before the close date, so applicants are encouraged to apply early.

You can find more information about SPRY and instructions for how to apply at: <https://www.tceq.texas.gov/airquality/terp/spry>

EIA: Corporate Goal Case, Annual Energy Outlook 2021 Issues in Focus

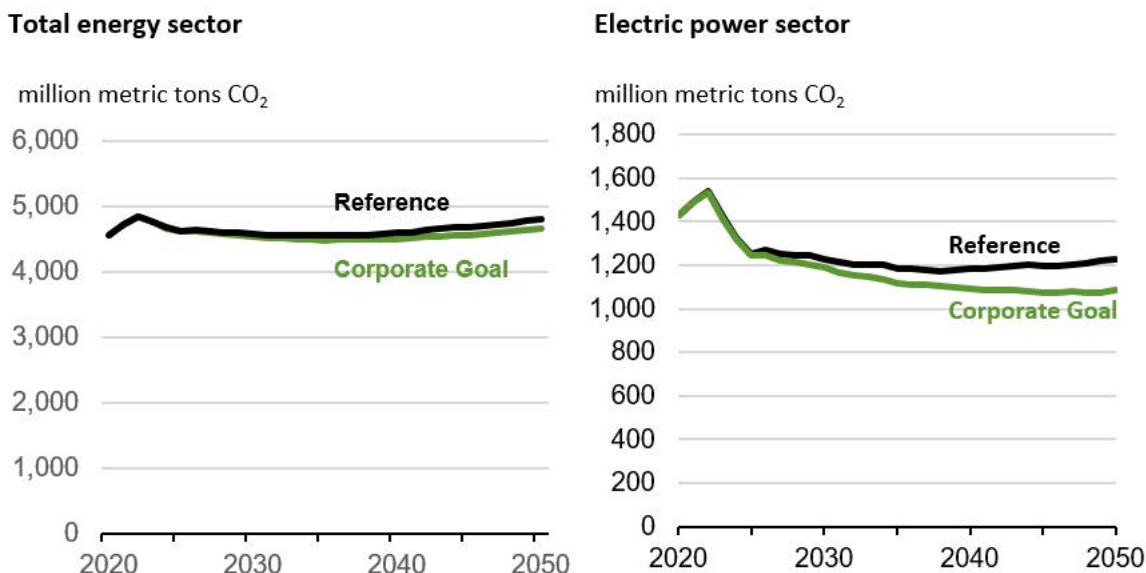
Executive Summary

The U.S. Energy Information Administration (“EIA”) released a paper in early February comparing the Reference case in their Annual Energy Outlook 2021 (“AEO2021”) to a Corporate Goal case that models announced utility plans in addition to current laws and regulations as of October 2020. In 2050, carbon dioxide (“CO₂”) emissions across the entire U.S. energy system are 2.9% lower in the Corporate Goal case than in the Reference case. This decrease in total emissions mostly follows an 11.6% decrease in CO₂ emissions from the electric power sector in the Corporate Goal case compared with the Reference case because additional carbon-neutral generation resources contribute to a greater share of generation. Higher nuclear generation, as a result of fewer nuclear plant retirements, account for the higher carbon-neutral generation.

Their model identifies existing nuclear generation as one of the lowest-cost options for meeting clean energy or carbon reduction goals, which is why CO₂ emissions are lower in the Corporate Goal case. Nuclear generation’s low cost is the result of nuclear plants’ operation and maintenance costs are typically less than the cost of building new low-carbon capacity. Electricity-related CO₂ emissions across both cases diverge beginning in 2025.

Overall U.S. production of natural gas is 2.9% lower in the Corporate Goal case than in the Reference case. This lower level occurs because of the industrial sector’s consistent consumption of natural gas and increased natural gas exports as a result of lower natural gas prices, despite the significant reduction in natural gas used for power generation.

Figure ES-1. Carbon dioxide (CO₂) emissions in the total energy sector and the electric power sector in the Reference case and Corporate Goal case, 2020–2050

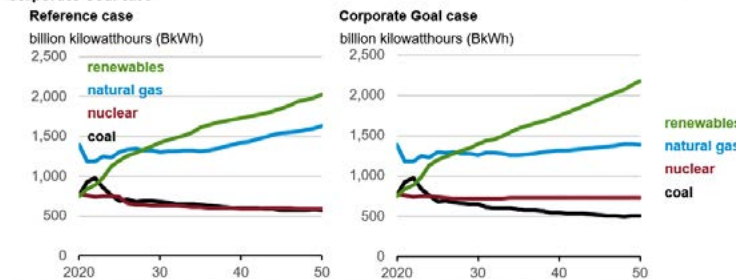


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2021*, Reference case and Corporate Goal case runs made for this report

Before 2025, electricity-related CO₂ emissions decline in both cases as a result of similar retirements of coal-fired generating units. Starting in 2025, factors such as continued low natural gas prices (compared with historical prices) and compliance with the Affordable Clean Energy Rule (“ACE Rule”) drive retirements of coal-fired generating units.¹ After 2025, when the ACE Rule takes full effect, the rule requires remaining coal-fired generating plants to operate at higher utilization rates following the retirement of older, less-efficient coal plants, leaving only the most-efficient plants in operation. More projected generation from natural gas in the Reference case than in the Corporate Goal case results in slightly higher electricity-related CO₂ emissions in the Reference case.

Because nuclear generation is a qualifying carbon-free source in the stated corporate goals, fewer nuclear plants retire in the Corporate Goal case. Nuclear generation in 2050 in the Corporate Goal case is 142 billion kilowatt-hours (BkWh), 24% more than in the Reference case. Generation from U.S. renewable resources in 2050 in the Corporate Goal case is 154 BkWh, 7.6% more than in the Reference case. High levels of both nuclear generation and renewables limit growth in natural gas-fired generation in the Corporate Goal case. The Corporate Goal case projects 240 BkWh (14.7%) less natural gas-fired generation and 66 BkWh (11.4%) less coal-fired generation in 2050 when compared with the Reference case.

Figure ES-2. Electricity generation by fuel type, 2020–2050, AEO2021 Reference case and the Corporate Goal case



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2021* (AEO2021), Reference case and Corporate Goal case runs made for this report

Their Reference case reflects current laws and regulations, and it includes state-level renewable portfolio standards (“RPS”). Other states implement carbon-free generation standards, also called clean energy standards, which require 100% of electricity sales in the state to come from carbon-free technologies by a certain date. In addition to following RPS, many utilities outline carbon reduction goals in integrated resource plans (“IRPs”), which are filed with the Public Utilities Commission (“PUC”) and announce carbon reduction goals in press releases and other documents. EIA did not include these announcements and plans in the Reference case.

The Corporate Goal case assumes that corporate commitments announced as of October 2020 will meet the stated reduction target by the stated target year. EIA made these projections using the National Energy Modeling System (“NEMS”), which balances energy supply and demand, accounting for economic competition across the various energy fuels and sources.

In the Corporate Goal case, EIA weights a utility’s carbon reduction goal by that utility’s sales in that state. They apply a linear growth rate for compliance, starting at 0% in 2020 and increasing to the target by the stated terminal date. If an existing state-level RPS is greater than the weighted utility carbon

reduction goal, then EIA used the higher state-level goal in the Reference case.

Corporate Goal Case

In recent years, many utilities in the United States have made corporate commitments to voluntarily reduce their carbon emissions beyond legislated requirements. Many of these companies are generating more electricity from carbon-free sources and have been phasing out generation from fossil fuel-fired generating units. Although EIA models current laws and regulations as part of their long-term electricity projections for the Annual Energy Outlook 2021 Reference case, EIA does not view corporate goals or integrated resource plans as binding governmental policy but rather as corporate goals subject to the influence of evolving market conditions. To illustrate the potential impacts of these corporate goals, EIA developed an alternative case in which they assume that these corporate goals are achieved. By the end of 2020, 30 states and the District of Columbia had passed legislation establishing renewable portfolio standards. Several of these jurisdictions recently established more aggressive RPS policies than those enacted over the past 20 years, requiring carbon-free generation standards, also called clean energy standards. These standards require 100% of electricity sales to the state to come from carbon-free technologies. Appendix 1 outlines these standards.

Generation resources that qualify for RPS commonly include solar, wind, geothermal, municipal solid waste, and new and small-scale hydroelectric. Carbon-free generating technologies typically also include nuclear, existing large-scale conventional hydropower (also referred to as legacy hydro), and fossil fuel generation with carbon capture and sequestration technologies.

Utilities or their parent companies often announce corporate commitments, and in many cases, the utilities also reaffirm their commitments by filing IRPs with state public service commissions (“PSCs”) or public utility commissions. These plans are commitments to reduce carbon dioxide emissions from electricity generation by a certain percentage, generally from a level reached between 2000 and 2008, by some point in the future, generally between 2030 and 2050.

Although EIA does not model these stated corporate goals in the AEO2021 Reference case, they do include all specific generator retirements or planned additions reported to them on survey forms. In many cases, these reported capacity retirements or additions may align with utility corporate goals. In addition to planned retirements, EIA models generating unit retirements based on unit economics when a unit experiences three consecutive years of negative operating margins based on a variety of factors.

Methodology

Corporate carbon reduction goals can take many forms. The AEO2021’s Corporate Goal case considers both the carbon reduction goals outlined in IRPs and the carbon reduction goals stated in press releases and other documents that utilities release to the public. EIA collected these carbon reduction goals through a thorough review of filed IRPs and announced commitments from investor-owned utilities (“IOUs”) as of October 2020. The Corporate Goal case assumes that any corporate commitment

announced by an IOU that operates in the Lower 48 states will meet the stated target reduction by the stated target year. In particular, EIA assumes:

- A utility’s state-level carbon reduction goal is weighted by the sales of that utility in that state.
- A linear growth rate is used for corporate goal compliance, where each annual carbon reduction goal compliance target starts at 0% in 2020 and then increases to the stated target at the stated terminal date.
- If existing state-level RPS is greater than the weighted utility carbon reduction goal, then the Reference case uses the higher state-level goal.
- Announced planned retirements of existing generating capacity are consistent with the filed IRPs and other company announcements.

Coal And Nuclear Retirements

The Corporate Goal case includes an additional 10.7 gigawatts (“GW”) of retired coal-fired capacity for a total of 121.8 GW. In the AEO2021 Reference case, EIA projects that 111.1 GW of coal-fired generating capacity will retire by 2050 (Table 1). These retirements include 55.7 GW reported on Form EIA-860, Annual Electric Generator Report, and 55.5 GW of unplanned retirements that are modeled in NEMS as a result of plant economics. Only 42.3 GW of the coal-fired capacity retire in the Corporate Goal case because of modeled economics, and the remaining 79.6 GW of retirements are planned retirements. The 24 GW of additional planned retirements in the Corporate Goal case compared with the Reference case represent coal retirements included in announced utility plans that have not been officially reported on EIA surveys. However, about 13 GW of these retirements had been modeled in the Reference case based on economic conditions.

Table 1. Comparison of modeled and planned coal-fired generator retirements, Reference case and Corporate Goal case, 2020–2050 gigawatts (GW)

Type of generator retirement	Reference case	Corporate Goal case	Difference
Modeled	55.5	42.3	13.2
Planned	55.7	79.6	23.9
Total	111.1	121.8	10.7

Source: U.S. Energy Information Administration, Annual Energy Outlook 2021, Reference case and Corporate Goal case runs made for this report.
Note: Totals may not equal the sum of the components as a result of independent rounding.

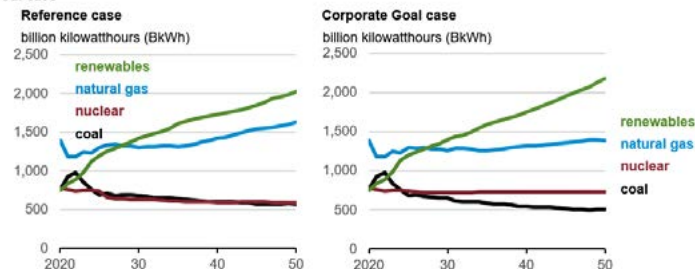
In the Corporate Goal case, nuclear generation contributes to many utilities’ stated carbon-free generation goals. Nuclear retirements total 29 GW over the projection period in the Reference case, and nuclear plants retire as late as 2047. Nuclear retirements in the Corporate Goal case reach 11 GW in 2027, but the model does not retire any additional nuclear capacity during the rest of the projection period.

Electricity Generation

The Corporate Goal case projects a different electricity-generation fuel mix over time compared with the Reference case (Figure 1). Dispatch decisions in the model occur on economic grounds subject to the limits of the case, and the modeled corporate goals are the only additional constraints to this case when compared with the Reference case. In the Corporate Goal case, EIA projects 142 billion kilowatthours (“BkWh”), or 24%, more nuclear generation in 2050 than in the Reference case. Fewer nuclear plants retire because nuclear generation and renewables help meet the carbon-

free generation requirements and limit growth in natural gas-fired generation. The Corporate Goal case projects 240 BkWh (14.7%) less natural gas-fired generation and 66 BkWh (11.4%) less coal-fired generation in 2050 when compared with the Reference case. Generation from renewable sources increases by 154 BkWh (7.6%) by 2050 in the Corporate Goal case when compared with the Reference case.

Figure 1. Electricity generation by fuel type, 2020–2050, AEO2021 Reference case and the Corporate Goal case



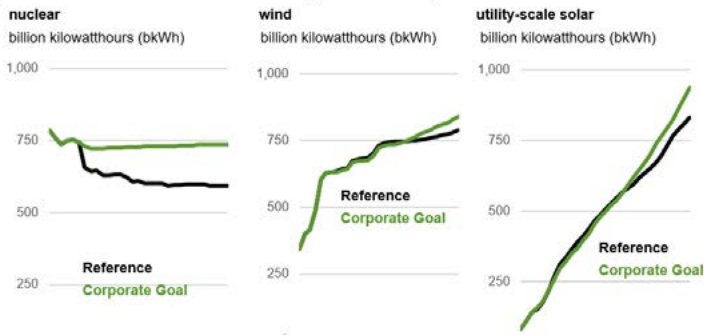
Source: U.S. Energy Information Administration, Annual Energy Outlook 2021, Reference case and Corporate Goal case runs made for this report.

In the Corporate Goal case, maintaining existing nuclear generation is among the lowest-cost options for meeting clean energy or carbon reduction goals because existing nuclear plants typically have operation and maintenance costs that are less than the cost of building new low-carbon capacity. To meet projected load growth, as well as to replace generation from retired fossil-fueled generating units, newly added carbon-free generation displaces the most expensive generation sources first, predominately yet-to-be-built fossil fuel (such as natural gas) capacity and existing natural gas generators that provide power during times of peak demand.

By 2050, EIA projects that coal-fired generation will be 11%, or 66 BkWh, lower in the Corporate Goal case than in the Reference case. Coal-fired generation in 2050 will be 511 BkWh in the Corporate Goal case, compared with 589 BkWh in the Reference case. Coal-fired generation that retires in the Corporate Goal case, either planned or modeled, generally represents generating units that are operating uneconomically or will become uneconomical over the projection period. More-efficient coal-fired generating units that operate during more hours of the year, paired with a larger nuclear fleet, provide a lower-cost alternative to retiring coal-fired generation and nuclear fleets in the Corporate Goal case, replacing them with new renewables and natural gas-fired generating units.

Projected levels of nuclear generation differ between the Reference case and the Corporate Goal case (Figure 2). This difference is primarily the result of nuclear plants that would otherwise retire for economic reasons in the Reference case but do not retire in the Corporate Goal case. In the Corporate Goal case, nuclear generation flattens out after 2025, when the last planned nuclear unit retirement reported to us occurs. In the Corporate Goal case, the nuclear plants that would otherwise be retired by the model in the Reference case continue to operate because they contribute to the carbon-free generation goals of the corporate entities. No new nuclear plants are added in either case. Small increases in nuclear generation in the later years result from modeled uprates for the remaining nuclear fleet, which slightly increase the overall capacity of each remaining plant.

Figure 2. Electricity generation from nuclear, wind (onshore and offshore), and utility-scale photovoltaic in the Reference case and Corporate Goal case, 2020–2050



Wind generation in the Corporate Goal case changes only slightly relative to the Reference case until 2035, when wind generation increases to 6.4% more than in the Reference case (Figure 2) by 2050. Similarly, photovoltaic solar generation remains unchanged relative to the Reference case until 2040. After 2040, utility-scale solar generation increases 12.7% more than in the Reference case by 2050.

In the Reference case, RPS-eligible generation exceeds the total renewable generation requirement through 2050, suggesting that renewables are largely built, not strictly to meet compliance, but because they are the most cost-effective technology to meet generation needs (Figure 3). Adding corporate goals to the state RPS requirements increases the total amount of zero-carbon generation available to ensure compliance with all policies. However, most state RPS policies do not include nuclear generation, but most corporate goals do allow nuclear generation to count toward carbon-free generation. Even with the higher target for carbon-free generation in the Corporate Goal case, the excess generation from compliant technologies still exceeds the total required generation for both state RPS and corporate carbon reduction goals in the early years. However, by 2050, the projected compliant generation and required generation are almost the same; compliant generation exceeds required generation by 390 BkWh.

Figure 3. Total qualifying carbon-free generation required for state renewable portfolio standards and projected total generation from compliant technologies, Reference case, 2020–2050

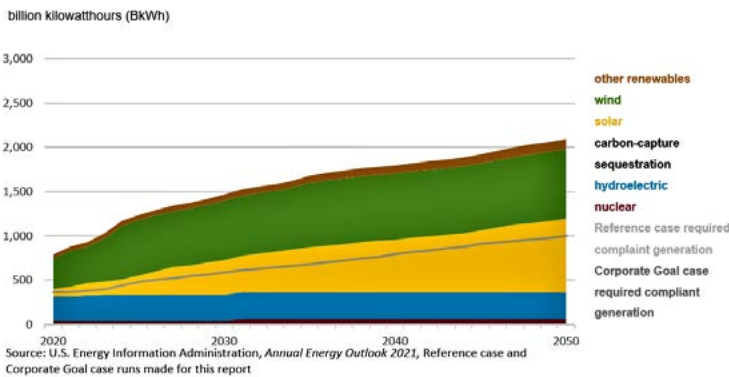
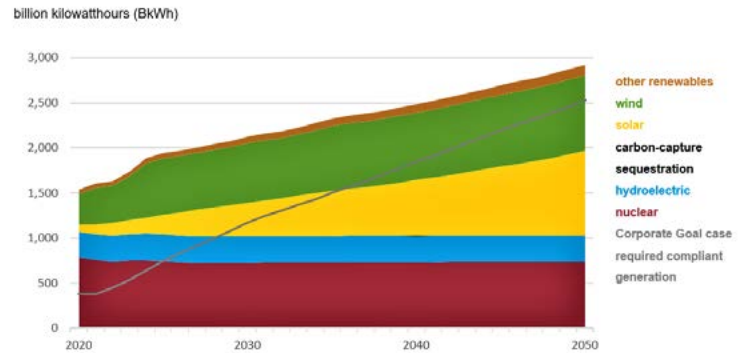


Figure 4. Total qualifying carbon-free generation required for combined state renewable portfolio standards and corporate goals and projected total generation from compliant technologies, Corporate Goal case, 2020–2050

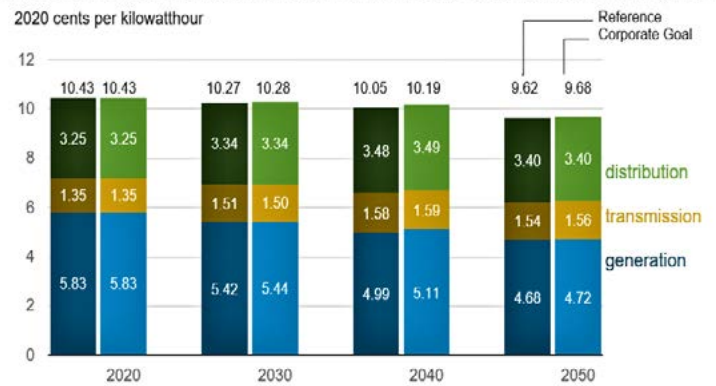


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2021*, Reference case and Corporate Goal case runs made for this report

Electricity Prices

The average electricity price for all sectors declines over time in both cases although the resulting electricity price is \$0.06/kWh higher in the Corporate Goal case in 2050 compared with the Reference case. Overall, the generation component of electricity prices falls in the later years as a result of the increasing penetration of renewables in both cases. Transmission prices increase after 2020, but they fluctuate slightly through the remainder of the projection period. Distribution costs also increase after 2020, but they fluctuate throughout the projection period.

Figure 5. U.S. average electricity prices in the Reference case and Corporate Goal case, 2020–2050



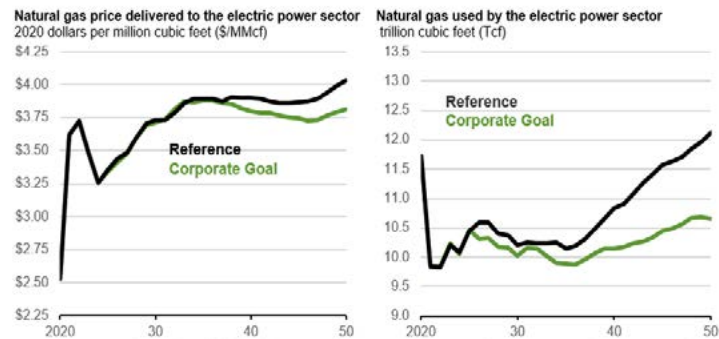
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2021*, Reference case and Corporate Goal case runs made for this report

Natural Gas

Natural gas consumed by the electric power sector differs between the two cases (Figure 5). Utilities rely on renewables and nuclear to meet their carbon reduction goals in the Corporate Goal case, and they use less natural gas to meet electricity demand than in the Reference case. This shift results in 12.1% less natural gas consumed by the electric power sector in most years of the projection period in the Corporate Goal case compared with the Reference case. As a consequence, natural gas prices decline, and the price of natural gas delivered to the electricity sector is 5.4% per million British thermal unit (“MMBtu”) lower in the

Corporate Goal case compared with the Reference case. Despite decreases in natural gas consumption in the electric power sector in the Corporate Goal case, overall U.S. production of natural gas declines 2.9% because of consistent consumption in the industrial sector and export demand attributed to lower prices. This slight decrease results in the average delivered price for natural gas across all sectors to decline by 1.5% per MMBtu.

Figure 6. Natural gas consumptions and prices in the Reference case and Corporate Goal case, 2020–2050



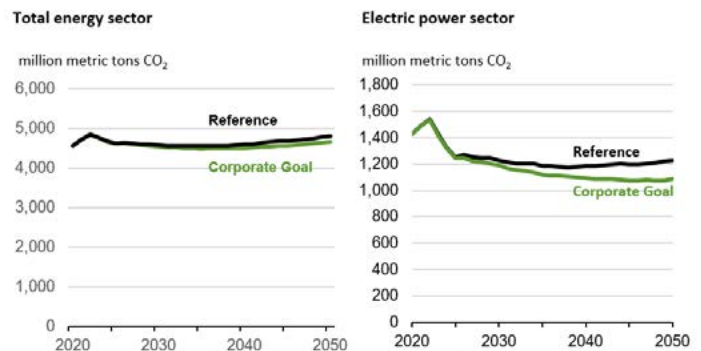
Source: U.S. Energy Information Administration, Annual Energy Outlook 2021, Reference case and Corporate Goal case runs made for this report

Electricity-Related CO2 Emissions

In 2050, CO2 emissions from the electric power sector in the Corporate Goal case are 11.6% lower than in the Reference case because additional carbon-neutral generation resources contribute to a higher share of generation. U.S. electricity-related CO2 emissions across both cases diverge beginning in 2025. Before

2025, electricity-related CO2 emissions decline in both cases as a result of similar levels of planned retirements of coal-fired generating units. Across both cases, starting in 2025, factors such as continued low natural gas prices (compared with historical prices) and compliance with the Affordable Clean Energy Rule (“ACE Rule”) drive the retirement of coal-fired generating units. After 2025, when the ACE Rule takes full effect across both cases, the remaining coal-fired generating plants operate at higher utilization rates following the retirement of older, less efficient coal plants, leaving only the more efficient plants in operation in both cases. After 2025, higher projected generation from natural gas in the Reference case than in the Corporate Goal case results in slightly higher electricity-related CO2 emissions in the Reference case when compared with the Corporate Goal case.

Figure 7. Carbon dioxide (CO₂) emissions in the total energy sector and the electric power sector in the Reference case and Corporate Goal case, 2020–2050



Source: U.S. Energy Information Administration, Annual Energy Outlook 2021, Reference case and Corporate Goal case runs made for this report

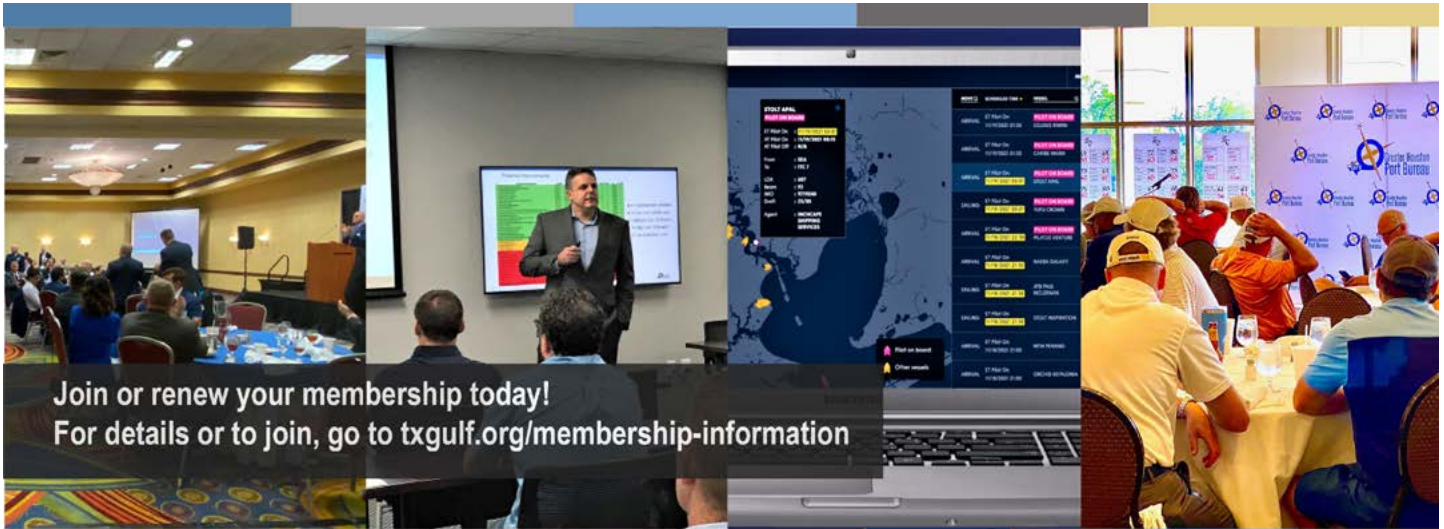
For the Appendix and other data, visit: eia.gov/outlooks/aeo/corporate_goal/.

BARGING AHEAD

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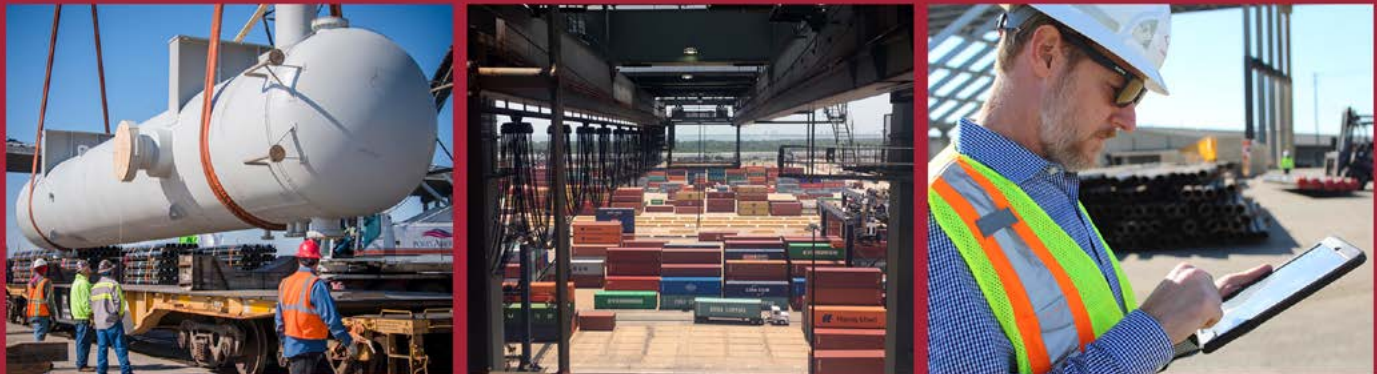
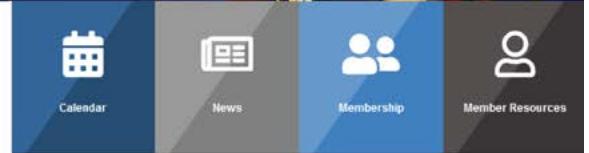
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February 2022 Commerce Club Featuring Manolo Sánchez, Adjunct Professor at Rice University's Jones Graduate School of Business



Sánchez Shares Cryptocurrency Impact in Global Market



Manolo Sánchez
Adjunct Professor
Rice University's Jones
Graduate School of
Business

Manolo Sánchez, an adjunct professor at Rice University's Jones Graduate School of Business, presented "How Cryptocurrencies Revolutionize Money and Rearchitect Trust Systems in our Society" to guests at the February 10 Commerce Club. The event was hosted at the Houston Marriott South at Hobby Airport.

Sánchez discussed the events leading to the birth of Bitcoin as a concept and the spreading influence of cryptocurrencies in today's global marketplace. His presentation included a lively Q&A. The subject is also

informatively recapped in more detail in the guest article on page 6 he authored for the Port Bureau in this month's magazine.

A director at Fannie Mae, Stewart Information Systems, and BanCoppel (Mexico) after having served as chairman and CEO of BBVA Compass for 10 years, Sánchez teaches disruption in financial services with a focus on cryptocurrencies and blockchain at the Jones Graduate School of Business. He is also an advisor to several fintech and blockchain start-ups, including SpringLabs (blockchain-based credit and identity data), Securitize (blockchain digital securities platform), and Topl (supply blockchain focused on ethical and sustainable practices).

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Cocktails & Networking Event

When: April 4, 4:00 PM – 5:30 PM (CDT)
Where: Port Bureau Office 4400 Hwy 225 E, Suite 200, Deer Park, TX 77536

Registration: www.bit.ly/3spRhde

3rd Annual Port of the Future Conference

When: April 5-7
Where: Marriott Marquis Houston

Registration:

www.portofthefutureconference.com

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